SAFETY WARNING

OPERATING HANDOOK

PLACE IN PILOT'S

Vacuum / Pressure Gyroscopic Flight Instrument Power System

ATTENTION: **MECHANIC/SERVICE FACILITY**
This important notice must be given to the Owner / Operator of the aircraft into which this air pump is installed. FAILURE TO DO SO MAY RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

ATTENTION: **AIRCRAFT OWNER/OPERATOR**
This important notice must be (1) read and understood and followed before operating the aircraft into which this air pump is installed, (2) distributed to all pilots using the aircraft, and (3) permanently retained in the Pilot's Operating Handbook for this aircraft. FAILURE TO DO SO MAY RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

Parker Aerospace

Parker Hannifin Corporation
Airborne Division
711 Taylor St.
Elyria, Ohio 44035 USA
(440) 284-6300

SI3001-7 12/8/86 (Reprinted June 2001)

Subject: SAFETY WARNING – Vacuum/Pressure Gyroscopic Flight Instrument Power System.

Applicability: This document communicates safety warning information concerning aircraft using air pumps to power gyro flight instruments while flying Instrument Flight Rules (IFR).

WARNING: FAILURE TO FOLLOW THE FOLLOWING INSTRUCTIONS MAY RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

1. A BACK-UP PNEUMATIC POWER SOURCE FOR THE AIR DRIVEN GYROS, OR A BACK-UP ELECTRIC ATTITUDE GYRO INSTRUMENT, MUST BE INSTALLED IN ALL AIRCRAFT WHICH FLY IFR.
2. ANY INOPERATIVE AIR PUMP OR OTHER COMPONENT OF THE GYRO SYSTEM, AND ANY INOPERATIVE BACK-UP SYSTEM OR COMPONENT, MUST BE REPLACED PRIOR TO THE NEXT FLIGHT.
3. THIS PILOT SAFETY WARNING MUST BE PERMANENTLY RETAINED IN THE PILOT'S OPERATING HANDBOOK FOR THE AIRCRAFT INTO WHICH THIS AIR PUMP IS INSTALLED.

Explanation: Failure of the air pump or any other component of the pneumatic system during IFR flight in Instrument Meteorological Conditions (IMC) can lead to spatial disorientation of the pilot and subsequent loss of aircraft control. This could result in an accident causing death, bodily injury, or property damage.

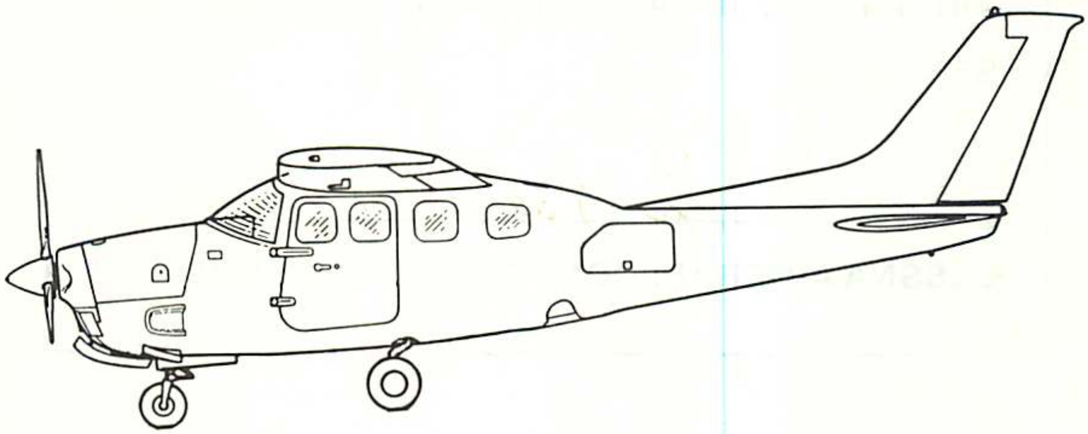
Use of single-engine aircraft in IMC is increasing. Many single-engine aircraft do not have a back-up pneumatic power source or back-up electric attitude gyro instruments. In aircraft without such back-up devices, the pilot due to added workload may not be able to fly the aircraft with only "partial panel" instruments (that is, turn and slip indicator, altimeter, and airspeed indicator) in the event of primary air pump or pneumatic system failure during IMC.

Air pump or pneumatic system failures can and do occur without warning. This can be a result of various factors, including but not limited to normal wear-out of components, improper installation or maintenance, premature failure, or the use of substandard overhauled components. It is recommended that an annunciator light or other device be installed to warn the pilot of loss of gyro power so that the pilot can take corrective action prior to the loss of correct gyro information.

Since air pump life cannot be accurately predicted and air pumps can fail without warning, the instructions set forth in this document must be followed.

PLACE IN PILOT'S OPERATING HANDBOOK

PILOT'S OPERATING HANDBOOK
and
FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1980 MODEL P210N

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

Serial No. P21000523

Registration No. N731PJ

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR PART 3 AND FAR PART 23 AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

Member of GAMA

1 OCTOBER 1979

THIS MANUAL WAS PROVIDED FOR THE AIRPLANE IDENTIFIED ON THE TITLE PAGE ON 5-6-80. SUBSEQUENT REVISIONS SUPPLIED BY CESSNA AIRCRAFT COMPANY MUST BE PROPERLY INSERTED.

Lee Little

CESSNA AIRCRAFT COMPANY, PAWNEE DIVISION

CONGRATULATIONS ....

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

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

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

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

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

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

PERFORMANCE - SPECIFICATIONS

SPEED:		
Maximum at 17,000 Ft		196 KNOTS
Cruise, 80% Power at 20,000 Ft		187 KNOTS
Cruise, 80% Power at 10,000 Ft		172 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.		
80% Power at 20,000 Ft	Range	680 NM
534 Pounds Usable Fuel	Time	3.8 HRS
80% Power at 10,000 Ft	Range	650 NM
534 Pounds Usable Fuel	Time	3.9 HRS
Maximum Range at 20,000 Ft	Range	895 NM
534 Pounds Usable Fuel	Time	6.6 HRS
Maximum Range at 10,000 Ft	Range	925 NM
534 Pounds Usable Fuel	Time	7.7 HRS
RATE OF CLIMB:		
Sea Level		930 FPM
10,000 Ft		795 FPM
20,000 Ft		470 FPM
CERTIFICATED MAXIMUM OPERATING ALTITUDE		23,000 FT
TAKEOFF PERFORMANCE:		
Ground Roll		1300 FT
Total Distance Over 50-Ft Obstacle		2160 FT
LANDING PERFORMANCE:		
Ground Roll		765 FT
Total Distance Over 50-Ft Obstacle		1500 FT
STALL SPEED (KCAS):		
Flaps Up, Power Off		67 KNOTS
Flaps Down, Power Off		58 KNOTS
MAXIMUM WEIGHT:		
Ramp		4016 LBS
Takeoff		4000 LBS
Landing		3800 LBS
STANDARD EMPTY WEIGHT:		
Pressurized Centurion		2342 LBS
Pressurized Centurion II		2406 LBS
MAXIMUM USEFUL LOAD:		
Pressurized Centurion		1674 LBS
Pressurized Centurion II		1610 LBS
BAGGAGE ALLOWANCE:		200 LBS
WING LOADING: Pounds/Sq Ft		22.9
POWER LOADING: Pounds/HP		12.9
FUEL CAPACITY: Total		90 GAL.
OIL CAPACITY		11 QTS
ENGINE: Teledyne Continental, Turbocharged Fuel Injection		TSIO-520-P
310 BHP at 2700 RPM (5-Minute Takeoff Rating)		
285 BHP at 2600 RPM (Maximum Continuous Rating)		
PROPELLER: 3-Bladed Constant Speed, Diameter		80 IN.

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

REVISION

PRESSURIZED CENTURION
1980 MODEL P210N
PILOT'S OPERATING HANDBOOK

REVISION 7
26 AUGUST 1981

D1188R7-13PH

INSERT THE FOLLOWING REVISED PAGES
INTO THE BASIC PILOT'S OPERATING HANDBOOK

COVERAGE

The Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft ompany contains information applicable to the 1980 Model P210N airplane designated by the serial umber and registration number shown on the Title Page of this handbook. This information is based on data available at the time of publication.

REVISIONS

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

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

NOTE

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

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

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

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

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

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:

Original	1 October 1979
Revision 1	15 November 1979
Revision 2	10 December 1979
Revision 3	28 March 1980
Revision 4	20 August 1980
Revision 5	7 November 1980
Revision 6	15 May 1981
Revision 7	26 August 1981

Page	Date
Title	1 October 1979
Assignment Record	1 October 1979
i	1 October 1979
ii	15 May 1981
*iii thru iv	26 August 1981
v	7 November 1980
vi Blank	7 November 1980
1-1 thru 1-2	1 October 1979
1-3	15 May 1981
1-4	1 October 1979
1-5	15 May 1981
1-6 thru 1-8	1 October 1979
2-1	7 November 1980
2-2 Blank	7 November 1980
2-3 thru 2-4	1 October 1979
2-5 thru 2-6	15 May 1981
2-7	1 October 1979
*2-8	26 August 1981
2-9 thru 2-10	1 October 1979
2-11	15 May 1981
2-12 thru 2-13	1 October 1979
2-14	7 November 1980
3-1 thru 3-2	10 December 1979
3-3 thru 3-6	1 October 1979
3-7 thru 3-8	15 May 1981
3-9	1 October 1979
3-10	7 November 1980
3-11 thru 3-15	10 December 1979
3-16 Blank	1 October 1979
3-17 thru 3-20	1 October 1979

LOG OF EFFECTIVE PAGES (Continued)

Page	Date
3-21	7 November 1980
3-22 thru 3-28	1 October 1979
*4-1	26 August 1981
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4-9	15 May 1981
*4-10 thru 4-14	26 August 1981
4-15 thru 4-17	1 October 1979
4-18	15 May 1981
4-19	1 October 1979
*4-20 thru 4-22A	26 August 1981
*4-22B Blank	26 August 1981
*4-23	26 August 1981
4-24 thru 4-25	1 October 1979
4-26	15 May 1981
4-27	1 October 1979
4-28 Blank	1 October 1979
5-1	15 May 1981
5-2 Blank	15 May 1981
5-3	1 October 1979
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5-8 thru 5-9	1 October 1979
5-10 thru 5-11	7 November 1980
5-12 thru 5-13	1 October 1979
5-14	15 May 1981
5-15	7 November 1980
*5-16	26 August 1981
5-17 thru 5-18	15 May 1981
*5-19 thru 5-30	26 August 1981
5-31 thru 5-35	15 May 1981
5-36 Blank	15 May 1981
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6-14 Blank	1 October 1979
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7-4 Blank	1 October 1979
7-5 thru 7-21	1 October 1979
7-22	15 May 1981
7-23	7 November 1980
7-24	15 May 1981
7-25	1 October 1979
7-26 thru 7-27	15 May 1981
7-28	1 October 1979
7-29 thru 7-30	15 May 1981
7-31 thru 7-42	1 October 1979
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7-45	1 October 1979
7-46	7 November 1980
7-47 thru 7-52	1 October 1979
7-53	15 November 1979
7-54 thru 7-64	1 October 1979
8-1	1 October 1979
8-2 Blank	1 October 1979
8-3	1 October 1979
*8-4 thru 8-5	26 August 1981
8-6 thru 8-17	1 October 1979
8-18 Blank	1 October 1979
9-1 thru 9-2	15 November 1979
9-3	1 October 1979
9-4 Blank	1 October 1979

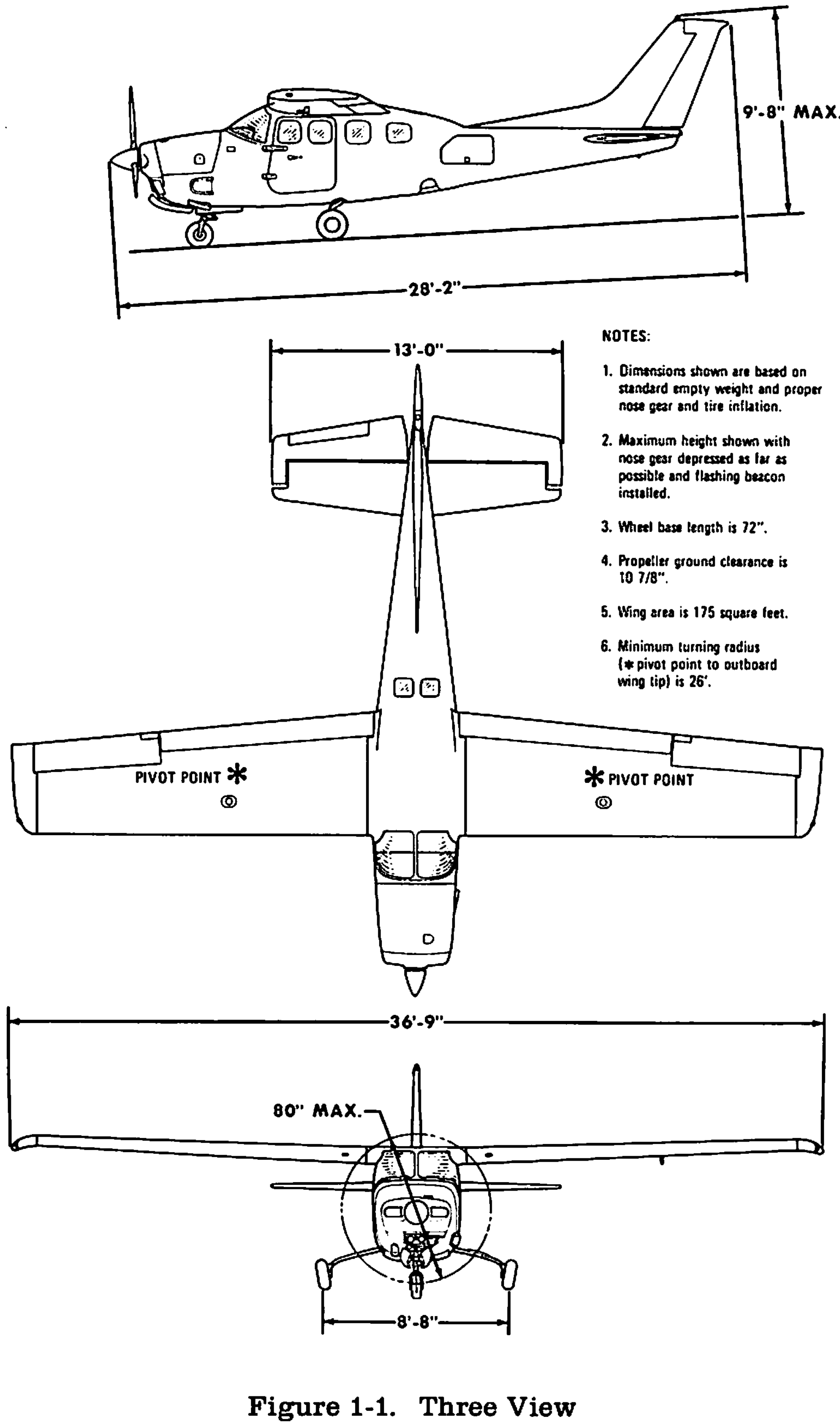
NOTE

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

SECTION 1
GENERAL

TABLE OF CONTENTS

Page



NOTES:

1. Dimensions shown are based on standard empty weight and proper nose gear and tire inflation.
2. Maximum height shown with nose gear depressed as far as possible and flashing beacon installed.
3. Wheel base length is 72".
4. Propeller ground clearance is 10 7/8".
5. Wing area is 175 square feet.
6. Minimum turning radius (* pivot point to outboard wing tip) is 26'.

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 and FAR Part 23. 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-P.
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 35.5 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).

NOTE

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

additional information.
Total Capacity: 90 gallons.
Total Capacity Each Tank: 45 gallons.
Total Usable: 89 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-24 (and all revisions thereto). Ashless Dispersant Oil: This oil **must be used** after first 50 hours or oil consumption has stabilized.
Recommended Viscosity for Temperature Range:
All temperatures, use SAE 20W-50 or
Above 4°C (40°F), use SAE 50
Below 4°C (40°F), use SAE 30

NOTE

Multi-viscosity oil with a range of SAE 20W-50 is recommended for improved starting and turbocharger controller operation in cold weather.

Oil Capacity:
Sump: 10 Quarts.
Total: 11 Quarts (with oil filter).

MAXIMUM CERTIFICATED WEIGHTS

Ramp: 4016 lbs.
Takeoff: 4000 lbs.
Landing: 3800 lbs.
Weight in Baggage Compartment:
Baggage Area "A" - Station 124 to 152: 200 lbs.
Baggage Area "B" - Station 152 to 166: 80 lbs.

NOTE

The maximum allowable combined weight capacity for baggage areas A and B is 200 pounds.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, Pressurized Centurion: 2342 lbs.
Pressurized Centurion II: 2406 lbs.
Maximum Useful Load, Pressurized Centurion: 1674 lbs.
Pressurized Centurion II: 1610 lbs.

CABIN AND ENTRY DIMENSIONS

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

BAGGAGE SPACE AND ENTRY DIMENSIONS

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

SPECIFIC LOADINGS

Wing Loading: 22.9 lbs./sq. ft.
Power Loading: 12.9 lbs./hp.

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

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

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

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

V_A — **Maneuvering Speed** is the maximum speed at which you may use abrupt control travel.

V_{FE} — **Maximum Flap Extended Speed** is the highest speed permissible with wing flaps in a prescribed extended position.

V_{LE} — **Maximum Landing Gear Extended Speed** is the maximum speed at which an airplane can be safely flown with the landing gear extended.

V_{LO} — **Maximum Landing Gear Operating Speed** is the maximum speed at which the landing gear can be safely extended or retracted.

V_{NO} — **Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, then only with caution.

V_{NE} — **Never Exceed Speed** is the speed limit that may not be exceeded at any time.

V_S — **Stalling Speed or the minimum steady flight speed** at which the airplane is controllable.

V_{S_O} — **Stalling Speed or the minimum steady flight speed** at which the airplane is controllable in the landing configuration at the most forward center of gravity.

V_X — **Best Angle-of-Climb Speed** is the speed which results in the greatest gain of altitude in a given horizontal distance.

V_Y — **Best Rate-of-Climb Speed** is the speed which results in the greatest gain in altitude in a given time.

METEOROLOGICAL TERMINOLOGY

OAT — **Outside Air Temperature** is the free air static temperature. It is expressed in either degrees Celsius or degrees Fahrenheit.

Standard Temperature — **Standard Temperature** is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 feet of altitude.

Pressure Altitude — **Pressure Altitude** is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013 mb).

ENGINE POWER TERMINOLOGY

BHP — **Brake Horsepower** is the power developed by the engine. Percent power values in this handbook are based on the maximum continuous power rating.

RPM	**Revolutions Per Minute** is engine speed.
MP	**Manifold Pressure** is a pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

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

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	**Station** is a location along the airplane fuselage given in terms of the distance from the reference datum.
Arm	**Arm** is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	**Moment** is the product of the weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.)

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

CESSNA AIRCRAFT COMPANY
AIRWORTHINESS DIRECTIVE
SMALL AIRCRAFT AND ROTORCRAFT

98-05-14 R1 CESSNA AIRCRAFT COMPANY: Amendment 39-10773; Docket No. 97-CE-62-AD; Revises AD 98-05-14, Amendment 39-10375.

Applicability: Models T210N (serial numbers 21063641 through 21064897), P210N (serial numbers P21000386 through P21000834), and P210R (all serial numbers) airplanes; certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (d) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated in the body of this AD, unless already accomplished.

To minimize the potential hazards associated with operating the airplane in severe icing conditions by providing more clearly defined procedures and limitations associated with such conditions, accomplish the following:

(a) Within 30 days after April 30, 1998 (the effective date AD 98-05-14), accomplish the requirements of paragraphs (a)(1) and (a)(2) of this AD.

NOTE 2: Operators should initiate action to notify and ensure that flight crewmembers are apprised of this change.

(1) Revise the FAA-approved Airplane Flight Manual (AFM) by incorporating the following into the Limitations Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

"WARNING

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

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

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

Accumulation of ice on the lower surface of the wing aft of the protected area.

- Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.
- All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night. [NOTE: This supersedes any relief provided by the Master Minimum Equipment List (MMEL).]"

(2) Revise the FAA-approved AFM by incorporating the following into the Normal Procedures Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

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

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

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT:

These procedures are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees

Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following:

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

(b) Incorporating the AFM revisions, as required by this AD, may be performed by the owner/operator holding at least a private pilot certificate as authorized by section 43.7 of the Federal Aviation Regulations (14 CFR 43.7), and must be entered into the aircraft records showing compliance with this AD in accordance with section 43.9 of the Federal Aviation Regulations (14 CFR 43.9).

(c) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

(d) An alternative method of compliance or adjustment of the compliance time that provides an equivalent level of safety may be approved by the Manager, Small Airplane Directorate, FAA, 1201 Walnut, suite 900, Kansas City, Missouri 64106. The request shall be forwarded through an appropriate FAA Maintenance Inspector, who may add comments and then send it to the Manager, Small Airplane Directorate.

NOTE 3: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Small Airplane Directorate.

(e) All persons affected by this directive may examine information related to this AD at the FAA, Central Region, Office of the Regional Counsel, Room 1558, 601 E. 12th Street, Kansas City, Missouri 64106.

(f) This amendment revises AD 98-05-14, Amendment 39-10375.

(g) This amendment becomes effective on September 22, 1998.

FOR FURTHER INFORMATION CONTACT:

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SECTION 2
LIMITATIONS

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INTRODUCTION

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

NOTE

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

NOTE

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

Your Cessna is certificated under FAA Type Certificate No. 3A21 as Cessna Model No. P210N.

AIRSPEED LIMITATIONS

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

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	195	200	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	165	167	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 4000 Pounds 3350 Pounds 2700 Pounds	 129 118 105	 130 119 106	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: To 10^o Flaps 10^o - 20^o Flaps 20^o - 30^o Flaps	 159 131 116	 160 130 115	Do not exceed these speeds with the given flap settings.
V_{LO}	Maximum Landing Gear Operating Speed	163	165	Do not extend or retract landing gear above this speed.
V_{LE}	Maximum Landing Gear Extended Speed	195	200	Do not exceed this speed with landing gear extended.
	Maximum Window Open Speed	195	200	Do not exceed this speed with window open.

Figure 2-1. Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

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

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	58 - 115	Full Flap Operating Range. Lower limit is maximum weight V_{S_0} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	73 - 167	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	167 - 200	Operations must be conducted with caution and only in smooth air.
Red Line	200	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: TSIO-520-P.
Engine Operating Limits for Takeoff and Continuous Operations:

Maximum Power, 5 Minutes - Takeoff: 310 BHP rating.
Continuous: 285 BHP.
Maximum Engine Speed, 5 Minutes - Takeoff: 2700 RPM.
Continuous: 2600 RPM.
Maximum Manifold Pressure,
5 Minutes - Takeoff: 36.5 inches Hg. (from sea level to 17,000 feet).
Continuous: 35.5 inches Hg from sea level to 17,000 feet.
33.5 inches Hg at 19,000 feet.
31.5 inches Hg at 21,000 feet.
29.5 inches Hg at 23,000 feet.
Maximum Cylinder Head Temperature: 460°F (238°C).
Maximum Oil Temperature: 240°F (116°C).
Oil Pressure, Minimum: 10 psi.
Maximum: 100 psi.
Fuel Pressure, Minimum: 3.0 psi.
Maximum: 19.5 psi (186 lbs/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 except for the takeoff minimum fuel flow setting of 180 lbs/hr which is indicated by a white triangle on the fuel flow indicator.

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 - 31 in. Hg	35.5 - 36.5 in. Hg	---	36.5 in. Hg
Oil Temperature	---	100° - 240°F	---	---	240°F
Cylinder Head Temperature	---	200° - 460°F	---	---	460°F
Fuel Flow (Pressure)	(3.0 psi)	36 - 125 lbs/hr	---	125 - 162 lbs/hr	186 lbs/hr (19.5 psi)
Oil Pressure	10 psi	30 - 60 psi	---	---	100 psi
Fuel Quantity	E (.5 Gal Unusable Each Tank)	---	---	---	---
Suction	---	4.6 - 5.4 in. Hg.	---	---	---

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Ramp Weight: 4016 lbs.
Maximum Takeoff Weight: 4000 lbs.
Maximum Landing Weight: 3800 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area "A" - Station 124 to 152: 200 lbs.
Baggage Area "B" - Station 152 to 166: 80 lbs.

NOTE

The maximum allowable combined weight capacity for baggage areas A and B is 200 pounds.

CENTER OF GRAVITY LIMITS

Center of Gravity Range with Landing Gear Extended:
Forward: 37.0 inches aft of datum at 3000 lbs. or less, with straight line variation to 42.5 inches aft of datum at 3800 lbs. and with straight line variation to 43.9 inches aft of datum at 4000 lbs.
Aft: 52 inches aft of datum at all weights.
Moment Change Due To Retracting Landing Gear: +2907 lb. -ins.
Reference Datum: Lower portion of front face of firewall.

MANEUVER LIMITS

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

Aerobatic maneuvers, including spins, are not approved.

FLIGHT LOAD FACTOR LIMITS

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

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

KINDS OF OPERATION LIMITS

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

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

2 Standard Tanks: 45 U.S. gallons each.
Total Fuel: 90 U.S. gallqns.
Usable Fuel (all flight conditions): 89 U.S. gallons.
Unusable Fuel: 1 U.S. gallon.

Takeoff and land on fuller tank.

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

MAXIMUM OPERATING ALTITUDE LIMIT

Certificated Maximum Operating Altitude: 23,000 Feet.

CABIN PRESSURIZATION LIMITS

Normal Cabin Operating Differential Pressure: 0 to 3.35 psi.
Maximum Cabin Operating Differential Pressure: 3.35 psi.
Landing with cabin pressurized is prohibited.

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 20°.
Approved Landing Range: 0° to 30°.

EGT LIMITATIONS

Use of an exhaust gas temperature (EGT) indicator to set mixture is prohibited:

1. Above either 80% power or 2500 RPM at any altitude.
2. Above the following power settings when outside air temperature is above standard:
   a. 75% at 17,000 feet or higher
   b. 70% at 20,000 feet or higher
   c. 65% at 22,000 feet or higher

All EGT operation must be accomplished in accordance with EGT limitations in Section 4.

FUEL FLOW AND LEANING PROCEDURES

Takeoff manifold pressure and fuel flow must be adjusted per Section 4 of the Pilot's Operating Handbook (POH) under "Takeoff Power Check."

During maximum continous power operation, maintain fuel flow at not less than 162 pounds per hour (PPH). (Top of the white arc).

For maximum cruise power (33" MP/2500 RPM), do not lean below 125 PPH.

At 60% power or less as defined by the POH, normal fuel flow settings or normal leaning with the exhaust gas temperature (EGT) may be used in accordance with the POH.

Above 60% power, do not lean to "peak EGT" at any time.

Between 60% and 80% power, do not lean unless an EGT indicator is installed. If an EGT indicator is installed, do not lean EGT above that EGT needle position established during engine operation at 33" MP, 2500 RPM and 125 PPH fuel flow.

PLACARDS

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

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

> The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the Normal Category. Other operating limitations which must be complied with when operating this airplane in this category are contained in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
>
> No acrobatic maneuvers, including spins, approved.
>
> Landing with cabin pressurized is prohibited.
>
> 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. Near landing gear lever:

> MAX SPEED IAS
>
> GEAR OPER 165 KTS
> GEAR DOWN 200 KTS

3. Near the airspeed indicator:

> MANEUVER SPEED - 130 KIAS

4. On control lock:

CONTROL LOCK - REMOVE BEFORE STARTING ENGINE.

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

OFF. LEFT ON - 44.5 GAL. RIGHT ON - 44.5 GAL. TAKEOFF AND LAND ON FULLER TANK.

6. Near fuel selector valve:

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

7. Aft of fuel tank caps:

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

8. Forward of fuel tank caps:

CAPACITY 33.5 GALLONS TO BOTTOM OF FILLER NECK EXTENSION

9. On baggage compartment door:

MAX BAGGAGE 200 LBS. TOTAL
RAISED AREA AFT OF BAGGAGE
DOOR 80 LBS MAX. REFER TO WEIGHT
AND BALANCE DATA FOR BAGGAGE/
CARGO LOADING.

10. On hand pump cover:

MANUAL GEAR EXTENSION

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

CAUTION
DO NOT PUMP WITH
GEAR UP SELECTED

11. Near the engine power instruments:

MINIMUM FUEL FLOWS

TAKEOFF: 2700 RPM
36.5 IN. MP., 180 LBS/HR

MAX. CONTINUOUS POWER: 2600 RPM

ALT-FT/1000	SL-17	18	19	20	21	22	23
MP. IN. HG	35.5	34.5	33.5	32.5	31.5	30.5	29.5
FUEL FLOW-LBS/HR	162	156	150	144	138	132	126

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

12. On flap control indicator:

0°-10°	(Partial flap range with dark blue color code and 160 knot callout; also, mechanical detent at 10°.)
10°- 20°	(Indices at these positions with light blue color code and 130 knot callout; also, mechanical detent at 20°.)
20°-FULL	(Indices at these positions with white color code and 115 knot callout.)

13. On inside nose wheel doors:

WARNING

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

14. Near pilot's outside door handle:

CLOSE
OPEN

15. Near emergency button to unlock pilot's cabin door from the outside:

EMERGENCY
PUSH TO UNLOCK

16. Near secondary lock for pilot's inside door handle:

DOOR HANDLE SAFETY LOCK
PUSH FLUSH TO LOCK
PULL TO UNLOCK

17. Near inside cabin door handle:

TO CLOSE DOOR

1. OPEN VENT WINDOW
2. PULL DOOR WITHIN 4-5 INCHES CLOSED - THEN CLOSE BRISKLY USING ASSIST STRAP.
3. ROTATE HANDLE FWD TO LOCK

TO OPEN DOOR

1. UNLOCK SAFETY LOCK (PULL OUT)
2. ROTATE HANDLE TO "OPEN" POSITION
3. PUSH DOOR OUTWARD

18. Near pilot's inside door handle:

CLOSE
OPEN ←→ LOCK

19. Near emergency exit handle:

OPEN ←→ CLOSE ←→ LATCH
PUSH FLUSH
TO LOCK
CLOSE AND LOCK FOR FLIGHT

20. Near emergency exit handle:

EMERGENCY EXIT - TO OPEN

1. LIFT HANDLE (DO NOT PULL INWARD)
2. ROTATE COUNTERCLOCKWISE TO "OPEN" POSITION
3. PUSH DOOR OUTWARD

21. On oil filler cap:

OIL 10 QTS

22. On the nose gear shock strut:

WARNING RELEASE AIR AND FLUID PRESSURE BEFORE REMOVING ANY PART OF THIS ASSEMBLY.

23. A calibration card is provided to indicate the accuracy of the magnetic compass in 30° increments.

24. In full view of the pilot:

MAJOR FUEL FLOW FLUCTUATIONS/POWER SURGES 1. AUX FUEL PUMP - ON, ADJUST MIXTURE. 2. SELECT OPPOSITE TANK. 3. WHEN FUEL FLOW STEADY, RESUME NORMAL OPERATIONS. SEE P.O.H. FOR EXPANDED INSTRUCTIONS.

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

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

26. Near fuel flow indicator:

SET FUEL FLOW PER LIMITATIONS SECTION OF POH/AFM. DO NOT LEAN TO "PEAK EGT" ABOVE 60% POWER

SECTION 3
EMERGENCY PROCEDURES

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INTRODUCTION

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

AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff:	
Wing Flaps Up	85 KIAS
Wing Flaps Down	80 KIAS
Maneuvering Speed:	
4000 Lbs	130 KIAS
3350 Lbs	119 KIAS
2700 Lbs	106 KIAS
Maximum Glide:	
4000 Lbs	91 KIAS
3350 Lbs	83 KIAS
2700 Lbs	74 KIAS
Precautionary Landing With Engine Power	75 KIAS
Landing Without Engine Power:	
Wing Flaps Up	90 KIAS
Wing Flaps Down	80 KIAS
Emergency Descent:	
Smooth Air	200 KIAS
Rough Air:	
4000 Lbs	130 KIAS
3350 Lbs	119 KIAS
2700 Lbs	106 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 -- 85 KIAS.
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (30° recommended).
6. Master Switch -- OFF.
7. Cabin Door Safety Lock -- UNLOCK (pull out).

ENGINE FAILURE DURING FLIGHT (RESTART PROCEDURES)

1. Airspeed -- 85 KIAS.
2. Auxiliary Fuel Pump -- ON.
3. Fuel Selector Valve -- OPPOSITE TANK (if it contains fuel).
4. Throttle -- HALF OPEN.
5. Auxiliary Fuel Pump -- OFF.

NOTE

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

6. Mixture -- LEAN from full rich until restart occurs.

NOTE

If propeller is windmilling, engine will restart automatically within a few seconds. If propeller has stopped (possible at low speeds), turn ignition switch to START, advance throttle slowly from idle, and (at higher altitudes) lean the mixture from full rich.

7. Mixture -- ADJUST as required as power is restored.
8. Throttle -- ADJUST power as required.
9. Fuel Selector Valve -- AS DESIRED after fuel flow is stabilized.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 90 KIAS (flaps UP).
   80 KIAS (flaps DOWN).

2. Seat Belts and Shoulder Harnesses -- SECURE.
3. Mixture -- IDLE CUT-OFF.
4. Fuel Selector Valve -- OFF.
5. Ignition Switch -- OFF.
6. Landing Gear -- DOWN (UP if terrain is rough or soft).
7. Wing Flaps -- AS REQUIRED (30° recommended).
8. Door -- UNLATCH PRIOR TO TOUCHDOWN.
9. Master Switch -- OFF when landing is assured.
10. Touchdown -- SLIGHTLY TAIL LOW.
11. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Airspeed -- 85 KIAS.
3. Wing Flaps -- 10°.
4. Selected Field -- FLY OVER, noting terrain and obstructions.
5. All Switches (except avionics power, master and ignition) -- OFF.
6. Dump Valve Control Handle -- PULL OUT.
7. Landing Gear -- DOWN (UP if terrain is rough or soft).
8. Wing Flaps -- 30° (on final approach).
9. Airspeed -- 75 KIAS.
10. Door -- UNLATCH PRIOR TO TOUCHDOWN.
11. Avionics Power and Master Switches -- OFF when landing is assured.
12. Touchdown -- SLIGHTLY TAIL LOW.
13. Ignition Switch -- OFF.
14. Brakes -- APPLY HEAVILY.

DITCHING

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

NOTE

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

7. Seat Belts and Shoulder Harnesses -- SECURE.
8. Cabin Pressurization Switch -- OFF.
9. Cabin Door -- UNLATCH.
10. Touchdown -- LEVEL ATTITUDE AT 300 FT/MIN DESCENT.
11. Face -- CUSHION at touchdown with folded coat.
12. Airplane -- EVACUATE through cabin door and emergency exit. If necessary, open the openable window and flood cabin to equalize pressure so cabin door and emergency exit can be opened.
13. 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. Airplane -- EVACUATE.
9. 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.

10. 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. Dump Valve Control Handle -- PULL OUT.
4. Electrical Load -- REDUCE.
5. Airspeed -- 120 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. Forced Landing -- EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1. Master Switch -- OFF.

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

2. Standby Generator Switch (if installed) -- OFF.
3. Avionics Power Switch -- OFF.
4. All Other Switches (except ignition switch, and if pressurized, cabin pressurization switch) -- OFF.
5. Overhead Vents -- CLOSED (to avoid drafts).

NOTE

If pressurized, reduce power to minimum required for pressurization (18 In. Hg) to reduce airflow into the cabin.

6. 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 pressurized, increase power to increase bleed airflow into cabin. If unpressurized, also open overhead vents, and if necessary, openable window.

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

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

CABIN FIRE

1. Master Switch -- OFF.

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

2. Overhead Vents -- CLOSED (to avoid drafts).

NOTE

If pressurized, reduce power to minimum required for pressurization (18 In. Hg) to reduce airflow into the cabin.

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. If pressurized, increase power to increase bleed airflow into cabin. If unpressurized, also open overhead vents, and if necessary, openable window.

4. Land the airplane as soon as possible to inspect for damage. Use electrical power as required until landing is assured.

ENGINE FIRE IN FLIGHT

1. Mixture -- IDLE CUT-OFF.
2. Fuel Selector Valve -- OFF.
3. Dump Valve Control Handle -- PULL OUT.
4. Electrical Load -- REDUCE.
5. Airspeed -- 120 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. Forced Landing -- EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1. Master Switch -- OFF.

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

2. Standby Generator Switch (if installed) -- OFF.
3. Avionics Power Switch -- OFF.
4. All Other Switches (except ignition switch, and if pressurized, cabin pressurization switch) -- OFF.
5. Overhead Vents -- CLOSED (to avoid drafts).

NOTE

If pressurized, reduce power to minimum required for pressurization (17 In. Hg) to reduce airflow into the cabin.

6. 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 pressurized, increase power to increase bleed airflow into cabin. If unpressurized, open overhead vents and if necessary openable window.

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

CABIN FIRE

1. Master Switch -- OFF.

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

2. Overhead Vents -- CLOSED (to avoid drafts).

NOTE

If pressurized, reduce power to minimum required for pressurization (17 in. Hg) to reduce airflow into the cabin.

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. If pressurized, increase power to increase bleed airflow into cabin. If unpressurized, open overhead vents and if necessary openable window.

4. Land the airplane as soon as possible to inspect for damage. Use electrical power as required until landing is assured.

WING FIRE

1. Navigation Light Switch -- OFF.
2. Pitot Heat Switch (if installed) -- OFF.
3. Strobe Light Switch (if installed) -- OFF.
4. Radar (if installed) -- OFF.

NOTE

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

ICING

INADVERTENT ICING ENCOUNTER

1. Turn pitot heat 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 and defrost controls full out to obtain maximum windshield defroster effectiveness.
4. Increase engine speed to minimize ice build-up on propeller blades. If excessive vibration is noted, momentarily reduce engine speed to 2200 RPM with the propeller control, and then rapidly move the control full forward.

NOTE

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

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

NOTE

If ice accumulates on the intake filter (causing the alternate air valve to open), a decrease of 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° to 20° landing flap setting for ice accumulations of 1 inch or less. With heavier ice accumulations, approach with flaps retracted to ensure adequate elevator effectiveness in the approach and landing.
10. Approach at 85 to 95 KIAS with 20° flaps and 95 to 105 KIAS with 0° to 10° flaps, depending upon the amount of ice accumulation. If ice accumulation is unusually large, decelerate to the planned approach speed while in the approach configuration (landing gear and flaps down) at a high enough altitude which would permit recovery in the event that a stall buffet is encountered.
11. Land on the main wheels first, avoiding the slow and high type of flare-out.
12. Missed approaches should be avoided whenever possible because of severely reduced climb capability. However, if a go-around is mandatory, make the decision much earlier in the approach than normal. Apply maximum power and maintain 95 KIAS while retracting the flaps slowly in 10° increments. Retract the landing gear after immediate obstacles are cleared.

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. Alternate Static Source Valve -- PULL ON.
2. Airspeed -- Climb 4 knots faster and approach 7 knots faster than normal or consult appropriate table in Section 5.
3. Altitude -- Cruise 70 feet higher and approach 50 feet higher than normal.

EXCESSIVE FUEL VAPOR

FUEL FLOW STABILIZATION PROCEDURES
(If Fuel Flow Fluctuations Of 5 Lbs/Hr Or More Or Power Surges Occur)

1. Auxiliary Fuel Pump -- ON.
2. Mixture -- RESET as required.
3. Fuel Selector Valve -- SELECT OPPOSITE TANK if vapor symptoms continue.

NOTE

If the opposite tank cannot be used because of a lack of fuel, then retarding the throttle quickly to 10 inches or less of manifold pressure for 30 seconds will also aid in eliminating vapor in the system. To restore power, switch auxiliary fuel pump OFF, advance the throttle (slowly at higher altitudes) and adjust the mixture as required to aid power restoration.

4. Auxiliary Fuel Pump -- OFF after fuel flow has stabilized.
5. Mixture -- RESET as required.
6. Fuel Selector Valve -- AS DESIRED after fuel flow has stabilized for one minute, provided there is fuel in the other tank.

LANDING GEAR MALFUNCTION PROCEDURES

LANDING GEAR FAILS TO RETRACT

1. Master Switch -- ON.
2. Landing Gear Lever -- CHECK (lever full up).
3. Landing Gear and Gear Pump Circuit Breakers -- IN.
4. Gear Up Light -- CHECK.
5. Landing Gear Lever -- RECYCLE.
6. Gear Motor -- CHECK operation (ammeter and noise).

LANDING GEAR FAILS TO EXTEND

1. Landing Gear Lever -- DOWN.
2. Emergency Hand Pump -- EXTEND HANDLE, and PUMP (perpendicular to handle until resistance becomes heavy -- about 35 cycles).
3. Gear Down Light -- ON.
4. Pump Handle -- STOW.

GEAR UP LANDING

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Landing Gear Lever -- UP.
3. Landing Gear and Gear Pump Circuit Breakers -- IN.
4. Runway -- SELECT longest hard surface or smooth sod runway available.
5. Wing Flaps -- 30° (on final approach).
6. Airspeed -- 75 KIAS.
7. Cabin Door -- UNLATCH PRIOR TO TOUCHDOWN.
8. Avionics Power and Master Switches -- OFF when landing is assured.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Mixture -- IDLE CUT-OFF.
11. Ignition Switch -- OFF.
12. Fuel Selector Valve -- OFF.
13. Airplane -- EVACUATE.

LANDING WITHOUT POSITIVE INDICATION OF GEAR LOCKING

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

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

1. Movable Load -- TRANSFER to rear seat.
2. Passenger -- MOVE to rear seat.
3. Before Landing Checklist -- COMPLETE.
4. Runway -- SELECT LONGEST, HARD SURFACE or SMOOTH SOD available.
5. Wing Flaps -- 30°.
6. Cabin Door -- UNLATCH PRIOR TO TOUCHDOWN.
7. Avionics Power and Master Switches -- OFF when landing is assured.
8. Land -- SLIGHTLY TAIL LOW.
9. Mixture -- IDLE CUT-OFF.
10. Ignition Switch -- OFF.
11. Fuel Selector Valve -- OFF.
12. Elevator Control -- HOLD NOSE OFF GROUND as long as possible.
13. Airplane -- EVACUATE as soon as it stops.

LANDING WITH A FLAT MAIN TIRE

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

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

AMMETER SHOWS EXCESSIVE RATE OF CHARGE (Full Scale Deflection)

1. Alternator -- OFF.
2. Alternator Circuit Breaker -- PULL.

3. Standby Generator Switch (if installed) -- ON.
4. Nonessential Electrical Equipment -- OFF.
5. Flight -- TERMINATE as soon as practical.

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

NOTE

Illumination of the low-voltage light may occur during low RPM conditions with an electrical load on the system such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

1. Avionics Power Switch -- OFF.
2. Alternator Circuit Breaker -- CHECK IN.
3. Master Switch -- OFF (both sides).

NOTE

If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

4. Master Switch -- ON.
5. Low-Voltage Light -- CHECK OFF.
6. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

7. Alternator -- OFF.
8. Standby Generator Switch (if installed) -- ON.
9. Nonessential Radio and Electrical Equipment -- OFF.
10. Flight -- TERMINATE as soon as practical.

PRESSURIZATION SYSTEM EMERGENCIES

PRESSURIZED AIR CONTAMINATION - CABIN HEAT ON

1. Cabin Heat Control -- PUSH OFF.

PRESSURIZED AIR CONTAMINATION - CABIN HEAT OFF

Use the following procedure only in the event that pressurized air contamination is severe enough to require immediate dumping of the pressurized air while above 12,500 feet rather than minor enough to allow a pressurized descent to 12,500 feet or less first.

1. Oxygen (if installed) -- USE.
2. Dump Valve Control Handle -- PULL OUT.
3. Cabin Pressurization Switch -- OFF.
4. Overhead Vents/Openable Window -- ON/OPEN as required to ventilate the cabin.
5. Emergency Descent -- PERFORM as outlined in this section.
6. Flight -- TERMINATE as soon as practical.

IMPENDING FAILURE OF WINDOW OR DOOR, OR CABIN OVER-PRESSURE (ABOVE 3.5 PSI)

1. Cabin Pressurization Switch -- OFF.
2. Dump Valve Control Handle -- PULL OUT.
3. If above 12,500 feet without supplemental oxygen, perform an emergency descent as outlined in this section.
4. If supplemental oxygen is available, check that each occupant is using oxygen in accordance with the appropriate procedures in Section 9.
5. Descend to 12,500 feet or below, prior to exhaustion of oxygen supply.
6. Dump Valve Control Handle -- PUSH IN (if cabin heating is required after cabin is depressurized).
7. Flight -- TERMINATE as soon as practical.

EMERGENCY DESCENT PROCEDURES

SMOOTH AIR

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Throttle -- IDLE.
3. Propeller -- HIGH RPM.
4. Mixture -- FULL RICH.
5. Landing Gear -- EXTEND.
6. Wing Flaps -- UP.
7. Airspeed:
   a. During landing gear extension -- 165 KIAS.
   b. After landing gear is fully extended -- 200 KIAS.

ROUGH AIR

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Throttle -- IDLE.

3. Propeller -- HIGH RPM.
4. Mixture -- FULL RICH.
5. Landing Gear -- EXTEND.
6. Wing Flaps -- UP.
7. Weights and Airspeeds:
   4000 Lbs -- 130 KIAS
   3350 Lbs -- 119 KIAS
   2700 Lbs -- 106 KIAS

INADVERTENT OPENING OF CABIN DOOR IN FLIGHT

1. Altitude -- CLIMB (after takeoff) or DESCEND (if above 12,500 feet) to a safe altitude. Do not exceed 167 KIAS with cabin door open.
2. Airspeed -- MAINTAIN 100 KIAS while closing door.
3. Pilot's Seat -- SLIDE AFT slightly at a safe altitude.
4. Openable Window -- OPEN inward (but not aft).
5. Door Handle -- POSITION (in detent at approximately the 1 o'clock position).
6. Door -- CLOSE and LATCH.
7. Door Handle Safety Lock -- LOCK.
8. Landing -- Make normal approach and landing if door fails to close and latch.

INADVERTENT OPENING OF EMERGENCY EXIT IN FLIGHT

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Altitude -- CLIMB (after takeoff) or DESCEND (if above 12,500 feet) to a safe altitude. Do not exceed 167 KIAS with emergency exit open.
3. Openable Window -- OPEN (to reduce buffeting).
4. Airspeed -- MAINTAIN 100 KIAS while closing exit.
5. Copilot's Seat -- SLIDE AFT.
6. Emergency Exit -- CLOSE and LOCK.
7. Landing -- Make normal approach and landing if window cannot be closed.

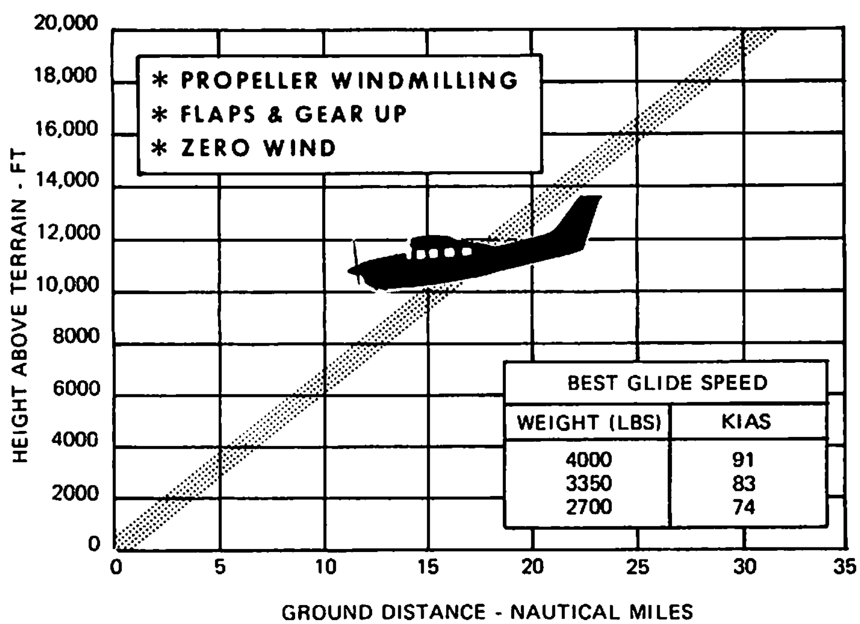
AMPLIFIED PROCEDURES

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.



BEST GLIDE SPEED	
WEIGHT (LBS)	KIAS
4000	91
3350	83
2700	74

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

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

LANDING WITHOUT ELEVATOR CONTROL

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

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

FIRES

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

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

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

INADVERTENT FLIGHT INTO ICING CONDITIONS

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

STATIC SOURCE BLOCKED

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

Baggage compartment pressures will be affected by pressurization, open window and varying airspeeds, and this will affect the readings.

With the cabin pressurized, maximum airspeed and altimeter variation from normal reaches 7 knots and 140 feet respectively at maximum cruise (instruments read high). At climb speeds, typical variations are 4 knots and 30 feet respectively (reads high).

With the cabin unpressurized , dump valve open, vents closed, and the window closed, variations up to 9 knots and 50 feet occur near stall (reads high) and 6 knots and 100 feet at maximum cruise (reads high). During approach, typical variations are 10 knots and 80 feet (reads high).

With the cabin unpressurized, dump valve closed, vents open, and the window closed, variations up to 4 knots and 20 feet occur near stall (reads high) and 2 knots and 30 feet at maximum cruise (reads high). During approach, typical variations are 4 knots and 30 feet, respectively (reads high).

With the cabin unpressurized and the window open, variations up to 5 knots and 30 feet occur near stall (reads high) and 6 knots and 100 feet at maximum cruise (reads high). During approach, typical variations are 7 knots and 55 feet (reads high).

With the alternate static source on, fly the airplane at airspeeds and altitudes which compensate for the variations from normal indications. For more exact airspeed correction, refer to the alternate static source airspeed calibration table in Section 5, appropriate to the pressurization and window configuration.

SPINS

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

1. RETARD THROTTLE TO IDLE POSITION.
2. PLACE AILERONS IN NEUTRAL POSITION.
3. APPLY AND **HOLD** FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
4. JUST **AFTER** THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL. Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.
5. **HOLD** THESE CONTROL INPUTS UNTIL ROTATION STOPS. Premature relaxation of the control inputs may extend the recovery.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

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

ROUGH ENGINE OPERATION OR LOSS OF POWER

SPARK PLUG FOULING

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

MAGNETO MALFUNCTION

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

ENGINE-DRIVEN FUEL PUMP FAILURE

Failure of the engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication **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 during landing.

EXCESSIVE FUEL VAPOR INDICATIONS

Excessive fuel vapor indications are most likely to appear during climb and the first hour of cruise on each tank, especially when operating at higher altitudes or in unusually warm temperatures.

Indications of excessive fuel vapor accumulation are fuel flow gage fluctuations greater than 5 lbs./hr. This condition with leaner mixtures or with larger fluctuations may result in power surges, and if not corrected, may cause power loss.

To eliminate vapor and stabilize fuel flows, turn the auxiliary fuel pump on and reset the mixture as required. If vapor symptoms persist, select the opposite fuel tank. When fuel flows stabilize, turn off the auxiliary fuel pump and reset the mixture as desired.

LOW OIL PRESSURE

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

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

LANDING GEAR MALFUNCTION PROCEDURES

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

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

RETRACTION MALFUNCTIONS

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

EXTENSION MALFUNCTIONS

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

A checklist is provided for step-by-step instructions for a manual gear extension.

If gear motor operation is audible after a period of one minute following gear lever extension actuation, pull the GEAR PUMP circuit breaker to prevent the electric motor from overheating. In this event, remember to re-engage the circuit breaker just prior to landing.

GEAR UP LANDING

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

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

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

EXCESSIVE RATE OF CHARGE

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

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

INSUFFICIENT RATE OF CHARGE

NOTE

> Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

If the over-voltage sensor should shut down the alternator, or if the alternator circuit breaker should trip, a discharge rate will be shown on the ammeter followed by illumination of the low-voltage warning light. Since this may be a "nuisance" trip-out, an attempt should be made to reactivate the alternator system.

NOTE

> If operating in unpressurized flight, the dump valve control handle should be pulled to the dump position prior to shutting off all electrical power, to avoid the possibility of sudden pressurization of the cabin.

To do this, turn the avionics power switch off, check that the alternator circuit breaker is in, then turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the low-voltage light will go off. The avionics power switch may then be turned back on. If the light illuminates again, a malfunction is confirmed. In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. If the standby generator is installed, it should be turned on for the remainder of the flight. In any case, battery power must be conserved for later operation of the landing gear and wing flaps and, if the emergency occurs at night, for possible use of the landing lights during landing.

PRESSURIZATION AIR CONTAMINATION

Strong fumes (smoke or odors) coming from the pressurization air outlets when the heater is turned on high and which go away when the heater is turned off, indicate oil contamination, either from recent ground pressurization system maintenance or from a malfunction in the turbo-charger lubricating system. Inspect and repair, if needed, at the earliest opportunity.

If fumes occur or do not clear up with the heater off, determine if the contamination is severe enough to require an immediate depressurization and an emergency descent rather than minor enough to allow a pressurized descent to 12,500 feet or less before depressurizing and ventilating the cabin. In this case, the flight should be terminated as soon as practical and the pressurization system, engine induction and exhaust components should be inspected and repaired.

INADVERTENT OPENING OF CABIN DOOR IN FLIGHT

If the cabin door should inadvertently open in flight while unpressurized or while just beginning to pressurize due to probable improper latching or locking procedure, turn the cabin pressurization switch off, and if desired, attempt to close the door in flight at a safe altitude following the checklist in this section. To facilitate closing the door, open the openable window inward (but not aft) to relieve cabin pressure, and slide the seat aft slightly (so as to retain control of the airplane) to obtain a better grasp of the door grip. It is important that the door handle be in the detent at approximately the 1 o'clock position prior to pulling the door closed, followed immediately by rotating the handle forward to latch.

If the cabin door inadvertently opens when locked closed, the flight should be terminated as soon as practical and repairs made.

Flight characteristics are normal in any flap position with the cabin door open.

INADVERTENT OPENING OF EMERGENCY EXIT IN FLIGHT

If the emergency exit should inadvertently open in flight while unpressurized or when just beginning to pressurize due to probable improper latching or locking procedure, the flight may be continued after closing the emergency exit following the checklist in this section.

If the emergency exit inadvertently opens when locked closed, the flight should be terminated as soon as practical and repairs made.

Flight characteristics are normal in any flap position with the emergency exit open, although a moderately strong buffet exists in the cabin due to air pressure fluctuations. This buffet can be minimized by opening the openable window.

SECTION 4
NORMAL PROCEDURES

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AMPLIFIED PROCEDURES

INTRODUCTION

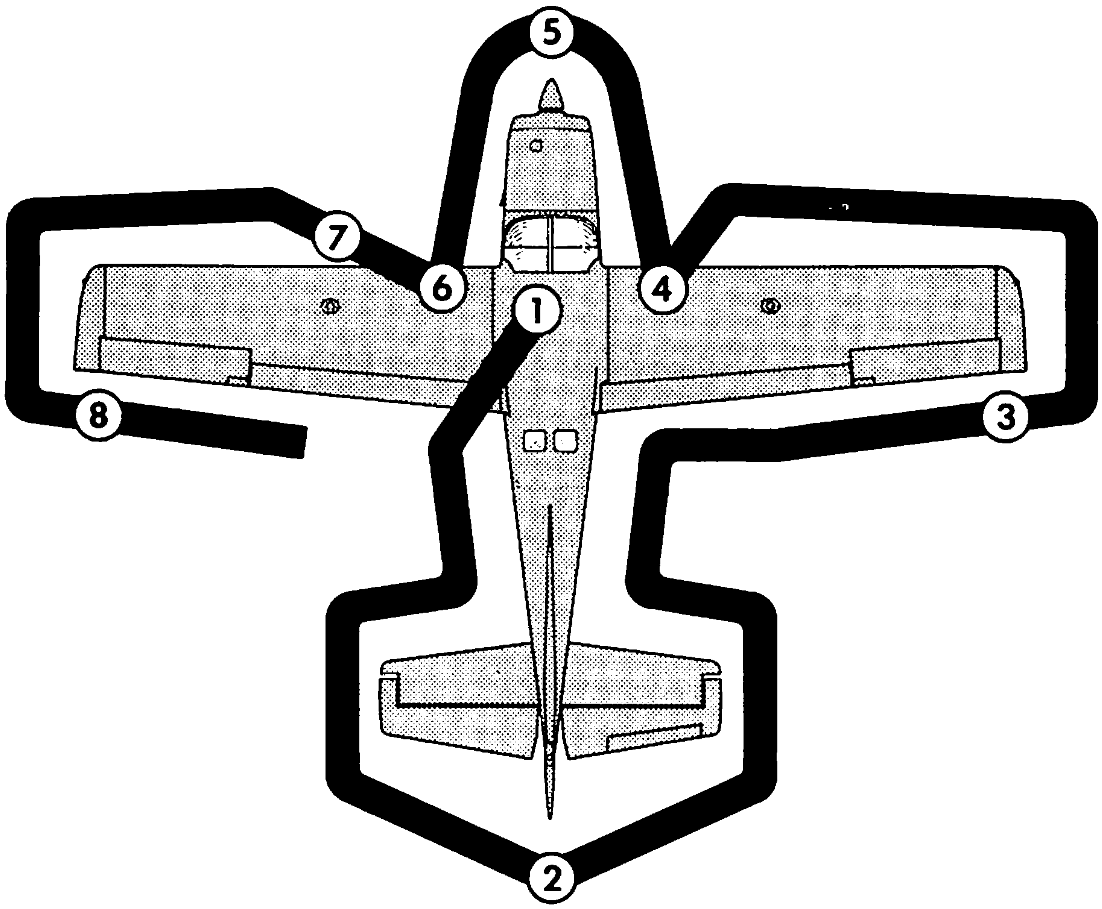
Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 4000 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	80-90 KIAS
Short Field Takeoff, Flaps 10°, Speed at 50 Feet	78 KIAS
Enroute Climb, Flaps and Gear Up:	
Normal	110-120 KIAS
Best Rate of Climb, Sea Level to 17,000 Feet	100 KIAS
Best Rate of Climb, 23,000 Feet	97 KIAS
Best Angle of Climb, All Altitudes	80 KIAS
Landing Approach (3800 Lbs):	
Normal Approach, Flaps Up	80-90 KIAS
Normal Approach, Flaps 30°	70-80 KIAS
Short Field Approach, Flaps 30°	72 KIAS
Balked Landing (3800 Lbs):	
Maximum Power, Flaps 20°	70 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
4000 Lbs	130 KIAS
3350 Lbs	119 KIAS
2700 Lbs	106 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff or Landing	21 KNOTS

50° CW 17-25KTS "TOUGH"
30° CW 18-28KTS "TOUGH" TOO



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

"DO NO REMOVE FROM POH"
Installed in POH of N731RJ on 5/24/93
To c/w AD 92-26-04 Rev date Suspended 1/22/93
James D. Hogan IA 506785481

BW 93-02

CESSNA AIRCRAFT CORPORATION
AIRWORTHINESS DIRECTIVE
SUSPENSION
SMALL AIRCRAFT & ROTORCRAFT

The effective date of this AD is suspended effective 1/22/93.

92-26-04 CESSNA: Amendment 39-8431. Docket No. 90-CE-58-AD.

Applicability: Models 210 and T210 series airplanes (serial numbers (S/N) 21058819 through 21065009), Model T210 series airplanes (S/N T210-0198 through T210-0454), and Model P210 series airplanes (S/N P21000001 through P21000874), certificated in any category.

Compliance: Required within the next 12 calendar months after the effective date of this AD, unless already accomplished.

To prevent loss of engine power caused by inadvertent fuel loss or inadequate fuel servicing, accomplish the following:

(a) Incorporate the PILOT OPERATING PROCEDURES - PREFLIGHT FUEL SYSTEM QUANTITY CHECK that is Figure 1 of this AD into the airplane flight manual or airplane records.

FIGURE 1

PILOT OPERATING PROCEDURES - PREFLIGHT FUEL SYSTEM QUANTITY CHECK

The following procedures are to be used on certain Cessna 210 Series airplanes whenever more than 75 gallons of fuel are needed for range and reserve.

1. Verify that the airplane is level laterally and is approximately 4.5 degrees nose up (normal nose strut on a level surface).

NOTE: The airplane turn and bank instrument may be used to check lateral leveling.

2. Visually inspect each fuel tank for fuel level with the upper wing surface when full fuel capacity is intended to be in each tank.

3. Check each fuel cap and seal for security and wing surface for a lack of fuel stains aft of each fuel cap.

NOTE: It is highly recommended that the tips and flap trailing edges are checked during flight for evidence of fuel syphoning.

(b) The incorporation of Figure 1 of this AD into the airplane flight manual or airplane records as required by paragraph (a) of this AD may be performed by the owner/operator holding at least a private pilot certificate as authorized by FAR 43.7, and must be entered into the aircraft records showing compliance with this AD in accordance with FAR 43.11.

(c) Calibrate the fuel quantity indicating system by accomplishing the calibration procedures that are outlined in the applicable maintenance manual. Prior to further flight, correct any deficiencies detected as a result of these procedures.

(d) If either of the criteria specified in paragraphs (d)(1) or (d)(2) are applicable, install raised fuel caps in accordance with the instructions to Cessna Service Kit SK210-136, which is referenced by Cessna SB SEB91-10, dated October 25, 1991; or Supplemental Type Certificate SA2456CE (owned by Mr. William J. Barton) for Monarch Air & Development, Inc., Assembly No. WW-100-2 fuel caps (only).

CHECKLIST PROCEDURES

PREFLIGHT INSPECTION

(1) CABIN

1. Pilot's Operating Handbook -- AVAILABLE IN THE AIRPLANE.
2. Landing Gear Lever -- DOWN.
3. Control Wheel Lock -- REMOVE.
4. Ignition Switch -- OFF.
5. Radar (if installed) -- OFF.
6. Avionics Power Switch -- OFF.
7. Standby Generator Switch (if installed) -- OFF.
8. Master Switch -- ON.

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

9. Fuel Quantity Indicators -- CHECK QUANTITY.
10. Fuel Selector Valve -- ON fuller tank.
11. Oxygen Expended Lights (if installed) -- CHECK.
12. Master Switch -- OFF.
13. Trim Controls -- NEUTRAL.
14. Static Pressure Alternate Source Valve -- OFF.
15. Oxygen System (if installed) -- CHECK MASKS and HOSES.
16. Windshield and Windows -- CHECK for CRACKS.
17. Static Source Openings (both sides of fuselage) -- CHECK for stoppage.
18. Baggage Door -- CHECK for security.

(2) EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down -- DISCONNECT.
3. Control Surfaces -- CHECK freedom of movement and security.

(3) RIGHT WING Trailing Edge

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

(4) RIGHT WING

1. Wing Tie-Down -- DISCONNECT.
2. Main Wheel Tire -- CHECK for proper inflation.
3. 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.
4. Fuel Quantity -- CHECK VISUALLY for desired level.
5. Fuel Filler Cap -- SECURE and vent unobstructed.
6. Radome (if weather radar is installed) -- CHECK for condition and security.

(5) NOSE

1. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
2. Air Inlets -- CHECK, engine induction air (right) and heat exchanger and oil cooler air (left) for restrictions.
3. Landing and Taxi Lights -- CHECK for condition and cleanliness.
4. Nose Gear Doors -- CHECK for security.
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 seven quarts. Fill to 10 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 fuel reservoir drain valves 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.

(8) LEFT WING Trailing Edge

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

BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Emergency Exit -- LOWER or CLOSE.
3. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
4. Cabin Door -- CLOSE and LOCK (with cabin door window open).
5. Openable Window -- AS DESIRED for ventilation.
6. Control Wheel Lock -- CHECK REMOVED.
7. Brakes -- TEST and SET.
8. Cowl Flaps -- OPEN (move lever out of locking hole to reposition).
9. 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.

10. Landing Gear Lever -- DOWN.
11. Master Switch -- ON.
12. Landing Gear Lights and Horn -- PRESS TO TEST.
13. Circuit Breakers -- CHECK IN.
14. Fuel Selector Valve -- FULLER TANK.
15. Cabin Pressurization:
    a. Dump Valve Control -- IN (OUT on warm days).
    b. Cabin Pressurization Switch -- ON (OFF on warm days).
    c. Cabin Altitude Selector -- SET (high on warm days).
    d. Cabin Altitude Warning Light -- PRESS TO TEST.

NOTE

For improved cabin comfort on warm days, the cabin altitude selector should be set to 8000 to 10,000 feet, the dump valve control should not be pushed in, and the pressurization switch should not be turned on until approaching the set altitude. With the individual overhead outlets open and the cabin ventilation fan on HIGH, this procedure will allow maximum entry and circulation of the cooler ram air from the wing airscoops while climbing or cruising through the warm lower altitudes. A similar procedure should be used for hot weather descents.

STARTING ENGINE

1. Mixture -- RICH.
2. Propeller -- HIGH RPM.
3. Throttle -- CLOSED.
4. Auxiliary Fuel Pump Switch -- ON.
5. Throttle -- ADVANCE to obtain 50-60 lbs/hr fuel flow, then RETURN to IDLE POSITION.
6. Auxiliary Fuel Pump Switch -- OFF.
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 -- RESET to desired idle speed.
12. Oil Pressure -- CHECK.
13. Low-Voltage Light -- OFF (at approximately 1000 RPM).
14. Flashing Beacon and Navigation Lights -- ON as required.
15. Avionics Power Switch -- ON.
16. Radios -- ON.

BEFORE TAKEOFF

1. Parking Brake -- SET.

Counsel, Room 1558, 601 East 12th Street, Kansas City, Missouri 64106.

This amendment becomes effective October 4, 1986.

APPENDIX 86-19-11

PILOT OPERATING PROCEDURES-PREFLIGHT FUEL SYSTEM CHECK

Fuel sampling: Fuel strainer, wing tank and reservoir quick drains.

1. Place a suitable container under the fuel strainer drain outlet prior to operating the strainer drain control for at least 4 seconds. Check strainer drain closed.

2. Inspect the fluid drained from the fuel strainer and each wing tank quick drain for evidence of fuel contamination in the form of water, rust, sludge, ice or any other substance not compatible with fuel. Also check for proper fuel grade before the first flight of each day and after each refueling. If any contamination is detected, comply with 4 below.

3. Repeat Steps 1 and 2 on each wing tank quick drain.

4. If the airplane has been exposed to rain, sleet or snow, or if the wing fuel tanks or fuel strainer drains produce water, the fuel reservoir(s) must be checked for the presence of water by operating the fuel reservoir quick drains. The airplane fuel system must be purged to the extent necessary to insure that there is no water, ice or other fuel contamination.

NOTE 1: The fuel reservoir(s) are located under the fuselage between the firewall and forward door post on all airplane models. Consult the pilots Operating Handbook or Owners Manual in order to determine if one or two reservoir(s) are installed.

NOTE 2: A check for the presence of water using the fuel reservoir quick drains prior to the first flight of each day is considered good operating practice.

(f) An alternative method of compliance or adjustment of the compliance time that provides an equivalent level of safety may be approved by the Manager, Wichita Aircraft Certification Office (ACO), 1801 Airport Road, Room 100, Mid-Continent Airport, Wichita, Kansas 67209. The request shall be forwarded through an appropriate FAA Maintenance Inspector, who may add comments and then send it to the Manager, Wichita ACO.

NOTE: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Wichita ACO.

(g) The replacement required by this AD shall be done in accordance with Cessna Service Kit SK210-136, which is referenced by Cessna Service Bulletin SEB91-10, dated October 25, 1991. This incorporation by reference was previously approved by the Director of the Federal Register as of January 23, 1993, in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from Cessna Aircraft Company, P.O. Box 7704, Wichita, Kansas 67277. Copies may be inspected at the FAA, Central Region, Office of the Assistant Chief Counsel, Room 1558, 601 E. 12th Street, Kansas City, Missouri, or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

(h) This amendment (39-8936) supersedes AD 92-26-04, Amendment 39-8431.

(i) This amendment becomes effective on July 22, 1994.

FOR FURTHER INFORMATION CONTACT: Mr. Paul O. Pendleton, Aerospace Engineer, FAA, Wichita Aircraft Certification Office, 1801 Airport Road, Room 100, Wichita, Kansas 67209; telephone (316) 946-4143; facsimile (316) 946-4407.

FIGURE 1

PILOT OPERATING PROCEDURES - PREFLIGHT FUEL SYSTEM QUANTITY CHECK

The following procedures are to be used on certain Cessna 210, P210, and T210 Series airplanes whenever more than 75 gallons of fuel are needed for range and reserve.

1. Verify that the airplane is level laterally and is approximately 4.5 degrees nose up (normal nose strut on a level surface).

NOTE: The airplane turn and bank instrument may be used to check lateral leveling.

2. Visually inspect each fuel tank for fuel level with the upper wing surface when full fuel capacity is intended to be in each tank.

3. Check each fuel cap and seal for security and wing surface for a lack of fuel stains aft of each fuel cap.

NOTE: It is highly recommended that the wing tips and flap trailing edges are checked during flight for evidence of fuel siphoning.

APPENDIX 86-19-11

PILOT OPERATING PROCEDURES-PREFLIGHT FUEL SYSTEM CHECK

Fuel sampling: Fuel strainer, wing tank and reservoir quick drains.

1. Place a suitable container under the fuel strainer drain outlet prior to operating the strainer drain control for at least 4 seconds. Check strainer drain closed

2. Inspect the fluid drained from the fuel strainer and each wing tank quick drain for evidence of fuel contamination in the form of water, rust, sludge, ice or any other substance not compatible with fuel. Also check for proper fuel grade before the first flight of each day and after each refueling. If any contamination is detected, comply with 4 below.

3. Repeat Steps 1 and 2 on each wing tank quick drain.

4. If the airplane has been exposed to rain, sleet or snow, or if the wing fuel tanks or fuel strainer drains produce water, the fuel reservoir(s) must be checked for the presence of water by operating the fuel reservoir quick drains. The airplane fuel system must be purged to the extent necessary to insure that there is no water, ice or other fuel contamination.

NOTE 1: The fuel reservoir(s) are located under the fuselage between the firewall and forward door post on all airplane models. Consult the Pilots Operating Handbook or Owners Manual in order to determine if one or two reservoir(s) are installed.

NOTE 2: A check for the presence of water using the fuel reservoir quick drains prior to the first flight of each day is considered good operating practice.

FAA APPROVED SUPPLEMENT TO THE
PILOT'S OPERATING HANDBOOK AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
FOR
CESSNA MODELS T210L, T210M, T210N, P210N,
AND T303 SERIES AIRCRAFT

REG. NO. 731 PJ
SER. NO. P21000523

This supplement must be attached to the FAA Approved Airplane Flight Manual on which Slick Aircraft Products Division, Unison Industries, Inc., Models 6220 or 6224 pressurized magnetos are installed. The information contained herein supplements or supersedes the basic manual only in those areas listed. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED:
Original signed by
W. F. Horn, Manager
Chicago Aircraft Certification
Office, FAA Central Region
DATE: April 1, 1988

AFMS for Cessna
T210L, T210M, T210N,
P210N, and T303
Series Aircraft

SECTION II. Limitations
No change.

SECTION III. Emergency Procedures.
No change.

SECTION IV. Normal Operating Procedures.

BEFORE TAKEOFF

Perform a magneto check of each engine at 1,700 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 doubt concerning operation of the ignition system, RPM checks at higher engine speed will usually confirm whether a deficiency exists.

CAUTION

Many non-ignition system factors influence engine performance during a magneto check, and the replacement or repair of ignition components may not remedy problems in all cases. After verifying that all non-ignition system related causes for problems have been explored, proceed with the inspection procedures as stated below. If the magneto check exceeds either of the above limits, both magnetos must be disassembled and inspected in accordance with Section III, 100-hour inspection of Slick Aircraft Products Division, Unison Industries, Inc., SB 1-88, dated April 10, 1988, or FAA approved equivalent. 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. Check ignition ground and magneto timing.

2. Cowl Flaps -- FULL OPEN.
3. Flight Controls -- FREE and CORRECT.
4. Flight Instruments -- CHECK.
5. Fuel Selector Valve -- FULLER TANK.
6. Auxiliary Fuel Pump Switch -- OFF.
7. Mixture -- RICH.
8. Elevator and Rudder Trim -- TAKEOFF.
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 in green arc.
10. Throttle -- 1000 RPM.
11. Radios -- SET.
12. Autopilot (if installed) -- OFF.
13. Air Conditioner (if installed) -- OFF.
14. Strobe Lights -- AS DESIRED.
15. Cabin Pressurization Controls -- RECHECK.
16. Cabin Door, Openable Window and Emergency Exit -- CLOSED and LOCKED.
17. Cabin Door Handle Safety Lock -- UNLOCKED (pulled out).
18. Throttle Friction Lock -- ADJUST.
19. Parking Brake - RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0°- 10° (10° preferred).
2. Power -- 36.5 INCHES Hg and 2700 RPM (5 minute limitation).
3. Mixture -- ADJUST to 180-186 lbs/hr.
4. Elevator Control -- LIFT NOSE WHEEL at 65-70 KIAS.

NOTE

When the nose wheel is lifted, the gear motor may run 2-3 seconds to restore hydraulic pressure.

5. Climb Speed -- 80-90 KIAS.
6. Brakes -- APPLY momentarily when airborne.
7. Landing Gear -- RETRACT in climb out.
8. Wing Flaps -- RETRACT after reaching 85 KIAS.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 10°.

2. Brakes -- APPLY.
3. Power -- 36.5 INCHES Hg and 2700 RPM (5 minute limitation).
4. Mixture -- ADJUST to 180 lbs/hr.
5. Brakes -- RELEASE.
6. Elevator Control -- LIFT NOSE WHEEL at 65 KIAS.
7. Climb Speed -- 78 KIAS until all obstacles are cleared.
8. Landing Gear -- RETRACT after obstacles are cleared.
9. Wing Flaps -- RETRACT after reaching 85 KIAS.

NOTE

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

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 110-120 KIAS.
2. Power -- 31 INCHES Hg and 2500 RPM (above 21,500 feet reduce manifold pressure in accordance with power and fuel flow placard).

NOTE

On hot days, use of 2600 RPM may be necessary at higher altitudes in order to maintain the desired manifold pressure. With 2600 RPM, set the fuel flow to correspond to the manifold pressure as shown on the power and fuel flow placard.

3. Mixture -- ADJUST to 125 lbs/hr. (for 31 inches Hg and 2500 RPM.)
4. Auxiliary Fuel Pump -- ON as required.

NOTE

During climb under warm day conditions, turn on the auxiliary fuel pump momentarily when switching tanks, and also be alert for fuel vapor indications. If fuel flow fluctuations or a dropoff is observed, place the auxiliary fuel pump switch in the ON position and reset the mixture control as required to maintain placarded fuel flow. If vapor symptoms persist, select the opposite fuel tank.

5. Cowl Flaps -- OPEN as required (full open on warm days).
6. Cabin Door Handle Safety Lock -- LOCK (before pressurizing).
7. Cabin Pressurization -- CHECK/PUSH dump valve control IN and CHECK/TURN pressurization switch ON at set altitude. CHECK maximum differential pressure at and above inner scale altitude.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 100 KIAS.
2. Power -- 35.5 INCHES Hg and 2600 RPM.
3. Mixture -- ADJUST to 162 lbs/hr.

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 above 15,000 feet, it may not be possible to maintain the placarded manifold pressure as the airplane climbs, even with full throttle. If this is the case, set fuel flow to correspond to available full throttle manifold pressure as shown on the power and fuel flow placard.

4. Auxiliary Fuel Pump -- ON as required.

NOTE

During climb under warm day conditions, turn on the auxiliary fuel pump momentarily when switching tanks, and also be alert for fuel vapor indications. If fuel flow fluctuations or a dropoff is observed, place the auxiliary fuel pump switch in the ON position and reset the mixture control as required to maintain placarded fuel flow. If vapor symptoms persist, select the opposite fuel tank.

5. Cowl Flaps -- FULL OPEN.
6. Cabin Door Handle Safety Lock -- LOCK (before pressurizing).
7. Cabin Pressurization -- CHECK/PUSH dump valve control IN and CHECK/TURN pressurization switch ON at set altitude. CHECK maximum differential pressure at and above inner scale altitude.

CRUISE

1. Power -- 21-31 INCHES Hg, 2200-2500 RPM (no more than 80% power). (Above 21,500 feet, observe maximum manifold pressure in accordance with the power and fuel flow placard.)

NOTE

2600 RPM may be used as required on hot days at high altitude if the desired cruise manifold pressure and power (limited to 31 inches Hg. and 80% maximum) cannot be obtained with 2500 RPM.

2. Elevator and Rudder Trim -- ADJUST.
3. Mixture -- LEAN for cruise fuel flow using the data in Section 5 or the Cessna Power Computer (2200-2500 RPM only).

NOTE

Cruise mixture may also be set using an EGT gage (if installed). Use of the EGT gage is prohibited at all RPM settings above 2500 RPM; at all power settings above 80% at any altitude; or above 75%, 70%, and 65% when operating at altitudes of 17,000, 20,000 and 22,000 feet, or greater, respectively, when outside air temperatures are above standard. Refer to Amplified Procedures listed later in this section.

4. Auxiliary Fuel Pump -- OFF.

NOTE

In hot weather at high altitudes, turn on the auxiliary fuel pump momentarily when switching tanks during the first 30 minutes of cruise. Also, be alert for fuel vapor indications. If fuel flow fluctuations or an unexplained drop in fuel flow are observed, place the auxiliary fuel pump switch in the ON position and reset the mixture control as desired. If vapor symptoms persist, select the opposite fuel tank. Turn the auxiliary fuel pump off when fuel flows will remain steady, and reset the mixture as necessary.

5. Cowl Flaps -- CLOSED (open as required on warm days or at high altitude).

DESCENT

1. Power -- AS DESIRED.

NOTE

A minimum of 18 inches Hg and 2500 RPM or 20 inches Hg and 2200 RPM is required for pressurization. If necessary, extend the landing gear (below 165 KIAS) to increase rate of descent.

2. Cabin Altitude Selector -- SET.

NOTE

For improved cabin comfort on warm days, slowly set cabin altitude selector to 8000 to 10,000 feet prior to or during initial descent. After descending below set altitude, turn pressurization switch off, pull cabin dump valve out, open the individual overhead outlets and turn the cabin ventilation fan on HIGH for maximum entry and circulation of the cooler air from the wing airscoops.

3. Auxiliary Fuel Pump -- OFF.

CAUTION

Failure to turn the auxiliary fuel pump off may result in a complete power loss at reduced throttle settings due to an excessively rich mixture.

4. Mixture -- ADJUST for smooth operation (full rich for idle power).
5. Cowl Flaps -- CLOSED.

BEFORE LANDING

1. Seats, Belts, Shoulder Harnesses -- SECURE.
2. Fuel Selector Valve -- FULLER TANK.
3. Landing Gear -- EXTEND (below 165 KIAS).
4. Landing Gear -- CHECK (observe main gear down and green indicator light on).
5. Auxiliary Fuel Pump -- OFF

CAUTION

Failure to turn the auxiliary fuel pump off may result in a complete power loss at reduced throttle settings due to an excessively rich mixture.

6. Mixture -- RICH.
7. Propeller -- HIGH RPM.
8. Cabin Pressurization -- CHECK ZERO differential.
9. Cabin Door Handle Safety Lock -- UNLOCK (pulled out).
10. Autopilot (if installed) -- OFF.
11. Wing Flaps -- AS DESIRED (0° to 10° below 160 KIAS, 10° to 20° below 130 KIAS, and 20° to 30° below 115 KIAS).
12. Elevator Trim -- ADJUST.
13. Air Conditioner (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 80-90 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (flaps down preferred).
3. Airspeed -- 70-80 KIAS (flaps DOWN).
4. Elevator Trim -- ADJUST.

5. Touchdown -- MAIN WHEELS FIRST.
6. Landing Roll -- LOWER NOSE WHEEL GENTLY.
7. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Wing Flaps -- FULL DOWN.
2. Airspeed -- 72 KIAS.
3. Elevator Trim -- ADJUST.
4. Power -- REDUCE to idle after clearing obstacle.
5. Touchdown -- MAIN WHEELS FIRST.
6. Brakes -- APPLY HEAVILY.
7. Wing Flaps -- RETRACT.

BALKED LANDING

1. Power -- 36.5 INCHES Hg and 2700 RPM.
2. Wing Flaps -- RETRACT to 20° (immediately).
3. Climb Speed -- 70 KIAS (until obstacles are cleared).
4. Wing Flaps -- RETRACT SLOWLY (after reaching safe altitude and 75 KIAS).
5. Cowl Flaps -- OPEN.

AFTER LANDING

1. Wing Flaps -- RETRACT.
2. Cowl Flaps -- OPEN.
3. Radar (if installed) -- OFF.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Electrical Equipment -- OFF.
3. Mixture -- IDLE CUT-OFF (pulled 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 below should be followed closely as it is effective under nearly all operating conditions.

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

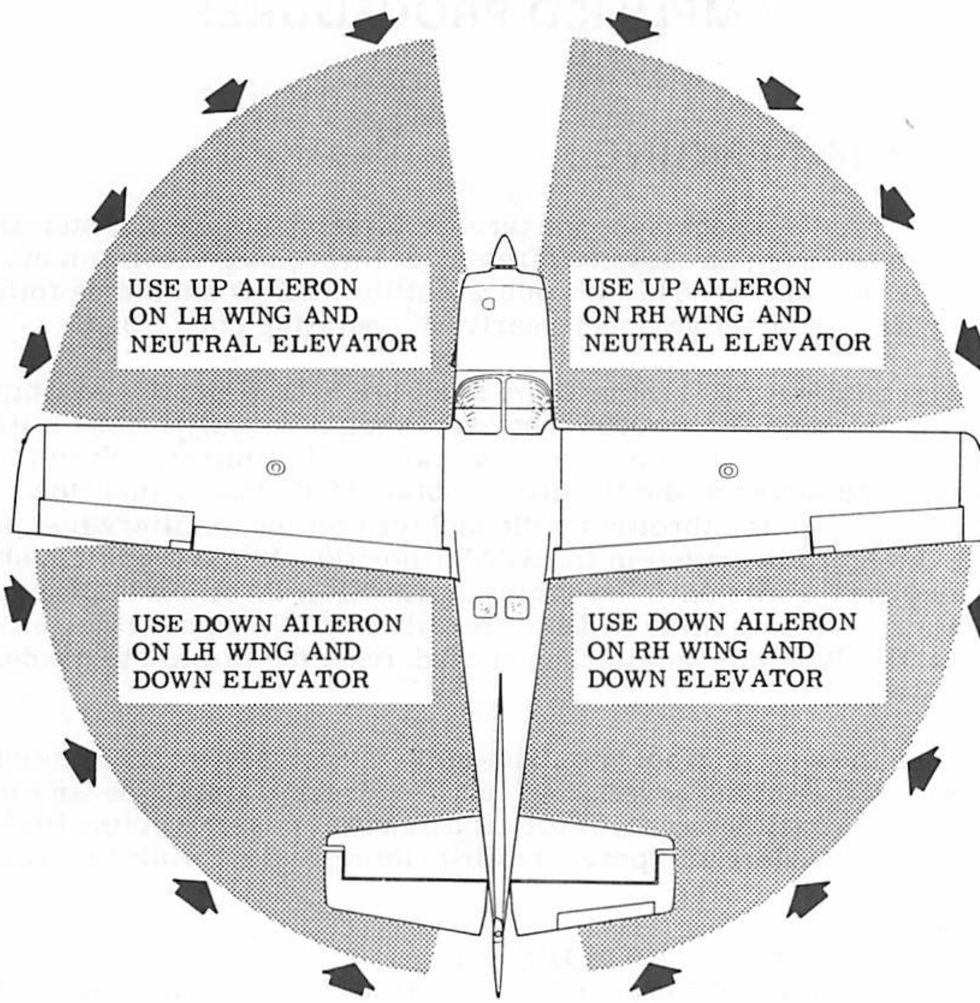
When the engine is hot or outside air temperatures are high, the engine may die after running several seconds because the mixture became either too lean due to fuel vapor, or too rich due to excessive prime fuel. The following procedure will prevent over-priming and alleviate fuel vapor in the system:

1. Set the throttle 1/3 to 1/2 open.
2. When the ignition switch is in the BOTH position and you are ready to engage the starter, place the right half of the auxiliary fuel pump switch in the ON position until the indicated fuel flow comes up to 25 to 35 lbs/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 use of the auxiliary fuel pump switch in the ON position for up to 1 minute or more before the vapor is cleared sufficiently to obtain 25 to 35 lbs/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.



CODE	NOTE
WIND DIRECTION ➡	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

4. If there is fuel vapor in the lines, it will pass into the injector nozzles in 2 to 3 seconds and the engine will gradually slow down and stop. When engine speed starts to decrease, hold the left half of the auxiliary fuel pump switch in the HI position for approximately one second to clear out the vapor. Intermittent use of the HI position of the switch is necessary since prolonged use of the HI position after vapor is cleared will flood out the engine during a starting operation.
5. Let the engine run at 1200 to 1400 RPM until the vapor is eliminated and the engine idles normally.

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

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

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 power checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

MAGNETO CHECK

The magneto check should be made at 1700 RPM as follows. Move ignition switch first to R position and note RPM. Next move switch back to BOTH to clear the other set of plugs. Then move switch to the L position, note RPM and return the switch to the BOTH position. RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system or should be cause for suspicion that the magneto timing is set in advance of the setting specified.

ALTERNATOR CHECK

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

TAKEOFF

POWER CHECK

It is important to check takeoff power early in the takeoff 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 flow may exceed 186 lbs/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 180 lbs/hr. With a heat soaked engine on a hot day, it may be necessary to use the auxiliary fuel pump to obtain the recommended takeoff fuel flow.

After throttle is advanced to 36.5 inches Hg, 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

For normal takeoffs, use of 10° flaps is preferred since it results in easier nose wheel lift-off and lower initial climb attitude, as well as a 10%

reduction in ground run and total distance over an obstacle compared to takeoff with flaps up. Compared to 20° flaps, use of 10° flaps facilitates transition to normal climb without greatly increasing total takeoff distance over an obstacle.

The use of 20° flaps is reserved for minimum ground runs or takeoffs from soft or rough fields, since it will allow safe use of slower takeoff speeds, resulting in shortening the ground run approximately 10% compared to 10° flaps.

Flap settings greater than 20° are not approved for takeoff.

SHORT FIELD TAKEOFF

If an obstruction dictates the use of a steep climb angle, after liftoff accelerate to and climb out at an obstacle clearance speed of 78 KIAS with 10° flaps and gear extended. This speed provides the best overall climb speed to clear obstacles when taking into account the turbulence often found near ground level. The takeoff performance data in Section 5 is based on this speed and configuration.

Minimum ground run takeoffs are accomplished using 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° of flaps are used on soft or rough fields with obstacles ahead, it is normally preferable to leave them extended rather than partially retract them in the climb to the obstacle. With 20° flaps, use an obstacle clearance speed of 72 KIAS. After clearing the obstacle, and reaching a safe altitude, the flaps may be retracted slowly as the airplane accelerates to the normal climbout speed.

CROSSWIND TAKEOFF

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. With the ailerons partially deflected into the wind, the airplane is accelerated to a speed higher than normal, and then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

LANDING GEAR RETRACTION

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

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

ENROUTE CLIMB

Power settings for climb must be limited to 35.5 inches of manifold pressure and 2600 RPM up to 17,000 feet with decreasing manifold pressure above 17,000 feet as noted on the power and fuel flow placard. On hot days it may not be possible to maintain placarded manifold pressure as the airplane climbs above 15,000 feet, even with full throttle. If this is the case, set the fuel flow to correspond to the available full throttle manifold pressure as shown on the power and fuel flow placard.

A cruising climb at 31 inches of manifold pressure, 2500 RPM, 125 lbs/hr fuel flow, and 110 to 120 KIAS is normally recommended to provide an optimum combination of performance, visibility ahead, engine cooling, economy and passenger comfort (due to lower noise level). On hot days it may be necessary to begin advancing the throttle to maintain 31 inches manifold pressure at altitudes as low as 4000 feet. On hot days it also may not be possible to maintain 31 inches Hg with 2500 RPM above 16,000 feet, even with full throttle. In this case, establish 2600 RPM and set the fuel flow to correspond to 31 inches Hg manifold pressure as shown on the power and fuel flow placard. This action will enable 31 inches Hg to be available for approximately another 3000 feet of climb.

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 may be turned off when fuel flow remains steady.

If it is necessary to climb rapidly to clear mountains or reach favorable winds or better weather at high altitudes, the best rate-of-climb speed should be used with maximum continuous power. This speed is 100 KIAS from sea level to 17,000 feet, decreasing to 97 KIAS at 23,000 feet.

If an obstruction dictates the use of a steep climb angle, climb with flaps retracted and maximum continuous power at 80 KIAS.

CRUISE

Normal cruising is performed between 60% and 80% of the maximum continuous power rating. The power settings and corresponding fuel consumption for various altitudes can be determined by using the data in Section 5 or the Cessna Power Computer. The cruise performance data shows cruise powers greater than 80% for some conditions. This data has been included for interpolation so that a power setting can be selected that results in no more than 80% power for the existing atmospheric conditions. Power settings contained within the shaded areas may not be obtainable on all airplanes. These settings have been included for interpolation purposes only.

Cruise at 2600 RPM is allowed at higher altitudes on warm days when the desired cruise manifold pressure or power cannot be obtained with 2500 RPM. With 2600 RPM, manifold pressure must be limited to 31 inches Hg or to placarded manifold pressures above 21,500 feet and power must be limited to 80%. With 2600 RPM, cruise fuel flows must be established using 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.

	80% POWER (2500 RPM)		70% POWER (2400 RPM)		60% POWER (2300 RPM)	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
5000 Feet	165	8.9	155	10.0	144	11.1
10,000 Feet	172	9.3	161	10.4	149	11.5
15,000 Feet	179	9.7	168	10.8	154	11.9
20,000 Feet	187	10.1	174	11.2	158	12.2
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

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.

For reduced noise levels and lower fuel consumption, 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, as required, to maintain the cylinder head temperature within the normal operating range (green arc).

MIXTURE DESCRIPTION	POWER	EXHAUST GAS TEMPERATURE (Degrees Rich of Peak EGT)			
		2500 RPM	2400 RPM	2300 RPM	2200 RPM
RECOMMENDED LEAN	* 76 to 80%	100°	75°	75°	50°
*See Usage Limitations listed in Section 2	* 71 to 75%	75°	75°	50°	50°
	* 66 to 70%	75°	50°	50°	25°
	61 to 65%	50°	50°	25°	25°
	56 to 60%	50°	25°	25°	Peak EGT
	51 to 55%	25°	25°	Peak EGT	Peak EGT
	46 to 50%	25°	Peak EGT	Peak EGT	Peak EGT
	45% or Less	Peak EGT	Peak EGT	Peak EGT	Peak EGT

Figure 4-4. EGT Table

The fuel injection system employed on this engine is considered to be non-icing. In the event that unusual conditions cause the intake air filter to become clogged or iced over, an alternate intake air valve opens automatically 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 valve or a partially blocked filter, manifold pressure can decrease up to 10 in. Hg from a cruise power setting. This pressure should be recovered by increased throttle setting or higher RPM as necessary to maintain the desired power. Maximum continuous manifold pressure (35.5 in. Hg) is available up to 11,000 feet under warm day conditions using the alternate air source with a fully blocked filter.

LEANING WITH AN EGT INDICATOR

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 up to 80% power, except at high cruise altitudes when the ambient temperatures are above standard or at cruise RPM settings higher than 2500 RPM.

To adjust the mixture with reference to an EGT indicator, lean carefully to establish the peak EGT as a reference point and then enrichen by an increment based on data in figure 4-4. These settings will yield approximately the fuel flows found in the cruise tables in Section 5. 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.

Certain limitations must be observed when using an EGT indicator. Operations which are not approved include:

1. Power settings above 80% at all altitudes.
2. Power settings above the following when outside air temperature (OAT) is above standard:
   a. 75% at 17,000 feet or higher
   b. 70% at 20,000 feet or higher
   c. 65% at 22,000 feet or higher.
3. Continuous operation leaner than shown in figure 4-4.
4. RPM settings higher than 2500 RPM.

STALLS

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

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

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.

CAUTION

Failure to turn the auxiliary fuel pump off could cause a complete power failure at reduced throttle settings due to an abnormally rich mixture if throttle switch rigging or fuel pressure settings are out of tolerance. In this event, turn the auxiliary fuel pump off, set the throttle to one-half open, and lean or adjust the mixture to regain power. Have the fuel metering system inspected as soon as practicable.

Descent should be adjusted to permit a cabin altitude rate of descent of approximately 500 FPM for passenger comfort, using enough power to maintain pressurization and to keep the engine warm. The optimum engine RPM in a descent is usually the lowest RPM in the green arc range that will allow cylinder head temperature to remain in the recommended green arc operating range and provide smooth engine operation.

If a steep descent is required, the landing gear can be extended at speeds as high as 165 KIAS after which the speed can be increased as desired in smooth air up to 200 KIAS.

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.

BEFORE LANDING

In view of the relatively low drag of the extended landing gear and the high allowable gear-operating speed (165 KIAS), the landing gear should be extended before entering the traffic pattern. This practice will allow more time to confirm that the landing gear is down and locked. As a further precaution, leave the landing gear extended in go-around procedures or traffic patterns for touch-and-go landing.

Landing gear extension can be detected by illumination of the gear-down indicator light (green), absence of a gear warning horn with the throttle retarded below 15 inches of manifold pressure, and visual inspection of the main gear position. Should the gear indicator light fail to illuminate, the light should be checked for a burned-out bulb by pushing to test. A burned-out bulb can be replaced in flight with the landing gear-up (amber) indicator light.

NOTE

Landing with the cabin pressurized is not authorized. Therefore, the differential pressure should be checked at traffic pattern altitude to assure that no residual pressure remains.

LANDING

NORMAL LANDING

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

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

SHORT FIELD LANDING

For short field landings, make a power approach at 72 KIAS with full flaps. After all approach obstacles are cleared, progressively reduce power. Maintain 72 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.

see 7-3 SLIPS
1 MIN ONLY AT ¼ fuel

BALKED LANDING

In a balked 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, which probably will be congealed prior to starting in extremely cold temperatures. When using an external power source, the position of the master switch is important. Refer to Section 9, Supplements, for Ground Service Plug Receptacle operating details.

For quick, smooth engine starts in very cold temperature, use six strokes of the manual primer (if installed) before cranking, with an additional one or two strokes as the engine starts.

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, the throttle motions should be made slowly and care should be exercised to prevent exceeding the 36.5 inches Hg manifold pressure limit.

The turbocharged 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 lower green arc range) in outside air temperatures 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 temperatures 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 to 23,000 feet.

During descent, observe engine temperatures closely and carry sufficient power to maintain them in the recommended green arc operating range.

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.

The certificated noise level for the Model P210N at 4000 pounds maximum weight is 78.0 dB(A). No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

SECTION 5
PERFORMANCE

TABLE OF CONTENTS

INTRODUCTION

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

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

USE OF PERFORMANCE CHARTS

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

SAMPLE PROBLEM

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

AIRPLANE CONFIGURATION	
Takeoff weight	3950 Pounds
Usable fuel	534 Pounds
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	705 Nautical Miles
Pressure altitude	15,500 Feet
Temperature	0°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 4000 pounds, pressure altitude of 4000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1945 Feet
Total distance to clear a 50-foot obstacle	3265 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	1945
Decrease in ground roll (1945 feet × 12%)	233
Corrected ground roll	1712 Feet
Total distance to clear a 50-foot obstacle, zero wind	3265
Decrease in total distance (3265 feet × 12%)	392
Corrected total distance to clear a 50-foot obstacle	2873 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. For this sample problem, a cruise power of approximately 70% will be used.

The cruise performance chart for 16,000 feet pressure altitude is entered using 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The power setting chosen is 2400 RPM and 29 inches of manifold pressure which results in the following:

Power	69%
True airspeed	171 Knots
Cruise fuel flow	92 PPH

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 4000 pounds. The difference between the values shown in the table for 4000 feet and 16,000 feet results in the following:

Time	23 Minutes
Fuel	49 Pounds
Distance	50 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 7°C above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16°C above standard, the correction would be:

$$\frac{16°C}{7°C} \times 10\% = 23\% \text{ Increase}$$

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

Fuel to climb, standard temperature	49
Increase due to non-standard temperature (49 × 23%)	11
Corrected fuel to climb	60 Pounds

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

Time to climb	28 Minutes
Distance to climb	61 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	61
Decrease in distance due to wind (28/60 ×10 knot headwind)	5
Corrected Distance to Climb	56 Nautical Miles

The resultant cruise distance is:

Total distance	705
Climb distance	56
Cruise distance	649 Nautical Miles

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

171
-10
161 Knots

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

$$\frac{649 \text{ Nautical Miles}}{161 \text{ Knots}} = 4.0 \text{ Hours}$$

The fuel required for cruise is:

$$4.0 \text{ hours} \times 92 \text{ pounds/hour} = 368 \text{ Pounds}$$

A 45-minute reserve requires:

$$\frac{45}{60} \times 92 \text{ pounds/hour} = 69 \text{ Pounds}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	16
Climb	60
Cruise	368
Reserve	69
Total fuel required	513 Pounds

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

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-10 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	900 Feet
Total distance to clear a 50-foot obstacle	1705 Feet

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

DEMONSTRATED OPERATING TEMPERATURE

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

AIRSPEED CALIBRATION
NORMAL STATIC SOURCE

CONDITIONS:
4000 Pounds.
Power required for level flight or maximum power during descent.
Pressurized or unpressurized (openable window open or closed).

FLAPS UP								
KIAS	60	80	100	120	140	160	180	200
KCAS	59	79	99	119	139	158	177	195
FLAPS 10°								
KIAS	60	70	80	90	100	120	140	160
KCAS	63	71	80	90	100	120	140	159
FLAPS 20°								
KIAS	60	70	80	90	100	110	120	130
KCAS	64	73	82	92	101	111	121	131
FLAPS 30°								
KIAS	50	60	70	80	90	100	110	115
KCAS	57	65	74	83	92	102	111	116

Figure 5-1. Airspeed Calibration (Sheet 1 of 3)

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

PRESSURIZED

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	63	82	103	125	146	167	189

UNPRESSURIZED WITH WINDOW CLOSED
(Dump Valve Open (Pulled Out) and Vents Closed)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	63	83	103	124	145	166	189
FLAPS 10^{o}							
NORMAL KIAS	60	80	100	120	140	150	- - -
ALTERNATE KIAS	65	85	106	127	147	158	- - -
FLAPS 30^{o}							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	60	69	79	90	100	110	120

Figure 5-1. Airspeed Calibration (Sheet 2 of 3)

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

UNPRESSURIZED WITH WINDOW CLOSED
(Dump Valve Closed (Pushed In) and Vents Open)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	58	77	98	119	140	162	186
FLAPS 10°							
NORMAL KIAS	60	80	100	120	140	150	---
ALTERNATE KIAS	61	81	102	123	143	154	---
FLAPS 30°							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	56	64	74	84	94	105	115

UNPRESSURIZED WITH WINDOW OPEN
(Dump Valve/Vents Open Or Closed)

FLAPS UP							
NORMAL KIAS	60	80	100	120	140	160	180
ALTERNATE KIAS	59	80	101	123	145	166	190
FLAPS 10°							
NORMAL KIAS	60	80	100	120	140	150	---
ALTERNATE KIAS	62	81	103	125	146	156	---
FLAPS 30°							
NORMAL KIAS	50	60	70	80	90	100	110
ALTERNATE KIAS	56	65	76	86	97	107	118

Figure 5-1. Airspeed Calibration (Sheet 3 of 3)

TEMPERATURE CONVERSION CHART

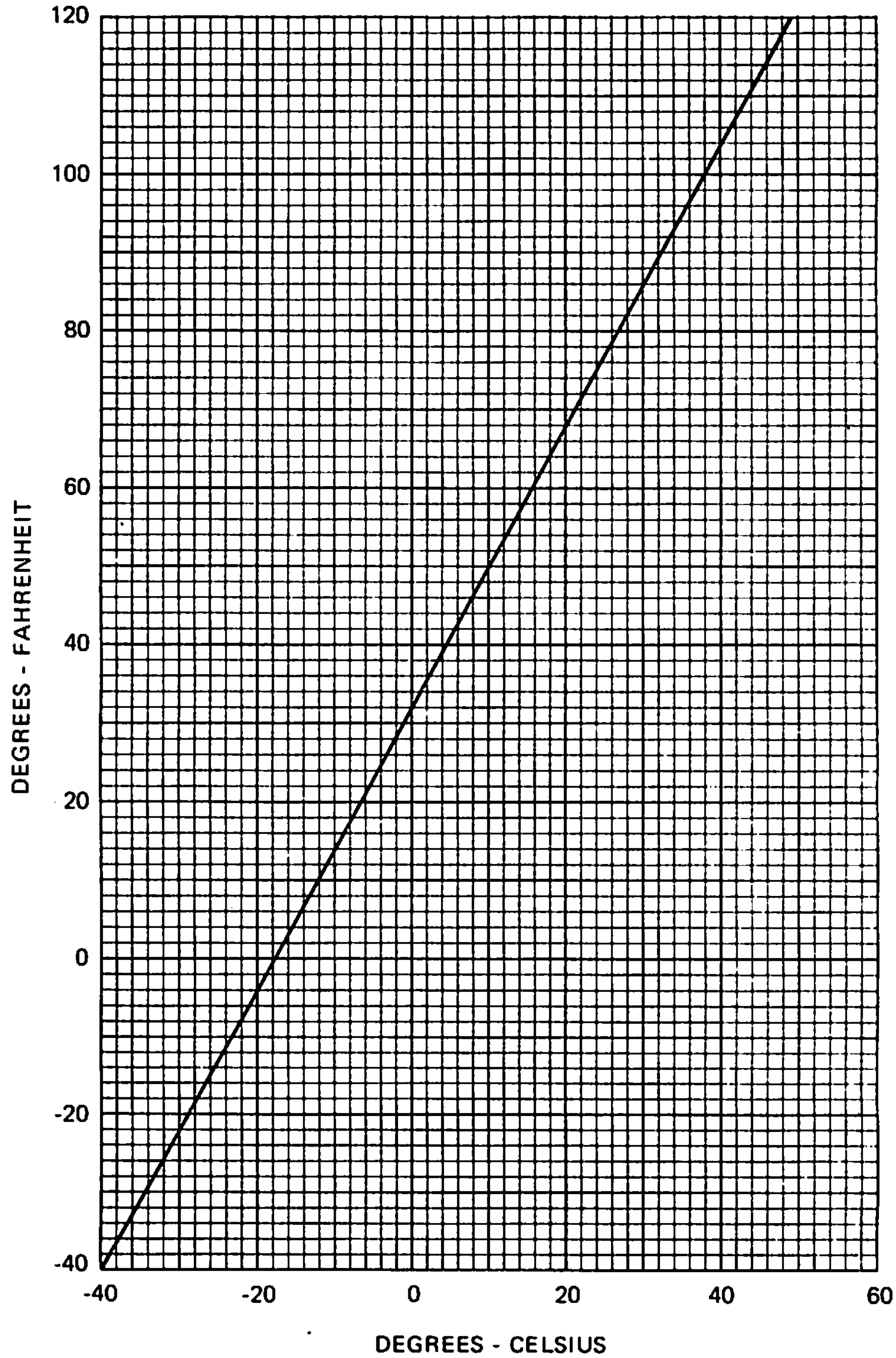


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off
Gear Up or Down

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

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
4000	UP	67	67	72	72	80	80	95	95
	10°	63	63	68	68	75	75	89	89
	20°	59	60	63	64	70	71	83	85
	30°	54	58	58	62	64	69	76	82

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
4000	UP	73	73	78	78	87	87	103	103
	10°	68	68	73	73	81	81	96	96
	20°	63	64	68	69	75	76	89	91
	30°	58	61	62	66	69	73	82	86

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE

MAXIMUM WEIGHT 4000 LBS

SHORT FIELD

CONDITIONS:
Flaps 10°
2700 RPM, 36.5 Inches Hg, and
Mixture Set at 180 PPH Prior to Brake Release
Cowl Flaps Open
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 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
4000	72	78	S.L.	1140	1885	1245	2065	1360	2265	1485	2490	1620	2755
			1000	1215	2005	1330	2195	1450	2415	1585	2660	1735	2950
			2000	1300	2130	1420	2340	1550	2575	1695	2845	1855	3160
			3000	1390	2270	1520	2495	1660	2755	1815	3045	1990	3390
			4000	1485	2425	1625	2665	1775	2945	1945	3265	2130	3645
			5000	1590	2585	1740	2850	1905	3155	2085	3510	2285	3930
			6000	1700	2765	1860	3050	2040	3385	2235	3770	2455	4240
			7000	1820	2955	1995	3270	2185	3630	2400	4060	2635	4585
			8000	1955	3165	2140	3505	2345	3905	2575	4385	2835	4970

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

TAKEOFF DISTANCE

3700 LBS AND 3400 LBS

SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
3700	69	75	S.L.	950	1565	1035	1705	1125	1865	1230	2045	1340	2245
			1000	1010	1660	1105	1815	1205	1985	1315	2180	1435	2395
			2000	1080	1765	1180	1930	1285	2115	1405	2325	1535	2560
			3000	1155	1875	1260	2055	1375	2255	1500	2480	1640	2740
			4000	1230	2000	1345	2190	1470	2405	1605	2650	1760	2935
			5000	1320	2130	1440	2335	1575	2570	1720	2835	1885	3145
			6000	1410	2270	1540	2495	1685	2745	1845	3040	2020	3380
			7000	1510	2420	1650	2665	1805	2940	1980	3260	2170	3630
			8000	1615	2585	1770	2850	1940	3150	2125	3500	2330	3910
3400	66	72	S.L.	780	1290	850	1405	925	1530	1010	1670	1100	1830
			1000	835	1370	910	1490	990	1625	1080	1780	1175	1950
			2000	890	1455	970	1585	1055	1730	1150	1895	1255	2075
			3000	950	1545	1035	1685	1130	1840	1230	2015	1345	2215
			4000	1015	1640	1105	1790	1205	1960	1315	2150	1440	2365
			5000	1085	1745	1185	1910	1290	2090	1410	2295	1540	2530
			6000	1160	1860	1265	2035	1380	2230	1510	2450	1650	2705
			7000	1240	1980	1355	2170	1480	2380	1620	2625	1770	2900
			8000	1325	2110	1450	2315	1585	2545	1735	2810	1900	3110

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

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2600 RPM
Cowl Flaps Open

PRESS ALT	MP	PPH
S.L. to 17,000	35.5	162
19,000	33.5	150
21,000	31.5	138
23,000	29.5	126

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			$-20^{o}C$	$0^{o}C$	$20^{o}C$	$40^{o}C$
4000	S.L.	100	1170	1035	895	755
	4000	100	1065	930	790	650
	8000	100	955	820	680	540
	12,000	100	835	700	565	---
	16,000	100	695	570	---	---
	20,000	98	440	310	---	---
	23,000	97	220	---	---	---
3700	S.L.	98	1310	1165	1020	875
	4000	98	1200	1060	915	770
	8000	98	1090	945	800	655
	12,000	98	965	825	685	---
	16,000	98	820	690	---	---
	20,000	97	550	420	---	---
	23,000	96	320	---	---	---
3400	S.L.	97	1465	1320	1165	1015
	4000	97	1355	1205	1055	900
	8000	97	1240	1090	935	785
	12,000	97	1110	960	815	---
	16,000	97	960	820	---	---
	20,000	96	675	540	---	---
	23,000	94	430	---	---	---

Figure 5-5. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

summer + winter

CONDITIONS:
Flaps Up
Gear Up
2600 RPM
Cowl Flaps Open
Standard Temperature

Keep mixture Full Rich #731PJ @T Keep oil Temp Cool. J.M.

PRESS ALT	MP	PPH
S.L. to 17,000	35.5	162
19,000	33.5	150
21,000	31.5	138
23,000	29.5	126

NOTES:
1. Add 16 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED POUNDS	DISTANCE NM
4000	S.L.	100	930	0	0	0
	4000	100	880	4	12	7
	8000	100	825	9	25	16
	12,000	100	760	14	38	26
	16,000	100	675	20	53	37
	20,000	98	470	27	71	52
	23,000	97	285	35	90	71
3700	S.L.	98	1060	0	0	0
	4000	98	1005	4	10	6
	8000	98	950	8	22	14
	12,000	98	885	12	33	22
	16,000	98	800	17	46	31
	20,000	97	580	23	61	44
	23,000	96	385	29	75	58
3400	S.L.	97	1205	0	0	0
	4000	97	1155	3	9	6
	8000	97	1095	7	19	12
	12,000	97	1025	11	29	19
	16,000	97	935	15	40	27
	20,000	96	705	20	53	37
	23,000	94	500	25	64	48

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

110 = 700'/M.
120 = 500'/M

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 110 KIAS

120

summer or winter FULL RICH
140
160 PPH fuel flow
to keep oil cool.

CONDITIONS:
Flaps Up
Gear Up
2500 RPM
31 Inches Hg.
125 PPH Fuel Flow
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 16 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 7°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	RATE OF CLIMB FPM	FROM SEA LEVEL		
			TIME MIN	FUEL USED POUNDS	DISTANCE NM
4000	S.L.	625	0	0	0
	4000	590	7	14	12
	8000	545	14	28	26
	12,000	495	21	45	43
	16,000	435	30	63	62
	20,000	360	40	84	87
3700	S.L.	725	0	0	0
	4000	690	6	12	11
	8000	645	12	24	23
	12,000	590	18	38	36
	16,000	530	25	53	52
	20,000	455	34	70	72
3400	S.L.	835	0	0	0
	4000	800	5	10	9
	8000	755	10	21	19
	12,000	700	16	32	31
	16,000	640	22	45	44
	20,000	560	28	59	61

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	84	164	117	79	162	109
	29	83	159	115	78	159	108	73	157	101
	27	76	154	105	72	153	98	67	151	92
	25	69	147	94	65	146	88	61	144	82
	23	61	139	83	57	137	78	54	135	73
2400	31	---	---	---	80	160	108	75	159	101
	29	79	156	106	74	155	99	69	154	92
	27	72	150	96	68	149	90	64	147	84
	25	65	143	86	61	142	81	57	140	76
	23	58	135	76	54	133	72	51	130	68
2300	31	80	157	107	76	156	99	71	155	92
	29	74	152	97	70	151	91	66	150	85
	27	68	146	88	64	145	83	60	143	77
	25	61	139	79	58	138	74	54	135	70
	23	54	131	70	51	129	66	48	125	62
2200	31	76	154	99	71	153	93	67	151	87
	29	70	148	91	66	147	85	62	145	80
	27	64	142	83	60	141	78	57	138	73
	25	57	135	74	54	133	70	51	130	66
	23	51	126	66	48	124	62	45	120	59

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	84	166	117	79	165	109
	29	83	162	115	78	161	108	73	160	101
	27	76	156	105	72	156	99	67	154	92
	25	69	150	94	65	149	89	61	146	83
	23	61	142	83	58	140	79	54	137	74
2400	31	---	---	---	80	163	108	75	161	101
	29	79	159	106	74	158	100	70	156	93
	27	72	153	97	68	152	90	64	150	85
	25	65	146	87	62	144	81	58	142	76
	23	58	138	77	55	136	72	51	132	68
2300	31	80	160	107	76	159	99	71	158	92
	29	74	155	97	70	154	91	66	152	85
	27	68	149	88	64	148	83	60	145	78
	25	62	142	79	58	140	75	55	137	70
	23	55	133	71	52	131	67	48	127	63
2200	31	76	156	100	72	155	93	67	154	87
	29	70	151	91	66	150	86	62	148	80
	27	64	145	83	61	143	78	57	141	73
	25	58	138	75	55	135	70	51	132	66
	23	51	129	66	48	126	63	46	121	60

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	84	169	117	78	168	109
	29	83	165	115	78	164	108	73	163	101
	27	76	159	105	72	158	99	68	156	92
	25	69	152	95	65	151	89	61	149	83
	23	62	144	84	58	142	79	55	139	74
2400	31	---	---	---	80	166	108	75	164	100
	29	79	161	106	74	160	100	70	159	93
	27	72	155	97	68	154	91	64	152	85
	25	66	149	87	62	147	82	58	144	77
	23	59	140	77	55	138	73	52	135	69
2300	31	80	163	106	76	162	99	71	160	92
	29	74	157	97	70	156	91	66	154	85
	27	68	151	89	64	150	83	60	148	78
	25	62	144	80	58	142	75	55	139	71
	23	55	136	71	52	133	67	49	129	63
2200	31	76	159	100	72	158	93	67	156	87
	29	70	153	91	66	152	86	62	150	80
	27	64	147	83	61	146	78	57	143	73
	25	58	140	75	55	138	71	52	134	66
	23	52	131	67	49	128	63	46	123	60

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

		20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	83	172	116	78	171	108
	29	83	168	115	78	167	108	73	165	101
	27	76	162	106	72	161	99	68	159	92
	25	70	155	95	66	154	89	62	151	84
	23	62	147	85	59	145	80	55	142	75
2400	31	---	---	---	79	168	108	75	167	100
	29	79	164	106	74	163	100	70	161	93
	27	73	158	97	68	157	91	64	155	85
	25	66	151	87	62	149	82	58	147	77
	23	59	143	78	56	140	74	52	136	69
2300	31	80	165	106	75	164	99	71	163	92
	29	75	160	98	70	159	91	66	157	85
	27	69	154	89	65	153	84	61	150	78
	25	62	147	80	59	145	76	55	141	71
	23	56	138	72	52	135	68	49	131	64
2200	31	76	161	100	71	160	93	67	158	87
	29	70	156	92	66	155	86	62	152	80
	27	65	150	84	61	148	79	57	145	74
	25	59	142	75	55	140	71	52	136	67
	23	52	133	67	49	130	64	46	124	61

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTE

Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	83	175	116	78	173	108
	29	83	171	115	78	170	108	73	168	100
	27	76	165	106	72	164	99	68	161	92
	25	70	158	96	66	156	89	62	153	84
	23	63	150	85	59	147	80	55	144	75
2400	31	---	---	---	79	171	107	74	169	100
	29	79	167	106	74	166	99	70	164	93
	27	73	161	97	68	159	91	64	157	85
	25	66	154	88	62	152	82	58	149	77
	23	59	145	78	56	143	74	52	138	70
2300	31	80	168	106	75	167	99	71	165	92
	29	75	163	97	70	162	91	66	159	85
	27	69	157	89	65	155	84	61	152	78
	25	62	149	81	59	147	76	55	143	71
	23	56	141	72	53	137	68	50	132	64
2200	31	76	164	99	71	163	93	67	161	87
	29	70	159	92	66	157	86	62	154	80
	27	65	152	84	61	150	79	57	147	74
	25	59	145	76	55	142	71	52	137	67
	23	53	135	68	50	131	64	47	126	61

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTE

Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	---	---	---	83	178	115	78	176	108
	29	83	173	115	78	173	108	73	170	100
	27	76	168	106	72	166	99	68	164	92
	25	70	161	96	66	159	90	62	156	84
	23	63	152	86	59	150	80	56	146	75
2400	31	---	---	---	79	174	107	74	172	100
	29	78	170	106	74	168	99	69	166	92
	27	73	164	97	68	162	91	64	159	85
	25	66	156	88	62	154	83	59	151	77
	23	60	148	79	56	145	74	53	140	70
2300	31	80	171	106	75	170	98	70	167	92
	29	74	166	97	70	164	91	66	161	85
	27	69	159	89	65	157	84	61	154	78
	25	63	152	81	59	149	76	55	145	71
	23	56	143	73	53	139	68	50	134	64
2200	31	76	167	99	71	165	93	67	163	86
	29	70	161	91	66	159	86	62	156	80
	27	65	155	84	61	152	79	57	149	74
	25	59	147	76	56	144	72	52	139	67
	23	53	137	68	50	133	65	47	127	61

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 14,000 FEET

DITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable
uise power is 80%

NOTE
Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -33°C			STANDARD TEMPERATURE -13°C			20°C ABOVE STANDARD TEMP 7°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2500	31	- - -	- - -	- - -	82	180	115	77	178	107
	29	82	176	115	78	175	107	73	173	100
	27	76	170	105	72	169	99	68	166	92
	25	70	163	96	66	161	90	62	158	84
	23	63	155	86	59	152	81	56	147	76
2400	31	- - -	- - -	- - -	79	176	106	74	174	99
	29	78	172	106	74	171	99	69	168	92
	27	73	166	97	68	164	91	64	161	85
	25	66	159	88	62	156	83	59	153	77
	23	60	150	79	56	147	75	53	141	70
2300	31	79	173	105	75	172	98	70	170	91
	29	74	168	97	70	166	91	66	163	85
	27	69	162	89	65	160	84	61	156	78
	25	63	154	81	59	151	76	55	146	71
	23	57	145	73	53	141	69	50	135	65
2200	31	75	169	99	71	168	92	- - -	- - -	- - -
	29	70	164	91	66	162	86	62	158	80
	27	65	157	84	61	154	79	57	150	74
	25	59	149	76	56	145	72	52	140	67
	23	53	139	69	50	134	65	47	127	61

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 16,000 FEET

TACH RPM ≡ 100' At 16H

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTE

Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -37°C			STANDARD TEMPERATURE -17°C			20°C ABOVE STANDARD TEMP 3°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2600	31	---	---	---	---	---	---	81	187	117
	29	---	---	---	81	182	116	76	180	108
	27	---	---	---	75	176	107	71	173	99
2500	31	---	---	---	82	183	114	77	181	109
	29	82	179	114	77	178	107	73	175	100
	27	76	173	105	72	171	99	67	168	92
	25	70	166	96	66	164	90	62	160	84
75% +50	23	63	157	86	60	154	81	56	149	76
2400	31	83	180	113	78	179	106	73	177	99
	29	78	175	105	74	174	99	69	171	92
	27	72	169	97	68	167	91	64	163	85
	25	66	161	88	63	159	83	59	154	78
	23	60	152	79	57	148	75	53	142	70
2300	31	79	176	105	74	175	97 (100)	70	172	91
	29	74	171	97	70	169	91	65	166	85
	27	69	164	89	65	162	84	61	158	78
	25	63	156	81	59	153	76	56	148	72
	23	57	147	73	53	142	69	50	135	65
2200	31	75	172	98	71	170	92	---	---	---
	29	70	166	91	66	164	85	62	160	80
	27	65	159	84	61	156	79	57	151	74
	25	59	151	76	56	147	72	52	141	67
	23	53	141	69	50	135	65	47	128	62

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

2300, 100 PPH, 74% Power

CRUISE PERFORMANCE

PRESSURE ALTITUDE 18,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTES

1. Use of an EGT indicator to set mixture is prohibited for power settings above 75% when OAT is above standard.
2. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -41°C			STANDARD TEMPERATURE -21°C			20°C ABOVE STANDARD TEMP -1°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2600	31	---	---	---	---	---	---	80	188	116
	29	---	---	---	81	185	115	76	182	107
2500	31	---	---	---	82	186	114	77	183	110
	29	82	182	114	77	180	106	72	178	99
	27	76	176	105	72	174	98	67	170	92
	25	70	168	96	66	166	90	62	161	84
	23	63	159	86	60	156	81	56	150	76
2400	31	83	183	113	78	182	105	73	179	102
	29	78	178	105	73	176	98	69	173	91
	27	72	171	97	68	169	90	64	165	85
	25	66	164	88	63	161	83	59	155	77
	23	60	154	79	57	150	75	53	143	70
2300	31	79	179	104	74	177	97	---	---	---
	29	74	173	96	70	171	90	65	167	84
	27	68	166	89	65	164	83	61	159	78
	25	63	159	81	59	155	76	56	149	72
	23	57	149	73	54	143	69	50	136	65
2200	29	70	168	91	66	166	85	---	---	---
	27	65	161	84	61	158	79	57	152	74
	25	59	153	76	56	148	72	52	141	67
	23	54	142	69	51	136	65	47	128	62

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 20,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTES

1. Use of an EGT indicator to set mixture is prohibited for power settings above 70% when OAT is above standard.
2. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -45°C			STANDARD TEMPERATURE -25°C			20°C ABOVE STANDARD TEMP -5°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2600	31	---	---	---	---	---	---	80	190	117
	29	---	---	---	80	187	115	75	184	106
2500	31	---	---	---	81	188	113	76	186	109
	29	81	185	113	77	183	106	72	180	101
	27	76	178	105	71	176	98	67	172	91
	25	70	171	96	66	168	90	62	163	84
	23	64	162	86	60	157	81	56	151	76
2400	31	82	186	112	77	184	104	73	181	103
	29	77	180	104	73	178	98	68	175	91
	27	72	174	96	68	171	90	64	166	84
	25	66	166	88	62	162	83	59	156	77
	23	60	156	80	57	151	75	53	144	71
2300	29	73	176	96	69	173	90	---	---	---
	27	68	169	89	64	165	83	60	160	78
	25	63	160	81	59	156	76	55	149	71
	23	57	150	73	54	144	69	50	136	65
2200	27	65	163	83	61	159	78	---	---	---
	25	59	154	76	56	149	72	52	141	67
	23	54	144	69	51	137	65	48	128	62

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 22,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTES

1. Use of an EGT indicator to set mixture is prohibited for power settings above 65% when OAT is above standard.
2. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -49°C			STANDARD TEMPERATURE -29°C			20°C ABOVE STANDARD TEMP -9°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2600	30.5	---	---	---	83	194	120	78	191	118
	29	---	---	---	80	190	114	75	187	112
	27	---	---	---	75	183	105	70	179	104
2500	30.5	---	---	---	79	190	110	75	186	112
	29	81	187	112	76	185	105	71	182	106
	27	76	181	104	71	178	98	67	174	99
	25	70	173	95	66	170	89	62	164	84
	23	64	164	86	60	159	81	56	151	76
2400	30.5	80	187	109	76	185	102	---	---	---
	29	77	183	104	72	180	97	68	176	101
	27	72	176	96	68	173	90	63	168	84
	25	66	168	88	62	164	82	58	157	77
	23	60	158	80	57	152	75	53	144	71
2300	27	68	171	88	64	167	83	---	---	---
	25	63	162	81	59	157	76	55	150	71
	23	57	152	73	54	145	69	50	136	65
2200	25	59	156	76	56	150	72	52	141	67
	23	54	144	69	51	137	65	48	127	62

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 23,000 FEET

CONDITIONS:
4000 Pounds
Cowl Flaps Closed
Recommended Lean Mixture
To set mixture using an EGT indicator, refer to Section 4.

Maximum allowable cruise power is 80%

NOTES

1. Use of an EGT indicator to set mixture is prohibited for power settings above 65% when OAT is above standard.
2. Power settings within shaded areas may not be obtainable but are listed to aid interpolation.

		20°C BELOW STANDARD TEMP -51°C			STANDARD TEMPERATURE -31°C			20°C ABOVE STANDARD TEMP -11°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2600	29.5	---	---	---	81	193	115	76	189	122
	27	---	---	---	74	184	105	70	180	110
2500	29.5	82	190	114	77	188	106	72	184	114
	27	75	182	104	71	179	97	67	174	104
	25	70	174	95	66	171	89	62	164	84
	23	64	165	86	60	159	81	56	152	76
2400	29.5	78	185	105	73	183	98	69	179	108
	27	72	177	96	67	174	90	63	168	84
	25	66	169	88	62	164	82	58	157	77
	23	60	159	80	57	153	75	53	144	71
2300	27	68	172	88	64	168	83	---	---	---
	25	63	163	81	59	157	76	55	149	71
	23	57	152	73	54	145	69	50	135	65
2200	25	59	156	76	56	150	72	52	141	67
	23	54	145	69	51	137	65	48	126	62

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

1 October 1979
Revision 7 - 26 August 1981

RANGE PROFILE
45 MINUTES RESERVE
396 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

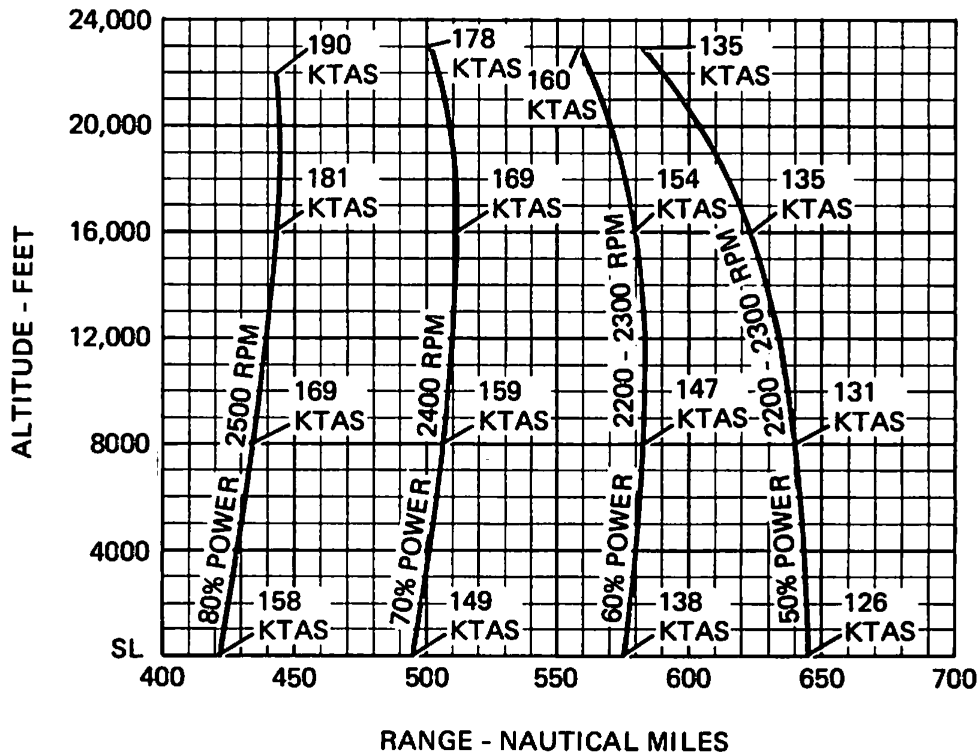


Figure 5-8. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
534 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

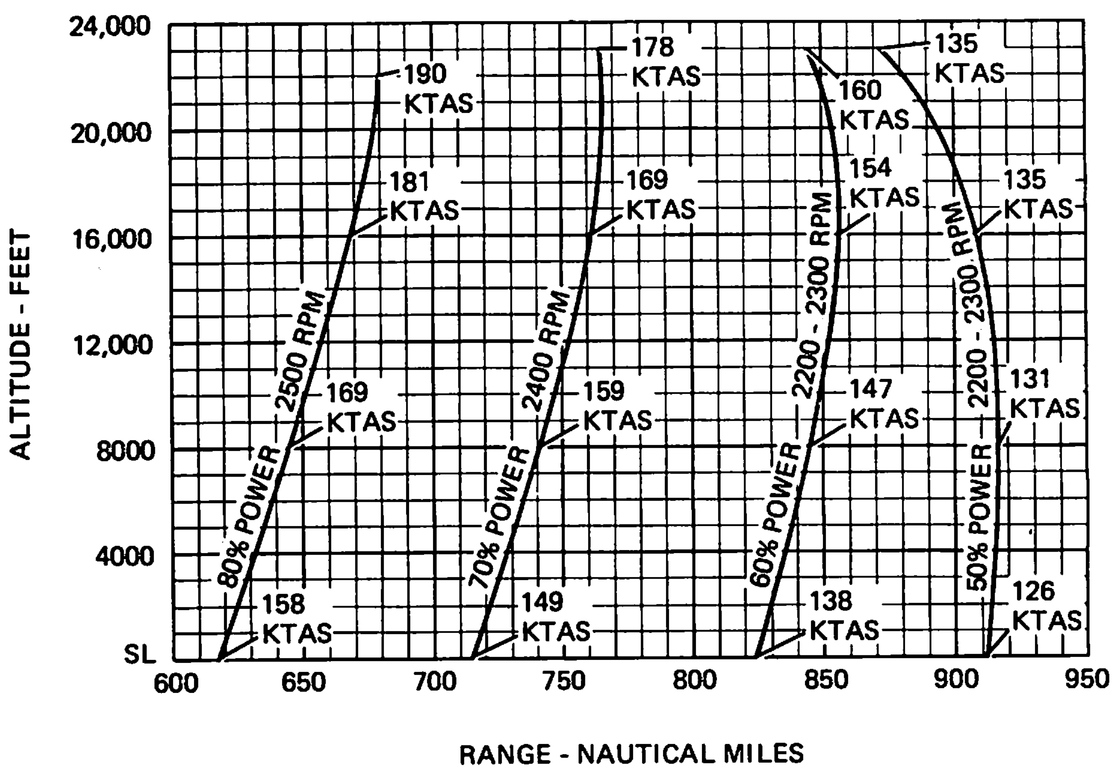


Figure 5-8. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
396 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

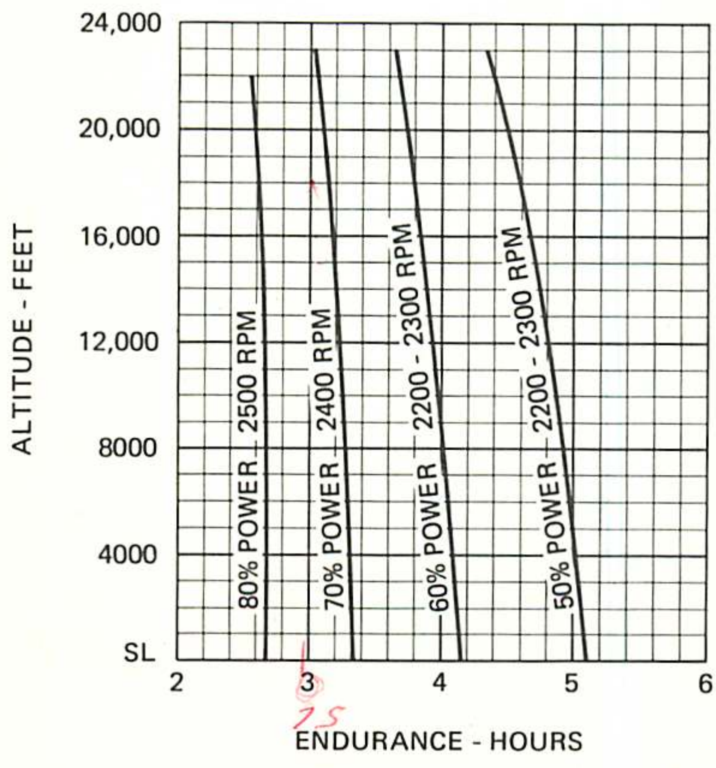


Figure 5-9. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
534 LBS. USABLE FUEL

CONDITIONS:
4000 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during a normal climb up to 20,000 feet and maximum climb above 20,000 feet.

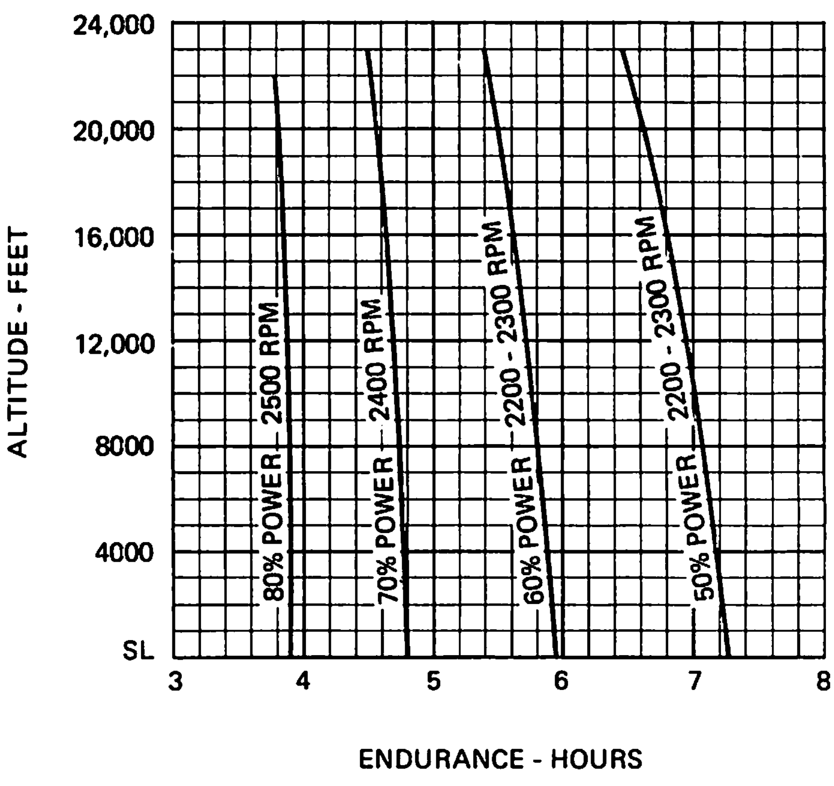


Figure 5-9. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

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

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
3800	72	S.L.	725	1440	750	1480	780	1520	805	1560	830	1600
		1000	750	1480	780	1520	805	1560	835	1605	860	1645
		2000	780	1525	810	1565	835	1605	865	1650	895	1695
		3000	810	1565	840	1610	870	1660	900	1705	930	1750
		4000	840	1615	870	1660	900	1705	930	1750	965	1800
		5000	870	1660	905	1710	935	1755	965	1805	1000	1855
		6000	905	1710	940	1765	970	1810	1005	1860	1035	1910
		7000	940	1765	975	1815	1010	1870	1045	1920	1075	1970
		8000	975	1815	1010	1870	1050	1930	1085	1980	1120	2035

Figure 5-10. Landing Distance

SECTION 6
WEIGHT & BALANCE/
EQUIPMENT LIST

TABLE OF CONTENTS

Page

INTRODUCTION

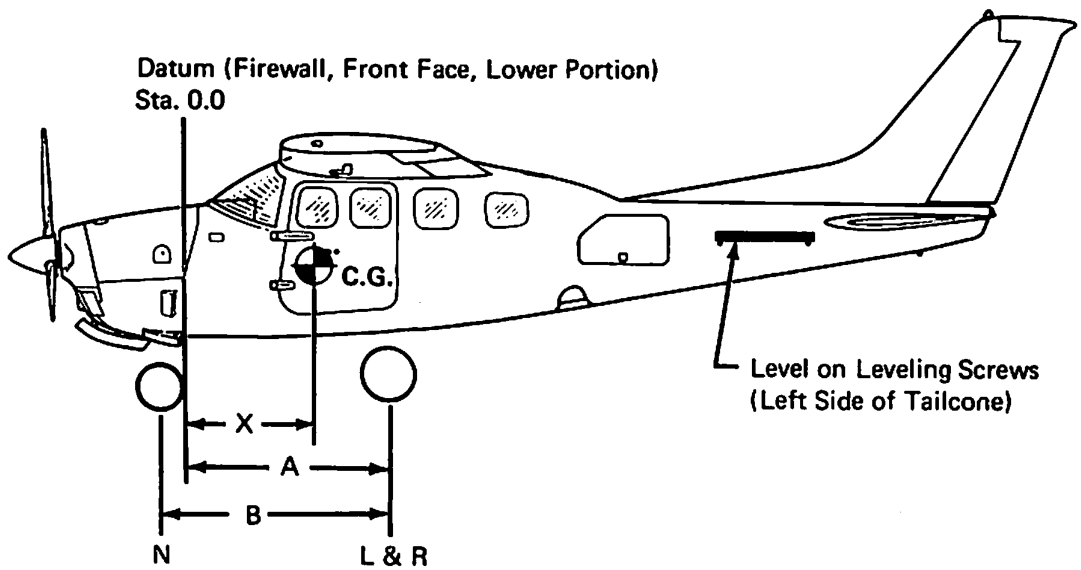
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

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

AIRPLANE WEIGHING PROCEDURES

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



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

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, Page 6-3)			
Add: Oil (11 Qts at 7.5 Lbs/Gal)	21	-12.5	-0.3
Add: Unusable Fuel (1 Gal at 6 Lbs/Gal)	6	23.0	0.1
Equipment Changes			
Airplane Basic Empty Weight			

Figure 6-1. Sample Airplane Weighing

SAMPLE WEIGHT AND BALANCE RECORD

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

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

Figure 6-2. Sample Weight and Balance Record

WEIGHT AND BALANCE

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

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

NOTE

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

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

NOTE

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

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

BAGGAGE LOADING

The baggage compartment consists of two areas. The forward compartment (area A) is immediately aft of the wheel well and extends aft to station 152. The baggage load in this area is limited to 200 pounds. The aft compartment (area B) is an elevated shelf that starts at station 152 and extends aft to station 166. The baggage load in this area is limited to 80 pounds. The maximum allowable combined weight capacity for baggage areas A and B is 200 pounds.

LOADING ARRANGEMENTS

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

**Baggage area center of gravity.

NOTES:
1. The usable fuel C.G. arm is located at station 43.0.
2. The aft baggage wall (approximate station 166) can be used as a convenient interior reference point for determining the location of baggage area fuselage station.

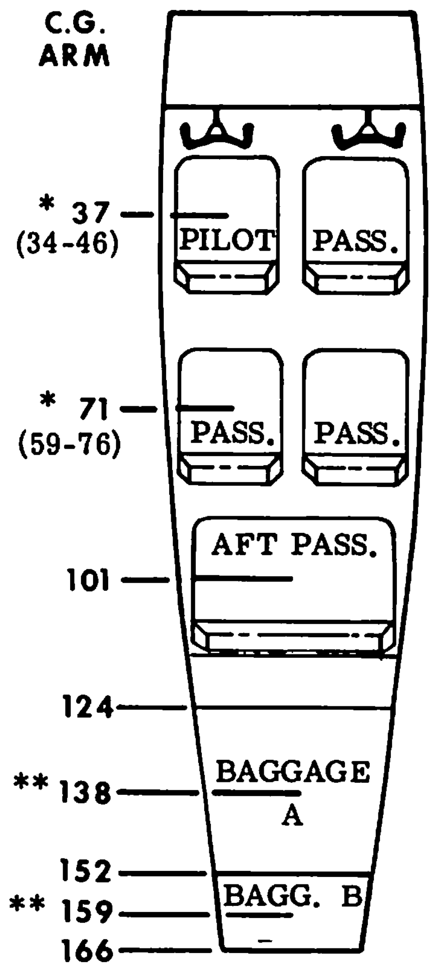
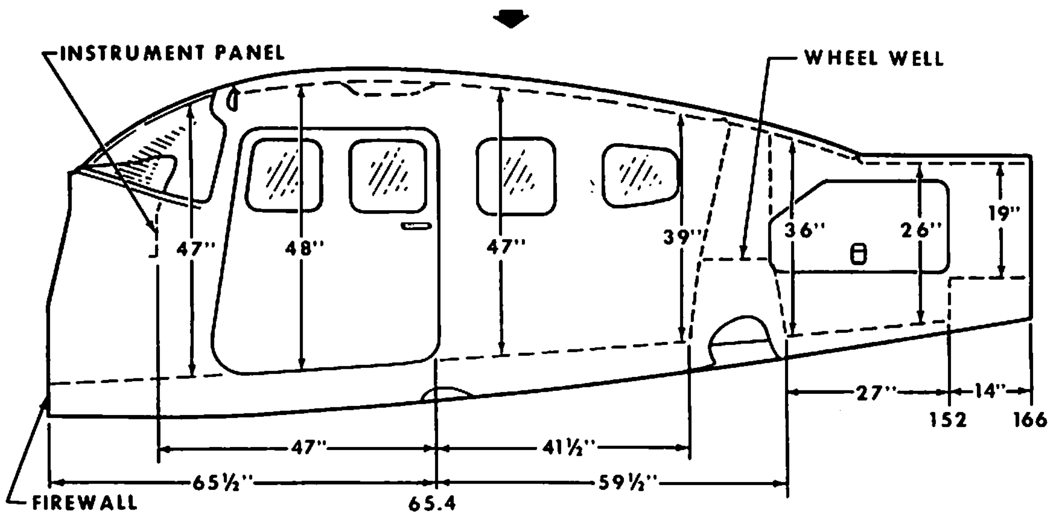


Figure 6-3. Loading Arrangements

CABIN HEIGHT MEASUREMENTS



DOOR OPENING DIMENSIONS

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

═══WIDTH═══
• LWR WINDOW LINE
* CABIN FLOOR

CABIN WIDTH MEASUREMENTS

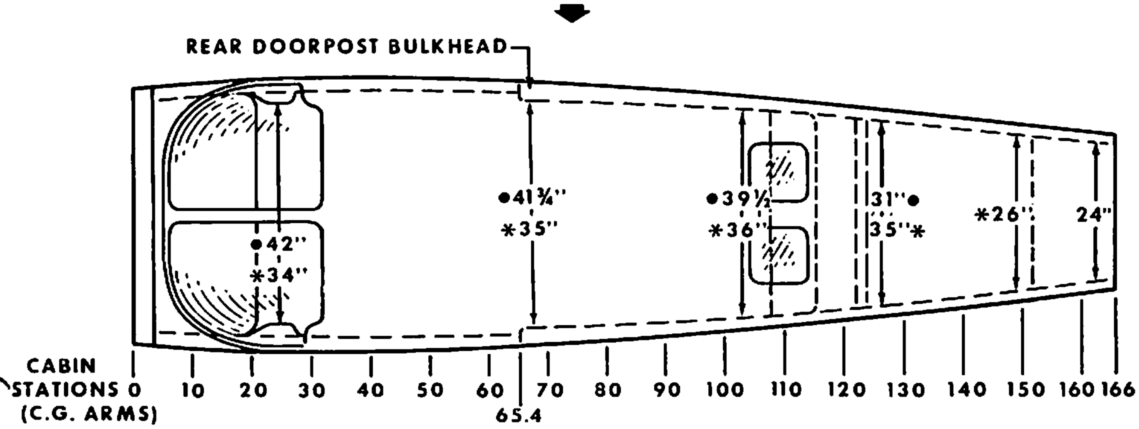


Figure 6-4. Internal Cabin Dimensions

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	2496	102.7		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (89 Gal. Maximum) . . .				
Reduced Fuel (66 Gal.)	396	17.0		
3. Pilot and Front Passenger (Station 34 to 46) .	340	12.6		
4. Center Passengers (Station 59 to 76)	340	24.1		
5. Aft Passengers	340	34.3		
6. *Baggage (Area "A") (Station 124 to 152) 200 Lbs. Max. . .	80	11.0		
7. *Baggage - Aft (Area "B") (Station 152 to 166) 80 Lbs. Max. . . .	24	3.8		
8. RAMP WEIGHT AND MOMENT	4016	205.5		
9. Fuel allowance for engine start, taxi and runup	-16	-.7		
10. TAKEOFF WEIGHT AND MOMENT (Subtract step 9 from step 8)	4000	204.8		
11. Locate this point (4000 at 204.8) on the Center of Gravity Moment Envelope. Since this loading falls within the shaded area of the moment envelope, proceed with steps 12, 13 and 14. If the computed loading point falls within the clear area of the moment envelope, no further steps are required and the loading is assumed satisfactory for take-off and landing provided that flight time is allowed for fuel burn-off to a maximum of 3800 pounds before landing.				
12. Estimated Fuel Burn-Off (Climb and Cruise) (43 Gallons at 6 Lbs./Gal.)	-258	-11.1		
13. Subtract step 12 from step 10 for estimated airplane landing weight	3742	193.7		
14. Locate this point (3742 at 193.7) on the Center of Gravity Moment Envelope. Since this point falls within the overall envelope, the loading may be assumed acceptable for landing.				

*The maximum allowable combined weight capacity for baggage areas A and B is 200 lbs.

Figure 6-5. Sample Loading Problem

Aircraft Weight and Balance Revision

Tail Number: N731PJ			Date: 6-18-2010	
Prepared by: NORTH STAR AVIATION INC. 516 Airport Road Hamilton, Montana 59840			Work Order No: Type Certificate Data No:	
Aircraft Make: Cessan	Model: P210N	Serial No: P21000523		Time:
Registered Owner: Joseph A Graziano		Address: 605 Inverness Trail, Hamilton, Montana 59840-9231		
Maximum Weight 4000		CG Range FWD	AFT	

As Received; Date of Previous Weight and Balance:	Useful Load:	EW:	EWCG:	Moment:
4/16/2006	1316.0	2684.0	41.81	112205.60

Notes:
This weight and balance revision is being done to reflect the removal and installation of the below listed items.

	Weight	Arm	Moment
Removed King KNS80 RNAV and KY196 COM	-9.60	14.00	-134.40
Removed King KR87 ADF	-3.20	14.00	-44.80
Removed King KI227 ADF Indicator	-0.70	17.5	-12.25
Removed King KA44 ADF Antenna	-2.00	51.00	-102.00
Install Garmin GNS430W	6.50	13.50	87.75
Install Garmin GA-35 GPS Antenna	0.60	143.00	85.80
Installed DAC International GDC31 Roll Steering Converter	0.50	12.50	6.25
Installed PS Engineering PM3000 Intercom	0.80	16.00	12.80
Installed Precise Flight Inc. Speedbrake System	8.00	64.30	514.40
Installed Speedbrake ALC	1.00	69.00	69.00

		New Empty Weight CG	New Useful Load
[X] As Calculated	Moment 112688.15	41.96	1314.10
[ ] As Weighed	Weight 2685.90		

Signature Herman Hill

Repair Agency or License No: A&P 3438614 IA

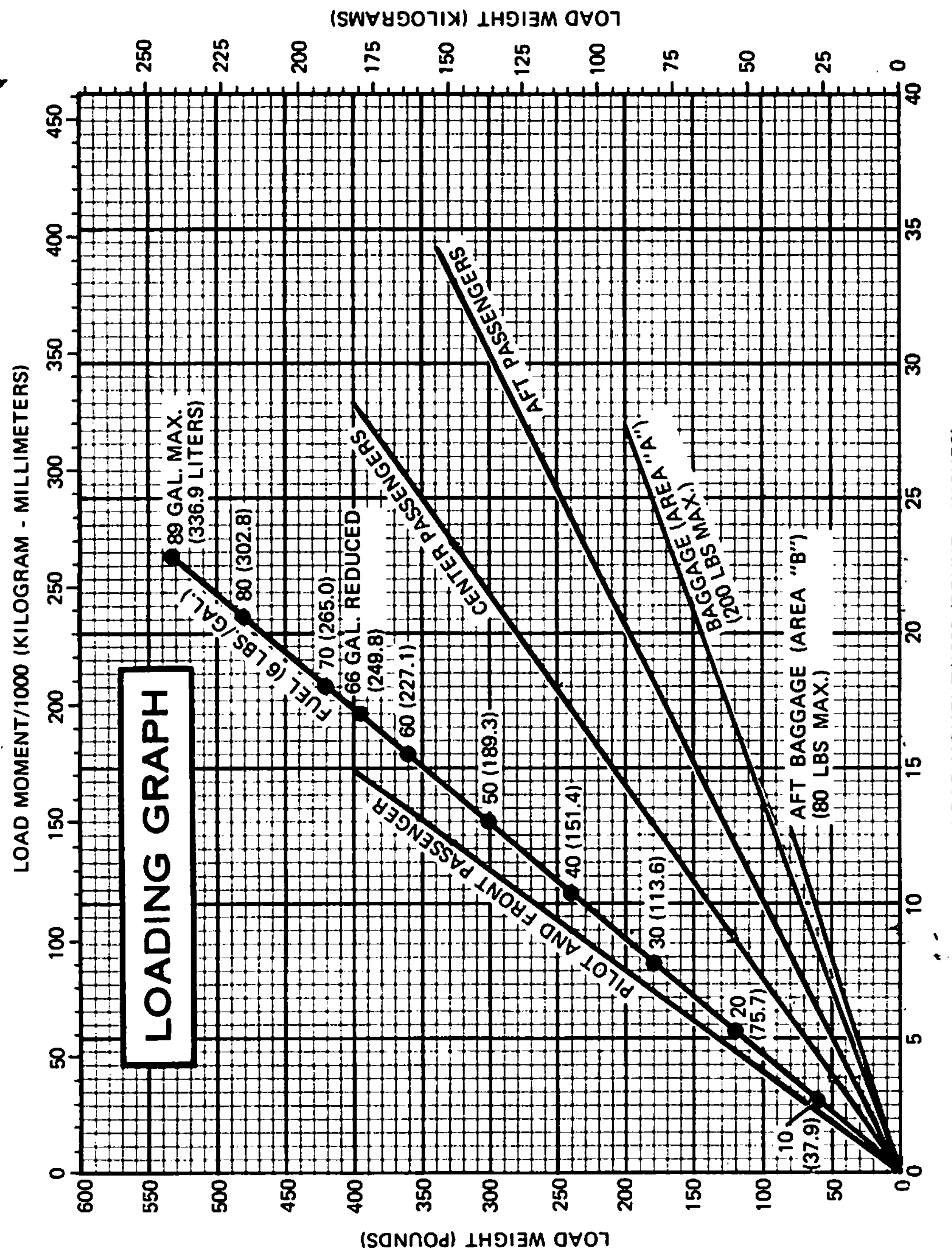
ADJUSTMENT FOR EQUIPMENT REMOVED.

	WT	MOMENT
PREVIOUS BALANCES	2685.90	112688.15
ADJUSTMENTS	-44.50	-3159.50
NEW BALANCES	2641.40	109528.65
NEW CG	41.47	

5/12/13 JS

SEE ATTACHED

NEW USEFUL LOAD = 1314.10 + 44.50 = 1358.60



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 6-6. Loading Graph

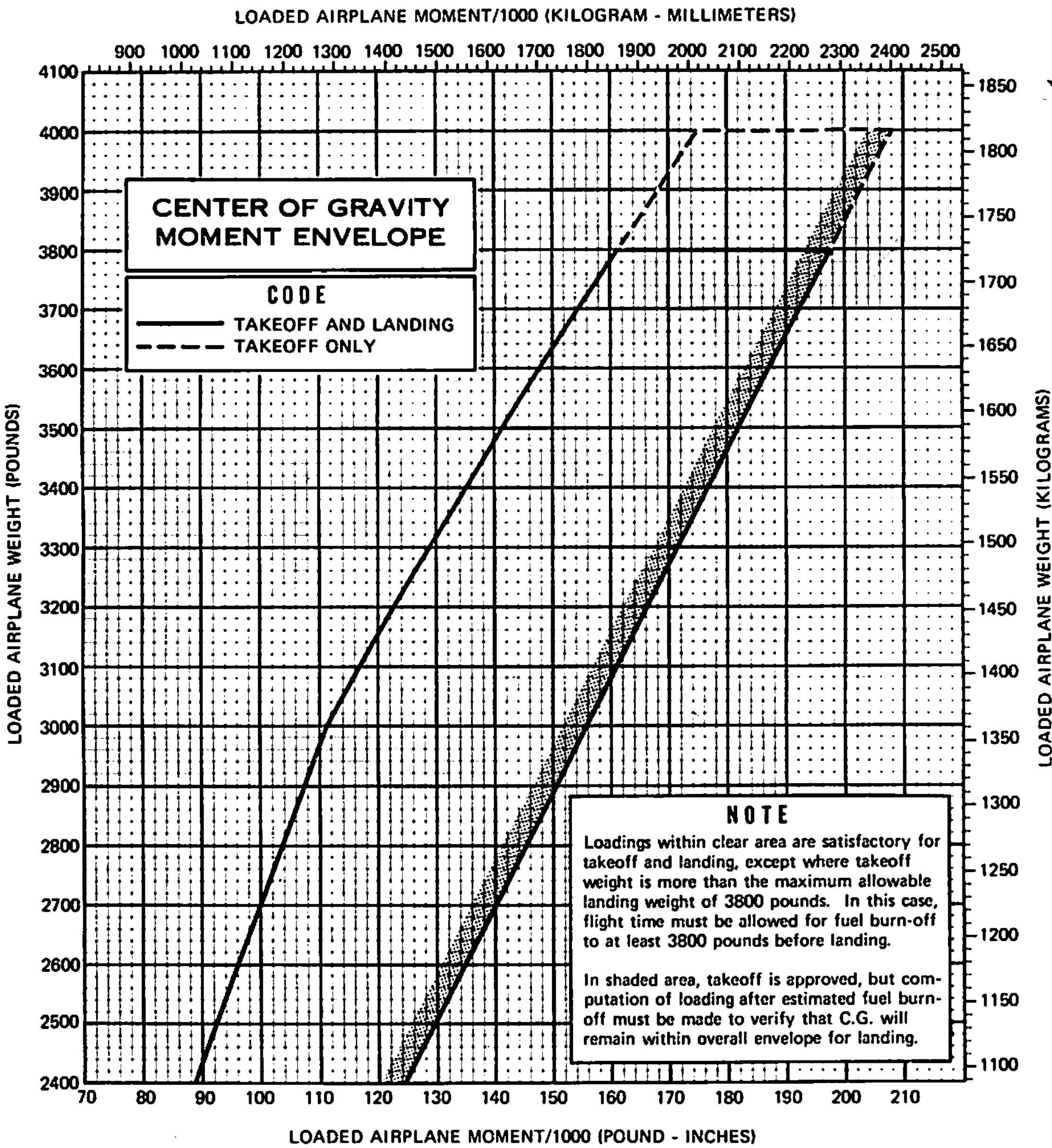


Figure 6-7. Center of Gravity Moment Envelope

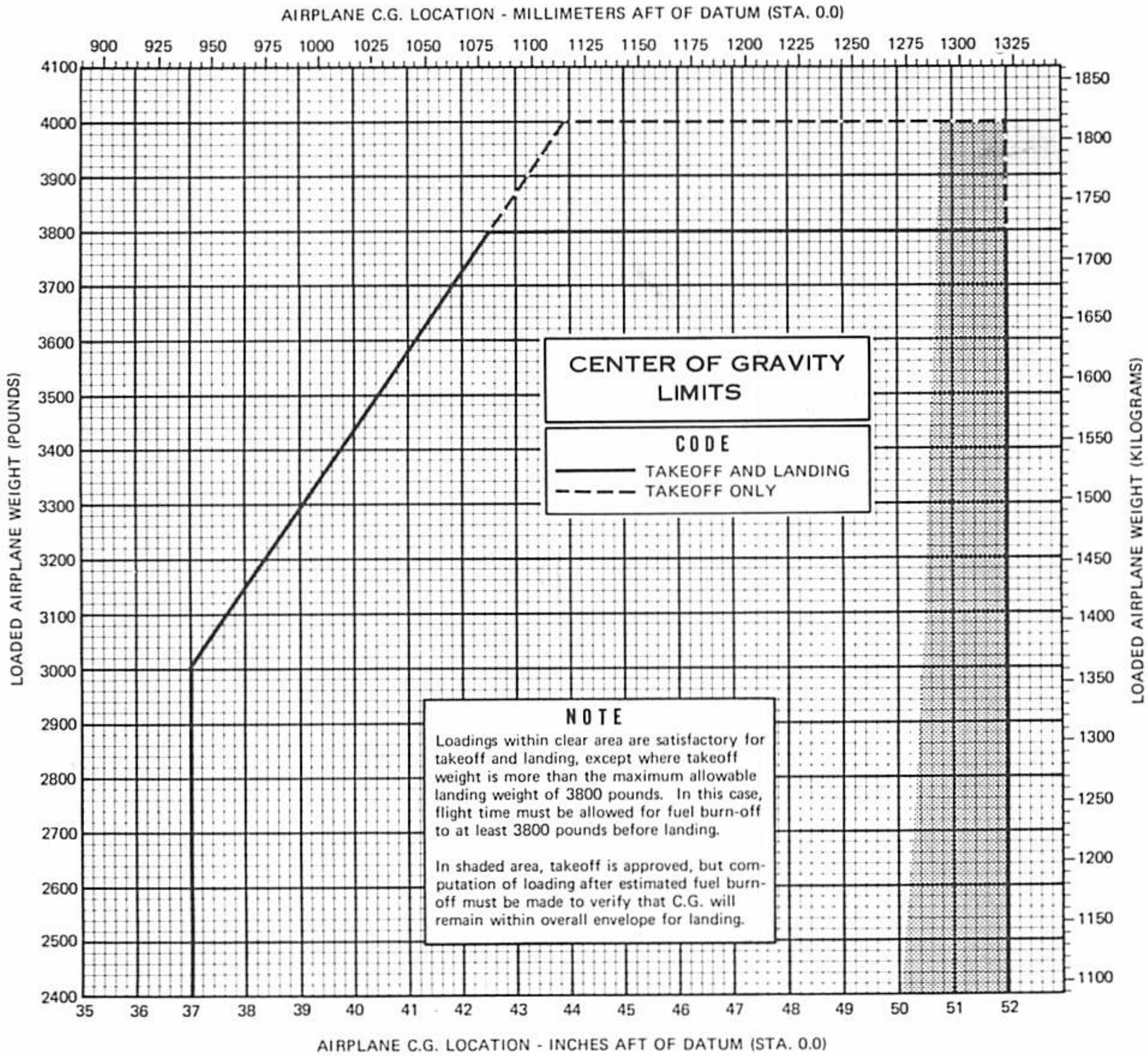


Figure 6-8. Center of Gravity Limits

EQUIPMENT LIST

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

This equipment list provides the following information:

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

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

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

NOTE

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

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

NOTE

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

NOTE

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

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	A. POWERPLANT & ACCESSORIES			
A01-R	ENGINE, CONTINENTAL TSIO 520-P SPEC. 2	2150125-1	454.3*	-17.7*
	TWO MAGNETOS WITH IMPULSE COUPLINGS	SLICK 662	12.9	-12.5
	OIL COOLER	10634C	4.2	-18.5
	TWELVE 18MM X 3/4 20-3A SPARK PLUGS	SL 350C	3.1	-19.5
	STARTER, 24 VOLT PRESTOLITE	TCM 634433	17.8	-5.0
A05-R	FILTER, ENGINE AIR INDUCTION	1255043	2.0*	-8.7*
	AIR FILTER	C294510-0801	1.0	-8.7
A09-R	ALTERNATOR, 28 VOLT 60 AMP HR	C611503-0102	10.7	-6.0
A09-O-1	ALTERNATOR INSTL., 95 AMP (NET CHANGE)	1601021-2	6.4*	-4.3*
	ALTERNATOR, 95 AMP & 28 VOLT	C611505-0101	15.8	-5.5
A09-O-2	STANDBY ELECTRICAL GENERATOR INSTALLATION	1250977-2	7.6*	-4.3*
	GENERATOR-STANDBY	C611507-0101	6.5	-5.5
	VOLTAGE REGULATOR	C611006-0101	0.6	-0.5
	BUS BAR	0713854	0.1	16.0
	CABLES & MISC HARDWARE		0.4	-4.4
A21-S	OIL FILTER, (SPIN-ON ELEMENT)	1656025-3	2.6*	-5.0*
	ADAPTER ASSEMBLY	1250922	1.5	-5.3
	FILTER ASSEMBLY	C294507-0102	1.1	-4.8
A33-R	PROPELLER 3 BLADE MCCAULEY D3A34C402/90DFA-10	C161007-0101	73.0	-44.0
A37-R	GOVERNOR, PROPELLER (MCCAULEY C290-D4/T2)	C161032-0101	3.0	-35.5
A41-R	SPINNER, PROPELLER	1250419	3.5	-44.5
A45-R	TURBOCHARGER ASSEMBLY	C295001-0202	31.3	-14.0
A49-R	TURBOCHARGER WASTE GATE VALVE ASSEMBLY	C165006-0106	3.8	-24.0
A53-R	TURBOCHARGER CONTROLLER	C165004-0503	1.7	2.5
A57-R	TURBOCHARGER OVERBOOST RELIEF VALVE	C482002-0107	1.5	-6.8
A61-A	VACUUM SYSTEM, ENGINE DRIVEN PUMP	2101003-1	4.5*	5.6*
	VACUUM PUMP	C431003-0102	1.8	-4.1
	RELIEF VALVE	C482001-0601	0.3	2.3
	MISC HOSES, CLAMPS & ETC.		2.4	13.3
A70-A	ENGINE PRIMING SYSTEM, MANIFOLD 2 POINT	2101010-2	0.8	5.7
	B. LANDING GEAR & ACCESSORIES			
B01-R-1	WHEEL, BRAKE & TIRE ASSY, 600X6 MAIN (2)	- -	44.5*	64.3*
	WHEEL ASSY, CLEVELAND 40-75B (EACH)	C163001-0301	7.8	64.0
	BRAKE ASSY, CLEVELAND 30-52 (LEFT)	C163030-0315	3.0	66.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	BRAKE ASSY, CLEVELAND 30-52 (RIGHT)	C163030-0316	3.0	66.5
	TIRE, 8 PLY RATED (EACH)	C262003-0208	9.4	64.0
	TUBE (EACH)	C262023-0102	2.1	64.0
B01-R-2	WHEEL, BRAKE & TIRE ASSY, 600X6 MAIN (2)	- -	45.8*	64.3*
	WHEEL ASSY, MCCAULEY (EACH)	C163006-0103	8.4	64.0
	BRAKE ASSY (LEFT)	C163032-0209	3.0	66.5
	BRAKE ASSY (RIGHT)	C163032-0210	3.0	66.5
	TIRE, 8 PLY RATED (EACH)	C262003-0208	9.4	64.0
	TUBE (EACH)	C262023-0102	2.1	64.0
B04-R	WHEEL & TIRE ASSY, 500X5 NOSE, MCCAULEY	C16301880107	9.9*	-7.4*
	WHEEL ASSY	C163005-0201	2.8	-7.4
	TIRE, 10 PLY RATED	C262003-0211	5.7	-7.4
	TUBE	C262023-0101	1.4	-7.4
	C. ELECTRICAL SYSTEMS			
C01-R	BATTERY, 24 VOLT STANDARD DUTY	C614001-0105	22.8	2.0
C01-O	BATTERY, 24 VOLT HEAVY DUTY	C614001-0106	24.8	2.0
C04-R	ALTERNATOR CONTROL UNIT WITH HIGH AND LOW VOLTAGE SENSING	C611005-0101	0.4	3.4
C07-A	GROUND SERVICE PLUG RECEPTACLE	2170003-1	1.9	-3.9
C10-A	ELECTRIC ELEVATOR TRIM INSTALLATION	1260671-1	4.1*	216.7*
	VOLTAGE REGULATOR	C611003-0101	0.2	215.2
	DRIVE ACTUATOR ASSY	1260153-1	3.3	220.0
C19-O-1	HEATING SYSTEM, STALL SENSOR & PITOT HEAD NET CHANGE	1201093-1	0.4	43.4
C19-O-2	HEATED PITOT & STALL WARNING SENSOR USED WITH J46-A ONLY, NET CHANGE	1201093-3	0.5	42.0
C22-A	LIGHTS INSTL., INSTRUMENT POST (SET OF 18)	2101009	0.5	19.5
C23-A	LIGHTS, INSTRUMENT PANEL, ELECTROLUMIN-ESCENCE	2101009-4	2.3	18.0
C25-A	LIGHT INSTALLATION, CONTROL WHEEL MAP (INCLUDED AUXILIARY MIC SWITCH AND CHANGES 1260243-2 TO 1260243-11)	1260243-11	0.1	22.5
C31-A	LIGHT INSTL., COURTESY UNDERWING LH	2101015-1	0.3	51.4
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF 2)	1221201	NEGL	-.-
C43-A	LIGHT INSTALLATION, OMNIFLASH BEACON	1201049	1.6*	226.0*
	BEACON LIGHT IN FIN TIP	C621001-0102	0.4	253.0
	FLASHER POWER SUPPLY (IN FIN TIP)	C594502-0102	0.7	253.1
C46-A	LIGHTS INSTL., WING TIP STROBE	1201129	3.3*	38.9*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	FLASHING POWER SUPPLY	C622008-0102	2.3	39.9
	STROBE LIGHTS IN WING TIP (SET OF 2)	C622006-0107	0.2	38.7
C49-S	LIGHTS, COWL MOUNTED LANDING & TAXI	2113000	2.0*	-30.0*
	LIGHT BULBS (SET OF 2)	GE 4591	1.0	-34.5
C57-A	ILLUMINATING LIGHT	1231069	1.7	226.0
C61-A	LIGHT INSTALLATION, ICE DETECTOR (WING)	2101005-1	0.6	9.6
C73-A	LIGHT, CABIN FLOOD (WHITE)		0.2	70.0
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0221	0.7	18.0
D01-O	TRUE AIR SPEED INDICATOR	1201108	0.8	18.0
D04-R	INSTRUMENT AIR ALTERNATE STATIC SOURCE	2100004	0.3	39.2
D07-R	ALTIMETER, SENSITIVE	C661071-0201	1.0	18.0
D07-O-1	ALTIMETER, SENSITIVE (FEET & MILLIBARS)	C661071-0202	0.9	18.0
D07-O-2	ALTIMETER, SENSITIVE 35,000 FT 20 FT MARKING INTERVALS	C661025-0102	1.0	18.0
D10-A	ALTIMETER, 2ND INSTRUMENT (R.H. SIDE)	2101013-9	1.1	17.5
D16-A-1	ALTIMETER, ENCODING (REQUIRES RELOCATION OF REGULAR ALTIMETER)	2101013	3.0	16.0
D16-A-2	ALTIMETER, ENCODING (REQUIRES RELOCATION OF REGULAR ALTIMETER)(FEET & MILLIBARS)	2101013	3.0	16.0
D16-A-3	ALTITUDE ENCODER, BLIND (INSTRUMENT PANEL INSTALLATION NOT REQUIRED)	2101011-2	1.6*	16.6*
	ENCODER	C744001-0101	1.3	15.5
D25-S	ELECTRIC CLOCK	C664508-0102	0.3	18.0
D25-O	ELECTRIC CLOCK, DIGITAL READ OUT	C664511-0101	0.2	18.0
D38-R	GAGE, FUEL QUANTITY (IN LOWER PEDESTAL)	C669525-0101	0.5	20.0
D41-R	GAGE, CYLINDER HEAD & OIL TEMPERATURE	C669526-0101	0.5	18.2
D43-R	GAGE, AMMETER & OIL PRESSURE	C669527-0101	0.5	18.2
D49-A	INDICATOR INSTALLATION, ECONOMY MIXTURE	1200677-7	0.7*	10.8*
	EGT INDICATOR, ALCOR 202-2AY	C668501-0211	0.4	18.3
	THERMOCOUPLE LEAD WIRE (IC)	C668501-0206	0.1	-0.3
	THERMOCOUPLE PROBE, ALCOR 01-005-1A44	C668501-0204	0.1	-18.0
D55-R	GAGE, MANIFOLD PRESSURE AND FUEL FLOW	C662037-0207	1.0	17.5
D64-A-1	GYRO INSTL, NON AUTO-PILOT	2101001-1	5.5*	15.1*
	HEADING INDICATOR	C661075-0101	3.0	15.0
	ATTITUDE INDICATOR	C661076-0103	2.1	16.0
	HOSES & MISC ITEMS		0.4	11.2
D64-A-2	GYRO INSTL FOR NOM 300A WITH UNSLAVED HSI	2101001-9	7.0*	15.1*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	(REQUIRES H09-A-2)			
	ATTITUDE INDICATOR	C661076-0103	2.1	16.0
	HSI GYRO (NON SLAVED)	44690-2000	4.5	15.0
	MISC ITEMS		0.4	11.2
D64-A-3	GYRO INSTL, CESSNA 300A NAV-O-MATIC	2101001-3	5.8*	15.1*
	ATTITUDE INDICATOR	C661076-0103	2.1	16.0
	HEADING INDICATOR (DG) (ARC)	40760-0104	3.3	15.0
D64-A-4	GYRO INSTALLATION, CESSNA NAV-O-MATIC 400B NON SLAVED HEADING INDICATOR	2101001-4	6.0*	15.1*
	ATTITUDE INDICATOR	37570-0105	2.3	16.0
	DIRECTIONAL INDICATOR	40760-0104	3.3	15.0
D64-A-5	GYRO INSTALLATION FOR CESSNA NAV-O-MATIC 400B WITH SLAVED HEADING INDICATOR	2101001-7	6.2*	15.1*
	ATTITUDE INDICATOR (HG)	37570-0105	2.3	16.0
	DIRECTIONAL INDICATOR (DG)	44760-0000	3.5	15.0
D64-A-6	GYRO INSTALLATION, CESSNA 400B NAV-O-MATIC WITH SLAVED HSI (REQUIRES H09-A-3)	2101001-8	7.5*	15.1*
	ATTITUDE INDICATOR	37570-0105	2.3	16.0
	HSI GYRO	44690-0000	4.8	15.0
D64-A-7	GYRO INSTALLATION FOR CESSNA 400B IFCS (REQUIRES H09-A-3)	2101001-6	8.3*	15.2*
	HSI GYRO	44690-0000	4.8	15.0
	ADI GYRO	44670-0000	3.1	16.0
D64-A-8	GYRO INSTL. FOR 400B NOM WITH UNSLAVED HSI (REQUIRES H09-A-2)	2101001-10	7.2*	15.1*
	ATTITUDE INDICATOR	37570-0105	2.3	16.0
	HSI GYRO	44690-2000	4.5	15.0
D67-A	HOURMETER INSTALLATION	2100010	0.5	9.8
D82-S	GAGE, OUTSIDE AIR TEMPERATURE	C668507-0101	0.1	26.5
D85-R	TACHOMETER, RECORDING	C668020-0108	0.6	17.5
D88-S-1	INDICATOR TURN COORDINATOR (24 VOLT ONLY)	C661003-0505	1.3	17.8
D88-S-2	INDICATOR, TURN COORDINATOR (10-30 VOLT)	C661003-0506	1.6	17.8
D88-O-1	INDICATOR, TURN COORDINATOR (FOR USE WITH NAV-O-MATIC 200A & 300A)	42320-0028	1.3	17.8
D88-O-2	INDICATOR, TURN AND BANK	S-1303-2	1.0	17.5
D91-S	INDICATOR, VERTICAL SPEED	C661080-0101	1.0	17.5
	E. CABIN ACCOMMODATIONS			
E01-A	ARM RESTS (2) 1ST ROW REMOVABLE INBOARD	1214121-2	1.5	37.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
F02-A	ARM RESTS (2) 2ND ROW REMCVABLE INBOARD	1214121-2	1.5	71.0
F05-R	SEAT, PILOT, INFINITE VERTICAL ADJUST	1214164	18.5	44.0
F05-O	SEAT, PILOT ARTICULATING VERTICAL ADJUST WITH LUMBAR SUPPCRT	1214164	24.1	39.5
F07-S	SEAT, CO-PILOT FIXED HEIGHT, ARTICULATING	1214164	18.5	44.0
F07-O-1	SEAT, CO-PILOT FIXED HEIGHT, ARTICULATING CUSHION, LUMBAR SUPPORT	1214113	19.3	44.0
F07-O-2	SEAT, CO-PILOT VERTICAL ADJUSTING, ARTICULATING CUSHION	1214113	23.3	39.5
F07-O-3	SEAT, CO-PILOT VERTICAL ADJUSTING, ARTICULATING CUSHION W/LUMBAR SUPPORT	1214164	24.1	39.5
F09-S	SEATS, TWO 2ND ROW INDIVIDUAL	1214129-1, -2	35.3	73.0
F11-S	SEAT, TWO PLACE 3RD RCW BENCH		22.6	104.5
F15-R	SEAT BELT ASSY, PILOT	S-2275-103	1.0	37.0
F15-S	SHOULDER HARNESS ASSY, PILCT	S-2275-201	0.6	37.0
F19-A	INERTIA REEL INSTALLATICN, 1ST RCW SEAT BELT & SHOULDER HARNESS NET CHANGE	1201057	0.6	145.3
F23-S	BELT & SHOULDER HARNESS ASSY, CO-PILCT	S-2275-3	1.6	37.0
F27-S	BELTS ASSY, 2ND ROW OCCUPANT LAP (SET OF 2)	S-1746-25	2.0	71.0
F27-O-1	BELTS & SHOULDER HARNESS ASSY., 2ND ROW OCCUPANT LAP (SET CF 2)	S-2275-5	3.2	71.0
F29-S	BELTS ASSY., 3ND ROW OCCUPANTS (SET OF 2)	S-1746-17	2.0	101.0
F29-O-1	BELTS & HARNESS ASSY., 3RD ROW (SET OF 2)	S-2275-32	3.2	101.0
F34-O	UPHOLSTERY, LEATHER SIDEPANELS NET CHANGE		2.0	65.0
F35-O-1	LEATHER SEAT COVERING, FULL COVER 6 PLACE (ADDS WEIGHT OF 0.5 LB. PER SEAT)		3.0	73.1
F35-O-2	LEATHER SEAT COVERING, PART CCVER 6 PLACE		1.5	73.1
F47-A	OXYGEN SYSTEM, SOLID STATE GENERATOR WITH APPROXIMATELY 15 MINUTES USE	2100001-1	5.6*	59.1*
	OXYGEN GENERATORS (2 USED) WT. EACH	C166025-0102	1.7	58.0
	OXYGEN MASKS FOR 6 PEOPLE (STOWED IN OVERHEAD CONSOLE AREA)	C166025-0104	2.2	63.5
F49-A-1	BEVERAGE CUP HOLDER, RETRACTABLE, PILOT	1201124-1	0.1	17.0
F49-A-2	BEVERAGE CUP HOLDER, RETRACTABLE, CO-PILOT	1201124-2	0.1	17.0
F50-A	HEADREST, FRONT ROW (EACH)	1215073	0.9	48.0
F51-A	HEADREST, 2ND ROW (EACH)	1215073	0.9	82.0
F59-A	APPROACH PLATE HOLDER	1515151-1	0.1	22.0
F85-A	CONTROLS INSTALLATION, DUAL	1260004-8	6.7	14.1
	RIGHT SIDE WHEEL, PEDAL & TCE BRAKES	1260455-2		
F89-O	CONTROL WHEEL ALL PURPOSE (NET CHANGE)	1260243	NEGL	-.-

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	F. PLACARDS, WARNINGS & MANUALS			
F01-R	PLACARD, OPERATIONAL LIMITATIONS VFR, DAY	2105015-1	NEGL	-.-
F01-0-1	PLACARD, OPERATIONAL LIMITATIONS VFR, DAY-NIGHT	2105015-2	NEGL	-.-
F01-0-2	PLACARD, OPERATIONAL LIMITATIONS IFR, DAY-NIGHT	2105015-3	NEGL	-.-
F01-0-3	PLACARD, FLIGHT INTO KNOWN ICING CONDITION	2105015-5	NEGL	-.-
F07-R	STALL & GEAR WARNING BLACKBOX (REQUIRES ITEM H61-R FOR AUDIBLE OPERATION)	1270733-2	0.5	41.0
F10-S	PILOT'S CHECK LIST (STOWED)	D6041	-.-	-.-
F16-R	PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRCRAFT FLIGHT MANUAL STOWED	D1188-13PH	1.3	-.-
	G. AUXILIARY EQUIPMENT			
G13-A	CORROSION PROOFING, INTERNAL	1260100	10.0	70.0
G16-A	STATIC DISCHARGERS INSTL. (SET OF 10)	1201131	0.4	154.8
G19-A	STABILIZER ABRASION BOOTS	0500041-2	2.7	202.0
G22-S	TOW BAR, AIRPLANE (STOWED)	0501019	1.6	138.0
G22-0	TOW BAR, TELESCOPING HANDLE (STOWED ARM)	1200008-8	2.0	138.0
G25-S	PAINT, OVERALL EXTERIOR	2104002-2	13.1*	90.8*
	OVERALL WHITE BASE		12.7	91.5
	COLORED STRIPE		0.4	67.0
G31-0	CONTROL CABLES, CORROSION RESISTANT (NET CHANGE)	1260417-10	NEGL	-.-
G55-A	FIRE EXTINGUISHER, HAND TYPE	0701014-5	3.0	35.0
G61-A	WRITING TABLE	1715072-1	3.6	61.5
G67-A	EXTENSIONS, RUDDER PEDAL, REMOVABLE, SET OF 2 (STOWABLE-INSTALLED ARM SHOW NOT FACTORY INSTALLED)	0701048	2.3	8.0
G76-A-1	DE-ICE SYSTEM, WING AND STABILIZER (REQUIRES VACUUM SYSTEM INSTALLATION)	2101018-6	26.3	63.8
G76-A-2	DE-ICE SYSTEM, WING, STABILIZER & VTL FIN (REQUIRES VACUUM SYSTEM AND USED WITH J46-A ONLY)	2101018	27.2	68.0
G76-A-3	DE-ICE PARTIAL PLUMBING INSTALLATION	2101018-4	2.8	71.4
G79-A	DE-ICE SYSTEM, 3 BLADE PROPELLER	1201072	6.6	-18.4
G82-A-1	WINDSHIELD ANTI-ICE SYSTEM	1201060	2.1*	9.2*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	REMOVABLE HEATING PANEL (INSTALLED ARM SHOWN)	1513460-6	1.9	9.0
G82-A-2	WINDSHIELD ANTI-ICE SYSTEM (KNOWN ICING) (USED WITH J46-A ONLY)	2101019	2.7	17.1
	H. AVIONICS & AUTOPILOTS			
H01-A-1	CESSNA 300 ADF (R-546E)	3910159-21	7.5*	27.4*
	RECEIVER WITH BFO, R-546E	41240-0001	3.3	12.5
	INDICATOR, IN-346A	40980-1001	0.9	17.0
	LOOP ANTENNA	41000-1000	1.4	50.0
	SENSE ANTENNA INSTALLATION	3960115-2	0.3	142.4
	ADF MOUNT AND CABLES	3950137	1.6	22.7
H01-A-2	CESSNA 400 ADF (446A) WITH BFO	3910160-17	7.7*	27.0*
	RECEIVER (WITH DUAL TUNERS), R-446A	43090-1028	3.5	12.5
	IN-346A INDICATOR	40980-1001	0.9	17.0
	LOOP ANTENNA	41000-1000	1.4	50.0
	SENSE ANTENNA INSTALLATION	3960115-2	0.3	142.4
	ADF MOUNT AND CABLES	3950137	1.6	22.7
H02-A	RMI-ADF INDICATOR INSTALLATION (THIS UNIT REQUIRES AN ADF, SLAVING SYSTEM WITH SLAVED GYROS AND AUTOPILOT WITH A BOOTSTRAP SLAVING ACCESSORY BE INSTALLED)	3910204	8.1*	75.3
	RMI REMOTE INDICATOR (DUAL NEEDLE)	46450-0404	2.1	17.0
	REMOTE GONIOMETER	41950-0001	1.3	15.0
	DYNAVERTER	47550-0000	5.4	97.0
	ADF INDICATOR DELETED	40980-1001	-0.9	16.0
H03-A	AM-FM STEREO & CASSETTE RECEIVER/PLAYER INSTL. WITH 2 HEADSETS	3910209-5	5.4*	31.0*
	RECEIVER/TAPE PLAYER INSTALLATION	3930211-1	2.4	15.0
	HEADSETS (2 LISTED, 4 MAY BE USED)	C596532-0101	2.0	37.0
	WIRING & HARDWARE		1.0	57.4
H04-A-1	CESSNA 400 DME INSTL W/300 OR 400 NAV/COM	3910167-20	16.4*	101.7*
	C-476A CONTROL UNIT	44020-1000	1.6	14.5
	RTA-476 REMOTE TRANSCEIVER	44000-0000	9.0	120.5
	ANTENNA	42940-0000	0.2	173.0
	BAGGAGE SCREEN INSTALLATION	2115050-1	1.8	120.0
	WIRING & MISC HARDWARE		3.8	80.9
H04-A-2	NARCO DME 190 WITH 300 OR 400 NAV/COMS	3910166-13	7.0*	22.7*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	TRANSCEIVER	3312-406	5.1	13.0
	CABLE & HARDWARE		1.9	44.8
H05-A-1	CESSNA AREA NAVIGATION WITH CESSNA 300 OR 400 SERIES NAV/COMS WITH 300 SERIES INDICATORS ONLY (INDICATORS EXCHANGE)	3910168	4.6*	13.8*
	R-NAV COMPUTER-INDICATOR RN-478	44100-0000	3.8	14.2
	INDICATOR, IN-442AR ADDED	43910-1000	1.0	16.5
	NAV/COM INDICATOR DELETED	46860-1000	-1.6	16.5
	MOUNT, WIRING & HARDWARE		1.4	14.1
H05-A-2	CESSNA 400 AREA NAVIGATION WITH IN-1048AC (AVAILABLE WITH 400 NAV/COM ONLY) (INDICATOR EXCHANGE FOR IN-485AC)	3910168	4.8*	13.8*
	R-NAV COMPUTER, RN-478	44100-0000	3.8	14.2
	INDICATOR, IN-1048AC ADDED	46880-1310	1.5	16.5
	NAV/COM INDICATOR DELETED	46870-1300	-1.9	16.5
	MOUNT, WIRING & HARDWARE		1.4	13.5
H05-A-3	FOSTER R-NAV WITH 190 DME OR CESSNA 400DME	3910203	3.0*	19.5*
	COMPUTER & MOUNT, FOSTER R-511	805A0202-1	2.4	16.4
	DME ADAPTOR INSTALLATION	3940258	0.3	5.6
	MISC HARDWARE		0.3	58.0
H07-A-1	CESSNA 400 GLIDESLOPE WITH IN-386A ILS EXCHANGED FOR VOR/LOC IND. (1ST UNIT)	3910157-14	3.9*	78.4*
	RECEIVER (R-443B)	42100-0000	2.1	99.3
	VOR/ILS INDICATOR (IN-386A) ADDED	46860-2000	1.7	16.5
	VOR/LOC INDICATOR (IN-385A) DELETED	46860-1000	-1.6	16.5
	ANT. COUPLER	S473-1	0.3	94.0
	WIRING & HARDWARE		1.4	48.1
H07-A-2	CESSNA 400 GLIDESLOPE WITH IN-486AC ILS IND. EXCHG FOR VOR/LOC IND. (1ST UNIT)	390157-17	3.9*	78.4*
	RECEIVER (R-443B)	42100-0000	2.1	99.3
	INDICATOR IN-486AC ADDED	46870-2300	2.0	16.5
	INDICATOR IN-485AC DELETED	46870-1300	-1.9	16.5
	ANT. COUPLER	S2473-1	0.3	94.0
	WIRING & HARDWARE		1.4	48.1
H07-A-3	CESSNA 400 GLIDESLOPE IN-386A ILS IND. EXCHANGED W/VOR-LOC IND (2ND UNIT) SAME AS H07-A-1 (1ST UNIT) EXCEPT	3910157-21	3.9*	78.4*
	ANTENNA COUPLER (NET CHANGE)	S2474-1	NEGL	-.-
H07-A-4	CESSNA 400 GLIDESLOPE W/486AC ILS IND. EXCHANGED FOR VOR/LOC IND. (2ND UNIT) SAME AS H07-A-2 (1ST UNIT) EXCEPT	3910157-22	3.9*	78.4*
	ANTENNA COUPLER (NET CHANGE)	S2474-1	NEGL	-.-

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H08-A-1	NAV. INDICATOR W/ARC-LOC EXCHG W/VOR-LOC	3910196-1	0.2*	16.5*
	ARC/LOC IN-385AC ALTO RADIAL CENTERING (ADDED)	46860-1200	1.8	16.5
	VOR/LOC IN-385A DELETED	46860-1000	-1.6	16.5
H08-A-2	NAV. INDICATOR W/ARC-ILS EXCHG W/VOR-ILS	3910196-2	0.1*	16.5*
	ARC/ILS IN-386AC ADDED	46860-2200	1.9	16.5
	VOR/ILS IN-386A DELETED	46860-2000	-1.8	16.5
H09-A-1	SLAVED COMPONENT INSTL.		3.2*	40.2*
	SLAVING ACCESSORY (W/C BCCT STRAP)	3940229-1	0.6	49.4
	FLUX DETECTOR INSTL.	3940200-2	0.6	44.9
	GYRO NON-SLAVED (D64-A-4) DELETED	2101001-4	-6.0	15.1
	GYRO SLAVED (D64-A-5) ADDED	2101001-7	6.2	15.1
	CABLES SLAVED	3950139-27	1.8	38.3
H09-A-2	HSI NON-SLAVED COMPONENT INSTL.		2.6*	92.1*
	CONVERTER INSTL.	3940236-2	1.1	98.0
	GYRO NON-SLAVED (D64-A-4) DELETED	2101001-4	-6.0	15.1
	GYRO W/HSI NON-SLAVED (D64-A-8)	2101001-10	7.2	15.1
	CABLES HSI NON-SLAVED	3950139-31	2.0	70.8
	VOR-ILS INDICATOR DELETED	46870-1300	-1.7	16.5
H09-A-3	HSI-SLAVED COMPONENT INSTL.		4.3*	54.8*
	CONVERTER INSTL.	3940236-2	1.1	98.0
	SLAVING ACCESSORY INSTL.	3940229-1	0.6	49.4
	FLUX DETECTOR INSTL.	3940200-2	0.6	44.9
	GYRO NON-SLAVED (D64-A-4) DELETED	2101001-4	-6.0	15.1
	GYRO W/SLAVED HSI (D64-A-6) ADDED	2101001-8	7.5	15.1
	CABLES SLAVED HSI	3950139-11	2.2	35.0
	VOR-ILS INDICATOR DELETED	46870-1300	-1.7	16.5
H11-A-1	PANTRONICS PT10-A HF TRANSCEIVER 2ND UNIT (REQUIRES BAGGAGE SCREEN INSTL.)	3910193-24	20.1*	81.3*
	PT10-A TRANSCEIVER CONTROL	C582103-0101	3.8	13.3
	PT10-PS-28 REMOTE POWER SUPPLY	C582103-0301	8.5	102.6
	DX10-RL-28 ANTENNA LOAD BOX	C589502-0201	4.5	116.0
	WIRING & HARDWARE	3950137-23	3.0	51.3
	HF ANTENNA INSTL	3960117-1	0.3	118.6
H11-A-2	SUNAIR ASB 125 SINGLE SIDE BAND HF TRANS-CEIVER (REQUIRES BAGGAGE SCREEN INSTL.)	3910158-41	23.9*	82.5*
	ANTENNA LOAD BOX	99816	4.9	116.0
	TRANSCEIVER	99681	5.3	13.5
	POWER SUPPLY & SHOCK MOUNT	99683	9.2	116.0
	HF ANTENNA INSTL.	3960117-1	0.3	118.6
	WIRING & HARDWARE	3950137-24	4.2	60.5
H13-A	CESSNA 400 MARKER BEACON	3910164-13	2.5*	88.0*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	REMOTE RECEIVER, R-402A	42410-5128	0.7	11.5
	ANTENNA INSTALLATION, FLUSH MTD IN TAIL	3960126-2	0.8	206.9
	WIRING & HARDWARE		0.9	51.6
H15-A-1	WEATHER RADAR INSTL., (BENDIX RDR-160)	3910179	21.9*	30.6*
	INDICATOR (VIEWING SCREEN, IN-152A)	4000946-5201	5.1	12.2
	ANTENNA-TRANSCEIVER (ART-161)	4001018-6101	9.3	34.4
	RADOME AND WING POD	2170300-1	4.5	43.9
	MISC ITEMS INCLUDING ELECTRICAL CABLES		3.0	30.1
H15-A-2	WEATHER RADAR INSTL (RCA WEATHER SCOUT)	3910207-4	19.7*	30.4*
	INDICATOR (VIEWING SCREEN) & MOUNT	MI585256-1	4.9	12.2
	ANTENNA-TRANSCEIVER	MI585264	7.3	34.4
	RADOME AND WING POD ASSEMBLY	2170300-1	4.5	43.9
	MISC ITEMS INCLUDING ELECTRICAL CABLES		3.0	30.1
H16-A	CESSNA 400 TRANSPONDER (RT-459A)	3910128-26	3.7*	13.5*
	RT-459A TRANSCEIVER	41470-1028	2.7	11.5
	ANTENNA TRANSPONDER	42940-0000	0.2	38.4
	CABLES & HARDWARE		0.7	13.8
H22-A-1	CESSNA 300 NAV/COM 720 CH COM 1ST UNIT	3910183	8.3*	13.7*
	REQUIRES H34-A TO BE OPERATIONAL			
	RECEIVER-TRANSMITTER RT-385A	46660-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-385A	46860-1000	1.6	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
H22-A-2	CESSNA 400 NAV/COM WITH 300 INDICATOR	3910189	8.3*	13.7*
	REQUIRES H34-A TO BE OPERATIONAL			
	RECEIVER-TRANSCEIVER (RT-485A)	47360-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-385A	46860-1000	1.6	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
	NOTE--CESSNA VOR/LOC AUTOMATIC RADIAL CENTERING IND. MAY BE CHANGED FOR STANDARD INDICATOR (H08-A-1 & H08-A-2)			
H22-A-3	CESSNA 400 NAV/COM W/400 IND. 1ST UNIT	3910189	8.5*	13.7*
	REQUIRES H34-A TO BE OPERATIONAL			
	RECEIVER-TRANCEIVER, RT-485A	47360-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-485AC	46870-1300	1.8	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
H25-A-1	CESSNA 300 NAV/COM 720 CH COM 2ND UNIT	3910183	8.3*	13.7*
	REQUIRES H37-A TO BE OPERATIONAL			
	RECEIVER-TRANSCEIVER, RT-385A	46660-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-385A	46860-1000	1.6	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
H25-A-2	CESSNA 400 NAV/COM 2ND UNIT W/300 SERIES INDICATOR, RQS H37-A TO BE OPERATIONAL	3910189	8.3*	13.7*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	RECEIVER-TRANSCEIVER, RT-485A	47360-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-385A	46860-1000	1.6	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
	NOTE--WITH THE 300 SERIES INDICATOR VOR/ LOC AUTOMATIC RADIAL CENTERING MAY BE EXCHANGED FOR STANDARD INDICATOR (H08-A-1 & H08-A-2)			
H25-A-3	CESSNA 400 NAV/COM 2ND UNIT W/400 SERIES INDICATOR, ROS H37-A TO BE OPERATIONAL	3910189	8.5*	13.7*
	RECEIVER-TRANSCEIVER, RT-485A	47360-1000	5.5	13.5
	VOR/LOC INDICATOR, IN-485AC	46870-1300	1.8	16.5
	MOUNT, WIRING & MISC ITEMS		1.2	10.7
H28-A-1	EMERGENCY LOCATOR TRANSMITTER	0470419-25	3.5*	159.0*
	TRANSMITTER (D & M DMELT-6-1)	C589511-0117	3.3	160.1
	ANTENNA, CABLES & HARDWARE	C589511-0109	0.2	142.5
H28-A-2	EMERGENCY LOCATOR TRANSMITTER (USED IN CANADA)	0470419-26	3.5*	159.0*
	TRANSMITTER (D & M DMELT-6-1C)	C589511-0113	3.3	160.1
	ANTENNA, CABLES & HARDWARE	C589511-0109	0.2	142.5
H31-A-1	CESSNA 300A NAV-O-MATIC INSTALLATION	3910163-23	19.1*	24.5*
	CONTROLLER INSTL.	3930145-7	2.2	14.8
	D88-O-1 TURN COORDINATOR (NET CHANGE)	42320-0028	NEGL	-.-
	WING SERVO INSTL.	1200237-7	4.6	56.6
	D64-A-3 GYRO INSTALLATION	2101001-3	5.8	15.1
	A61-A VACUUM SYSTEM	2101003-1	4.5	5.6
	WIRING & MISC ITEMS		2.0	48.1
H31-A-2	CESSNA 400B NAV-O-MATIC WITH NON-SLAVED HEADING INDICATOR	3910197-3	47.9*	65.7*
	AILERON ROLL ACTUATOR (PA-495-1)	45850-2909	4.2	56.2
	ELEVATOR PITCH ACTUATOR (PA-495-2)	45850-3912	4.2	154.7
	CONTROLLER	37960-1028	1.6	18.0
	COMPUTER - AMPLIFIER	42680-0007	5.8	98.0
	ALTITUDE SENSOR	44400-0000	2.3	97.5
	PITCH TRIM ACTUATOR	44430-3025	2.2	220.5
	D64-A-4 GYRO, NON-SLAVED	2101001-4	6.0	15.1
	A61-A VACUUM SYSTEM	2101003-1	4.5	5.6
	ACCESS UNIT INSTALLATION	3930200-1	1.0	15.0
	FILTER INSTALLATION	3940262-2	1.1	92.4
	C01-O BATTERY CHANGE TO HEAVY DUTY	C614001-0106	2.0	2.0
	WIRING & MISC ITEMS		13.0	55.2
H31-A-3	CESSNA 400B NAV-O-MATIC W/SLAVED HEADING IND. (SAME AS H31-A-2 & ADDES H09-A-1)	3910197-11	51.1*	64.1*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	H31-A-2 400B NAV-O-MATIC, NON-SLAVED	3910197-3	47.9	65.7
	H09-A-1 CESSNA SLAVED COMPONENT		3.2	40.2
H31-A-4	CESSNA 400B NAV-O-MATIC W/NON-SLAVED HSI IND. (SAME AS H31-A-2 & ADDES H09-A-2)	3910197-26	50.5*	67.0*
	H31-A-2 400B NAV-O-MATIC, NON-SLAVED	3910197-3	47.9	65.7
	H09-A-2 CESSNA HSI NON-SLAVED COMPONENT		2.6	92.1
H31-A-5	CESSNA 400B NAV-O-MATIC WITH SLAVED HSI. (SAME AS H31-A-2 & ADDES H09-A-3)	3910197-19	52.2*	64.8*
	H31-A-2 400B NAV-O-MATIC, NON-SLAVED	3910197-3	47.9	65.7
	H09-A-3 HSI SLAVED COMPONENT		4.3	54.8
H31-A-6	CESSNA 400 IFCS W/SLAVED HSI	3910198-6	55.3*	62.0*
	CESSNA 400B IFCS W/ALTITUDE ALERT OPTION		60.3*	58.1*
	CONTROLLER	41090-1028	1.3	16.5
	MODE SELECTOR	42710-0000	2.6	13.0
	PITCH ACTUATOR	45850-3912	4.2	154.7
	ALTITUDE SENSOR	44400-0000	2.3	97.5
	COMPUTER-AMPLIFIER	42680-0007	5.8	98.0
	PITCH TRIM ACTUATOR	44430-3025	2.2	220.5
	ROLL ACTUATOR	45850-2909	4.2	56.2
	A61-A VACUUM SYSTEM	2101003-1	4.5	5.6
	H09-A-3 HSI SLAVED COMPONENT		4.3	54.8
	D64-A-6 GYRO DELETED (H09-A-3)	2101001-8	-7.5	15.1
	D64-A-7 GYRO INSTL. FOR IFCS ADDED	2101001-6	8.3	15.1
	C01-O BATTERY CHANGED TO HEAVY DUTY.	C614001-0106	2.0	2.0
	WIRING & MISC HARDWARE		21.1	44.1
	ALTITUDE ALERT SYSTEM (INCLUDED 801A ENCODING ALTIMETER)		5.0	14.9
H34-A	BASIC AVIONICS KIT (REQUIRES W/1ST UNIT NAV-COM RADIO INSTALLATION)	3910186-15	6.2*	55.0*
	1ST NAV/COM INSTALLATION ITEMS	3930186-6	0.1	16.8
	NOISE FILTER ON ALTERNATOR FOR AUDIO	3940148-1	0.1	-2.0
	OMNI ANTENNA INSTALLATION	3960102-6	0.6	250.6
	VHF COM ANTENNA INSTL., LH	3960113-1	0.5	50.7
	AUDIO CONTROL PANEL	3970147-1	1.8	13.0
	HEADPHONE INSTALLATION	3970138-4	0.2	17.6
	MICROPHONE INSTALLATION	3970143-1	0.3	16.4
	BUS BAR INSTALLATION	3930178-10	0.1	25.0
	RADIO COOLING INSTALLATION	3930207-3	1.0	5.5
	OMNI ANTENNA CABLE ASSEMBLY	3950137-1	0.8	139.3
	COM ANTENNA CABLE ASSEMBLY	3950137-4	0.5	34.8
	ANTENNA ADAPTER	3960139-4	0.2	7.0
	FUSEHOLDER INSTALLATION	3940247-3	NEGL	-.-

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H37-A	ANTENNA & COUPLER KIT (FOR 2ND UNIT ONLY)	3910185-13	1.1*	41.2*
	OMNI ANTENNA COUPLER ASSEMBLY	3960111-13	0.2	11.5
	VHF COM ANTENNA (SPIKE ON RH WING)	3960113-2	0.5	50.6
	2ND COM INSTALLATION ITEMS	3930186-7	0.1	16.8
	RH VHF COM CABLE ASSY	3950137-5	0.5	34.8
	ANTENNA ADAPTER FOR 1ST COM DELETED	3960139-4	-0.2	7.0
H46-A	ADF ANTI-PRECIP ANTENNA	3910154-101	0.7	140.0
H52-A	FLUSH MOUNTED COM ANTENNA INSTALLATION (MOUNTED IN LEADING EDGE OF VTL FIN)	3910154-98	1.3	198.5
H55-A	HEADSET-MICROPHONE INSTL	C596530-0101	0.2	17.6
H56-A	HEADSET-MICROPHONE, PADDED (STOWED)	C596531-0101	1.1	15.0
H61-R	GEAR WARNING HORN & CABIN SPEAKER	C596510-0101	1.9	45.8
H64-A	AVIONICS OPTION 'A' (FOR EXPORT ONLY)	3910206-21	3.9*	81.7*
	RADIO COOLING INSTALLATION	3930198-1	1.0	5.5
	OMNI ANTENNA CABLE INSTALLATION	3950137-1	0.8	139.3
	VHF COM ANTENNA CABLE INSTALLATION	3950137-4	0.5	34.8
	OMNI ANTENNA INSTALLATION	3960102-6	0.6	250.6
	VHF COM ANTENNA INSTALLATION, LEFT HAND	3960113-1	0.5	50.7
	HEADPHONE INSTALLATION	3970138-4	0.2	17.6
	MICROPHONE INSTALLATION	3970143-1	0.3	16.4
H67-A	AVIONICS OPTION 'B' (FOR EXPORT ONLY)	3910206-22	5.1*	71.2*
	VHF COM ANTENNA CABLE INST., RIGHT HAND	3950137-5	0.5	34.8
	VHF OMNI ANTENNA COUPLER (2ND NAV/COM)	3960111-6	0.2	11.5
	VHF COM ANTENNA INSTALLATION, R.H.	3960113-2	0.5	50.6
	AVIONICS OPTION 'A'	3910206-21	3.9	81.7
H70-A	REMOTE TRANSPONDER IDENT SWITCH, CONTROL WHEEL MOUNTED	3910205-6	0.2	17.0
	J. SPECIAL OPTION PACKAGES			
J01-A	CENTURION II KIT FOR PRESSURIZED 210	2100000-1	64.6*	36.6*
	A61-A VACUUM SYSTEM	2101003-1	4.5	5.6
	C07-A GROUND SERVICE RECEPTACLE	2170003-1	1.9	-3.9
	C19-0-1 HEATED PITOT & STALL SENSOR	1201093-1	0.4	43.4
	C22-A INSTRUMENT POST LIGHTS	2101009-1	0.5	19.5
	C31-A COURTESY ENTRANCE LIGHTS	2101015-1	0.3	51.4
	C40-A NAVIGATION LIGHT DETECTORS	1221201	NEGL	-.-
	C43-A FLASHING BEACON	1201049-1	1.6	226.0
	D01-0 TRUE AIRSPEED IND. (NET CHANGE)	1201108-13	0.1	18.0
	D49-A ECONOMY MIXTURE INDICATOR (EGT)	1200677	0.7	10.8

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	D64-A-1 GYRO INSTALLATION	2101001-1	5.5	15.1
	F07-O-2 VERT. ADJUST RH SEAT NET CHANGE	1214113-40	4.8	22.2
	E85-A DUAL FLIGHT CONTROLS	1260004-8	6.7	14.1
	F89-O CONTROL WHEEL ALL PURPOSE (NET CHANGE)	1260243-11	NEGL	-.-
	G25-S EXTERIOR STYLING (NET CHANGE)	2104002	NEGL	-.-
	H01-A-1 CESSNA 300 ADF (R-546E)	3910159	7.5	25.7
	H16-A CESSNA 400 TRANSPONDER RT-459A	3910128	3.6	13.5
	H22-A-1 CESSNA 300 NAV/COM W/300 IND.	3910183-32	8.3	13.7
	H28-A-1 E.L.T. INSTALLATION	0470419	3.5	159.4
	H31-A-1 300A AUTOPILOT (NOT INCLUDED GYRO & VACUUM SYSTEM)	3910163-23	8.1	41.7
	H34-A BASIC AVIONICS KIT	3910186-15	6.2	55.0
	G16-A STATIC DISCHARGERS (SET OF 10)	1201131	0.4	154.8
J04-A	NAV/PAC RADIO OPTION KIT	- -	16.0*	41.0*
	H07-A-1 CESSNA 400 GLIDESLOPE (R-443B)	3910157-17	4.1	67.4
	H13-A CESSNA 400 MARKER BEACON	3910164-10	2.5	88.0
	H25-A-1 300 NAV/COM 2ND UNIT	3910183	8.3	13.7
	H37-A ANTENNA & COUPLER KIT	3910185	1.1	41.2
J46-A	FLIGHT INTO KNOWN ICING CONDITIONS EQUIPMENT INSTALLATION KIT (REQUIRES INSTL. OF VACUUM & GYRO SYSTEMS WHICH ARE NOT INCLUDED IN WEIGHT)	1200254-2	44.4*	41.3*
	A09-O-1 95 AMP ALTERNATOR (NET CHANGE)	1601121-2	6.4	-4.3
	C19-O-2 HEATED PITOT & STALL SENSOR	1201093-3	0.5	42.0
	C61-A ICE DETECTOR LIGHT	2101005-1	0.6	9.6
	G16-A STATIC DISCHARGERS	1201131-3	0.4	154.8
	G76-A-2 WING, STAB. & VTL FIN DE-ICE	2101018	27.2	68.0
	G79-A PROPELLER ANTI-ICE INSTL.	1201072-1	6.6	-18.4
	G82-A-2 WINDSHIELD ANTI-ICE INSTL	2101019	2.7	17.1

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

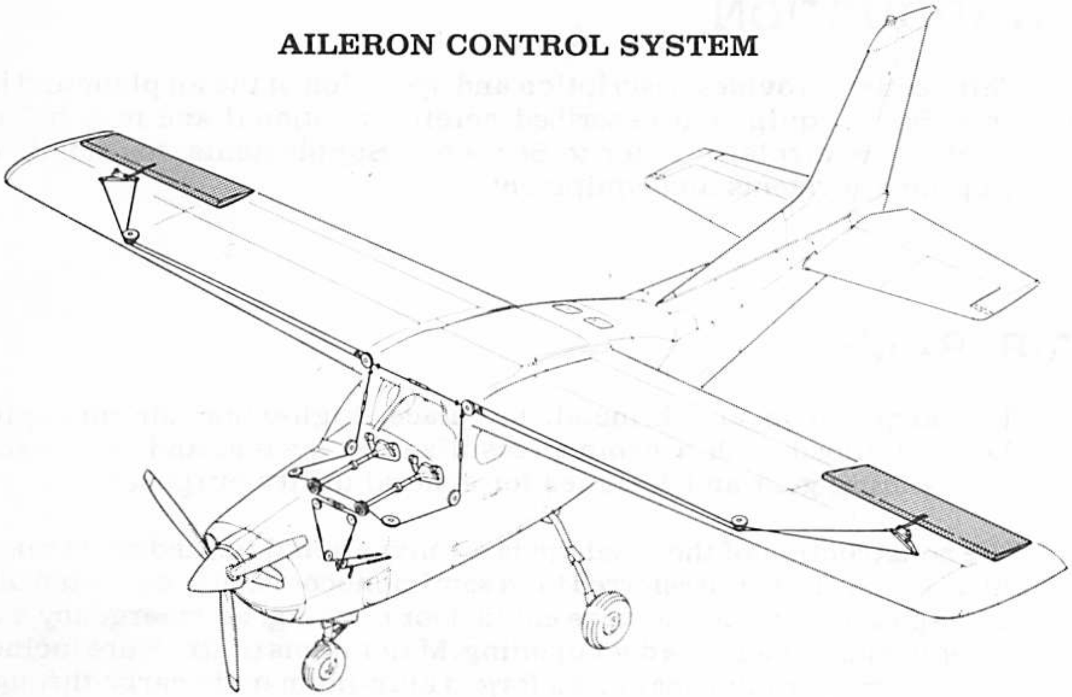
The airplane is an all-metal, six-place, high-wing, single-engine airplane equipped with a cabin pressurization system and retractable tricycle landing gear and designed for general utility purposes.

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

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

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

AILERON CONTROL SYSTEM



RUDDER AND RUDDER TRIM CONTROL SYSTEMS

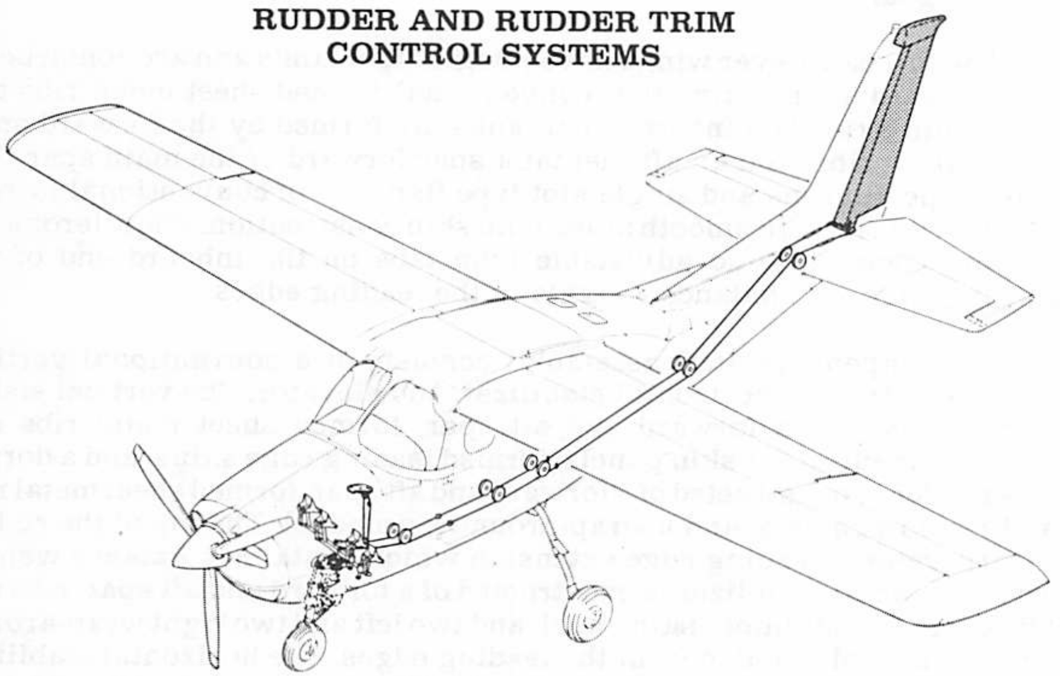
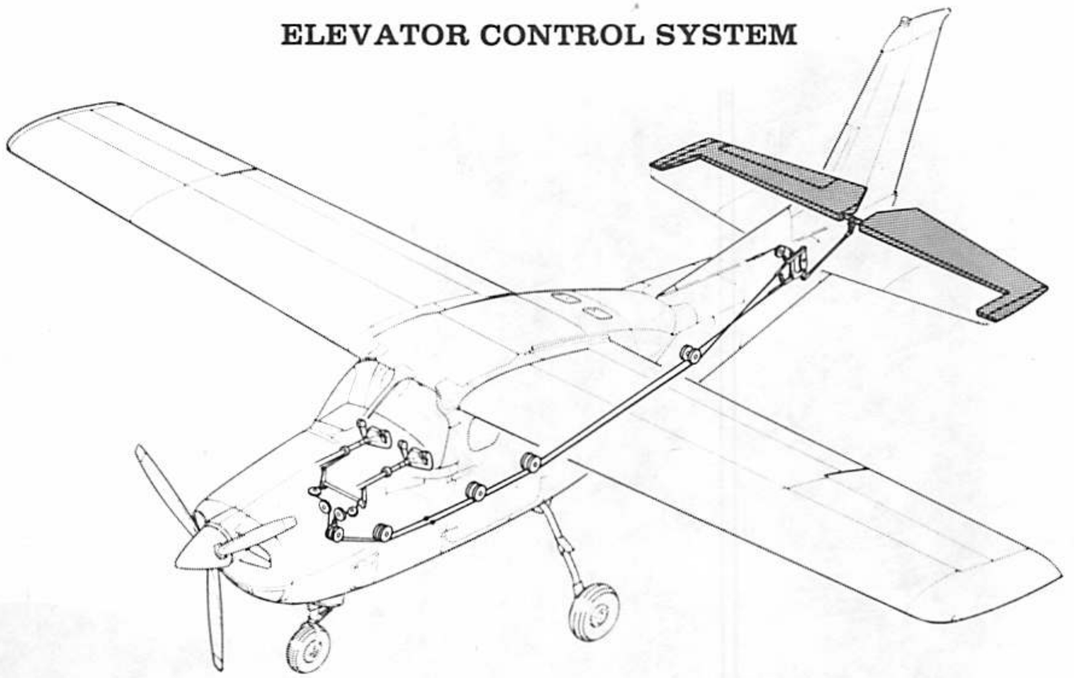


Figure 7-1. Flight Control and Trim Systems (Sheet 1 of 2)



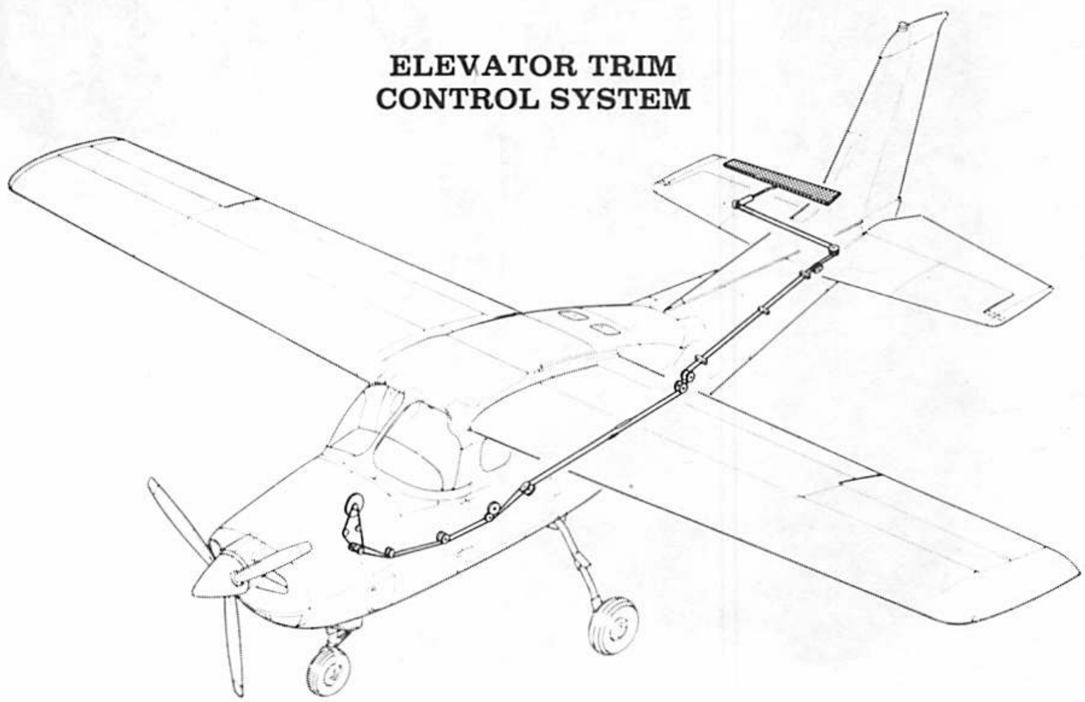


Figure 7-1. Flight Control and Trim Systems (Sheet 2 of 2)

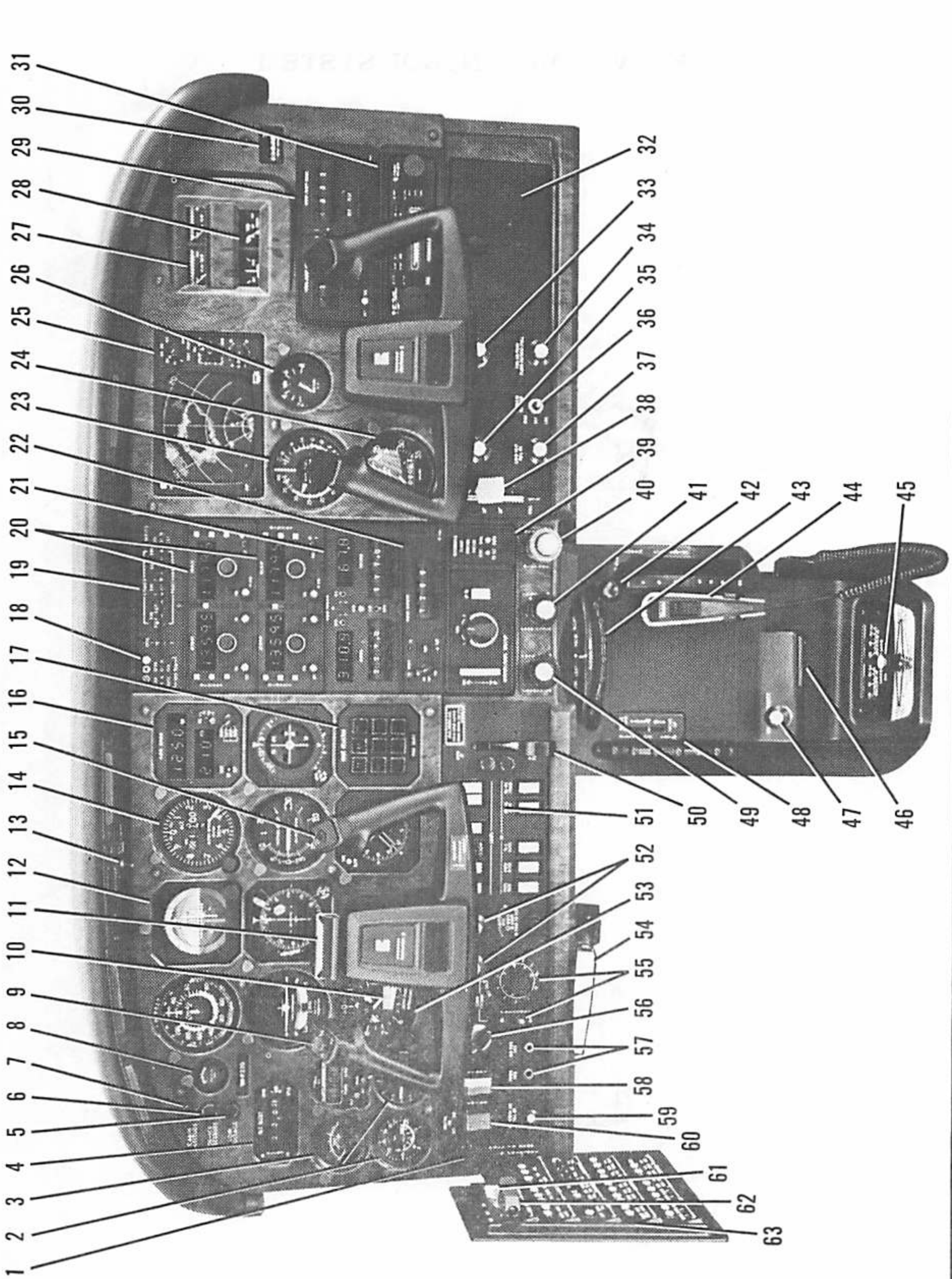


Figure 7-2. Instrument Panel (Sheet 1 of 2)

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

Figure 7-2. Instrument Panel (Sheet 2 of 2) 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, elevator and rudder control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder. The elevator control system is equipped with a downspring, and an aileron-rudder interconnect is incorporated to provide improved stability in flight.

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

TRIM SYSTEMS

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

INSTRUMENT PANEL

The instrument panel (see figure 7-2) is designed around the basic "T" configuration. The gyros are located directly 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 slighty right of the panel center line, with the right side of the panel containing the weather radar unit (if installed), manifold pressure/fuel flow indicator, tachometer, suction gage, AM/FM cassette stereo player (if installed), map compartment, and space for additional instruments and avionics equipment. The top right hand corner of the panel contains the engine instrument cluster angled slightly toward the pilot. A switch and control panel at the lower edge of the instrument panel, contains most of the switches and controls necessary to operate the airplane. The left side of this panel contains the master switch, auxiliary fuel pump switch, ignition switch, light intensity controls, electrical switches, cabin pressurization controls, static pressure alternate source valve, and the landing gear lever with its associated gear position indicator lights. The lower center portion of the instrument panel contains the throttle, propeller control and mixture control. The right side of the panel contains the wing flap switch lever and indicator, cabin heating and ventilating controls and the cigar lighter. A pedestal, extending from the lower center area of the instrument 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 and adjacent fuel quantity indicators are located at the base of the pedestal. A parking brake handle is mounted under the switch and control panel in front of the pilot. All electrical equipment circuit breakers, including an avionics power switch type circuit breaker and a stand-by generator switch (if installed), are located on a separate circuit breaker panel mounted on the left cabin sidewall adjacent to the pilot.

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

GROUND CONTROL

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

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

The minimum turning radius of the airplane, using differential braking and nose wheel steering during taxi, is approximately 26 feet.

WING FLAP SYSTEM

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

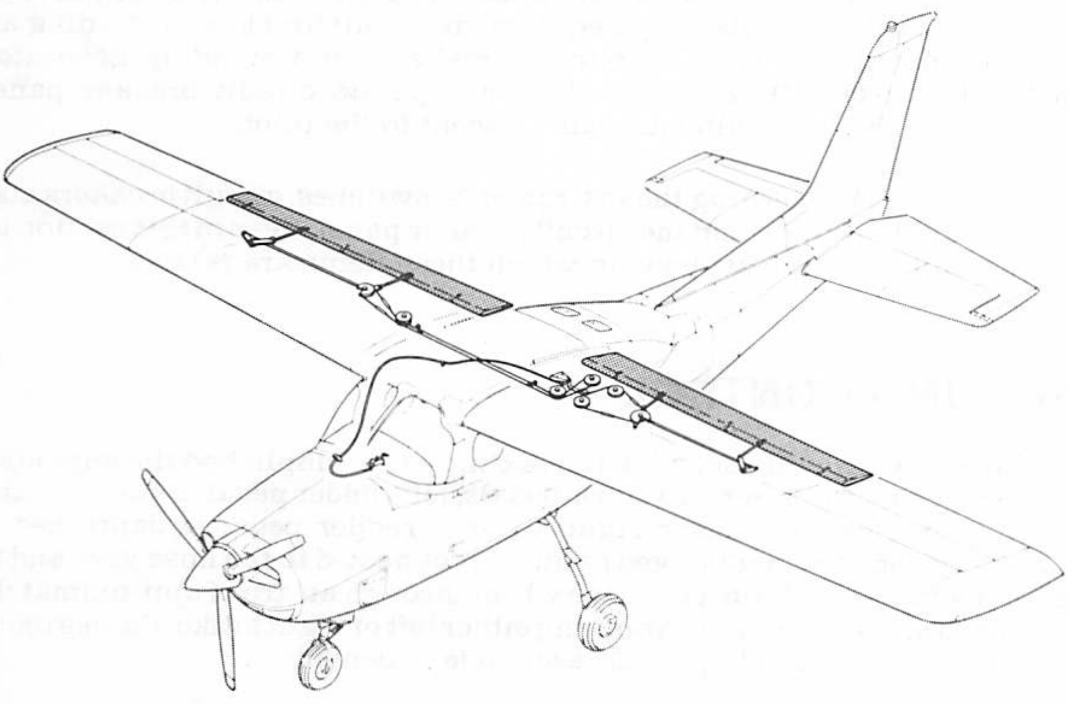


Figure 7-3. Wing Flap System

LANDING GEAR SYSTEM

The landing gear is a retractable, tricycle type with a steerable nose wheel and two main wheels. Shock absorption is provided by the tubular spring-steel main landing gear struts and the air/oil nose gear shock strut. Each main wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of the wheel.

Landing gear extension, retraction, and down lock operation is accomplished by hydraulic actuators powered by an electrically-driven hydraulic power pack (see figure 7-8). The power pack assembly is housed within the control pedestal. Hydraulic system fluid level may be checked by utilizing the dipstick/filler cap, on the power pack, behind a snap-out cover panel on the right side of the control pedestal. The system should be checked at 25-hour intervals. If the fluid level is at or below the ADD line on the dipstick, hydraulic fluid (MIL-H-5606) should be added. Nose gear wheel and strut door operation is accomplished mechanically.

Power pack operation is initiated by a landing gear lever, and is turned off by a pressure switch. Two position indicator lights are provided to show landing gear position. The landing gear system is also equipped with a nose gear safety switch, an emergency extension hand pump, and a gear-up warning system.

LANDING GEAR LEVER

The landing gear lever, mounted to the left of the engine controls, has two positions (up labeled GEAR UP and down labeled GEAR DOWN) which give a mechanical indication of the gear position selected. From either position, the lever must be pulled out to clear a detent before it can be repositioned. Moving the lever out of the GEAR DOWN detent will start the hydraulic power pack. Positioning the lever in the GEAR UP position will direct hydraulic pressure to retract the landing gear. Operation of the landing gear system to extend the gear will not begin until the landing gear lever is repositioned in the GEAR DOWN detent.

LANDING GEAR POSITION INDICATOR LIGHTS

Two position indicator lights, mounted adjacent to the landing gear lever, indicate that the gear is either up or down and locked. The lights are the press-to-test type. The gear-down indicator light (green) has two positions; with the light pushed in half way (throttle retarded and master switch on) the gear warning system should be heard intermittently on the airplane speaker, and with the light pushed full in, it should illuminate. The gear-up indicator light (amber) has only one test position; with the light pushed full in, it should illuminate. The indicator lights contain dimming shutters for night operation.

LANDING GEAR OPERATION

To retract or extend the landing gear, pull out on the gear lever and move it to the desired position. After the lever is positioned, the electrically-driven hydraulic power pack will create pressure in the system and the landing gear will be actuated to the selected position.

CAUTION

If for any reason the hydraulic pump continues to run after gear cycle completion (up or down), the 30-amp "pull-off" type circuit breaker labeled GEAR PUMP should be pulled out. This will shut off the hydraulic pump motor and prevent damage to the pump and motor. Refer to Section 3 for complete emergency procedures.

During a normal cycle, the gear stops full up or locks down and the position indicator light (amber for up and green for down) comes on. When the light illuminates, hydraulic pressure will continue to build until a pressure switch turns off the hydraulic pump. The gear is held in the full up position by hydraulic pressure. If the system pressure drops below minimum, the power pack pressure switch will turn the power pack on and return the pressure to maximum except when the nose gear safety (squat) switch is open.

A landing gear safety (squat) switch, actuated by the nose gear strut, electrically prevents inadvertent retraction by the electrically-driven hydraulic power pack whenever the nose gear strut is compressed by the weight of the airplane. When the nose gear is lifted off the runway during takeoff, the squat switch will close, causing the power pack to operate for 1 to 2 seconds which will return system pressure to maximum in the event pressure has dropped.

A "pull-off" type circuit breaker, mounted on the left sidewall circuit breaker panel, should be used for safety during maintenance. With the circuit breaker pulled out, landing gear operation by the gear motor cannot occur. After maintenance is completed, and prior to flight, the circuit breaker should be pushed back in.

WARNING

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

EMERGENCY HAND PUMP

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

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

LANDING GEAR WARNING SYSTEM

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

When the throttle is retarded below approximately 15 inches of manifold pressure (master switch on), the throttle linkage will actuate a switch which is electrically connected to the gear warning portion of a dual warning unit. If the landing gear is retracted (or not down and locked), an intermittent tone will be heard on the airplane speaker. The system may be checked for correct operation before flight by retarding the throttle to idle and depressing the green gear-down position indicator light half way in. With the indicator light depressed as described, an intermittent tone should be heard on the airplane speaker. 12/16/11 17" W/ NEW THROTTLE CABLES

BAGGAGE COMPARTMENT

The baggage compartment consists of the area immediately behind the aft cabin pressure bulkhead and extends rearward to a removable baggage compartment wall in the tailcone. Access to the baggage compartment is gained through a lockable baggage door on the left side of the airplane. When loading the airplane, no material which might be hazardous to the airplane or occupants should be placed in the baggage compartment. For baggage area and door dimensions, refer to Section 6.

SEATS

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

The six-way adjustable pilot's seat may be moved forward or aft, adjusted for height and the seat back angle is infinitely adjustable. A lever on the left forward side of the seat controls a special aft position stop, enabling the seat to be positioned aft far enough for easy entry of the copilot and pilot. Once the copilot and pilot are aboard, position the pilot's seat forward 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.

Six-way adjustable seats may be equipped with variable lumbar supports located inside the lower seat backs. The firmness of the lower seat back may be controlled by utilizing a button located on the lower inboard side of the seat back. After adjusting the seat back to a comfortable position, move forward on the seat to remove all the weight from the seat back. Hold the button in until the support fully inflates, release the button, and lean back in the seat. If the support is too firm, hold the button in until the desired amount of firmness is obtained.

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

The aft passengers' seats consist of a fixed position one-piece seat bottom and a one-piece seat back rigidly attached to the aft cabin pressure bulkhead. The space under the aft seat is used to house some avionics components and to provide an exit passage for the cabin air. Consequently, the space around the seat bottom should not be blocked closed.

Headrests are available for any of the seat configurations except the aft passengers' fixed seat. 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.

Removable arm rests are available for the inboard sides of the pilots, front passenger's and center passengers' seats.

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts (see figure 7-4). The pilot's and front vassenger's seats are also equipped with separate shoulder harnesses; separate shoulder harnesses are available for the remaining seat positions. Integrated seat belt/shoulder harnesses with inertia reels can be furnished for the pilot's and front passenger's seat positions if desired.

SEAT BELTS

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

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

SHOULDER HARNESSES

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

To use the shoulder harness, fasten and adjust the seat belt first. Lengthen the harness as required by pulling on the connecting link on the end of theharness and the narrow release strap. Snap the connecting link

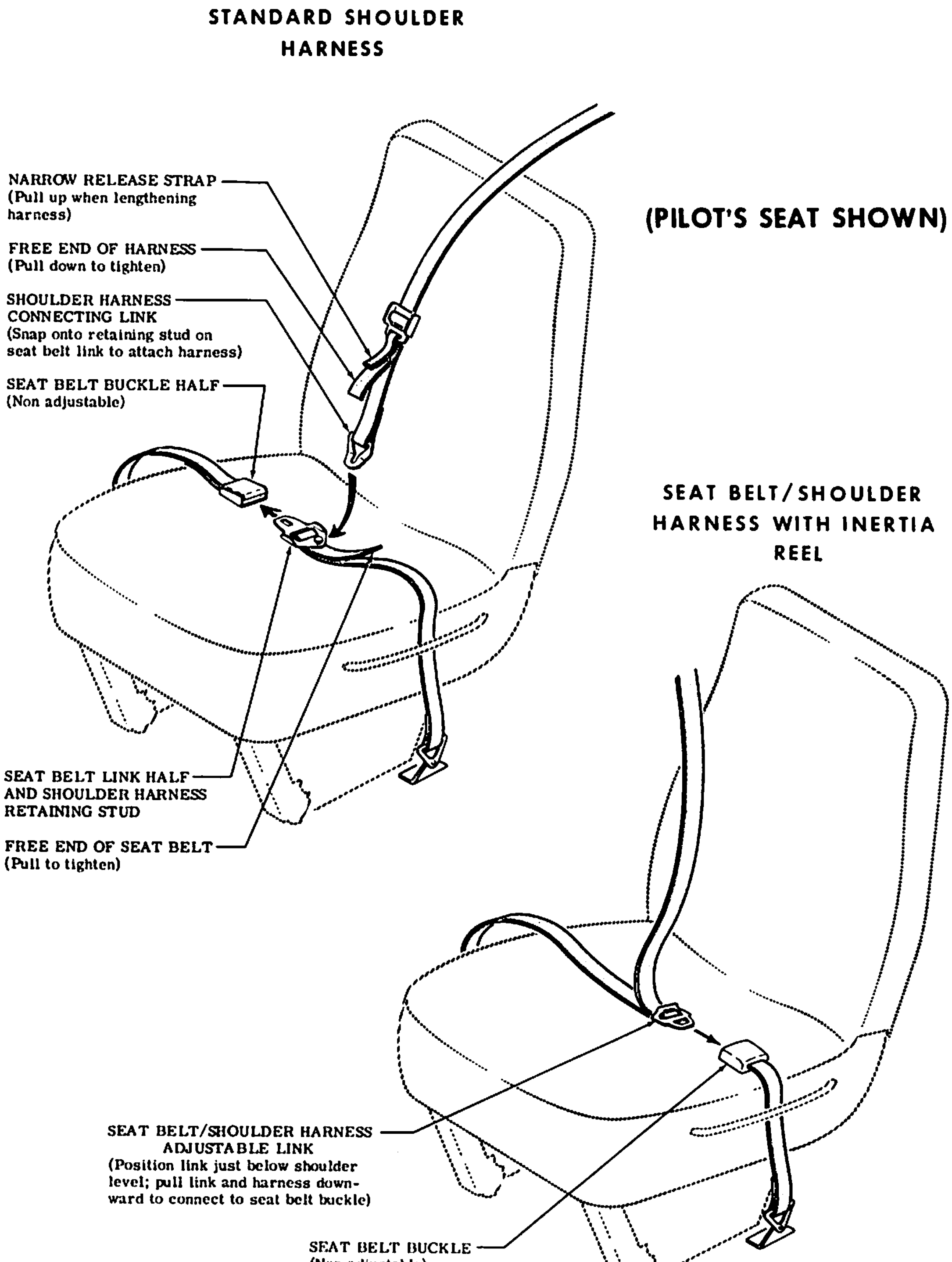


Figure 7-4. Seat Belts and Shoulder Harnesses

firmly onto the retaining stud on the seat belt link half. Then adjust to length. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect, but prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

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

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS

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

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

ENTRY DOOR

Entry to, and exit from the airplane is accomplished through a cabin entry door on the left side of the fuselage at the pilot's position (refer to Section 6 for cabin and cabin door dimensions). The door incorporates a recessed exterior door handle with separate key operated lock, a conventional interior door handle with separate push-pull type safety lock and the internal linkage necessary to connect both handles to several pin-type lock devices spaced around the edge of the door. Additional features of the door include a door stop mechanism, an emergency external push button-type handle safety lock release and two windows one of which may be opened at anytime except when the cabin is pressurized.

To open the door from outside the airplane, utilize the recessed door handle near the center of the door. Grasp the handle through the cutout provided, pull it out from its recess and rotate it clockwise approximately 90 degrees. A placard, labeled OPEN and CLOSE on the door adjacent to the handle indicates the direction of handle rotation.

From inside the airplane, the door is closed or opened using the conventional inside door handle and the push-pull safety lock. The inside door handle has three positions as indicated by a placard directly behind the handle. The positions are labeled OPEN, CLOSE, and LOCK with the handle spring loaded to the CLOSE position. To close the door after entering the airplane, position the door approximately four or five inches from the fully closed position; then using the assist strap handle, briskly pull the door shut and rotate the inside handle clockwise (full forward) to the LOCK position.

NOTE

Due to the sealing characteristics of the cabin and entry door, it is necessary to close and lock the door from the inside with the openable window open.

Lock the handle by pushing the handle safety lock flush with the door. In this position the red and white visual indicator on the lock should NOT be visible. The cabin entry door should be locked prior to flight and should not be opened during flight. The handle safety lock should be locked after takeoff (but before pressurizing) and unlocked before landing if passengers are not familiar with its necessary unlocked position to enable opening the door.

CAUTION

Refer to Section 3 for proper operational procedures to be followed if the entry door should inadvertently open in flight.

Exit from the airplane is accomplished by lifting out on the safety lock (visual indicator exposed), rotating the inside door handle full aft to the OPEN position and pushing the door open. To lock the airplane after exiting, ensure the emergency exit door is closed and locked, close and lock the entry door using the exterior handle, then lock the handle in its recess by use of the ignition key in the key lock.

The exterior emergency push button-type lock release located just forward of the exterior door handle operates in conjunction with the interior safety lock and is used whenever it is desired to open the door from outside the airplane while the interior door handle and safety lock are in their locked positions. Depressing the pushbutton releases the interior safety lock and allows the exterior door handle to function normally to open the door.

An openable window is incorporated into the entry door and may be opened in flight (unpressurized only), if required. The window pivots inboard at its forward edge then slides aft along upper and lower tracks to increase the amount of opening. To open the window, rotate the detent equipped latch counterclockwise until it is clear of its striker, then pull the window inboard until it locks at a slight angle. From this position, the window can be pushed aft as desired. To close the window, reverse this procedure.

EMERGENCY EXIT DOOR

The airplane is provided with an emergency exit door for use in exiting the airplane in the event the cabin door cannot be used. The door, which is located on the right side of the fuselage, is hinged at the top and incorporates a hydraulically-loaded telescoping door lift mechanism attached to the aft edge of the door. Once the door has been opened and pushed outboard a few inches, the door lift automatically lifts it gently to the fully open position.

The emergency exit door is opened or closed from inside the airplane only, utilizing the recessed interior "D" handle and the assist strap. The handle has three positions as indicated by a placard above the handle labeled OPEN, CLOSE and LATCH, and is spring loaded to the CLOSE position. To close the door, pull the door shut and rotate the "D" handle clockwise to the horizontal or LATCH position. From this position, the "D" handle is pushed flush with the door to lock it, as indicated by a placard behind the handle labeled PUSH FLUSH TO LOCK. To open the door, lift the "D" handle out of its recess and rotate it fully counterclockwise to the OPEN position; then push out on the door. The emergency exit door should be locked prior to flight and should not be opened in flight.

CAUTION

Refer to Section 3 for proper operational procedures if the emergency exit door should inadvertently open in flight.

CABIN WINDOWS

The airplane is equipped with a one-piece windshield reinforced with a metal center strip. There are eight cabin side windows. Except for one openable window in the cabin entry door, all windows are the fixed type. In addition, two smaller fixed windows equipped with retractable shades are located in the fuselage top just above the aft passengers' seat.

CONTROL LOCKS

A control lock is provided to lock the aileron and elevator control surfaces to prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod 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. Installation of the lock will secure the ailerons in a neutral position and the elevators in a slightly trailing edge down position. Proper installation of the lock will place the 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 injected engine equipped with a wet sump oil system and remotely mounted oil cooler. The engine is a Continental Model TSIO-520-P 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 35.5 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, with associated components, and connections to the cabin pressurization system. Provisions are also made for a vacuum pump and a stand-by generator.

ENGINE CONTROLS

Engine manifold pressure is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open, and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it. The throttle linkage is designed to mechanically actuate a microswitch electrically connected to the landing gear warning system. The switch will cause a warning tone to sound anytime the throttle is retarded with the landing gear retracted, with less than approximately 15 inches of manifold pressure.

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

ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage, oil temperature gage, cylinder head temperature gage, tachometer, and manifold pressure/fuel flow indicator. An economy mixture (EGT) indicator 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. Gage markings indicate the normal operating range (green arc) which is 100°F (38°C) to 240°F (116°C), and the maximum (red line) which is 240°F (116°C).

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

The engine-driven mechanical tachometer is located on the lower right side of the instrument panel. The instrument is calibrated in increments of 100 RPM and indicates both engine and propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time in hours and tenths. Instrument markings include a normal operating range (green arc) of 2200 to 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 31 inches of mercury, a five minute maximum power range (yellow arc) of 35.5 to 36.5 inches of mercury, and a maximum (red line) of 36.5 inches of mercury.

The fuel flow indicator is the right half of a dual-indicating instrument mounted above the tachometer. The indicator is a fuel pressure gage calibrated to indicate the approximate pounds per hour of fuel being metered to the engine. The normal cruise range (green arc) is from 36 to 125 pounds per hour, the normal climb range (white arc) is from 125 to 162 pounds per hour, the minimum fuel flow for takeoff power (white triangle) is 180 pounds per hour, the minimum (red line) is 3.0 PSI, and the maximum (red line) is 186 pounds per hour (19.5 PSI).

An economy mixture (EGT) indicator is available for the airplane and is located on the left side of the instrument panel. A thermocouple probe in the exhaust manifold at the inlet to the turbocharger measures exhaust gas temperature and transmits it to the indicator. The indicator serves as a visual aid to the pilot in adjusting cruise mixture up to 80% power. Exhaust gas temperature varies with fuel-to-air ratio, power, and RPM. However, the difference between the peak EGT and the EGT at the recommended cruise mixture setting provides a useful leaning aid. The indicator is equipped with a manually positioned 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 lubrication and system control is supplied from a sump on the bottom of the engine. The capacity of the engine sump is 10 quarts (one additional quart is contained in the engine oil filter). Oil is drawn from the sump through a filter screen on the end of a pickup tube to the engine-driven oil pump. Oil from the pump passes through the full flow oil filter to the turbocharger system controls, a pressure relief valve at the rear of the right oil gallery, and a thermostatically controlled, remotely mounted, 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 bypass valve which will cause lubricating oil to bypass 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 7 quarts of oil. To minimize loss of oil through the breather, fill to 8 quarts for normal flights of less than three hours. For extended flight, fill to 10 quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

IGNITION-STARTER SYSTEM

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

Ignition and starter operation is controlled by a rotary type switch located on the left switch and control panel. The switch is labeled clockwise, OFF, R, L, BOTH, and START. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the stacter 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 flush aerodynamic scoop which is an integral part of the lower right removable cowl. Air enters the scoop and flows through a removable air filter mounted adjacent to the scoop. The filter removes dust and other foreign matter from the induction air. However, in the event the airscoop or the induction air filter become blocked, suction created by the engine will open an alternate air door allowing air to be admitted from a series of louvered openings located immediately aft of the main induction air scoop. This air bypasses the air filter and will result in a decrease of up to 10 inches Hg manifold pressure from a cruise power setting. Maximum continuous manifold pressure (35.5 inches Hg) can be maintained with throttle and/or RPM adjustment up to 11,000 feet under warm day conditions with the alternate air door open. A flexible duct connects the air filter airbox to the turbocharger compressor inlet. As the air passes through the compressor, it is pressurized, 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.

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 cowling. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through cowl flaps on the lower aft edge of the cowling. An airscoop on the lower left side of the cowling directs ram air to the remotely mounted oil cooler. After passing through the oil cooler, ram air is exhausted through the cowl flaps. The cowl flaps are mechanically operated from the cabin by means of a cowl flap lever on the right side of the control pedestal. The pedestal is labeled COWL FLAP, OPEN, CLOSED. During takeoff and high power operation, the cowl flap lever should be placed in the OPEN position for maximum cooling. This is accomplished by moving the lever to the right to clear a detent, then moving the lever up to the OPEN position. Anytime the lever is repositioned, it must first be moved to the right. While in cruise flight, cowl flaps should be adjusted to keep the cylinder head temperature within 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 lower right cowling, 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 compressor has the capability of producing manifold pressures in excess of the 5 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.

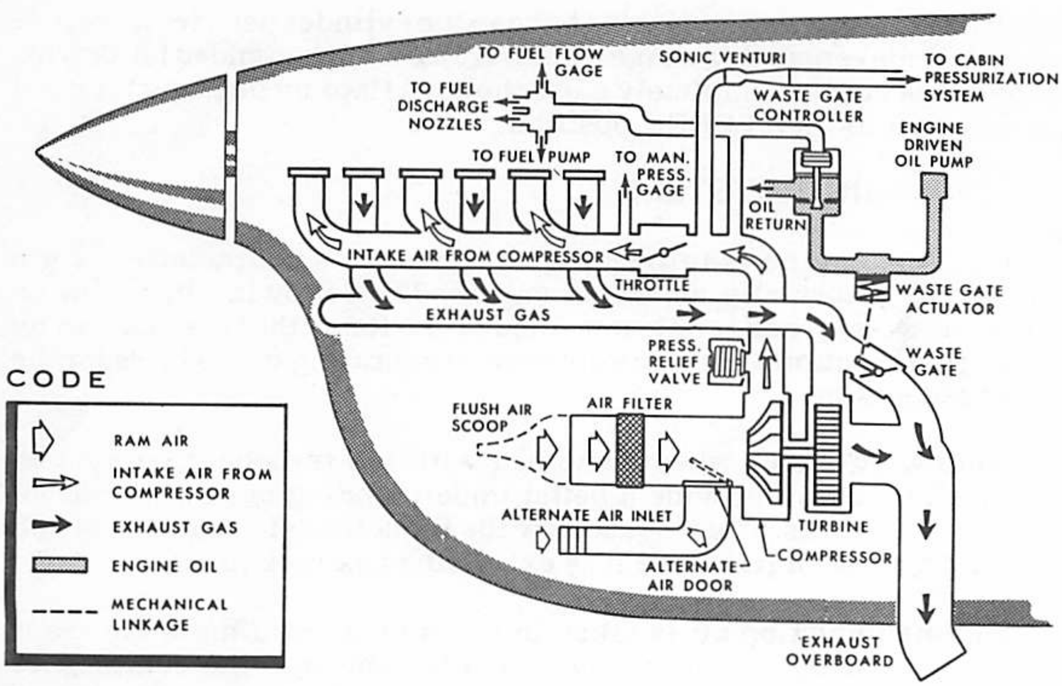


Figure 7-5. Turbocharger System

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 35.5 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 must be reduced above 17,000 feet, as noted on the operating placard in the airplane (subtract 1 inch Hg from 35.5 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 31 in. Hg from sea level to 9,000 feet in standard temperatures, and from sea level to 4,000 feet under hot day conditions without changing the throttle position, once the power setting is established after takeoff. This climb power setting is maintained above these altitudes by advancing the throttle as necessary to maintain 31 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 4 inches.

A slight overboost of 2 to 4 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 4 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 ±5 lbs/hr or more are observed (as a "nervous" fuel flow needle), 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 readjusted 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.

PROPELLER

The airplane has an all-metal, three-bladed, constant-speed, governor-regulated propeller. A setting introduced into the governor with the propeller control establishes the propeller speed, and thus the engine speed to be maintained. The governor then controls flow of engine oil, boosted to high pressure by the governing pump, to or from a piston in the propeller hub. Oil pressure acting on the piston twists the blades toward high pitch (low RPM). When oil pressure to the piston in the propeller hub is relieved, centrifugal force, assisted by an internal spring, twists the blades toward low pitch (high RPM).

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

FUEL SYSTEM

The fuel system (see figure 7-6) consists of two vented integral 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, when the fuel tanks are 1/4 full or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets, causing fuel starvation and

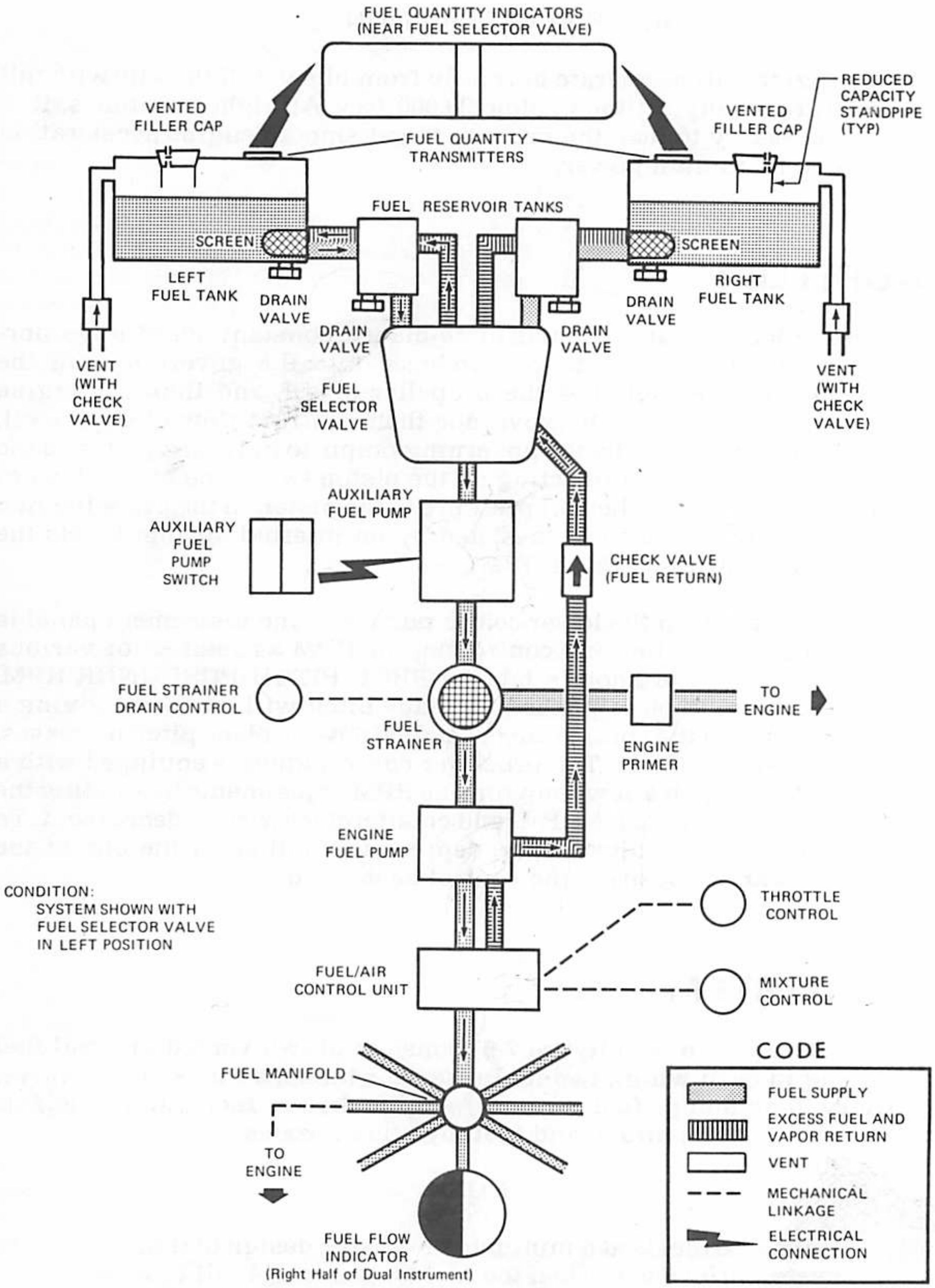


Figure 7-6. Fuel System

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 integral 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.

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to the bottom edge of the fuel filler neck, thus giving a reduced fuel load of 201 pounds in each tank (198 pounds usable in all flight conditions).

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

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank) and indicated by two electrically-operated fuel quantity indicators on the lower portion of the pedestal adjacent to the fuel selector valve handle. The indicators are marked in pounds (top scale) and gallons (bottom scale) with a red line indicating an empty tank. When an indicator shows an empty tank, approximately 0.5 gallon remains in the tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes. Maximum indicator travel is reached with 41 to 42 gallons in the tank. Therefore, indications at the right end of the scale (40 gallons to F) should be verified by visual inspection of the tanks if a short field takeoff or a long range flight is planned. If both indicator pointers should rapidly move to a zero reading, check the cylinder head temperature and oil temperature gages for operation. If these gages are not indicating, an electrical malfunction has occured.

FUEL QUANTITY DATA (U. S. GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (45 Gal. Each)	89	1	90
REDUCED FUEL (33.5 Gal. Each)	66	1	67

Figure 7-7. Fuel Quantity Data

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 (unless takeoff fuel flow is slightly deficient).

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 5 lbs./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. At high altitudes, leaning the mixture will hasten restarting.

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 minimize condensation.

HYDRAULIC SYSTEM

Hydraulic power (see figure 7-8) is supplied by an electrically-driven hydraulic power pack located behind the control pedestal. The power pack's only function is to supply hydraulic power for operation of the retractable landing gear. This is accomplished by applying hydraulic pressure to actuator cylinders which extend or retract the gear and operate the gear down locks. The electrical portion of the power pack is protected by a 30-amp "pull-off" type circuit breaker on the circuit breaker panel.

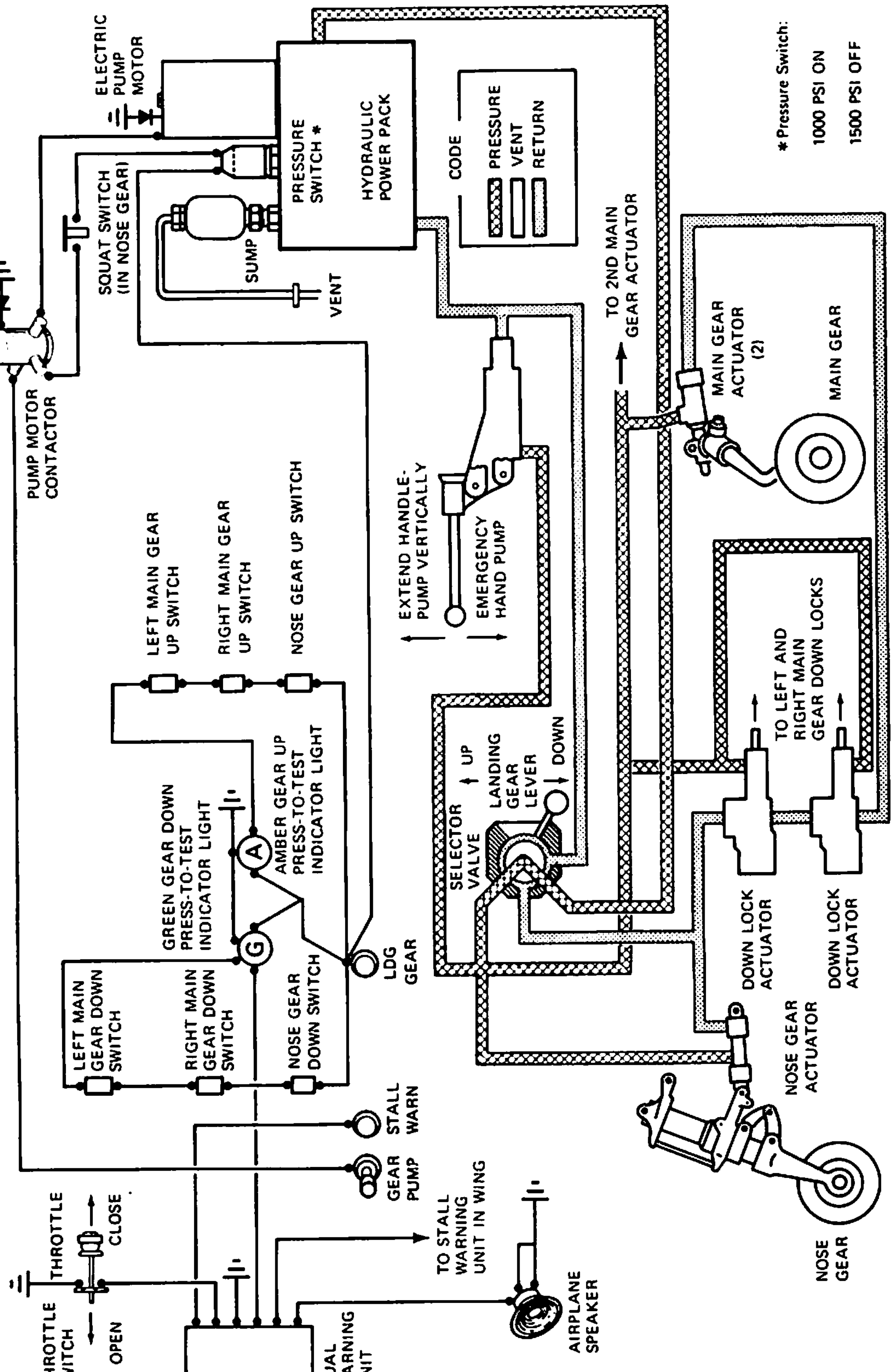
The hydraulic power pack is turned on, and the direction of actuation is selected by the landing gear lever when it is placed in either the gear-up or gear-down position. When the gear has fully extended and locked, or retracted, a series of electrical switches will illuminate one of two indicator lights on the instrument panel to show gear position. A hydraulic pressure switch will automatically turn off the power pack when hydraulic pressure reaches a preset value.

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

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

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated 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



CONDITION: AIRPLANE ON GROUND - ENGINE AND ELECTRICAL POWER OFF

Figure 7-8. Hydraulic System

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

The airplane is equipped with a 28-volt, direct-current electrical system (see figure 7-9). The system uses a battery located on the forward side, upper left portion, of the firewall, as the source of electrical energy and a belt-driven, 60-amp alternator (or 95-amp, if installed) to maintain the battery's state of charge. Power is supplied to most general electrical and all avionics circuits through the primary bus bar and the avionics bus bar, which are interconnected by 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. A stand-by electric generator system of approximately seven amperes capacity may be installed. Details of this equipment are presented in Section 9, Supplements.

CAUTION

Prior to turning the master switch on or off, starting the engine or applying an external power source, the avionics power switch, labeled AVN PWR 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

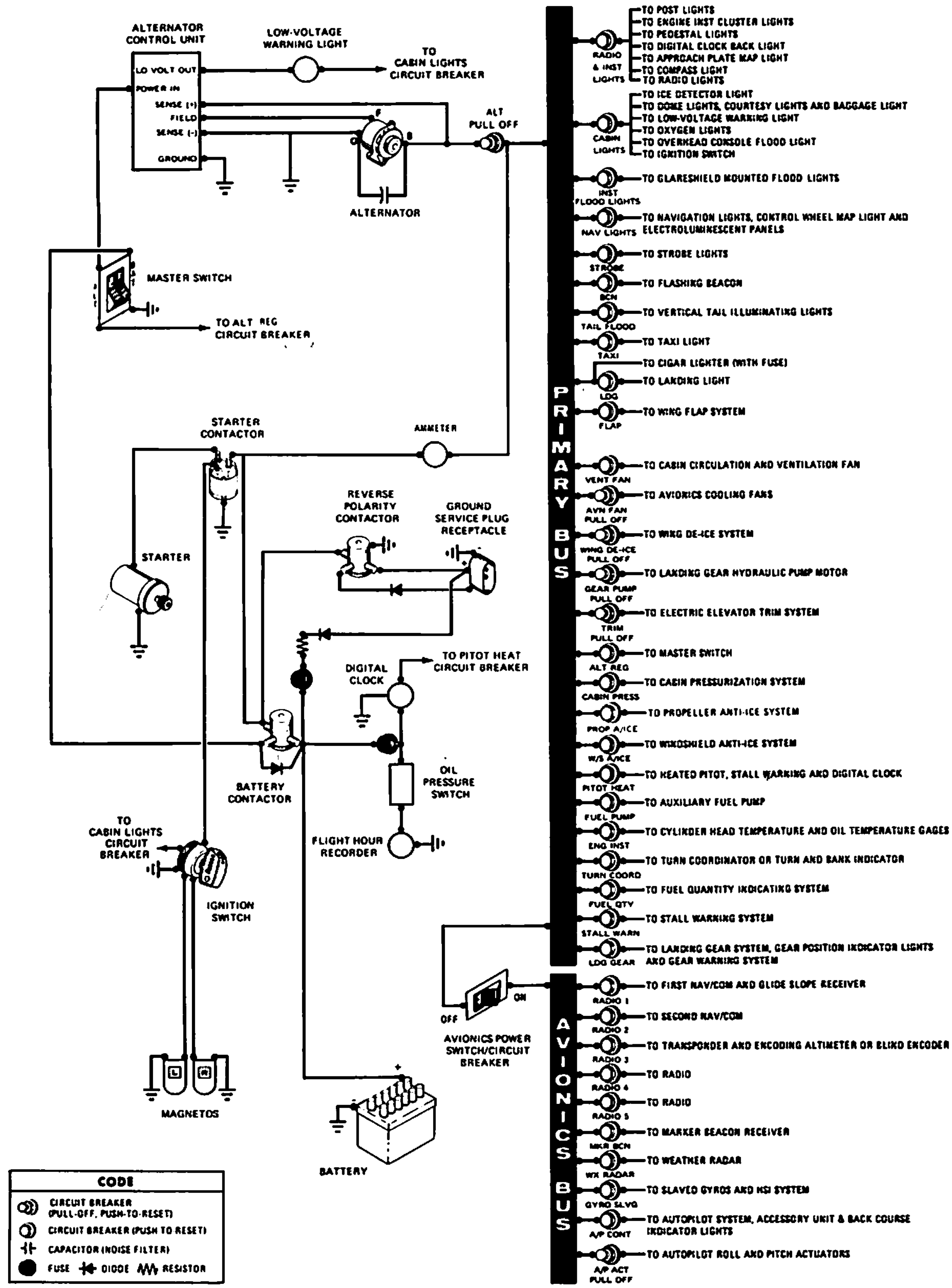


Figure 7-9. Electrical System

switch, labeled BAT, controls electrical power to the airplane through the primary bus bar. The left half, labeled ALT, controls the alternator.

Normally, both sides of the master switch should be used simultaneously; however, the BAT side of the switch could be turned on separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, 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 7-9) is controlled by a rocker-type circuit breaker-switch labeled AVN PWR. The switch is located on the left sidewall circuit breaker panel and is ON in the forward position and OFF in the aft 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 will automatically move to the OFF position. If this occurs, allow the circuit breaker approximately two minutes to cool before placing the switch 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, located on the upper right side of the instrument panel, indicates the amount of current, in amperes, from the alternator to the battery or from the battery to the airplane electrical system. When the engine is operating and the master switch is turned on, the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the battery discharge rate.

ALTERNATOR CONTROL UNIT AND LOW-VOLTAGE WARNING LIGHT

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

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

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

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

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by "push-to-reset" type circuit breakers mounted on a single circuit breaker panel on the left cabin sidewall between the forward doorpost and the instrument panel. Six "pull off" type circuit breakers on this panel protect the alternator output, landing gear system hydraulic pump motor, avionics cooling fan, wing and stabilizer de-ice system, electric elevator trim system, and the autopilot pitch and roll actuators. If a 95-amp alternator is installed, the ALT circuit breaker will also be of the "pull-off" type. All of the avionics circuits are protected by circuit breakers grouped together in the lower portion of the circuit breaker panel and also by a rocker-type circuit breaker switch labeled AVN PWR. Fuses protect the cigar lighter circuit, the battery contactor closing circuit (when used with external power), and the digital clock and flight hour recorder circuits.

GROUND SERVICE PLUG RECEPTACLE

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the airplane electrical system. Details of the ground service plug receptacle are presented in Section 9, Supplements.

LIGHTING SYSTEMS

EXTERIOR LIGHTING

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

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

INTERIOR LIGHTING

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

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

Instrument panel flood lighting consists of six red flood lights on the underside of the glare shield, two red flood lights in the forward part of the overhead console (one, if an air conditioner is installed) and a directional type white flood light (if installed) just aft of the airplane speaker in the overhead console. Except for the white light, the flood lights are utilized by adjusting light intensity with the large (outer) control knob of the concentric control knobs labeled POST, FLOOD. Intensity of the white flood light is controlled by a separate rheostat located adjacent to the light in the overhead console. Flood lighting may be used 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 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, digital clock, and magnetic compass have integral lighting and operate independently of post or flood lighting. The light intensity of the instrument cluster, magnetic compass, digital clock, 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.

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

The control pedestal has two integral lights and, if an air conditioner is installed, the overhead console is illuminated by post lights. Pedestal and console light intensity is controlled by the large (outer) control knob of the concentric control knobs labeled POST, FLOOD.

Map lighting is provided by overhead console map lights and a glare shield mounted map light. The airplane may also be equipped with a control wheel map light. The overhead console map lights (not installed if an air conditioner is installed) operate in conjunction with instrument panel flood lighting and consist of two openings just aft of the red instrument panel flood lights. The map light openings have sliding covers controlled by small round knobs which uncover the openings when moved toward each other. The covers should be kept closed unless the map lights are required. A map light and toggle switch, mounted in front of the pilot on the underside of the glare shield, is used for illuminating approach plates or other charts when using a control wheel mounted approach plate holder. The switch is labeled MAP LIGHT ON, OFF and light intensity is controlled by the POST, FLOOD control knob. A map light mounted on the bottom of the pilot's control wheel illuminates the lower portion of the cabin in front of the pilot, and is used for checking maps and other flight data during night operation. The light is utilized by turning on the NAV LIGHTS switch, and adjusting light intensity with the rheostat control knob on the bottom of the control wheel.

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

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

PRESSURIZATION SYSTEM

The airplane is equipped with a cabin pressurization system (refer to figure 7-10) to permit flight at high altitude without the need for oxygen masks and to increase passenger comfort. The system functions by utilizing bleed air from the engine turbocharger system and is designed to provide maximum pressure differential of 3.35 PSI. This differential allows an approximate 12,100 foot cabin altitude when the airplane is operating at its placarded maximum operating altitude of 23,000 feet. The system operates in conjunction with the cabin heating, ventilating and defrosting system by using the same ducts and outlets in the cabin.

When the pressurized mode is selected by the pilot, heated bleed air from the engine turbocharger compressor is ducted through a sonic venturi (flow limiter) to a heat exchanger. At the heat exchanger, the bleed air is either cooled or heated further, depending on the position of the cabin heat control on the instrument panel. If cool pressurized air is desired (cabin heat control pushed full in), ram air from an airscoop on the lower left side of the engine cowling is directed through the heat exchanger, cooling the bleed air. If heated air is desired, the cabin heat control is pulled out. This action closes the heat exchanger to cool ram air flow, and instead, allows ram air heated by passing through a shroud over the engine left exhaust manifold to pass through the heat exchanger. Bleed air is, therefore, further heated by this hotter air as it flows through the heat exchanger. Refer to the Cabin Heating, Ventilating and Defrosting System paragraphs in this section for further operating details.

From the heat exchanger, the bleed air is ducted to a dump valve chamber on the engine side of the firewall. This chamber houses the pressurization system dump valve and the cabin pressure check valve. In order for pressurized bleed air to enter the cabin from the dump valve chamber, the dump valve control handle on the left side of the instrument panel must be pushed fully in, closing the valve. Otherwise, with the dump valve handle pulled out (dump valve open), bleed air will dump from the chamber to the inside of the engine compartment, flowing overboard through the cowl flaps. The other component of the dump valve chamber, the cabin pressure check valve, closes to prevent a sudden loss in cabin pressure such as when the dump valve is opened or the engine fails to provide sufficient pressurized airflow.

A cabin air selector valve chamber is located on the cabin side of the dump valve chamber. The air selector valve allows selection of one or a combination of both pairs of fixed outlets depending on the position of the cabin air selector control, located on the right switch and control panel. The forward outlets are located just above the rudder pedals on both sides of the airplane and the other pair of outlets (one per side) are located at floor level on the cabin sidewalls adjacent to the pilot's and front passenger's positions.

NOTE

A cabin air ventilation fan is installed in the overhead console to augment the distribution and circulation of cabin air, whether pressurized or unpressurized. Refer to the paragraph Cabin Ventilating in this section.

Cabin pressure is controlled by two dual-purpose valves on the aft cabin bulkhead. One valve functions as an outflow valve and begins to regulate airflow from the cabin as the airplane climbs through the altitude selected for pressurization to begin. The outflow valve will continue to regulate airflow until maximum cabin differential pressure is reached, at which point the valve will maintain this pressure differential. The other valve is a safety dump valve that contains an electric solenoid which, when the pressurization switch is placed in the OFF position, activates and opens the valve, dumping cabin pressure overboard. Both valves have as an integral part differential pressure valves. The one in the outflow valve prevents cabin differential pressure from exceeding 3.35 PSI. In the event this valve fails, another one incorporated into the safety/dump valve will actuate and prevent the cabin differential pressure from exceeding 3.50 PSI.

SYSTEM SHOWN PRESSURIZED AND UNHEATED

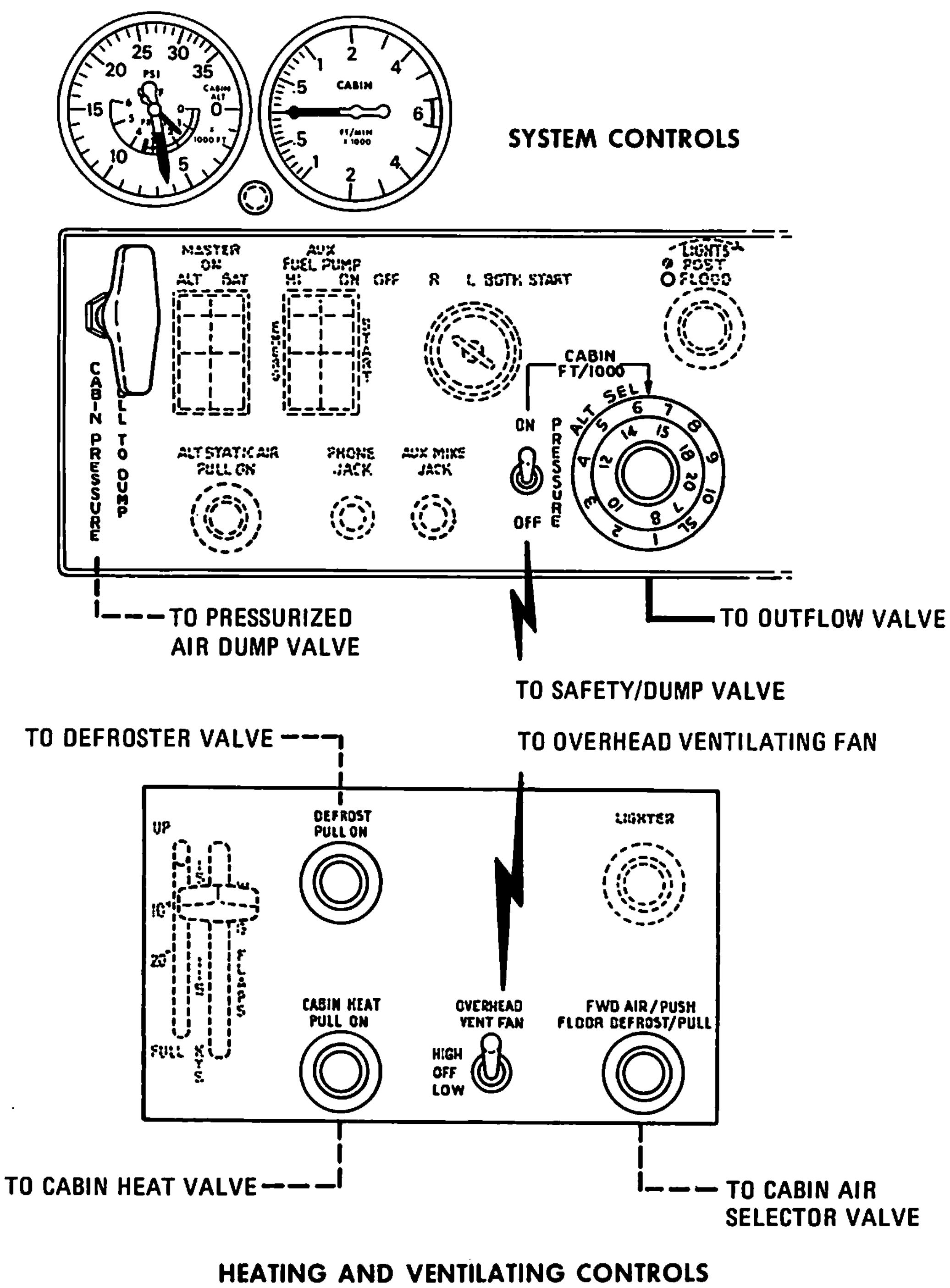


Figure 7-10. Pressurization System (Sheet 1 of 2)

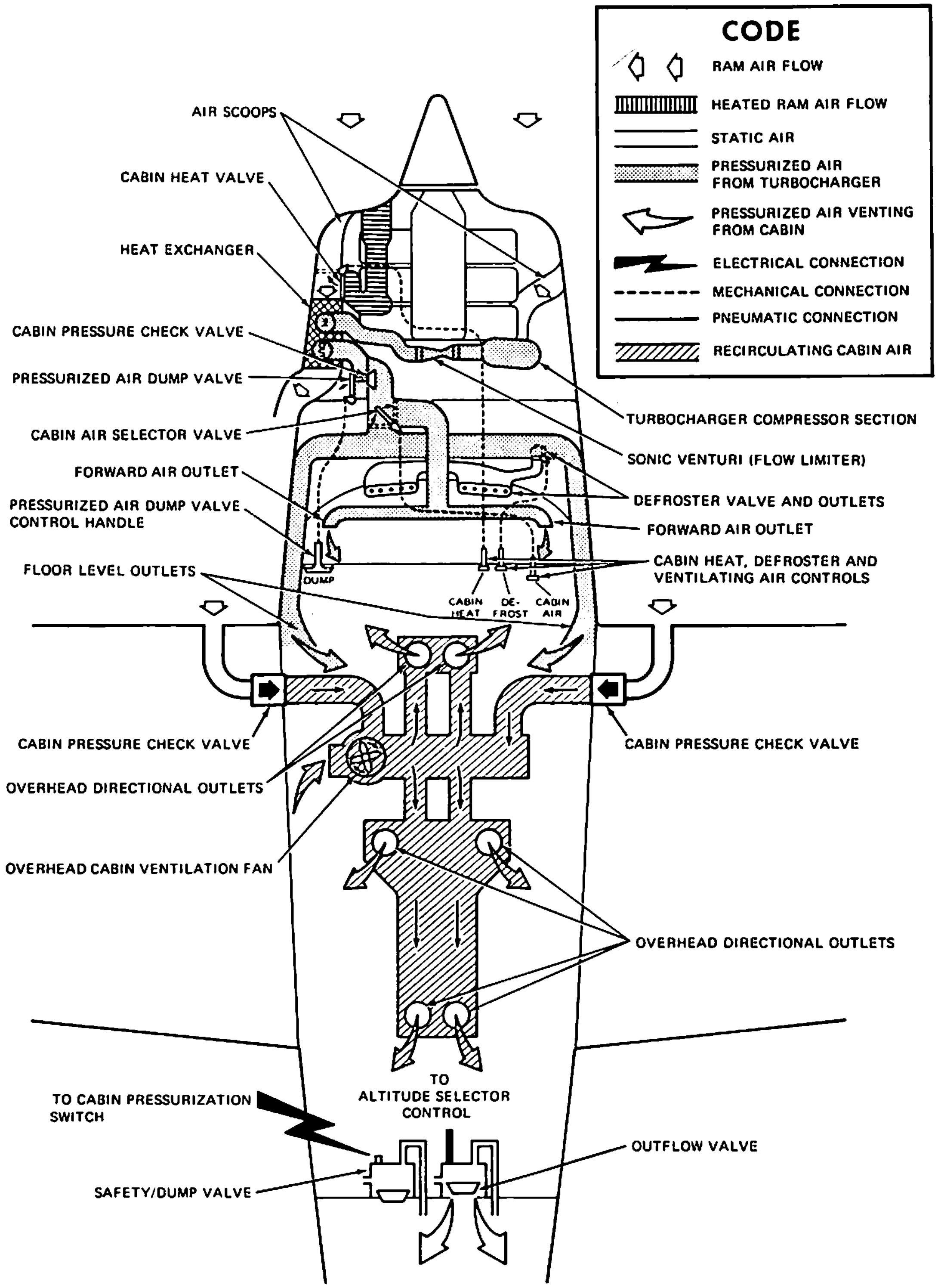


Figure 7-10. Pressurization System (Sheet 2 of 2)

Anytime the cabin is not pressurized, outside air from the wing leading edge intakes may be vented into the cabin through the overhead outlets. When the cabin is pressurized however, the flow of outside air is stopped by two pressure check valves located at the wing roots.

PRESSURIZATION CONTROLS AND INDICATORS

CABIN ALTITUDE SELECTOR

A cabin altitude selector, labeled ALT SEL, is mounted on the lower left side of the instrument panel. This control is used in selecting the altitude at which pressurization will begin and be maintained by controlling the outflow valve. The selector control knob has an outer scale marked SL, indicating sea level, and additional positions marked 1 through 10 indicating thousands of feet. An inner scale is included on this knob which reflects the airplane altitude in relation to the cabin altitude selected on the outer scale at maximum cabin pressure differential.

CABIN PRESSURIZATION SWITCH

A detent equipped switch adjacent to the cabin altitude selector turns the pressurization system on or off depending on its position. The detent requires that the switch be pulled out before repositioning, thus preventing inadvertent actuation. The two-position switch is labeled PRESSURE, and is ON in the up position and OFF in the down position. When the switch is placed in the ON position, electrical power to a solenoid in the safety-/dump valve is removed and the valve will close to permit pressurization. In the OFF position, electrical power is applied to the safety/dump valve solenoid, and the valve will open to prevent pressurization. Loss of electrical power, for any reason, will cause the safety/dump valve to close.

DUMP VALVE CONTROL HANDLE

A T-handle labeled, CABIN PRESSURE, PULL TO DUMP is located on the lower left side of the instrument panel, adjacent to the master switch. This handle is mechanically connected to the dump valve located in the dump valve chamber on the engine side of the firewall. When the handle is pulled, the dump valve opens and allows pressurization air to flow overboard. With the handle pushed in, pressurized air flows to the cabin through the air selector valve.

CABIN AIR SELECTOR CONTROL

A push-pull type control labeled, FWD AIR/PUSH, FLOOR DEFROST/PULL, permits incoming pressurized air to be directed to the two forward air outlets or to the two floor level outlets. With the cabin air selector control pushed fully in, pressurized air passes to the forward outlets. With the control pulled fully out, all airflow is diverted to the floor level outlets. A push-button type lock on the cabin air selector control allows positioning the control to any intermediate setting between full in and full out which results in pressurized airflow to both pairs of outlets.

CABIN RATE-OF-CLIMB INDICATOR

A cabin rate-of-climb indicator is located on the left side of the instrument panel above the dump valve control handle. The instrument is vented directly to the cabin and senses changes in pressure within the cabin to show cabin rate of climb or descent.

CABIN ALTITUDE/DIFFERENTIAL PRESSURE INDICATOR

This instrument, located adjacent to the cabin rate-of-climb indicator, shows both cabin altitude and differential pressure. It has two dials and two pointers. The outside dial indicates cabin altitude, and the inside dial indicates the pressure differential between cabin pressure and atmospheric pressure. The instrument is vented to the airplane cabin and the static air source.

CABIN ALTITUDE WARNING LIGHT

Anytime the cabin altitude exceeds 12,325 ± 175 feet, a barometric switch closes and illuminates a red press-to-test warning light labeled CABIN ALTITUDE. The light, located on the upper left corner of the instrument panel, indicates to the pilot that cabin altitude is too high and corrective action must be taken. Oxygen should be employed if available. If oxygen is not available, the airplane should be flown to a lower altitude. When the airplane descends to a cabin altitude of approximately 11,700 feet, the barometric switch opens and the warning light turns off.

PRESSURIZATION SYSTEM OPERATION

Operation of the pressurization system in the airplane is relatively simple, requiring few adjustments. Although the system is simple to operate, there are some things that should be remembered about flight with a pressurized cabin. These items, and the normal operating procedures for this system are covered in the following paragraphs. Pressurization emergencies are covered in Section 3 of this handbook.

Prior to starting the engine, set all of the pressurization controls for the anticipated flight. If the flight is to be made pressurized, place the dump valve control handle in the full in position, place the pressurization switch in the ON position, and set the cabin altitude selector approximately 1000 feet above the field elevation of the point of departure or the destination, whichever is the highest. No further adjustment of the system should be required.

NOTE

For improved cabin comfort on warm days, the cabin altitude selector should be set to 8000 to 10,000 feet, the dump valve control should not be pushed in, and the pressurization switch should not be turned on until approaching the set altitude. With the individual overhead outlets open, and the overhead ventilating fan set to HIGH, this procedure will allow maximum entry and circulation of the cooler ram air from the wing airscoops while climbing or cruising through the warm lower altitudes. A similar procedure should be used for hot weather descents.

Because the cabin is sealed, supplying air into the cabin either by the wing ram air system (in flight) or by engine bleed air results in a small residual amount of cabin pressurization whenever the window is closed and the airplane altitude is lower than the altitude set on the cabin altitude selector. For example, cabin indicated altitude relative to airplane altitude will be up to 200 feet lower using ram air only, 350 feet lower using both ram and bleed air with the pressurization switch OFF (safety valve open), and 700 feet lower with the pressurization switch ON (safety valve closed).

NOTE

For improved cabin comfort during takeoff, the throttle should be advanced slowly or the pressurization switch should be turned off until after takeoff to avoid a sudden but natural slight increase in cabin pressure.

Pressurization will begin as the airplane climbs through the pressure altitude set on the cabin altitude selector. As the airplane passes through this altitude, the outflow valve will begin regulating air flow causing the cabin to start to pressurize. Pressurization can be verified by checking the cabin rate-of-climb indicator which should read zero at 700 feet above this altitude.

The cabin rate-of-climb indicator will continue to read zero until maximum cabin pressure differential (3.35 PSI) is attained. Maximum allowable cabin pressure differential is indicated by a red line on the cabin altitude/differential pressure indicator. Pressure differential is the difference between the pressure within the cabin and the atmospheric pressure at the altitude of the airplane.

CABIN ALTITUDE vs. AIRPLANE ALTITUDE WITH 3.35 PSI DIFFERENTIAL	
AIRPLANE ALTITUDE IN FEET	CABIN ALTITUDE IN FEET
7000	Sea Level
8000	800
10,000	2400
12,000	4000
14,000	5500
16,000	7000
18,000	8500
20,000	10,000
23,000	12,100

Figure 7-11. Cabin Altitude Vs. Airplane Altitude

NOTE

If the maximum cabin pressure differential stabilizes between 3.4 and 3.5 PSI, it may indicate that the safety valve is regulating cabin pressure instead of the outflow valve. In this case, monitor the pressure closely during the remainder of the flight, and upon landing, have the outflow valve and/or underseat and aft bulkhead air passages cleared. If pressure tends to go above 3.5 PSI, follow the overpressure emergency procedure checklist in Section3.

If the airplane continues to climb, exceeding the system's ability to maintain the selected cabin altitude, the cabin rate-of-climb indicator will begin to indicate a rate of climb which will be approximately 75% of that of the airplane. Refer to figure 7-11 for the maximum altitude at which the airplane can be operated without causing the cabin altitude to climb above the altitude selected.

If, for any reason, the selected cabin altitude requires a change while enroute, consider carefully the current condition of the pressurization system and then act accordingly. If the system has not attained maximum pressure differential, any change in the cabin altitude selector (lower or higher) will result in a positive or negative cabin pressure change. If the cabin altitude selector is moved too rapidly, passenger discomfort can result. If a lower cabin altitude is desired, turn the cabin altitude selector to the desired setting VERY SLOWLY. Slow movement is important because the cabin pressure will respond almost instantly to cabin altitude selector movement. Should the pilot desire to increase the cabin altitude setting, again, turn the selector VERY SLOWLY.

When the pressurization system is operating at maximum pressure differential (3.35 PSI) with a cabin altitude equal to or above that selected, the cabin altitude selector may be repositioned as fast as desired to either a higher or lower altitude with no noticeable effect, provided the setting is not increased to a cabin altitude requiring less than the maximum allowable pressure differential to maintain, as described in the above paragraphs.

If the pilot climbs or descends, with the cabin pressure at maximum differential, the cabin altitude will follow at a proportional rate. In a descent, the cabin rate of climb will show a rate of descent about 75% of that of the airplane until the airplane descends through the altitude at which the system can maintain the selected cabin altitude (the point at which cabin pressure differential begins to drop). At this point, cabin rate of climb will return to zero and the selected cabin altitude will be maintained.

Pressurization or re-pressurization of the airplane during flight should be accomplished with care to avoid passenger discomfort. If the airplane is at or below 10,000 feet, set the cabin altitude selector to 10,000 feet on the outer scale. After setting the selector, push the dump valve control handle full in and place the cabin pressurization switch in the ON position. Once the system is set up for pressurization, VERY SLOWLY turn the cabin altitude selector to the desired cabin altitude. By turning the selector slowly, no passenger discomfort is likely as the cabin pressure increases to the desired level.

If the airplane is above 10,000 feet, set the cabin altitude selector to 10,000 feet on the outer scale and check that the dump valve control handle is pulled **full out**. Place the pressurization switch in the ON position and VERY SLOWLY push the dump valve control handle full in. Very slow movement will prevent any sudden pressure change in the cabin. When the cabin rate-of-climb indicator has stabilized, VERY SLOWLY adjust the cabin altitude selector to the desired cabin altitude.

As the pilot approaches his destination, or if he is required to descend to a lower altitude enroute, care must be taken to maintain proper pressurization system operation. Descents should be made with sufficient power to maintain cabin pressure. Prior to landing, the differential pressure indicator should be checked to assure the airplane is depressurized. The airplane is not approved for landing while pressurized.

After completing a trip, it is good practice to leave the pressurization controls in the positions expected to be appropriate for the next flight.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

Air for cabin heating, ventilating and defrosting is supplied by the compressor section of the turbocharger. This heated air (bleed air) is first passed through the heat exchanger where it is either cooled or further heated and then is directed to the cabin through the same ducts and outlets used by the cabin pressurization system (refer to figure 7-10). In addition, fresh air for cabin ventilation can enter through the overhead outlet system from airscoops in both wing leading edges anytime the cabin is not pressurized. The cabin heating, ventilating and defrosting system controls are located on a comfort control panel on the right side of the avionics equipment at the lower edge of the instrument panel. All the controls are the push-pull type and feature a push-button type lock to allow intermediate settings. The following paragraphs describe these controls and their operation. An air conditioning system may be installed in the airplane. Details of this system are presented in Section 9, Supplements.

CABIN HEATING

A full range of control of heated cabin air temperature is available when utilizing the cabin heat control. The control, labeled CABIN HEAT, PULL ON, is connected mechanically to a valve which admits ram air to the pressurization system heat exchanger. The valve allows ram air at outside air temperature (OAT) or heated ram air from a shroud surrounding the exhaust manifold to pass through the heat exchanger. Since the heat exchanger governs the temperature of bleed air fed to the cabin, the setting of the cabin heat control will determine the cabin air temperature. With the cabin heat control pushed fully in, the air entering the cabin will not be heated. However, pulling the control fully out results in maximum system heating of incoming cabin air.

Cabin heat can be selected with the pressurization system operating to pressurize the cabin or with the cabin unpressurized. To obtain heated air flow, first ensure the pressurized air dump valve control is pushed fully in, then select the desired cabin air temperature by pulling out the cabin heat control as required.

CABIN VENTILATING

Ventilating airflow into the airplane cabin while in unpressurized flight is available from any of three sources, simultaneously or individually: bleed air from the engine turbocharger compressor, ram air from an airscoop in each wing leading edge, or outside air from the openable window in the cabin entry door. When the airplane is on the ground, taxiing or parked, the cabin emergency exit door can be opened to provide an additional ventilating air source.

NOTE

The airplane is not approved for flight with the emergency exit door open.

Distribution of ventilating airflow from the wing ram airscoops or from recirculation of cabin air is provided by an overhead ventilating system in the overhead console. This system consists of six individually controllable outlets and a two-speed recirculating fan exhausting through the outlets into the cabin. Any time it is desired to increase cabin ventilating airflow, whether in pressurized or unpressurized flight, select one of the two positions of the ventilating fan switch, labeled OVERHEAD VENT FAN on the comfort control panel (figure 7-10). Ventilating airflow is then individually adjusted at each seat position using the overhead outlets.

To obtain maximum cabin ventilation during unpressurized flight, turn the pressurization switch off, open the individual overhead outlets, turn the overhead ventilating fan to HIGH, push the dump valve control handle full in, and adjust the cabin air selector control to obtain desired airflow distribution from the forward or floor outlets. In hot weather, use of only the ram air from the wing airscoops (dump valve pulled out) will provide the coolest cabin temperatures.

Whenever bleed air is being used for cabin ventilation (dump valve control pushed full in) with the cabin unpressurized (pressurization switch OFF), and the airplane altitude is higher than set on the cabin altitude selector, any loss of electrical power, such as turning off the master switch, will cause the cabin to pressurize. This occurs because the safety/dump valve requires electrical power to be held open. An electrical power loss for any reason allows the valve to close, causing the cabin to pressurize. Therefore, if the master switch must be turned off in flight, it is recommended that first the dump valve control be pulled full out or the cabin altitude selector be adjusted to a value greater than the airplane altitude. Under these circumstances, if ventilating air to the cabin is desired, ram air from the wing airscoops to the overhead outlets should be used.

WINDSHIELD DEFROSTING AND DEFOGGING

The airplane incorporates provisions for windshield defrosting or defogging. Components include a valve, ducting, windshield outlets and a separate defroster control, labeled DEFROST, PULL ON. The defroster control is located directly above the cabin heat control and is mechanically connected to the defroster valve. This valve is located in the duct leading to the right side floor level outlet in the cabin. When the defrost control is pulled out, the valve opens to admit bleed air to a series of fixed outlets at the base of the windshield. The volume of airflow supplied to the windshield is, thus, controlled by the setting of the defrost control. However, the temperature of the air reaching the windshield will be the same as that supplied to the floor level outlets and this temperature is dependent on the setting of the cabin heat control. Therefore, to obtain heated airflow to the windshield for defrosting, the cabin heat control must be pulled to the on position.

PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, vertical speed indicator, airplane altimeter and the cabin altimeter/differential pressure indicator. The system is composed of a pitot tube mounted on the lower surface of the left wing, two external static ports, one on each side of the fuselage below the rear corners of the aft side windows, an alternate static source valve located on the lower left corner of the instrument panel, and the associated plumbing necessary to connect the instruments and 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 left sidewall circuit breaker panel, and associated wiring. When the pitot heat switch is turned on, the element in the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

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

If erroneous instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static source valve should be pulled on.

Pressures within the baggage compartment will vary. Refer to Sections 3 and 5 for the effect of varying pressures on airspeed and altimeter readings.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings (in KIAS) include the white arc (58 to 115 knots), green arc (73 to 167 knots), yellow arc (167 to 200 knots), and a red line (200 knots).

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

VERTICAL SPEED INDICATOR

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

ALTIMETER

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

VACUUM SYSTEM AND INSTRUMENTS

An engine-driven vacuum system (see figure 7-12) 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 mounted on the engine side of the firewall, the vacuum-operated attitude and directional indicators mounted on the instrument panel directly in front of the pilot, a suction gage located on the right side of the instrument panel and a system air filter mounted in the left wing root area.

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

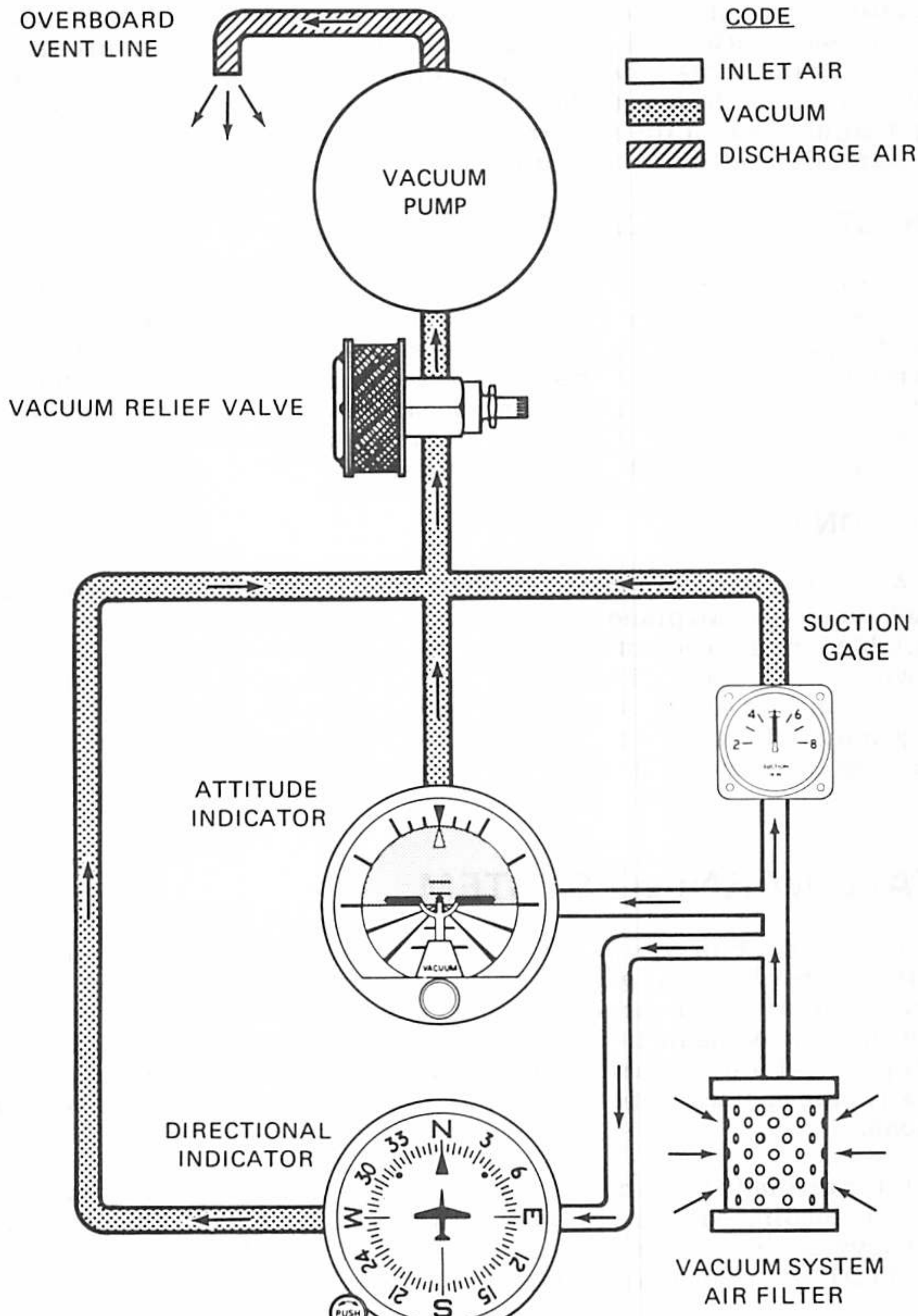


Figure 7-12. Vacuum System

miniature airplane superimposed over a symbolic horizon area divided into two sections by a white horizon bar. The upper "blue sky" area and the lower "ground" area have arbitrary pitch reference lines useful for pitch attitude control. A knob at the bottom of the instrument is provided for 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 upper 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. The unit is electrically connected to a dual warning unit located above the cabin emergency exit door and behind the headliner. The vane in the wing senses the change in airflow over the wing, and operates the dual warning unit, which produces a continuous tone over the airplane speaker between 5 and 10 knots above the stall in all configurations.

If the airplane has a heated stall warning system, the vane-type unit in the wing leading edge is equipped with a heating element. The heated part of the system is operated by the 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 a continuous tone is heard on the airplane speaker as the vane is pushed upward.

AVIONICS SUPPORT EQUIPMENT

If the airplane is equipped with avionics, various avionics support equipment may also be installed. Equipment available includes two types of audio control panels, microphone-headset installations and control surface static dischargers. The following paragraphs discuss these items. Description and operation of radio equipment is covered in Section 9 of this handbook.

Avionic cooling fans are provided anytime the airplane is equipped with a radio to supply cooling for prolonged avionic equipment life. The fans operate whenever the master switch is turned on. If a fan malfunction occurs, the fans can be shut off using the "pull-off" type circuit breaker labeled AVN FAN.

AUDIO CONTROL PANEL

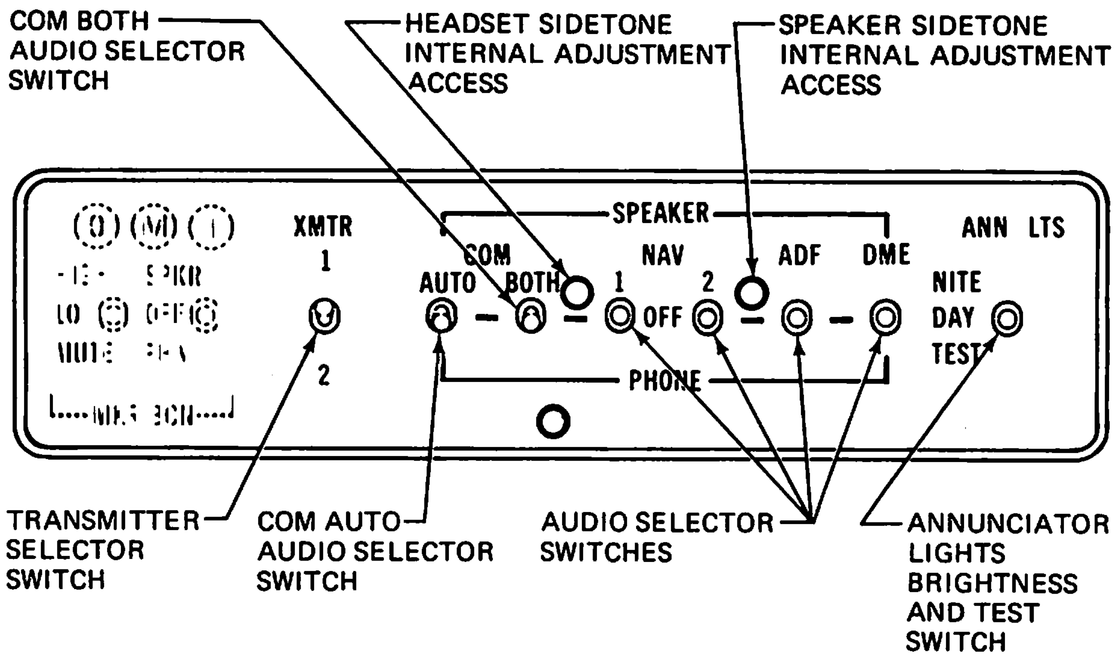
Two types of audio control panels (see figure 7-13) are available for this airplane, depending upon how many transmitters are included. The operational features of both audio control panels are similar and are discussed in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

When the avionics package includes a maximum of two transmitters, a two-position toggle-type switch, labeled XMTR, is provided to switch the microphone to the transmitter the pilot desires to use. If the airplane avionics package includes a third transmitter, the transmitter selector switch is a three-position rotary-type switch, labeled XMTR SEL. The numbers 1, 2, or 1, 2 and 3 adjacent to the selector switches correspond to the first, second and third (from top to bottom) transmitters in the avionics stack. To select a transmitter, place the transmitter selector switch in the position number corresponding to the desired transmitter.

The action of selecting a particular transmitter using the transmitter selector switch simultaneously selects the audio amplifier associated with that transmitter to provide speaker audio. For example, if the number one transmitter is selected, the audio amplifier in the number one NAV/COM is also selected and is used for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio, selecting an alternate transmitter will reestablish speaker audio using the alternate transmitter audio amplifier. Headset audio is not affected by audio amplifier operation.

USED WITH ONE OR TWO TRANSMITTERS



USED WITH THREE TRANSMITTERS

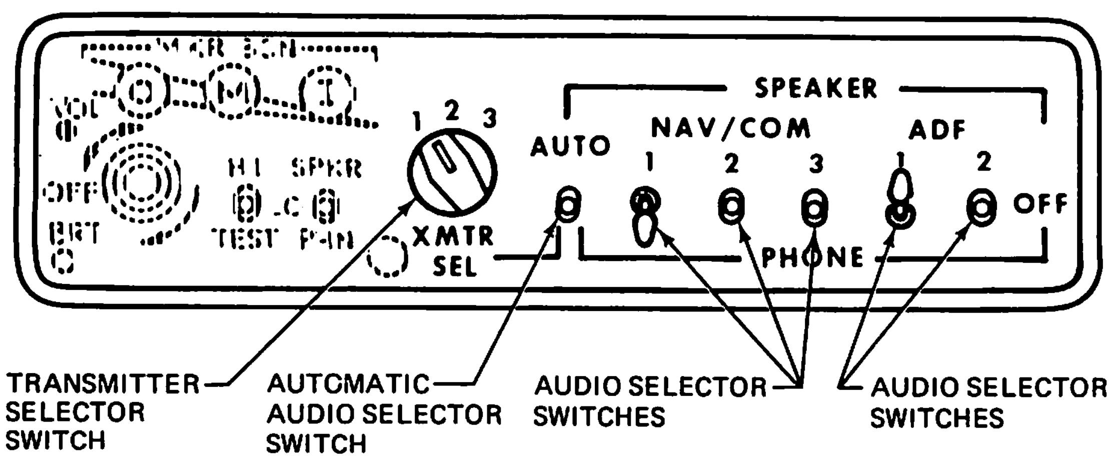


Figure 7-13. Audio Control Panel

AUDIO SELECTOR SWITCHES

Both audio control panels (see figure 7-13) incorporate three-position toggle-type audio selector switches for individual control of the audio from systems installed in the airplane. These switches allow receiver audio to be directed to the airplane speaker or to a headset, and heard singly or in combination with other receivers. To hear a particular receiver on the airplane speaker, place that receiver's audio selector switch in the up (SPEAKER) position. To listen to a receiver over a headset, place that receiver's audio selector switch in the down (PHONE) position. The center (OFF) position turns off all audio from the associated receiver.

NOTE

Volume level is adjusted using the individual receiver volume controls on each radio.

A special feature of the audio control panel used when one or two transmitters are installed is separate control of NAV and COM audio from the NAV/COM radios. With this installation, the audio selector switches labeled NAV, 1 and 2 select audio from the navigation receivers of the NAV/COM radios only. Communication receiver audio is selected by the switches labeled COM, AUTO and BOTH. Description and operation of these switches is described in later paragraphs.

When the audio control panel for three transmitters is installed, audio from both NAV and COM frequencies is combined, and is selected by the audio selector switches labeled NAV/COM, 1, 2 and 3.

COM AUTO AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM AUTO, which is provided to automatically match the audio of the appropriate NAV/COM communications receiver to the transmitter selected by the transmitter selector switch. When the COM AUTO selector switch is placed in the up (SPEAKER) position, audio from the communications receiver selected by the transmitter selector switch will be heard on the airplane speaker. Switching the transmitter selector switch to the other transmitter automatically switches the other communications receiver audio to the speaker. This automatic audio switching feature may also be utilized when listening on a headset by placing the COM AUTO switch in the down (PHONE) position. If automatic audio selection is not desired, the COM AUTO selector switch should be placed in the center (OFF) position.

COM BOTH AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM BOTH, which is provided to allow both COM receivers to be monitored at the same time. For example, if the COM AUTO switch is in the SPEAKER position, with the transmitter selector switch in the number one transmitter position, number one communications receiver audio will be heard on the airplane speaker. If it is also desired to monitor the number two communications receiver audio without changing the position of the transmitter selector switch, place the COM BOTH selector switch in the up (SPEAKER) position so that the number two communications receiver audio will be heard in addition to the number one communications receiver audio. This feature can also be used when listening on a headset by placing the COM BOTH audio selector switch in the down (PHONE) position.

NOTE

The combination of placing the COM AUTO switch in the SPEAKER position and the COM BOTH switch in the PHONE position (or vice versa) is not normally recommended as it will cause audio from both communications receivers (and any other navigation receiver with its audio selector switch in the PHONE position) to be heard on both the airplane speaker and the headset simultaneously.

AUTO AUDIO SELECTOR SWITCH

The audio control panel used with three transmitters incorporates a three-position toggle switch, labeled AUTO, which is provided to automatically match the audio of the appropriate NAV/COM receiver to the selected transmitter. To utilize this automatic feature, leave all NAV/COM audio selector switches in the center (OFF) 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 center (OFF) position.

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.

ANNUNCIATOR LIGHTS BRIGHTNESS AND TEST SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle-type switch to control the brightness level of the marker beacon indicator lights (and certain other annunciator lights associated with avionics equipment). When the switch is placed in the center (DAY) position, the indicator lights will show full bright. When this switch is placed in the up (NITE) position, the lights are set to a reduced level for typical night operations and can be further adjusted using the RADIO LT dimming rheostat knob. The down (TEST) position illuminates all lamps (except the ARC light in the NAV indicators) which are controlled by the switch to the full bright level to verify lamp operation.

SIDETONE OPERATION

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). While adjusting sidetone, be aware that if the sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

When the airplane has one or two transmitters, sidetone is provided in both the speaker and headset anytime the COM AUTO selector switch is utilized. Placing the COM AUTO selector switch in the OFF position will eliminate sidetone. Sidetone internal adjustments are available to the pilot through the front of the audio control panel (see figure 7-13). Adjustment can be made by removing the appropriate plug-button from the audio control panel (left button for headset adjustment and right button for speaker adjustment), inserting a small screwdriver into the adjustment potentiometer and rotating it clockwise to increase the sidetone volume level.

When the airplane has three transmitters, sidetone will be heard on either the speaker or a headset as selected with the AUTO selector switch. Sidetone may be eliminated by placing the AUTO selector switch in the OFF position, and utilizing the individual audio selector switches. Adjustment of speaker and headset sidetone volume can only be accomplished by adjusting the sidetone potentiometers located inside the audio control panel.

NOTE

Sidetone is not available on HF Transceivers (Types PT10-A and ASB-125), when installed.

MICROPHONE-HEADSET INSTALLATIONS

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

NOTE

When transmitting, the pilot should key the microphone, place the microphone as close as possible to the lips and speak directly into it.

STATIC DISCHARGERS

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

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

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

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

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

IDENTIFICATION PLATE

All correspondence regarding your airplane should include the SERIAL NUMBER. The Serial Number, Model Number, Production Certificate Number (PC) and Type Certificate Number (TC) can be found on the Identification Plate, located on the floorboard at the base of the 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 airplane when delivered from the factory. These items are listed below.

- CUSTOMER CARE PROGRAM BOOK
- PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL
- AVIONICS OPERATION GUIDE
- PILOT'S CHECKLISTS
- POWER COMPUTER
- CUSTOMER CARE 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.

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

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

NOTE

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

AIRPLANE FILE

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

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

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

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

Most of the items listed are required by the United States Federal Aviation Regulations. Since the Regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

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

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

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

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

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

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

CESSNA PROGRESSIVE CARE

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your airplane at a minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations 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 accumulated 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 the entire airplane off the ground, or when wing jack points are used in the jacking operation, refer to the Service Manual for specific procedures and equipment required.

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

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

NOTE

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

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

NOTE

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

LEVELING

Longitudinal leveling of the airplane is accomplished by placing a level on the leveling screws located on the left side of the tailcone. Deflate the nose tire and/or lower or raise the nose strut to properly center the bubble in the level. Corresponding points on 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 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 AND VISCOSITY FOR TEMPERATURE RANGE --
All temperatures, use SAE 20W-50 or
Above 4°C (40°F), use SAE 50
Below 4°C (40°F), use SAE 30

Multi-viscosity oil with a range of SAE 20W-50 is recommended for improved starting and turbocharger controller operation in cold weather. Ashless dispersant oil, conforming to Continental Motors Specification MHS-24 (and all revisions thereto), **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 -- 10 Quarts.

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

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain engine oil sump and replace 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.

NOTE

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

FUEL

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

NOTE

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

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

NOTE

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

FUEL ADDITIVES --

Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

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

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

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

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

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

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

1. For best results, the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fuel operation.

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

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

CAUTION

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

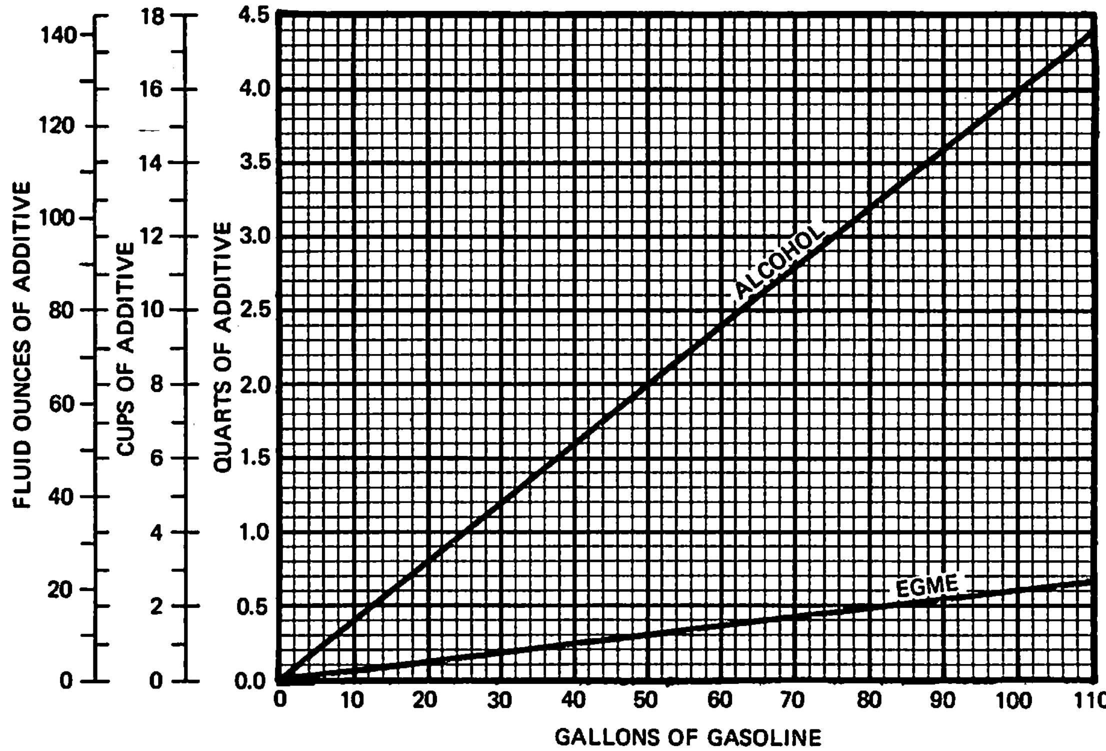


Figure 8-1. Additive Mixing Ratio

CAUTION

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

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

LANDING GEAR

NOSE WHEEL TIRE PRESSURE -- 88 PSI on 5.00-5, 10-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 55 PSI on 6.00-6, 8-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --
Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 90 PSI. Do not over-inflate.
HYDRAULIC FLUID RESERVOIR -- Check every 25 hours and service

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

OXYGEN

PILOT/FRONT PASSENGER OXYGEN GENERATOR -- When expended, replace with Part No. C166025-0102.
REAR PASSENGER OXYGEN GENERATOR -- When expended, replace with Part No. C166025-0102.
Refer to Oxygen Supplement (Section 9) for system description.

CLEANING AND CARE

WINDSHIELD-WINDOWS

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

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

NOTE

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

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

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

PAINTED SURFACES

The painted exterior surfaces of your new Cessna have a durable, long lasting finish and, under normal conditions, require no polishing or buffing. Approximately 10 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

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

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. Isopropyl alcohol will satisfactorily remove ice accumulations without damaging the paint. 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 Stoddard solvent.

LANDING GEAR CARE

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

ENGINE CARE

The engine may be cleaned 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.

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.

SECTION 9
SUPPLEMENTS
(Optional Systems Descriptions & Operating Procedures)

TABLE OF CONTENTS

INTRODUCTION

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

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

SUPPLEMENT
CESSNA 400B NAVOMATIC AUTOPILOT
(Type AF-550A)

SECTION 1
GENERAL

Cessna 400B Navomatic Autopilot (Type AF-550A) is a two axis automatic flight control system that governs the positions 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 or ILS localizer and glide slope beams, and includes automatic pitch synchronization and trim, manual turn and pitch command, altitude hold, back course switching, Nav 1 or Nav 2 receiver selection, an automatic autopilot disengage acceleration sensor with an associated autopilot disengagement warning horn and a prior-to-flight test function.

The major components in a standard 400B autopilot system consist of a control unit and accessory unit mounted side-by-side in the lower center stack of the instrument panel, a panel-mounted vacuum driven unslaved directional gyro and an attitude gyro, a remote mounted acceleration sensor with a built in "G" switch, an associated autopilot disengage warning horn, an altitude sensor, an aileron, elevator and elevator trim actuator. A heavy duty aircraft battery is also installed as standard equipment with this autopilot system. In addition, an optional unslaved HSI is offered as replacement for the standard unslaved directional gyro and two optional slaved compass systems consisting of a remote mounted flux detector, a slaving accessory unit (offered without course datum on 300 Series Radios and with, or without, course datum on 400 Series Radios), and either a slaved directional gyro or a slaved Horizontal Situation Indicator (HSI) are offered. Both the optional slaved DG and optional slaved HSI are panel-mounted and incorporate a slaving meter that monitors heading displacement error between the flux detector and the slaved DG or slaved HSI. The HSI, in addition to replacing the standard DG, also replaces the standard Course Deviation Indicator (CDI) normally installed with the navigational receiver.

NOTE

400 Nav/Com radios equipped with course datum aid the

pilot by eliminating the need to set the DG heading bug to the desired VOR or ILS course. When course datum is installed, the autopilot will automatically track the VOR or ILS course selected by the OBS on the CDI or course selector on the slaved HSI.

The control unit (flight controller) and accessory unit contain most of the operating controls for the autopilot. In addition, there are three switches mounted on the pilot's control wheel and two switches mounted in the autopilot accessory unit. The three switches on the pilot's control wheel provide for manual electric trim operation, autopilot disengage and electric trim disengage. An AP NAV 1/NAV 2 switch in the autopilot accessory unit provides for selection of the desired VOR receiver (NAV 1 or NAV 2) and a REV SNS selector switch (LOC 1 or LOC 2), also in the autopilot accessory unit, is provided to select back-course (reverse sensing) operation on the desired navigation receiver. All operating controls necessary to properly operate the 400B autopilot are shown in Figure 1.

An automatic autopilot disengage function (provided by the "G" switch in the acceleration sensor) will automatically disengage the autopilot anytime the airplane pitches down at more than a normal rate from normal flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the TEST EA FLT button, located on the accessory unit. When the TEST button is pressed with the autopilot engaged, the "G" switch in the acceleration sensor is actuated and if the "G" switch is functional, the autopilot will disengage, the autopilot disconnect horn will sound, and the autopilot disconnect (DISC) warning (WARN) light will illuminate yellow to advise the pilot the autopilot disengage system is operational.

The autopilot will also be automatically disengaged anytime the airplane pitches up or down more than a normal amount from a level flight attitude. In this event, the disconnect horn would sound and the disconnect light would illuminate, advising the pilot that the autopilot has disengaged.

An additional autopilot disengage feature is provided by a thermostatic switch which monitors the operating temperature of the aileron and elevator actuators. If the temperature becomes abnormal in either the roll or pitch actuator, the thermostatic switch opens and disengages the autopilot to remove power from the actuator. After approximately 10 minutes, the switch automatically resets to close the autopilot interlock circuit. Power can then be reapplied to the actuator by re-engaging the AP/ON-OFF switch.

The autopilot disconnect (DISC) warning (WARN) light, on the accessory unit, will illuminate yellow when the autopilot is disengaged by any means other than the control wheel AUTOPILOT DISENGAGE switch. Whenever the autopilot is disengaged by any means, the autopilot disengage horn will produce a short tone lasting 1 to 2 seconds with decreasing amplitude. The autopilot disconnect warning (WARN) light (yellow) will remain on, until it is cancelled by pressing the control wheel AUTOPILOT DISENGAGE switch.

The back course (REV SNS LOC 1/LOC 2) selector switch, mounted in the autopilot accessory unit, is only used when conducting localizer approaches. With the navigation receiver set to a localizer frequency, positioning the switch to LOC 1 or LOC 2 (back course) will reverse the appropriate signals to provide for back course operation for either autopilot or manual flight. Except when a Horizontal Situation Indicator (HSI) is installed, selecting back course (REV SNS LOC 1/LOC 2) causes reversal of the Course Deviation Indicator (CDI) indication, whether or not the autopilot is being used.

The navigation receiver selector switch (AP NAV 1/NAV 2), installed in the autopilot accessory unit when dual navigation receivers are installed, allows the autopilot to operate in conjunction with either navigation receiver.

SECTION 2
LIMITATIONS

The following autopilot limitations must be followed during airplane operation.

1. Autopilot must be OFF for takeoff and landing.

OPERATING LIMITATIONS WITH AUTOPILOT ENGAGED:

1. Maximum Airspeed -- 165 KIAS.
   Reduce maximum speed 10 KTS every 3,000 Ft. above FL 180.
2. Maximum Altitude Loss During Malfunction Recovery:
   Cruise -- 300 Ft.
   Approach -- 200 Ft.
3. Maximum Flap Deflection -- 10°.
4. In Altitude Hold Mode:
   Maximum Speed for Flap and Gear Operation -- 115 KIAS.
5. Maximum Right Wing Heavy Fuel Unbalance With Autopilot Engaged -- 50 Lbs.

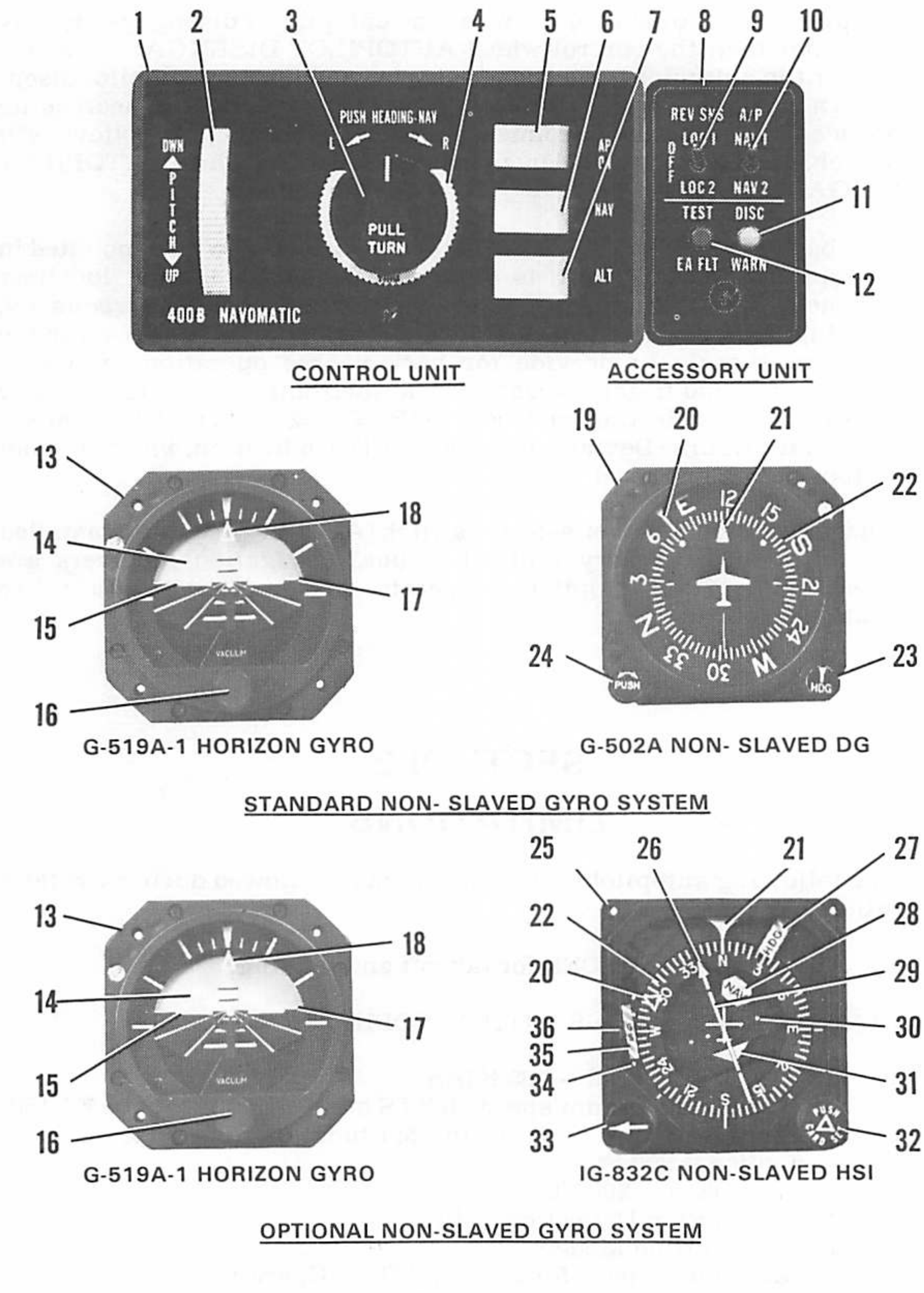
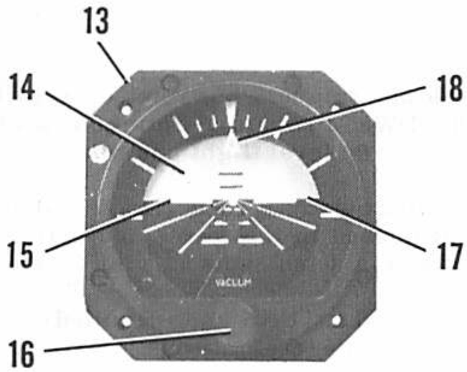
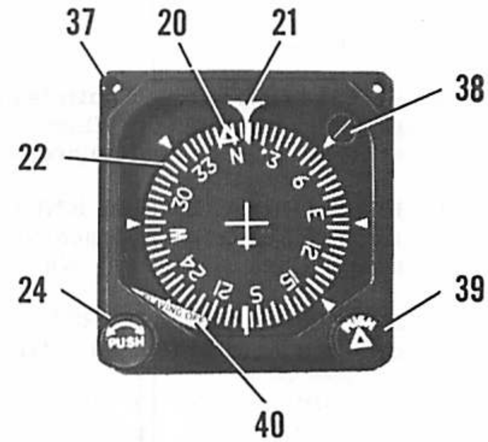


Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A)
(Sheet 1 of 6)

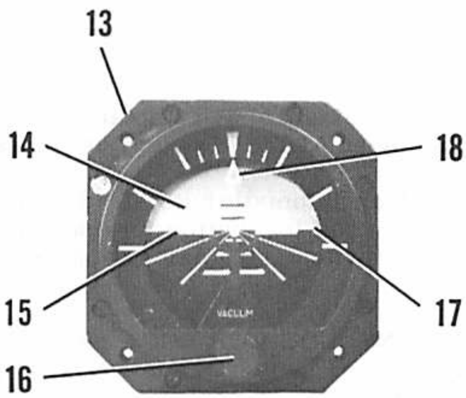


G-519A-1 HORIZON GYRO

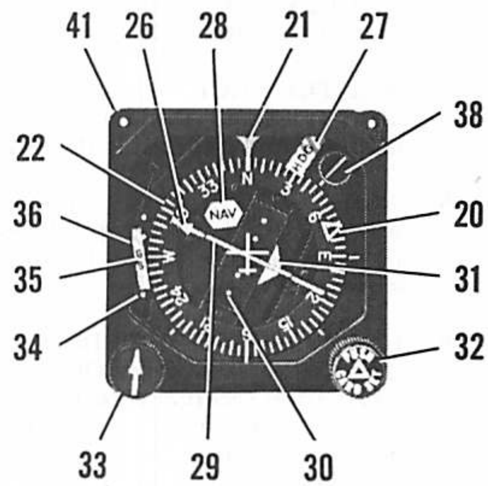


G-504A SLAVED DG

OPTIONAL SLAVED GYRO SYSTEM

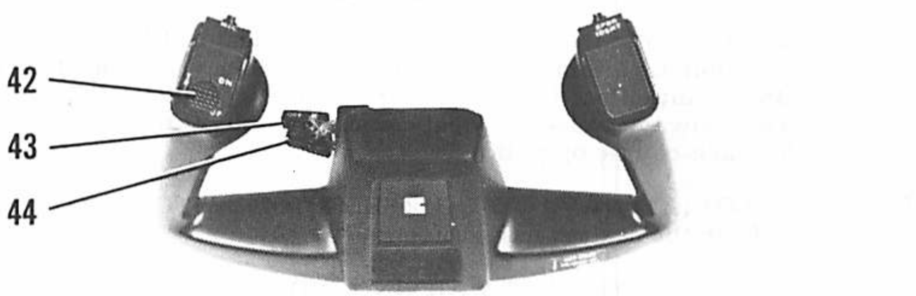


G-519A-1 HORIZON GYRO



IG-832A SLAVED HSI

OPTIONAL SLAVED GYRO SYSTEM



CONTROL WHEEL SWITCHES

Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A)
(Sheet 2 of 6)

1. CONTROL UNIT - Provides the primary switches and controls for operating the autopilot.

2. 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 level flight position.

3. PULL-TURN CONTROL KNOB - When pulled out and turned, aircraft will bank right (R) or left (L). When in detent and pushed in intercepts and maintains selected heading (HDG). When pulled out and in detent, acts as wing leveler.

4. LATERAL TRIM CONTROL (TRIM) - When PULL-TURN knob is pulled out and centered, control is used to trim aircraft for wings level attitude.

5. AUTOPILOT ON-OFF SWITCH (AP/ON) - Controls primary power to turn on or off the Navomatic 400B. When the AP/ON switch is turned off, the autopilot disengage horn will produce a short tone lasting from 1 to 2 seconds with decreasing amplitude and autopilot disconnect light will illuminate.

6. NAVIGATION ENGAGE SWITCH (NAV) - When PULL-TURN knob is pushed in, selects automatic VOR radial or localizer intercept and tracking operation.

7. ALTITUDE HOLD ENGAGE SWITCH (ALT) - Selects automatic altitude hold. If aircraft is in anything but level flight, the altitude control will smoothly level the airplane and return it to the altitude existing when ALT hold switch was pressed.

8. ACCESSORY UNIT - Provides the pilot with an automatic autopilot disconnect warning light, an autopilot disconnect system self-test button for use prior to flight, a reverse sense (back-course) selector switch and a navigation receiver selector switch.

9. BACK COURSE REVERSE SENSE (REV SNS) LOC 1 OR LOC 2 SELECTOR SWITCH - Used with LOC operation only. With AP switch OFF or ON, and when navigation receiver selected by AP switch (on autopilot accessory unit) is set to a localizer frequency, it reverses normal localizer needle indication on a course deviation indicator (CDI) and causes localizer reversed (BC) light to illuminate. With AP switch ON (on autopilot flight controller), reverses localizer signal to autopilot.

CAUTION

When an optional horizontal situation indicator (HSI) is installed, the omni deviation bar does not reverse. However, with AP switch ON (on autopilot flight controller), selection of either LOC 1 or LOC 2 will always cause the localizer signal to the autopilot to reverse for back-course operation.

10. AUTOPILOT (AP) NAV 1 OR NAV 2 SELECTOR SWITCH - Selects appropriate signals from the desired navigation receiver.

11. AUTOPILOT DISCONNECT WARNING INDICATOR LIGHT (DISC WARN) - Whenever the autopilot is disengaged by any means, other than the control wheel

Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A)
(Sheet 3 of 6)

AUTOPILOT DISENGAGE switch, the autopilot disconnect (DISC) warning (WARN) light will illuminate yellow and will remain lighted until it is cancelled by pulling aft the control wheel AUTOPILOT DISENGAGE switch. When the autopilot disconnect DISC WARN indicator light is activated, the circuit will also automatically activate an autopilot disengage warning horn that will produce a short tone lasting from 1 to 2 seconds with decreasing amplitude.

12. AUTOPILOT DISCONNECT TEST BUTTON (TEST EA FLT) - When the TEST EA FLT pushbutton is pressed and held with the autopilot engaged, the "G" switch in the acceleration sensor is actuated and if the "G" switch is functional, the AP/ON-OFF switch will automatically disengage, the autopilot disconnect horn will produce a short tone and the yellow autopilot disconnect warning light will illuminate to advise the pilot the "G" switch disengaging function is operational.

13. ATTITUDE GYRO - Provides the pilot with a visual indication of the airplane's pitch and roll attitude with respect to the earth and also provides the autopilot with electrical roll and pitch signals.

14. GYRO HORIZON (ATTITUDE BACKGROUND) - Moves with respect to symbolic aircraft to display actual pitch and roll attitude.

15. SYMBOLIC AIRCRAFT - Serves as a stationary symbol of the aircraft. Aircraft pitch and roll attitudes are displayed by the relationship between the fixed symbolic aircraft and the movable background.

16. SYMBOLIC AIRCRAFT ALIGNMENT KNOB - Provides manual positioning of the symbolic aircraft for level flight under various load conditions.

17. HORIZON LINE - Provides indentification of artificial horizon.

18. ROLL ATTITUDE INDEX - Displays actual roll attitude through movable index and fixed reference marks at 0, 10, 20, 30, 60 and 90 degrees.

19. NON-SLAVED DIRECTIONAL GYRO - Provides a stable visual indication of aircraft heading to the pilot and provides electrical heading information to the autopilot.

20. HEADING BUG - Moved by HDG knob on DG or PUSH Knob on Slaved DG or PUSH CARD SET Knob on HSI's to select desired heading.

21. LUBBER LINE - Indicates aircraft magnetic heading on compass card (22).

22. COMPASS CARD - Rotates to display heading of airplane with reference to lubber line (21) on DG's or HSI.

23. HEADING SELECTOR KNOB (HDG) - When pushed in, the heading bug (15) may be positioned to the desired magnetic heading by rotating the HDG selector knob. Also used to select VOR or ILS course when the autopilot is installed with 300 Series Radios or 400 Series Radios without course datum.

24. GYRO ADJUSTMENT KNOB (PUSH) - When pushed in, allows the pilot to manually rotate the gyro compass card (22) to correspond with the magnetic

Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A) (Sheet 4 of 6)

heading indicated by the compass. The unslaved directional gyro's (19) compass card (22) must be manually reset periodically to compensate for precessional errors in the gyro. The slaved directional gyro's (37) compass card (22) 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.

25. NON-SLAVED 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. The unslaved HSI's directional gyro compass card (22) must be manually reset periodically to compensate for precessional errors in the gyro.

26. OMNI BEARING POINTER - Indicates selected VOR course or localizer course on compass card (22). The selected VOR radial or localizer heading remains set on the compass card when the compass card (22) is rotated.

27. HEADING WARNING FLAG (HDG) - When flag is in view, the heading display is invalid due to interruption of either electrical or vacuum power.

28. NAV FLAG - Flag is in view when the NAV receiver signal is inadequate.

29. COURSE 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.

30. COURSE DEVIATION DOTS - A course deviation bar displacement of 2 dots represents full scale (VOR = ±10° or LOC = ±2½°) deviation from beam centerline.

31. TO/FROM INDICATOR FLAG - Indicates direction of VOR station relative to selected course.

32. HEADING SELECTOR KNOB (PUSH/CARD SET/△) - Positions heading "bug" on compass card (22) by rotating the CARD SET knob. Pushing in and rotating the CARD SET knob sets the compass card. The "bug" (36) rotates with the compass card. Also used to select VOR or ILS course when the autopilot is installed with 300 Series Radios or 400 Series Radios without course datum.

33. COURSE SELECTOR KNOB - Positions omni bearing pointer (26) on the compass card (22) by rotating the course selector knob.

34. 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.

35. GLIDE SLOPE FLAG - When in view, indicates glide slope receiver signal is not reliable.

Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A)
(Sheet 5 of 6)

36. GLIDE SLOPE POINTER - Indicates on glide slope scale (34) aircraft displacement from glide slope beam center.

37. 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 since the gyro motor will keep the card aligned with the earth's magnetic field.

38. GYRO SLAVING INDICATOR - Displays visual indication of heading indicator and flux detector synchronization. When slaving needle is aligned with the 45° right index on the DG or HSI, it shows that the heading indicator agrees with the aircraft magnetic heading. Off-center pointer deflections show the direction of the heading indicator error relative to aircraft magnetic heading. The slaved HSI's (41) compass CARD SET knob (32) or the slaved DG's gyro adjustment knob (24) 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.

39. HEADING SELECTOR KNOB (PUSH/△) - When pushed in the heading bug (20) may be positioned to the desired magnetic heading by rotating the PUSH/△ selector knob. Also used to select VOR or ILS course when autopilot is installed with a 300 Series Radio or 400 Series Radios without course datum.

40. SLAVING OFF WARNING FLAG - When out of view, indicates adequate slaving voltage. When in view, indicates absent or low slaving voltage.

41. SLAVED 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. The slaving feature associated with the HSI's directional gyro compass card (22) eliminates the need to manually compensate for precessional errors in the gyro. However, the slaved DG may be manually reset at any time in order to accelerate precessional adjustment.

42. ELECTRIC TRIM SWITCH - When moved forward to DN position, 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. Electric trim switch is only operational with autopilot AP/ON-OFF switch OFF.

43. ELECTRIC TRIM DISENGAGE SWITCH - When pulled aft to the OFF position, disengages the electric trim system. A secondary disengagement of electric trim is provided by a TRIM/PULL OFF circuit breaker; pull out to remove all electrical power from the electric trim system.

44. AUTOPILOT DISENGAGE SWITCH - When momentarily pulled aft to the OFF position, trips primary AP ON/OFF switch to OFF and removes all electrical power from the system. Autopilot will remain OFF until primary AP ON/OFF switch is turned ON even though the switch is spring loaded to return to ON when released.

Figure 1. Cessna 400B Navomatic Autopilot (Type AF-550A) (Sheet 6 of 6)

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. If pitch axis is overpowered, electric trim will run in opposition to overpowering force. Manually overpowering the autopilot should be kept to a minimum since slip clutch wear will result from extended periods of manual overpower.

2. AUTOPILOT DISENGAGE Switch (on Control Wheel) -- PULL OFF.

NOTE

This action automatically trips autopilot ON-OFF switch OFF. If electrical malfunction still persists, turn avionics power switch OFF and, if necessary, turn the airplane master switch OFF.

SECTION 4
NORMAL PROCEDURES

BEFORE TAKEOFF RELIABILITY TESTS:

1. Autopilot Automatic Disconnect Check (with Engine Running and Gyros Erected) -- PERFORM the following checks.
   a. PULL-TURN Knob -- CENTER and PULL OUT.
   b. Autopilot Lateral TRIM Control -- CENTER.
   c. AP ON-OFF Rocker Switch -- ON.

NOTE

The roll servo will engage immediately. The pitch servo will engage after pitch synchronization as evidenced by the autopilot pitch command wheel coming to rest.

d. Airplane Control Wheel -- HOLD to reduce movement.
e. Autopilot Disconnect TEST Prior To EA FLT Button -- PUSH and HOLD.
f. Verify the following:
(1) AP ON-OFF Rocker Switch -- OBSERVE disengage to OFF position.
(2) Autopilot DISC WARN Light -- OBSERVE yellow illumination.
(3) Autopilot Disengage Horn -- OBSERVE 1 to 2 second aural tone.
g. Airplane Control Wheel AUTOPILOT DISENGAGE Switch -- PULL to turn off autopilot DISC WARN light.

BEFORE TAKEOFF AND LANDING:

1. AP ON-OFF Rocker Switch -- PUSH OFF.
2. REV SNS LOC 1/LOC 2 Switch (on Autopilot Accessory Unit) -- OFF.

IN-FLIGHT WINGS LEVELING:

1. Airplane Elevator and Rudder Trim -- ADJUST.
2. PULL-TURN Knob -- CENTER and PULL OUT.
3. AP ON-OFF ROCKER SWITCH -- PUSH ON.
4. Lateral TRIM Knob -- ADJUST to level wings.
5. Pitch Command Wheel -- ADJUST as desired.

NOTE

For proper autopilot operation, the fuel selector valve must be repositioned periodically to ensure that the right wing heavy fuel unbalance does not exceed 50 lbs.

ALTITUDE HOLD:

1. ALT Rocker Switch -- PUSH to hold altitude.

NOTES

The autopilot ON-OFF switch must be engaged for a short time (maximum of 30 seconds) before the ALT switch can be engaged.

Altitude Hold mode will automatically disengage on a coupled ILS approach when the glide slope is captured.

2. Airplane Rudder Trim -- ADJUST.
3. Lateral TRIM -- ADJUST to level wings.

COMMAND TURNS:

1. PULL-TURN Knob -- PULL OUT and ROTATE as desired.

CLIMB OR DESCENT:

1. ALT Rocker Switch -- DISENGAGE.
2. Pitch Command Wheel -- ROTATE UP or DOWN as desired.
3. Rudder Trim -- ADJUST as required.

HEADING SELECT:

1. PUSH Knob on DG or HSI -- SET to aircraft magnetic heading.
2. HDG Knob on DG or CARD SET Knob on HSI -- ROTATE bug to desired heading.
3. NAV Rocker Switch -- OFF.
4. PULL-TURN Knob -- PUSH IN.

NOTE

Airplane will turn automatically to selected heading.

VOR COUPLING:

1. PULL-TURN Knob -- PULL OUT.
2. AP NAV 1/NAV 2 Selector Switch (on Autopilot Accessory Unit) -- SET to desired VOR receiver.
3. Nav Indicator OBS or Course Selector Knob on HSI -- SET VOR course.
4. HDG Knob on DG or CARD SET Knob on HSI (300 or 400 Nav/Com Radios without Course Datum Only) -- ROTATE bug to agree with OBS.
5. PULL-TURN Knob -- PUSH IN.
6. NAV Rocker Switch -- ON (within 135° of desired heading).

NOTE

Airplane will automatically intercept and then track the selected VOR course.

ILS/LOC APPROACH:

1. Wing Flaps -- SELECT desired 0° to 10° approach setting.

NOTE

Maximum allowable flap deflection is 10° with autopilot engaged. Airspeed should be reduced to 115 KIAS prior to operation of the flaps if operating in the altitude hold mode.

2. Airspeed -- ADJUST to approach speed (95 to 115 KIAS).
3. Rudder Trim -- ADJUST as required.
4. PULL-TURN KNOB -- PULL out and turn airplane to within 30° to 45° of localizer heading. *
5. A/P NAV 1/NAV 2 Selector Switch (on Autopilot Accessory Unit) --SET for NAV 1 receiver (or NAV 2 as desired, if optional second Glide Slope receiver is installed).
6. REV SNS LOC 1/LOC 2 Selector Switch (on Autopilot Accessory Unit) -- SELECT only if intercepting localizer front course outbound or back course inbound.

CAUTION

N/A → When Rev SNS switch is placed in the LOC 1 or LOC 2 position (on Autopilot Accessory Unit), and a localizer frequency is selected, the CDI on the selected Nav radio will be reversed even when the autopilot switch is OFF. N/A

NOTE

Selection of LOC 1 or LOC 2 will only reverse the vertical needle on a Course Deviation Indicator. When the optional Horizontal Situation Indicator is installed, operation of the HSI needle is unaffected by the selection of LOC 1 or LOC 2. However, selection of LOC 1 or LOC 2 (corresponding to the selected A/P NAV 1/NAV 2 switch position) will always cause the localizer signal to the autopilot to reverse for back-course operation.

7. Nav Indicator OBS or Course Selector Knob on HSI -- SET to localizer front course heading for both front and back course approaches.
8. N/A → HDG Knob on DG or CARD SET Knob on HSI (300 or 400 Nav/Com Radios without Course Datum Only) -- ROTATE bug to localizer course (inbound or outbound as appropriate).
9. PULL-TURN Knob -- PUSH.
10. NAV Rocker Switch -- ON for automatic intercept and ILS tracking.
11. HDG Knob on DG or CARD SET Knob on HSI (400 Nav/Com Radios with Course Datum Only) -- ROTATE bug to missed approach heading.

* OR TURN WITH HSI HDG BUG & GPS IN HDG MODE.

12. ALT Rocker Switch -- ON when at published approach altitude.

NOTE

*

Autopilot can only capture glide slope from below beam center.

13. ALT Rocker Switch:
    CHECK -- AUTOMATIC DISENGAGEMENT at glide slope capture.
    OFF -- AT FINAL APPROACH FIX if localizer approach only.
14. Autopilot PITCH Command Wheel -- ADJUST for proper descent if localizer approach only.
15. Landing Gear -- EXTEND by outer marker.

NOTE

Airspeed should be reduced to 115 KIAS prior to operation of the gear if operating in the altitude hold mode.

16. AUTOPILOT DISENGAGE SWITCH (on Control Wheel) -- OFF before landing and extending flaps more than 10°, or when executing missed approach.
17. Wing Flaps -- EXTEND as required after landing is assured.

SECTION 5
PERFORMANCE

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

DAC International
6702 McNeil Dr.
Austin, Texas 78729

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR AIRCRAFT Cessna P210N
Listed on DAC International GDC31 Approved Model List

WITH

DAC GDC31 ROLL STEERING COMPUTER

Reg. No. N731PJ

Serial No. P21000523

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

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

FAA APPROVED: [signature]

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

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LOG OF REVISIONS

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

SECTION 1 - GENERAL

A. GENERAL

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

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

1. GPS is selected on the A/P SEL switch.

2. Autopilot is in HDG mode.

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

SECTION 2 - OPERATING LIMITATIONS

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

NOTE:

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

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

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

SECTION 3 - EMERGENCY/ABNORMAL PROCEDURES

A. EMERGENCY PROCEDURES

1. Engine failure in a multi-engine aircraft:

NOTE:

In landing configuration below blue line, expect up to a 10° pitch down and up to a 30° bank angle.

a. **Manually disengage the autopilot immediately.**

b. Disconnect auto-trim if engaged.

2. In the event of a failure of the GDC31:

a. Maintain pitch and yaw control.

b. **Disengage the autopilot immediately.**

c. Regain control of the aircraft.

d. Select HDG on A/P SEL switch.

e. Do not attempt to use the GDC31 (GPS mode).

NOTE:

*A failure of the GDC31 will affect the lateral axis only of the autopilot, and only if the A/P SEL switch is in the GPS position. HDG hold mode is **not** affected by the GDC31 when the A/P SEL switch is in the HDG position.*

3. Altitude loss during a malfunction and recovery.

No change.

SECTION 2 - EMERGENCY/ABNORMAL PROCEDURES Continued.

B. ABNORMAL PROCEDURES

A blinking GPS Annunciator indicates a fault. The aircraft will roll wings level and WILL NOT follow course guidance from the GPS.

1. Disengage autopilot.
2. Establish aircraft on course.
3. Select HDG on A/P SEL switch.
4. Re-engage autopilot.

SECTION 4 - NORMAL OPERATING PROCEDURES

A. ANNUNCIATOR / SWITCH

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

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

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

B. OPERATION

1. Couple the GPS to the HSI / CDI.

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

3. Engage the autopilot in the HDG mode.

CAUTION:

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

NOTE:

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

SECTION 4 - NORMAL OPERATING PROCEDURES Continued.

C. COURSE REVERSAL

1. Couple the GPS to the HSI / CDI.

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

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

CAUTION:

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

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

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

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

7. Monitor tracking to the FAF then MAP.

NOTE:

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

SECTION 5 - PERFORMANCE

No Change

SECTION 6 - SYSTEM DESCRIPTION

A. EQUIPMENT DESCRIPTION

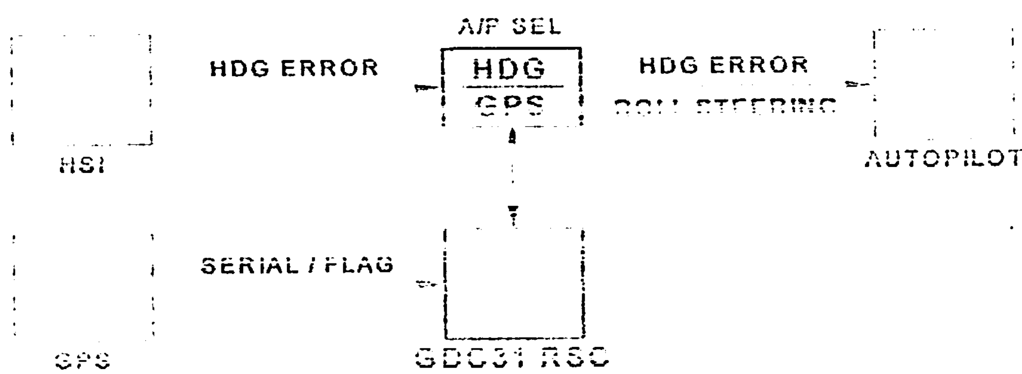
The GDC31 Roll Steering Converter provides autopilot coupling of the GPS to the autopilot.

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

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

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

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



Block Diagram

SUPPLEMENT

ELECTRIC ELEVATOR TRIM SYSTEM

SECTION 1
GENERAL

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

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

SECTION 2
LIMITATIONS

The following limitation applies to the electric elevator trim system:

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

SECTION 3
EMERGENCY PROCEDURES

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

SECTION 4
NORMAL PROCEDURES

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

1. Master Switch -- ON.
2. Elevator Trim 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.

GARMIN Ltd. or its subsidiaries
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1200 E. 151st Street, Olathe, KS 66062 USA

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
GARMIN 400W SERIES GPS-WAAS NAVIGATION SYSTEM
as installed in

Cessna P210N
Make and Model Airplane

Reg. No. N731PJ S/N P21000523

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin 400W Series unit. This document must be carried in the airplane at all times when the Garmin 400W Series unit is installed in accordance with STC SA01933LA.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA APPROVED
Patrick Power
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: December 21, 2006

GARMIN Ltd. or its subsidiaries
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1200 E. 151st Street, Olathe, KS 66062 USA

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 400W Series Navigation System

LOG OF REVISIONS				
Rev. No.	Page No.	Date	Description	FAA Approved
A Original	All	11/06/06	Complete Supplement	Patrick Power Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date November 6, 2006
B	All	12-21-06	Added GA 35 antenna selection to Limitations section.	Patrick Power Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date December 21, 2006

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AIRPLANE FLIGHT MANUAL SUPPLEMENT or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL for a Garmin 400W Series Navigation System

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AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 400W Series Navigation System

Section 1. GENERAL

1.1 Garmin 400W Series GPS/WAAS Nav Com

The Garmin 400W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation, (plus optional VHF Com and VHF Nav radios) in an integrated unit with a moving map and color display. The 400W Series unit features a graphical display which may also be used to depict traffic, weather, or terrain data.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

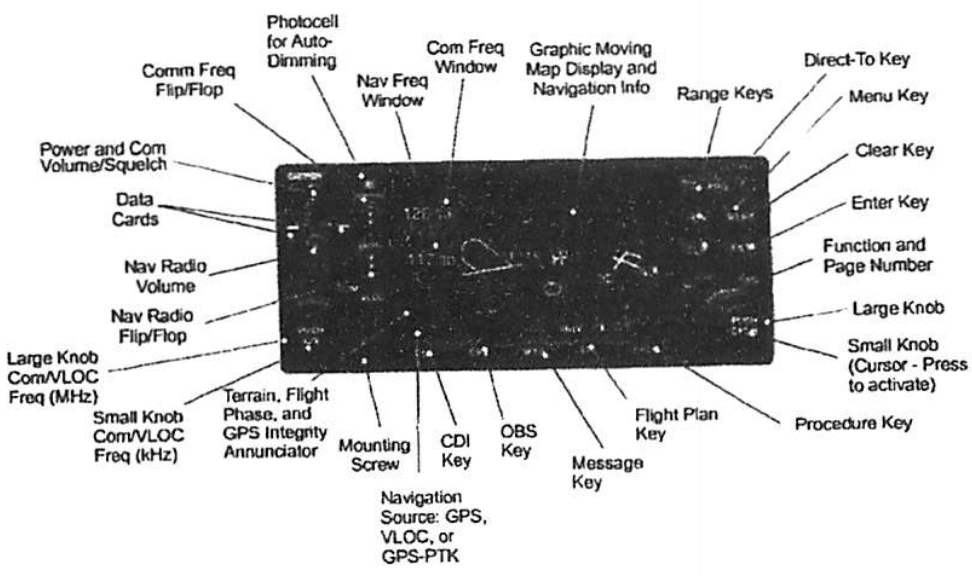

Figure 1 - 400W Series Control and Display Layout

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1.2 Operation

GPS/WAAS TSO-C146a Class 3 Operation: The Garmin 400W Series unit, when installed in accordance with STC SA01933LA, uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS", "or GPS", and "RNAV" approaches), and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

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

1.3 Class II Oceanic, Remote, and other Operations:

The Garmin 400W Series, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the 400W Series unit annunciates OCN. This provides an alarm limit of four nmi and a mask angle of five degrees. The 400W series unit also has the ability to predict RAIM availability at any waypoint in the database if WAAS corrections are expected to be absent or disabled. This does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

a) Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source. (It may be a second 400W/500W Series unit.)
b) Redundant VHF Com and VHF Nav systems may be required for other than U.S. 14 CFR Part 91 operations. Check foreign regulation requirements as applicable. (It may be a second 400W/500W Series unit.)
c) Operations approval *may* be granted for the use of the 400W Series unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

Section 2. LIMITATIONS

2.1 Pilot's Guide

The GARMIN 400W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 400W Series unit.

- 400W Series Pilot's Guide & Reference P/N 190-00356-00 Rev A
- 400W/500W Series Optional Displays P/N 190-00356-30 Rev A
- 400W/500W Series Display Interfaces P/N 190-00356-31 Rev A

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval. Systems limited to VFR shall be placarded in close proximity to the 400W Series unit **"GPS LIMITED TO VFR USE ONLY"**.

2.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 400W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	**Approved Software Version** *(or later FAA approved versions)*	
	SW version	As displayed on unit
Main SW Version	2.00	2.00
GPS SW Version	2.4	2.4

2.3 Navigation Database

The 400W Series unit database cards listed in the following table (or later FAA approved versions) must be installed.

a) IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

b) GPS instrument approaches using the 400W Series units are prohibited, unless the 400W Series unit's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the 400W Series unit database.

Table 2 – Approved Navigation Database Cards

Part Number	Revision	Description
010-10546-00	B or later	Data Card, WAAS, IFR, World Wide
010-10546-01	B or later	Data Card, WAAS, IFR, Americas
010-10546-02	B or later	Data Card, WAAS, IFR, International

2.4 Terrain Database

The 400W Series unit supports Terrain and requires a Terrain database card to be installed in order for the feature to operate. The table below lists compatible database cards for the 400W series. Each of the data base cards contains the following data:

a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.
b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.
c) The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

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

Table 3 – Approved Terrain Database Cards

Part Number	Revision	Description
010-10201-20	C or later	Data Card, TAWS / Terrain, 128MB
010-10201-21	A or later	Data Card, TAWS / Terrain, 256MB

2.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

2.6 IFR Operational Limitation

This system does not currently comply with US 14 CFR part 91, SFAR 97 requirements for TSO-C146a equipment. Until complete compliance is demonstrated and approved by the FAA, authorization to conduct any GPS or WAAS operation under Instrument Flight Rules (IFR) requires that:

a) Aircraft using the GPS or WAAS capability of the 400W series navigation equipment under IFR must be equipped with an approved and operational alternate means of navigation appropriate to the flight with the exception of oceanic and remote operations.
b) For flight planning purposes, if an alternate airport is required it must have an approved instrument approach procedure other than GPS or RNAV that is anticipated to be operational and available at the estimated time of arrival. All equipment required for this procedure must be installed and operational.
c) For flight planning purposes, Garmin Prediction Program part number 006-A0154-03 (with the installed antenna part number selected) should be used to confirm the availability of RAIM for the intended flight in accordance with the local aviation authority guidelines for TSO-C129a equipment. WAAS NOTAMs (or their absence) and generic prediction tools do not provide an acceptable indication of availability.
d) When flight planning an LNAV/VNAV or LPV approach, operators should use the Garmin Prediction Program part number 006-A0154-03 (with the installed antenna part number selected) in addition to any NOTAMs issued for the approach.

The installed antenna must be specified for the Garmin Prediction Program compute the overall system performance. The antenna installed in this installation is (one antenna to be checked by installer):

☐ A-33 (575-9 / 590-1104) ☐ A-34 (575-93 / 590-1112)

☐ GA 56A (011-01154-00) ☐ GA 56W (011-01111-00)

☐ GA 57 (011-01032-00) ☒ GA 35 (013-00235-00)

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2.7 Approaches

a) During GPS approaches, the pilot must verify the 400W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, or LPV)
b) When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.
c) Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.
d) Use of the GNS 430W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).
e) For aircraft with remote source selection annunciation or remote GPS navigation annunciations installed, conducting IFR approaches is prohibited if the remote annunciation is found to be inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight. The indications provided on the 400W Series unit display may be used as a backup).
f) Except in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the 400W Series unit or the affected CDI.

2.8 Autopilot Coupling

IFR installations of a Garmin 400W Series unit allow the operator to fly all phases of flight based on the navigation information presented to the pilot; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes; however, the FAA requires that vertical coupling of an autopilot for approaches be demonstrated to meet their intended function and provide safe and proper operation. This installation is limited to:

☐ No limitations for autopilot coupling.

☒ Lateral GPS coupling (LNAV only). For 430W units: The GS of an ILS (VLOC) may be coupled to the autopilot without any limitations.

This limitation may be removed after an FAA Flight Test demonstration. Contact Garmin International, Tech Support for additional information.

2.9 Terrain Display

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS. Navigation must not be predicated upon the use of the terrain display.

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

2.10 Weather Display

If an optional weather receiver is interfaced to the 400W Series unit, the weather information displayed is limited to supplemental use only and may not be used in lieu of an official weather data source.

2.11 Traffic Display

Traffic may be displayed on the 400W Series unit when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Display of this traffic data and related operations are described in the 400W Series unit Pilot's Guide.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No change.

3.2 Abnormal Procedures

a) If the Garmin 400W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 400W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.

b) If a "Loss of Integrity" (INTEG) message is displayed during:
   - Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
   - GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.

c) During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 400W Series unit will downgrade the approach if the Horizontal or Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.

d) During any GPS approach in which precision and non-precision alarm limits are exceeded, the 400W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

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DATE: DEC 2 1 2006

Section 4. NORMAL PROCEDURES

Refer to the 400W Series unit Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information. For information on TIS traffic, or data linked weather see the Pilot's Guide addendum for optional displays. For information on active traffic sensor or Stormscope operation and displays see the Pilot's Guide addendum for display interfaces.

Although intuitive and user friendly the 400W Series unit requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the 400W Series unit in IMC conditions

4.1 Approaches with Vertical Guidance

The 400W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 400W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE:

> If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance refer to the 400W Series unit Pilot's Guide.

4.2 Autopilot Operation

The Garmin 400W Series may be coupled to an optional autopilot if installed in the aircraft when operating as prescribed in the LIMITATIONS section of this manual. For lateral guidance, some installations may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. If an HSI is used with GPSS engaged, the pilot should rotate the course pointer as prompted on the 400W Series unit to prevent any spatial disorientation and to prevent the aircraft from turning inappropriately if the autopilot is switched from digital (GPSS) to analog mode. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.3 Coupling the Autopilot during approaches

The Garmin 400W Series supports analog and digital (GPSS) control interfaces to an optionally installed autopilot. Some autopilots revert to ROLL mode (wings level) and/or flag a NAV failure if the digital data becomes unavailable or is inhibited. The CDI selection of VLOC should inhibit the digital control interface. When switching between GPS and VLOC the pilot should be aware that the autopilot may need to be re-engaged into APR or NAV mode after changing the CDI source.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. Some autopilots may revert to ROLL mode when the navigation outputs of the 400W Series unit sequence to the final approach fix. In these installations the unit will be configured to PROMPT the pilot to "Enable the autopilot approach outputs" in order to prevent the autopilot from entering ROLL mode without the pilot being aware of the transition.

☒ This installation prompts the pilot and requires the pilot to enable the A/P outputs just prior to engaging the autopilot in APR mode.

☐ This installation supports a seamless transition from digital (GPSS) to analog guidance for the autopilot. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).

☐ This installation interfaces to the autopilot in analog mode only. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid.

☐ The autopilot does not support any vertical capture or tracking in this installation.

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

4.4 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations and may be required for IFR Enroute/Terminal and Approach operations; reference the Limitations section of this manual.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations; RAIM is required for IFR Enroute/Terminal operations; and Approach availability should be validated whenever conducting RNAV(GPS) approaches.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin 400W Series unit Pilot's Guide for a complete description of the 400W Series unit.

PILOT'S OPERATING HANDBOOK
AND
FAA APPROVED AIRPLANE FLIGHT MANUAL
SUPPLEMENT
FOR
PRECISE FLIGHT SPEEDBRAKE 2000 SYSTEM
CESSNA

210G, T210G, 210H, T21OH, 210J, T210J, 210K, T210K, 210L, T210L, 210M, T210M, 210N, P210N, P210R, 210R, T210R

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Precise Flight SpeedBrake System is installed per Precise Flight STC SA2602NM

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

FAA APPROVED: ______________________

Manager,
Special Certification Branch
Seattle Aircraft Certification Office

DATE OF APPROVAL: November 16, 1999

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Precise Flight SpeedBrakes are installed in accordance with FAA Approved Precise Flight data.

SECTION 2 - LIMITATIONS

(a) Airspeed Limitations are the same as the basic airplane
(b) The SpeedBrakes are not approved for deployment in icing conditions.
(c) The SpeedBrake Circuit Breaker is to be indicated by placard or equivalent
(d) Placards:
On each wing, at each SpeedBrake location, in full view

ELECTRICALLY ACTUATED
DO NOT MANUALLY OPERATE

SECTION 3 - EMERGENCY PROCEDURES

(a) SpeedBrake OFF for a forced landing after engine failure.
(b) SpeedBrake OFF for any spin recovery.
(c) SpeedBrake OFF for ditching.
(d) SpeedBrake OFF if the elevator is disabled.
(e) SpeedBrake OFF for aircraft electrical failure.
(f) PULL SpeedBrake Circuit Breaker for SpeedBrake Switch or Electrical failure.

NOTE:
If use of the circuit breaker is required for SpeedBrake retraction, leave the circuit breaker in the pulled position, and have maintenance personnel inspect system per Precise Flight SpeedBrake 2000 Maintenance Manual.

SECTION 4 - NORMAL PROCEDURES

The SpeedBrake system should be functionally checked for proper operation prior to flight. The independent electrical clutches need to be synchronized by SpeedBrake activation before flight and/or after SpeedBrake Circuit Breaker Pull.

BEFORE TAKE-OFF

(a) Depress the SpeedBrake Switch **ON** to extend SpeedBrakes. **Verify Annunciator BLUE lights - ILLUMINATED and both SpeedBrakes are extended.**

(b) Depress the SpeedBrake Switch AGAIN (OFF) to retract SpeedBrakes prior to take-off. Verify Annunciator BLUE light - OFF.

DURING AIRCRAFT TAKE-OFF

(a) The SpeedBrake switch should be OFF.

WARNING:
If SpeedBrakes do not fully extend or do not operate simultaneously (extend or retract), place SpeedBrake circuit breaker in the pulled position, and have maintenance personnel inspect system per Precise Flight SpeedBrake 2000 Maintenance Manual

EXPEDITED DESCENTS

(a) Select 2200 RPM and approximately 22 inches Manifold Pressure

(b) SpeedBrake switch ON to extend SpeedBrakes

- Maintain 2200 RPM AND Approx. 22" Manifold Pressure

(c) SpeedBrake switch OFF to retract SpeedBrakes

FINAL APPROACH

(a) Fly a high base leg and final approach. Extend wing flaps as desired and place the SpeedBrake switch ON to extend the SpeedBrakes.

NOTE:
The SpeedBrake switch may be operated intermittently - as required - to modulate the glide path.

Maintain an 80 to 90 KIAS approach speed by establishing a moderately steep, nose-down attitude.

NOTE:
Increase the aircraft nose down attitude in anticipation of increased drag as the SpeedBrake System is actuated.

LANDING

(a) Rotate the aircraft more rapidly than usual to perform a tail-low touchdown.

CAUTION:
If the landing rate of sink is excessive, place the SpeedBrake System switch OFF to retract the SpeedBrakes and add power as required to reduce the rate of descent.

BALKED LANDING (Go Around)

(a) Advance throttle, SpeedBrake System - Retracted, retract wing flaps

SECTION 5 - PERFORMANCE

(a) Inadvertent takeoff with SpeedBrakes Deployed expect an extended take off roll, and reduction in rate of climb until SpeedBrakes are retracted

(b) Cruise flight with SpeedBrakes deployed expect cruise speed and range to be reduced approximately the same amount as flight with landing gear extended.

(c) In the unlikely event of one SpeedBrake Cartridge deploying while the other remains retracted, a maximum of 10% of corrective aileron travel and 5 lbs. of rudder pressure are required for coordinated flight from stall through Vne. Indication of this condition will be noted by the only one annunciator light illuminated with the SpeedBrake Switch in the ON position.

STALL SPEEDS - KCAS, POWER OFF, SpeedBrake "ON".

Condition	0°	20°	40°	60°	
	Angle of Bank				
Flaps up	67	69	78	95	Model 210 Aft CG
Flaps Full (Gear Down)	58	60	66	82	* 3800 lbs.

Condition	0°	20°	40°	60°	
Flaps up	71	75	81	100	Model 210 Fwd CG
Flaps Full (Gear Down)	63	65	72	89	*3800 lbs.

Condition	0°	20°	40°	60°	
Flaps up	58	60	66	82	Model 210 Aft CG
Flaps Full (Gear Down)	49	51	56	69	*3800 lbs. with "Robertson STOL"

Condition	0°	20°	40°	60°	
Flaps up	58	60	66	85	Model 210 Fwd CG
Flaps Full (Gear Down)	53	55	60	75	*3800 lbs. with "Robertson STOL"

Condition	0°	20°	40°	60°	
Flaps up	69	71	79	98	Model P210 Aft CG
Flaps Full (Gear Down)	60	62	68	85	*4000 lbs.

Condition	0°	20°	40°	60°	
Flaps up	75	78	85	106	Model P210 Fwd CG
Flaps Full (Gear Down)	63	65	72	89	*4000 lbs.

Condition	0°	20°	40°	60°	
Flaps up	75	78	85	106	Model P210 Fwd CG
Flaps Full (Gear Down)	59	61	67	83	*4000 lbs. with "Robertson STOL"

SECTION 6 - WEIGHT AND BALANCE

Factory installed optional equipment is included in the licensed weight and balance data of the Pilot's Operating Handbook

SECTION 7 - DESCRIPTION AND OPERATION OF THE PRECISE FLIGHT SPEEDBRAKE 2000 SYSTEM

Precise Flight SpeedBrake 2000 System is installed to provide expedited descents at low cruise power, glide path control on final approach, airspeed reduction and an aid to the prevention of excessive engine cooling in descent. The SpeedBrakes can be extended at aircraft speeds up to Vne.

WARNING:
If icing is encountered with the SpeedBrakes extended, retract the SpeedBrakes immediately.

The Series 2000 SpeedBrake System consists of wing mounted electrically actuated SpeedBrake Cartridges. Each SpeedBrake Cartridge is interconnected electronically by a central logic-switching unit and a SpeedBrake actuator switch. The SpeedBrake Cartridges receive electrical power from the aircraft electrical buss through a disconnect type circuit breaker.

The SpeedBrake push button switch is located on the Pilot's control wheel yoke outside left hand arm or on panel. The switch is depressed once to fully extend and is depressed again to fully retract the SpeedBrakes. The system features annunciation to indicate the status of the SpeedBrake system. Annunciator ON - Individual units Extended - Annunciator OFF - Individual units Retracted or a possible malfunction exists.

NOTE:
The failure of a single cartridge extending will prevent the Speedbrake annunciator from illuminating.

SPEEDBRAKE ANNUNCIATOR

FIGURE 1-1

The Annunciator is located in the upper, left on the instrument panel. The Annunciator will illuminate after the SpeedBrake Switch is depressed **ON** and both brakes are in the fully extended position. If the annunciator fails to illuminate and one or both brakes do not extend after the switch is depressed on, it indicates a failure of one SpeedBrake cartridge and the SpeedBrake switch should be depressed **OFF**. The system can be checked again for proper operation, but after the second attempt the SpeedBrake switch should be left **OFF**. When the SpeedBrake Switch is depressed to the **OFF** position, the annunciator will extinguish when both brakes are retracting into the wing.

The central logic unit will disconnect SpeedBrake clutch power to both SpeedBrake cartridges if one cartridge does not reach full extension, however, the drive motors will continue to operate until the SpeedBrake Switch is depressed **OFF**. The central-logic unit also disconnects clutch power within 10 degrees of the fully stowed position on every retraction.

NOTE:

A SpeedBrake cartridge that operates, but does not fully stow flush with the wing surface, is an indication of a failed cartridge clutch. Place the SpeedBrake circuit breaker in the pulled position and have maintenance personnel inspect the system per Precise Flight SpeedBrake 2000 maintenance procedures before any subsequent SpeedBrake System operation.

J. P Instruments
PO Box 7033
Huntington Beach CA 92646

FAA APPROVED
AIRPLANE/ROTORCRAFT FLIGHT MANUAL SUPPLEMENT OR
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL (INCLUDING POH AND FAA AFM)
(FOR THOSE AIRCRAFT WITHOUT A BASIC AIRPLANE FLIGHT MANUAL)

EDM-711 TEMPERATURE INDICATOR with Primary CHT, OIL and/or TIT
Supplement No. 1 Revision New

FOR

Single Engine Reciprocating Engine Powered Aircraft as listed on STC SA00954SE.

REG. NO. N731PJ

SER. NO. P21000523

This Supplement must be attached to the **FAA Approved Airplane Flight Manual** when the J.P. Instruments EDM-711 is installed in accordance with Supplemental Type Certificate SA00954SE. For those airplanes without a : Airplane Flight Manual, the Supplemental AFM must be in the aircraft when the EDM-711 is installed.

.e information contained in this **Airplane Flight Manual Supplement/ Supplemental Aircraft Flight Manual** supplements or supersedes the basic manual/ placards only in those areas listed. For limitations, procedures and performance information not contained in this supplement, consult the basic manuals, markings, and placards.

FAA APPROVED:

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Manager, Special Certification Branch, ANM-190S
Federal Aviation Administration
Seattle Aircraft Certification Office
Transport Airplane Directorate

Date:__August 10, 2001______

Revision No.	Description	Affected Pages	Approval
New	Complete Flight Manual Supplement for EDM-711	1 thru 5	A. J. Pasion Manager, Special Certification Branch Federal Aviation Administration Seattle Aircraft Certification Office Date______________

FAA APPROVED ________________ Date:_August 10, 2001___

1-GENERAL

DESCRIPTION/OPERATING INSTRUCTIONS

The EGT as displayed is based on probes located near the exhaust outlet for each cylinder and the TIT probe, if installed, is adjacent to the turbo charger. Primary CHT, OIL and TIT probes are in the same location as the original aircraft's factory location.

The analog display is an electronic bar graph (vertical columns, one per cylinder) of EGT, OIL, & TIT temperatures presented as a percentage of maximum EGT or TIT (1650 F). Below the vertical columns the specific value for EGT and CHT are displayed digitally, flashing in the specific location, EGT-CHT every few seconds. A scale of CHT from 300 F to 500 F appears on the left side of the window. The dot over the column indicates which cylinder's digital information is presently displayed. The missing bars at the base of the columns indicate CHT from 300 to 500 degrees F with 25 degrees per bar. OIL temperature and TIT are similarly displayed in the right hand column as a percentage of the Limit. The Oil temperature is displayed as the missing bar in the TIT column when the TIT is installed ("T" over column) and as the column when the TIT is not present, ("O" over the column).

Each Primary function has a remote Limit light (red) and caution light (yellow). Any primary alarm causes the digital function (acronym CHT, OIL, and /or TIT) to flash and a remote yellow 'Caution" light or red "Limit" light to illuminate.

Depressing the LF and STEP button simultaneously brings up the program mode to place the OAT in °F or °C, EGT in 1 or 10 degrees for EGT and K-factor questions. Depressing the LF button will change Oat in °C or °F. Exit by depressing STEP. If either the STEP or LF buttons are not pushed for three minutes the EDM-711 will revert to auto-scanning of the primary functions CHT, OIL, and TIT. Depressing the STEP button will stop the automatic scan and revert to manual scan. Holding the STEP button down causes the functions to index in the reverse order.

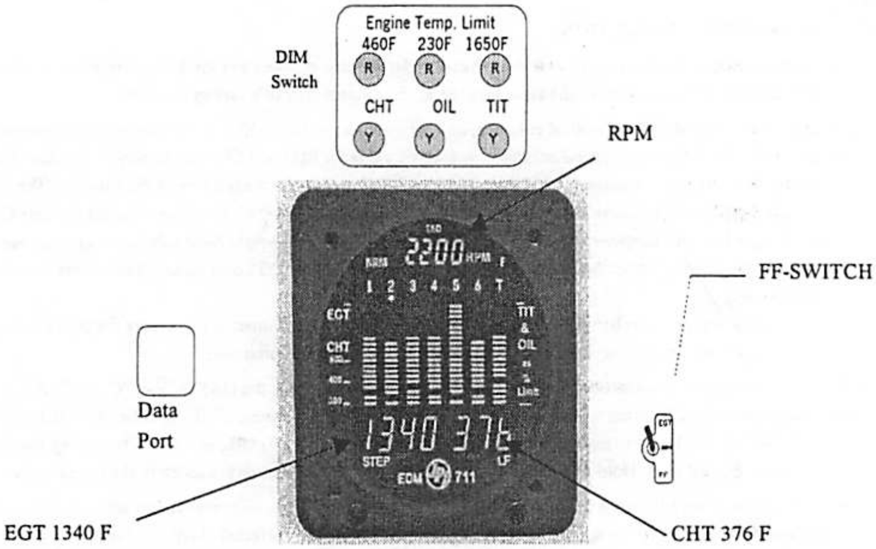
During constant power cruise, if the LF button is depressed for five seconds the Bargraph will level at mid scale. Each bar represents 10 °F and now acts as an EGT & TIT trend monitor. Depress again to return to normal; nothing else is affected. With the fuel flow option there is a three position toggle switch. The positions are: 1) EGT, digital and Bargraph display of temperatures, 2) FF, digital display of GPH, REM and USED Fuel. Temperature Bargraph remains. 3) Both, cycles through everything installed. The Data memory module will store 25 hrs of flight, recording every 6 seconds.

Options of Fuel Flow, OAT, IAT (induction air temp.), BAT (voltage) are only displayed digitally with acronyms after the number, as "140 IAT" or "14 GPH". A large value (50 +) of "CLD" indicates shock cooling usually associated with rapid descents at low power. Optional functions not installed will not be displayed. RPM is displayed constantly in the top display. Manifold pressure is displayed in the scan sequence.

Primary Alarm Limits:
The Primary orange acronyms are programmed to flash at a specific temperature below the programmed limit before reaching the actual limit, that is Oil 20 F, CHT 40 F and TIT 50 F before the Actual Factory Limit. Factory set primary alarm limits for CHT, OIL and TIT (if installed) are the same as the actual aircraft limits and cannot be set by the pilot. The caution and limit lights can only be extinguished by changing power and/or airspeed to reduce the temperatures below the caution or limit trigger points. Tapping the STEP button will stop the display from flashing but will not extinguish the yellow or red lights.

Advisory Alarm Limits:
Exhaust Gas Temperature (EGT), Outside Air Temperature "OAT", Carburetor Air Temperature "CRB", Bus Voltage "BAT", Shock Cooling "CLD", and fuel flow functions "GPH", "REQ", "RES", "MPG", "H.M.", and "USD" appear as orange gas discharge displays of two or three letter acronyms at the bottom of the instrument for each engine. These limits may be set by the pilot.

Alarm hierarchy;
When a primary parameter limit is reached, the pilot should momentarily depress the STEP button on the EDM instrument to extinguish the particular flashing alarm acronym. If another primary alarm has also reached its limit, that acronym will then begin to flash. For each primary parameter which has reached its limit the alarm light will continue to illuminate until the particular primary temperature has been reduced to below its limit. The pilot should continue to monitor the affected parameters as he would if a conventional analog display had reached a limit. The bar graph functions of CHT, EGT, and TIT remain displayed for easy reference if one of these has reached a limit. Alarm light actuation for a particular parameter limit is based on that parameter which reaches a limit first. If two or more parameters reach their limits at the same time, the order of alarm display is 1 CHT, 2 OIL, 3 TIT. No other parameter limit will flash until the pilot depresses the step button on the instrument. A non-primary alarm is "Canceled" by tapping the STEP button giving a 10 minute cancellation period or by holding the step button in for 5 seconds and seeing the word "OFF". Then, only that particular alarm is canceled. Canceled alarms will not appear again until the power has been removed and reapplied to the EDM-711. The entire alarm light display dims with a DIM/BRIGHT switch near the instrument The basic instrument display automatically dims in low light conditions.



EDM-711-6C

II OPERATING LIMITATIONS

a. The EDM-711 may replace any existing Cylinder Head Temperature, Oil Temperature or Turbine Inlet Temperature indicator required by the aircraft type design or operating limits.

b. The EDM-711 will not be used as primary (CHT, OIL and/or TIT) if any "CAUTION" or "LIMIT" lights are not working.

III. EMERGENCY PROCEDURES

No change

IV. NORMAL PROCEDURES

a. PRIMARY FUNCTIONS

Before each flight, verify that primary "CAUTION" or "LIMIT" lights are working. Whenever main electrical power is turned on the EDM-711 performs a self-test procedure which initially illuminates all "CAUTION" and "LIMIT" lights together and then each light individually. During engine start, there may be a power interruption to the EDM-711 while the starter is engaged. After start, automatic scan of primary parameters will occur after 3 minutes or immediately, by selecting the LF and STEP buttons sequentially.

b. ENGINE MIXTURE LEANING

After establishing desired cruise-power depress the LF button to activate the Lean Find Mode. As the mixture is leaned, one cylinder's column will begin blinking, indicating the exhaust gas temperature (EGT)for that cylinder has peaked. Continue with the leaning procedure, enriching as recommended by the aircraft manufacturer while monitoring the primary engine instruments. Once the leaning procedure has been completed, depress the Step button briefly to exit the Lean Find Mode and enter the Monitor Mode.

CAUTION

Comply with manufacturer's Airplane Flight Manual leaning procedure.
Do not exceed applicable engine or aircraft limitations.

After establishing desired cruise power, depress the LF button to activate the Lean Find Mode. As the mixture is lean one column on the EDM-711 display will begin blinking, indicating the exhaust gas temperature for that cylinder has peaked showing its digital value along with the fuel flow (option) at that time. Continue with the leaning procedure as recommended by the aircraft manufacturer while monitoring the primary engine instruments and the EDM-711 display. Once the leaning procedure has been completed, depress the Step button briefly to exit the Lean Find Mode and enter the Monitor Mode.

FAA APPROVED ________________ Date:_August 10, 2001___

PARKER HANNIFIN CORPORATION
AIRBORNE DIVISION
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P.O. BOX 800
LONGMONT, CO 80501

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

CESSNA MODELS 210N, T210N, & P210N

REG. NO. N 731 PJ

SERIAL NO. P21000523

This supplement must be attached to the FAA Approved Airplane Flight Manual when an Airborne airconditioning system is installed in accordance with STC SA71RM & SE70RM. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic airplane flight manual, dated October 1, 1978.

I. LIMITATIONS:

The following placards are required on the Instrument Panel:

TURN OFF AIRCONDITIONER FOR TAKE-OFF AND LANDING.

TURN OFF AIRCONDITIONER TO READ MDI OR SET DG.

II. EMERGENCY PROCEDURES:

In the event of engine or generator failure, turn off the airconditioner.

III. NORMAL PROCEDURES:

Turn airconditioner OFF when battery-starting engines.

Airconditioner system operation:

To turn airconditioner ON - move switch to 'airconditioner'.
To turn airconditioner OFF - move switch to 'OFF'.
For circulation without cooling - move switch to 'FAN ONLY'.
To set DG to MDI - turn airconditioner OFF.

NOTE: Adjust electrical load to preclude battery discharge.

FAA APPROVAL Gerald E. Goodblood DATED March 23, 1979
Chief, Engineering & Manufacturing Branch
FAA, ARM-210

IV. PERFORMANCE:

The airconditioner requires approximately 3 H.P. For any critical or emergency performance condition, turn off airconditioner.

Parker Hannifin Corp.
Airborne Division
Longmont, Colorado

STC SA71RM &
SE70RM

REVISION NUMBER	PAGES NO.	PAGES DATE	DESCRIPTION	FAA APPROVED
	ALL		Original Manual	[signature]
1	SHT 1	6-7-79	Added Model P210N	[signature]
1	SHT 3	6-7-79	Added Revision 1	[signature]
2	SHT 1	4-18-80	Revised Mag Compass limitation. Added note to Normal Procedures Section.	[signature]
	SHT 2		Revised Performance Section.	
3	ALL	9-17-80	Revised to reflect new company name.	GEG

FAA APPROVED

DATED March 23, 1979

REVISION 3.

SUPPLEMENT

OXYGEN SYSTEM

SECTION 1
GENERAL

A six-place solid state oxygen system provides supplementary oxygen for emergency purposes. Two small oxygen generators are provided, one mounted just forward and one just aft of the main spar above the headliner. The generators contain solid chemicals which, when activated, provide supplementary oxygen for approximately 15 minutes from each generator. The oxygen masks are located in two separate compartments in the overhead console. A lanyard is provided in each mask stowage compartment to activate the chemical process in the generator. Once the chemical reaction has been initiated, the flow of oxygen will continue until the generator is entirely expended. When expended, they must be replaced.

NOTE

Flow rate decreases with time after activation. Therefore, flow rate will remain adequate (i.e., above or at the level specified by FAR 23.1443) for a particular altitude for only a limited time as shown in the following table:

Altitude (Feet)	Adequate Flow Rate Time (Minutes)
23,000	4.7
20,000	5.7
17,000	6.6
14,000	7.5
12,500	15

Amber lights are located adjacent to each compartment in the overhead console to indicate that oxygen is being supplied by the generator or has been expended. These lights, therefore, indicate the oxygen availability during the preflight inspection, provided the master switch is turned ON. An illuminated amber light during preflight indicates the need to replace the oxygen generator, if it is desired to have emergency oxygen available for the planned flight.

Disposable partial rebreathing type masks are provided which incorporate flow indicators in the lines to each mask. With no oxygen flow, a red indicator will be visible in the line. When flow of oxygen begins, the red indicator will disappear.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when oxygen equipment is installed. The following placards are displayed in oxygen equipped airplanes.

1. On each oxygen mask compartment door:

EMERGENCY OXYGEN PULL

OXYGEN LIGHT ON INDICATES CANNISTER IN USE OR EXPENDED

2. Attached to end of each oxygen generator actuator lanyard:

PULL FOR OXYGEN **CAUTION** THIS SYSTEM ONCE ACTIVATED CAN NOT BE TURNED OFF

SECTION 3
EMERGENCY PROCEDURES

In the event that the emergency oxygen system is needed, proceed as follows:

1. Mask Compartment(s) -- OPEN.
2. Mask -- SELECT. Adjust mask to face and adjust metallic nose strap for snug mask fit.
3. Lanyard(s) -- PULL to commence oxygen flow.
4. Flow Indicator(s) -- CHECK that red indicator disappears.
5. Cabin Altitude -- REDUCE to 12,500 feet or lower before the 15-minute oxygen supply is entirely depleted.

NOTE

Descent should be started as soon as possible in order to assure that flow rate remains adequate throughout the descent. Refer to Section 3 for emergency descent procedures.

SECTION 4
NORMAL PROCEDURES

Prior to each flight, turn on the master switch and check that the oxygen expended lights are not illuminated. If either of the lights are illuminated, the respective oxygen generator should be replaced. Also, check that the face masks and hoses are accessible and in good condition.

SECTION 5
PERFORMANCE

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

SUPPLEMENT

DIGITAL CLOCK

SECTION 1
GENERAL

The Astro Tech LC-2 Quartz Chronometer (see figure 1) is a precision, solid state time keeping device which will display to the pilot the time-of-day, the calendar date, and the elapsed time interval between a series of selected events, such as in-flight check points or legs of a cross-country flight, etc. These three modes of operation function independently and can be alternately selected for viewing on the four digit liquid crystal display (LCD) on the front face of the instrument. Three push button type switches directly below the display control all time keeping functions. These control functions are summarized in figures 2 and 3.

The digital display features an internal light (back light) to ensure good visibility under low cabin lighting conditions or at night. The intensity of the back light is controlled by the ENG-RADIO lights rheostat. In addition, the display incorporates a test function (see figure 1) which allows checking that all elements of the display are operating. To activate the test function, press the LH and RH buttons at the same time.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the digital clock is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the digital clock is installed.

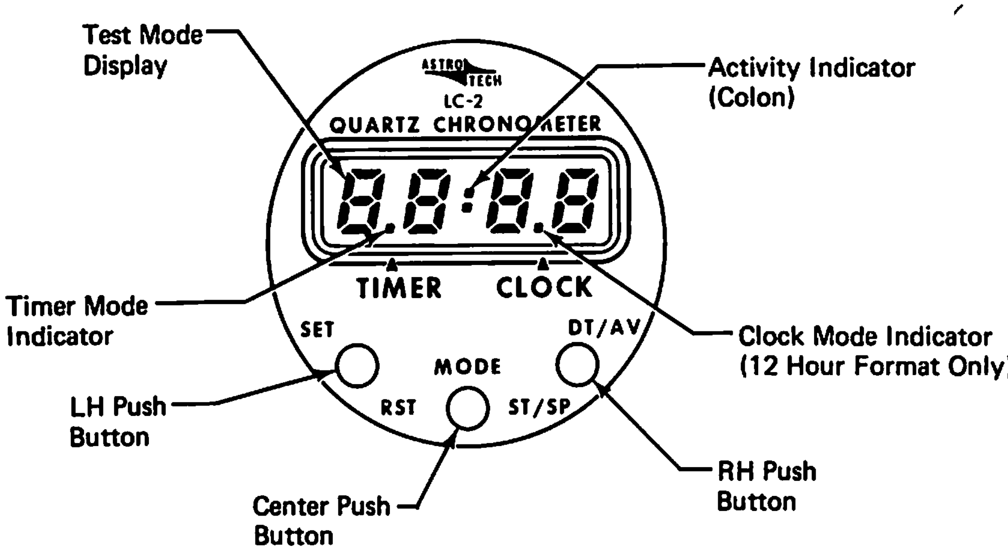


Figure 1. Digital Clock

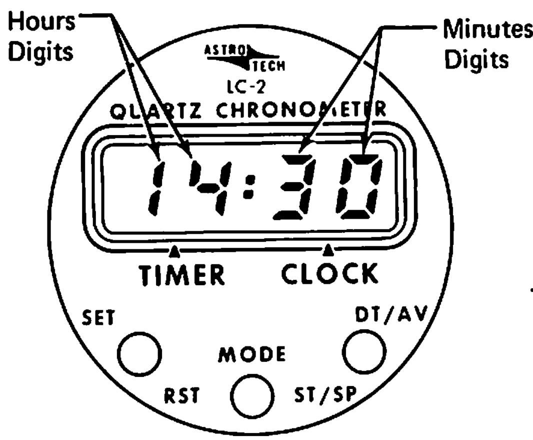
SECTION 4
NORMAL PROCEDURES

CLOCK AND DATE OPERATION

When operating in the clock mode (see figure 2), the display shows the time of day in hours and minutes while the activity indicator (colon) will blink off for one second each ten seconds to indicate proper functioning. If the RH push button is pressed momentarily, while in the clock mode, the calendar date appears numerically on the display with month of year to the left of the colon and day of the month shown to the right of the colon. The display automatically returns to the clock mode after approximately 1.5 seconds. However, if the RH button is pressed continuously longer than approximately two seconds, the display will return from the date to the clock mode with the activity indicator (colon) blinking altered to show continuously or be blanked completely from the display. Should this occur, simply press the RH button again for two seconds or longer, and correct colon blinking will be restored.

NOTE

The clock mode is set at the factory to operate in the 24-hour format. However, 12-hour format operation may be selected by changing the position of an internal slide switch accessible through a small hole on the bottom of the instrument case. Notice that in the 24-hour format, the clock mode indicator does not appear.

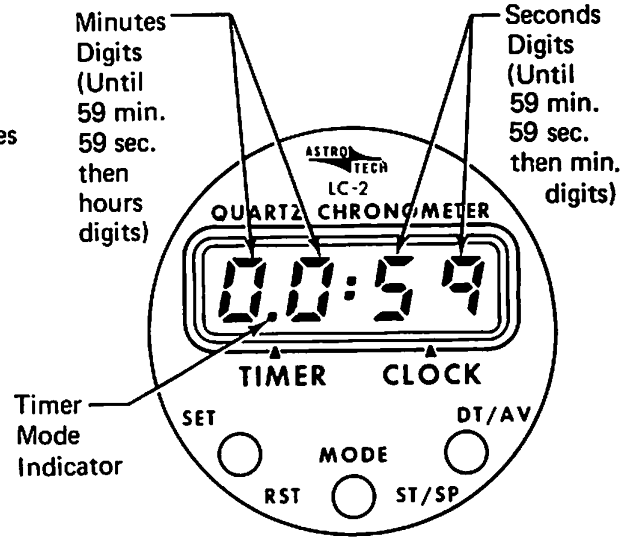


LH Button: Sets date and time of day (when used with RH button).

Center Button: Alternately displays clock or timer status

RH Button: Shows calendar date momentarily; display returns to clock mode after 1.5 seconds.

Figure 2. Clock Mode



LH Button: Resets timer to "zero".

Center Button: Alternately displays clock or timer status

RH Button: Alternately starts and stops timer; timer starts from any previously accumulated total.

Figure 3. Timer Mode

SETTING CORRECT DATE AND TIME

The correct date and time are set while in the clock mode using the LH and RH push buttons as follows: press the LH button once to cause the date to appear with the month flashing. Press the RH button to cause the month to advance at one per second (holding button), or one per push until the correct month appears. Push the LH button again to cause the day of month to appear flashing, then advance as before using RH button until correct day of month appears.

Once set correctly, the date advances automatically at midnight each day until February 29 of each leap year, at which time one day must be added manually.

Pressing the LH button two additional times will cause the time to appear with the hours digits flashing. Using the RH button as before, advance the hour digits to the correct hour as referenced to a known time standard. Another push of the LH button will now cause the minutes digits to flash. Advance the minutes digits to the next whole minute to be reached by the time standard and "hold" the display by pressing the LH button once more. At the exact instant the time standard reaches the value "held" by the display, press the RH button to restart normal clock timing, which will now be synchronized to the time standard.

In some instances, however, it may not be necessary to advance the minutes digits of the clock; for example when changing time zones. In such a case, do not advance the minutes digits while they are flashing. Instead, press the LH button again, and the clock returns to the normal time keeping mode without altering the minutes timing.

TIMER OPERATION

The completely independent 24-hour elapsed timer (see figure 3) is operated as follows: press the center (MODE) push button until the timer mode indicator appears. Reset the display to "zero" by pressing the LH button. Begin timing an event by pressing the RH button. The timer will begin counting in minutes and seconds and the colon (activity indicator) will blink off for 1/10 second each second. When 59 minutes 59 seconds have accumulated, the timer changes to count in hours and minutes, up to a maximum of 23 hours, 59 minutes. During the count in hours and minutes, the colon blinks off for one second each ten seconds. To stop timing the event, press the RH button once again and the time shown by the display is "frozen". Successive pushes of the RH button will alternately restart the count from the "held" total or stop the count at a new total. The hold status of the timer can be recognized by lack of colon activity, either continuously on or continuously off. The timer can be reset to "zero" at anytime using the LH button.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the digital clock is installed.

SUPPLEMENT

GROUND SERVICE PLUG RECEPTACLE

SECTION 1
GENERAL

The ground service plug receptacle permits the use of an external power source for cold weather starting and lengthy maintenance work on the electrical and electronic equipment. The receptacle is located behind a small hinged door on the left side of the cowling.

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.

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

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located on the inside of the ground service plug access door:

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

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the ground service plug receptacle is installed.

SECTION 4
NORMAL PROCEDURES

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

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

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

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the ground service plug receptacle is installed.

SUPPLEMENT

STROBE LIGHT SYSTEM

SECTION 1
GENERAL

The high intensity strobe light system enhances anti-collision protection for the airplane. The system consists of two wing tip-mounted strobe lights (with integral power supplies), a two-position rocker switch labeled STROBE LIGHTS on the left switch and control panel, and a 5-ampere "push-to-reset" type circuit breaker, also located on the left sidewall circuit breaker panel.

SECTION 2
LIMITATIONS

Strobe lights must be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when strobe lights are installed.

SECTION 4
NORMAL PROCEDURES

To operate the strobe light system, proceed as follows:

1. Master Switch -- ON.
2. Strobe Light Switch -- ON.

SECTION 5
PERFORMANCE

The installation of strobe lights will result in a minor (less than 1 knot) reduction in cruise performance.

CESSNA AIRCRAFT COMPANY
AIRWORTHINESS DIRECTIVE
SMALL AIRCRAFT AND ROTORCRAFT

98- 14 R1 CESSNA AIRCRAFT COMPANY: Amendment 39-10773; Docket No. 97-CE-62-AD; Revises AD 98-05-14, Amendment 39-10375.

Applicability: Models T210N (serial numbers 21063641 through 21064897), P210N (serial numbers P21000386 through P21000834), and P210R (all serial numbers) airplanes; certificated in any category.

NOTE 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the re ments of this AD. For airplanes that have been modified, altered, or repaired so that the pe .ance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (d) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated in the body of this AD, unless already accomplished.

To minimize the potential hazards associated with operating the airplane in severe icing co ons by providing more clearly defined procedures and limitations associated with such co ons, accomplish the following:

(a) Within 30 days after April 30, 1998 (the effective date AD 98-05-14), accomplish the requirements of paragraphs (a)(1) and (a)(2) of this AD.

NOTE 2: Operators should initiate action to notify and ensure that flight crewmembers are apprised of this change.

(1) Revise the FAA-approved Airplane Flight Manual (AFM) by incorporating the following in : Limitations Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

"WARNING

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

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

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

.cumulation of ice on the lower surface of the wing aft of the protected area.

- Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.
- All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night. [NOTE: This supersedes any relief provided by the Master Minimum Eq ent List (MMEL).]"

(2) Revise the FAA-approved AFM by incorporating the following into the Normal Procedures Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

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

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

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT:

These procedures are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees

Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following:

Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.

- Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- Do not engage the autopilot.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
- If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.

Do not extend flaps when holding in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.

- If the flaps are extended, do not retract them until the airframe is clear of ice.
- Report these weather conditions to Air Traffic Control."

(b) Incorporating the AFM revisions, as required by this AD, may be performed by the owner/operator holding at least a private pilot certificate as authorized by section 43.7 of the Federal Aviation Regulations (14 CFR 43.7), and must be entered into the aircraft records showing compliance with this AD in accordance with section 43.9 of the Federal Aviation Regulations (14 CFR 43.9).

(c) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

(d) An alternative method of compliance or adjustment of the compliance time that provides an equivalent level of safety may be approved by the Manager, Small Airplane Directorate, FAA, 1201 Walnut, suite 900, Kansas City, Missouri 64106. The request shall be forwarded through an appropriate FAA Maintenance Inspector, who may add comments and then send it to the Manager, Small Airplane Directorate.

NOTE 3: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Small Airplane Directorate.

(e) All persons affected by this directive may examine information related to this AD at the FAA, Central Region, Office of the Regional Counsel, Room 1558, 601 E. 12th Street, Kansas City, Missouri 64106.

(f) This amendment revises AD 98-05-14, Amendment 39-10375.

(g) This amendment becomes effective on September 22, 1998.

FOR FURTHER INFORMATION CONTACT:
Mr. John P. Dow, Sr., Aerospace Engineer, FAA, Small Airplane Directorate, 1201 Walnut, suite 900, Kansas City, Missouri 64106; telephone: (816) 426-6932, facsimile: (816) 426-2169.

SUPPLEMENT

KNOWN ICING EQUIPMENT

SECTION 1
GENERAL

The flight into known icing equipment package allows flight penetration of icing conditions as defined by the FAA. The package includes extended coverage pneumatic de-icing boots on the wings and horizontal and vertical stabilizer leading edges, electrically-heated propeller blade anti-ice boots, a permanentally installed electric windshield anti-ice panel, a high power heated pitot tube, a high power heated stall warning transducer, a high capacity (95-amp) alternator, an ice detector light, and control surface-mounted static discharger wicks. The package is designed to provide adequate in-flight protection during the normally encountered extremes of icing conditions produced by moisture laden clouds. It will not necessarily provide total protection under abnormally severe conditions such as those which exist in areas of freezing rain or extremely widespread areas of heavy cloud moisture content. During all operations, the pilot must exercise good judgment and be prepared to alter his flight if conditions exceed the capacity of the ice protection equipment or if any component of this equipment fails.

The in-flight ice protection equipment was not designed to remove ice, snow, or frost accumulations on a parked airplane sufficiently enough to ensure a safe takeoff or subsequent flight. Other means (such as a heated hangar or approved de-icing solutions) should be employed to ensure that all wing, tail, control, propeller, windshield and static port surfaces are free of ice, snow, and frost accumulations, and that there are no internal accumulations of ice or debris in the control surfaces, engine intakes and pitot-static system ports prior to takeoff.

WING AND STABILIZER DE-ICE BOOTS

The pneumatic de-ice boot system installed on the leading edges of the wings and horizontal and vertical stabilizers is designed to remove ice after accumulation in flight rather than prevent ice formation. The system consists of the pneumatically-operated boots, an engine-driven pneumatic pump, an annunciator light to monitor system operation, system controls, and the hardware necessary to complete the installation. In operation, the boots expand and contract, using pressure or vacuum from the engine-driven pneumatic pump. Normally, vacuum is applied to all boots to hold them against the leading edge surfaces. When a de-icing cycle is initiated, the vacuum is removed and a pressure is applied to "blow up" the boots. The resulting change in contour will break the ice accumulation on the leading edges. Ice on the boots will then be removed by normal in-flight air forces.

Controls for the de-icing system consist of a spring-loaded on-off rocker switch on the left switch and control panel, a pressure indicator light on the upper left side of the instrument panel, and a 5-amp "pull-off" type circuit breaker on the left sidewall circuit breaker panel. The two-position de-icing switch, labeled DE-ICE PRESS, is spring-loaded to the normal off (lower) position. When pushed to the ON (upper) position and released, it will activate one de-icing cycle. Each time a cycle is desired, the switch must be pushed to the ON position and released. If necessary, the system can be stopped at any point in the cycle (deflating the boots) by pulling out the circuit breaker labeled WING, DE-ICE.

During a normal de-icing cycle, the boots will inflate according to the following sequence: first the tail section (horizontal and vertical stabilizer) boots inflate for approximately six seconds, then the inboard wing boots inflate for the next six seconds, followed by the outboard wing boots for another six seconds. The total time required for one cycle is approximately 18 seconds.

The pressure indicator light, labeled DE-ICE PRESSURE, should illuminate when the tail section boots reach proper operating pressure. At lower altitudes, it should come on within one to two seconds after the cycle is initiated and remain on for approximately 17 seconds if the system is operating properly. At higher altitudes, the light will come on initially within three seconds and will go off for one to three seconds during sequencing. The system may be recycled six seconds after the light goes out. The absence of illumination during any one of the three sequences of a cycle indicates insufficient pressure for proper system operation, and icing conditions should be avoided.

PROPELLER ANTI-ICE BOOTS

The propeller anti-ice system provides a measure of protection for the propeller blade surfaces if icing conditions are encountered. The system is operated by a rocker-type switch on the left switch and control panel. When the switch is placed in the ON position, current flows to an anti-ice timer which cycles electric power every 20 seconds between the inboard and outboard set of heating 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 left corner of the instrument panel. The system is protected by a "push-to-reset" type circuit breaker, labeled PROP A/ICE, located on the left sidewall circuit breaker panel.

WINDSHIELD ANTI-ICE PANEL

An electrically-heated panel is permanently installed on the pilot's side of the windshield to assure a clear view for landing during icing conditions. The system is designed to prevent ice formation rather than remove it once formed. Components of the system include a heating element and temperature sensor within the windshield panel, a 15-amp "push-to-reset" type circuit breaker, and a rocker-type switch, labeled W/S A/ICE, on the left switch and control panel.

During operation, the windshield heat will cycle on and off as required to maintain the proper heater element temperature. Operation can be verified by feeling the inside of the windshield and noting the relatively warmer surface behind the panel as compared to elsewhere on the windshield. In addition, slight changes to the panel light transmissibility, compass deviation, and airplane ammeter readings will provide an indication as the element cycles on and off.

PITOT TUBE AND STALL WARNING HEATER

A special pitot tube with a larger inlet and higher capacity heating element and a higher capacity heated stall warning transducer are installed in the left wing to assure proper airspeed indications and stall warning in the event icing conditions are encountered. These systems are designed to prevent ice formation rather than remove it once formed. Both systems are controlled by a rocker switch, labeled PITOT HEAT, on the left switch and control panel. When the airplane is on the ground, a resistor is introduced into the stall warning heater circuit by the nose wheel squat switch in order to prevent overheating. In addition, thinner static port buttons are used with the special pitot tube in order to maintain the standard airspeed calibration.

ICE DETECTOR LIGHT

An ice detector light is installed to facilitate the detection of wing ice at night or during reduced visibility. The ice detector light system consists of a light installed on the left side of the cowl deck forward of the windshield which is positioned to illuminate the leading edge of the wing, and a rocker-type switch, labeled DE-ICE LIGHT, located on the left switch and control panel.

SECTION 2
LIMITATIONS

This airplane is approved for flight into icing conditions as defined by the FAA, provided the following Cessna (drawing number 1200254) and FAA approved equipment is installed and is operational:

1. Wing leading edge boots.
2. Horizontal stabilizer leading edge boots.
3. Vertical stabilizer leading edge boots.
4. Propeller anti-ice boots.
5. Windshield anti-ice panel.
6. Heated pitot tube (high capacity).
7. Heated stall warning transducer(high capacity).
8. Ice detector light.
9. 95-amp alternator.
10. Control surface static dischargers.

If the pilot's windshield is covered with ice, do not leave the windshield anti-ice switch on for more than one minute. Prolonged operation may cause an overheat condition which can result in warpage and distortion of the panel and possible damage to the windshield.

The following placards must be installed when a known icing equipment package is installed:

1. In full view of the pilot in place of the similar type placard shown in Section 2 of the basic handbook:

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

2. On the windshield centerpost above the magnetic compass:

Operation of ice protection equipment (windshield, propeller, and pitot heat) may cause a deviation of more than 10 degrees.

SECTION 3
EMERGENCY PROCEDURES

PROPELLER ANTI-ICE SYSTEM MALFUNCTION

If uneven de-icing of propeller blades is indicated by excessive vibration:

1. Propeller -- EXERCISE to MAX RPM.
2. Propeller Anti-Ice Ammeter -- CHECK for proper operation by periodic fluctuations within the green arc.
3. If reading is below the green arc indicating that the propeller blades may not be de-iced uniformly:
   a. Propeller Anti-Ice Switch -- OFF.

WARNING

When uneven anti-icing of the propeller blades is indicated, it is imperative that the anti-ice system be turned OFF. Uneven anti-icing of the blades can result in propeller unbalance and engine failure.

4. Icing Conditions -- DIVERT to non-icing conditions with assistance of ATC.

WING AND STABILIZER DE-ICE SYSTEM MALFUNCTION

If the wing and stabilizer de-ice boots fail to inflate sufficiently during any or all of the three sequences of one cycle, verify that the circuit breaker switch is pushed full in and the pressure indicator light is operative (press to test); then attempt another cycle. If the system is still deficient, avoid or divert from the existing icing conditions. If there are unshed ice accumulations along the wing and stabilizer leading edges during an approach and landing, follow the procedures listed under Inadvertent Icing Encounters in Section 3 of the basic handbook.

SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

1. De-Ice Boots -- CHECK for tears, abrasions and cleanliness.
2. Propeller Anti-Ice Boots -- CHECK condition of boots and wires.
3. Pitot Heat Switch -- ON for 30 seconds, then OFF (ensure pitot cover is removed).
4. Pitot Tube -- CLEAR and VERY WARM.
5. Stall Warning Transducer -- PERCEPTIBLY WARM.
6. Ice Detector Light Switch -- ON.
7. Ice Detector Light -- ILLUMINATED.
8. Wing, Tail, Control, Propeller, Windshield and Static Port Surfaces -- CHECK free of ice, snow and frost accumulations. Also, check that control surfaces, engine intakes and static ports contain no internal accumulations of ice or debris.

DURING ENGINE RUNUP

1. De-Icing Switch -- ON and release. Check inflation and deflation cycle of tail and wing boots.
2. Pressure Indicator Light -- CHECK ON within three seconds and OFF after 18 seconds.
3. Boots -- CHECK VISUALLY FOR COMPLETE DEFLATION to the vacuum hold-down condition.
4. Propeller Anti-Ice Switch -- ON.
5. Propeller Anti-Ice Ammeter -- CHECK in green arc range and for periodic cycling.

NOTE

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

6. Windshield Anti-Ice Switch -- ON and observe momentary flicker of airplane ammeter and/or slight change in compass indication.
7. Windshield Surface -- WARM to touch behind panel after 5 minutes.

CAUTION

Do not operate the windshield anti-ice system if the windshield is covered with ice. Refer to Section 2, Limitations.

8. Pitot Heat, Propeller Anti-Ice and Windshield Anti-Ice Switches -- AS REQUIRED for takeoff and climb-out conditions.

CAUTION

Do not operate the pitot heat and propeller anti-ice heaters for prolonged periods on the ground.

IN FLIGHT

1. Before Visible Moisture Is Encountered Below Approximately 40°F (4°C):
   a. Propeller Anti-Ice Switch -- ON.
   b. Propeller Anti-Ice Ammeter -- MONITOR.

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.

   c. Windshield Anti-Ice Switch -- ON.

NOTE

Under non-icing conditions (especially at night), turn the windshield anti-ice switch OFF to avoid a mild impairment (distortion) of vision through the panel that occurs when the heating elements in the panel are activated during the on cycle.

NOTE

For accurate magnetic compass readings, turn the pitot heat, propeller anti-ice and windshield anti-ice switch OFF momentarily.

   d. Pitot Heat Switch -- ON.

NOTE

While using the anti-ice systems, 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.

2. During Icing Encounters:
   a. Ice Detector Light -- ON as required.
   b. Ice Build-Up -- MONITOR until approximately 1/4 to 1/2 inch thick on the leading edges.

NOTE

De-icing boots are intended for removal of ice after it has accumulated rather than prevent its formation. If ice accumulation is slow, best results can be obtained by not using the de-ice system until approximatley 1/4 to 1/2 inch of ice has accumulated. Clear the accumulation with one or two cycles of operation. Do not repeat de-icing procedure until ice has again accumulated.

   c. De-Icing Switch -- ON and release. The switch must be actuated after each complete boot cycle if additional cycles are required.

NOTE

Cycling the de-icing boots produces no adverse aerodynamic effects in any attitude within the allowable flight limitations. Continual cycling of the de-ice system, however, is not recommended as this may cause ice to form outside the contour of the inflated boots, preventing its removal. The de-ice system will operate effectively up to a maximum altitude of 22,000 feet; however, at or near this altitude, engine RPM must be a minimum of 2500 RPM.

   d. Power -- INCREASE as required to maintain a safe airspeed or to climb out of icing conditions, if feasible.

NOTE

An accumulation of 1/2 inch of ice on the leading edges can cause a large (up to 500 FPM) loss in rate of climb, a cruise speed reduction of up to 30 KIAS, as well as a significant buffet and stall speed increase (up to 15 knots). Even after cycling the de-icing boots, the ice accumulation remaining on the unprotected areas of the airplane can cause large performance losses. With residual ice from the initial 1/2 inch accumulation, losses up to 300 FPM in climb, 15 KIAS in cruise, and a stall speed increase of 7 knots can result. With one inch of residual accumulation, these losses can double.

e. Airspeed -- MAINTAIN BETWEEN 90 KIAS AND 165 KIAS with 1/2 inch or more of ice accumulation.

NOTE

Prior to a landing approach, cycle the wing and stabilizer de-ice boots to shed any accumulated ice. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on unprotected areas. Do not cycle the boots during an approach or landing since boot inflation increases stall speeds by 3 knots, decreases stall warning by the same amount, and may cause or increase any rolling tendency during stall.

CARE AND MAINTENANCE

De-icing boots have a special electrically-conductive coating to bleed off static electricity which causes radio interference and could perforate the boots. Fueling and other servicing should be done carefully to avoid damage to the conductive coating or tearing of the boot. Keep the boots clean and free from oil and grease which can swell the rubber. Wash them with mild soap and water, using benzol or unleaded gasoline to remove stubborn grease. Do not scrub the boots, and be sure to wipe off all solvent before it dries. Small tears and abrasions can be repaired temporarily and the conductive coating can be renewed, without removing the boots. Your Cessna Dealer has the proper materials and know-how to do this correctly.

During each icing season at 50 to 150 flight hour intervals, depending upon the amount of exposure to the erosive effect of rain, apply ICEX (available from B.F. Goodrich aviation supply dealers) to wing and stabilizer de-ice boots to decrease the ice adhesive force and enhance shedding of ice when the boots are cycled.

SECTION 5
PERFORMANCE

The following approximate performance changes from those shown in Section 5 of the basic handbook occur in clear air (no ice accumulation) as a result of the installation of the flight into known icing package:

Climb Rate: 30 FPM decrease.

Cruise Speed: 2 to 3 KTAS decrease.

As noted in Section 4 of this supplement, much greater changes in performance occur with ice accumulation. Make appropriate allowances for the possibility of these losses occurring when planning a flight into or through forecast or reported icing conditions.

SUPPLEMENT

PROPELLER ANTI-ICE SYSTEM

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 rocker-type switch 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 left corner of the instrument panel. The system is protected by a "push-to-reset" type circuit breaker, labeled PROP A/ICE, located on the left sidewall circuit breaker 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 icing conditions is prohibited. If unexpected icing conditions are encountered, the following procedure are 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 the 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

WINDSHIELD ANTI-ICE SYSTEM

SECTION 1
GENERAL

The windshield anti-ice system assures adequate visibility for a landing during flight conditions where ice may form on the windshield. A detachable electrically-heated glass panel, 11.0 inches high by 5.5 inches wide, mounts to the base of the windshield in front of the pilot. Quick disconnects are provided to facilitate ease of installation and removal. When not in use, a padded cover is provided for protection against scratches, breakage, and wiring damage, and the panel may be stowed in the seat pocket on the aft side of the pilot's or copilot's seat back. Windshield anti-icing is controlled by a rocker-type switch, labeled W/S A/ICE, on the left switch and control panel. The system is protected by a 5-ampere, "push-to-reset" type circuit breaker, labeled W/S A/ICE, located on the left sidewall circuit breaker panel.

The heated glass panel should be installed whenever icing conditions are a possibility on a proposed flight, especially if the freezing level is near or at the surface.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the windshield 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 windshield anti-ice system is installed.

SECTION 4
NORMAL PROCEDURES

The anti-ice system should be checked, **prior to engine start**, as follows:

1. Anti-Ice Panel -- INSTALL.
2. Master Switch -- ON.
3. Windshield Anti-Ice Switch -- ON for one minute.
4. Anti-Ice Panel -- CHECK FOR WARMTH (step outside the airplane to feel for warmth in the panel).
5. Windshield Anti-Ice and Master Switches -- OFF.

CAUTION

Inadvertent prolonged operation of the heated anti-icing panel without the engine running may cause damage to the panel and crazing of the windshield.

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

1. Windshield Anti-Ice Switch -- ON 5 to 10 minutes in advance of its need. The anti-ice system may become ineffective if a large accumulation of ice is allowed to form.
2. Windshield Anti-Ice Switch -- OFF when the possibility of icing no longer exists.

SECTION 5
PERFORMANCE

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

SUPPLEMENT

WING AND STABILIZER DE-ICE SYSTEM

SECTION 1
GENERAL

Pneumatic de-icing boots, installed on the leading edges of the wings and horizontal stabilizer, provide a measure of protection if unexpected icing conditions are encountered. The system is designed to remove ice after accumulation in flight, rather than prevent ice formation.

NOTE

This system was not designed to remove ice, snow, or frost accumulations on a parked airplane sufficiently enough to ensure a safe takeoff or subsequent flight. Other means (such as a heated hangar or approved de-icing solutions) should be employed to ensure that all wing, tail, control, propeller, windshield and static port surfaces are free of ice, snow, and frost accumulations, and that there are no internal accumulations of ice or debris in the control surfaces, engine intakes and pitot-static system ports prior to takeoff.

The de-ice boot system consists of pneumatically-operated boots, an engine-driven pneumatic pump, an annunciator light to monitor system operation, system controls, and the hardware necessary to complete the system. In operation, the boots expand and contract, using pressure or vacuum from the engine-driven vacuum pump. Normally, vacuum is applied to all boots to hold them against the leading edge surfaces. When a de-icing cycle is initiated, the vacuum is removed and a pressure is applied to "blow up" the boots. Ice on the boots will then be removed by normal in-flight air forces.

Controls for the de-icing system consist of a spring-loaded on-off rocker switch on the left switch and control panel, a pressure indicator light on the upper left side of the instrument panel, and a 5-amp "pull-off" type circuit breaker on the left sidewall circuit breaker panel. The two-position de-icing switch, labeled DE-ICE PRESS, is spring-loaded to the normal off (lower) position. When pushed to the ON (upper) position and released, it will activate one de-icing cycle. Each time a cycle is desired, the switch must be pushed to the ON position and released. If necessary, the system can be stopped at any point in the cycle (deflating the boots) by pulling out the circuit breaker labeled WING, DE-ICE.

During a normal de-icing cycle, the boots will inflate according to the following sequence: first the horizontal stabilizer boots inflate for approximately six seconds, then the inboard wing boots inflate for the next six seconds, followed by the outboard wing boots for another six seconds. The total time required for one cycle is approximately 18 seconds.

The pressure indicator light, labeled DE-ICE PRESSURE, should illuminate when the horizontal stabilizer boots reach proper operating pressure. At lower altitudes, it should come on within one to two seconds after the cycle is initiated and remain on for approximately 17 seconds if the system is operating properly. At higher altitudes, the light will come on initially within three seconds and will go off for one to three seconds during sequencing. The system may be recycled six seconds after the light goes out. The absence of illumination during any one of the three sequences of a cycle indicates insufficient pressure for proper boot inflation and effective de-icing ability.

An ice detector light is also installed to facilitate the detection of wing ice at night or during reduced visibility. The ice detector light system consists of a light installed on the left side of the cowl deck forward of the windshield which is positioned to illuminate the leading edge of the wing, and a rocker-type switch, labeled DE-ICE LIGHT, located on the left switch and control panel.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the wing and stabilizer de-ice system is installed; intentional flight into known icing conditions is prohibited.

SECTION 3
EMERGENCY PROCEDURES

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

SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

Prior to flight, make an exterior inspection to check the de-icing boots for tears, abrasions, and cleanliness. Any damage must be repaired prior to flight.

DURING ENGINE RUNUP

The system should be checked through several cycles as follows:

1. De-Icing Switch -- ON and release. Check inflation and deflation cycle of all boots.
2. Pressure Indicator Light -- CHECK ON within three seconds and OFF after 18 seconds.
3. Boots -- CHECK VISUALLY FOR COMPLETE DEFLATION to the vacuum hold-down condition.

IN FLIGHT

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

1. Icing Condition -- LEAVE as soon as possible. Divert to non-icing conditions with assistance of ATC.

NOTE

Since wing and horizontal stabilizer de-icer boots alone do not provide adequate protection for the entire airplane, known icing conditions should be avoided. If icing is inadvertently encountered, close attention should be given to the pitot-static system, propeller, induction system and other components subject to icing.

2. Ice Detector Light -- ON as required.
3. Ice Build-up -- MONITOR until approximately 1/4 to 1/2 inch thick on the leading edges.

NOTE

De-icing boots are intended for removal of ice after it has accumulated rather than prevent its formation. If ice accumulation is slow, best results can be obtained by not using the de-ice system until approximately 1/4 to 1/2 inch of ice has accumulated. Clear the accumulation with one or two cycles of operation. Do not repeat de-icing procedure until ice has again accumulated.

4. De-Icing Switch -- ON and release. The switch must be actuated after each complete boot cycle if additional cycles are required.

NOTE

Cycling the de-icing boots produces no adverse aerodynamic effects in any attitude within the allowable flight limitations. Continual cycling of the de-ice system, however, is not recommended as this may cause ice to form outside the contour of the inflated boots, preventing its removal. The de-ice system will operate effectively up to a maximum altitude of 22,000 feet; however, at or near this altitude, engine RPM must be a minimum of 2500 RPM.

5. Power -- INCREASE as required to maintain a safe airspeed or, if feasible, to climb out of icing conditions.

NOTE

An accumulation of 1/2 inch of ice on the leading edges can cause a large (up to 500 FPM) loss in rate of climb, a cruise speed reduction of up to 30 KIAS, as well as a significant buffet and stall speed increase (up to 15 knots). Even after cycling the de-icing boots, the ice accumulation remaining on the unprotected areas of the airplane can cause large performance losses. With residual ice from the initial 1/2 inch accumulation, losses up to 300 FPM in climb, 15 KIAS in cruise, and a stall speed increase of 7 knots can result. With one inch of residual accumulation, these losses can double.

6. Airspeed -- MAINTAIN BETWEEN 90 KIAS AND 165 KIAS with 1/2 inch or more ice accumulation.

NOTE

Prior to a landing approach, cycle the wing and stabilizer de-ice boots to shed any accumulated ice. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on unprotected areas. Do not cycle the boots during an approach or landing since boot inflation increases stall speeds by 3 knots, decreases stall warning by the same amount, and may cause or increase any rolling tendency during stall.

CARE AND MAINTENANCE

De-icing boots have a special electrically-conductive coating to bleed off static electricity which causes radio interference and could perforate the boots. Fueling and other servicing should be done carefully to avoid damage to the conductive coating or tearing of the boot. Keep the boots clean and free from oil and grease which can swell the rubber. Wash them with mild soap and water, using benzol or unleaded gasoline to remove stubborn grease. Do not scrub the boots, and be sure to wipe off all solvent before it dries. Small tears and abrasions can be repaired temporarily and the conductive coating can be renewed, without removing the boots. Your Cessna Dealer has the proper materials and know-how to do this correctly.

During each potential icing season at 50 to 150 flight hour intervals, depending upon the amount of exposure to the erosive effect of rain, apply ICEX (available from B.F. Goodrich aviation supply dealers) to wing and stabilizer de-ice boots to decrease the ice adhesive force and enhance shedding of ice when the boots are cycled.

SECTION 5
PERFORMANCE

The following approximate performance changes from those shown in Section 5 of the basic handbook occur as a result of the installation of the wing and stabilizer de-ice system:

Climb Rate: 30 FPM decrease.

Cruise Speed: 2 to 3 KTAS decrease.

SUPPLEMENT

EMERGENCY LOCATOR TRANSMITTER (ELT)

SECTION 1
GENERAL

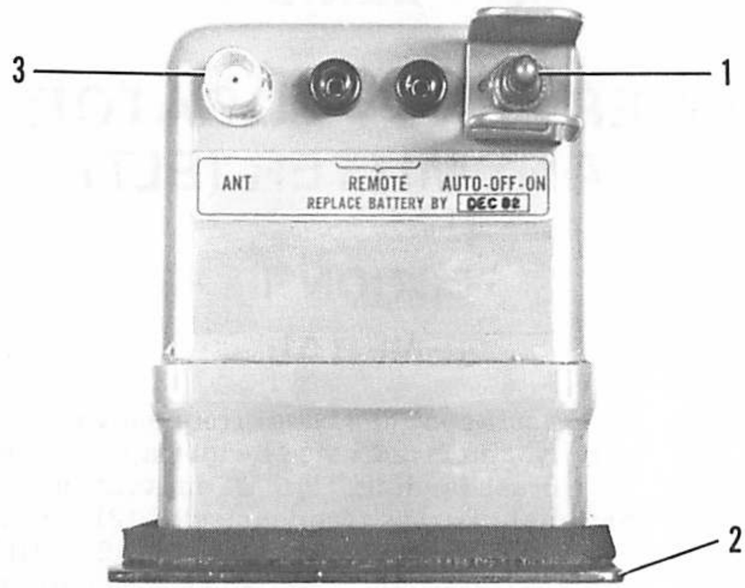
The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5g or more as may be experienced in a crash landing. The ELT emits an omni-directional signal on the international distress frequencies of 121.5 and 243.0 MHz. (Some ELT units 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 50 continuous hours in the temperature range of -4°F to +131°F (-20°C to +55°C). The ELT unit in export aircraft transmits on 121.5 MHz at 25 mw rated power output for 50 continuous hours in the temperature range of -4°F to +131°F (-20°C to +55°C).

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment 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

The following information is presented in the form of a placard located on the baggage compartment wall.

EMERGENCY LOCATOR TRANSMITTER INSTALLED AFT OF THIS PARTITION. MUST BE SERVICED IN ACCORDANCE WITH FAR PART 91.52



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 over a short period of time.

Following a lightning strike, or an exceptionally hard landing, the ELT may activate although no emergency exists. To check your ELT for inadvertent activation, select 121.5 MHz on your radio transceiver and listen for an emergency tone transmission. If the ELT can be heard transmitting, place the function selector switch in the OFF position and the tone should cease. Immediately place the function selector switch in the AUTO position to re-set the ELT for normal operation.

SECTION 5
PERFORMANCE

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

FLINT AERO
FAA Approved Airplane Flight Manual Supplement

To

Cessna Flight Manuals for Models 210G, T210G, 210H, T210H, 210J, T210J, 210K, T210K, 210L, T210L, 210M, T210M, P210N, 210N, T210N

The information in this document is FAA approved material which, together with the basic AFM is applicable and must be carried in the basic manual when the airplane is modified by the installation of auxiliary wing tip tanks and fuel system in accordance with STC SA4300WE.

The information in this document supersedes the basic manual only where covered in the items contained herein. For limitations, procedures, and performance not contained in this supplement, consult the manual proper.

Limitations and Conditions

Placards: The following placards are required in locations noted:

On instrument panel in clear view of the pilot. "Total aux. fuel 33 U.S. gals. (32.5 useable). Transfer aux. fuel only in level flight when main tank is half empty and when main tank is not supplying engine. Aux. fuel switch must be off during take-off, landing, filling and when empty. Monitor main fuel tank gauge while transferring aux. fuel to prevent overfilling"

Adjacent to the airspeed indicator (Models T210G, T210H,T210J,T210K, T210L, T210M, P210N, and T210N only): "Reduce V^{nc} 5 Knots per 1,000 feet above 18,000 feet. Maximum altitude 25,000 feet"

In full view of the pilot:

(a) For Models 210G, T210G, 210H, T210H, 210J andT210J: "Design weight 3400 lbs. max. provided each wing tip contains 7 gals., or more fuel. 3240 lbs. max. with no fuel in wing tips."

(b) For Models 210K,T210K, 210L, T210L, 210M, T210M,and 210N: "Design weights 3800 lbs. max. provided each wing tip contains 7 gals. Or more fuel and main tanks are 2/3 full or more. 3530 lbs. max. with no fuel in wing tips."

FAA Approved Date: January 16, 1984

(c) For Models P210N and T210N:
Wing Tip Aux. Tank Weight Limits

Aux. Fuel Tank	Max. T.O. Weight	Max. Ldg. Weight
Either is less Than 7 gals.	3730lbs.	3530lbs.
Both are 7 gals.	4000 lbs.	3800 lbs.

Procedures: No Change.

Performance: Noted in Placards.

James M Bygbee
Jan 16, 1984
FAA APPROVED
Chief, Flight Test Section, AWE-216
Federal Aviation Administration

BASIC AIRCRAFT PRODUCTS, INC.
4474 Hickory Drive
Evans, GA 30809

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
for
Cessna Model 210, T210 & P210
S/N 21062955 and subsequent
and
S/N P21000151 and subsequent

Registration No. N731PJ

Serial No. P21000523

..is Airplane Flight Manual Supplement (AFMS) must be attached to the FAA Approved Airplane Flight Manual (AFM) whenever the Basic Type BAE-28 TurboAlternator is installed in accordance with Supplemental Type Certificate SA00702AT The Information contained in this document supplements or supercedes the information in the basic AFM. For limitations, procedures and performance information not contained in this AFMS, consult the basic AFM.

.A Approved [signature] Date: 3/28/95

FOR
Manager, Aircraft Certification Office
Federal Aviation Administration
Atlanta, GA

I. LIMITATIONS: This modification reduces Vne depending on aircraft model. The following Vne speeds apply:

MODEL	Vne
210N, R/P210N,R	180 KCAS
T210N	183 KCAS
T210R	180 KCAS

II. PROCEDURES:

I. PREFLIGHT:

A. No preflight necessary each flight.

B. Approximately every 10 flights, deploy alternator and inspect for structural integrity, wiring, and rotation of turbine fan.

C. Approximately every 100 hours or during the annual inspection, the alternator can be tested as follows: deploy the unit, spin the alternator with a high velocity garden leaf blower, and turn on an electrical load that draws 1-2 amps and check for proper operation.

II. PROCEDURES (cont'd)

2. INFLIGHT:

A. In case of LOW VOLTAGE warning or over charge warning, follow procedure in Airplane flight manual for electrical failure.

B. If procedure verifies a primary alternator failure, **LEAVE ALTERNATOR SWITCH OFF** to prevent malfunction of TurboAlternator. Leave battery on, if functional.

C. Pull knob to deploy BAE-28.

D. Maintain normal cruise speed.

E. Turn off non-essential equipment until LOW VOLTAGE light goes out.

F. Continue flight at discretion of pilot.

G. After landing, the BAE-28 may be retracted manually with a gentle slam.

III. OUTPUT: The TurboAlternator output will vary as function of airspeed. Below 130 KCAS, the output will drop below 10 amps.

IV. PERFORMANCE: Cruise speed of the aircraft could be reduced by up to 5 knots with the TurboAlternator deployed. Range planning should be adjusted accordingly.

V. MAINTENANCE: None required.

CAUTION: Do not spray solvent or degreaser on alternator. This can cause bearing failure and damage electrical components. If cleaning is necessary, dampen cloth with cleaner and wipe surfaces to be cleaned.

VI. NOTE: The BAE-28 TurboAlternator is certified as a stand-by electric power source, and is not intended to replace or supplement the primary alternator.

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FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
for
Cessna Model 210, T210 & P210
S/N 21062955 and subsequent
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Registration No.________________
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MODEL	Vne
210N, R/P210N,R	180 KCAS
T210N	183 KCAS
T210R	180 KCAS

II. PROCEDURES:

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B. Approximately every 10 flights, deploy alternator and inspect for structural integrity, wiring, and rotation of turbine fan.

C. Approximately every 100 hours or during the annual inspection, the alternator can be tested as follows: deploy the unit, spin the alternator with a high velocity garden leaf blower, and turn on an electrical load that draws 1-2 amps and check for proper operation.

FAA APPROVED
DATE: MAR 2 8 1995

II. PROCEDURES (cont'd)

2. INFLIGHT:

A. In case of LOW VOLTAGE warning or over charge warning, follow procedure in Airplane flight manual for electrical failure.

B. If procedure verifies a primary alternator failure, **LEAVE ALTERNATOR SWITCH OFF** to prevent malfunction of TurboAlternator. Leave battery on, if functional.

NOTE: ALWAYS LEAVE AUX ELEC. CIRCUIT BREAKER ENGAGED.

C. Pull knob to deploy BAE-28.

D. Maintain normal cruise speed.

E. Turn off non-essential equipment ~~until LOW~~ TO ~~VOLTAGE light goes out~~. MAINTAIN SUFFICIENT BUS VOLTAGE.

F. Continue flight at discretion of pilot.

G. After landing, the BAE-28 may be retracted manually with a gentle slam.

FAA APPROVED
DATE MAR 2 6 199[illegible]

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