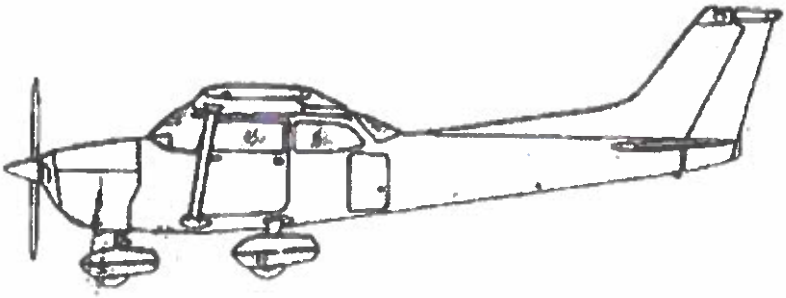
PILOT'S OPERATING HANDBOOK
and
FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1979 MODEL 172N

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

Serial No 172-71219B

Registration No. D-ETKM

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

COPYRIGHT © 1978

CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

Matjaž Meze
CA No. 001
AUTORIZIRANI INŽENIR SCAO.024

D1138-13PH-RPC-1,100-11/78

JULY 1978

COVERAGE

The Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the 1979 Model 172N airplane designated by the serial number and registration number shown on the Title Page of this handbook.

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 a listing of all pages in the handbook. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed.

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:
Original . . . . . 1 July 1978

Page	Date
Title	1 July 1978
Assignment Record	1 July 1978
i thru iv	1 July 1978
1-1 thru 1-9	1 July 1978
1-10 Blank	1 July 1978
2-1	1 July 1978
2-2 Blank	1 July 1978
2-3 thru 2-12	1 July 1978
3-1 thru 3-9	1 July 1978
3-10 Blank	1 July 1978
3-11 thru 3-18	1 July 1978
4-1 thru 4-34	1 July 1978
5-1	1 July 1978
5-2 Blank	1 July 1978
5-3 thru 5-21	1 July 1978
5-22 Blank	1 July 1978
6-1	1 July 1978
6-2 Blank	1 July 1978
6-3 thru 6-23	1 July 1978
6-24 Blank	1 July 1978
7-1 thru 7-28	1 July 1978
8-1	1 July 1978
8-2 Blank	1 July 1978
8-3 thru 8-14	1 July 1978
9-1 thru 9-2	1 July 1978

NOTE

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

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.

TABLE OF CONTENTS

SECTION

GENERAL 1

LIMITATIONS 2

EMERGENCY PROCEDURES 3

NORMAL PROCEDURES 4

PERFORMANCE 5

WEIGHT & BALANCE/
EQUIPMENT LIST 6

AIRPLANE & SYSTEMS
DESCRIPTIONS 7

AIRPLANE HANDLING,
SERVICE & MAINTENANCE 8

SUPPLEMENTS
(Optional Systems Description
& Operating Procedures) 9

This handbook will be kept current by Service Letters published by Cessna Aircraft Company. These are distributed to Cessna Dealers and to those who subscribe through the Owner Follow-Up System. If you are not receiving subscription service, you will want to keep in touch with your Cessna Dealer for information concerning the change status of the handbook. Subsequent changes will be made in the form of stickers. These should be examined and attached to the appropriate page in the handbook immediately after receipt; the handbook should not be used for operational purposes until it has been updated to a current status.

SECTION 1
GENERAL

TABLE OF CONTENTS

Page

Three View 1-2
Introduction 1-3
Descriptive Data 1-3
Engine 1-3
Propeller 1-3
Fuel 1-3
Oil 1-4
Maximum Certificated Weights 1-5
Standard Airplane Weights 1-5
Cabin And Entry Dimensions 1-5
Baggage Space And Entry Dimensions 1-5
Specific Loadings 1-5
Symbols, Abbreviations And Terminology 1-6
General Airspeed Terminology And Symbols 1-6
Meteorological Terminology 1-6
Engine Power Terminology 1-7
Airplane Performance And Flight Planning Terminology . . . 1-7
Weight And Balance Terminology 1-8

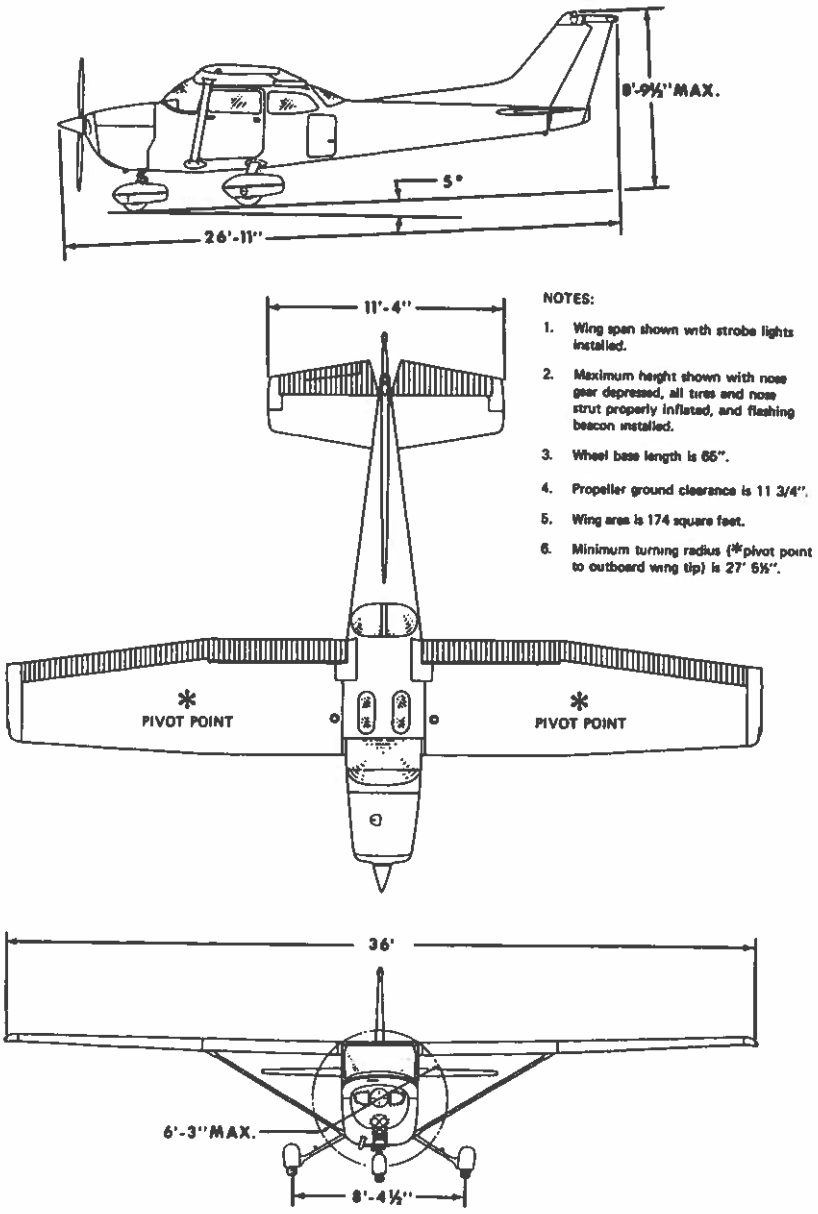


Figure 1-1. Three View

INTRODUCTION

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

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

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Avco Lycoming.
Engine Model Number: O-320-H2AD.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor equipped, four-cylinder engine with 320 cu. in. displacement.
Horsepower Rating and Engine Speed: 160 rated BHP at 2700 RPM.

SEE SUPPLEMENT POH FOR TAE 125-02-114

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 1C160/DTM7557.
Number of Blades: 2.
Propeller Diameter, Maximum: 75 inches.
Minimum: 74 inches.
Propeller Type: Fixed pitch.

FUEL

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

Fuel Capacity:
Standard Tanks:
Total Capacity: 43 gallons.
Total Capacity Each Tank: 21.5 gallons.
Total Usable: 40 gallons.
Long Range Tanks:
Total Capacity: 54 gallons.
Total Capacity Each Tank: 27 gallons.
Total Usable: 50 gallons.

NOTE

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either LEFT or RIGHT position to prevent cross-feeding.

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.

SEE SUPPLEMENT POH FOR TAE

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.

MIL-L-22851 Ashless Dispersant Oil: This oil must be used after first 50 hours or consumption has stabilized.

Recommended Viscosity for Temperature Range:
MIL-L-6082 Aviation Grade Straight Mineral Oil:
SAE 50 above 16°C (60°F).
SAE 40 between 4°C (30°F) and 32°C (90°F).
SAE 30 between -18°C (0°F) and 21°C (70°F).
SAE 20 below -12°C (10°F).
MIL-L-22851 Ashless Dispersant Oil:
SAE 40 or SAE 50 above 16°C (60°F).
SAE 40 between -1°C (30°F) and 32°C (90°F).
SAE 30 or SAE 40 between -18°C (0°F) and 21°C (70°F).
SAE 30 below -12°C (10°F).

Oil Capacity:
Sump: 8 Quarts.
Total: 7 Quarts (if oil filter installed).

MAXIMUM CERTIFICATED WEIGHTS

Takeoff, Normal Category: 2300 lbs.
Utility Category: 2000 lbs.
Landing, Normal Category: 2300 lbs.
Utility Category: 2000 lbs.
Weight in Baggage Compartment, Normal Category:
Baggage Area 1 (or passenger on child's seat) - Station 82 to 108: 120 lbs. See note below.
Baggage Area 2 - Station 108 to 142: 50 lbs. See note below.

NOTE

The maximum combined weight capacity for baggage areas 1 and 2 is 120 lbs.

Weight in Baggage Compartment, Utility Category: In this category, the baggage compartment and rear seat must not be occupied.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, Skyhawk: 1393 lbs.
Skyhawk II: 1419 lbs.

Maximum Useful Load:

	Normal Category	Utility Category
Skyhawk:	907 lbs.	607 lbs.
Skyhawk II:	881 lbs.	581 lbs.

CABIN AND ENTRY DIMENSIONS

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

BAGGAGE SPACE AND ENTRY DIMENSIONS

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

SPECIFIC LOADINGS

Wing Loading: 13.2 lbs./sq. ft.
Power Loading: 14.4 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	**Manuevering 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_{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 (formerly Centigrade) 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.
RPM	**Revolutions Per Minute** is engine speed.
Static RPM	**Static RPM** is engine speed attained during a full-throttle engine runup when the airplane is on the ground and stationary.

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.
GPH	**Gallons Per Hour** is the amount of fuel (in gallons) 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 takeoff weight and the basic empty weight.
Gross (Loaded) Weight	**Gross (Loaded) Weight** is the loaded weight of the airplane.
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.





SECTION 2
LIMITATIONS

TABLE OF CONTENTS

	Page
Introduction	2-3
Airspeed Limitations	2-4
Airspeed Indicator Markings	2-5
Power Plant Limitations	2-5
Power Plant Instrument Markings	2-6
Weight Limits	2-6
Normal Category	2-6
Utility Category	2-7
Center Of Gravity Limits	2-7
Normal Category	2-7
Utility Category	2-7
Maneuver Limits	2-7
Normal Category	2-7
Utility Category	2-7
Flight Load Factor Limits	2-8
Normal Category	2-8
Utility Category	2-8
Kinds Of Operation Limits	2-9
Fuel Limitations	2-9
Placards	2-10





INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment are included in Section 9.

NOTE

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

Your Cessna is certificated under FAA Type Certificate No. 3A12 as Cessna Model No. 172N.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1. Maneuvering speeds shown apply to normal category operations. The utility category maneuvering speed is shown on the operational limitations placard.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	158	160	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	126	128	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 2300 Pounds 1950 Pounds 1600 Pounds	 96 88 80	 97 89 80	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed	86	85	Do not exceed this speed with flaps down.
	Maximum Window Open Speed	158	160	Do not exceed this speed with windows open.

Figure 2-1. Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

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

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	41 - 85	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	47 - 128	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	128 - 160	Operations must be conducted with caution and only in smooth air.
Red Line	160	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.
Engine Model Number: O-320-H2AD.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Power: 160 BHP.
Maximum Engine Speed: 2700 RPM.

SEE SUPPLEMENT POH FOR TAE 125-02-114

NOTE

The static RPM range at full throttle (carburetor heat off and full rich mixture) is 2280 to 2400 RPM.

Maximum Oil Temperature: 118°C (245°F).
Oil Pressure, Minimum: 25 psi.
Maximum: 100 psi.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 1C160/DTM7557.
Propeller Diameter, Maximum: 75 inches.
Minimum: 74 inches.

POWER PLANT INSTRUMENT MARKINGS

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

INSTRUMENT	RED LINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	YELLOW ARC CAUTION RANGE	RED LINE MAXIMUM LIMIT
Tachometer	- - -	2200 - 2700 RPM	- - -	2700 RPM
Oil Temperature	- - -	100° - 245°F	- - -	245°F
Oil Pressure	25 psi	60-90 psi	- - -	100 psi
Carburetor Air Temperature	- - -	- - -	-15° to 5°C	- - -

SEE SUPPLEMENT POH FOR TAE 125-02-114

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

NORMAL CATEGORY

Maximum Takeoff Weight: 2300 lbs.
Maximum Landing Weight: 2300 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area 1 (or passenger on child's seat) - Station 82 to 108: 120 lbs. See note below.
Baggage Area 2 - Station 108 to 142: 50 lbs. See note below.

NOTE

The maximum combined weight capacity for baggage areas 1 and 2 is 120 lbs.

UTILITY CATEGORY

Maximum Takeoff Weight: 2000 lbs.
Maximum Landing Weight: 2000 lbs.
Maximum Weight in Baggage Compartment: In the utility category, the baggage compartment and rear seat must be not occupied.

CENTER OF GRAVITY LIMITS

NORMAL CATEGORY

Center of Gravity Range:
Forward: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 38.5 inches aft of datum at 2300 lbs.
Aft: 47.3 inches aft of datum at all weights.
Reference Datum: Lower portion of front face of firewall.

UTILITY CATEGORY

Center of Gravity Range:
Forward: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 35.5 inches aft of datum at 2000 lbs.
Aft: 40.5 inches aft of datum at all weights.
Reference Datum: Lower portion of front face of firewall.

MANEUVER LIMITS

NORMAL CATEGORY

This airplane is certificated in both the normal and utility 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.

UTILITY CATEGORY

This airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such as commercial pilot and flight instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category.

In the utility category, the baggage compartment and rear seat must not be occupied. No aerobatic maneuvers are approved except those listed below:

MANEUVER	RECOMMENDED ENTRY SPEED*
Chandelles	105 knots
Lazy Eights	105 knots
Steep Turns	95 knots
Spins	Slow Deceleration
Stalls (Except Whip Stalls)	Slow Deceleration

*Abrupt use of the controls is prohibited above 97 knots.

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

FLIGHT LOAD FACTOR LIMITS

NORMAL CATEGORY

Flight Load Factors (Gross Weight - 2300 lbs.):

*Flaps Up	+3.8g, -1.52g
*Flaps Down	+3.0g

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

UTILITY CATEGORY

Flight Load Factors (Gross Weight - 2000 lbs.):

*Flaps Up	+4.4g, -1.76g
*Flaps Down	+3.0g

*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: 21.5 U.S. gallons each.
Total Fuel: 43 U.S. gallons.
Usable Fuel (all flight conditions): 40 U.S. gallons.
Unusable Fuel: 3 U.S. gallons.
2 Long Range Tanks: 27 U.S. gallons each.
Total Fuel: 54 U.S. gallons.
Usable Fuel (all flight conditions): 50 U.S. gallons.
Unusable Fuel: 4 U.S. gallons.

SEE SUPPLEMENT POH FOR TAE 125-02-114

NOTE

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either LEFT or RIGHT position to prevent cross-feeding.

NOTE

Takeoff and land with the fuel selector valve handle in the BOTH position.

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

PLACARDS

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

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

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

MAXIMUMS

	Normal Category	Utility Category
MANEUVERING SPEED (IAS)	97 knots	97 knots
GROSS WEIGHT	2300 lbs.	2000 lbs.
FLIGHT LOAD FACTOR		
Flaps Up	+3.8, -1.52	+4.4, -1.76
Flaps Down	+3.0	+3.0

Normal Category - No Acrobatic maneuvers including spins approved.
Utility Category - Baggage compartment and rear seat must not be occupied.

NO ACROBATIC MANEUVERS APPROVED
EXCEPT THOSE LISTED BELOW

Maneuver	Recm. Entry Speed	Maneuver	Recm. Entry Speed
Chandelles	105 knots	Spins	Slow Deceleration
Lazy Eights	105 knots	Stalls (except whip stalls)	Slow Deceleration
Steep Turns	95 knots		

Altitude loss in stall recovery -- 180 feet.
Abrupt use of the controls prohibited above 97 knots.
Spin Recovery: opposite rudder - forward elevator - neutralize controls. Intentional spins with flaps extended are 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. Forward of fuel selector valve:

BOTH TANKS ON FOR
TAKEOFF & LANDING

3. On the fuel selector valve (standard tanks):

BOTH - 40 GAL. ALL FLIGHT ATTITUDES
LEFT - 20 GAL. LEVEL FLIGHT ONLY
RIGHT - 20 GAL. LEVEL FLIGHT ONLY
OFF

On the fuel selector valve (long range tanks):

SEE SUPPLEMENT POH FOR TAE 125-02-114

BOTH - 50 GAL. ALL FLIGHT ATTITUDES
LEFT - 25 GAL. LEVEL FLIGHT ONLY
RIGHT - 25 GAL. LEVEL FLIGHT ONLY
OFF

4. Near fuel tank filler cap (standard tanks):

FUEL
100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 21.5 U.S. GAL.

Near fuel tank filler cap (long range tanks):

FUEL
100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 27 U.S. GAL.

5. Near flap indicator:

AVOID SLIPS WITH FLAPS EXTENDED

6. In baggage compartment:

120 POUNDS MAXIMUM
BAGGAGE AND/OR AUXILIARY PASSENGER
FORWARD OF BAGGAGE DOOR LATCH

50 POUNDS MAXIMUM
BAGGAGE AFT OF BAGGAGE DOOR LATCH

MAXIMUM 120 POUNDS COMBINED

FOR ADDITIONAL LOADING INSTRUCTIONS
SEE WEIGHT AND BALANCE DATA

SECTION 3
EMERGENCY PROCEDURES

TABLE OF CONTENTS

Page

Introduction 3-3
Airspeeds For Emergency Operation 3-3

OPERATIONAL CHECKLISTS

Engine Failures 3-3
Engine Failure During Takeoff Run 3-3
Engine Failure Immediately After Takeoff 3-4
Engine Failure During Flight 3-4
Forced Landings 3-4
Emergency Landing Without Engine Power 3-4
Precautionary Landing With Engine Power 3-4
Ditching 3-5
Fires 3-5
During Start On Ground 3-5
Engine Fire In Flight 3-6
Electrical Fire In Flight 3-6
Cabin Fire 3-6
Wing Fire 3-7
Icing 3-7
Inadvertent Icing Encounter 3-7
Static Source Blockage (Erroneous Instrument Reading Suspected) 3-8
Landing With A Flat Main Tire 3-8
Electrical Power Supply System Malfunctions 3-8
Over-Voltage Light Illuminates 3-8
Ammeter Shows Discharge 3-9

AMPLIFIED PROCEDURES

Engine Failure 3-11
Forced Landings 3-12
Landing Without Elevator Control 3-12
Fires 3-12

SEE SUPPLEMENT POH FOR TAE 125-02-114

TABLE OF CONTENTS (Continued)

	Page
Emergency Operation In Clouds (Vacuum System Failure)	3-13
Executing A 180° Turn In Clouds	3-13
Emergency Descent Through Clouds	3-13
Recovery From A Spiral Dive	3-14
Flight In Icing Conditions	3-14
Static Source Blocked	3-14
Spins	3-15
Rough Engine Operation Or Loss Of Power	3-16
Carburetor Icing	3-16
Spark Plug Fouling	3-16
Magneto Malfunction	3-16
Low Oil Pressure	3-16
Electrical Power Supply System Malfunctions	3-17
Excessive Rate Of Charge	3-17
Insufficient Rate Of Charge	3-17

SEE SUPPLEMENT POH FOR TAE 125-02-114

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	65 KIAS
Wing Flaps Down	60 KIAS
Maneuvering Speed:	
2300 Lbs	97 KIAS
1950 Lbs	89 KIAS
1600 Lbs	80 KIAS
Maximum Glide:	
2300 Lbs	65 KIAS
Precautionary Landing With Engine Power	60 KIAS
Landing Without Engine Power:	
Wing Flaps Up	65 KIAS
Wing Flaps Down	60 KIAS

OPERATIONAL CHECKLISTS

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

SEE SUPPLEMENT POH FOR TAE 125-02-114

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 -- 65 KIAS (flaps UP).
   60 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED.
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT

1. Airspeed -- 65 KIAS.
2. Carburetor Heat -- ON.
3. Fuel Selector Valve -- BOTH.
4. Mixture -- RICH.
5. Ignition Switch -- BOTH (or START if propeller is stopped).
6. Primer -- IN and LOCKED.

SEE SUPPLEMENT POH FOR TAE 125-02-114

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 65 KIAS (flaps UP).
   60 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (40° recommended).
6. Master Switch -- OFF.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Touchdown -- SLIGHTLY TAIL LOW.
9. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Wing Flaps -- 20°.
2. Airspeed -- 60 KIAS.
3. Selected Field -- FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
4. Avionics Power Switch and Electrical Switches -- OFF.
5. Wing Flaps -- 40° (on final approach).
6. Airspeed -- 60 KIAS.
7. Master Switch -- OFF.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.

9. Touchdown -- SLIGHTLY TAIL LOW.
10. Ignition Switch -- OFF.
11. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.
4. Wing Flaps -- 20° - 40°.
5. Power -- ESTABLISH 300 FT/MIN DESCENT AT 55 KIAS.

NOTE

If no power is available, approach at 65 KIAS with flaps up or at 60 KIAS with 10° flaps.

SEE SUPPLEMENT POH FOR TAE 125-02-114

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

FIRES

DURING START ON GROUND

1. Cranking -- CONTINUE, to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

If engine starts:

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

If engine fails to start:

4. Throttle -- FULL OPEN.
5. Mixture -- IDLE CUT-OFF.

6. Cranking -- CONTINUE.
7. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
8. Engine -- SECURE.
   a. Master Switch -- OFF.
   b. Ignition Switch -- OFF.
   c. Fuel Selector Valve -- OFF.
9. Fire -- EXTINGUISH using fire extinguisher, wool blanket, or dirt.
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. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except overhead vents).
5. Airspeed -- 100 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).

SEE SUPPLEMENT FOR FAE 125-02-14

ELECTRICAL FIRE IN FLIGHT

1. Master Switch -- OFF.
2. Avionics Power Switch -- OFF.
3. All Other Switches (except ignition switch) -- OFF.
4. Vents/Cabin Air/Heat -- CLOSED.
5. Fire Extinguisher -- ACTIVATE (if available).

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

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

6. Master Switch -- ON.
7. Circuit Breakers -- CHECK for faulty circuit, do not reset.
8. Radio Switches -- OFF.
9. Avionics Power Switch -- ON.
10. Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.

11. Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

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

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

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

WING FIRE

SEE SUPPLEMENT POH FOR TAE 125-02-114

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

NOTE

Perform a sideslip to keep the flames away from the fuel tank and cabin, and land as soon as possible using flaps only as required for final approach and touchdown.

ICING

INADVERTENT ICING ENCOUNTER

1. Turn pitot heat switch ON (if installed).
2. Turn back or change altitude to obtain an outside air temperature that is less conducive to icing.
3. Pull cabin heat control full out and open defroster outlet to obtain maximum windshield defroster airflow. Adjust cabin air control to get maximum defroster heat and airflow.
4. Open the throttle to increase engine speed and minimize ice build-up on propeller blades.
5. Watch for signs of carburetor air filter ice and apply carburetor

heat as required. An unexplained loss in engine speed could be caused by carburetor ice or air intake filter ice. Lean the mixture for maximum RPM, if carburetor heat is used continuously.

6. 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 significantly higher stall speed.
8. Leave wing flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
9. Open left window and, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
10. Perform a landing approach using a forward slip, if necessary, for improved visibility.
11. Approach at 65 to 75 KIAS depending upon the amount of the accumulation.
12. Perform a landing in level attitude.

SEE SUPPLEMENT POH FOR TAE 125-02-114

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. Alternate Static Source Valve -- PULL ON.
2. Airspeed -- Consult appropriate calibration tables in Section 5.

LANDING WITH A FLAT MAIN TIRE

1. Approach -- NORMAL.
2. Touchdown -- GOOD TIRE FIRST, hold airplane off flat tire as long as possible.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

OVER-VOLTAGE LIGHT ILLUMINATES

SEE SUPPLEMENT POH FOR TAE 125-02-114

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

If over-voltage light illuminates again:

6. Flight -- TERMINATE as soon as possible.

AMMETER SHOWS DISCHARGE

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

SEE SUPPLEMENT POH FOR TAE 125-02-114

AMPLIFIED PROCEDURES

ENGINE FAILURE

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

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

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

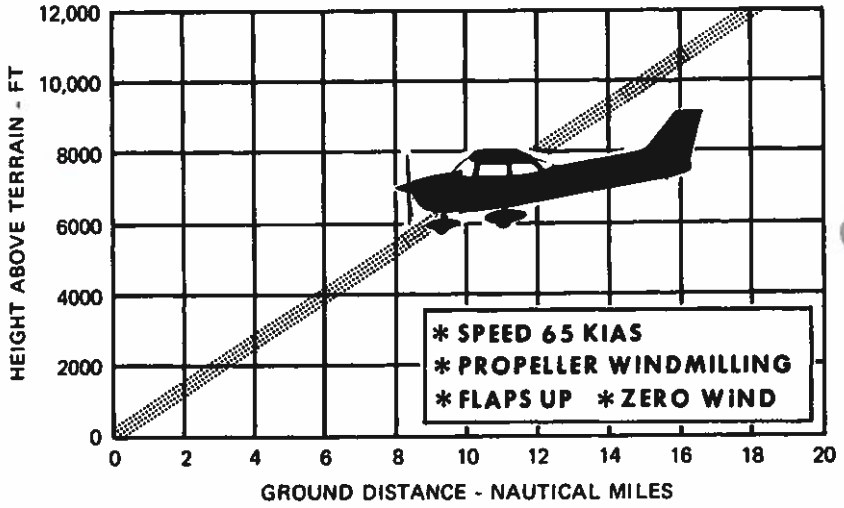


Figure 3-1. Maximum Glide

FORCED LANDINGS

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

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

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

LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight (with an airspeed of approximately 60 KIAS and flaps set to 20°) by using throttle and elevator trim controls. Then **do not change the elevator trim control setting**; 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 elevator trim control should be adjusted toward the 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

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 if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator 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 the hands off the control wheel as much as possible and steering only with rudder.

EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 180° turn, a descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Apply full rich mixture.
2. Use full carburetor heat.
3. Reduce power to set up a 500 to 800 ft/min rate of descent.
4. Adjust the elevator trim and rudder trim (if installed) for a stabilized descent at 70-80 KIAS.
5. Keep hands off the control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Check trend of compass card movement and make cautious corrections with rudder to stop the turn.
8. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply elevator back pressure to slowly reduce the airspeed to 80 KIAS.
4. Adjust the elevator trim control to maintain an 80 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading. Adjust rudder trim (if installed) to relieve unbalanced rudder force.
6. Apply carburetor heat.
7. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
8. Upon breaking out of clouds, resume normal cruising flight.

SEE SUPPLEMENT POH FOR TAE 125-02-114

FLIGHT IN ICING CONDITIONS

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

STATIC SOURCE BLOCKED

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

NOTE

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

With the alternate static source on, adjust indicated airspeed slightly during climb or approach according to the alternate static source airspeed calibration table in Section 5, appropriate to vent/window(s) configuration, causing the airplane to be flown at the normal operating speeds.

Maximum airspeed and altimeter variation from normal is 4 knots and 30 feet over the normal operating range with the window(s) closed. With window(s) open, larger variations occur near stall speed. However, maximum altimeter variation remains within 50 feet of normal.

SPINS

Should an inadvertent spin occur, the following recovery procedure should be used:

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

NOTE

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

For additional information on spins and spin recovery, see the discussion under SPINS in Normal Procedures (Section 4).

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

A gradual loss of RPM and eventual engine roughness may result from the formation of carburetor ice. To clear the ice, apply full throttle and pull the carburetor heat knob full out until the engine runs smoothly; then remove carburetor heat and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight, use the minimum amount of heat necessary to prevent ice from forming and lean the mixture for smoothest engine operation.

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.

SEE SUPPLEMENT FOR FOR TAE 125-02-114

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.

LOW OIL PRESSURE

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

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce

engine power immediately and select a suitable forced landing field. Use only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

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

EXCESSIVE RATE OF CHARGE

SEE SUPPLEMENT POH FOR TAE 125-02-114

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate. Electronic components in the electrical system could be adversely affected by higher than normal voltage if a faulty voltage regulator is causing the overcharging. To preclude these possibilities, an over-voltage sensor will automatically shut down the alternator and the over-voltage warning light will illuminate if the charge voltage reaches approximately 31.5 volts. Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system. To do this, turn the avionics power switch off, then turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the warning light will go off. The avionics power switch should then be turned on. If the light comes on again, a malfunction is confirmed. In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. If the emergency occurs at night, power must be conserved for later use of the landing lights and flaps during landing.

INSUFFICIENT RATE OF CHARGE

If the ammeter indicates a continuous discharge rate in flight, the

alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminated as soon as practical.

SEE SUPPLEMENT POH FOR TAE 125-02-114

SECTION 4
NORMAL PROCEDURES

TABLE OF CONTENTS

Page

Introduction 4-3
Speeds For Normal Operation 4-3

CHECKLIST PROCEDURES

Preflight Inspection 4-5
Cabin 4-5
Empennage 4-5
Right Wing, Trailing Edge 4-5
Right Wing 4-5
Nose 4-5
Left Wing 4-6
Left Wing, Leading Edge 4-6
Left Wing, Trailing Edge 4-6
Before Starting Engine 4-6
Starting Engine 4-7
Before Takeoff 4-7
Takeoff 4-7
Normal Takeoff 4-7
Short Field Takeoff 4-8
Enroute Climb 4-8
Cruise 4-8
Descent 4-8
Before Landing 4-8
Landing 4-9
Normal Landing 4-9
Short Field Landing 4-9
Balked Landing 4-9
After Landing 4-9
Securing Airplane 4-9

AMPLIFIED PROCEDURES

Starting Engine 4-11
Taxiing 4-11

SEE SUPPLEMENT POH FOR TAE 125-02-14

TABLE OF CONTENTS (Continued)

	Page
Before Takeoff	4-13
Warm-Up	4-13
Magneto Check	4-13
Alternator Check	4-13
Takeoff	4-13
Power Check	4-13
Wing Flap Settings	4-14
Short Field Takeoff	4-14
Crosswind Takeoff	4-15
Enroute Climb	4-15
Cruise	4-15
Stalls	4-17
Spins	4-17
Landing	4-19
Normal Landing	4-19
Short Field Landing	4-19
Crosswind Landing	4-20
Balked Landing	4-20
Cold Weather Operation	4-20
Starting	4-20
Flight Operations	4-22
Hot Weather Operation	4-23
Noise Abatement	4-23

SEE SUPPLEMENT POH FOR TAE 125-02-114

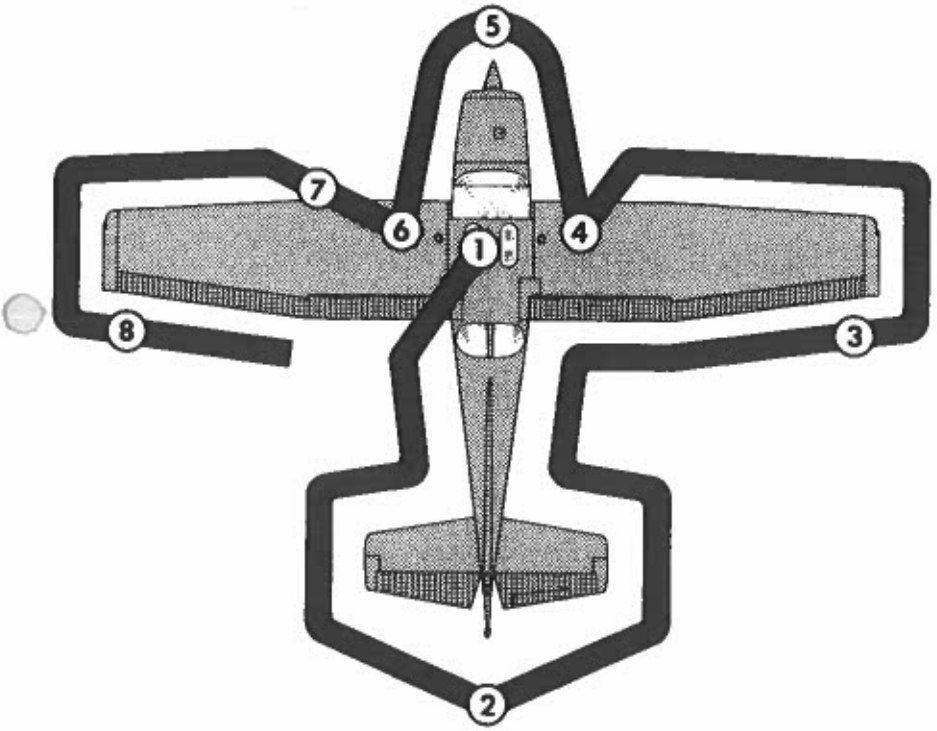
INTRODUCTION

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 2300 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distance, the speed appropriate to the particular weight must be used.

Takeoff, Flaps Up:	
Normal Climb Out	70-80 KIAS
Short Field Takeoff, Flaps Up, Speed at 50 Feet	59 KIAS
Enroute Climb, Flaps Up:	
Normal, Sea Level	75-85 KIAS
Normal, 10,000 Feet	70-80 KIAS
Best Rate of Climb, Sea Level	73 KIAS
Best Rate of Climb, 10,000 Feet	68 KIAS
Best Angle of Climb, Sea Level	59 KIAS
Best Angle of Climb, 10,000 Feet	61 KIAS
Landing Approach:	
Normal Approach, Flaps Up	60-70 KIAS
Normal Approach, Flaps 40°	55-65 KIAS
Short Field Approach, Flaps 40°	60 KIAS
Balked Landing:	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
2300 Lbs	97 KIAS
1950 Lbs	89 KIAS
1600 Lbs	80 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff or Landing	15 KNOTS



NOTE

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

Figure 4-1. Preflight Inspection

CHECKLIST PROCEDURES

PREFLIGHT INSPECTION

(1) CABIN

1. Control Wheel Lock -- REMOVE.
2. Ignition Switch -- OFF.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Fuel Quantity Indicators -- CHECK QUANTITY.
6. Master Switch -- OFF.
7. Baggage Door -- CHECK, lock with key if child's seat is to be occupied.

(2) EMPENNAGE

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

SEE SUPPLEMENT POH FOR TAE 125-02-114

(3) RIGHT WING Trailing Edge

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

(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.

(5) NOSE

1. Engine Oil Level -- CHECK, do not operate with less than four quarts. Fill to six quarts for extended flight.
2. 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 selector valve drain plug will be necessary.

3. Propeller and Spinner -- CHECK for nicks and security.
4. Landing Light(s) -- CHECK for condition and cleanliness.
5. Carburetor Air Filter -- CHECK for restrictions by dust or other foreign matter.
6. Nose Wheel Strut and Tire -- CHECK for proper inflation.
7. Nose Tie-Down -- DISCONNECT.
8. Static Source Opening (left side of fuselage) -- CHECK for stoppage.

(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.

(7) LEFT WING Leading Edge

SEE SUPPLEMENT POH FOR TAE 125-02-114

1. Pitot Tube Cover -- REMOVE and check opening for stoppage.
2. Fuel Tank Vent Opening -- CHECK for stoppage.
3. Stall Warning Opening -- CHECK for stoppage. To check the system, place a clean handkerchief over the vent opening and apply suction; a sound from the warning horn will confirm system operation.
4. Wing Tie-Down -- DISCONNECT.

(8) LEFT WING Trailing Edge

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

BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
3. Fuel Selector Valve -- BOTH.
4. Avionics Power Switch, Autopilot (if installed), Electrical Equipment -- OFF.

CAUTION

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

5. Brakes -- TEST and SET.
6. Circuit Breakers -- CHECK IN.

STARTING ENGINE

1. Mixture -- RICH.
2. Carburetor Heat -- COLD.
3. Master Switch -- ON.
4. Prime -- AS REQUIRED (2 to 6 strokes; none if engine is warm).
5. Throttle -- OPEN 1/8 INCH.
6. Propeller Area -- CLEAR.
7. Ignition Switch -- START (release when engine starts).
8. Oil Pressure -- CHECK.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Cabin Doors and Window(s) -- CLOSED and LOCKED.
3. Flight Controls -- FREE and CORRECT.
4. Flight Instruments -- SET.
5. Fuel Selector Valve -- BOTH.
6. Mixture -- RICH (below 3000 feet).
7. Elevator Trim and Rudder Trim (if installed) -- TAKEOFF.
8. Throttle -- 1700 RPM.
   a. Magnetos -- CHECK (RPM drop should not exceed 125 RPM on either magneto or 50 RPM differential between magnetos).
   b. Carburetor Heat -- CHECK (for RPM drop).
   c. Engine Instruments and Ammeter -- CHECK.
   d. Suction Gage -- CHECK.
9. Avionics Power Switch -- ON.
10. Radios -- SET.
11. Autopilot (if installed) -- OFF.
12. Air Conditioner (if installed) -- OFF.
13. Flashing Beacon, Navigation Lights and/or Strobe Lights -- ON as required.
14. Throttle Friction Lock -- ADJUST.
15. Brakes -- RELEASE.

SEE SUPPLEMENT POH FOR TAE 125-02-11

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- UP.
2. Carburetor Heat -- COLD.
3. Throttle -- FULL OPEN.
4. Elevator Control -- LIFT NOSE WHEEL (at 55 KIAS).
5. Climb Speed -- 70-80 KIAS.

SHORT FIELD TAKEOFF

1. Wing Flaps -- UP.
2. Carburetor Heat -- COLD.
3. Brakes -- APPLY.
4. Throttle -- FULL OPEN.
5. Mixture -- RICH (above 3000 feet, LEAN to obtain maximum RPM).
6. Brakes -- RELEASE.
7. Elevator Control -- SLIGHTLY TAIL LOW.
8. Climb Speed -- 59 KIAS (until all obstacles are cleared).

ENROUTE CLIMB

1. Airspeed -- 70-85 KIAS.

NOTE

If a maximum performance climb is necessary, use speeds shown in the Rate Of Climb chart in Section 5.

2. Throttle -- FULL OPEN.
3. Mixture -- RICH (above 3000 feet, LEAN to obtain maximum RPM).

SEE SUPPLEMENT POH FOR TAE 125-02-114

CRUISE

1. Power -- 2200-2700 RPM (no more than 75% is recommended).
2. Elevator and Rudder Trim (if installed) -- ADJUST.
3. Mixture -- LEAN.

DESCENT

1. Mixture -- ADJUST for smooth operation (full rich for idle power).
2. Power -- AS DESIRED.
3. Carburetor Heat -- AS REQUIRED (to prevent carburetor icing).

BEFORE LANDING

1. Seats, Belts, Harnesses -- SECURE.
2. Fuel Selector Valve -- BOTH.
3. Mixture -- RICH.
4. Carburetor Heat -- ON (apply full heat before closing throttle).
5. Autopilot (if installed) -- OFF.
6. Air Conditioner (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 60-70 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (below 85 KIAS).
3. Airspeed -- 55-65 KIAS (flaps DOWN).
4. Touchdown -- MAIN WHEELS FIRST.
5. Landing Roll -- LOWER NOSE WHEEL GENTLY.
6. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 60-70 KIAS (flaps UP).
2. Wing Flaps -- FULL DOWN (40°).
3. Airspeed -- 60 KIAS (until flare).
4. Power -- REDUCE to idle after clearing obstacle.
5. Touchdown -- MAIN WHEELS FIRST.
6. Brakes -- APPLY HEAVILY.
7. Wing Flaps -- RETRACT.

SEE SUPPLEMENT POH FOR TAE 125-02-114

BALKED LANDING

1. Throttle -- FULL OPEN.
2. Carburetor Heat -- COLD.
3. Wing Flaps -- 20° (immediately).
4. Climb Speed -- 55 KIAS.
5. Wing Flaps -- 10° (until obstacles are cleared).
   RETRACT (after reaching a safe altitude and 60 KIAS).

AFTER LANDING

1. Wing Flaps -- UP.
2. Carburetor Heat -- COLD.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Electrical Equipment, Autopilot (if installed) -- 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

During engine starting, open the throttle approximately 1/8 inch. In warm temperatures, one or two strokes of the primer should be sufficient. In cold weather, up to six strokes of the primer may be necessary. If the engine is warm, no priming will be required. In extremely cold temperatures, it may be necessary to continue priming while cranking the engine.

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

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

SEE SUPPLEMENT POH FOR TAE 125-02-114

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

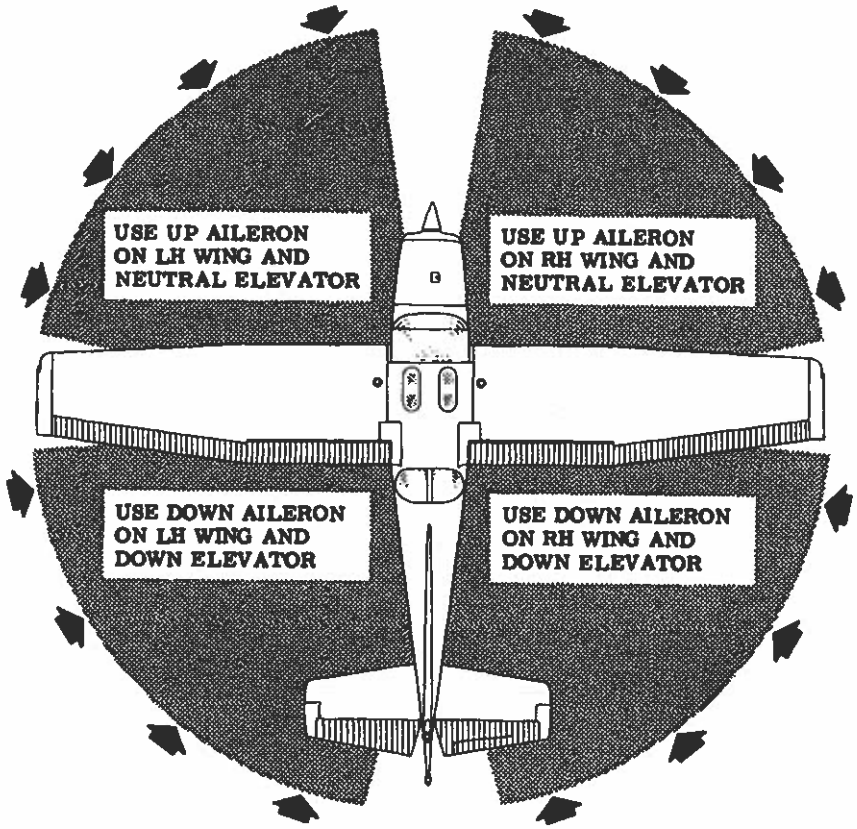
NOTE

Additional details concerning cold weather starting and operation may be found under COLD WEATHER OPERATION paragraphs in this section.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see Taxiing Diagram, figure 4-2) to maintain directional control and balance. Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

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



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

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

BEFORE TAKEOFF

WARM-UP

If the engine accelerates smoothly, the airplane is ready for takeoff. Since the engine is closely cowled for efficient in-flight engine cooling, precautions should be taken to avoid overheating during prolonged engine operation on the ground. Also, long periods of idling may cause fouled spark plugs.

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 125 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.

SEE SUPPLEMENT FOR PAGE 4-13 AND 4-14

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

ALTERNATOR CHECK

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

TAKEOFF

POWER CHECK

It is important to check full-throttle engine operation early in the

takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff. If this occurs, you are justified in making a thorough full-throttle static runup before another takeoff is attempted. The engine should run smoothly and turn approximately 2280 to 2400 RPM with carburetor heat off and mixture full rich.

NOTE

Carburetor heat should not be used during takeoff unless it is absolutely necessary for obtaining smooth engine acceleration.

Full-throttle 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. When unavoidable small dents appear in the propeller blades, they should be immediately corrected as described in Section 8 under Propeller Care.

Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full-throttle, static runup.

SEE SUPPLEMENT POH FOR TAE 125-02-114

After full throttle is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping back 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

Normal and short field takeoffs are performed with flaps up. Flap settings greater than 10° are not approved for takeoff.

Use of 10° flaps is reserved for takeoff from soft or rough fields. Use of 10° flaps allows safe use of approximately 5 KIAS lower takeoff speeds than with flaps up. The lower speeds result in shortening takeoff distances up to approximately 10%. However, this advantage is lost if flaps up speeds are used, or in high altitude takeoffs at maximum weight where climb performance would be marginal with 10° flaps. Therefore, use of 10° flaps is not recommended for takeoff over an obstacle at high altitude in hot weather.

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 59 KIAS with flaps retracted. 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 provided in Section 5 is based on the flaps up configuration.

If 10° of flaps are used on soft or rough fields with obstacles ahead, it is normally preferable to leave them extended rather than retract them in the climb to the obstacle. With 10° flaps, use an obstacle clearance speed of 55 KIAS. As soon as the obstacle is cleared, the flaps may be retracted as the airplane accelerates to the normal flaps-up climb-out 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. The airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

SEE SUPPLEMENT POH FOR TAE 125-02-114

ENROUTE CLIMB

Normal climbs are performed with flaps up and full throttle and at speeds 5 to 10 knots higher than best rate-of-climb speeds for the best combination of performance, visibility and engine cooling. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother operation or to obtain maximum RPM. For maximum rate of climb, use the best rate-of-climb speeds shown in the Rate-of-Climb chart in Section 5. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used with flaps up and maximum power. Climbs at speeds lower than the best rate-of-climb speed should be of short duration to improve engine cooling.

CRUISE

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

NOTE

Cruising should be done at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabil-

ized. This is to ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The Cruise Performance Table, figure 4-3, illustrates the true airspeed and nautical miles per gallon during cruise for various altitudes and percent powers. 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.

To achieve the recommended lean mixture fuel consumption figures shown in Section 5, the mixture should be leaned until engine RPM peaks and drops 25-50 RPM. At lower powers it may be necessary to enrichen the mixture slightly to obtain smooth operation.

SEE SUPPLEMENT POH FOR TAE 125-02-114

Should it be necessary to cruise at higher than 75% power, the mixture should not be leaned more than is required to provide peak RPM.

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

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
Sea Level	114	13.5	107	14.8	100	16.1
4000 Feet	118	14.0	111	15.3	103	16.6
8000 Feet	122	14.5	115	15.8	106	17.1
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

SEE SUPERSEDED PER TR 95-02-114

The use of full carburetor heat is recommended during flight in heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion or carburetor ice. The mixture setting should be readjusted for smoothest operation. Power changes should be made cautiously, followed by prompt adjustment of the mixture for smoothest operation.

STALLS

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

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

SPINS

Intentional spins are approved in this airplane within certain restricted loadings. Spins with baggage loadings or occupied rear seat(s) are not approved.

However, before attempting to perform spins several items should be carefully considered to assure a safe flight. No spins should be attempted without first having received dual instruction both in spin entries and spin recoveries from a qualified instructor who is familiar with the spin characteristics of the Cessna 172N.

The cabin should be clean and all loose equipment (including the microphone and rear seat belts) should be stowed or secured. For a solo flight in which spins will be conducted, the copilot's seat belt and shoulder harness should also be secured. The seat belts and shoulder harnesses should be adjusted to provide proper restraint during all anticipated flight conditions. However, care should be taken to ensure that the pilot can easily reach the flight controls and produce maximum control travels.

It is recommended that, where feasible, entries be accomplished at high enough altitude that recoveries are completed 4000 feet or more above ground level. At least 1000 feet of altitude loss should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require somewhat more than twice that amount. For example, the recommended entry altitude for a 6-turn spin would be 6000 feet above ground level. In any case, entries should be planned so that recoveries are completed well above the minimum 1500 feet above ground level required by FAR 91.71.

Another reason for using high altitudes for practicing spins is that a greater field of view is provided which will assist in maintaining pilot orientation.

The normal entry is made from a power-off stall. As the stall is approached, the elevator control should be smoothly pulled to the full aft position. Just prior to reaching the stall "break", rudder control in the desired direction of the spin rotation should be applied so that full rudder deflection is reached almost simultaneously with reaching full aft elevator. A slightly greater rate of deceleration than for normal stall entries, application of ailerons in the direction of the desired spin, and the use of power at the entry will assure more consistent and positive entries to the spin. As the airplane begins to spin, reduce the power to idle and return the ailerons to neutral. Both elevator and rudder controls should be held full with the spin until the spin recovery is initiated. An inadvertent relaxation of either of these controls could result in the development of a nose-down spiral.

For the purpose of training in spins and spin recoveries, a 1 or 2 turn spin is adequate and should be used. Up to 2 turns, the spin will progress to a fairly rapid rate of rotation and a steep attitude. Application of recovery controls will produce prompt recoveries (within 1/4 turn). During extended spins of two to three turns or more, the spin will tend to change into a spiral, particularly to the right. This will be accompanied by an increase in airspeed and gravity loads on the airplane. If this occurs, recovery should be accomplished quickly by leveling the wings and recovering from the resulting dive.

Regardless of how many turns the spin is held or how it is entered, the following recovery technique should be used:

1. VERIFY THAT THROTTLE IS IN IDLE POSITION AND AILERONS ARE NEUTRAL.
2. APPLY AND **HOLD** FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
3. JUST **AFTER** THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL.
4. **HOLD** THESE CONTROL INPUTS UNTIL ROTATION STOPS.
5. 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 may be referred to for this information.

Variations in basic airplane rigging or in weight and balance due to installed equipment or right seat occupancy can cause differences in behavior, particularly in extended spins. These differences are normal and will result in variations in the spin characteristics and in the spiraling tendencies for spins of more than 2 turns. However, the recovery technique should always be used and will result in the most expeditious recovery from any spin.

Intentional spins with flaps extended are prohibited, since the high speeds which may occur during recovery are potentially damaging to the flap/wing structure.

LANDING

NORMAL LANDING

Normal landing approaches can be made with power-on or power-off with any flap setting desired. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. Steep slips should be avoided with flap settings greater than 20° due to a slight tendency for the elevator to oscillate under certain combinations of airspeed, sideslip angle, and center of gravity loadings.

NOTE

Carburetor heat should be applied prior to any significant reduction or closing of the throttle. N/A

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

SHORT FIELD LANDING

For a short field landing in smooth air conditions, make an approach at the minimum recommended airspeed with full flaps using enough power to control the glide path. (Slightly higher approach speeds should be used under turbulent air conditions.) After all approach obstacles are cleared, progressively reduce power and maintain the approach speed by lowering the nose of the airplane. Touchdown should be made with power off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply heavy braking as required. For maximum brake effectiveness, retract the flaps, hold the control wheel full back, and apply maximum brake pressure without sliding the tires.

CROSSWIND LANDING

When landing in a strong crosswind, use the minimum flap setting required for the field length. If flap settings greater than 20° are used in sideslips with full rudder deflection, some elevator oscillation may be felt at normal approach speeds. However, this does not affect control of the airplane. 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.

The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations. With average pilot technique, direct crosswinds of 15 knots can be handled with safety.

BALKED LANDING

In a balked landing (go-around) climb, reduce the flap setting to 20° immediately after full power is applied. If obstacles must be cleared during the go-around climb, reduce the wing flap setting to 10° and maintain a safe airspeed until the obstacles are cleared. Above 3000 feet, lean the mixture to obtain maximum RPM. After clearing any obstacles, the flaps may be retracted as the airplane accelerates to the normal flaps-up climb speed.

COLD WEATHER OPERATION

STARTING

Prior to starting on cold mornings, it is advisable to pull the propeller through several times by hand to "break loose" or "limber" the oil, thus conserving battery energy.

NOTE

When pulling the propeller through by hand, treat it as if the ignition switch is turned on. A loose or broken ground wire on either magneto could cause the engine to fire.

SEE SUPPLEMENT POH FOR TAE 125-02-114

In extremely cold (-18°C and lower) weather, the use of an external preheater and an external power source are recommended whenever possible to obtain positive starting and to reduce wear and abuse to the engine and 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 7 under Ground Service Plug Receptacle for operating details.

Cold weather starting procedures are as follows:

With Preheat:

1. With ignition switch OFF and throttle closed, prime the engine four to eight strokes as the propeller is being turned over by hand.

NOTE

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

2. Propeller Area -- CLEAR.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Mixture -- FULL RICH.
6. Throttle -- OPEN 1/8 INCH.
7. Ignition Switch -- START.
8. Release ignition switch to BOTH when engine starts.
9. Oil Pressure -- CHECK.

SEE SUPPLEMENT POH FOR TAE 125-02-114

Without Preheat:

1. Prime the engine six to ten strokes while the propeller is being turned by hand with the throttle closed. Leave the primer charged and ready for a stroke.
2. Propeller Area -- CLEAR.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Mixture -- FULL RICH.
6. Ignition Switch -- START.
7. Pump throttle rapidly to full open twice. Return to 1/8 inch open position.
8. Release ignition switch to BOTH when engine starts.
9. Continue to prime engine until it is running smoothly, or alternately, pump throttle rapidly over first 1/4 of total travel.
10. Oil Pressure -- CHECK.
11. Pull carburetor heat knob full on after engine has started. Leave on until engine is running smoothly.
12. Primer -- LOCK.

NOTE

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

CAUTION

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

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

FLIGHT OPERATIONS

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

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

SEE SUPPLEMENT POH FOR TAE 125-02-114

When operating in temperatures below -18°C, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 0° to 21°C range, where icing is critical under certain atmospheric conditions.

HOT WEATHER OPERATION

Refer to the general warm temperature starting information under Starting Engine in this section. Avoid prolonged engine operation on the ground.

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 172N at 2300 pounds maximum weight is 73.8 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.

SEE SUPPLEMENT POH FOR TAE 125-02-114

SECTION 5
PERFORMANCE

TABLE OF CONTENTS

Page

Introduction 5-3
Use of Performance Charts 5-3
Sample Problem 5-3
Takeoff 5-4
Cruise 5-5
Fuel Required 5-5
Landing 5-7
Figure 5-1, Airspeed Calibration - Normal Static Source 5-8
Airspeed Calibration - Alternate Static Source . . . 5-9
Figure 5-2, Temperature Conversion Chart 5-10
Figure 5-3, Stall Speeds 5-11
Figure 5-4, Takeoff Distance - 2300 Lbs 5-12
Takeoff Distance - 2100 Lbs and 1900 Lbs 5-13
Figure 5-5, Rate Of Climb - Maximum 5-14
Figure 5-6, Time, Fuel, And Distance To Climb 5-15
Figure 5-7, Cruise Performance 5-16
Figure 5-8, Range Profile - 40 Gallons Fuel 5-17
Range Profile - 50 Gallons Fuel 5-18
Figure 5-9, Endurance Profile - 40 Gallons Fuel 5-19
Endurance Profile - 50 Gallons Fuel 5-20
Figure 5-10, Landing Distance 5-

SEE SUPPLEMENT POH FOR TAE 125-02-114

INTRODUCTION

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

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

SEE SUPPLEMENT POH FOR TAF 125-02-114

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	2250 Pounds
Usable fuel	40 Gallons
TAKEOFF CONDITIONS	
Field pressure altitude	1500 Feet
Temperature	28°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	3500 Feet

CRUISE CONDITIONS	
Total distance	460 Nautical Miles
Pressure altitude	5500 Feet
Temperature	20°C (16°C above standard)
Expected wind enroute	10 Knot Headwind
LANDING CONDITIONS	
Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

TAKEOFF

The takeoff distance chart, figure 5-4, 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 2300 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

SEE SUPPLEMENT POH FOR TAE 125-02-114

Ground roll	1075 Feet
Total distance to clear a 50-foot obstacle	1915 Feet

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

$$\frac{12 \text{ Knots}}{9 \text{ Knots}} \times 10\% = 13\% \text{ Decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	1075
Decrease in ground roll (1075 feet × 13%)	140
Corrected ground roll	935 Feet
Total distance to clear a 50-foot obstacle, zero wind	1915
Decrease in total distance (1915 feet × 13%)	249
Corrected total distance to clear 50-foot obstacle	1666 Feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A typical cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in figure 5-7, the range profile chart presented in figure 5-8, and the endurance profile chart presented in figure 5-9.

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

The range profile chart indicates that use of 65% power at 5500 feet yields a predicted range of 523 nautical miles with no wind. The endurance profile chart, figure 5-9, shows a corresponding 4.7 hours.

The range figure of 523 nautical miles is corrected to account for the expected 10 knot headwind at 5500 feet.

SEE SUPPLEMENT FOR FOR TAE 125-02-114

Range, zero wind	523
Decrease in range due to wind (4.7 hours × 10 knot headwind)	47
Corrected range	476 Nautical Miles

This indicates that the trip can be made without a fuel stop using approximately 65% power.

The cruise performance chart, figure 5-7, is entered at 6000 feet altitude and 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The engine speed chosen is 2500 RPM, which results in the following:

Power	64%
True airspeed	114 Knots
Cruise fuel flow	7.1 GPH

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

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in figures 5-6 and 5-7. For this sample problem, figure 5-6 shows that a climb from 2000 feet to 6000 feet requires 1.3 gallons

of fuel. The corresponding distance during the climb is 9 nautical miles. These values are for a standard temperature and are sufficiently accurate for most flight planning purposes. However, a further correction for the effect of temperature may be made as noted on the climb chart. The approximate effect of a non-standard temperature is to increase the time, fuel, and distance by 10% for each 10°C above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16°C above standard, the correction would be:

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

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

Fuel to climb, standard temperature	1.3
Increase due to non-standard temperature (1.3 × 16%)	0.2
Corrected fuel to climb	1.5 Gallons

Using a similar procedure for the distance to climb results in 10 nautical miles.

SEE SUPPLEMENT POH FOR TAE 125-02-114

The resultant cruise distance is:

Total distance	460
Climb distance	-10
Cruise distance	450 Nautical Miles

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

114
-10
104 Knots

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

$$\frac{450 \text{ Nautical Miles}}{104 \text{ Knots}} = 4.3 \text{ Hours}$$

The fuel required for cruise is:

4.3 hours × 7.1 gallons/hour = 30.5 Gallons

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.1
Climb	1.5
Cruise	30.5
Total fuel required	33.1 Gallons

This will leave a fuel reserve of:

40.0
-33.1
6.9 Gallons

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

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-10 presents landing distance information for the short field technique. The distances corresponding to 2000 feet and 30°C are as follows:

Ground roll	590 Feet
Total distance to clear a 50-foot obstacle	1370 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.

SEE SUPPLEMENT POH FOR TAE 125-02-114

AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

FLAPS UP											
KIAS	40	50	60	70	80	90	100	110	120	130	140
KCAS	49	55	62	70	80	89	99	108	118	128	138
FLAPS 10°											
KIAS	40	50	60	70	80	85	---	---	---	---	---
KCAS	49	55	62	71	80	85	---	---	---	---	---
FLAPS 40°											
KIAS	40	50	60	70	80	85	---	---	---	---	---
KCAS	47	54	62	71	81	86	---	---	---	---	---

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

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

FLAPS UP											
NORMAL KIAS	40	50	60	70	80	90	100	110	120	130	140
ALTERNATE KIAS	39	51	61	71	82	91	101	111	121	131	141
FLAPS 10°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	40	51	61	71	81	85	---	---	---	---	---
FLAPS 40°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	38	50	60	70	79	83	---	---	---	---	---

HEATER/VENTS OPEN AND WINDOWS CLOSED

FLAPS UP											
NORMAL KIAS	40	50	60	70	80	90	100	110	120	130	140
ALTERNATE KIAS	36	48	59	70	80	89	99	108	118	128	139
FLAPS 10°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	38	49	59	69	79	84	---	---	---	---	---
FLAPS 40°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	34	47	57	67	77	81	---	---	---	---	---

WINDOWS OPEN

FLAPS UP											
NORMAL KIAS	40	50	60	70	80	90	100	110	120	130	140
ALTERNATE KIAS	26	43	57	70	82	93	103	113	123	133	143
FLAPS 10°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	25	43	57	69	80	85	---	---	---	---	---
FLAPS 40°											
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---
ALTERNATE KIAS	25	41	54	67	78	84	---	---	---	---	---

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

TEMPERATURE CONVERSION CHART

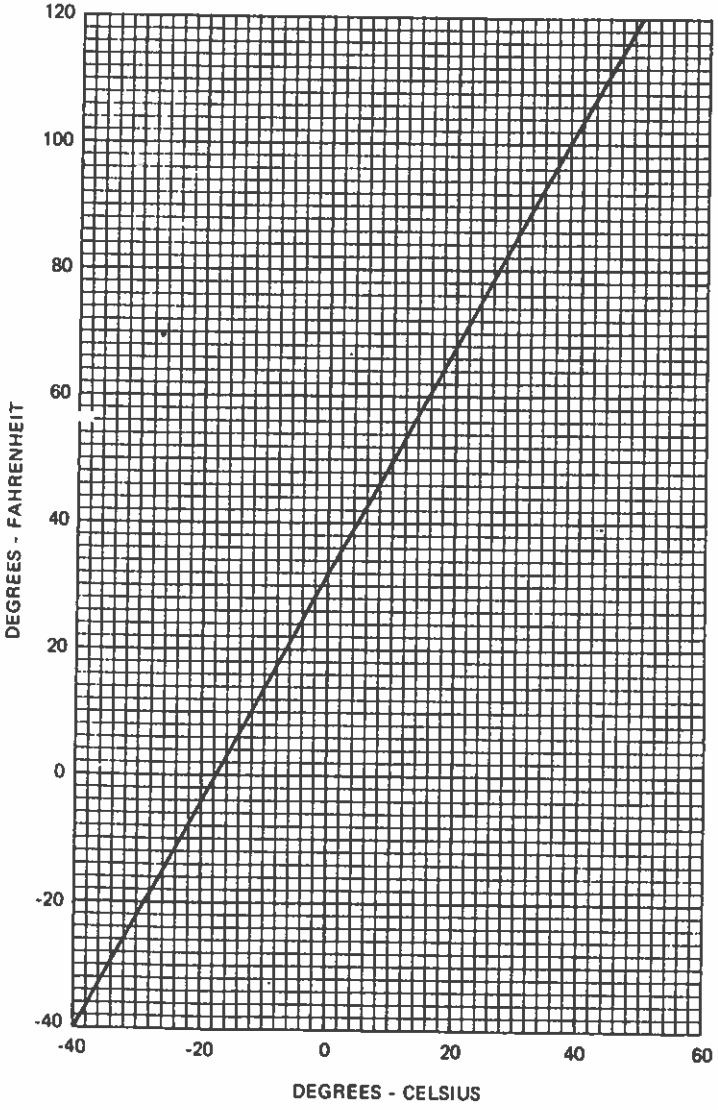


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:
1. Maximum altitude loss during a stall recovery may be as much as 180 feet.
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
2300	UP	42	50	45	54	50	59	59	71
	10°	38	47	40	51	45	56	54	66
	40°	36	44	38	47	43	52	51	62

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2300	UP	47	53	51	57	56	63	66	75
	10°	44	51	47	55	52	61	62	72
	40°	41	47	44	51	49	56	58	66

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2300 LBS

SHORT FIELD

CONDITIONS:
Flaps Up
Full Throttle Prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

SEE SUPPLEMENT POH FOR TAE 125-02-114

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
2300	52	59	S.L.	720	1300	775	1390	835	1490	895	1590	960	1700
			1000	780	1420	850	1525	915	1630	980	1745	1050	1865
			2000	865	1555	930	1670	1000	1790	1075	1915	1155	2055
			3000	950	1710	1025	1835	1100	1970	1185	2115	1270	2265
			4000	1045	1880	1125	2025	1210	2175	1300	2335	1400	2510
			5000	1150	2075	1240	2240	1335	2410	1435	2595	1540	2795
			6000	1265	2305	1365	2485	1475	2680	1585	2895	1705	3125
			7000	1400	2565	1510	2770	1630	3000	1755	3245	1890	3515
			8000	1550	2870	1675	3110	1805	3375	1945	3670	2095	3990

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

TAKEOFF DISTANCE
2100 LBS AND 1900 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
2100	50	56	S.L.	585	1070	630	1140	680	1220	725	1300	780	1390
			1000	640	1165	690	1240	740	1330	795	1420	850	1520
			2000	700	1270	755	1360	810	1455	870	1555	935	1665
			3000	770	1390	830	1490	890	1595	955	1710	1025	1830
			4000	845	1525	910	1640	980	1755	1050	1880	1130	2015
			5000	930	1680	1000	1805	1075	1935	1155	2075	1240	2230
			6000	1025	1850	1100	1990	1185	2140	1275	2300	1370	2475
			7000	1130	2050	1215	2210	1310	2380	1410	2560	1515	2755
			8000	1245	2275	1345	2480	1450	2655	1560	2865	1680	3090
1900	47	54	S.L.	470	865	505	920	540	985	580	1045	620	1115
			1000	515	940	550	1005	590	1070	635	1140	680	1215
			2000	560	1025	605	1095	645	1170	695	1245	745	1330
			3000	615	1115	660	1195	710	1275	760	1365	815	1455
			4000	670	1220	725	1305	780	1400	835	1495	895	1595
			5000	740	1340	795	1435	855	1535	920	1640	985	1755
			6000	810	1470	875	1575	940	1690	1010	1810	1085	1940
			7000	895	1620	965	1740	1035	1865	1115	2000	1195	2145
			8000	985	1790	1065	1925	1145	2065	1230	2220	1320	2385

SEE SUPPLEMENT POH FOR TAE 125-02-14

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

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
Full Throttle

NOTE:
Mixture leaned above 3000 feet for maximum RPM.

SEE SUPPLEMENT POH FOR TAE 125-02-114

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
2300	S.L.	73	875	815	755	695
	2000	72	765	705	650	590
	4000	71	655	600	545	485
	6000	70	545	495	440	385
	8000	69	440	390	335	280
	10,000	68	335	285	230	---
	12,000	67	230	180	---	---

Figure 5-5. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature

NOTES:
1. Add 1.1 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned above 3000 feet for maximum RPM.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

SEE SUPPLEMENT POH FOR TAE 125-02-114

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
2300	S.L.	15	73	770	0	0.0	0
	1000	13	73	725	1	0.3	2
	2000	11	72	675	3	0.6	3
	3000	9	72	630	4	0.9	5
	4000	7	71	580	6	1.2	8
	5000	5	71	535	8	1.6	10
	6000	3	70	485	10	1.9	12
	7000	1	69	440	12	2.3	15
	8000	-1	69	390	15	2.7	19
	9000	-3	68	345	17	3.2	22
	10,000	-5	68	295	21	3.7	27
	11,000	-7	67	250	24	4.2	32
	12,000	-9	67	200	29	4.9	38

Figure 5-6. Time, Fuel, and Distance to Climb

CRUISE PERFORMANCE

CONDITIONS:
2300 Pounds
Recommended Lean Mixture

PRESSURE ALTITUDE FT	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2500	---	---	---	75	116	8.4	71	115	7.9
	2400	72	111	8.0	67	111	7.5	63	110	7.1
	2300	64	106	7.1	60	105	6.7	56	105	6.3
	2200	56	101	6.3	53	100	6.1	50	99	5.8
	2100	50	95	5.8	47	94	5.6	45	93	5.4
4000	2550	---	---	---	75	118	8.4	71	118	7.9
	2500	76	116	8.5	71	115	8.0	67	115	7.5
	2400	68	111	7.6	64	110	7.1	60	109	6.7
	2300	60	105	6.8	57	105	6.4	54	104	6.1
	2200	54	100	6.1	51	99	5.9	48	98	5.7
	2100	48	94	5.6	46	93	5.5	44	92	5.3
6000	2600	---	---	---	75	120	8.4	71	120	7.9
	2500	72	116	8.1	67	115	7.6	64	114	7.1
	2400	64	110	7.2	60	109	6.8	57	109	6.4
	2300	57	105	6.5	54	104	6.2	52	103	5.9
	2200	51	99	5.9	49	98	5.7	47	97	5.5
	2100	46	93	5.5	44	92	5.4	42	91	5.2
8000	2650	---	---	---	75	122	8.4	71	122	7.9
	2600	76	120	8.6	71	120	8.0	67	119	7.5
	2500	68	115	7.7	64	114	7.2	60	113	6.8
	2400	61	110	6.9	58	109	6.5	55	108	6.2
	2300	55	104	6.2	52	103	6.0	50	102	5.8
	2200	49	98	5.7	47	97	5.5	45	96	5.4
10,000	2650	76	122	8.5	71	122	8.0	67	121	7.5
	2600	72	120	8.1	68	119	7.6	64	118	7.1
	2500	65	114	7.3	61	114	6.8	58	112	6.5
	2400	58	109	6.5	55	108	6.2	52	107	6.0
	2300	52	103	6.0	50	102	5.8	48	101	5.6
	2200	47	97	5.6	45	96	5.4	44	95	5.3
12,000	2600	68	119	7.7	64	118	7.2	61	117	6.8
	2500	62	114	6.9	58	113	6.5	55	111	6.2
	2400	56	108	6.3	53	107	6.0	51	106	5.8
	2300	50	102	5.8	48	101	5.6	46	100	5.5
	2200	46	96	5.5	44	95	5.4	43	94	5.3

SEE SUPPLEMENT POH FOR TAE 125-02-114

Figure 5-7. Cruise Performance

RANGE PROFILE
45 MINUTES RESERVE
40 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

SEE SUPPLEMENT POH FOR TAE 125-02-114

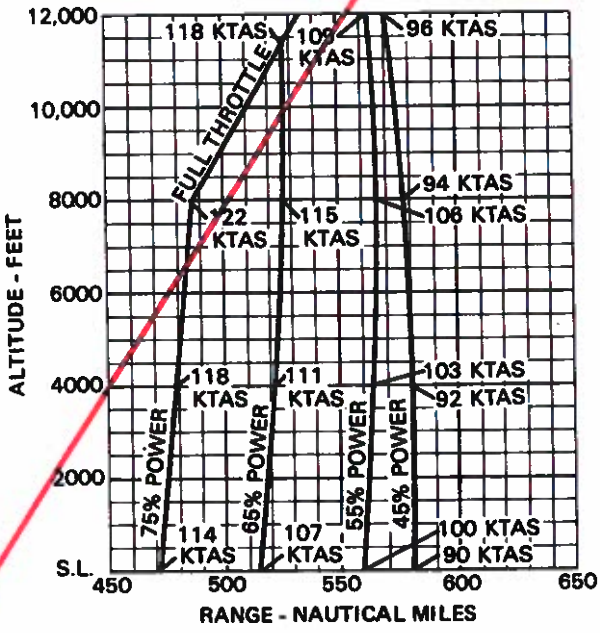


Figure 5-8. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
50 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

SEE SUPPLEMENT POH FOR TAE 125-02-114

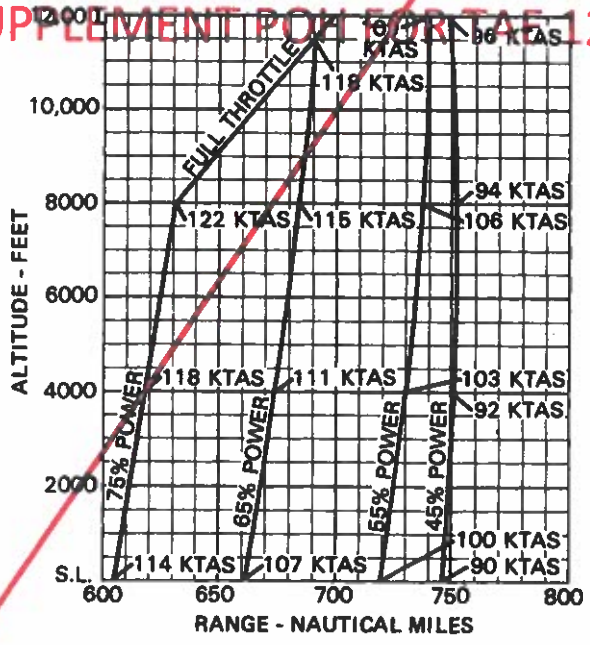


Figure 5-8. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
40 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

SEE SUPPLEMENT POH FOR TAE 125-02-114

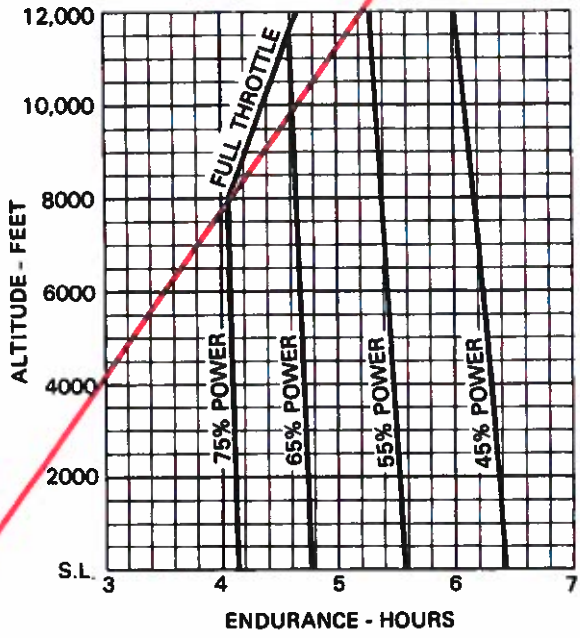


Figure 5-9. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
50 GALLONS USABLE FUEL

CONDITIONS:
2300 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb as shown in figure 5-6.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.1 gallons.

SEE SUPPLEMENT POH FOR TAE 125-02-114

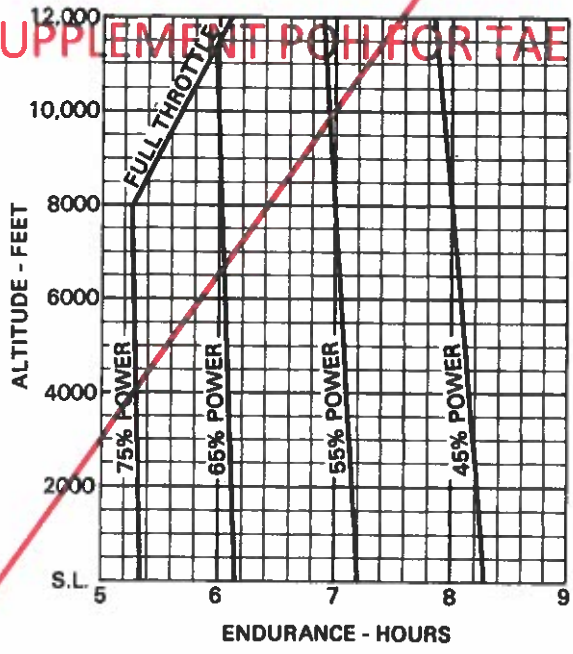


Figure 5-9. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 40°
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots
3. For operation on a dry, grass runway, increase distances by 45% 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
2300	60	S.L.	495	1205	510	1235	530	1265	545	1295	565	1330
		1000	510	1235	530	1265	550	1300	565	1330	585	1365
		2000	530	1265	550	1300	570	1335	590	1370	610	1405
		3000	550	1300	570	1335	590	1370	610	1405	630	1440
		4000	570	1335	590	1370	615	1410	635	1445	655	1480
		5000	590	1370	615	1415	635	1450	655	1485	680	1525
		6000	615	1415	640	1455	660	1490	685	1535	705	1570
		7000	640	1455	660	1495	685	1535	710	1575	730	1615
		8000	665	1500	690	1540	710	1580	735	1620	760	1665

Figure 5-10. Landing Distance





SECTION 6
WEIGHT & BALANCE/ EQUIPMENT LIST

TABLE OF CONTENTS

	Page
Introduction	6-3
Airplane Weighing Procedures	6-3
Weight And Balance	6-6
Equipment List	6-13

INTRODUCTION

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

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

AIRPLANE WEIGHING PROCEDURES

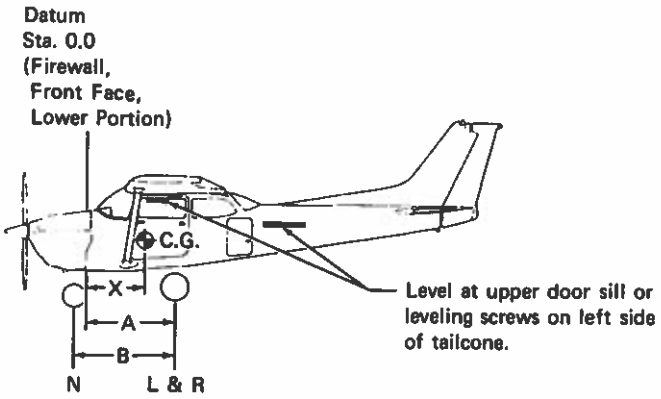
1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Remove the fuel tank sump quick-drain fittings and fuel selector valve drain plug to drain all fuel.
   c. Remove oil sump drain plug to drain all oil.
   d. Move sliding seats to the most forward position.
   e. Raise flaps to the fully retracted position.
   f. Place all control surfaces in neutral position.

2. Leveling:
   a. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1000 pounds each main).
   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



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

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-3)			
Add Oil:			
No Oil Filter (6 Qts at 7.5 Lbs/Gal)		-14.0	
With Oil Filter (7 Qts at 7.5 Lbs/Gal)		-14.0	
Add Unusable Fuel:			
Std. Tanks (3 Gal at 6 Lbs/Gal)		46.0	
L.R. Tanks (4 Gal at 6 Lbs/Gal)		46.0	
Equipment Changes			
Airplane Basic Empty Weight			

SEE SUPPLEMENT POH FOR TAE 125-02-114

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

SEE SUPPLEMENT POH FOR TAE 125-02-114

Figure 6-2. Sample Weight and Balance Record

airplane weight and C.G. can be determined.

6. Basic Empty Weight may be determined by completing figure 6-1.

WEIGHT AND BALANCE

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

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

NOTE

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

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

NOTE

Loading Graph information for the pilot, passengers and baggage 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 and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

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

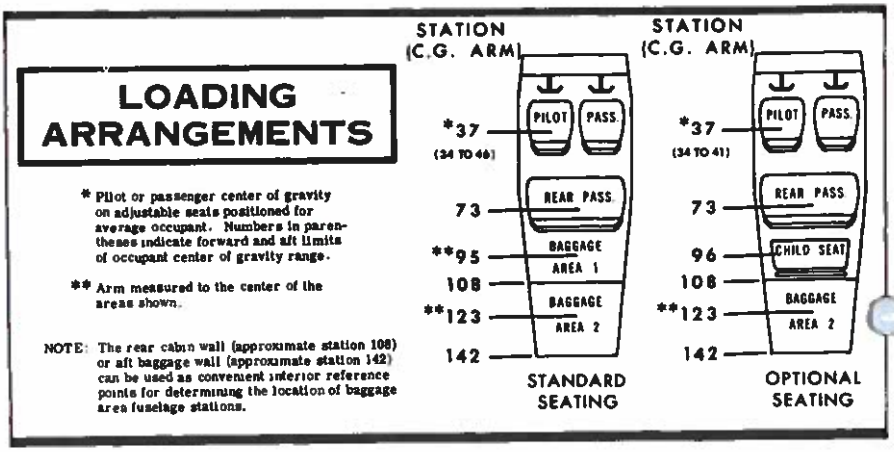
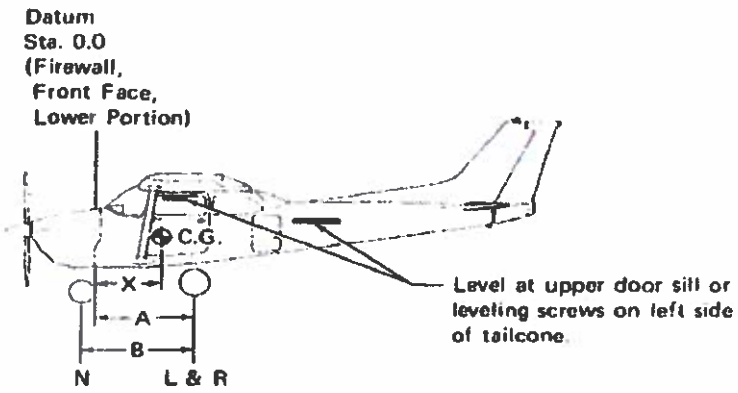


Figure 6-3. Loading Arrangements

AEROSERVICE

Owner/operator	CESSNA C172 HOLDING S.L	Work Order Nr.
Registration	D-ETKM	WO 251275
Aircraft typ	C 172 N	
Serial Nr	172-712198	
Date:	11.12.2025	



Scale position	Scale reading (Kg)	Symbol	Net weight(Kg)	Net weight(lbs)
Nose Wheel	178,5	N	178,5	393,53
Left Wheel	287	L	287	632,73
Right Wheel	280,5	R	280,5	618,40
			Kg	lbs
		Empty weight W	746	1644,65

Finding Arm	cm	in
A	147,9	58,25
B	165,2	65,04
B-A	17,3	6,81

$$Xcg = A - \frac{(N)*(B)}{W} = 108,37 \text{ cm} \quad 42,67 \text{ In}$$

M= Empty weight G * Xcg = 80845,20 cmKg

70170,53 inlbs

Max. T/O weight KG 1043
Useful load kg: 297

Weighing performed with equipment listed in AC equipment list, dated 11.12.2025, unusable fuel, engine and gearbox oil, fire extinguisher, first aid kit, pilot&copilot seat, passengers seat with seatbelts.

Weighing performed by: Matjaž Meze, SI.CAO.024, CA001

Signature:

Date of Weighing: 11.12.2025

Stamp:

AIRCRAFT EQUIPMENT LIST

OWNER: CESSNA C172 HOLDING S.L	
ADDRESS:	

I. AIRCRAFT DATA

TYPE: CESSNA	SERIAL N..: 172-712198	REGISTRATION MARK
Model: 172N		D-ETKM
MANUFACTURER: CESSNA AIRCRAFT CORPORATION		PRODUCTION YR:1979

Instrument	Manufacturer	Units	Number Inst.	Type	Serial number	Operative
ENGINE	CONTINENTAL		1	TAE 125-02-114	02-02-13026	✓
AED INSTRUMENT	CONTINENTAL		1	30-7730-5503-(07)-(05)	43202	✓
TED INSTRUMENT	CONTINENTAL		1	02-7730-5501-(06)-(02)	3300	✓
PROPELLER	MT- PROPELLER		1	MTV-6-A/190-69	220686	✓
GTN650Xi, BLACK, STANDARD – NAV/COM/GPS 1	GARMIN		1	010-01999-05	5FP056184	✓
GNC 215 NAV/COM2	GARMIN		1	010-02481-01	70D001851	✓
G5 – STBY LH	GARMIN		1	011-03809-00	4JQ087248	✓
G5 – STBY RH	GARMIN		1	011-03809-00	4JQ087158	✓
G3X - PFD	GARMIN		1	K11-00038-00, 010-12253-01		✓
AUTOPILOT GFC 500 With components: -GMC507 -GSA28 ROLL SERVO -GSA28 PITCH SERVO -GSA28 P. TRIM SERVO	GARMIN		1	K11-00024-03, K11-00024-01 011-04548-01 11-02927-21 11-02927-21 11-02927-21	5H1112989 6N2028738 6N2028683 6N2028680	✓
GTX 335 – TRX	GARMIN			010-01214-01	3EE023335	✓
GMA 350C DIGITAL BLUETOOTH AUDIO PANEL	GARMIN		1	010-00871-41	10F400411	✓
KN64 – DME	BENDIX KING		1	066-1088-00	7783	✓
ELT 406 AF	KANNAD		1	1002824	KA0047407009	✓
AT-1 TRAFFIC	AIR AVIONICS		1	AT-1-(7301)	AT1-03986	✓
WINGTIP PTA GREEN, 28V LED, ORION 650	WHELEN		1	01-0790725-11	760269	✓
WINGTIP PTA RED 28V LED, ORION 650	WHELEN		1	01-0790725-12	340225	✓
LED TAIL LIGHT	WHELEN		1	01-0771554-03	360158	✓
LED LANDING LIGHT	PARMETHEUS		1	01-0790906-00	05313	✓
LED BEACON LIGHT	WHELEN		1	01-0772010-10	520290	✓
USB PORT-GSB15	GARMIN		2	010-02544-21	63M265811, 63M265481	✓
SUNVISOR	ROSEN		2	13-18343	-	✓
SEAT BELT	CESSNA		2	S2275	0486873, 0486874	✓
SEAT BELT	CESSNA		2	S2275		✓
SEAT BELT	CESSNA		2	S1746		✓
MAGNETIC COMPASS	CESSNA		1	-		✓
LED INTERIOR LIGHT	EYEBEAM			AVE-ENB3B-00A	115461-2509-00296	✓
FIRE EXTINGUISHER	H3R		1	A344	I-30388522	✓
FIRST AID KIT	-		1	-		✓

Performed by: M. BERNIK 006 date: 11.12.2025

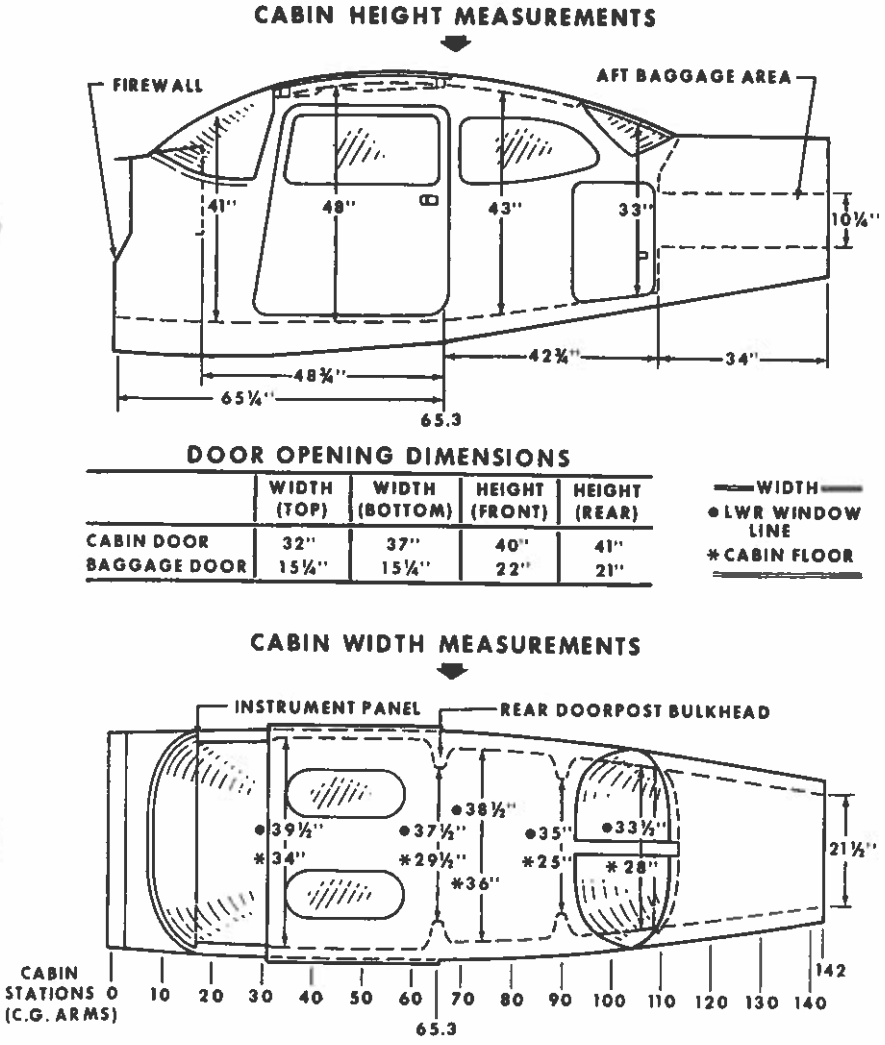


Figure 6-4. Internal Cabin Dimensions

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)	1454	57.9		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (40 Gal. Maximum) / Long Range Tanks (50 Gal. Maximum)	240	11.5		
3. Pilot and Front Passenger (Station 34 to 46)	340	12.6		
4. Rear Passengers	170	12.4		
5. * Baggage Area 1 or Passenger on Child's Seat (Station 82 to 108) 120 Lbs. Max.	96	9.1		
6. * Baggage Area 2 (Station 108 to 142) 50 Lbs. Max				
7. TOTAL WEIGHT AND MOMENT	2300	103.2		

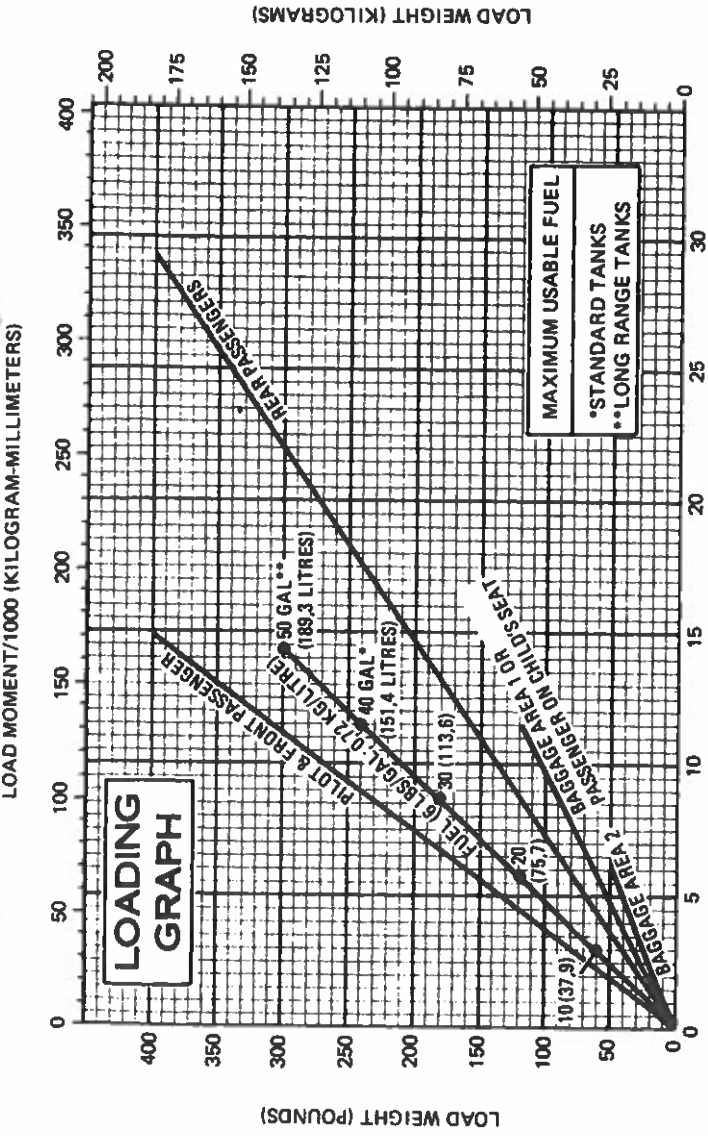
8. Locate this point (2300 at 103.2) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.

NOTE

*** The maximum allowable combined weight capacity for baggage areas 1 and 2 is 120 lbs.**

SEE SUPPLEMENT POH FOR TAE 125-02-114

Figure 6-5. Sample Loading Problem



NOTE: Line representing adjustable seats shows 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

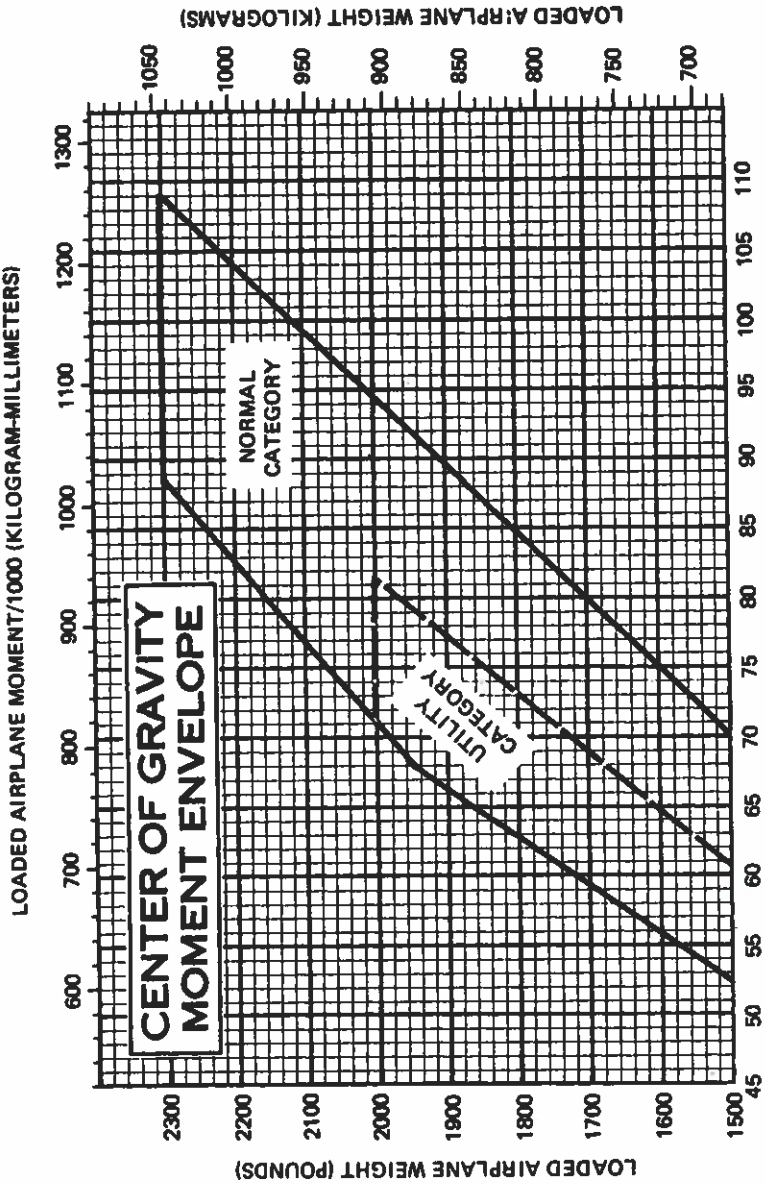


Figure 6-7. Center of Gravity Moment Envelope

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, LYCOMING O-320-H2AD (INCLUDES ELECTRIC STARTER, VACUUM PUMP PAD, SPARK PLUGS & CARBURETOR	0550333	269.5*	-19.7*
A05-R	FILTER, CARBURETOR AIR	C294510-0301	0.5	-26.0
A09-R	ALTERNATOR, 28 VOLT, 60 AMP (BELT DRIVE)	C611503-0102	10.7	-29.0
A17-R	OIL COOLER INSTALLATION	0550333	2.5*	-2.5*
	OIL COOLER	10599A	2.1	-2.5
A21-A	OIL FILTER INSTALLATION (SPIN-ON ELEMENT)	0501060	2.5	-6.5
	NET CHANGE			
A33-R	PROPELLER ASSY. (METAL CONSTANT SPEED)	C161001-0310	39.9*	-38.5*
	PROPELLER (MCCAULEY)	1C160/DTM7557	30.1	-39.1
	3.5 INCH PROP SPACER ADAPTOR (MCCAULEY)	C4516	3.6	-35.4
A33-O	PROPELLER ASSY. (FIXED PITCH-FLOATPLANE)	C161001-0307	37.5*	-38.6*
	PROPELLER (MCCAULEY)	1A175/ETM8042	31.8	-39.1
	3.5 INCH PROP SPACER ADAPTOR (MCCAULEY)	C4516	3.6	-35.4
A41-R	SPINNER INSTALLATION, PROPELLER	0550320	2.0*	-41.4*
	SPINNER DOME	0550236-8	1.2	-43.1
	FWD SPINNER BULKHEAD	0550321-4	0.3	-40.8
	AFT SPINNER BULKHEAD	0550321-10	0.4	-37.3
A61-S	VACUUM SYSTEM INSTALLATION	0501054	4.3*	-3.0*
	DRY VACUUM PUMP	C431003-0101	2.8	-6.3
	FILTER	1201075-2	0.2	4.7
	VACUUM GAUGE	C668509-0101	0.1	16.2
	RELIEF VALVE-REGULATOR	C482001-0401	0.5	4.5
A70-A	PRIMER SYSTEM, ENGINE THREE CYLINDER	0501056-1	0.5	-12.0
A73-A	OIL QUICK DRAIN VALVE (NET CHANGE)	1701015	0.0	- -
	B. LANDING GEAR & ACCESSORIES			
B01-R	WHEEL, BRAKE & TIRE ASSY, 6.00X6 MAIN (2)	C163018-0201	41.7*	57.8*
	WHEEL ASSY, MCCAULEY	C163005-0101	7.6	58.2
	BRAKE ASSY., MCCAULEY (LEFT)	C163032-0115	11.9	54.4
	BRAKE ASSY., MCCAULEY (RIGHT)	C163032-0114	11.9	54.4
	TIRE, 4-PLY BLACKWALL (EACH)	C262003-0101	8.5	58.2
	TUBE (EACH)	C262023-0102	1.8	58.2
B04-R	WHEEL & TIRE ASSY., 5.00X5 NOSE	C163018-0101	18.7*	-6.8*
	WHEEL ASSY., MCCAULEY	C163005-0201	2.4	-6.8

SEE SUPPLEMENT POH FOR TAF 125-02-114

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	TIRE, 4-PLY BLACKWALL	C262003-0102	4.7	-6.8
	TUBE	C262023-0101	1.2	-6.8
B10-S	FAIRING INSTALLATION, WHEEL (SET OF 3)	0541225-1	17.8*	47.1*
	NOSE WHEEL FAIRING		4.0	-4.9
	MAIN WHEEL FAIRING (EACH)		5.7	60.3
	C. ELECTRICAL SYSTEMS			
C01-R-1	BATTERY, 24 VOLT, 14 AMP HR	0870060-1	27.5	0.0
C01-R-2	BATTERY, 24 VOLT, 14 AMP HR	C614001-0101	22.8	0.0
C01-O	BATTERY, 24 VOLT, 17 AMP HR	C614001-0102	24.8	0.0
C04-R	REGULATOR, 28 VOLT ALTERNATOR	C611004-0101	0.5	3.5
C07-A	GROUND SERVICE PLUG RECEPTACLE	0501064	2.7	-2.6
C16-O	HEATING SYSTEM, PITOT (NET CHANGE)	0422355	0.6	24.4
C22-A	LIGHTS, INSTRUMENT POST (REQUIRES INSTALLATION OF E34-O DELUXE GLARESHIELD)	0513094	0.5	16.5
C25-A	LIGHT, MAP (CONTROL WHEEL MOUNTED)	0570087	0.2	21.5
C28-S	LIGHT, MAP & INSTRUMENT PANEL FLOOD (DOORPOST MOUNTED)	0700149	0.3	32.0
C31-A	LIGHTS, COURTESY ENTRANCE (SET OF 2)	0521101	0.5	61.0
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF 2)	0701013-1, -2	NEGL	- -
C43-A	LIGHT INSTALLATION, OMNIFLASH BEACON	0506003	2.1*	184.2*
	BEACON LIGHT ON FIN TIP	C621001-0102	0.4	243.0
	FLASHER POWER SUPPLY	C594502-0102	0.8	205.8
	RESISTOR (MEMCOR)	OR95-6	0.3	208.1
C46-A	LIGHT INSTALLATION, WING TIP STROBE	0501027	3.4*	43.3*
	FLASHER POWER SUPPLY (SET OF 2 IN WING)	C622008-0102	2.3	47.0
	STROBE LIGHT, WING TIP (SET OF 2)	C622006-0101	0.2	43.5
C49-S	LIGHT INSTALLATION, COWL MOUNTED LANDING LAMP, 250 WATT (G.E.)	0570312 4553	1.9* 0.8	-27.1* -29.0
C49-O	LIGHTS, DUAL COWL MOUNTED LANDING LAMP, 250 WATT (G.E.) (EACH)	0552141 4591	3.2* 0.5	-23.0* -29.0
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0102	0.6	16.2
D01-O	INDICATOR, TRUE AIRSPEED	0513279	0.7	16.35
D04-A	STATIC AIR ALTERNATE SOURCE	0501017	0.2	15.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D07-R	ALTIMETER (SENSITIVE	C661071-0101	1.0	14.0
D07-0-1	ALTIMETER, SENSITIVE (50 FT. MARKINGS) (FEET AND MILLIBARS)	C661071-0102	1.0	14.0
D07-0-2	ALTIMETER (SENSITIVE) 20FT. MARKINGS (FEET AND MILLIBARS)	C661025-0102	1.0	14.0
D10-A	ALTIMETER, 2ND UNIT INSTALLATION (DUAL)	2001015	1.0	14.5
D16-A-1	ENCODING ALTIMETER (REQUIRES RELOCATION OF REGULAR ALTIMETER)	0501049	3.0	14.0
D16-A-2	ENCODING ALTIMETER, FEET & MILLIBARS (REQUIRES RELOCATION OF REGULAR ALTIMETER)	0501049	3.0	14.0
D16-A-3	ENCODING ALTIMETER, USED WITH TRANSPONDER, (BLIND ENCODER-DOES NOT REQUIRE INSTRUMENT PANEL MOUNT)	0501059	1.5*	14.4*
D19-R	~~AMMETER~~			
D22-A	~~GAGE, CARBURETOR AIR TEMPERATURE~~ N/A	S-1320-5	0.3	16.5
D25-S	CLOCK, ELECTRIC	0513339	1.0	14.0
D28-R	COMPASS, MAGNETIC-INSTALLATION	C664508-0101	0.4	16.3
D38-R	INSTRUMENT CLUSTER, LH & RH FUEL QUANTITY	0513262-1	0.5	14.0
D41-R	INSTRUMENT CLUSTER, OIL PRESS, OIL TEMP.	C669511-0102	0.5	16.5
D64-S	GYROS, ATTITUDE & DIRECTIONAL INDICATORS (NON-NAV-O-MATIC)	C669512-0102	0.5	16.5
	DIRECTIONAL INDICATOR (AV. OF 4)	0501054-1	5.8*	14.0*
	ATTITUDE INDICATOR (AV. OF 3)	C661075	2.7	13.2
D64-O	GYRO INSTALLATION FOR 300 NAV-O-MATIC	C661076	2.2	13.4
	DIRECTIONAL INDICATOR (ARC)	0501054-2	6.9*	13.4*
	ATTITUDE INDICATOR	040760	3.3	13.3
D67-A	RECORDER INSTALLATION, FLIGHT HOUR	C661076	2.2	13.4
D82-S	GAGE, OUTSIDE AIR TEMPERATURE	0501052	0.5	6.3
D85-R	TACHOMETER INSTALLATION, ENGINE	C668507-0101	0.1	28.6
	RECORDING TACH INDICATOR	0506004	1.0*	12.1*
	FLEXIBLE TACH SHAFT	C668020-0118	0.7	16.0
D88-S	INDICATOR, TURN COORDINATOR	S-1605-10	0.3	3.0
D88-O	INDICATOR, TURN COORDINATOR (FOR USE WITH NAV-O-MATIC 200A AND 300A)	C661003-0505	1.3	15.8
D91-S	INDICATOR, VERTICAL SPEED	42320-0028	1.9	14.6
		C661080-0101	1.0	14.9
	E. CABIN ACCOMMODATIONS			
E02-S	ARM RESTS - 2ND ROW (SET OF 2)	0715039	1.5	72.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E05-R	SEAT, ADJUSTABLE FORE & AFT - PILOT		12.6	44.0
E05-0	SEAT, INFINITE ADJUSTABLE - PILOT		23.0	41.0
E07-S	SEAT, ADJUSTABLE FORE & AFT - CO-PILOT		12.6	44.0
E07-0	SEAT, INFINITE ADJUSTABLE - CO-PILOT		23.0	41.0
E09-S	SEAT, REAR (ONE PIECE BACK CUSHION)		22.0	79.5
E09-0	SEAT, REAR (TWO PIECE BACK CUSHION)		23.4*	101.1*
E11-A	SEAT INSTALLATION, CHILDS FOLD AWAY		8.8	100.8
	LAP BELT ASSY	0501009	7.0	137.0
	SEAT ASSY	S-1746-5		
E15-R	PILOT LAP BELT ASSY	0714005-103	1.0	37.0
E15-S	SHOULDER HARNESS ASSY, PILOT	S-2275-201	0.6	82.0
E19-0	SHOULDER HARNESS INERTIA REEL INSTALLATION PILOT & CO-PILOT - REPLACES STD BELTS AND HARNESS (NET CHANGE)	0501046-1	2.0	
E23-S	BELT & SHOULDER ASSY - CO-PILOT	S-2275-3	1.6	37.0
E27-S	BELT ASSY, 2ND ROW (SET OF 2)	S-1746-39	2.0	70.0
E27-0	SEAT BELT & SHOULDER HARNESS ASSY FOR 2ND ROW SEATING	S-2275-8	3.2	70.0
E34-0	DELUXE GLARESHIELD (NET CHANGE)	0515034	1.0	21.0
E35-A	LEATHER SEAT COVERING (NET CHANGE)	CES-1151	2.0	62.0
E37-A	WINDOWS, HINGED, RH DOOR (NET CHANGE)	0511803	2.9	47.0
E39-A	WINDOWS, OVERHEAD CABIN TOP (NET CHANGE)	0511800	0.7	60.0
E43-A	VENTILATION SYSTEM, REAR SEAT	0700322	1.7	15.0
E49-A	BEVERAGE CUP HOLDER	0501023	1.7	47.0
E50-A	HEADREST, 1ST ROW (WT EACH)	1215073-11	0.7	86.0
E51-A	HEADREST, 2ND ROW (WT EACH)	1215073-11	0.7	86.0
E53-A	MIRROR, REAR VIEW	0500312	0.3	155.0
E55-S	SUN VISORS (SET OF 2)	0500040	0.9	32.0
E57-A	WINDOWS, TINTED FRONT, SIDE & REAR (NET CHANGE)	0500267	0.0	-
E65-S	BAGGAGE NET	2015009	0.5	95.0
E71-A	RINGS, CARGO TIE-DOWN (STOWED) (USE ARM AS INSTALLED WITH CARGO)	0500042	1.0	-
E85-A	CONTROLS INSTALLATION, DUAL	0513335	4.9	12.4
E87-A	RUDDER TRIM SYSTEM	0513290-1	1.9*	19.4*
E88-A	CABIN AIR CONDITIONING SYSTEM -CHILLED AIR	0501066	6.5*	43.2*
	COMPRESSOR		20.2	-29.0
	EVAPORATOR (LOCATED ABOVE AFT BAGGAGE)		9.1	123.5
	CONDENSOR (LOCATED UNDER SIDE)		5.3	96.2
E93-R	HEATING SYSTEM, CABIN & CARBURETOR AIR (INCLUDES EXHAUST SYSTEM)	0550333	17.5	-21.0
		0506004		

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	F. PLACARDS & WARNING			
F01-R	PLACARD, OPERATIONAL LIMITATIONS-DAY VFR	0505053-1	NEGL	- -
F01-0-1	PLACARD, OPERATIONAL LIMITATIONS-DAY NIGHT VFR	0505053-2	NEGL	- -
F01-0-2	PLACARD, OPERATIONAL LIMITATIONS-DAY NIGHT VFR IFR	0505053-3	NEGL	- -
F01-0-3	PLACARD, OPERATIONAL LIMITATIONS-DAY VFR FLOATPLANE	0505053-16	NEGL	- -
F01-0-4	PLACARD, OPERATIONAL LIMITATIONS-DAY NIGHT VFR FLOATPLANE	0505053-17	NEGL	- -
F01-0-5	PLACARD, OPERATIONAL LIMITATIONS-DAY NIGHT VFR IFR FLOATPLANE	0505053-18	NEGL	- -
	NOTE THE ABOVE PLACARDS ARE INSTALLED ACCORDING TO AIRCRAFT EQUIPMENT			
F04-R	INDICATOR, AUDIBLE PNEUMATIC STALL WARNING	0523112	0.2	28.5
F13-S	OVERVOLT WARNING LIGHT, ALTERNATOR		NEGL	- -
	G. AUXILIARY EQUIPMENT			
G07-A	RINGS, AIRPLANE HOISTING (CABIN TOP)	0541115	0.9	49.1
G13-A	CORROSION PROOFING, INTERNAL	0500036	10.0	77.0
G16-A	STATIC DISCHARGERS	0501048	0.4	143.2
G19-A	STABILIZER ABRASION BOOTS	0500041	2.7	206.0
G22-S	TOW BAR (STOWED)	0501019	1.6	95.0
G25-S-1	PAINT, OVERALL EXTERIOR (MODIFIED POLY URETHANE)	0504035	12.6*	90.4*
	OVERALL BASE WHITE		11.6	90.5
	COLOR STRIPE		0.6	89.2
	WASH PRIME COATING (OVERALL COVER)		0.4	90.5
G25-S-2	PAINT, OVERALL COVER (ACRYLIC)	0504035	11.7*	90.4*
	OVERALL WHITE		10.8	90.5
	COLOR STRIPE		0.5	89.2
	WASH PRIME		0.4	90.5
G25-0-1	PAINT SCHEME-SKYHAWK II	0504035	12.6*	90.4*
G25-0-2	PAINT OVERALL EXTERIOR (MODIFIED POLY-URETHANE--USED WITH INTERNAL CORROSION PROOFING, ITEM G13-A)	0504035	12.6*	90.4*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
G31-A	CABLES, CORROSION RESISTANT CONTROL (NET CHANGE)	0500036	0.0	- -
G55-A	FIRE EXTINGUISHER INSTALLATION	0501011	3.0*	43.8*
	FIRE EXTINGUISHER	C421001-0101	2.6	44.0
	FIRE EXTINGUISHER MOUNTING BRACKET	C421001-0102	0.3	42.2
G58-A	STEPS & HANDLES, REFUELING ASSISTING	0513415	1.7	16.3
G67-A	RUDDER PEDAL EXTENSIONS, REMOVABLE - SET OF 2 (STOWABLE - INSTALLED ARM SHOWN)	0701048	2.3	8.0
G88-A-1	WINTERIZATION KIT INSTALLATION, ENGINE	0501008	0.8*	-22.7*
	BREATHER TUBE INSULATION	0552011	0.4	-13.8
	TWO COWL INLET AIR COVERS (INSTALLED)	0552132-1, -2	0.3	-32.0
	(STOWED)	0552132-1, -2	0.3	95.0
G88-A-2	WINTERIZATION KIT INSTL., FLOATPLANE ONLY	0552011	1.0*	-7.2*
	BREATHER TUBE INSULATION		0.4	-12.0
	COWL OUTLET COVER (1) (INSTALLED)		0.6	-4.0
	(STOWED)		0.6	95.0
G92-D	FUEL SYSTEM, LONG RANGE WING TANKS (NET CHANGE)	0520013	9.5	48.0
	H. AVIONICS & AUTOPILOTS			
H01-A	CESSNA 300 ADF INSTALLATION	3910159-2	7.0*	21.0*
	CONSISTS OF			
	RECEIVER WITH BFO (R-546E)	41240-0101	2.3	12.1
	INDICATOR (IN-346A)	40980-1001	0.9	14.0
	SENSE ANTENNA INSTALLATION	0570400-632	0.2	108.6
	LOOP ANTENNA INSTALLATION	3960104-1	1.4	39.3
	RECEIVER MOUNT, WIRES AND MISC ITEMS		2.2	13.7
H04-A	DME INSTALLATION, NARCO	3910166-1	7.5*	18.5*
	RECEIVER (DME-190)	3312-400	4.9	11.3
	MOUNTING BOX		0.6	11.3
	ANTENNA,	UDA-3	0.2	86.1
H07-A-1	CESSNA 400 GLIDESLOPE (INCLUDES VOR/ILS INDICATOR--NET CHANGE FOR VOR/LOC	3910157	4.4*	81.1*
	RECEIVER (R-443B)	42100-0000	2.1	117.0
	ANTENNA (LOCATED-UPPER WINDSHIELD)	1200098-2	0.2	30.0
	VOR/ILS INDICATOR (IN-386A)(INDICATOR WT NET CHANGE, ACTUAL WT IS 2.3 LBS)	46860-2000	0.1	15.5
H07-A-2	CESSNA 400 GLIDESLOPE (INCLUDES AUTOCOURSE VOR/ILS INDICATOR, WT NET CHANGE FOR	3910157	4.1*	81.1*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	VOR/LOC INDICATOR)			
	RECEIVER (R-443B)	42100-0000	2.1	117.3
	ANTENNA (LOCATED-UPPER WINDSHIELD)	1200098-2	0.2	30.0
	VOR/ILS INDICATOR (IN-386AC)(INDICATOR	46860-2200	0.1	15.5
	WT NET CHANGE, ACTUAL WT IS 2.3 LBS)			
H11-A-1	PANTRONICS PT-10A HF TRANSCEIVER 2ND UNIT	3910156-9	20.2*	88.8*
	TRANSCEIVER (PANEL MOUNTED)	C582103-0102	4.2	10.4
	ANTENNA LOAD BOX	C589502-0201	4.2	112.5
	HF POWER SUPPLY (REMOTE)	C582103-0301	8.5	114.4
	NOISE FILTER, HIGH FREQ.	0570400-715	0.1	-0.5
	POWER & SIGNAL CABLES		2.5	41.0
	ANTENNA INSTALLATION, 351 IN. LONG	3960117	0.3	144.4
H11-A-2	SUNAIR ASB-125 HF TRANSCEIVER, 2ND UNIT	3910158-1	22.0*	82.8*
	ANTENNA LOAD BOX	99816	4.9	112.0
	POWER SUPPLY (REMOTE)	99683	8.5	114.0
	TRANSCEIVER (PANEL MOUNTED)	99681	4.6	10.4
	ANTENNA INSTALLATION, 351 IN. LONG	3960117	0.3	144.4
	MISC SWITCHES, WIRES AND ETC.	- -	3.7	57.5
H11-A-3	PANTRONICS PT-10A HF TRANSCEIVER 3RD UNIT	3910156-11	20.2*	88.8*
H11-A-4	SAME AS 2ND UNIT (ITEM H-11-A-1)			
	SUNAIR ASB-125 HF TRANSCEIVER, 3RD UNIT	3910158-5		
H13-A-1	SAME AS 2ND UNIT (ITEM H-11-A-2)			
	CESSNA 400 MARKER BEACON	3910164-1	2.3*	34.5*
	RECEIVER (R-402A)	42410-5128	0.7	11.8
	ANTENNA, L SHAPED ROD	0770681-1	0.7	136.0
H13-A-2	BENDIX MARKER BEACON (USED IN EXPORT A/C)	3910174-2	3.1*	100.8*
	RECEIVER, GM-247A	3940185-1	1.5	115.9
	ANTENNA, L SHAPED ROD	0770681-1	0.7	136.0
H16-A-1	CESSNA 300 TRANSPONDER	3910127-17	4.0*	25.8*
	TRANSCEIVER (RT-359A)	41420-1128	2.7	11.1
	ANTENNA	- -	0.3	126.0
H16-A-2	CESSNA 400 TRANSPONDER (USED FOR EXPORT)	3910128-21	4.2*	25.1*
	TRANSCEIVER (RT-459A)	41470-1128	2.9	11.1
	ANTENNA	- -	0.3	126.0
H22-A-1	CESSNA 300 NAV/COM, 720 CH, FIRST UNIT	3910183-4	15.8*	30.0*
	WITH VOR/LOC			
	RECEIVER-TRANSCEIVER (RT-385A)	46660-0000	5.4	11.5
	VOR/LOC INDICATOR (IN-385A)	46860-1000	2.2	14.5
	H34-A BASIC AVIONICS KIT	3910186	7.0	52.6
	MOUNT, WIRE & MISC HARDWARE		1.2	10.0
H22-A-2	CESSNA 300 NAV/COM, 720 CH, FIRST UNIT	3910183	15.8*	30.0*
	WITH VOR/LOC AUTOCOURSE INDICATOR			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	RECEIVER-TRANSCEIVER (RT-385A)	46660-0000	5.4	11.5
	VOR/LOC INDICATOR (IN-385AC) (AUTOMATIC	46860-1200	2.2	14.5
	RADIAL CENTERING)			
	H34-A BASIC AVIONICS KIT	3910186	7.0	52.6
H25-A-1	CESSNA 300 NAV/COM 720 CH COM 2ND UNIT	3910183-6	1.2*	10.6*
	MOUNT, WIRING & MISC HARDWARE		9.8*	14.6*
	WITH VOR/LOC			
	RECEIVER-TRANSCEIVER (RT-385A)	46660-0000	5.4	11.5
	VOR/LOC INDICATOR (IN-385A)	46860-1000	2.2	14.5
	VHF COMMUNICATIONS ANTENNA CABLE		0.2	27.8
	OMNI ANTENNA COUPLER (SIGNAL SPLITTER)	3960111-1	0.2	7.0
	COM. ANTENNA, R.H. SIDE HARDWARE	3960113-2	0.2	62.0
H25-A-2	CESSNA 300 NAV/COM 720 CH COM 2ND UNIT	3910183	1.2*	10.6*
	WITH VOR/LOC AUTOCOURSE INDICATOR		9.8*	14.6*
	RECEIVER-TRANSCEIVER (RT-385A)	46660-0000	5.4	11.5
	VOR/LOC INDICATOR (IN-385AC) (AUTOMATIC	46860-1200	2.2	14.5
	RADIAL CENTERING)			
	VHF COM ANTENNA CABLE ASSY		0.2	27.8
	OMNI ANTENNA COUPLER (SIGNAL SPLITTER)	3960111-1	0.2	7.0
	COM. ANTENNA R.H. SIDE	3960113-2	0.2	62.0
	MOUNT, WIRING & MISC HARDWARE		1.2	10.0
H28-A-1	EMERGENCY LOCATOR TRANSMITTER	0470419-3	1.8*	116.6*
	TRANSMITTER (D-6 M DMELT-6)	C5895111-0101	1.6	122.0
	ANTENNA	C5895111-0109	0.1	116.6
H28-A-2	EMERGENCY LOCATOR TRANSMITTER (USED IN	0470419-4	1.8*	116.6*
	CANADA)			
	TRANSMITTER (D & M DMELT-6)	C5895111-0102	1.6	116.4
	ANTENNA	C5895111-0109	0.1*	122.0*
H31-A-1	NAV-O-MATIC 200A	3910162-1	9.8*	148.6*
	CONTROLLER-AMPLIFIER	3930144-6	1.6	133.1
	TURN COORDINATOR (NET CHNG) (G-300A)	4232032-0014	0.6	122.0*
	WING INSTALLATION	0522632-1	0.6*	68.9*
	SERVO-UNIT (PA-495)	42330	3.9	68.9
H31-A-2	NAV-O-MATIC 300A (AF395) & MOUNT	3910163-1	11.5*	142.8*
	CONTROLLER-AMPLIFIER	CA-3955A	1.8	133.1
	D64-O GYRO INSTALLATION NET CHANGE	0513398	1.1	10.2
	D88-O TURN COORDINATOR NET CHANGE	4232032-0028	0.6	122.0*
	WING INSTALLATION	0522632-1	0.6*	68.9*
	SERVO UNIT (PA-495)	42330	3.9	68.9
	RELAY INSTALLATION	3940151-1	0.4	64.0
H34-A	BASIC AVIONICS KIT--AVAILABLE WITH 1ST	3910186-2	7.0*	52.6*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	UNIT NAV/COM ONLY			
	RADIO COOLING INSTL.	3930152-1	1.1	10.2
	NOISE FILTER-AUDIO (ON ALTERNATOR)	3940148-1	0.1	-26.1
	COM ANTENNA CABLE	3950122-3	0.4	27.8
	OMNI ANTENNA CABLE	3950122-4	0.6	116.0
	OMNI ANTENNA INSTALLATION	3960102-10	0.8	220.8
	LH VHF COM ANTENNA	3960113-1	0.4	62.4
	CABIN SPEAKER INSTL.	3970123-5	1.2	37.9
	MIKE INSTL--HANDHELD	3970124-1	0.3	17.2
	HEADPHONE INSTALLATION	3970125-4	0.2	14.2
	AUDIO CONTROL PANEL INSTL	3970131-1	1.9	12.5
H43-A	AVIONICS OPTION D NAV-O-MATIC WING PROV.	0522632-2	1.7	68.2
H55-A	MIKE-HEADSET COMBO. INSTL (HEADSET STOWED) (STOWED ARM SHOWN)(INCLUDES ALL PURPOSE CONTROL WHEEL)	3970112-1	0.3	13.0
H56-A	PADDED HEADPHONES (STOWED)	C59653-0101	1.1	- -
	J. SPECIAL OPTION PACKAGES			
J01-A	SKYHAWK II EQUIPMENT CONSISTS OF ITEMS	0500510	26.0*	45.4*
	D01-0 TRUE AIRSPEED IND.(NET CHANGE)	0513279	0.1	16.7
	C16-0 HEATED PITOT SYSTEM	0422355	0.6	24.4
	E85-A DUAL CONTROLS	0513335	4.9	12.4
	C40-A NAV LIGHT DETECTORS	0701013	NEGL	- -
	C31-A COURTESY LIGHTS	0521101	0.5	61.0
	C43-A FLASHING BEACON LIGHT	0506003	2.1	184.2
	D04-A STATIC ALTERNATE AIR SOURCE	0501017	0.2	15.5
	H28-A EMERGENCY LOCATOR XMTR (ELT)	470419	1.8	116.6
	G25-0 SKYHAWK II PAINT (NET CHANGE)	0504035	0.0	- -
	H22-A-1 NAV/COM 385A VOR/LOC	3910183-4	15.8	30.0
J04-A	NAV-PAC INSTALLATION (SKYHAWK II ONLY)	3910161	20.8*	19.0*
	H25-A-1 385A NAV/COM VOR/LOC 2ND UNIT		9.8	14.6
	H01-A 300 ADF (546E)		7.0	21.0
	H16-A-1 300 TRANSPONDER (RT-359)		4.0	26.1
J10-A	FLOATPLANE FUSELAGE STRUCTURAL MODIFICATIONS & FITTINGS (OPTION C)	0500083	6.1	45.5
J13-A	FLOATPLANE COWLDECK V BRACE (INSTALLED) (STOWED)	0513003	1.1 1.1	26.2 95.0
J15-A	FLOATPLANE AILERON-RUDDER INTERCONNECT FLOATPLANE ONLY (INSTALLED)	0560012	0.4	69.6

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	ITEMS J10-A & J13-A ARE (STOWED)		0.4	95.0
	LANDPLANE OPERATIONS. ALSO APPROVED FOR			
J27-A	MODEL 85A2000 FLOATS & 502 ATTACHMENTS	EDC-36335	- -	- -
	NET CHANGE BETWEEN STANDARD LANDING			
	GEAR (LESS NOSE BOI-R, BO4-R, B10-S			
	AND BRAKE & NOSE WHEEL STEERING			
	SYSTEMS) AND FLOATPLANE KIT (ITEM NO.			
	J30-A-1) IS APPROXIMATELY 155 LBS. AT			
	52.3 IN. THE CORRECT VALUES OF WT & ARM			
	CHANGE FOR WT & BALANCE CALCULATIONS			
	SHOULD BE DETERMINED FROM THE ACTUAL			
	INSTALLATION.			
J30-A-1	FLOATPLANE EQUIPMENT KIT, COMPLETE, OPTION	0500083	21.7*	52.3*
	A CONSISTS OF ITEMS, FLOATPLANE, EXCHANGE	0550320	1.3	-41.4
	A33-00- PROPELLER, FLOATPLANE OPERATION	0505053	0.0	- -
	FC01-00- PLACARD, CORROSION RESIST, EXCH.	0500036	0.0	- -
	G13-A CORROSION PROOFING, INTERNAL	0500036	10.0	77.0
	G07-A RINGS, AIRPLANE HOISTING	0541115	1.1	49.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE MODIFICATION (OPT C)	0500083	6.1	45.5
	J13-A COWL DECK V-BRACE (INSTALLED)	0513033	1.1	26.2
	J15-A INTERCONNECT SYSTEM, INSTALLED	0560012	0.4	69.6
	COWL ASSY, FLOATPLANE (NET CHG)	0552162	NEGL	- -
J30-A-2	FLOATPLANE EQUIPMENT KIT, PARTIAL OPTION B	0500083	20.4*	62.5*
	CONSISTS OF ITEMS, FLOATPLANE OPERATION	0505053	0.0	- -
	FC01-00- PLACARD, CORROSION RESIST, EXCH	0500036	0.0	- -
	G13-A CORROSION PROOFING, INTERNAL	0500036	10.0	77.0
	G07-A RINGS, AIRPLANE HOISTING	0541115	1.1	49.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE MODIFICATION	0500083	6.1	45.5
	J13-A COWL DECK V-BRACE (STOWED)	0513033	1.1	95.0
	J15-A INTERCONNECT SYSTEM (STOWED)	0560012	0.4	95.0
	COWL ASSY, FLOATPLANE (NET CHG)	0552162	NEGL	- -
J30-A-3	FLOATPLANE KIT B WITH NO INTERNAL CORRCS-	0500083-17	10.4*	41.2*
	ION PROOFING)			
	G07-A RINGS, AIRPLANE HOISTING	0541115	1.1	49.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE MODIFICATIONS	0500083	6.1	45.5
	J13-A COWL DECK V-BRACE (INSTALLED)	0513033	1.1	26.2

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	J15-A INTERCONNECT SYSTEM (STOWED) COWL ASSY, FLOATPLANE (NET CHG)	0560012 0552162	0.4 NEGL	95.0

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

TABLE OF CONTENTS

	Page
Introduction	7-3
Airframe	7-3
Flight Controls	7-8
Trim System	7-8
Instrument Panel	7-8
Ground Control	7-9
Wing Flap System	7-10
Landing Gear System	7-10
Baggage Compartment	7-11
Seats	7-11
Seat Belts And Shoulder Harnesses	7-12
Seat Belts	7-12
Shoulder Harnesses	7-12
Integrated Seat Belt/Shoulder Harnesses With Inertia Reels	7-14
Entrance Doors And Cabin Windows	7-15
Control Locks	7-16
Engine	7-16
Engine Controls	7-16
Engine Instruments	7-17
New Engine Break-In And Operation	7-17
Engine Oil System	7-18
Ignition-Starter System	7-18
Air Induction System	7-19
Exhaust System	7-19
Carburetor And Priming System	7-19
Cooling System	7-20
Propeller	7-20
Fuel System	7-20
Brake System	7-23
Electrical System	7-23
Master Switch	7-25
Avionics Power Switch	7-25

TABLE OF CONTENTS (Continued)

Page

Ammeter 7-26
Over-Voltage Sensor And Warning Light 7-26
Circuit Breakers And Fuses 7-26
Ground Service Plug Receptacle 7-27
Lighting Systems 7-27
Exterior Lighting 7-27
Interior Lighting 7-28
Cabin Heating, Ventilating And Defrosting System 7-29
Pitot-Static System And Instruments 7-31
Airspeed Indicator 7-32
Rate-Of-Climb Indicator 7-32
Altimeter 7-32
Vacuum System And Instruments 7-32
Attitude Indicator 7-34
Directional Indicator 7-34
Suction Gage 7-34
Stall Warning System 7-34
Avionics Support Equipment 7-35
Audio Control Panel 7-35
Transmitter Selector Switch 7-35
Automatic Audio Selector Switch 7-35
Audio Selector Switches 7-37
Microphone - Headset 7-37
Static Dischargers 7-38

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, four-place, high-wing, single-engine airplane equipped with tricycle landing gear, and is designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment at the base of the rear door posts, and a bulkhead with attaching plates at the base of the forward door posts for the lower attachment of the wing struts. Four engine mount stringers are also attached to the forward door posts and extend forward to the firewall.

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

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a spar, formed sheet metal ribs and reinforcements, a wrap-around skin panel, formed leading edge skin and a dorsal. The rudder is constructed of a formed leading edge skin containing hinge halves, a center wrap-around skin panel, ribs, an aft wrap-around skin panel which is joined at the trailing edge of the rudder by a filler strip, and a ground adjustable trim tab at the base of the trailing edge. The top of the rudder incorporates a leading edge extension which contains a balance weight.

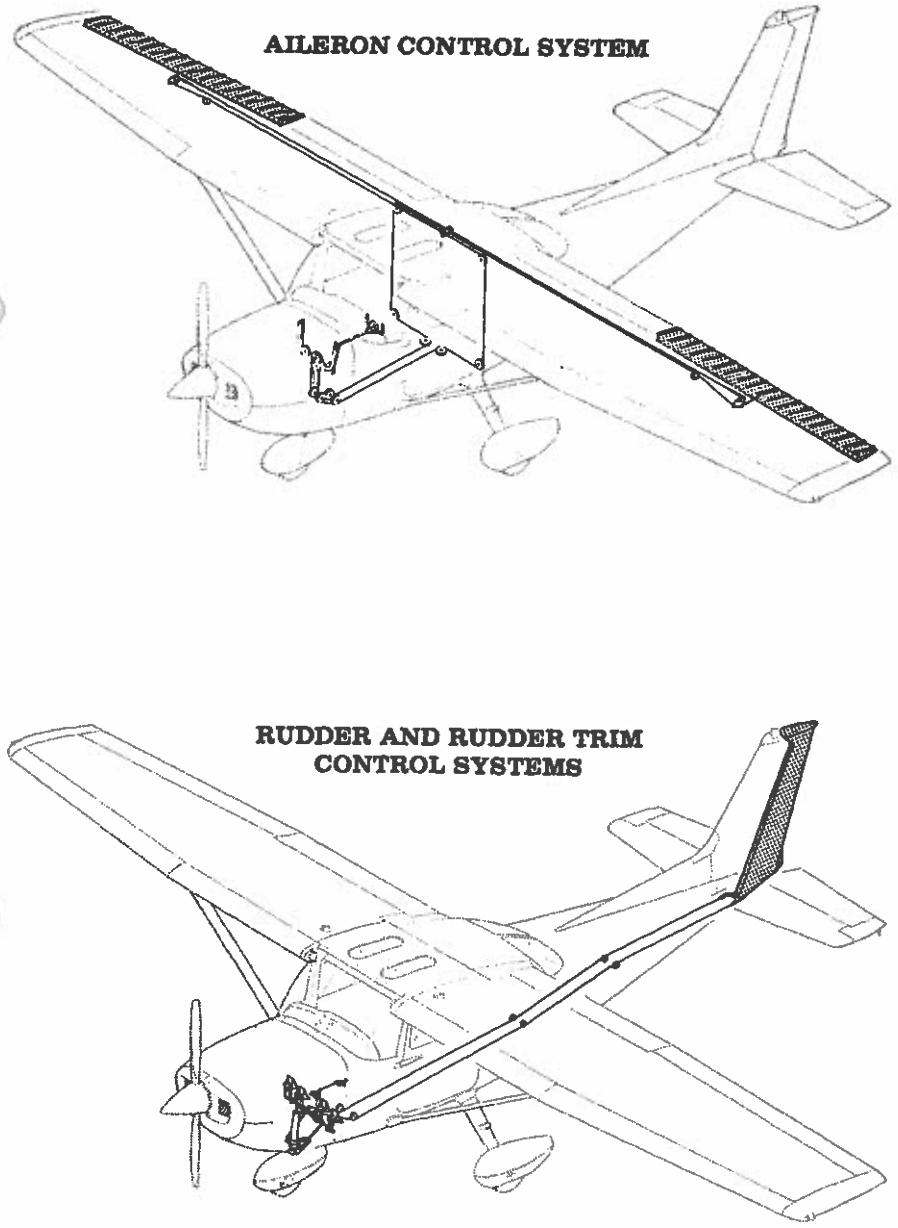


Figure 7-1. Flight Control and Trim Systems (Sheet 1 of 2)

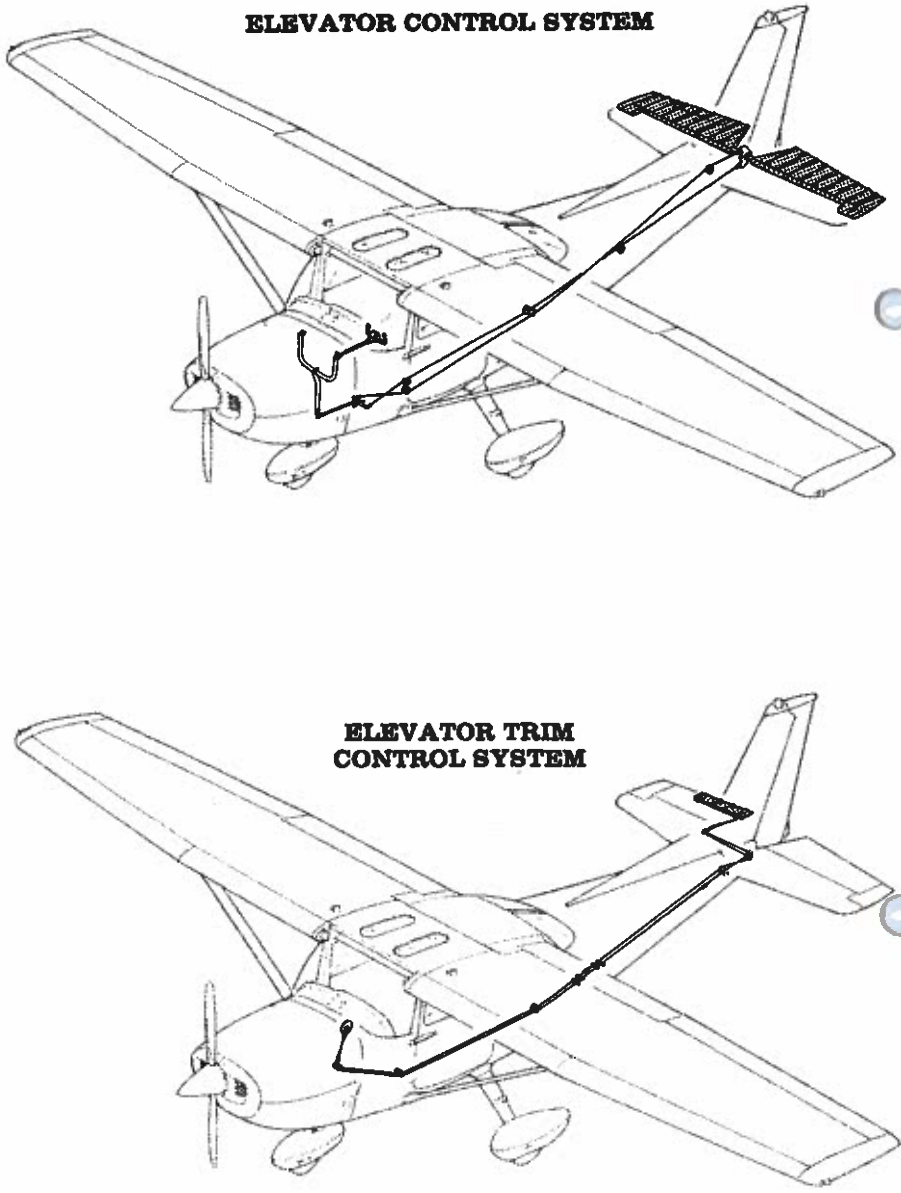


Figure 7-1. Flight Control and Trim Systems (Sheet 2 of 2)

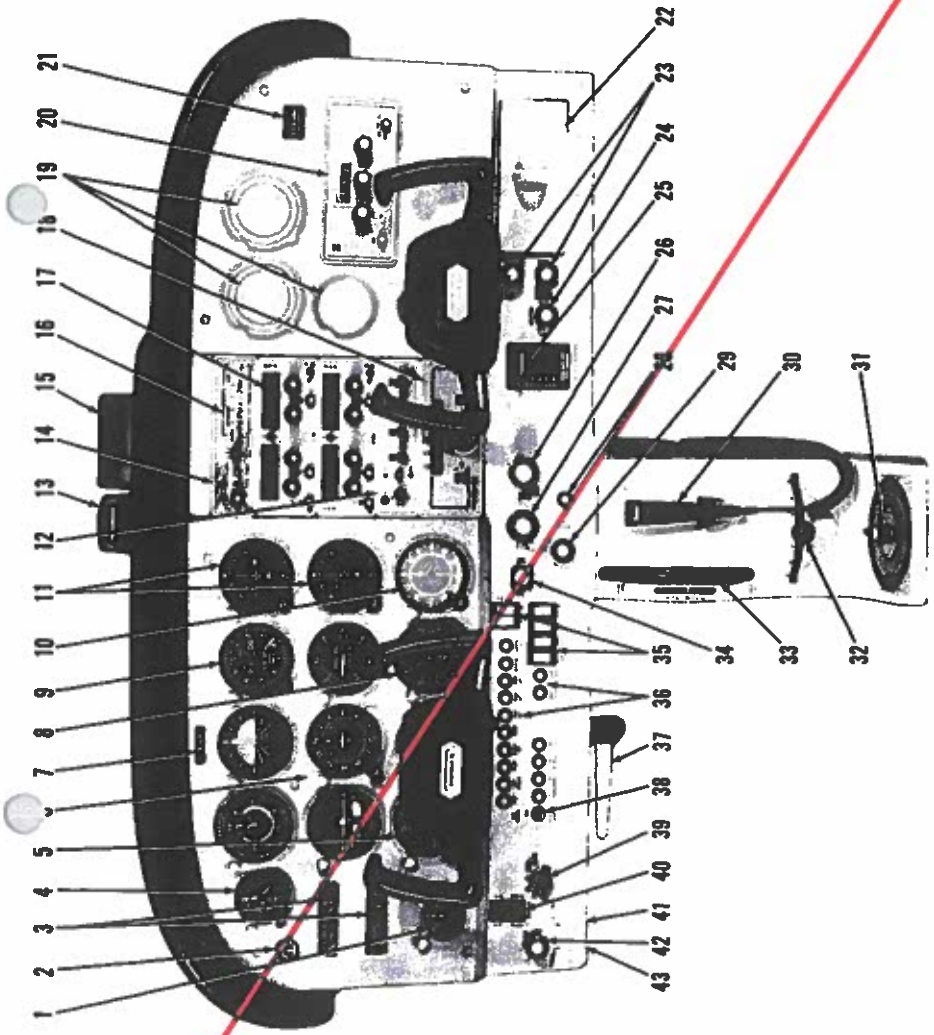


Figure 7-2. Instrument Panel (Sheet 1 of 2)

1. Ammeter
2. Suction Gage
3. Oil Temperature, Oil Pressure, and Left and Right Fuel Quantity Indicators
4. Clock
5. Tachometer
6. Flight Instrument Group
7. Airplane Registration Number
8. Secondary Altimeter
9. Encoding Altimeter
10. ADF Bearing Indicator
11. Omni Course Indicators
12. Transponder
13. Magnetic Compass
14. Marker Beacon Indicator Lights and Switches
15. Rear View Mirror
16. Audio Control Panel
17. Radios
18. Autopilot Control Unit
19. Additional Instrument Space
20. ADF Radio
21. Flight Hour Recorder
22. Map Compartment
23. Cabin Heat and Air Control Knobs
24. Lighter
25. Wing Flap Switch and Position Indicator
26. Mixture Control Knob
27. Throttle (With Friction Lock)
28. Static Pressure Alternate Source Valve
29. Instrument and Radio Dial Light Rheostat Control Knobs
30. Microphone
31. Fuel Selector Valve Handle
32. Rudder Trim Control Lever
33. Elevator Trim Control Wheel
34. Carburetor Heat Control Knob
35. Electrical Switches
36. Circuit Breakers
37. Parking Brake Handle
38. Avionics Power Switch
39. Ignition Switch
40. Master Switch
41. Auxiliary Mike Jack
42. Primer
43. Phone Jack

N/A

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





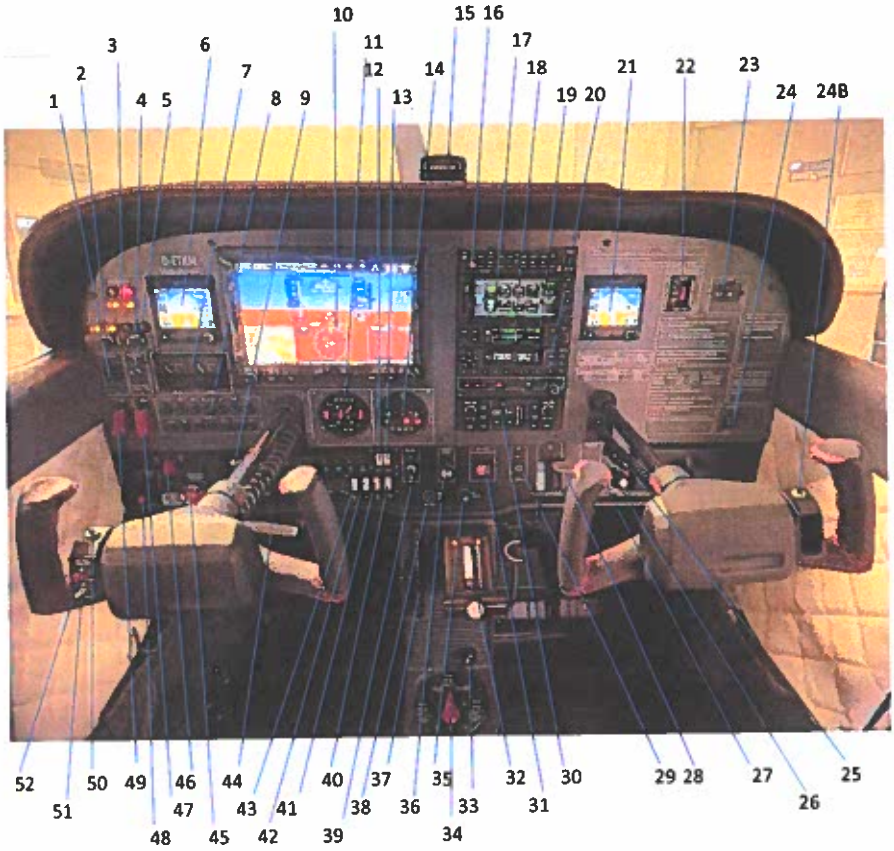


Figure 7-2. Instrument Panel (Sheet 1 of 2)

1. USB1/C-PORT
2. AED/CED LIGHTS
3. WARNING/CAUTION LIGHTS
4. FADEC TEST SWITCH
5. TRAFFIC MUTE SWITCH
6. GARMIN G5 ATT
7. LH, RH FUEL QUANTITY INDICATOR
8. AVIONICS FUSES
9. AVIONICS MASTER SWITCH
10. GARMIN G3X (PFD)
11. CED INDICATOR
12. TAXI LIGHT SWITCH
13. LDG LIGHT SWITCH
14. AED INDICATOR
15. COMPASS
16. GARMIN GMA350C
17. GPS/NAV/COM1 GARMIN GTN650XI
18. NAV/COM2 GARMING GNC215
19. TRANSPONDER GTX335
20. DME BENDIX/KING 64
21. GARMIN G5 HSI
22. ELT REMOTE SWITCH
23. HOBBS METER
24. USB2/C-PORT

24B. COMM SWITCH 2

25. CABINE HEAT
26. CABIN AIR
27. POWER SOCKET 24V DC
28. FLAPS LEVER
29. DME SWITCH
30. A/P GARMIN GFC500
31. SMART GLIDE SWITCH
32. THROTTLE
33. FUEL SHUT OFF VALVE
34. FUEL SELECTOR
35. ALT STATIC AIR
36. ALTERNATE AIR DOOR
37. TRIMMER
38. FLIGHT MODE TOGA
39. FUEL PUMP
40. STROBE LIGHT
41. BEACON LIGHT
42. NAV LIGHTS
43. PITOT HEAT
44. PARKING BRAKE
45. STARTER
46. MAIN BATTERY SWITCH
47. FADEC FORCE B
48. ENGINE MASTER SWITCH
49. ALT SWITCH
50. COMM SWITCH 1
51. ELECTRIC TRIMM
52. A/P SWITCH OFF

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





The horizontal stabilizer is constructed of a forward and aft spar, ribs and stiffeners, center, left, and right wrap-around skin panels, and formed leading edge skins. The horizontal stabilizer also contains the elevator trim tab actuator. Construction of the elevator consists of formed leading edge skins, a forward spar, aft channel, ribs, torque tube and bellcrank, left upper and lower "V" type corrugated skins, and right upper and lower "V" type corrugated skins incorporating a trailing edge cut-out for the trim tab. The elevator trim tab consists of a spar, rib, and upper and lower "V" type corrugated skins. The leading edge of both left and right elevator tips incorporate extensions which contain balance weights.

FLIGHT CONTROLS

The airplane's flight control system (see figure 7-1) consists of conventional aileron, rudder, and elevator control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder.

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

TRIM SYSTEM

A manually-operated elevator trim system is provided; a rudder trim system may also be installed (see figure 7-1). 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. Rudder trimming is accomplished through a bungee connected to the rudder control system and a trim lever, mounted on the control pedestal. Rudder trimming is accomplished by lifting the trim lever up to clear a detent, then moving it either left or right to the desired trim position. Moving the trim lever to the right will trim the airplane nose-right; conversely, moving the lever to the left will trim the airplane nose-left.

INSTRUMENT PANEL

The instrument panel (see figure 7-2) is designed around the basic "T" configuration. The gyros are located immediately in front of the pilot, and arranged vertically over the control column. 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". Engine instruments and fuel quantity indicators are near the left edge of the panel. Avionics equipment is stacked approximately on the centerline of the panel, with the right side of the panel containing space for additional instruments and avionics equipment. A subpanel under the primary instrument panel contains the primer, master and ignition switches, avionics power switch, circuit breakers, and electrical switches on the left side, with the engine controls, light intensity controls, and alternate static air control in the center, over the control pedestal. The right side of the subpanel contains the wing flap switch lever and position indicator, cabin heat and vent controls, cigar lighter, and map compartment. A pedestal installed below the subpanel, contains the elevator trim control wheel and position indicator, and provides a bracket for the microphone. A rudder trim control lever may be installed below the trim wheel and microphone bracket, and the fuel selector valve handle is located at the base of the pedestal. A parking brake handle is mounted below the subpanel in front of the pilot.

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

GROUND CONTROL

Effective ground control while taxiing is accomplished through nose wheel steering by using the rudder pedals; left rudder pedal to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a spring-loaded steering bungee (which is connected to the nose gear and to the rudder bars) will turn the nose wheel through an arc of approximately 10° each side of center. By applying either left or right brake, the degree of turn may be increased up to 30° each side of center.

Moving the airplane by hand is most easily accomplished by attaching a tow bar to the nose gear strut. If a tow bar is not available, or pushing is required, use the wing struts as push points. Do not use the vertical or horizontal surfaces to move the airplane. If the airplane is to be towed by vehicle, never turn the nose wheel more than 30° 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 27 feet 5 and 1/2 inches. To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on a tailcone bulkhead just forward of the horizontal stabilizer to raise the nose wheel off the ground.

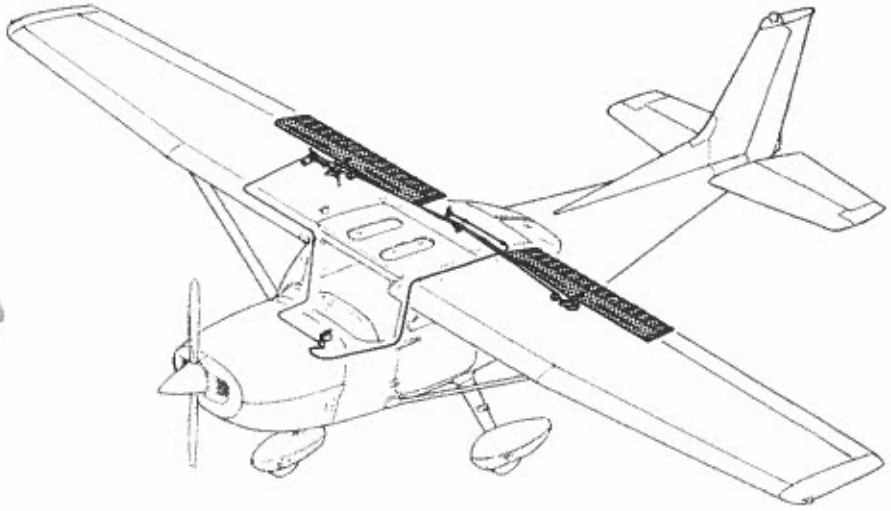


Figure 7-3. Wing Flap System

WING FLAP SYSTEM

The wing flaps are of the single-slot type (see figure 7-3), and are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down in a slotted panel that provides mechanical stops at the 10° and 20° positions. For flap settings greater than 10°, move the switch lever to the right to clear the stop and position it as desired. A scale and pointer on the left side of the switch lever indicates flap travel in degrees. The wing flap system circuit is protected by a 15-ampere circuit breaker, labeled FLAP, on the left side of the instrument panel.

LANDING GEAR SYSTEM

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

BAGGAGE COMPARTMENT

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

SEATS

The seating arrangement consists of two separate adjustable seats for the pilot and front passenger, a split-backed fixed seat in the rear, and a child's seat (if installed) aft of the rear seats. The pilot's and front passenger's seats are available in two different designs: four-way and six-way adjustable.

Four-way seats may be moved forward or aft, and the seat back angle changed. To position either seat, lift the tubular handle under the center of the seat, slide the seat into position, release the handle, and check that the seat is locked in place. The seat back is spring-loaded to the vertical position. To adjust its position, lift the lever under the right front corner of the seat, reposition the back, release the lever, and check that the back is locked in place. The seat backs will also fold full forward.

The six-way seats may be moved forward or aft, adjusted for height, and the seat back angle is infinitely adjustable. Position the seat by lifting the tubular handle, under the center of the seat bottom, and slide the seat into position; then release the lever 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 left seat and the left corner of the right seat. Seat back angle is adjustable by rotating a small crank under the left corner of the left seat and the right corner of the right 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 rear passenger's seats consist of a fixed one-piece seat bottom with individually adjustable seat backs. Two adjustment levers, under the left and right corners of the seat bottom, are used to adjust the angle of the respective seat backs. To adjust either seat back, lift the adjustment lever

and reposition the back. The seat backs are spring-loaded to the vertical position.

A child's seat may be installed aft of the rear passenger seats, and is held in place by two brackets mounted on the floorboard. The seat is designed to swing upward into a stowed position against the aft cabin bulkhead when not in use. To stow the seat, rotate the seat bottom up and aft as far as it will go. When not in use, the seat should be stowed.

Headrests are available for any of the seat configurations except the child's 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.

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts (see figure 7-4). The pilot's and front passenger's seats are also equipped with separate shoulder harnesses; shoulder harnesses are available for the rear 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

All of the seat belts are attached to fittings on the floorboard. The buckle half is inboard of each seat and the link half is outboard of each seat.

To use the seat belts for the front seats, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the belt to a snug fit. Seat belts for the rear seats and the child's seat (if installed) are used in the same manner as the belts for the front seats. To release the seat belts, grasp the top of the buckle opposite the link and pull outward.

SHOULDER HARNESSES

Each front seat shoulder harness (see figure 7-4) is attached to a rear doorpost above the window line and is stowed behind a stowage sheath above the cabin door. To stow the harness, fold it and place it behind the sheath. The rear seat shoulder harnesses are attached adjacent to the lower corners of the rear window. Each rear seat harness is stowed behind a

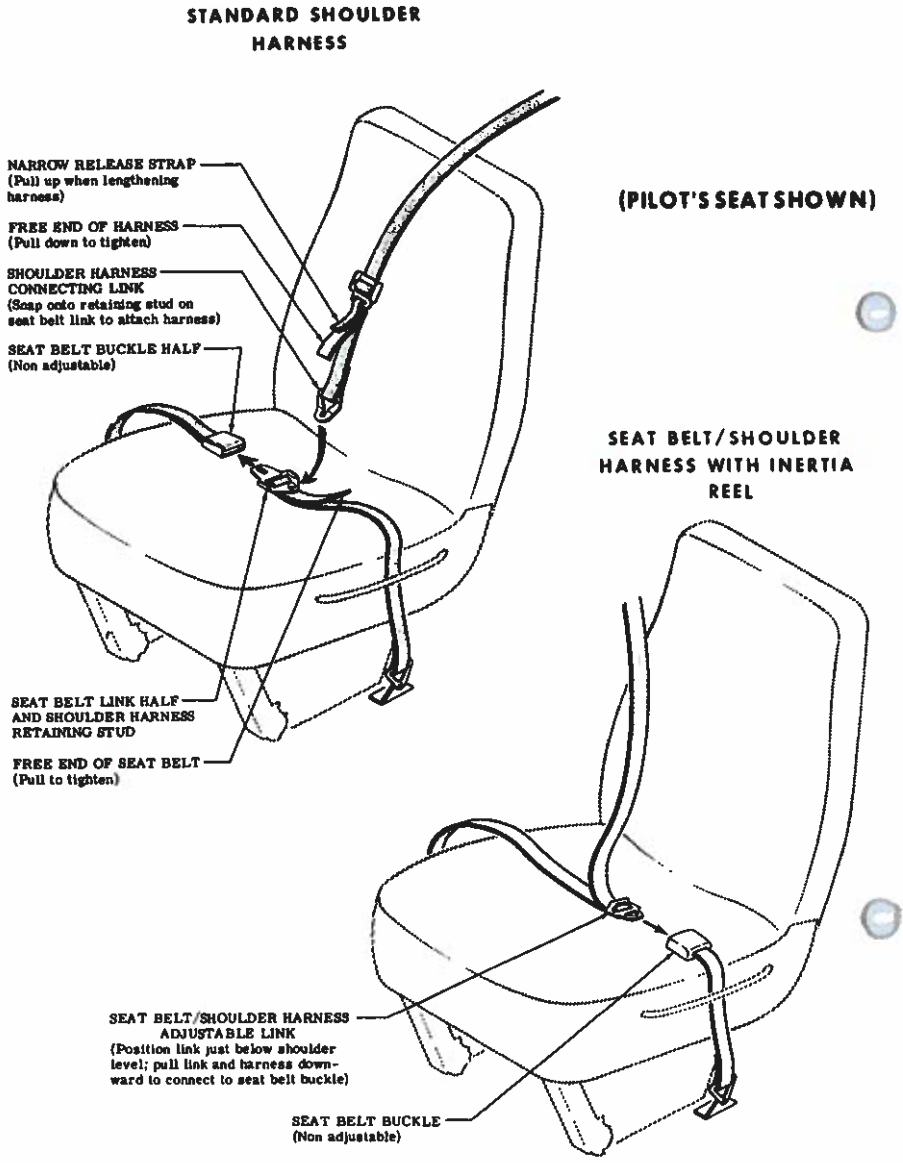


Figure 7-4. Seat Belts and Shoulder Harnesses

stowage sheath above an aft side window. No harness is available for the child's seat.

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

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

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS

Integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and front seat passenger. The seat belt/shoulder harnesses extend from inertia reels located in the cabin ceiling 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.

NOTE

The inertia reels are located for maximum shoulder harness comfort and safe retention of the seat occupants. This location requires that the shoulder harnesses cross near the top so that the right hand inertia reel serves the pilot and the left hand reel serves the front passenger. When fastening the harness, check to ensure the proper harness is being used.

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 into the seat belt buckle. Adjust belt tension across the lap by pulling upward on the shoulder harness. Removal is accomplished by releasing the seat belt buckle, which will allow the inertia reel to pull the harness inboard of the seat.

ENTRANCE DOORS AND CABIN WINDOWS

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

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

NOTE

Accidental opening of a cabin door in flight due to improper closing does not constitute a need to land the airplane. The best procedure is to set up the airplane in a trimmed condition at approximately 75 knots, momentarily shove the door outward slightly, and forcefully close and lock the door.

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

The left cabin door is equipped with an openable window which is held in the closed position by a detent equipped latch on the lower edge of the window frame. To open the window, rotate the latch upward. The window is equipped with a spring-loaded retaining arm which will help rotate the window outward, and hold it there. An openable window is also available for the right door, and functions in the same manner as the left window. If required, either window may be opened at any speed up to 160 knots. The cabin top windows (if installed), rear side windows, and rear windows are of the fixed type and cannot be opened.

CONTROL LOCKS

A control lock is provided to lock the ailerons and elevator control surfaces in a neutral position and prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod with a red metal flag attached to it. The flag is labeled CONTROL LOCK, REMOVE BEFORE STARTING ENGINE. To install the control lock, align the hole in the top of the pilot's control wheel shaft with the hole in the top of the shaft collar on the instrument panel and insert the rod into the aligned holes. Proper installation of the lock will place the red flag over the ignition switch. In areas where high or gusty winds occur, a control surface lock should be installed over the vertical stabilizer and rudder. The control lock and any other type of locking device should be removed prior to starting the engine.

ENGINE

The airplane is powered by a horizontally-opposed, four-cylinder, overhead-valve, air-cooled, carbureted engine with a wet sump oil system. The engine is a Lycoming Model O-320-H2AD and is rated at 160 horsepower at 2700 RPM. Major accessories include a starter and belt-driven alternator mounted on the front of the engine, and dual magnetos and a vacuum pump which are mounted on an accessory drive pad on the rear of the engine. Provisions are also made for a full flow oil filter.

ENGINE CONTROLS

SEE SUPPLEMENT POH FOR TAE 125-02-114

Engine power is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open, and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it.

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

ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage, oil temperature gage, and a tachometer. A carburetor air temperature gage is also available.

The oil pressure gage, located on the left 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 25 PSI (red line), the normal operating range is 60 to 90 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage adjacent to the oil pressure gage. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Oil temperature limitations are the normal operating range (green arc) which is 38°C (100°F) to 118°C (245°F), and the maximum (red line) which is 118°C (245°F).

SEE SUPPLEMENT POH FOR TAE 125-02-114

The engine-driven mechanical tachometer is located near the lower portion of the instrument panel to the left of the pilot's control wheel. 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 2700 RPM, and a maximum (red line) of 2700 RPM.

A carburetor air temperature gage may be installed on the right side of the instrument panel to help detect carburetor icing conditions. The gage is marked in 5° increments from -30°C to +30°C, and has a yellow arc between -15°C and +5°C which indicates the temperature range most conducive to icing in the carburetor. A placard on the lower half of the gage face reads KEEP NEEDLE OUT OF YELLOW ARC DURING POSSIBLE CARBURETOR ICING CONDITIONS.

NEW ENGINE BREAK-IN AND OPERATION

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

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

ENGINE OIL SYSTEM

Oil for engine lubrication is supplied from a sump on the bottom of the engine. The capacity of the engine sump is six quarts (one additional quart is required if a full flow oil filter is installed). Oil is drawn from the sump through an oil suction strainer screen into the engine-driven oil pump. From the pump, oil is routed to a bypass valve. If the oil is cold, the bypass valve allows the oil to bypass the oil cooler and go directly from the pump to the oil pressure screen (full flow oil filter if installed). If the oil is hot, the bypass valve routes the oil out of the accessory housing and into a flexible hose leading to the oil cooler on the lower right side of the firewall. Pressure oil from the cooler returns to the accessory housing where it passes through the pressure strainer screen (full flow oil filter, if installed). The filter oil then enters a pressure relief valve which regulates engine oil pressure by allowing excessive oil to return to the sump while the balance of the oil is circulated to various engine parts for lubrication. Residual oil is returned sump by gravity flow.

An oil filler cap/oil dipstick is located at the rear of the engine near the center. The filler cap/dipstick is accessible through an access door in the engine cowling. The engine should not be operated on less than four quarts of oil. To minimize loss of oil through the breather, fill to five quarts for normal flights of less than three hours. For extended flight, fill to six quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

SUPERSEDED BY PSP 172-2502-14

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

IGNITION-STARTER SYSTEM

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

Ignition and starter operation is controlled by a rotary type switch located on the left switch and control panel. The switch is labeled clockwise OFF, R, L, BOTH, and START. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L

positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the starter contactor is energized and the starter will crank the engine. When the switch is released, it will automatically return to the BOTH position.

AIR INDUCTION

The engine air induction system receives ram air through an intake in the lower front portion of the engine cowling. The intake is covered by an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an airbox. After passing through the airbox, induction air enters the inlet in the carburetor which is under the engine, and is then ducted to the engine cylinders through intake manifold tubes. In the event carburetor ice is encountered or the intake filter becomes blocked, alternate heated air can be obtained from a shroud around an exhaust riser through a duct to a valve, in the airbox, operated by the carburetor heat control on the instrument panel. Heated air from the shroud is obtained from an unfiltered outside source. Use of full carburetor heat at full throttle will result in a loss of approximately 100 to 225 RPM.

SEE SUPPLEMENT POH FOR TAE 125-02-114

EXHAUST SYSTEM

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

CARBURETOR AND PRIMING SYSTEM

The engine is equipped with an up-draft, float-type, fixed jet carburetor mounted on the bottom of the engine. The carburetor is equipped with an enclosed accelerator pump, simplified fuel passages to prevent vapor locking, an idle cut-off mechanism, and a manual mixture control. Fuel is delivered to the carburetor by gravity flow from the fuel system. In the carburetor, fuel is atomized, proportionally mixed with intake air, and delivered to the cylinders through intake manifold tubes. The proportion of atomized fuel to air is controlled, within limits, by the mixture control on the instrument panel.

For easy starting in cold weather, the engine is equipped with a manual primer. The primer is actually a small pump which draws fuel from the fuel strainer when the plunger is pulled out, and injects it into the cylinder intake ports when the plunger is pushed back in. The plunger knob, on the instrument panel, is equipped with a lock and, after being pushed full in, must be rotated either left or right until the knob cannot be pulled out.

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 an opening at the bottom aft edge of the cowling. No manual cooling system control is provided.

A winterization kit is available and consists of two baffles which attach to the air intakes in the cowling nose cap, a restrictive cover plate for the oil cooler air inlet in the right rear vertical engine baffle, insulation for the crankcase breather line, and a placard to be installed on the instrument panel. This equipment should be installed for operations in temperatures consistently below -7°C (20°F). Once installed, the crankcase breather insulation is approved for permanent use in both hot and cold weather.

SEE SUPPLEMENT POH FOR TAE 125-02-114

PROPELLER

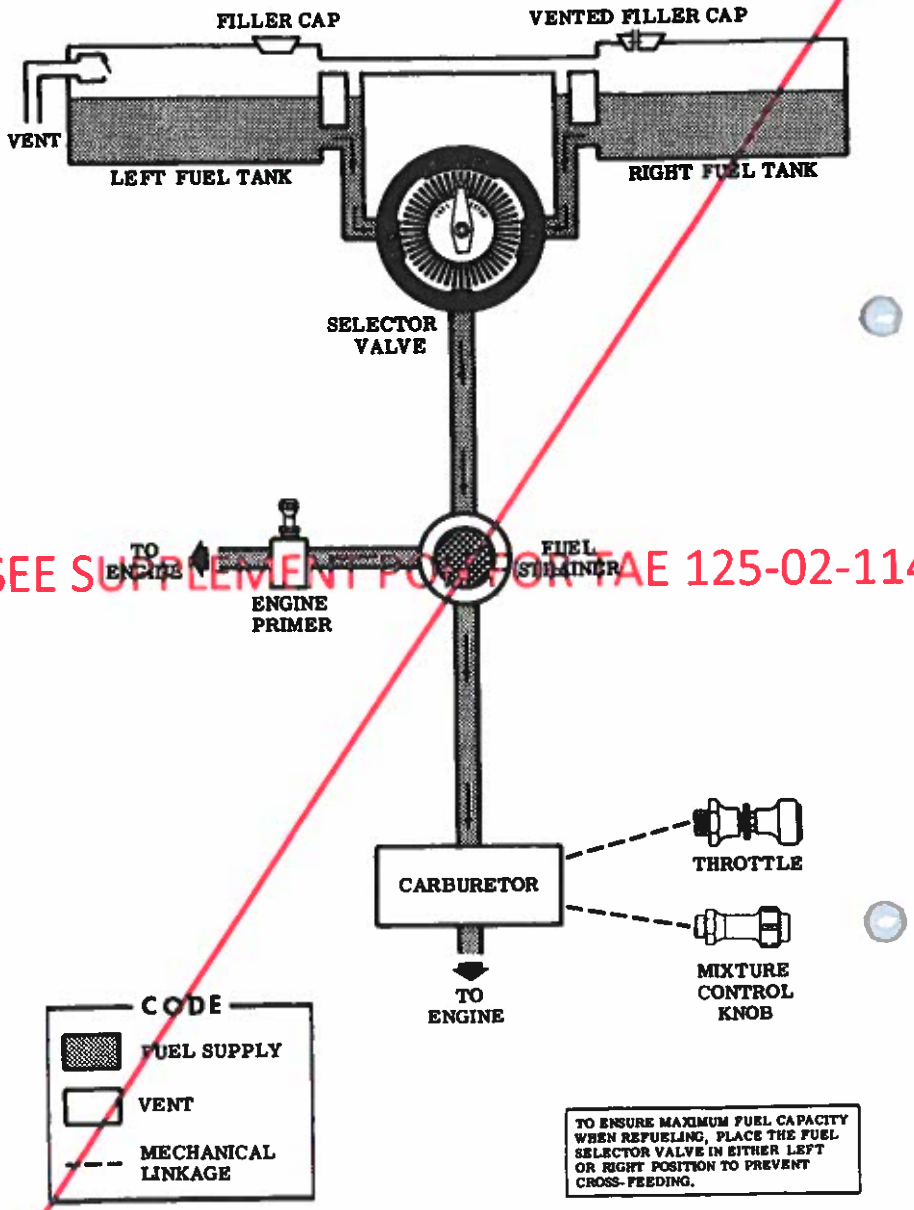
The airplane is equipped with a two-bladed, fixed-pitch, one-piece forged aluminum alloy propeller which is anodized to retard corrosion. The propeller is 75 inches in diameter.

FUEL SYSTEM

The airplane may be equipped with either a standard fuel system or long range system (see figure 7-6). Both systems consist of two vented fuel tanks (one in each wing), a four-position selector valve, fuel strainer, manual primer, and carburetor. Refer to figure 7-5 for fuel quantity data for both systems.

FUEL QUANTITY DATA (U. S. GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (21.5 Gal. Each)	40	3	43
LONG RANGE (27 Gal. Each)	50	4	54

Figure 7-5. Fuel Quantity Data



SEE SUPPLEMENT FOR FAE 125-02-114

Figure 7-6. Fuel System (Standard and Long Range)

Fuel flows by gravity from the two wing tanks to a four-position selector valve, labeled BOTH, RIGHT, LEFT, and OFF. With the selector valve in either the BOTH, LEFT, or RIGHT position, fuel flows through a strainer to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the cylinder intake ports.

Fuel system venting is essential to system operation. Blockage of the system will result in decreasing fuel flow and eventual engine stoppage. Venting is accomplished by an interconnecting line from the right fuel tank to the left tank. The left fuel tank is vented overboard through a vent line, equipped with a check valve, which protrudes from the bottom surface of the left wing near the wing strut. The right fuel tank filler cap is also vented.

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 left side of the instrument panel. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 5 gallons remain in a standard tank and 2 gallons remain in a long range tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes.

SEE SUPPLEMENT FOR PA-172-02-114

The fuel selector valve should be in the BOTH position for takeoff, climb, landing, and maneuvers that involve prolonged slips or skids. Operation from either LEFT or RIGHT tank is reserved for cruising flight.

NOTE

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

NOTE

It is not practical to measure the time required to consume all of the fuel in one tank, and, after switching to the opposite tank, expect an equal duration from the remaining fuel. The airspace in both fuel tanks is interconnected by a vent line and, therefore, some sloshing of fuel between tanks can be expected when the tanks are nearly full and the wings are not level.

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 right side of the engine cowling. The fuel tanks should be filled after each flight to prevent condensation.

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (copilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by utilizing the parking brake which is operated by a handle under the left side of the instrument panel. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.

For maximum brake life, keep the brake system properly maintained, and minimize brake usage during taxi operations and landings.

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

ELECTRICAL SYSTEM

Electrical energy (see figure 7-7) is supplied by a 28-volt, direct-current system powered by an engine-driven, 60-amp alternator and a 24-volt, 14-amp hour battery (or 17-amp hour battery, if installed) located on the left side of the firewall. 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

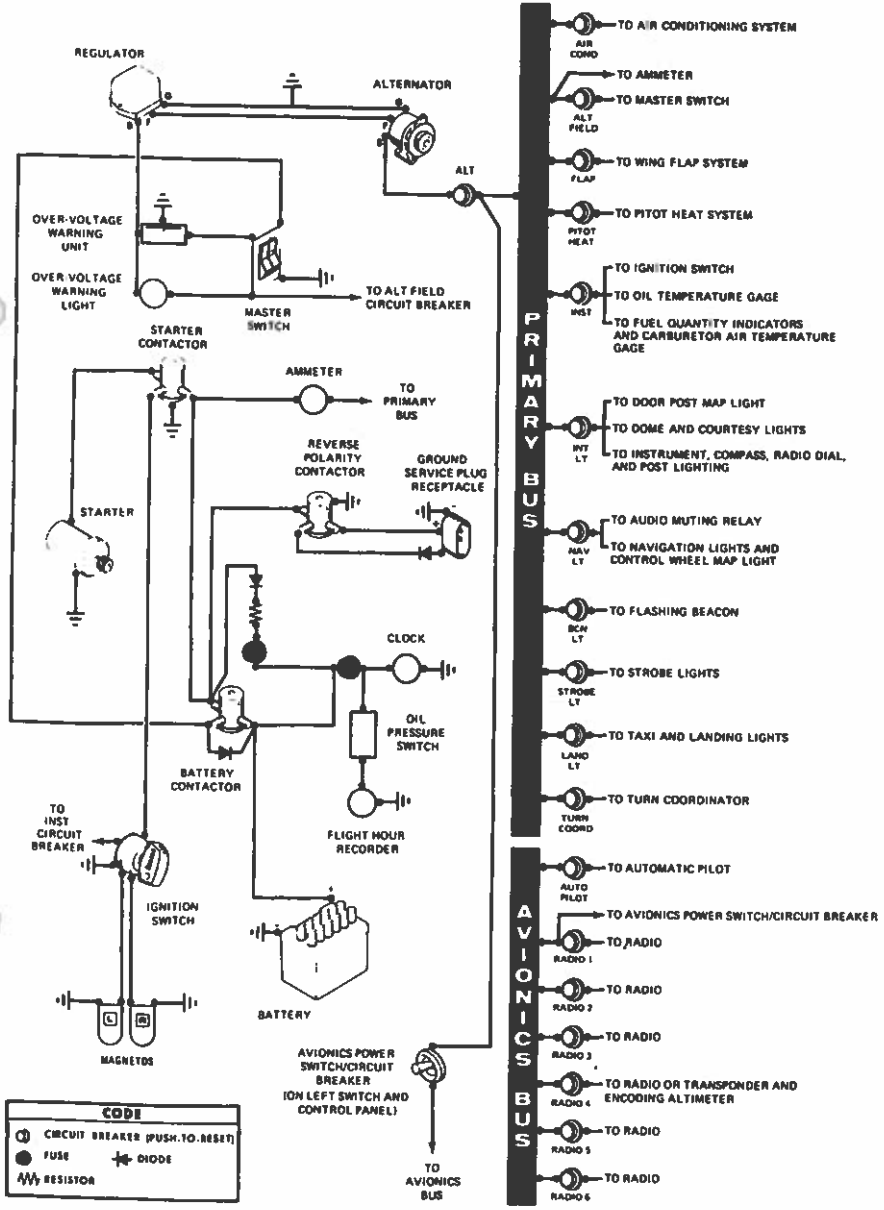


Figure 7-7. Electrical System

on anytime the master switch is turned on, and is not affected by starter or external power usage. Both bus bars are on anytime the master and avionics power switches are turned on.

CAUTION

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

MASTER SWITCH

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

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

AVIONICS POWER SWITCH

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

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

AMMETER

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

OVER-VOLTAGE SENSOR AND WARNING LIGHT

SEE SUPPLEMENT NO. 2 FOR TAE 125-02-14

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

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

The over-voltage sensor may be reset by turning off the avionics power switch and then turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as practical. In either case, the avionics power switch may be turned on again if required.

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

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by "push-to-reset" circuit breakers mounted on the lower left side of the instrument panel. In addition to the individual circuit breakers, a toggle-type circuit breaker-switch, labeled AVIONICS POWER, on the left switch and control panel also protects the avionics systems. The cigar lighter is protected by a manually-reset type circuit breaker on the back of the lighter, and a fuse behind the instrument panel. The control wheel map light (if installed) is protected by the NAV LT circuit breaker and a fuse behind the instrument panel. Electrical circuits which are not protected by circuit breakers are the battery contactor closing (external power) circuit, clock circuit, and

flight hour recorder circuit. These circuits are protected by fuses mounted adjacent to the battery.

GROUND SERVICE PLUG RECEPTACLE

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

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

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

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

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Conventional navigation lights are located on the wing tips and top of

the rudder. A single landing light or dual landing/taxi lights are installed in the cowl nose cap, and a flashing beacon is mounted on top of the vertical fin. Additional lighting is available and includes a strobe light on each wing tip and two courtesy lights, one under each wing, just outboard of the cabin door. The courtesy lights are operated by the dome light switch on the overhead console. All exterior lights, except the courtesy lights, are controlled by rocker type switches on the left switch and control panel. The switches are ON in the up position and OFF in the down position.

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

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

INTERIOR LIGHTING

Instrument and control panel lighting is provided by flood lighting, integral lighting, and post lighting (if installed). Two concentric rheostat control knobs below the engine controls, labeled PANEL LT and RADIO LT, control intensity of the instrument and control panel lighting. A slide-type switch (if installed) on the overhead console, labeled PANEL LIGHTS, is used to select flood lighting in the FLOOD position, post lighting in the POST position, or a combination of post and flood lighting in the BOTH position.

Instrument and control panel flood lighting consists of a single red flood light in the forward part of the overhead console. To use the flood lighting, rotate the PANEL LT rheostat control knob clockwise to the desired intensity.

The instrument panel may be equipped with post lights which are mounted at the edge of each instrument or control and provide direct lighting. The lights are operated by placing the PANEL LIGHTS selector switch in the POST position and adjusting light intensity with the PANEL LT rheostat control knob. By placing the PANEL LIGHTS selector switch in the BOTH position, the post lights can be used in combination with the standard flood lighting.

The engine instrument cluster (if post lighting is installed), radio equipment, and magnetic compass have integral lighting and operate independently of post or flood lighting. Light intensity of the engine instrument cluster and radio lighting is controlled by the RADIO LT

rheostat control knob. The integral compass light intensity is controlled by the PANEL LT rheostat control knob.

A cabin dome light, in the aft part of the overhead console, is operated by a switch near the light. To turn the light on, move the switch to the right.

A control wheel map light is available and is mounted on the bottom of the pilot's control wheel. The light illuminates the lower portion of the cabin just forward of the pilot and is helpful when checking maps and other flight data during night operations. To operate the light, first turn on the NAV LT switch; then adjust the map light's intensity with the knurled disk type rheostat control located at the bottom of the control wheel.

A doorpost map light is available, and is located on the left forward doorpost. It contains both red and white bulbs and may be positioned to illuminate any area desired by the pilot. The light is controlled by a switch, below the light, which is labeled RED, OFF, and WHITE. Placing the switch in the top position will provide a red light. In the bottom position, standard white lighting is provided. In the center position, the map light is turned off. Light intensity is controlled by the PANEL LT rheostat control knob.

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

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated to any degree desired by manipulation of the push-pull CABIN HT and CABIN AIR control knobs (see figure 7-8).

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

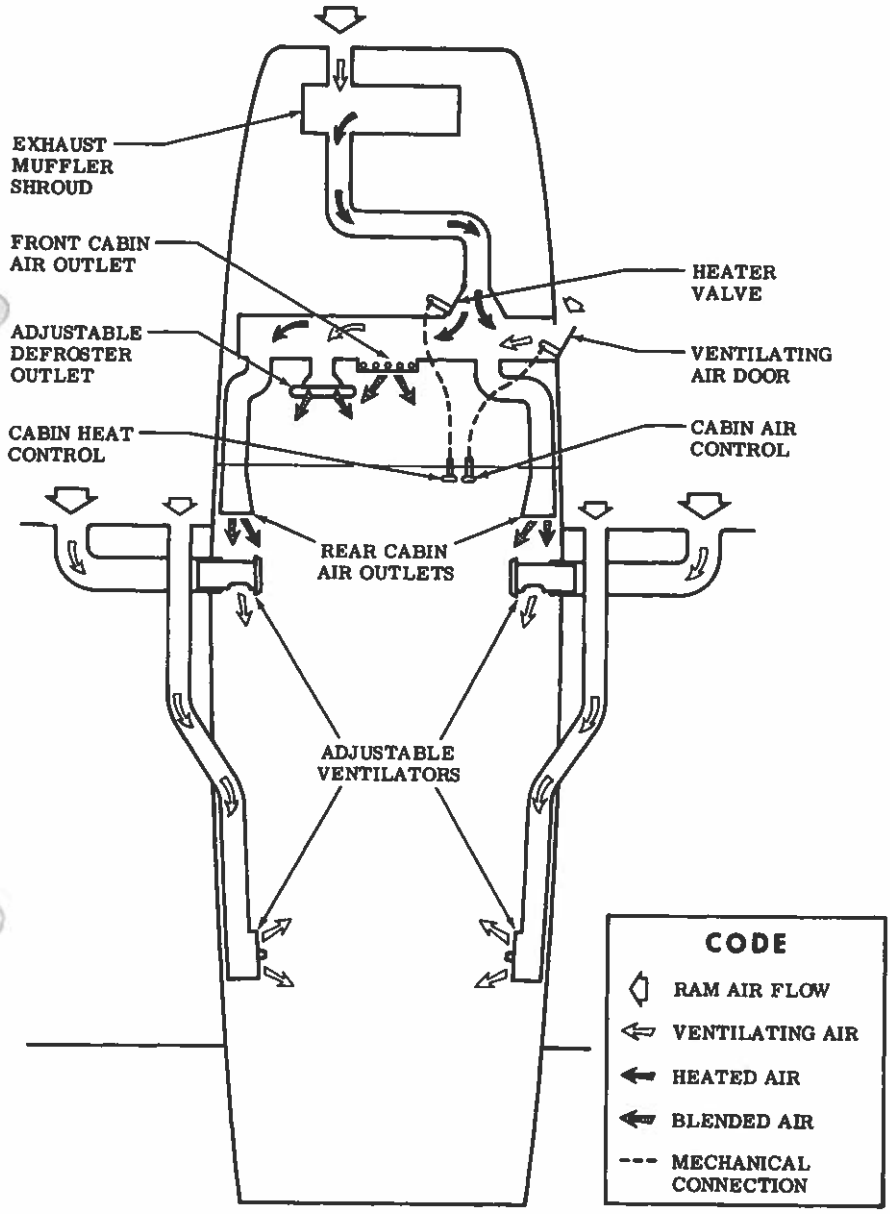


Figure 7-8. Cabin Heating, Ventilating, and Defrosting System

Front cabin heat and ventilating air is supplied by outlet holes spaced across a cabin manifold just forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by two ducts from the manifold, one extending down each side of the cabin to an outlet at the front doorpost at floor level. Windshield defrost air is also supplied by a duct leading from the cabin manifold. Two knobs control sliding valves in the defroster outlet and permit regulation of defroster airflow.

Separate adjustable ventilators supply additional air; one near each upper corner of the windshield supplies air for the pilot and copilot, and two ventilators are available for the rear cabin area to supply air to the rear seat passengers. The airplane may also be equipped with an air conditioning system. For operating instructions and details concerning this system, refer to Section 9, Supplements.

PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb indicator and altimeter. The system is composed of either an unheated or heated pitot tube mounted on the lower surface of the left wing, an external static port on the lower left side of the forward fuselage, and the associated plumbing necessary to connect the instruments to the sources.

The heated pitot system consists of a heating element in the pitot tube, a rocker-type switch labeled PITOT HT on the lower left side of the instrument panel, a 5-amp circuit breaker on the switch and control panel, and associated wiring. When the pitot heat switch is turned on, the element in the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

A static pressure alternate source valve may be installed adjacent to the throttle, and can be used if the external static source is malfunctioning. This valve supplies static pressure from inside the cabin instead of the external static port.

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

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

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings include the white arc (41 to 85 knots), green arc (47 to 128 knots), yellow arc (128 to 160 knots), and a red line (160 knots).

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

RATE-OF-CLIMB INDICATOR

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

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 7-9) provides the suction necessary to operate the attitude indicator and directional indicator. The system consists of a vacuum pump mounted on the engine, a vacuum relief valve and vacuum system air filter on the aft side of the firewall below the instrument panel, and instruments (including a suction gage) on the left side of the instrument panel.

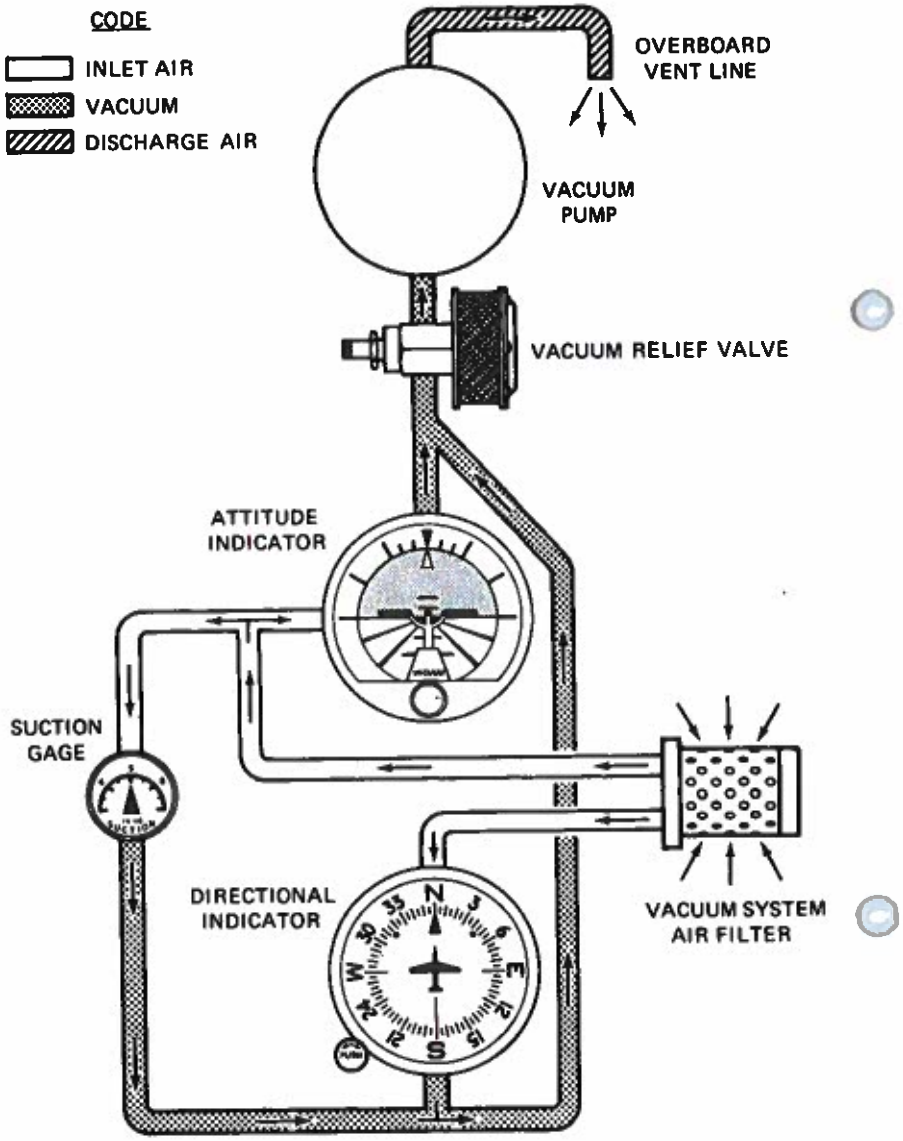


Figure 7-9. Vacuum System

ATTITUDE INDICATOR

The attitude indicator gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60°, and 90° either side of the center mark. Pitch and roll attitudes are presented by a miniature airplane in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

DIRECTIONAL INDICATOR

A directional indicator displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The 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 precession.

SUCTION GAGE

The suction gage, located on the left side of the instrument panel, is calibrated in inches of mercury and indicates suction available for operation of the attitude and directional indicators. The desired suction range is 4.6 to 5.4 inches of mercury. A suction reading 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 pneumatic-type stall warning system consisting of an inlet in the leading edge of the left wing, an air-operated horn near the upper left corner of the windshield, and associated plumbing. As the airplane approaches a stall, the low pressure on the upper surface of the wings moves forward around the leading edge of the wings. This low pressure creates a differential pressure in the stall warning system which draws air through the warning horn, resulting in an audible warning at 5 to 10 knots above stall in all flight conditions.

The stall warning system should be checked during the preflight inspection by placing a clean handkerchief over the vent opening and applying suction. A sound from the warning horn will confirm that the system is operative.

AVIONICS SUPPORT EQUIPMENT

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

AUDIO CONTROL PANEL

Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios are installed, a transmitter/audio switching system is provided (see figure 7-10). The operation of this switching system is described in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

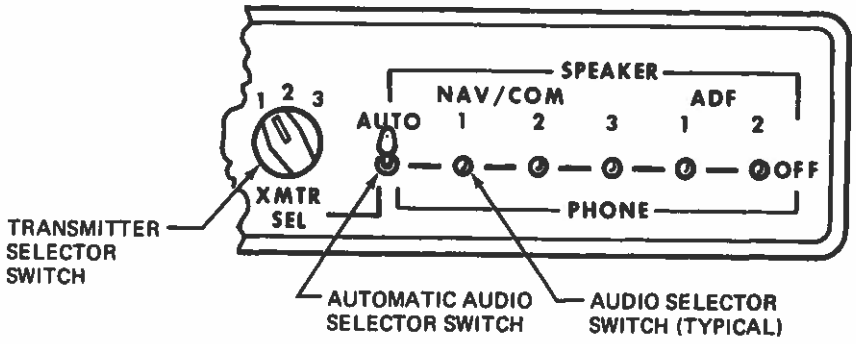
A rotary type transmitter selector switch, labeled XMTR SEL, is provided to connect the microphone to the transmitter the pilot desires to use. To select a transmitter, rotate the switch to the number corresponding to that transmitter. The numbers 1, 2 and 3 above the switch correspond to the top, second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

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

AUTOMATIC AUDIO SELECTOR SWITCH

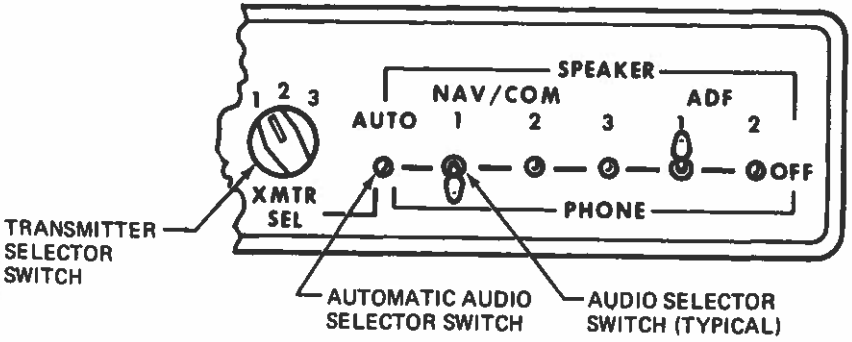
A toggle switch, labeled AUTO, can be used to automatically match the appropriate NAV/COM receiver audio to the transmitter being selected. To utilize this automatic feature, leave all NAV/COM receiver switches in the OFF (center) position, and place the AUTO selector switch in either the SPEAKER or PHONE position, as desired. Once the AUTO selector switch is positioned, the pilot may then select any transmitter and its associated NAV/COM receiver audio simultaneously with the transmitter selector

AUTOMATIC AUDIO SELECTION



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

INDIVIDUAL AUDIO SELECTION



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

Figure 7-10. Audio Control Panel

switch. If automatic audio selection is not desired, the AUTO selector switch should be placed in the OFF (center) position.

NOTE

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). Sidetone will be heard on either the airplane speaker or a headset as selected with the AUTO selector switch. sidetone may be eliminated by placing the AUTO selector switch in the OFF position, and utilizing the individual radio selector switches.

AUDIO SELECTOR SWITCHES

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

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

NOTE

If the NAV/COM audio selector switch corresponding to the selected transmitter is in the PHONE position with the AUTO selector switch in the SPEAKER position, all audio selector switches placed in the PHONE position will automatically be connected to both the airplane speaker and any headsets in use.

MICROPHONE-HEADSET

The microphone-headset combination consists of the microphone and headset combined in a single unit and a microphone keying switch located

on the left side of the pilot's control wheel. The microphone-headset permits the pilot to conduct radio communications without interrupting other control operations to handle a hand-held microphone. Also, passengers need not listen to all communications. The microphone and headset jacks are located near the lower left corner of the instrument panel.

STATIC DISCHARGERS

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

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

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

Page

Introduction 8-3
Identification Plate 8-3
Owner Follow-Up System 8-3
Publications 8-3
Airplane File 8-4
Airplane Inspection Periods 8-5
FAA Required Inspections 8-5
Cessna Progressive Care 8-5
Cessna Customer Care Program 8-6
Pilot Conducted Preventive Maintenance 8-7
Alterations Or Repairs 8-7
Ground Handling 8-7
Towing 8-7
Parking 8-8
Tie-Down 8-8
Jacking 8-8
Leveling 8-9
Flyable Storage 8-9
Servicing 8-10
Engine Oil 8-10
Fuel . . . . . 8-[illegible]
Landing Gear 8-12
Cleaning And Care 8-12
Windshield-Windows 8-12
Painted Surfaces 8-13
Propeller Care 8-13
Engine Care 8-14
Interior Care 8-14

INTRODUCTION

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

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

IDENTIFICATION PLATE

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

OWNER 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/SUPPLEMENTS FOR YOUR
  AIRPLANE
  AVIONICS AND AUTOPILOT
- PILOT'S CHECKLISTS
- POWER COMPUTER
- SALES AND SERVICE DEALER DIRECTORY

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

- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
  AIRPLANE
  ENGINE AND ACCESSORIES
  AVIONICS AND AUTOPILOT

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

AIRPLANE FILE

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

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

B. To be carried in the airplane at all times:
   1. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
   2. Equipment List.

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

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

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

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

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

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

In lieu of the 100 HOUR and ANNUAL inspection requirements, 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, the inspection and maintenance work load is divided into smaller operations that can be accomplished in shorter time periods. The operations are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

While Progressive Care may be used on any Cessna, its benefits depend primarily on the utilization (hours flown per year) and type of operation. The procedures for both the Progressive Care Program and the 100-hour/annual inspection program have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. Your Cessna Dealer can assist you in selecting the inspection program most suitable for your type of aircraft and operation. 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 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 30° 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. 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, tail, and nose tie-down fittings and secure each rope or chain to a ramp tie-down.
4. 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.

Individual main gear may be jacked by using the jack pad which is incorporated in the main landing gear strut step bracket. 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 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 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 both upper door sills may be used to level the airplane laterally.

FLYABLE STORAGE

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

WARNING

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

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

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

SERVICING

In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the Service Manual. The Service Manual outlines all items which require attention at specific 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 --

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, and the following oils used as specified for the average ambient air temperature in the operating area.

SEE SUPPLEMENT FOR FOR TAE 125-02-114

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

SAE 50 above 16°C (60°F).
SAE 40 between -1°C (30°F) and 32°C (90°F).
SAE 30 between -18°C (0°F) and 21°C (70°F).
SAE 20 below -12°C (10°F).

MIL-L-22851 Ashless Dispersant Oil: This oil must be used after the first 50 hours or oil consumption has stabilized.

SAE 40 or SAE 50 above 16°C (60°F).
SAE 40 between -1°C (30°F) and 32°C (90°F).
SAE 30 or SAE 40 between -18°C (0°F) and 21°C (70°F).
SAE 30 below -12°C (10°F).

CAPACITY OF ENGINE SUMP -- 6 Quarts.

Do not operate on less than 4 quarts. To minimize loss of oil through breather, fill to 5 quart level for normal flights of less than 3 hours. For extended flight, fill to 6 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 the engine oil sump and oil cooler and clean the oil pressure screen. If an oil filter is installed, change the filter at this time. 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.

On airplanes not equipped with an oil filter, drain the engine oil sump and oil cooler and clean the oil pressure screen each 50 hours thereafter.

SEE SUPPLEMENT POH FOR TAE 125-02-114

On airplanes which have an oil filter, drain the engine oil sump and oil cooler and change the oil filter again at the first 50 hours; thereafter, the oil and filter change interval may be extended to 100-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. 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).
CAPACITY EACH STANDARD TANK -- 21.5 Gallons.
CAPACITY EACH LONG RANGE TANK -- 27 Gallons.

SEE SUPPLEMENT PROVIDED FOR TAE 125-02-114

NOTE

To ensure maximum fuel capacity when refueling, place the selector valve in either LEFT or RIGHT position to prevent cross-feeding.

LANDING GEAR

NOSE WHEEL TIRE PRESSURE -- 31 PSI on 5.00-5, 4-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 29 PSI on 6.00-6, 4-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --
Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 45 PSI. Do not over-inflate.

CLEANING AND CARE

WINDSHIELD-WINDOWS

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

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

NOTE

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

Follow by carefully washing with a mild detergent and plenty of water. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial wax will finish the cleaning

job. A thin, even coat of wax, polished out by hand with clean soft flannel cloths, will fill in minor scratches and help prevent further scratching.

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

PAINTED SURFACES

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

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

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

When the airplane is parked outside in cold climates and it is necessary to remove ice before flight, care should be taken to protect the painted surfaces during ice removal with chemical liquids. A 50-50 solution of isopropyl alcohol and water will satisfactorily remove ice accumulations without damaging the paint. A solution with more than 50% alcohol is harmful and should be avoided. While applying the de-icing solution, keep it away from the windshield and cabin windows since the alcohol will attack the plastic and may cause it to craze.

PROPELLER CARE

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

SEE SUPPLEMENT FOR 172 PAGE 7-1

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.

SEE SUPPLEMENT FOR TAE 125-02-114

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

LOG OF APPROVED SUPPLEMENTS

Supplement Number	Name	Revision Level
1.	CONTINENTAL DIESEL TAE 125-02-114	2/11
2.	GARMIN GTN650Xi	3
3.	GARMIN G3X	1
4.	GARMIN G5	9
5.	GARMIN GTX335	6
6.	GARMIN GFC500	10
7.	AT-1 TRAFFIC	1.0
8.	GARMIN GMA350C (Pilot's Guide)	L
9.	GARMIN GNC215 (Pilot's Guide)	A



Continental Aerospace Technologies GmbH
Platanenstraße 14
D - 09356 St. Egidien

Tel. +49 37204 696-0
Fax +49 37204 696-2912
www.continentaldiesel.com
support@continentaldiesel.com

Supplement
Pilot´s Operating Handbook
for the
(Reims) Cessna (F) 172
N & P
Equipped with TAE 125-02-114 Installation

Issue 2
Revision 12

MODEL No. _____

SERIAL No. _____

REGISTER No. _____

This supplement must be attached to the EASA approved Pilot´s Operating Handbook when the TAE 125-02-114 installation has been installed in accordance with EASA STC 10014287.

The information contained in this supplement supersede or add to the information published in the EASA approved Pilot´s Operating Handbook only as set forth herein.
For limitations, procedures, performance and loading information not contained in this supplement, consult the EASA approved Pilot´s Operating Handbook.

This supplement Pilot's Operating Handbook is approved with EASA AFM Approval 10036563.

Doc.-No.: 20-0310-20122*

*The last digit of the document number describes the issue of the manual. All manuals with a lower last digit are previous issues of this version.

APPROVAL

The technical content of this document is approved under the authority of the DOA, ref. EASA.21J.010.

LOG OF REVISIONS

Revision	Section	Description	Date	Approved
2/0	all	new Issue	May 21, 2010	EASA STC 10014287
2/1	1	New oil, editorial changes	April 14, 2011	Revision No. 1 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: April 14, 2011 Office of Airworthiness
	2	New oil, editorial changes		
	3	Procedures updated		
	4	Procedures updated		
	5	Editorial changes		
	6	Editorial changes		
	9	New Section		
2/2	1	New gearbox oil, editorial changes	Sept. 22, 2011	EASA AFM Approval 10036563
	2	New gearbox oil, Fuel capacity integral fuel tank		
	4	Procedures updated		
	5	Flight performance with integral fuel tanks		
	7	Editorial changes		

Revision	Section	Description	Date	Approved
2/3	1	New Fuel, new gearbox oil	March 16 2012	Revision No. 3 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: March 16, 2012 Office of Airworthiness
	2	New fuel, new gearbox oil		
	4	New fuel, Procedures updated		
	5	Procedures updated		
	6	New fuel		
2/4	1	New gearbox oil	March 11, 2013	Revision No. 4 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: March 11, 2013 Office of Airworthiness
	2	New gearbox oil		
	5	Procedures updated		
2/5	---	EASA STC / AFM numbers corrected on the cover	May 27, 2013	Revision No. 5 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: May 27, 2013 Office of Airworthiness

Revision	Section	Description	Date	Approved
2/6	1	Safety Recommendation New fuel New gearbox oil Note fuel additive	03.09.2014	Revision No. 6 to AFM supplement ref. 20-0310-22122 is approved under the authority of DOA ref. EASA.21J.010. Date: september 03, 2014 Office of Airworthiness
	2	Note added New fuel New gearbox oil Note fuel additive	03.09.2014	
	3	Description adapted wording	03.09.2014	
	4	Note added	03.09.2014	
	5	Wording	03.09.2014	
	6	Wording	03.09.2014	
	7	Wording	03.09.2014	
	8	Wording	03.09.2014	
	9	Wording	03.09.2014	
2/7	4	Procedure added	26.01.2015	Revision No. 7 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: January 26, 2015 Office of Airworthiness

Revision	Section	Description	Date	Approved
2/8	1	New propeller	April 08, 2015	EASA STC 10014287, Rev. 8
	5	splitted due to new propeller specs		
	5a	New section		
	5b	New section		
2/9	1	Update Liquids	Jan. 22, 2018	Revision No. 9 to AFM supplement ref. 20-0310-20122 is approved under the authority of DOA ref. EASA.21J.010. Date: Jan. 22, 2018 Office of Airworthiness
	2	Update liquids Update Engine Instrument Markings		
	3	various minor corrections		
	4	Update FADEC Test above 5500ft		
2/10	all	Change of company name	Mar. 01, 2022	Office of Airworthiness
	1	Update liquids according to OM-02-02 (Rev. 5/3)		
	2	Update liquids according to OM-02-02 (Rev. 5/3), update Placards		
	6	Caution and Note deleted		

Revision	Section	Description	Date	Approved
2/11	4	Figure gearbox oil level added	Feb. 03, 2023	 Office of Airworthiness
2/12	1	Coolant type added	Jun. 23, 2025	 Office of Airworthiness
	2	Coolant type and placards added		
	4	Description Cabin heat updated		

Remark: The parts of the text which changed are marked with a vertical line on the margin of the page.

LIST OF EFFECTIVE SECTIONS

Sections	Issue/Revision	Date
1	2/10	Jun. 23, 2025
2	2/9	Jun. 23, 2025
3	2/7	Jan. 22, 2018
4	2/9	Jun. 23, 2025
5	2/7	April 08, 2015
5a	2/0	April 08, 2015
5b	2/0	April 08, 2015
6	2/7	Mar. 01, 2022
7	2/6	Sept. 03, 2014
8	2/6	Sept. 03, 2014
9	2/6	Sept. 03, 2014

GENERAL REMARK

The content of this POH supplement is developed on basis of the EASA-approved POH.

TABLE OF CONTENTS

COVER SHEET

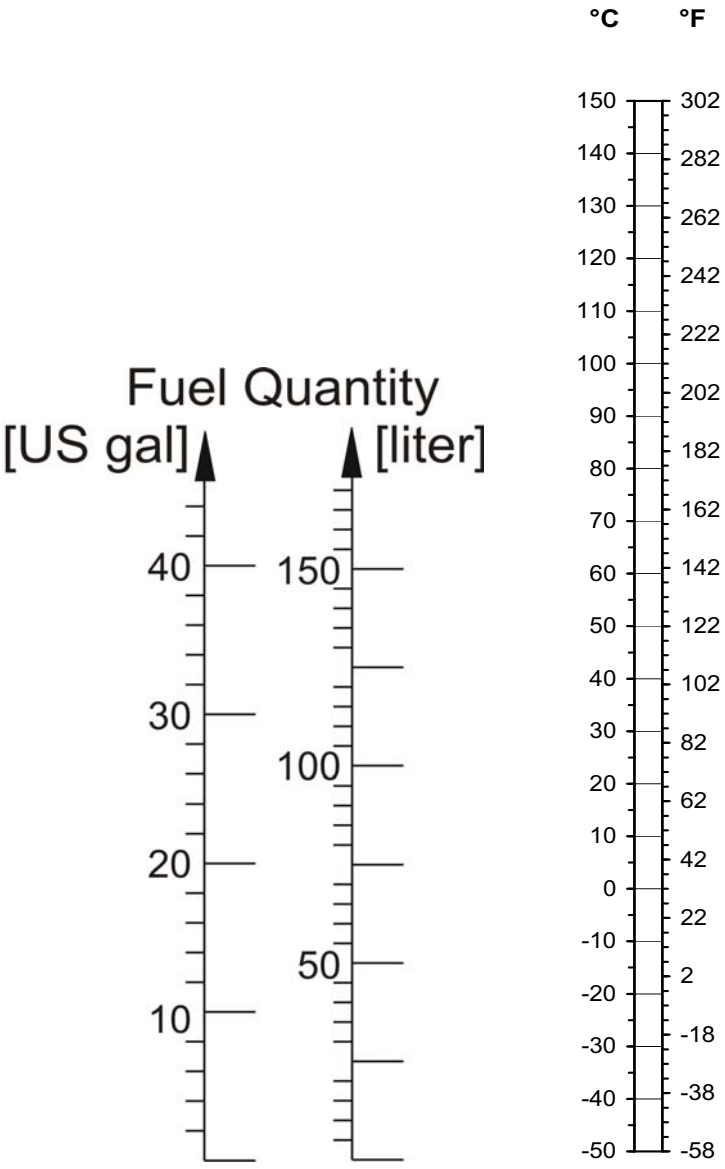
LOG OF REVISIONS ..... page iii
LIST OF EFFECTIVE SECTIONS ..... page viii
GENERAL REMARK ..... page viii
TABLE OF CONTENTS ..... page ix
CONVERSION TABLES ..... page x
ABBREVIATIONS ..... page xiv

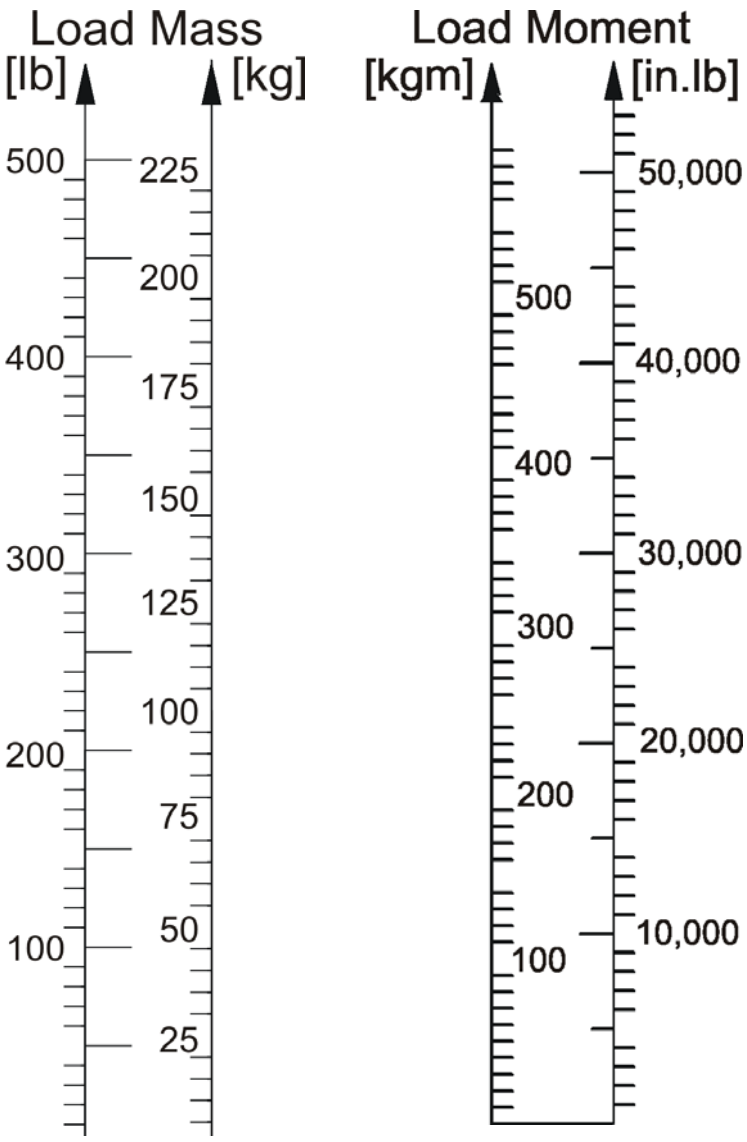
SECTION 1	GENERAL
SECTION 2	LIMITATIONS (EASA approved chapter)
SECTION 3	EMERGENCY PROCEDURES
SECTION 4	NORMALPROCEDURES
SECTION 5	PERFORMANCE
SECTION 6	HANDLING ON GROUND & MAINTENANCE
SECTION 7	WEIGHT & BALANCE
SECTION 8	SPECIAL EQUIPMENT
SECTION 9	SUPPLEMENTS

CONVERSION TABLES

VOLUME		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Liter [l] US gallon [US gal] US quart [US qt] Imperial gallon [Imp gal] Cubic inch [in³]	[l] / 3.7854 = [US gal] [l] / 0.9464 = [US qt] [l] / 4.5459 = [[Imp gal] [l] x 61.024 = [in³]	 [US gal] x 3.7854 = [l] [[US qt] x 0.9464 = [l] [[Imp gal] x 4.5459 = [l] [in³] / 61.024 = [l]
TORQUE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilopondmeter [kpm] Foot pound [ft.lb] Inch pound [in.lb]	[kpm] x 7.2331 = [ft.lb] [kpm] x 86.7962 = [in.lb]	 [ft.lb] / 7.2331 = [kpm] [in.lb] / 86.7962 = [kpm]
TEMPERATURE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Degree Celsius [ºC] Degree Fahrenheit [ºF]	[ºC] x 1.8 + 32 = [ºF]	 ([ºF] - 32) / 1.8 = [ºC]
SPEED		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilometers per hour [km/h] Meters per second [m/s] Miles per hour [mph] Knots [kts] Feet per minute [fpm]	[km/h] / 1.852 = [kts] [km/h] / 1.609 = [mph] [m/s] x 196.85 = [fpm]	 [mph] x 1.609 = [km/h] [kts] x 1.852 = [km/h] [fpm] / 196.85 = [m/s]

PRESSURE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Bar [bar] Hectopascal [hpa] =Millibar [mbar] Pounds per square inch [psi] inches of mercury column [inHg]	[bar] x 14.5038 = [psi] [hpa] / 33.864= [inHg] [mbar] / 33.864 = [inHg]	 psi] / 14.5038 = [bar] [inHg] x 33.864 = [hPa] [inHg] x 33.864 = [mbar]
MASS		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Kilogramm [kg] Pound [lb]	[kg] / 0.45359 = [lb]	 [lb] x 0.45359 = [kg]
LENGTH		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Meter [m] Millimeter [mm] Kilometer [km] Inch [in] Foot [ft] Nautical mile [nm] Statute mile [sm]	[m] / = 0.3048 [ft] [mm] / = 25.4 [in] [km] / = 1.852 [nm] [km] / = 1.609 [sm]	 [in] x 25.4 = [mm] [ft] x 0.3048 = [m] [nm] x 1.852 = [km] [sm] x 1.609 = [km]
FORCE		
Unit [Abbr.]	Conversion factor SI to US / Imperial	Conversion factor US / Imperial to Si
Newton [N] Decanewton [daN] Pound [lb]	[N] / 4.448 = [lb] [daN] / 0.4448 = [lb]	 [lb] x 4.448 = [N] [lb] x 0.4448 = [daN]


°C
°F
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
302
282
262
242
222
202
182
162
142
122
102
82
62
42
22
2
-18
-38
-58
Fuel Quantity
[US gal]
[liter]
40
30
20
10
150
100
50


Load Mass
[lb]
[kg]
500
400
300
200
100
225
200
175
150
125
100
75
50
25
Load Moment
[kgm]
[in.lb]
500
400
300
200
100
50,000
40,000
30,000
20,000
10,000

ABBREVIATIONS

FADEC	Full Authority Digital Engine Control
CED 125	Compact Engine Display Multifunctional instrument for indication of engine data of the TAE 125-02-114
AED 125	Auxiliary Engine Display Multifunctional instrument for indication of engine and airplane data

SECTION 1
GENERAL

Safety Recommendations

The following symbols and warnings are used in this manual. They must be heeded strictly to prevent personal injury and material damage, to avoid impairment of the operational safety of the aircraft and to rule out any damage to the aircraft as a consequence of improper handling.

▲ **WARNING:**	Non-compliance with these safety rules could lead to injury or even death.
■ CAUTION:	Non-compliance with these special notes and safety measures could cause damage to the engine or to the other components.
◆ Note:	Information added for a better understanding of an instruction.

UPDATE AND REVISION OF THE MANUAL

▲ **WARNING:**	A safe operation is only assured with an up to date POH supplement. Information about actual POH supplement issues and revisions are published in the Service Bulletin TM TAE 000-0004.
◆ Note:	The Doc.-No of this POH supplement is published on the cover sheet of this supplement.

ENGINE

▲ **WARNING:** The engine requires an electrical power source for operation. If the main battery and alternator fail, the engine will only operate for a maximum of 30 minutes on FADEC backup battery power. Therefore, it is important to pay attention to indications of alternator failure.

Engine manufacturer: Continental Aerospace Technologies GmbH
Engine model: .....TAE 125-02-114

The TAE 125-02-114 is a liquid cooled in-line four-stroke 4-cylinder turbocharged engine with DOHC (double overhead camshaft), direct fuel injection and common-rail technology. It has a displacement of 1991 ccm (121.5 in^3). The engine is controlled by a FADEC system. The propeller is driven by a built-in gearbox (i = 1.69) with mechanical vibration dampening and overload release. The engine has an electrical self starter and an alternator.

▲ **WARNING:** The engine requires an electrical power source for operation. If the main battery and alternator fail, the engine will only operate for a maximum of 30 minutes on FADEC backup battery power. Therefore, it is important to pay attention to indications of alternator failure.

Due to this specific characteristic, all of the information from the are no longer valid with reference to:

- carburetor and carburetor pre-heating
- ignition magnetos and spark plugs, and
- mixture control and priming system

PROPELLER

Manufacturer: ..... MT Propeller Entwicklung GmbH
Model: MTV-6-A/187-129
..... MTV-6-A/190-69
Number of blades: 3
Diameter: ..... 1.87 m (MTV-6-A/187-129
..... 1.90 m (MTV-6-A/190-69)
Type: ..... constant speed

FUELS and LIQUIDS

▲ **WARNING:**	The engine must not be started under any circumstances if any fluid level is too low.
■ CAUTION:	Use of unapproved fuels may result in damage to the engine and fuel system components, resulting in possible engine failure.
■ CAUTION:	Use approved oil with exact designation only!
■ CAUTION:	Normally it is not necessary to fill the cooling liquid or gearbox oil between maintenance intervals. If the level is too low, please notify the service center immediately.

Fuel: ..... JET A-1 (ASTM 1655)
..... JET A (ASTM 1655)
..... Jet Fuel No.3 (GB 6537-2006)
..... JP-8 (MIL-DTL-83133E)
..... JP-8+100 (MIL-DTL-83133E)
..... TS-1 (GOST 10227-86)
..... TS-1 (GSTU 320.00149943.011-99
Alternative: ..... Diesel (**DIN** EN 590)
..... SASOL GTL Diesel

◆ Note: The additive Biobor JF can be used in jet and diesel fuel systems to prevent microbial contamination and ensure fuel quality. The recommended dosage is 1 oz. per 80 gal fuel. Drain water bottoms prior application. For further information refer to manufacturer specifications especially in the case of an already contaminated fuel system.

Engine oil: ..... AeroShell Oil Diesel Ultra
..... AeroShell Oil Diesel 10W-40
.....Shell Helix Ultra 5W-30
.....Shell Helix Ultra 5W-40

Gearbox oil: .....Centurion Gearbox Oil N1
..... Shell Spirax S6 ATF ZM
..... Shell Spirax S6 GXME 75W-80, API GL-4
..... Shell Spirax S4 G 75W-90, API GL-4

Coolant:..... Use of Ready Mix ratio 50:50 is recommended

◆ Note: If Ready Mix is not available please use concentrate and distilled water in a ratio of 50:50 to ensure an ice flocculation point at -38°C +/-2°C.

Approved types of coolant:

■ CAUTION: The type of coolant to be used depends on whether the coolant system includes a silicate pouch or not. If installed, the silicate pouch is integrated into the expansion tank. All expansion tanks designated for G40 are labeled accordingly.
Refer to “Placards” chapter 2.

For systems without a silicat pouch: .....BASF Glysantin / G40

For systems with a silicat pouch:: .....BASF Glysantin / G48
..... Valvoline/Zerex Glysantin / G48
.....Mobil Antifreeze Extra / G48
..... Comma Xstream Green - Concentrate / G48
..... BASF Glysantin Protect / G05
..... Valvoline/Zerex Glysantin / G05

■ CAUTION: G05, G40 and G48 must not be mixed with each other.

INSTRUMENT PANEL

Components of the new installation can be seen as example in the following Figure

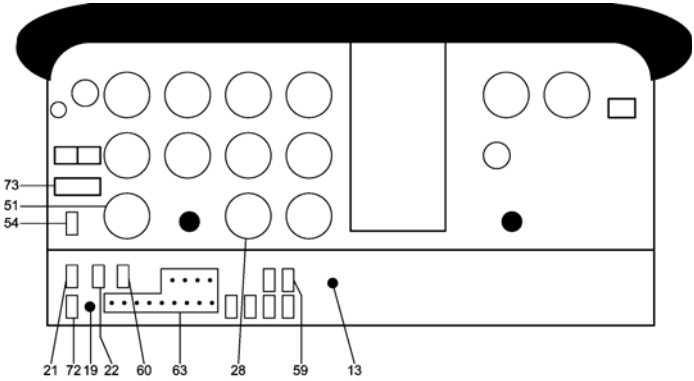


Figure 1-1 Example of Instrument panel

13. "Alt. Air Door" Alternate Air Door
    (Carburetor Heat Button **N/A**)
19. "Starter"-Push Button for Starter
21. "BAT"-Switch for Battery
22. "MAIN"-Switch for Main Bus
28. CED 125 (Tachometer **N/A**)
    The Compact Engine Display contains indication of Propeller Rotary Speed, Oil Pressure, Oil Temperature, Coolant Temperature, Gearbox Temperature and Load.
51. AED 125 SR (Voltmeter, Ammeter) with indication of Fuel-Temperature,
    Voltage and a caution light "Water Level" (amber) for low coolant level
54. "Force B"-Switch for manually switching the FADEC
59. "Fuel Pump"-Switch for the Electric Fuel Pump
60. "ALT"-Switch for Alternator
62. Fuse Electric Fuel Pump

63. Fuses, among other for Alternator Warning light, Starter, FADEC and Main Bus

72. "Engine Master"-Switch
electrical supply FADEC

73. Lightpanel with:
"FADEC" Test Knob
"A FADEC B" Warning Lights for FADEC A and B (red)
"Alt" Alternator Warning Light (red)
"AED" Caution Light (amber) for AED 125
"CED" Caution Light (amber) for CED 125
"CED/AED" - Test/Confirm Knob for CED 125, AED 125 and Caution Lights (amber)
"Fuel L";"Fuel R" Caution Lights for low fuel level (amber)
"Glow" Glow Control Light (amber)

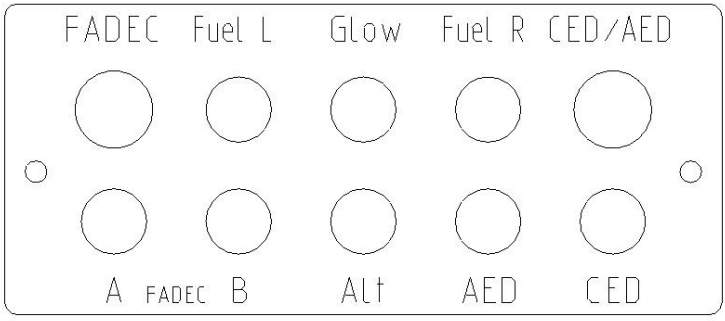


Figure 1-2 Lightpanel

FUEL SYSTEM (Left, Right, Both)

The fuel system of the engine includes the original standard or long-range tanks of the Cessna 172. Additional sensors for fuel temperature and "Low Level" warning are installed.
The fuel flows out of the tanks to the fuel selector valve with the positions LEFT, RIGHT and BOTH, through a reservoir tank to the fuel shut-off valve and then via the electrically driven fuel pump to the fuel filter.
The electrically driven fuel pump supports the fuel flow to the filter module if required. Fuel can be shut off by the separate shut-off valve. The engine-driven feed pump and the high-pressure pump supply the rail, from where the fuel is injected into the cylinders depending upon the position of the thrust lever and regulation by the FADEC. Surplus fuel flows to the fuel cooler and through the fuel selector valve back into the pre-selected tank; if BOTH is selected the fuel returns to both tanks.
A temperature sensor in the filter module controls the heat exchange between the fuel feed and return. The fuel cooler reduces the fuel temperature in the return line.
The fuel cooler receives its cooling air through an inlet in the air duct to the heating radiator. This inlet is closed with a baffle, which must be removed at high outside air temperatures (OAT higher than 20 °C (68 °F), see also Section 4).
Figure 1-3Since the density of diesel and jet fuel (0.84 kg/l) is higher than AVGAS (0.715 kg/l), the usable fuel capacity was reduced by this factor through the fuel filler neck, to stay within the approved wing load

Fuel Capacity			
Tanks	Total Capacity	Total Unusable Fuel	Total Usable Fuel
2 Standard-Tanks: each 69.4l (18.30 US gal)	138.8 l (36.6 US gal)	11.4 l (3 US gal)	127.4 l (33.6 US gal)
2 Long-Range Tanks: each 86.8l (22.95 US gal)	173.6 l (45.9 US gal)	15.1 l (4 US gal)	158.6 l (41.9 US gal)
2 Integral Tanks (normal category): each 119.8 l (29 US gal)	219.6 l (58 US gal)	22.8 l (6 US Gal)	196.8 l (52 US gal)
2 Integral Tanks (utility category): each 90.7 l (23.95 US gal)	181.4 l (47.9 US gal)	22.8 l (6 US Gal)	158.6 l (41.9 US gal)

FUEL SYSTEM (Left, Right, Both)

■ CAUTION: In flight conditions with downward pointing wing, switch the fuel selector to the upper fuel tank or to the BOTH position.

■ CAUTION: In turbulent air it is strongly recommended to use the BOTH position.

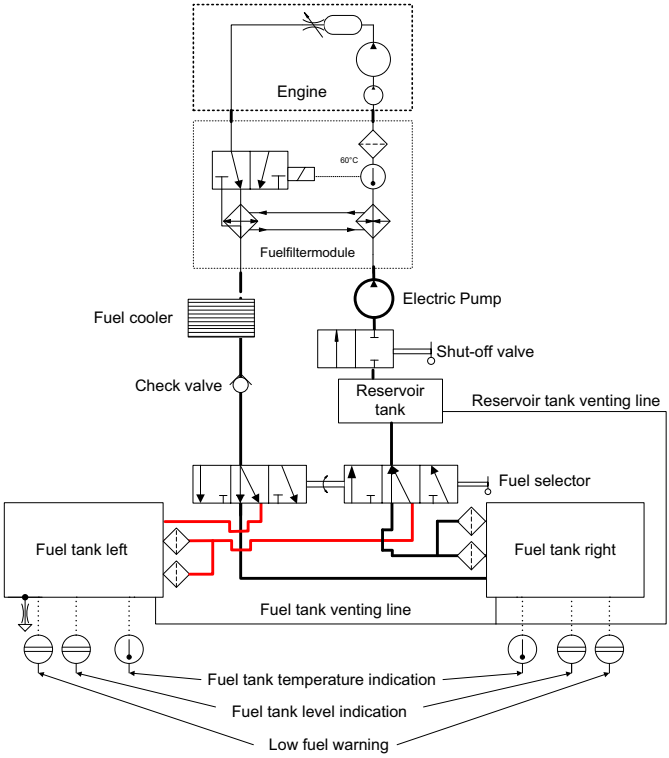


Figure 1-4 Scheme of the Fuel System (Left, Right, Both)

◆ Note: The handling of the fuel selector positions left, right and both are described in the original POH.

ELECTRICAL SYSTEM

The electrical system differs from the previous installation and is equipped with the following operating and display elements:

1. "Main Bus" Switch
   This switch controls the Main Bus. The Main Bus is required to be able to run FADEC and engine with the Battery/Alternator in the event of electrical system malfunctions. In normal operation Alternator, Main Bus and Battery must be ON.

2. "Alternator" Switch
   Controls the alternator. Must be ON in normal operation.

3. "Battery" Switch
   Controls the battery.

4. "Starter" Push Button
   Controls the magneto switch of the starter.

5. Ammeter
   The Ammeter shows the alternator current. In case of battery discharge if alternator inoperative the alternator warning light will illuminate.

6. "Alternator" Warning light
   Illuminates when the power output of the alternator is too low or the alternator switch is switched off. Normally, this warning light always illuminates when the "Engine Master" is switched on without revolution and extinguishes immediately after starting the engine.

7. "Fuel Pump" Switch
   Controls the electric fuel pump.

8. Engine Master" Switch
   Controls the two redundant FADEC components and the alternator excitation battery with two independent contacts. The alternator excitation battery is used to ensure that the alternator continues to function properly even if the main battery fails.

▲ **WARNING:** If the "Engine Master" is switched off, the power supply to the FADEC is interrupted and the engine will shut down.

9. "Force B" Switch
   If the FADEC does not automatically switch from A-FADEC to B-FADEC in an emergency, this switch allows to manually switch to the B-FADEC.

▲ **WARNING:** When operating on FADEC backup battery only, the "Force B" switch must not be activated. This will shut down the engine.

10. FADEC Backup Battery
    The electrical system includes a FADEC backup battery to ensure power supply to A-FADEC in case the battery and alternator fail or are disconnected. The engine can be operated for a maximum of 30 minutes when powered by the FADEC backup battery only. Only A-FADEC is connected to the backup battery.

The basic wiring of the installation is available in 14V as well as 28V versions.

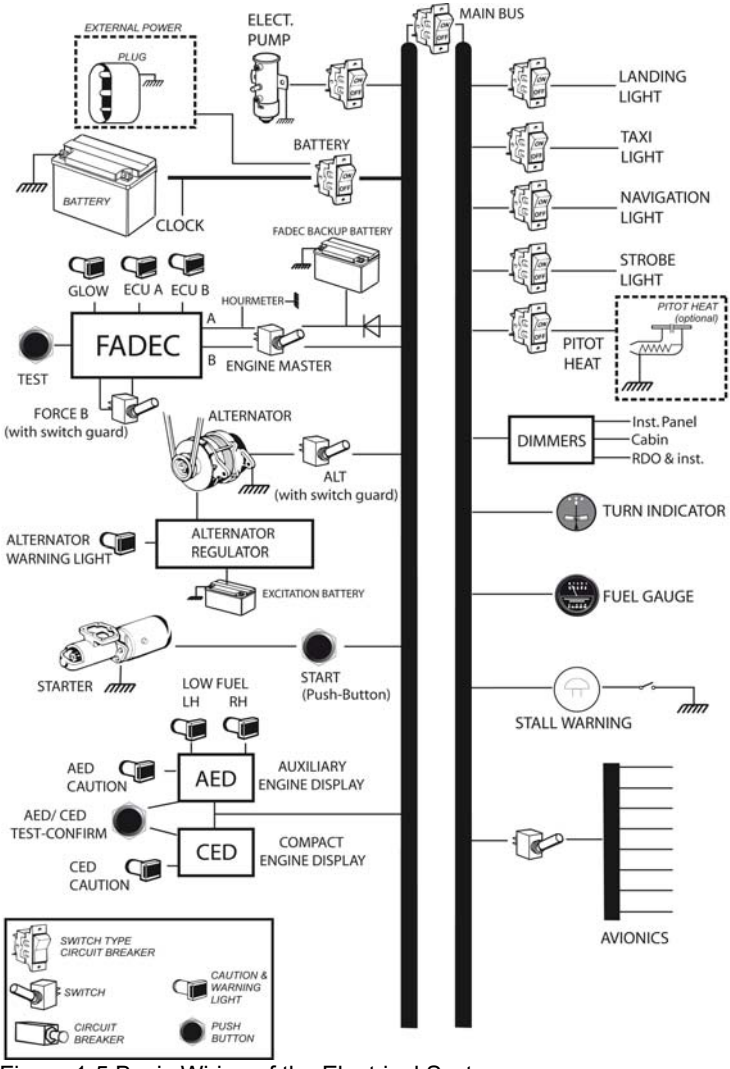


Figure 1-5 Basic Wiring of the Electrical System

FADEC-RESET

In case of a FADEC warning, one or both FADEC warning lights are flashing. If the "FADEC" test knob is pressed for at least 2 seconds,

a) the active warning lights will extinguish if it was a LOW category warning.

b) the active warning lights will be illuminated steady if it was a HIGH category warning.

■ CAUTION: If a FADEC warning occurred, contact your service center.

When a high category warning occurs the pilot should land as soon as possible, since the affected FADEC ECU has diagnosed a severe fault. A low category fault has no significant impact on engine operation.
Refer also to the engine OM-02-02 for additional information.

COOLING

The installation is fitted with a fluid-cooling system, whose three-way thermostat regulates the flow of coolant between the large and small cooling circuit.
At a coolant temperature of up to 84°C (183°F) the coolant flows exclusively through the small circuit, between 84°C (183°F) and 94°C (201°F) through the small and the large circuit simultaneously.
If the cooling water temperature rises above 94°C (201°F), the complete volume of coolant flows through the large circuit and therefore through the radiator. This ensures a maximum cooling water temperature of 105°C (221°F).
There is a sensor in the expansion reservoir, which sends a signal to the warning light "Water level" on the AED 125 in the instrument panel if the coolant level is low.
The cooling water temperature is measured in the cylinder head near the thermostat and passed on to the FADEC and CED 125.
The connection to the heat exchanger for cabin heating is always open; the warm air supply is regulated by the pilot over

the heating valve. See Figure 1-5.
The supply of warm air into the cabin is controlled through the cabin heat control knob. In normal operation, the cabin heat control knob must be in the OPEN position.
In case of certain emergencies (refer to Section 3), the control knob "Shut-off Cabin Heat" has to be closed according to the appropriate procedures.

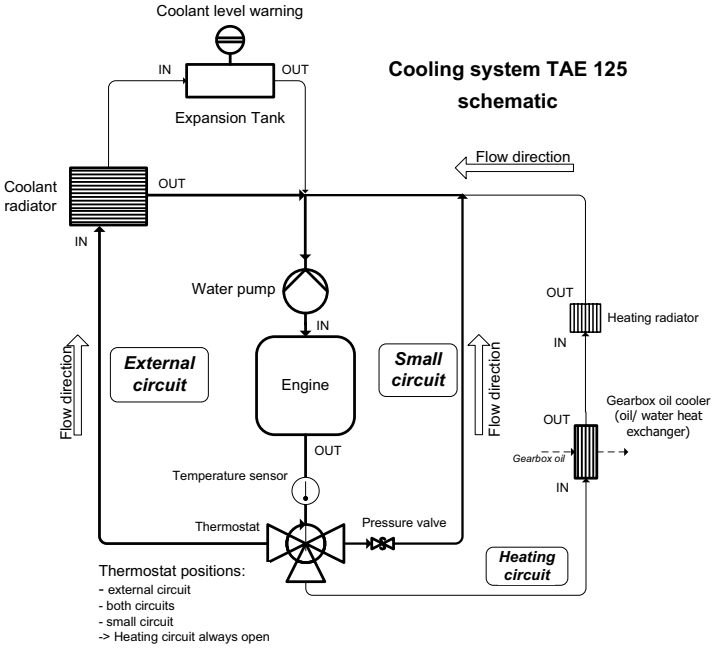


Figure 1-5 Cooling system

SECTION 2
LIMITATIONS

▲ **WARNING:** It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

Normal Category Cessna 172 N:

Maximum Ramp Weight: ..... 1044 kg (2302 lbs)
Maximum Takeoff Weight: ..... 1043 kg (2300 lbs)
Maximum Landing Weight ..... 1043 kg (2300 lbs)

Utility Category Cessna 172 N:

Maximum Ramp Weight: ..... 908 kg (2002 lbs)
Maximum Takeoff Weight: ..... 907 kg (2000 lbs)
Maximum Landing Weight ..... 907 kg (2000 lbs)

Normal Category Cessna 172 P:

Maximum Ramp Weight: ..... 1090 kg (2402 lbs)
Maximum Takeoff Weight: ..... 1089 kg (2400 lbs)
Maximum Landing Weight ..... 1089 kg (2400 lbs)

Utility Category Cessna 172 P:

Maximum Ramp Weight: ..... 954 kg (2102 lbs)
Maximum Takeoff Weight: ..... 953 kg (2100 lbs)
Maximum Landing Weight ..... 953 kg (2100 lbs)

MANEUVER LIMITS

■ CAUTION:	Intentionally initiating negative G maneuvers is prohibited

Normal Category: No change

Utility Category: Intentionally initiating spins is prohibited

FLIGHT LOAD FACTORS

No change

■ CAUTION:	Avoid extended negative g-loads duration. Extended negative g-loads can cause propeller control and engine problems.

◆ Note:	The load factor limits for the engine must also be observed. Refer to the Operation & Maintenance Manual for the engine.

ENGINE OPERATING LIMITS

Engine manufacturer: Continental Aerospace Technologies GmbH

Engine model: .....TAE 125-02-114

Take-off and Max. continuous power: ..... 114 kw (155 HP)

Take-off and Max. continuous RPM: ..... 2300 min^{-1}

Max. recommended cruise.....85%

◆ Note:	In the absence of any other explicit statements, all of the information on RPM in this supplement to the Pilot´s Operating Handbook are propeller RPM.

◆ Note:	This change of the original aircraft is certified up to an altitude of 18,000 ft.

Engine operating limits for take-off and continuous operation**:**

▲ **WARNING:**	It is not allowed to start the engine outside of these temperature limits.
◆ Note:	The operating limit temperature is a temperature limit below which the engine may be started, but not operated at the Take-off RPM. The warm-up RPM to be selected can be found in Section 4 of this supplement.

Oil temperature:
Minimum engine starting temperature: ..... -32 °C
Minimum operating limit temperature: .....50 °C
Maximum operating limit temperature: .....140 °C

Coolant temperature:
Minimum engine starting temperature: ..... -32 °C
Minimum operating limit temperature: .....60 °C
Maximum operating limit temperature: .....105 °C

Gearbox temperature:
Mininum operating limit temperature: ..... -30 °C
Maximum operating limit temperature: .....120 °C

Min. fuel temperature limits in the fuel tank:

Fuel	Minimum fuel temperature in the fuel tank before Take-off	Minimum fuel temperature in the fuel tank during the flight
JET A-1, JET A, Fuel No.3 JP-8, JP-8+100 TS-1	-30°C	-35°C
Diesel Sasol GTL Diesel	0°C	-5°C

Table 2-3a Minimum fuel temperature limits in the fuel tank

▲ **WARNING:** The fuel temperature of the fuel tank not used should be monitored if its later use is intended.

▲ **WARNING:** The following applies to Diesel and JET fuel mixtures in the tank:
As soon as the proportion of Diesel in the tank is more than 10% Diesel, the fuel temperature limits for Diesel operation must be monitored. If there is uncertainty about which fuel is in the tank, the assumption should be made that it is Diesel.

Oil Pressure

Minimum oil pressure: .....1.2 bar
Minimum oil pressure (at Take-off power) .....2.3 bar
Minimum oil pressure (in flight) .....2.3 bar
Maximum oil pressure.....6.0 bar
Maximum oil pressure (cold start < 20 sec.): .....6.5 bar
Maximum oil consumption: .....0.1 l/h (0.1 quart/h)

ENGINE INSTRUMENT MARKINGS

The engine data to be monitored are integrated in the combined engine instrument CED 125.
The ranges of the individual engine monitoring parameters are shown in the following table.

◆ Note: "Load" describes the available percentage of maximum engine power.

Instrument AED/CED		Red range	Amber range	Green range	Amber range	Red range
Tachometer	[RPM]	--------	--------	0-2300	--------	> 2300
Oil pressure	[bar]	0 - 1.1	1.2 - 2.2	2.3 - 5.1	5.2 - 6.5	> 6.5
	[psi]	0 - 16	17.4 - 32	33.4 - 74	75.4 - 87.0	> 87.0
Coolant temperature	[°C]	< -32	-32...+59	60 - 100	101 - 105	> 105
Oil temperature	[°C]	< -32	-32...+49	50 - 129	130 - 140	> 140
Gearbox temperature	[°C]	--------	--------	< 115	115 - 120	> 120
Load	[%]	--------	--------	0 - 100	--------	--------
Fuel Temperature (left and right)	[°C]	< -30	-30...-1	0 - 69	70 - 75	> 75
Alternator Current (14V)	[A]	--------	--------	0 - 84	85 - 90	>90
Alternator Current (28V)	[A]	--------	--------	0 - 52.4	52.5 - 60	>60
Electrical System Voltage (14V)	[V]	0 - 10	11 - 12.5	12.6 - 14.0	15.0	>15.0
Electrical System Voltage (28V)	[V]	0 - 21	22 - 24	25 - 29.4	29.5 - 30	>30

Table 2-2 Markings of the engine instruments

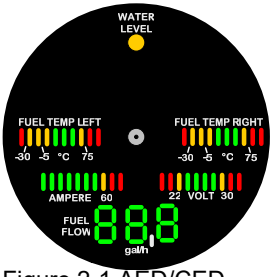




Figure 2-1 AED/CED

◆ Note: The AED/CED caution lamp is switched on if an engine reading is in the amber or red range.
The AED/CED caution lamp remains on even when the parameter returns to the green/normal operating range and must be confirmed by pressing the Confirm/Test knob.
After being confirmed, the AED/CED caution lamp will switch on again whenever another parameter enters amber/red range.
Pressing the Confirm/Test knob longer than one second will initiate the power-up test sequence.

PERMISSIBLE FUEL GRADES

■ CAUTION: Using non-approved fuels and additives can lead to dangerous engine malfunctions.

Fuel: .....JET A-1 (ASTM 1655)
.....JET A (ASTM 1655)
..... Jet Fuel No.3 (GB 6537-2006)
.....JP-8 (MIL-DTL-83133E)
.....JP-8+100 (MIL-DTL-83133E)
..... TS-1 (GOST 10227-86)
.....TS-1 (GSTU 320.00149943.011-99

Alternative: ..... Diesel (**DIN** EN 590)
.....SASOL GTL Diesel

◆ Note: The additive Biobor JF can be used in jet and diesel fuel systems to prevent microbial contamination and ensure fuel quality. The recommended dosage is 1 oz. per 80 gal fuel. Drain water bottoms prior application. For further information refer to manufacturer specifications especially in the case of an already contaminated fuel system.

MAXIMUM FUEL QUANTITIES

Due to the higher specific density of Kerosene in comparison to Aviation Gasoline (AVGAS) the permissible tank capacity has been reduced.

Fuel Capacity			
Tanks	Total Capacity	Total Unusable Fuel	Total Usable Fuel
2 Standard-Tanks: each 69.4l (18.30 US gal)	138.8 l (36.6 US gal)	11.4 l (3 US gal)	127.4 l (33.6 US gal)
2 Long-Range Tanks: each 86.8 l (22.95 US gal)	173.6 l (45.9 US gal)	15.1 l (4 US gal)	158.6 l (41.9 US gal)
2 Integral Tanks (normal category): each 119.8 l (29 US gal)	219.6 l (58 US gal)	22.8 l (6 US gal)	196.8 l (52 US gal)
2 Integral Tanks (utility category): each 90.7 l (23.95 US gal)	181.4 l (47.9 US gal)	22.8 l (6 US gal)	158.6 l (41.9 US gal)

■ CAUTION: To prevent air from penetrating into the fuel system avoid running one tank dry. As soon as the "Low Level" caution light illuminates, switch to the tank with sufficient fuel or land as soon as possible.

■ CAUTION: With ¼ tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank.

■ CAUTION: In turbulent air it is strongly recommended to use the BOTH position.

◆ Note: The tanks are equipped with a low fuel sensor. If the fuel level is below 10 l (2.6 US gal) usable fuel per tank, the "Fuel L" or "Fuel R" Caution light illuminates respectively.

PERMISSIBLE OIL TYPES

Engine oil: ..... AeroShell Oil Diesel Ultra
..... AeroShell Oil Diesel 10W-40
..... Shell Helix Ultra 5W-30
..... Shell Helix Ultra 5W-40
Gearbox oil: .....Centurion Gearbox Oil N1
..... Shell Spirax S6 ATF ZM
..... Shell Spirax S6 GXME 75W-80, API GL-4
..... Shell Spirax S4 G 75W-90, API GL-4

■ CAUTION: Use approved oil with exact designation only!

PERMISSIBLE COOLING LIQUID

Coolant:..... Use of Ready Mix ratio 50:50 is recommended

◆ Note: If Ready Mix is not available please use concentrate and distilled water in a ratio of 50:50 to ensure an ice flocculation point at -38°C +/-2°C.

Approved types of coolant:

■ CAUTION: The type of coolant to be used depends on whether the coolant system includes a silicate pouch or not. If installed, the silicate pouch is integrated into the expansion tank. All expansion tanks designated for G40 are labeled accordingly.
Refer to “Placards” in this chapter.

For systems without a silicat pouch: ..... BASF Glysantin / G40

For systems with a silicat pouch:: ..... BASF Glysantin / G48
..... Valvoline/Zerex Glysantin / G48
..... Mobil Antifreeze Extra / G48
..... Comma Xstream Green - Concentrate / G48
..... BASF Glysantin Protect / G05
..... Valvoline/Zerex Glysantin / G05

■ CAUTION: G05, G40 and G48 must not be mixed with each other.

PLACARDS

Near the fuel tank caps:

With standard tanks:

JET FUEL ONLY
JET A-1 / DIESEL
CAP. 63.7 LITER (16.8 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

With long-range tanks:

JET FUEL ONLY
JET A-1 / DIESEL
CAP. 79.3 LITER (20.9 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

Normal category aircraft with integral fuel tanks:

JET FUEL ONLY
JET A-1/ DIESEL
CAP. 98.4 LITER (26 U.S. GAL.)
USABLE TO BOTTOM OF FILLER INDICATOR TAB

At the fuel selector valve:

With standard tanks:

Left and Right position: 63.7 Ltr/ 16.8 gal
Both position: 127.4 Ltr/ 33.6 gal

With long-range tanks:

Left and Right position: 79.3 Ltr/ 20.9 gal
Both position: 158.6 Ltr/ 41.9 gal

Normal category aircraft with integral fuel tanks:

Left and Right position: 98.4 Ltr/ 26 gal
Both position: 196.8 Ltr/ 52 gal

Utility category aircraft with integral fuel tanks:

Left and Right position: 79.3 Ltr/ 20.9 gal
Both position: 158.6 Ltr/ 41.9 gal

On the oil funnel or at the flap of the engine cowling:



Figure 2-2

Drain Valve Fuel filter

The decal is attached to the drain valve of the fuel filter.

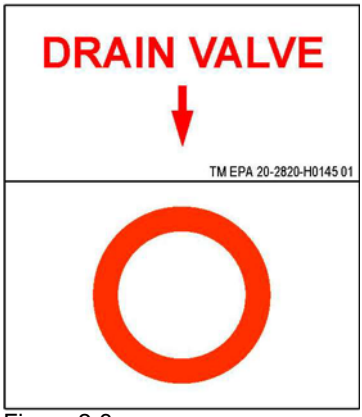


Figure 2-3

Expansion Tank: Coolant

The decal is attached to the expansion tank.

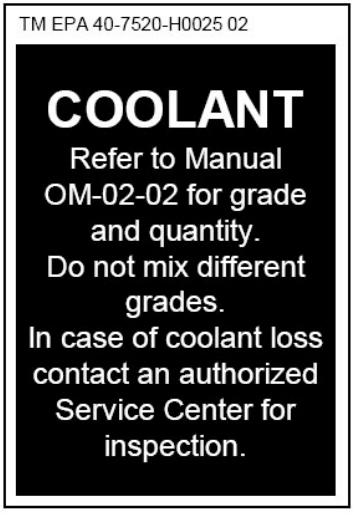


Figure 2.4



Figure 2-5 Expansion tank for G40 coolant type ("new" resp. "modified")



Figure 2-6 Expansion tank for G48 coolant type

If installed, at the flap of the engine cowling to the External Power Receptacle**:**

"ATTENTION 12 V DC OBSERVE CORRECT POLARITY"
OR
"ATTENTION 24 V DC OBSERVE CORRECT POLARITY“

All further placards contained in this section remain valid.

SECTION 3
EMERGENCY PROCEDURES

INDEX OF CHECKLISTS

ENGINE MALFUNCTION 3-2
During Take-off (with sufficient Runway ahead) 3-2
Immediately after Take-off 3-3
During Flight 3-3
Restart after Engine Failure 3-4
FADEC Warning 3-5
Abnormal Engine Behavior 3-7
FIRES 3-8
Engine Fire when starting Engine on Ground 3-8
Engine Fire during Take-OFF (on Ground) 3-8
Engine Fire in Flight 3-8
Electrical Fire in Flight 3-9
ENGINE SHUT DOWN IN FLIGHT 3-10
EMERGENCY LANDING 3-10
Emergency Landing with Engine out 3-10
FLIGHT IN ICING CONDITIONS 3-11
RECOVERY FROM SPIRAL DIVE 3-12
ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS 3-13
Alternator Warning during normal Engine Operation 3-15
Ammeter shows Battery Discharge during normal
Engine Operation for more than 5 Minutes 3-16
Total Electrical Failure 3-17
ROUGH ENGINE OPERATION OR LOSS OF POWER 3-18
Decrease in Power 3-18
Oil pressure too low 3-19
Oil temperature "OT" too high: 3-19
Coolant temperature "CT" too high: 3-20
"Water Level" Light illuminates / Caution COOL LVL 3-20
Gearbox temperature "GT" too high: 3-20
Fuel Temperature too high: 3-20
Fuel Temperature too low: 3-21
Propeller RPM too high: 3-21
Fluctuations in Propeller RPM: 3-22

GENERAL

In addition to the original AFM/POH, the following applies:

▲ **WARNING:**	Due to failures indicated by the FADEC warning lights there might be a loss propeller valve current which leads in a low pitch setting of the propeller. This might result in overspeed. Airspeeds below 100 KIAS are suitable to avoid overspeed in failure case. If the propeller speed control fails, climbs can be performed at 65 KIAS and a powersetting of 100%.

EMERGENCY PROCEDURES CHECK LIST

ENGINE MALFUNCTION

DURING TAKE-OFF (WITH SUFFICENT RUNWAY AHEAD)

(1) Thrust Lever - IDLE
(2) Brakes - APPLY
(3) Wing flaps (if extended) - RETRACT to increase the braking effect on the runway
(4) Engine Master - OFF
(5) AlternatorMain Bus and Battery switch - OFF

IMMEDIATELY AFTER TAKE-OFF

If there is an engine malfunction after take-off, at first lower the nose to keep the airspeed and attain gliding attitude. In most cases, landing should be executed straight ahead with only small corrections in direction to avoid obstacles.

▲ **WARNING:** Altitude and airspeed are seldom sufficient for a return to the airfield with a 180° turn while gliding.

(1) Airspeed..... 65 KIAS (wing flaps retracted)
.....60 KIAS (wing flaps extended)
(2) Fuel Shut-off Valve - CLOSED
(3) Engine Master - OFF
(4) Wing flaps - as required (full down recommended)
(5) Alternator Main Bus and Battery switch - OFF

DURING FLIGHT

◆ Note: Running a tank dry activates both FADEC warning lights flashing.

In case that one fuel tank was flown empty, at the first signs of insufficient fuel feed proceed as follows:

(1) Fuel Shut-off Valve - OPEN (push full in)
(2) Immediately switch the Fuel Selector to BOTH position
(3) Electric Fuel Pump - ON
(4) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position).
(5) If the engine acts normally, continue the flight and land as soon as possible.

▲ **WARNING:** The high-pressure pump must be checked by an authorized service center before the next flight.

RESTART AFTER ENGINE FAILURE

Whilst gliding to a suitable landing strip, try to determine the reason for the engine malfunction. If time permits and a restart of the engine is possible, proceed as follows:

(1) Airspeed between 65 and 85 KIAS
(2) Glide below 13,000 ft
(3) Fuel Shut-off Valve - OPEN (push full in)
(4) Fuel Selector switch toBOTH position
(5) Electric Fuel Pump - ON
(6) Thrust Lever - IDLE
(7) Engine Master OFF and then ON
(if the propeller does not turn, then additionally Starter ON)

◆ Note:	The propeller will normally continue to turn as long as the airspeed is above 65 KIAS. Should the propeller stop at an airspeed of more than 65 KIAS or more, the reason for this should be found out before attempting a restart. If it is obvious that the engine or propeller is blocked, do not use the Starter.

)

◆ Note:	If the Engine Master is in position OFF, the Load Display shows no value even if the propeller is turning.

(8) Check the engine power: Thrust lever 100%, engine parameters, check altitude and airspeed.

FADEC WARNING

FADEC MALFUNCTION IN FLIGHT

◆ Note: The FADEC consists of two components that are independent of each other: FADEC A and FADEC B. In case of malfunctions in the active FADEC, it automatically switches to the other.

a) One FADEC Light is flashing

1. Press FADEC test knob at least 2 seconds
2. FADEC light extinguished (LOW category warning):
   a) Continue flight normally
   b) Inform service center after landing
3. FADEC light illuminated steady (HIGH category warning)
   a) Observe the other FADEC light
   b) Land as soon as possible
   c) Select an airspeed to avoid engine overspeed
   d) Inform service center after landing

a) Both FADEC Lights are flashing

◆ Note: CED load display should be considered unreliable with both FADEC lights illuminated. Use other indications to assess engine condition.

1. Press FADEC test knob at least 2 seconds
2. FADEC Lights extinguished (LOW category warning):
   a) Continue flight normally
   b) Inform service center after landing
3. Steady FADEC Lights (HIGH category warning):
   a) Check the available engine power
   b) Expect engine failure
   c) Flight can be continued, however the pilot should
      i) Select an appropriate airspeed to avoid engine overspeed.
      ii) Land as soon as possible
      iii) Be prepared for an emergency landing
   d) Inform service center after landing
4. In case a fuel tank was flown empty, proceed at the first signs of insufficient fuel feed as follows:
   a) Immediately switch the Fuel Selector to BOTH
   b) Electric Fuel Pump - ON
   c) Select an airspeed to avoid engine overspeed.
   d) Check the engine (engine parameters, airspeed/altitude change, whether the engine responds to changes in the Thrust Lever position).
   e) If the engine acts normally, continue the flight and land as soon as possible.

▲ **WARNING:** The high-pressure pump must be checked by an authorized service center before the next flight.

ABNORMAL ENGINE BEHAVIOR

If the engine acts abnormal during flight and the system does not automatically switch to the B-FADEC, it is possible switch to the B-FADEC manually.

▲ **WARNING:** It is only possible to switch from the automatic position to B-FADEC (A-FADEC is active in normal operation, B-FADEC is active in case of malfunction). This only becomes necessary when no automatic switching occurred in case of abnormal engine behavior.

(1) Select an appropriate airspeed to avoid engine overspeed.

▲ **WARNING:** When operating on FADEC backup battery only, the "Force B" switch MUST not be activated. This will shut down the engine.

(2) "FORCE-B" switch to B-FADEC
(3) Flight may be continued, but the pilot should:
    i) Select an airspeed to avoid engine overspeed
    ii) Land as soon as possible
    iii) Be prepared for an emergency landing

FIRES

ENGINE FIRE WHEN STARTING ENGINE ON GROUND

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electric Fuel Pump - OFF
(4) Battery Switch - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Inform service center after landing for examination of fire damages.

ENGINE FIRE DURING TAKE-OFF (ON GROUND)

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Electric Fuel Pump - OFF
(4) Battery switch - OFF
(5) Extinguish the flames with a fire extinguisher, wool blankets or sand.
(6) Inform service center after landing for examination of fire damages.

ENGINE FIRE IN FLIGHT

(1) Engine Master - OFF
(2) Fuel Shut-off Valve - CLOSED
(3) Select an airspeed to avoid engine overspeed
(4) Electric Fuel Pump - OFF
(5) Cabin heat and ventilation OFF resp. CLOSE (except the fresh air nozzles on the ceiling)
(6) Perform emergency landing (as described in the procedure "Emergency Landing With Engine Out")

ELECTRICAL FIRE IN FLIGHT

The first sign of an electrical fire is an unmistakable sharp, acrid smell. As the fire grows, electrical load might be higher than normal or circuit breakers start to trip. In this event proceed as follows:

(1) Main Bus - OFF
(2) Avionics Master - OFF
(3) Fresh air nozzles, Cabin Heat and Ventilation - OFF (closed)
(4) Fire Extinguisher - Activate (if available)
(5) All electrical consumers - Switch OFF, leave Alternator, battery and Engine Master ON

▲ **WARNING:** After the fire extinguisher has been used, make sure that the fire is extinguished before exterior air is used to remove smoke from the cabin.

(6) If there is evidence of continued electrical fire, consider turning off battery and alternator.

▲ **WARNING:** If both alternator and main battery are turned OFF, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC backup battery only.

(7) Fresh Air Nozzles, Cabin Heat and Ventilation - ON (open)
(8) Check Circuit Breakers, do not reset if open

If the fire has been extinguished:

(9) Main Bus - ON
(10) Avionics Master - ON

▲ **WARNING:** Turn on electrical equipment required to continue flight depending on the situation and land as soon as possible. Switch circuit breakers switch ON one at a time, with delay after each.

ENGINE SHUT DOWN IN FLIGHT

If it is necessary to shut down the engine in flight (for instance, abnormal engine behavior does not allow continued flight or there is a fuel leak, etc.), proceed as follows:

(1) Select an airspeed to avoid engine overspeed (best glide recommended)
(2) Engine Master - OFF
(3) Fuel Shut-off Valve - CLOSED
(4) Electric Fuel Pump - OFF
(5) If the propeller also has to be stopped (for instance, due to excessive vibrations)
    i) Reduce airspeed below 55 KIAS
    ii) When the propeller is stopped, continue to glide at 65 KIAS

EMERGENCY LANDING

EMERGENCY LANDING WITH ENGINE OUT

If all attempts to restart the engine fail and an emergency landing is immanent, select suitable site and proceed as follows:

(1) Airspeed
    i) 65 KIAS (flaps retracted)
    ii) 60 KIAS (flaps extended)
(2) Fuel Shut-off Valve - CLOSED,
(3) Engine Master - OFF
(4) Wing Flaps - as required (full down recommended)
(5) AlternatorMain Bus and Battery switch - OFF
(6) Cabin Doors - unlock before touch-down
(7) Touch-down - slightly nose up attitude
(8) Brake firmly

◆ Note: Gliding Distance. Refer to "Maximum Glide" in the approved Pilot´s Operating Handbook“

FLIGHT IN ICING CONDITIONS

▲ **WARNING:** It is prohibited to fly in known icing conditions.

In case of inadvertent icing encounter proceed as follows:

(1) Pitot Heat switch - ON (if installed)
(2) Turn back or change the altitude to obtain an outside air temperature that is less conducive to icing.
(3) Pull the cabin heat control full out and open defroster outlets to obtain maximum windshield defroster airflow. Adjust cabin air control to get maximum defroster heat and airflow.
(4) Advance the Thrust Lever to increase the propeller speed and keep ice accumulation on the propeller blades as low as possible.
(5) Watch for signs of air filter icing and pull the "Alternate Air Door" control if necessary. An unexplaned loss in engine power could be caused by ice blocking the air intake filter. Opening the "Alternate Air Door" allows preheated air from the engine compartment to be aspirated.
(6) Plan a landing at the nearest airfield. With an extremely rapid ice build up, select a suitable "off airfield" landing site.
(7) With an ice accumulation of 0.5 cm or more on the wing leading edges, a significantly higher stall speed should be expected.
(8) Leave wing flaps retracted. With a severe ice build up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
(9) Perform a landing approach using a forward slip, if necessary, for improved visibility.
(10) Approach at 65 to 75 KIAS depending upon the amount of the accumulation.
(11) Perform a landing in level attitude.

RECOVERY FROM SPIRAL DIVE

If a spiral is encountered in the clouds, proceed as follows:

(1) Retard Thrust Lever to idle position
(2) Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizontal reference line.
(3) Cautiously apply elevator back pressure to slowly reduce the airspeed to 80 KIAS.
(4) Adjust the elevator trim control to maintain an 80 KIAS glide.
(5) Keep hands off the control wheel, using rudder control to hold a straight heading.
(6) Readjust the rudder trim (if installed) to relieve the rudder of asymmetric forces.
(7) Clear the engine occasionally, but avoid using enough power to disturb the trimmed glide.
(8) Upon breaking out of clouds, resume normal cruising flight and continue the flight.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

▲ **WARNING** If the power supply from both alternator and main battery is interrupted, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC backup battery only. In this case, all electrical equipment will not operate:

- land as soon as possible
- do not switch the FORCE-B switch, this will shut down the engine

■ CAUTION: The TAE 125-02-114 requires an electrical power source for its operation. If the alternator fails, continued engine operation time is dependent upon the remaining capacity of the main battery, the FADEC backup battery and equipment powered. The engine has been demonstrated to continue operating for approximately 120 minutes based upon the following assumptions:

■ CAUTION: This table only gives a reference point. The pilot should turn off all nonessential items and supply power only to equipment which is absolutely necessary for continued flight depending upon the situation.

Deviating from this recommendation, the remaining engine operating time may change.

Equipment		Time switched on	
		in [min]	in [%]
NAV/COM 1 receiving	ON	120	100
NAV/COM 1 transmitting	ON	12	10
NAV/COM 2 receiving	OFF	0	0
NAV/COM 2 transmitting	OFF	0	0
GPS	ON	60	50
Transponder	ON	120	100
Fuel Pump	OFF	0	0
AED-125	ON	120	100
Battery	ON	120	100
CED-125	ON	120	100
Landing Light	ON	12	10
Flood Light	ON	1.2	1
Pitot Heat	ON	24	20
Wing Flaps	ON	1.2	1
Interior Lighting	OFF	0	0
Nav Lights	OFF	0	0
Beacon	OFF	0	0
Strobes	OFF	0	0
ADF	OFF	0	0
Intercom	OFF	0	0
Engine Control	ON	120	100

Table 3-1a

ALTERNATOR WARNING DURING NORMAL ENGINE OPERATION

(1) Ammeter - CHECK
(2) Alternator switch CHECK - ON
(3) Battery Switch CHECK - ON

■ CAUTION: If the FADEC was supplied by battery only until this point, the RPM can momentarily drop, when the alternator will be switched on. In any case: leave the alternator switched ON!

(4) Electrical load - REDUCE IMMEDIATELY as follows:

iii) Fuel Pump – OFF
iv) Landing Light – OFF (use as required for landing)
v) Taxi Light – OFF
vi) Strobe Light – OFF
vii) Nav Lights – OFF
viii) Beacon – OFF
ix) Interior Lights – OFF
x) Intercom – OFF
xi) Pitot Heat – OFF (use as required)
xii) Autopilot – OFF
xiii) Non-essential equipment – OFF

(5) The pilot should:

i) Land as soon as possible.
ii) Be prepared for an emergency landing.
iii) Expect an engine failure.

AMMETER SHOWS BATTERY DISCHARGE DURING NORMAL ENGINE OPERATION FOR MORE THAN 5 MINUTES

(1) Ammeter - CHECK
(2) Alternator switch CHECK - ON
(3) Battery Switch CHECK - ON

■ CAUTION: If the FADEC was supplied by battery only until this point, the RPM can momentarily drop, when the alternator will be switched on. In any case: leave the alternator switched ON!

---

(4) Electrical load - REDUCE IMMEDIATELY as follows:
    i) NAV/ COM 2 – OFF
    ii) Fuel Pump – OFF
    iii) Landing Light – OFF (use as required for landing)
    iv) Taxi Light – OFF
    v) Strobe Light – OFF
    vi) Nav Lights – OFF
    vii) Beacon – OFF
    viii) Interior Lights – OFF
    ix) Intercom – OFF
    x) Pitot Heat – OFF (use as required)
    xi) Autopilot – OFF
    xii) Non-essential equipment – OFF
(5) The pilot should:
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

TOTAL ELECTRICAL FAILURE
(all equipment inoperative, except engine)

▲ **WARNING:** If the power supply from both alternator and main battery is interrupted simultaneously, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. The engine has been demonstrated to continue operating for a maximum of 30 minutes when powered by the FADEC backup battery only. In this case, all other electrical equipment will not operate.

▲ **WARNING:** If the aircraft was operated on battery power only until this point (alternator warning light illuminated), the remaining engine operating time may be less than 30 minutes.

▲ **WARNING:** Do not activate the FORCE-B switch, this will shut down the engine.

(1) Alternator switch CHECK - ON
(2) Battery Switch CHECK – ON
(3) Land as soon as possible
    i) Be prepared for an emergency landing
    ii) Expect an engine failure

ROUGH ENGINE OPERATION OR LOSS OF POWER

DECREASE IN POWER

(1) Push Thrust Lever full forward (take-off position)
(2) Fuel Selector to BOTH position
(3) Electric Fuel Pump - ON
(4) Reduce airspeed to 65-85 KIAS/75-98 mph (best glide recommended), (max. 100 KIAS/115 mph)
(5) Check engine parameters (FADEC lights, oil pressure and temperature, fuel quantity)

If normal engine power is not achieved, the pilot should:

i) Land as soon as possible
ii) Be prepared for an emergency landing
iii) Expect an engine failure

▲ **WARNING:** The high pressure pump must be checked by an authorized service center before the next flight.

ICE FORMATION IN THE CARBURETOR

- N/A, since this is a Diesel engine -

SOILED SPARK PLUGS

- N/A, since this is a Diesel engine -

IGNITION MAGNET MALFUNCTIONS

- N/A, since this is a Diesel engine -

iv)

OIL PRESSURE TOO LOW (< 2.3 BAR IN CRUISE (AMBER RANGE) OR < 1.2 BAR AT IDLE (RED RANGE)):

(1) Reduce power as quickly as possible
(2) Check oil temperature: If the oil temperature is high or near operating limits,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

◆ Note: During warm-weather operation or long climbs at low airspeed engine temperatures could rise into the amber range and trigger the "Caution" light. This indication allows the pilot to avoid overheating of the engine as follows:

(3) Increase the climbing airspeed, reduce angle of climb
(4) Reduce power, if the engine temperatures approach the red range

OIL TEMPERATURE TOO HIGH (RED RANGE):

(1) Increase airspeed and reduce power as quickly as possible
(2) Check oil pressure: if the oil pressure is lower than normal (< 2.3 bar in cruise or < 1.2 bar at idle),
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure
(3) If the oil pressure is in the normal range:
    i) Land as soon as possible

COOLANT TEMPERATURE TOO HIGH (RED RANGE):

(1) Increase airspeed and reduce power as quickly as possible
(2) Cabin Heat - COLD
(3) If coolant temperature reduces rapidly to normal range, continue to fly normally and monitor coolant temperature, Cabin Heat.
(4) If coolant temperature does not decrease,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

"WATER LEVEL" LIGHT ILLUMINATES

(1) Increase airspeed and reduce power as quickly as possible
(2) Coolant temperature "CT" check and observe
(3) Oil temperature "OT" check and observe
(4) If coolant temperature and/or oil temperature are rising into amber or red range,
    i) Land as soon as possible
    ii) Be prepared for an emergency landing
    iii) Expect an engine failure

GEARBOX TEMPERATURE TOO HIGH (RED RANGE):

(1) Reduce power to 55% - 75% as quickly as possible
(2) Land as soon as possible

FUEL TEMPERATURE TOO HIGH:

(1) Switch to fuel tank with lower fuel temperature, if this contains sufficient fuel
(2) Reduce engine power, if possible
(3) If fuel temperature remains in Red Range, land as soon as possible

FUEL TEMPERATURE TOO LOW (AMBER RANGE for Diesel Operation, RED RANGE for Kerosine Operation):

(1) Switch to fuel tank with higher fuel temperature, if this contains sufficient fuel
(2) Change to altitude with higher outside air temperature
(3) If use of the non-active tank is intended, switch fuel selector to BOTH

◆ Note: Low fuel temperature may be caused when flying in cold weather with fuel cooler in operation (baffle removed).

PROPELLER RPM TOO HIGH:

With propeller RPM between 2,400 and 2,500 for more than 10 seconds or over 2,500:

(1) Reduce power
(2) Reduce airspeed below 100 KIAS or as appropriate to prevent propeller overspeed
(3) Set power as required to maintain altitude and land as soon as possible.

◆ Note: If the propeller speed control fails, climbs be performed at 65 KIAS and a power setting of 100%.
In case of overspeed the FADEC will reduce the engine power at higher airspeeds to avoid propeller speeds above 2500 rpm.

FLUCTUATIONS IN PROPELLER RPM:

If the propeller RPM fluctuates by more than + / - 100 RPM with a constant Thrust Lever position:

(1) Change the power setting and attempt to find a power setting where the propeller RPM no longer fluctuates.
(2) If this does not work, set the maximum power at an airspeed < 100 KIAS until the propeller speed stabilizes.
(3) If the problem is resolved, continue the flight
(4) If the problem continues, select a power setting where the propeller RPM fluctuations are minimum. Fly at an airspeed below 100 KIAS and land as soon as possible.

This page intentionally left blank

SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

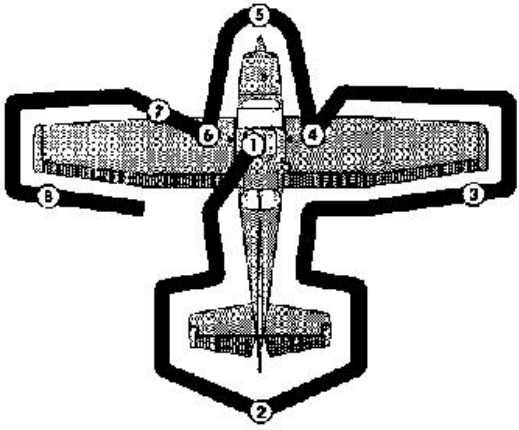


Figure 4-1 Preflight Inspection

◆ 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.

(1) CABIN

(1) Pilot´s Operating Handbook - AVAILABLE IN THE AIRPLANE
(2) Airplane Weight and Balance - CHECKED
(3) Parking Brake - SET
(4) Control Wheel Lock - REMOVE
(5) "Engine Master" - OFF
(6) Avionics Power Switch - OFF
(7) Cabin Heat – OFF

▲ **WARNING:** When turning on the Battery switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the Engine Master was on.

(8) Battery and Main Bus switches - ON
(9) Fuel Quantity Indicators and Fuel Temperature CHECK
(10) Light "Water Level" - CHECK OFF
(11) Battery and Main Bus switches - OFF
(12) Entry in log-book concerning type of fuel filled - CHECK
(13) Static Pressure Alternate Source Valve - CHECK
(14) Fuel Selector Valve - BOTH
(15) Fuel Shut-off Valve - ON (Push Full In)
(16) Baggage Door - CHECK, lock with key if the child's seat is supposed to be occupied

(2) EMPENNAGE

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

(3) RIGHT WING Trailing Edge

(1) Aileron - CHECK freedom of movement and security

(2) Flap - CHECK for security and condition

(4) RIGHT WING

(1) Wing Tie-Down - DISCONNECT

(2) Main Wheel Tire - CHECK for proper inflation and general condition (weather checks, tread depth and wear, etc.).

▲ **WARNING** If, after repeated sampling, evidence of contamination still exists, the airplane should not be flown. Tanks should be drained and system purged by qualified maintenance personnel. All evidence of contamination must be removed before further flight.

(3) Fuel Tank Sump Quick Drain Valves - DRAIN at least a cupful of fuel (using sampler cup) from each sump location to check for water, sediment and the right type of fuel (Diesel or JET-A1) before each flight and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed. If contaminants are still present, refer to above WARNING and do not fly airplane.

(4) Fuel Quantity - CHECK VISUALLY for desired level not above marking in fuel filler

(5) Fuel Filler Cap - SECURE

(5) NOSE

(1) Reservoir Tank Quick Drain Valve - DRAIN at least a cupful of fuel (using sampler cup) from valve to check for water, sediment and proper fuel grade (Diesel or JET-A1) before each flight and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling point. Take repeated samples until all contamination has been removed.

◆ Note: The reservoir tank drain is located in the fuselage on the co-pilot side of the aircraft.

(2) Before first flight of the day and after each refueling - DRAIN the Fuel Strainer Quick Drain Valve with the sampler cup to remove water and sediment from the screen. Ensure that the screen drain is properly closed again. If water is discovered, there might be even more water in the fuel system. Therefore, take further samples from fuel strainer and the tank sumps.

◆ Note: The fuel strainer drain is located on the left-hand side of the firewall (flight direction).

(3) Engine Oil Dipstick/Filler Cap:
   a) Oil level - CHECK
   b) Dipstick/filler cap - SECURE

   Do not operate below the minimum dipstick indication.

(4) Engine Air and Cooling Inlets - CLEAR of obstructions

(5) Landing Light - CHECK for condition and cleanliness

(6) Propeller and Spinner - CHECK for nicks and security

(7) Gearbox Oil Level - CHECK the oil has to cover at least half of the inspection glass

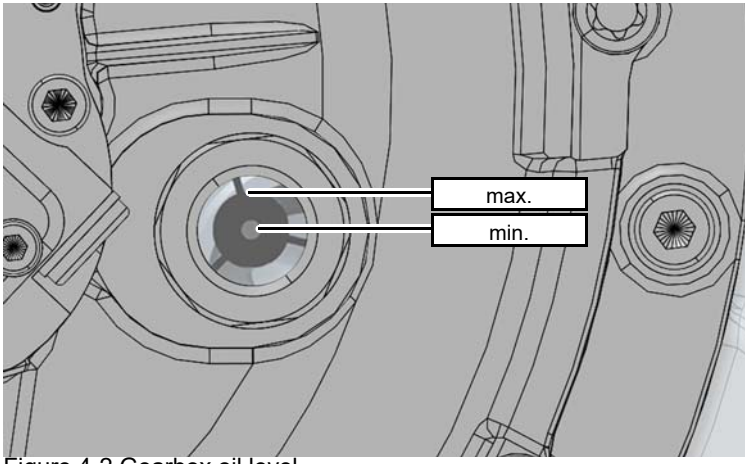


Figure 4-2 Gearbox oil level

(8) Nose Wheel Strut and Tire- CHECK for proper inflation of strut and general condition (weather checks, tread depth and wear, etc.) of tire

(9) Left Static Source Opening - CHECK for blockage

(10) Fuel cooler baffle - CHECK

- REMOVE, if OAT on ground is higher than 20°C (68°F)
- INSTALL, if OAT on ground is lower than 20°C (68°F)

(6) LEFT WING

(1) Fuel Quantity - CHECK VISUALLY for desired level not above marking in fuel filler

(2) Fuel Filler Cap - SECURE

(3) Fuel Tank Sump Quick Drain Valves - DRAIN at least a cupful of fuel (using sampler cup) from each sump location to check for water, sediment and the right type of fuel (Diesel or JET-A1) before each flight and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed. If contaminants are still present, refer to previous WARNING (see right wing) and do not fly airplane.

(4) Main Wheel Tire - CHECK for proper inflation and general condition (weather checks, tread depth and wear, etc.)

(7) LEFT WING Leading Edge

(1) Pitot Tube Cover (if mounted) - REMOVE and CHECK for pitot blockage

(2) Fuel Tank Vent Opening - CHECK for blockage

(3) Stall Warning Opening - CHECK for blockage
To check the system, place a clean handkerchief over the vent opening and apply suction; a sound from the warning horn will confirm system operation.

(4) Wing Tie-Down - DISCONNECT

(8) LEFT WING Trailing Edge

(1) Aileron - CHECK freedom of movement and security

(2) Flap - Check for security and conditions

BEFORE STARTING ENGINE

(1) Preflight Inspection - COMPLETE
(2) Seats and Seat Belts - ADJUST and LOCK
(3) Brakes - TEST and SET
(4) Avionics Power Switch, Autopilot (if installed) and Electrical Equipment - OFF

■ CAUTION: The Avionics Power Switch must be off during engine start to prevent possible damage to avionics.

(5) Circuit Breakers - CHECK IN
(6) Alternator Switch - CHECK ON
(7) Battery and Main Bus Switches - ON

■ CAUTION: The electronic engine control needs an electrical power source for its operation. For normal operation Battery, Alternator and Main Bus have to be switched on. Separate switching is only allowed for tests and in the event of emergencies.

(8) Fuel Quantity and Temperature - CHECK
(9) Fuel Selector Valve - SET to BOTH position.The fuel temperature limitations must be observed.
(10) Fuel Shut-off Valve - OPEN (Push Full In)
(11) Alternate Air Door - CLOSED
(12) Thrust Lever - CHECK for freedom of movement
(13) Load Display - CHECK 0% at Propeller RPM 0

PROCEDURES UP TO 5500ft AIRFIELD ELEVATION

STARTING ENGINE

▲ **WARNING:** Do not use ground power unit for engine starts. It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

(1) Electric Fuel Pump - ON
(2) Navigation Lights and Flashing Beacon - ON (as required).
(3) Thrust Lever - IDLE
(4) Area Aircraft / Propeller - CLEAR
(5) "Engine Master" - ON , wait until the Glow Control light extinguishes
(6) Starter - ON, keep starter engaged until min. 500rpm
Release when engine starts, leave Thrust Lever in idle

■ CAUTION: Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

(7) Oil Pressure - CHECK

■ CAUTION: If after 3 seconds the minimum oil pressure of 1 bar is not indicated:
shut down the engine immediately!

(8) CED 125 Test Knob - PRESS (to delete Caution light)
(9) Ammeter - CHECK for positive charging current
(10) Voltmeter - CHECK for green range
(11) FADEC Backup Battery test
a) Alternator - OFF, engine must operate normally
b) Battery - OFF, for min. 10 seconds;
engine must operate normally, the red FADEC lamps must not be illuminated
c) Battery - ON
d) Alternator - ON

▲ **WARNING:** It must be ensured that both battery and alternator are ON!
If the guarded alternator switch is installed, the switch guard muts be closed.

(12) Avionic-Power Switch - ON
(13) Radios - ON
(14) Ammeter - Check positive charge, alternator warning light must be OFF
(15) Voltmeter - Check in green range
(16) Electric Fuel Pump - OFF
(17) Flaps - RETRACT

WARM UP

(1) Let the engine warm up about 2 minutes at IDLE (890 RPM).
(2) Increase RPM to max. 1,400 RPM until oil temperature 50°C (122°F), coolant temperature 60°C (140°F).

BEFORE TAKE-OFF

(1) Parking Brake - SET
(2) Cabin Doors and Windows - CLOSED and LOCKED
(3) Flight Controls - FREE and CORRECT
(4) Flight Instruments - CHECK and SET
(5) Fuel quantity - CHECK
(6) Fuel Selector Valve - SET to BOTH
(7) Elevator Trim and Rudder Trim (if installed) - SET for take-off
(8) FADEC and propeller adjustment function check:
    a) Thrust Lever - IDLE (both FADEC lights should be OFF)
    b) FADEC Test Button - PRESS and HOLD button for entire test
    c) Both FADEC lights - ON, RPM increases.

▲ **WARNING:** If the FADEC lights do not come on at this point, it means that the test procedure has failed and take off should not be attempted.

    d) The FADEC automatically switches to B-component (only FADEC B light is ON)
    e) The propeller control is excited, RPM decreases
    f) The FADEC automatically switches to channel A (only FADEC A light is ON), RPM increases
    g) The propeller control is excited, RPM decreases
    h) FADEC A light goes OFF, idle RPM is reached, the test is completed.
    i) FADEC Test Button - RELEASE

(9) Force B Switch - switch to FADEC B

(10) Engine - check running without a change

(11) Force B Switch - switch back to Automatic

▲ **WARNING:**	If there are prolonged engine misfires or the engine shuts down during the test, take off may not be attempted.
▲ **WARNING:**	The whole test procedure has to be performed without any failure. In case the engine shuts down or the FADEC lights are flashing, take-off is prohibited. This applies even if the engine seems to run without failure after the test.
◆ Note:	If the test button is released before the self test is over, the FADEC immediately switches over to normal operation.
◆ Note:	While switching from one FADEC to another, it is normal to hear and feel a momentary surge in the engine.

(12) Thrust Lever - FULL FORWARD, load display min. 94%, RPM 2240 - 2300

(13) Thrust Lever - IDLE

(14) Engine Instruments and Ammeter - CHECK

(15) Suction gage - CHECK

(16) Wing Flaps - SET for Take-off (0° or 10°).

(17) Electric Fuel Pump - ON

(18) Strobe Lights - AS DESIRED

(19) Radios and Avionics - ON and SET

(20) Autopilot (if installed) - OFF

(21) Air Conditioning (if installed) - OFF

(22) Thrust Lever Friction Control - ADJUST

(23) Brakes - RELEASE

PROCEDURES OVER 5500ft AIRFIELD ELEVATION

◆ Note: Due to the increase of the idle speed with increasing pressure altitudes, the FADEC test is only possible to a limited extent from an airfield elevation of approximately 5500ft.
Over 5500ft, the FADEC test is only possible if the load selector lever remains in the idle position after engine start until the FADEC test is starting.
If the load selector lever is moved from the idle position, a FADEC test is no longer possible at pressure altitudes above 5500ft. For this purpose, the engine has to be stopped and re-started to perform the FADEC test.

STARTING ENGINE

▲ **WARNING:** Do not use ground power unit for engine starts. It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

(1) Electric Fuel Pump – ON
(2) Navigation Lights and Flashing Beacon - ON (as required)
(3) Thrust Lever – IDLE
(4) Area Aircraft / Propeller – CLEAR
(5) "Engine Master" – ON, wait until the Glow Control light extinguishes
(6) Starter – ON, keep starter engaged until min. 500rpm
Release when engine starts, leave Thrust Lever in idle

■ CAUTION: Do not overheat the starter motor. Do not operate the starter motor for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

(7) Oil Pressure – CHECK

■ CAUTION: If after 3 seconds the minimum oil pressure of 1 bar is not indicated:
shut down the engine immediately!

(8) CED-Test Knob – PRESS (to delete Caution light)
(9) Ammeter – CHECK for positive charging current
(10) Voltmeter – CHECK for green range
(11) FADEC Backup Battery test
   a) Alternator – OFF, engine must operate normally
   b) Battery – OFF, for min. 10 seconds;
   engine must operate normally, the red FADEC lamps must not be illuminated
   c) Battery – ON
   d) Alternator – ON

▲ **WARNING:** It must be ensured that both battery and alternator are ON!
If the guarded alternator switch is installed, the switch guard must be closed.

(12) Ammeter – Check positive charge, alternator warning light must be OFF
(13) Voltmeter – Check in green range
(14) Flaps – RETRACT

WARM UP AND FADEC-TEST

(1) Let the engine warm up about 2 minutes at IDLE (890 RPM).
(2) Increase RPM to max. 1,400 RPM until Oil Temperature 50°C, Coolant Temperature 60°C.
(3) Thrust Lever - IDLE
(4) "Engine Master" - OFF
(5) Area Aircraft / Propeller - CLEAR
(6) "Engine Master" - ON, wait until the Glow Control light extinguishes
(7) Starter - ON, keep starter engaged until min. 500rpm Release when engine starts, leave Thrust Lever in idle
(8) Ammeter - CHECK for positive charging current
(9) Voltmeter - CHECK for green range
(10) FADEC and propeller adjustment function check:
    a) Thrust Lever - IDLE (both FADEC lights should be OFF).
    b) FADEC Test Button - PRESS and HOLD button for entire test.
    c) Both FADEC lights - ON, RPM increases

▲ **WARNING:** If the FADEC lights do not come on at this point, it means that the test procedure has failed and take off should not be attempted.

    d) The FADEC automatically switches to B-component (only FADEC B light is ON)
    e) The propeller control is excited, RPM decreases
    f) The FADEC automatically switches to channel A (only FADEC A light is ON), RPM increases
    g) The propeller control is excited, RPM decreases
    h) FADEC A light goes OFF, idle RPM is reached, the test is completed.
    i) FADEC Test Button - RELEASE
(11) Force B Switch - switch to FADEC B
(12) Engine - check running without a change
(13) Force B Switch - switch back to Automatic

▲ **WARNING:**	If there are prolonged engine misfires or the engine shuts down during the test, take off may not be attempted.

▲ **WARNING:**	The whole test procedure has to be performed without any failure. In case the engine shuts down or the FADEC lights are flashing, take off is prohibited. This applies even if the engine seems to run without failure after the test.

◆ Note:	If the test button is released before the self test is over, the FADEC immediately switches over to normal operation.

◆ Note:	While switching from one FADEC to another, it is normal to hear and feel a momentary surge in the engine.

(14) Avionic Switch – ON
(15) Radios – ON
(16) Electric Fuel Pump – OFF

BEFORE TAKE-OFF

(1) Parking Brake – SET
(2) Cabin Doors and Windows – CLOSED and LOCKED
(3) Flight Controls – FREE and CORRECT
(4) Flight Instruments – CHECK and SET
(5) Fuel quantity – CHECK
(6) Fuel Selector Valve – SET to BOTH position
(7) Elevator Trim and Rudder Trim (if installed) – SET for Takeoff
(8) Thrust Lever – FULL FORWARD, load display min. 94%, RPM 2240 - 2300
(9) Thrust Lever – IDLE
(10) Engine Instruments and Ammeter – CHECK
(11) Suction gage – CHECK
(12) Wing Flaps – SET for Take-off (0° or 10°).
(13) Electric Fuel Pump – ON
(14) Strobe Lights – AS DESIRED
(15) Radios and Avionics – ON and SET
(16) Autopilot (if installed) – OFF
(17) Air Conditioning (if installed) – OFF
(18) Thrust Lever Friction Control – ADJUST
(19) Brakes – RELEASE

TAKE-OFF

NORMAL TAKE-OFF

(1) Wing Flaps - 0° or 10°
(2) Thrust Lever - FULL FORWARD
(3) Elevator Control - LIFT NOSE WHEEL at 55 KIAS/63 mph.
(4) Climb Speed - 65 to 80 KIAS/75 to 92 mph

SHORT FIELD TAKE-OFF

(1) Wing Flaps - 10°
(2) Brakes - APPLY
(3) Thrust Lever - FULL FORWARD
(4) Brakes - RELEASE
(5) Airplane Attitude - SLIGHTLY TAIL LOW
(6) Elevator Control - LIFT NOSE WHEEL at 44 KIAS
(7) Climb Speed - 58 KIAS67mph(until all obstacles are cleared)

AFTER TAKE-OFF

(1) Altitude about 300 ft, Airspeed more than 65 KIAS/75 mph - Wing Flaps - RETRACT
(2) Electric Fuel Pump - OFF

CLIMB

(1) Airspeed - 70 to 85 KIAS/80 to 98 mph.

◆ Note:	If a maximum performance climb is necessary, use speeds shown in the "Maximum Rate Of Climb" chart in Section 5. In case that oil temperature and/or coolant temperature are approaching the upper limit, continue at a lower climb angle for better cooling if possible.

◆ Note:	The fuel temperatures have to be monitored.

(2) Thrust Lever - FULL FORWARD

CRUISE

(1) Power - maximum load 100% (maximum continuous power), 75% or less is recommended.
For economic cruise set load 70% or less.

(2) Elevator trim and Rudder trim (if installed) - ADJUST

(3) Compliance with Limits for oil pressure, oil temperature, coolant temperature and gearbox temperature (CED 125 and Caution light) - MONITOR constantly

(4) Fuel Quantity and Temperature (Display and LOW LEVEL caution lights) - MONITOR.

Whenever possible, the airplane should be flown with the fuel selector in the BOTH position to empty and heat both fuel tanks evenly. However, operation in the LEFT or RIGHT position may be desirable to correct a fuel quantity imbalance or during periods of intentional uncoordinated flight maneuvers. During prolonged operation with the fuel selector in either the LEFT or RIGHT position the fuel balance and temperatures should be closely monitored.

■	CAUTION:	Do not use any fuel tank below the minimum permissible fuel temperature!

■	CAUTION:	In turbulent air it is strongly recommended to use the BOTH position.

■	CAUTION:	With ¼ tank or less prolonged or uncoordinated flight is prohibited when operating on either the left or right tank.

(5) FADEC and Alternator Warning lights - MONITOR

DESCENT

(1) Fuel Selector Valve - SELECT BOTH position
(2) Power - AS DESIRED

BEFORE LANDING

(1) Pilot and Passenger Seat Backs - MOST UPRIGHT POSITION
(2) Seats and Seat Belts - SECURED and LOCKED
(3) Fuel Selector Valve - SELECT BOTH position
(4) Electric Fuel Pump - ON
(5) Landing / Taxi Lights - ON
(6) Autopilot (if installed) - OFF
(7) Air Conditioning (if installed) - OFF

LANDING

NORMAL LANDING

(1) Airspeed - 69 to 80 KIAS/80 to 92 mph (wing flaps UP)
(2) Wing Flaps - AS DESIRED (0°-10° below 110 KIAS/126 mph; 10°-below 85 KIAS/98 mph)
(3) Airspeed in Final Approach:
    - wing flaps 20°: 63 KIAS/72 mph
    - wing flaps 30°: 60 KIAS/69 mph
(4) Touchdown - MAIN WHEELS FIRST
(5) Landing Roll - LOWER NOSE WHEEL GENTLY
(6) Brakes - MINIMUM REQUIRED

SHORT FIELD LANDING

(1) Airspeed - 69 to 80 KIAS/80 to 92 mph (Flaps UP)
(2) Wing Flaps - FULL DOWN
(3) Airspeed in Final Approach - 60 KIAS/69 mph (until flare)
(4) Power - REDUCE to idle after clearing obstacles.
(5) Touchdown - MAIN WHEELS FIRST
(6) Brakes - APPLY HEAVILY
(7) Wing Flaps - RETRACT

BALKED LANDING

(1) Thrust Lever - FULL FORWARD
(2) Wing Flaps - RETRACT TO 20° (immediately after Thrust Lever FULL FORWARD)
(3) Climb Speed - 58 KIAS/67 mph
(4) Wing Flaps - 10° (until all obstacles are cleared)
(5) Wing Flaps - RETRACT after reaching a safe altitude and 65 KIAS/75 mph

AFTER LANDING

(1) Wing Flaps - RETRACT
(2) Electric Fuel Pump - OFF

SECURING AIRPLANE

(1) Parking Brake - SET
(2) Thrust Lever - IDLE
(3) Avionics Power Switch, Electrical Equipment, Autopilot (if installed) - OFF
(4) Main Bus switch - OFF
(5) "Engine Master" - OFF
(6) Switch Battery - OFF
(7) Control Lock - INSTALL
(8) Fuel Selector Valve - LEFT or RIGHT (to prevent crossfeeding between tanks)

AMPLIFIED PROCEDURES

STARTING ENGINE

The TAE 125-02-114is a direct Diesel injection engine with common-rail technology and a turbocharger. It is controlled automatically by the FADEC, which makes a proper performance of the FADEC test important for safe flight operation. All information relating to the engine are compiled in the CED 125 multifunction instrument.
Potentiometers within the thrust lever transmit the load value selected by the pilot to the FADEC.
If the engine master is switched ON, the preheating relay is actuated by the FADEC and the glow plugs are supplied with power. The glow duration depends on the engine temperature.
If the engine master is switched OFF, the injection valves are not supplied with power and remain closed. The switch/push button "Starter" controls the Starter.

EXTERNAL POWER

External power may be used to charge the battery or for maintenance purposes. To charge the battery with external power the battery switch must be ON.

When using an External Power Source, the Battery Switch must be in the OFF position before connecting the External Power Source to the airplane receptacle.

It is not allowed to start up the engine using external power. If starting the engine is not possible using battery power, the condition of the battery must be verified before flight.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized to maintain directional control and balance.
The alternate air door should always be pushed for ground operation to ensure that no unfiltered air is sucked in.
Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKE-OFF

WARM UP

To warm up the engine, operate the engine for about 2 minutes at IDLE (890 RPM).
Let the engine run at propeller RPM of max. 1,400 RPM until it reaches an engine oil temperature of 50°C (122°F) (green range) and a coolant temperature of 60°C (140°F) (green range to ensure normal operation).

MAGNETO CHECK

N/A since this is a Diesel engine.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and alternator control unit operation is essential (such as night and instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light or by operating the wing flaps during the engine run-up (20% load). The ammeter will remain within a needle width of zero if the alternator and alternator control unit are operating properly.

BATTERY CHECK

If there is doubt regarding the battery conditions or functionality the battery has to be checked after warm-up as follows:

Switch off the alternator while the engine is running (battery remains "ON")"

Perform a 10 sec. engine run. The voltmeter must remain in the green range. If not, the battery has to be charged or, if necessary, exchanged.

After this test the alternator has to be switched on again.

TAKE-OFF

POWER CHECK

It is important to check full load engine operation early in the take-off roll. Any signs of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off. If this occurs, you are justified in making a thorough full load static run-up before another take-off is attempted.
After full load is applied, adjust the thrust lever friction control to prevent the thrust lever from creeping back from a maximum power position. Similar friction lock adjustments should be made as required in other flight conditions to maintain a fixed thrust lever setting.

WING FLAP SETTINGS

Flap deflections greater than 10° are not approved for normal and short field take-offs. Using 10° wing flaps reduces the ground roll and total distance over a 15 m/50 ft obstacle by approximately 10%.

CLIMB

Normal climbs are performed with flaps up and full load and at speeds 5 to 10 knots/7 to 12 mph higher than best rate-of-climb speeds for the best combination of engine cooling, climb speed and visibility. The speed for best climb is about 69 KIAS. If an obstruction dictates the use of a steep climb angle, climb at 62 KIAS/71 mph and flaps up.

◆ Note: Climbs at low speeds should be of short duration to improve engine cooling.

CRUISE

As guidance for calculation of the optimum altitude and power setting for a given flight use the tables in Section 5.

LANDING

NORMAL LANDING

Remarks in Pilot´s Operating Handbook concerning carburetor pre-heating are **N/A**

BALKED LANDING

In a balked landing (go around) climb, reduce the flap setting to 20° immediately after full power is applied. If obstacles must be cleared during the go-around climb, reduce wing flap setting to 10° and maintain a safe airspeed until the obstacles are cleared. After clearing any obstacles, the flaps may be retracted as the airplane accelerates to the normal flaps up climb speed.

CARBURETOR ICING

N/A since this is a Diesel engine.

FLIGHT IN HEAVY RAIN

N/A since no special procedures are necessary for heavy rain.

COLD WEATHER OPERATION

Special attention should be paid to operation of the aircraft and the fuel system in winter or before any flight at low temperatures. Correct preflight draining of the fuel system is particularly important and will prevent the accumulation of water.
The following limitations for cold weather operation are established due to temperature. “Operating limits“ (refer also to Section 2 "Limitations").

Fuel	Minimum permissible fuel temperature in the fuel tank before Take-off	Minimum permissible fuel temperature in the fuel tank during the flight
JET A-1, JET-A, Fuel No.3 JP-8 JP8+100 TS-1	-30°C (-22°F)	-35°C (-31°F)
Diesel Sasol GTL Diesel	0°C	-5°C

Figure 4-1 Minimum fuel temperature limits in the fuel tank

▲ **WARNING:** The fuel temperature of the fuel tank not in use should be observed if it is intended for later use.

▲ **WARNING:** The following applies to Diesel and JET fuel mixtures in the tank:
As soon as the proportion of Diesel in the tank is more than 10% Diesel, the fuel temperature limits for Diesel operation must be monitored. If there is uncertainty about which fuel is in the tank, the assumption should be made that it is Diesel.

◆ Note: It is advisable to refuel before each flight and to enter the type of fuel filled and the additives used in the log-book of the airplane.

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

Cold weather starting procedures are the same as the normal starting procedures. Use caution to prevent inadvertent forward movement of the airplane during starting when parked on snow or ice.

HOT WEATHER OPERATION

Engine temperatures may rise into the amber range and activate the "Caution" light when operating in hot weather or longer climbs at low speed. This warning gives the pilot the opportunity to keep the engine from possibly overheating by doing the following:

i) decrease rate of climb
ii) increase airspeed
iii) reduce power, if the engine temperatures approach the red range

Should the seldom case occur that the fuel temperature is rising into the amber or red range, switch to the other tank or to the BOTH position

This page intentionally left blank

SECTION 5
PERFORMANCE

SAMPLE PROBLEM

The following sample flight problem utilizes information from the various tables and diagrams of this section to determine the predicted performance data for a typical flight.
Assume the following information has already been determined:

AIRPLANE CONFIGURATION

Takeoff Weight ..... 1043 kg
Usable Fuel ..... 127.4 l (33.6 US gal)

TAKEOFF CONDITIONS

Field Pressure Altitude ..... 1000 ft
Temperature ..... 28°C (ISA +15°C)
Wind Component along Runway ... 12 Knot Headwind
Field Length ..... 1067 m (3500 ft)

CRUISE CONDITIONS

Total Distance ..... 841 km (400 NM)
Pressure Altitude ..... 6000 ft
Temperature ..... 23°C (ISA + 20°C)
Expected Wind Enroute ..... 10 Knot Headwind

LANDING CONDITIONS

Field Pressure Altitude ..... 2000 ft
Temperature ..... 25°C
Field Length ..... 914 m (3000 ft)

GROUND ROLL AND TAKE-OFF

The ground roll and take-off distance chart, Figure 5-1a ff (Ground Roll and Take-off Distance), should be consulted, keeping in mind that 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, temperature and altitude. For example, in this particular sample problem, the takeoff distance information presented for a weight of 1043 kg, pressure altitude of 1000 ft and a temperature of 30°C should be used and results in the following:

Ground Roll.....263 m (863 ft)

Total Distance to clear a 15 m obstacle.....451 m (1478 ft)

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:

$$\frac{12\ \text{Kt}}{9\ \text{Kt}} \times 10\ \% = 13\ \%\ \text{(Decrease)}$$

This results in the following distances, corrected for wind:

Ground Roll, zero wind ..... 263 m (863 ft)
Decrease at 12 Knot Headwind (263m x 13%)=- 34 m (112 ft)
Corrected Ground Roll ..... 229 m (751 ft)

Total Distance to clear a 15 m obstacle,
zero wind..... 451 m (1478 ft)
Decrease at 12 Knot Headwind (451 m x 13%)= - 58 m (192 ft)
Corrected Total Distance to clear a ..... 393 m (1286 ft)
15 m obstacle

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft and the airplanes performance. A typical 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 Figures 5-4. Considerable fuel savings and longer range result when lower power settings are used.

Figure 5-4a shows a range of 567 NM at zero wind, a power setting of 70% and altitude of 6000 ft.

With an expected headwind of 10 Knot at 6,000 ft altitude the range has to be corrected as follows:

Range at zero wind (standard tanks)	.....	567 NM
Reduction due to Headwind	..... (4.5 h x 10 Knots) =	- 45NM
Corrected Range	.....	522 NM

This shows that the flight can be performed at a power setting of approximately 70% with full tanks without an intermediate fuel stop.

Figure 5-4a is based on ISA conditions. For a temperature of 20°C above ISA temperature, according to Note 3, true airspeed and maximum range are increased by 2 %.

The following values most nearly correspond to the planned altitude and expected temperature conditions. Engine Power setting chosen is 70%.

The resultants are:

Engine Power:	70%
True Airspeed:	120 kt + 2% = 122 kt
Fuel Consumption in cruise:	22.1 l/h (5.8 US gal/h)

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in Figures 5-3 and 5-4. For this sample problem, Figure 5-3a shows that a climb from 1000 ft to 6,000 ft requires 3.3 l (0.9 US gal) of fuel. The corresponding distance during the climb is 7.6 NM. These values are for a standard temperature and are sufficiently accurate for most flight planning purposes.
However, a further correction for the effect of temperature may be made as noted in Note 2 of the climb chart in Figure 5-3a. An effect of 10°C above the standard temperature is to increase time and distance by 10%.

In this case, assuming a temperature 20°C above standard, the correction would be:

$$\frac{20\ °C}{10\ °C} \times 10\ \% = \quad 20\ \%\ \text{(Increase)}$$

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

Fuel to climb, standard temperature:
3.3 l (0.9 US gal)

Increase due to non-standard temperature:
3.3 l (0.9 US gal) x 20.0% = 0.7 l (0.2 US gal)

Corrected fuel to climb:
4.0 l (1.1 US gal)

Using a similar procedure for the distance to climb results in 9.1 NM.

The resultant cruise distance is:

Total Distance	400.0 NM
Climbout Distance	- 9.1 NM
Cruise Distance	390.9 NM

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

122 Knot
- 10 Knot
112 Knot

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

$$\frac{390.9 \text{ NM}}{112 \text{ Kt}} = 3.5 \text{ hrs}$$

The fuel required for cruise is:

3.5 h x 22.1 l/h = 77.4 l (20.5 US gal)

The total estimated fuel required is as follows:

Engine Start, Taxi and Takeoff	4.0 l (1.1 US gal)
Climb	+ 4.0 l (1.1 US gal)
Cruise	+ 77.4 l (20.5 US gal)
Total fuel required	85.4 l (22.7 US gal)

This gives with full tanks a reserve of:

127.4 l (33.6 US gal)
- 85.4 l (22.7 US gal)
42.0 l (10.9 US gal)

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

LANDING DISTANCE

Refer to Pilot´s Operating Handbook

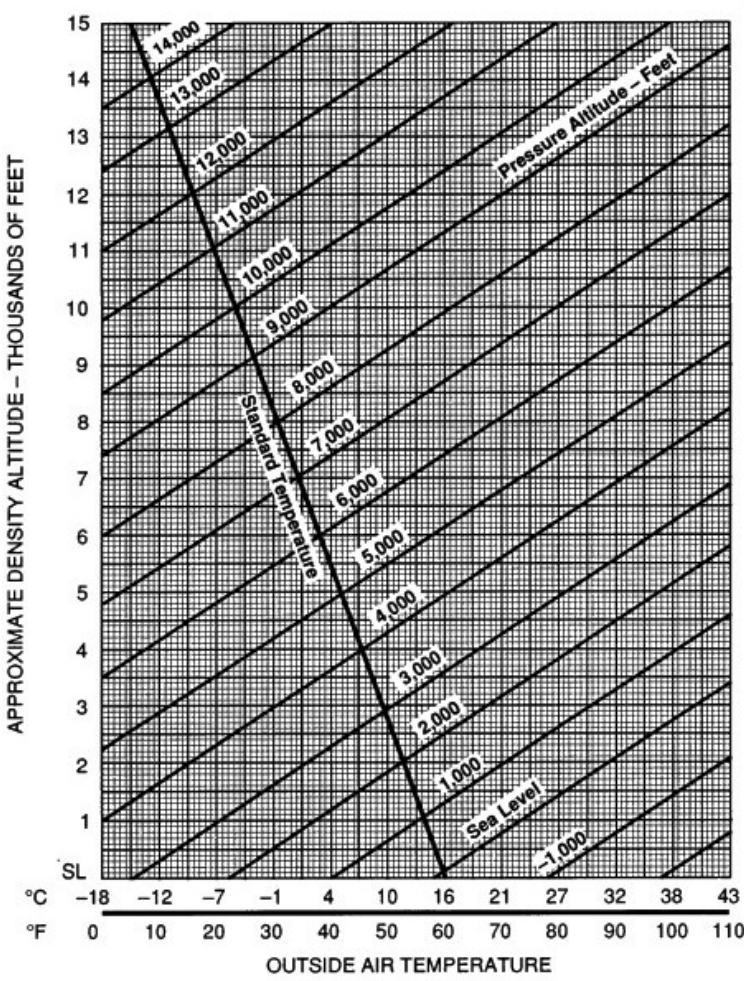


Figure 5-1 Density Altitude Chart

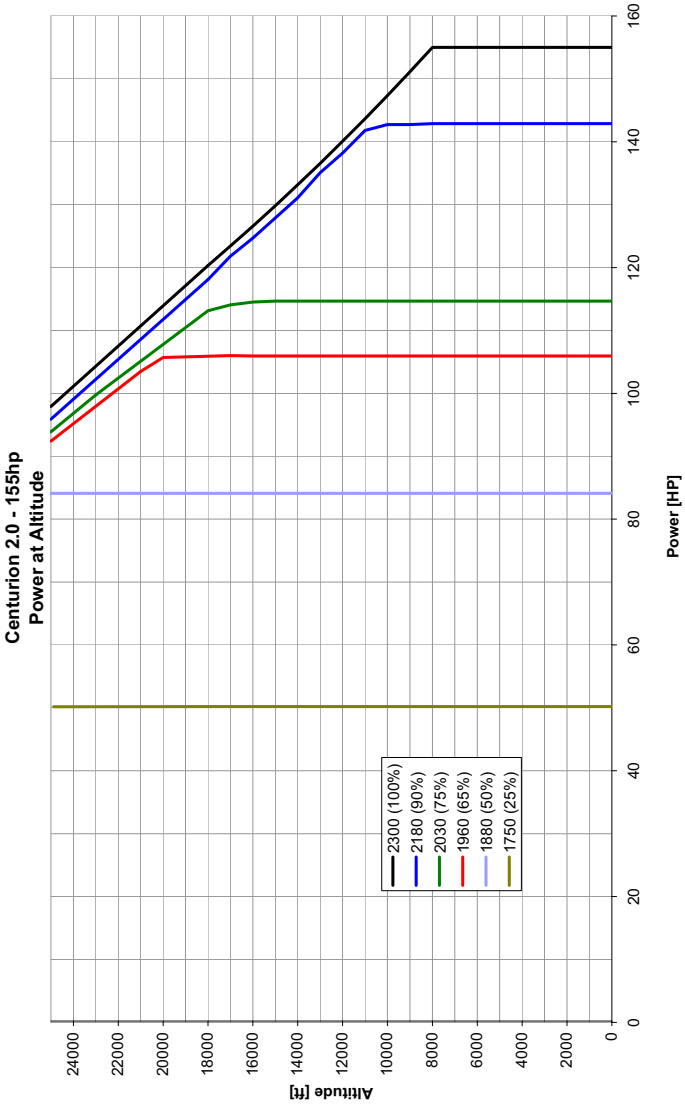


Figure 5-2 Engine Power Over Altitude

This page intentionally left blank

SECTION 5a
PERFORMANCE

◆ Note:	This chapter applies to aircraft with propellers **MTV-6-A/187-129**. The correct propeller designation can be found on the blades.

◆ Note:	The chapter not relevant to the respective propeller can be omitted.

GROUND ROLL AND TAKE-OFF DISTANCE at 1043 kg (2300 lbs)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind

Lift Off: .....48 KIAS/ 55 mph

Speed at 15 m / 50 ft: .....54 KIAS/ 62 mph

Notes:

1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additional distances (min. 20%) for wet grass runway, softened ground or snow.

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	172	199	213	227	246	273	307
	50 ft (15 m) obstacle	294	340	364	388	421	469	530
1000	Gnd Roll	184	213	228	243	263	292	329
	50 ft (15 m) obstacle	315	364	390	416	451	502	568
2000	Gnd Roll	198	228	244	260	282	313	352
	50 ft (15 m) obstacle	338	391	418	446	483	538	609
3000	Gnd Roll	212	245	262	279	302	336	378
	50 ft (15 m) obstacle	363	419	448	478	518	577	653
4000	Gnd Roll	227	263	281	300	324	360	406
	50 ft (15 m) obstacle	389	449	481	513	556	619	701
5000	Gnd Roll	244	282	302	322	348	387	435
	50 ft (15 m) obstacle	418	482	516	550	597	665	752
6000	Gnd Roll	262	303	324	345	374	415	468
	50 ft (15 m) obstacle	448	518	554	591	641	714	808
7000	Gnd Roll	287	332	355	379	410	455	513
	50 ft (15 m) obstacle	492	568	608	648	703	783	886
8000	Gnd Roll	315	364	390	416	450	500	563
	50 ft (15 m) obstacle	540	624	667	711	771	859	972
9000	Gnd Roll	350	404	432	461	499	554	624
	50 ft (15 m) obstacle	599	692	741	790	856	954	1080
10000	Gnd Roll	389	449	480	512	555	616	694
	50 ft (15 m) obstacle	666	770	824	878	952	1061	1201

Figure 5-1a Take-Off Distance [m] at take-off weight 1043 kg (2300 lbs)

PRESS ALT	Ground Roll and Take-Off Distance [ft] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	564	652	697	744	805	894	1007
	50 ft (15 m) obstacle	966	1116	1194	1273	1380	1537	1740
1000	Gnd Roll	605	698	747	797	863	958	1079
	50 ft (15 m) obstacle	1035	1195	1279	1364	1478	1647	1864
2000	Gnd Roll	648	749	801	854	925	1027	1156
	50 ft (15 m) obstacle	1109	1281	1371	1462	1585	1765	1998
3000	Gnd Roll	695	803	859	916	992	1101	1240
	50 ft (15 m) obstacle	1189	1374	1470	1567	1699	1893	2142
4000	Gnd Roll	745	861	921	983	1064	1181	1330
	50 ft (15 m) obstacle	1276	1474	1577	1682	1823	2031	2299
5000	Gnd Roll	800	925	989	1055	1142	1268	1428
	50 ft (15 m) obstacle	1370	1582	1693	1805	1957	2180	2467
6000	Gnd Roll	859	993	1062	1133	1227	1362	1533
	50 ft (15 m) obstacle	1471	1700	1818	1939	2102	2341	2650
7000	Gnd Roll	942	1089	1165	1242	1345	1493	1681
	50 ft (15 m) obstacle	1613	1863	1993	2126	2304	2567	2905
8000	Gnd Roll	1034	1195	1278	1363	1476	1638	1845
	50 ft (15 m) obstacle	1770	2045	2187	2333	2529	2817	3189
9000	Gnd Roll	1148	1326	1418	1513	1638	1818	2048
	50 ft (15 m) obstacle	1966	2271	2429	2591	2809	3129	3541
10000	Gnd Roll	1275	1473	1576	1681	1820	2020	2275
	50 ft (15 m) obstacle	2186	2526	2701	2881	3123	3480	3938

Figure 5-1b Take-Off Distance [ft] at take-off weight 1043 kg (2300 lbs)

GROUND ROLL AND TAKE-OFF DISTANCE at 1089 kg (2400 lbs) (Cessna 172P only)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1089 kg (2400 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind

Lift Off: .....48 KIAS/ 55 mph

Speed at 15 m / 50 ft: .....54 KIAS/ 62 mph

Notes:

1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additional distances (min. 20%) for wet grass runway, softened ground or snow.

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	192	222	238	254	275	305	343
	50 ft (15 m) obstacle	329	381	407	434	471	524	593
1000	Gnd Roll	206	238	255	272	294	327	368
	50 ft (15 m) obstacle	353	408	436	465	504	562	636
2000	Gnd Roll	221	255	273	291	315	350	394
	50 ft (15 m) obstacle	378	437	467	499	540	602	681
3000	Gnd Roll	237	274	293	312	338	375	423
	50 ft (15 m) obstacle	406	469	501	535	580	646	731
4000	Gnd Roll	254	294	314	335	363	403	454
	50 ft (15 m) obstacle	435	503	538	574	622	693	784
5000	Gnd Roll	273	315	337	360	390	432	487
	50 ft (15 m) obstacle	467	540	577	616	667	744	842
6000	Gnd Roll	293	339	362	386	418	464	523
	50 ft (15 m) obstacle	502	580	620	661	717	799	904
7000	Gnd Roll	321	371	397	424	459	509	573
	50 ft (15 m) obstacle	550	636	680	725	786	876	991
8000	Gnd Roll	353	408	436	465	503	559	629
	50 ft (15 m) obstacle	604	698	746	796	863	961	1088
9000	Gnd Roll	391	452	484	516	559	620	698
	50 ft (15 m) obstacle	670	775	829	884	958	1067	1208
10000	Gnd Roll	435	502	537	573	621	689	776
	50 ft (15 m) obstacle	746	861	921	983	1065	1187	1343

Figure 5-1c Take-Off Distance [m] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	631	729	780	832	901	1000	1126
	50 ft (15 m) obstacle	1080	1248	1335	1424	1544	1720	1946
1000	Gnd Roll	676	781	836	892	965	1072	1207
	50 ft (15 m) obstacle	1158	1337	1431	1526	1654	1843	2085
2000	Gnd Roll	725	838	896	956	1035	1149	1293
	50 ft (15 m) obstacle	1241	1434	1533	1635	1773	1975	2235
3000	Gnd Roll	777	898	961	1025	1109	1232	1387
	50 ft (15 m) obstacle	1330	1537	1644	1753	1901	2118	2397
4000	Gnd Roll	834	964	1031	1099	1190	1321	1488
	50 ft (15 m) obstacle	1427	1649	1764	1881	2039	2272	2572
5000	Gnd Roll	895	1034	1106	1180	1278	1418	1597
	50 ft (15 m) obstacle	1532	1770	1894	2019	2189	2439	2760
6000	Gnd Roll	961	1111	1188	1267	1372	1523	1715
	50 ft (15 m) obstacle	1646	1901	2034	2169	2351	2619	2965
7000	Gnd Roll	1054	1218	1303	1390	1505	1670	1881
	50 ft (15 m) obstacle	1804	2085	2230	2378	2578	2872	3250
8000	Gnd Roll	1157	1337	1430	1525	1651	1833	2064
	50 ft (15 m) obstacle	1980	2288	2447	2610	2829	3152	3567
9000	Gnd Roll	1284	1483	1587	1692	1832	2034	2291
	50 ft (15 m) obstacle	2199	2541	2718	2898	3142	3501	3962
10000	Gnd Roll	1426	1648	1763	1880	2036	2260	2545
	50 ft (15 m) obstacle	2445	2826	3022	3223	3494	3893	4406

Figure 5-1d Take-Off Distance [ft] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

MAXIMUM RATE-OF-CLIMB at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power

Notes:

1. For operation in air colder than this table provides, use coldest data shown.
2. For operation in air warmer than this table provides, use extreme caution.

PRESS ALT [FT]	Climb speed [KIAS]	Rate of Climb [ft/min] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	879	865	851	706	576
1000	69	872	858	844	698	568
2000	69	865	851	837	691	561
3000	69	858	844	829	683	553
4000	69	851	836	822	675	545
5000	69	844	829	814	667	536
6000	69	836	821	806	658	528
7000	69	829	813	797	650	519
8000	69	821	805	789	641	510
9000	69	788	771	755	610	481
10000	69	755	738	721	578	452
11000	69	721	704	687	547	423
12000	69	688	670	653	515	393
13000	69	654	636	619	482	363
14000	69	620	601	584	450	333
15000	69	585	567	549	417	302
16000	69	551	531	513	384	271
17000	69	516	496	477	350	240
18000	69	480	461	441	317	209

Figure 5-2a Maximum Rate of Climb at take-off weight 1043 kg (2300 lbs)

MAXIMUM RATE-OF-CLIMB at 1089 kg (2400 lbs) (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up, Full Power

Notes:

1. For operation in air colder than this table provides, use coldest data shown.
2. For operation in air warmer than this table provides, use extreme caution.

PRESS ALT [FT]	Climb speed [KIAS]	Rate of Climb [ft/min] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	819	804	790	650	525
1000	69	812	797	783	642	518
2000	69	805	790	776	635	510
3000	69	798	783	768	627	502
4000	69	790	775	760	619	493
5000	69	783	767	752	610	485
6000	69	775	759	744	602	476
7000	69	767	751	735	593	467
8000	69	759	743	727	584	458
9000	69	727	710	694	554	430
10000	69	695	678	661	523	401
11000	69	662	645	628	492	373
12000	69	630	612	594	461	344
13000	69	596	578	560	429	314
14000	69	563	544	526	397	285
15000	69	530	511	492	365	255
16000	69	496	476	458	333	224
17000	69	462	442	423	300	194
18000	69	427	407	387	267	163

Figure 5-2b Maximum Rate of Climb at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

TIME, FUEL AND DISTANCE TO CLIMB at 1043 KG (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power
Standard Temperature (ISA)

Notes :

1. Add 4 l (1.1 US gal) of fuel for engine start, taxi and takeoff allowance.
2. Increase time and distance by 10% for 10°C above standard temperature.
3. Distances shown are based on zero wind.
4. Time, distance and fuel required are only valid from the point where the airplane climbs at v_y = 69 KIAS.

Press. Alt.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	855	0.0	0.0	0.0	0.0
1000	13	69	849	1.2	1.4	0.7	0.2
2000	11	69	843	2.4	2.8	1.3	0.3
3000	9	69	837	3.5	4.2	2.0	0.5
4000	7	69	831	4.7	5.8	2.6	0.7
5000	5	69	825	6.0	7.3	3.3	0.9
6000	3	69	818	7.2	9.0	4.0	1.1
7000	1	69	812	8.4	10.7	4.7	1.2
8000	-1	69	805	9.6	12.4	5.4	1.4
9000	-3	69	774	10.9	14.3	5.9	1.6
10000	-5	69	742	12.2	16.3	6.5	1.7
11000	-7	69	710	13.6	18.4	7.0	1.9
12000	-9	69	678	15.0	20.7	7.6	2.0
13000	-11	69	645	16.6	23.1	8.1	2.1
14000	-13	69	613	18.1	25.8	8.7	2.3
15000	-15	69	580	19.8	28.6	9.2	2.4
16000	-17	69	547	21.6	31.7	9.8	2.6
17000	-19	69	514	23.5	35.1	10.3	2.7
18000	-21	69	481	25.5	38.7	10.8	2.9

Figure 5-3a Time, Fuel and Distance to Climb at 1043 kg (2300 lbs)

TIME, FUEL AND DISTANCE TO CLIMB at 1089 KG (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power
Standard Temperature (ISA)

Notes :

1. Add 4 l (1.1 US gal) of fuel for engine start, taxi and takeoff allowance.
2. Increase time and distance by 10% for 10°C above standard temperature.
3. Distances shown are based on zero wind.
4. Time, distance and fuel required are only valid from the point where the airplane climbs at v_y = 69 KIAS.

Press. Alt.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	794	0.0	0.0	0.0	0.0
1000	13	69	788	1.3	1.5	0.7	0.2
2000	11	69	782	2.5	3.0	1.4	0.4
3000	9	69	776	3.8	4.6	2.1	0.6
4000	7	69	770	5.1	6.2	2.9	0.8
5000	5	69	763	6.4	7.9	3.6	0.9
6000	3	69	757	7.7	9.7	4.3	1.1
7000	1	69	750	9.1	11.5	5.1	1.3
8000	-1	69	743	10.4	13.4	5.8	1.5
9000	-3	69	713	11.8	15.4	6.4	1.7
10000	-5	69	682	13.2	17.6	7.0	1.9
11000	-7	69	651	14.7	19.9	7.6	2.0
12000	-9	69	619	16.3	22.4	8.2	2.2
13000	-11	69	588	17.9	25.1	8.8	2.3
14000	-13	69	556	19.7	28.0	9.4	2.5
15000	-15	69	525	21.5	31.1	10.0	2.6
16000	-17	69	493	23.5	34.5	10.6	2.8
17000	-19	69	460	25.6	38.3	11.2	3.0
18000	-21	69	428	27.9	42.3	11.8	3.1

Figure 5-3b Time, Fuel and Distance to Climb at 1089 kg (2400 lbs) (Cessna 172P only)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard tanks at 1043 kg (2300 lbs)

Conditions:
Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	131	151	33.6	8.9	383	2.9
SL	90	126	145	29.6	7.8	431	3.4
SL	80	120	138	25.8	6.8	484	4.0
SL	70	114	131	22.1	5.8	551	4.8
SL	60	106	122	18.6	4.9	624	5.9
SL	50	97	112	15.3	4.0	710	7.3
2000	100	133	154	33.6	8.9	386	2.8
2000	90	128	147	29.6	7.8	435	3.3
2000	80	122	141	25.8	6.8	489	3.9
2000	70	116	133	22.1	5.8	557	4.7
2000	60	108	124	18.6	4.9	631	5.8
2000	50	99	114	15.3	4.0	718	7.2
4000	100	136	156	33.6	8.9	392	2.8
4000	90	131	150	29.6	7.8	442	3.3
4000	80	124	143	25.8	6.8	493	3.9
4000	70	118	135	22.1	5.8	562	4.6
4000	60	110	126	18.6	4.9	637	5.7
4000	50	100	115	15.3	4.0	720	7.1
6000	100	139	159	33.6	8.9	398	2.7
6000	90	133	153	29.6	7.8	445	3.2
6000	80	127	146	25.8	6.8	501	3.8
6000	70	120	138	22.1	5.8	567	4.5
6000	60	111	128	18.6	4.9	638	5.5
6000	50	102	117	15.3	4.0	728	6.9
8000	100	141	162	33.6	8.9	401	2.6
8000	90	135	156	29.6	7.8	449	3.1
8000	80	129	148	25.8	6.8	505	3.7
8000	70	122	140	22.1	5.8	572	4.4
8000	60	113	130	18.6	4.9	644	5.4
8000	50	103	119	15.3	4.0	729	6.8
10000	90	138	159	29.6	7.8	455	3.0
10000	80	131	151	25.8	6.8	509	3.6

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	124	142	22.1	5.8	576	4.3
10000	60	115	132	18.6	4.9	650	5.3
10000	50	105	120	15.3	4.0	737	6.7
12000	90	140	162	29.6	7.8	458	2.9
12000	80	134	154	25.8	6.8	516	3.5
12000	70	126	145	22.1	5.8	581	4.2
12000	60	117	134	18.6	4.9	655	5.2
12000	50	106	122	15.3	4.0	737	6.5
14000	90	143	165	29.6	7.8	465	2.8
14000	80	136	157	25.8	6.8	520	3.4
14000	70	128	147	22.1	5.8	585	4.1
14000	60	119	137	18.6	4.9	661	5.1
14000	50	108	124	15.3	4.0	744	6.4
16000	80	138	159	25.8	6.8	524	3.2
16000	70	130	150	22.1	5.8	590	4.0
16000	60	121	139	18.6	4.9	666	4.9
16000	50	109	126	15.3	4.0	745	6.2
18000	80	141	162	25.8	6.8	531	3.1
18000	70	132	152	22.1	5.8	594	3.8
18000	60	123	141	18.6	4.9	671	4.8
18000	50	111	127	15.3	4.0	751	6.1

Figure 5-4a Cruise Performance, Range and Endurance with standard tanks, at 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks (Cessna 172N) at 1043 kg (2300 lbs)

Conditions:
Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	131	151	33.6	8.9	505	3.9
SL	90	126	145	29.6	7.8	564	4.5
SL	80	120	138	25.8	6.8	629	5.2
SL	70	114	131	22.1	5.8	712	6.2
SL	60	106	122	18.6	4.9	802	7.6
SL	50	97	112	15.3	4.0	907	9.4
2000	100	133	154	33.6	8.9	510	3.8
2000	90	128	147	29.6	7.8	570	4.4
2000	80	122	141	25.8	6.8	636	5.2
2000	70	116	133	22.1	5.8	720	6.1
2000	60	108	124	18.6	4.9	812	7.5
2000	50	99	114	15.3	4.0	920	9.2
4000	100	136	156	33.6	8.9	519	3.7
4000	90	131	150	29.6	7.8	580	4.3
4000	80	124	143	25.8	6.8	643	5.1
4000	70	118	135	22.1	5.8	728	6.0
4000	60	110	126	18.6	4.9	822	7.3
4000	50	100	115	15.3	4.0	924	9.1
6000	100	139	159	33.6	8.9	527	3.6
6000	90	133	153	29.6	7.8	586	4.2
6000	80	127	146	25.8	6.8	655	5.0
6000	70	120	138	22.1	5.8	736	5.9
6000	60	111	128	18.6	4.9	824	7.2
6000	50	102	117	15.3	4.0	936	9.0
8000	100	141	162	33.6	8.9	532	3.5
8000	90	135	156	29.6	7.8	591	4.1
8000	80	129	148	25.8	6.8	661	4.9
8000	70	122	140	22.1	5.8	744	5.8
8000	60	113	130	18.6	4.9	834	7.1
8000	50	103	119	15.3	4.0	939	8.8
10000	90	138	159	29.6	7.8	601	4.0
10000	80	131	151	25.8	6.8	667	4.8

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	124	142	22.1	5.8	751	5.7
10000	60	115	132	18.6	4.9	843	7.0
10000	50	105	120	15.3	4.0	951	8.7
12000	90	140	162	29.6	7.8	606	3.9
12000	80	134	154	25.8	6.8	678	4.7
12000	70	126	145	22.1	5.8	759	5.6
12000	60	117	134	18.6	4.9	852	6.9
12000	50	106	122	15.3	4.0	953	8.6
14000	90	143	165	29.6	7.8	616	3.8
14000	80	136	157	25.8	6.8	685	4.6
14000	70	128	147	22.1	5.8	766	5.5
14000	60	119	137	18.6	4.9	860	6.7
14000	50	108	124	15.3	4.0	964	8.4
16000	80	138	159	25.8	6.8	691	4.4
16000	70	130	150	22.1	5.8	773	5.4
16000	60	121	139	18.6	4.9	869	6.6
16000	50	109	126	15.3	4.0	967	8.3
18000	80	141	162	25.8	6.8	701	4.3
18000	70	132	152	22.1	5.8	780	5.2
18000	60	123	141	18.6	4.9	878	6.4
18000	50	111	127	15.3	4.0	977	8.1

Figure 5-4b Cruise Performance, Range and Endurance with long-range tanks, at 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with standard tanks at 1089 kg (2400 lbs)
(Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	128	147	33.6	8.9	374	2.9
SL	90	123	141	29.6	7.8	421	3.4
SL	80	117	135	25.8	6.8	472	4.0
SL	70	111	127	22.1	5.8	537	4.8
SL	60	103	119	18.6	4.9	606	5.9
SL	50	94	108	15.3	4.0	688	7.3
2000	100	130	150	33.6	8.9	377	2.8
2000	90	125	144	29.6	7.8	424	3.3
2000	80	119	137	25.8	6.8	476	3.9
2000	70	112	129	22.1	5.8	537	4.7
2000	60	105	120	18.6	4.9	613	5.8
2000	50	96	110	15.3	4.0	696	7.2
4000	100	133	153	33.6	8.9	383	2.8
4000	90	127	146	29.6	7.8	428	3.2
4000	80	121	139	25.8	6.8	481	3.8
4000	70	114	131	22.1	5.8	542	4.6
4000	60	106	122	18.6	4.9	613	5.6
4000	50	97	111	15.3	4.0	698	7.0
6000	100	135	155	33.6	8.9	386	2.7
6000	90	129	149	29.6	7.8	431	3.1
6000	80	123	142	25.8	6.8	485	3.7
6000	70	116	134	22.1	5.8	547	4.5
6000	60	108	124	18.6	4.9	620	5.5
6000	50	98	113	15.3	4.0	698	6.9
8000	100	138	158	33.6	8.9	392	2.6
8000	90	132	152	29.6	7.8	438	3.0
8000	80	125	144	25.8	6.8	489	3.6
8000	70	118	136	22.1	5.8	552	4.4
8000	60	110	126	18.6	4.9	626	5.4
8000	50	100	115	15.3	4.0	706	6.8
10000	90	134	154	29.6	7.8	441	2.9
10000	80	128	147	25.8	6.8	496	3.5

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	556	4.3
10000	60	111	128	18.6	4.9	626	5.3
10000	50	101	116	15.3	4.0	707	6.6
12000	90	137	157	29.6	7.8	447	2.8
12000	80	130	149	25.8	6.8	500	3.4
12000	70	122	140	22.1	5.8	561	4.2
12000	60	113	130	18.6	4.9	631	5.1
12000	50	102	118	15.3	4.0	707	6.5
14000	90	139	160	29.6	7.8	451	2.7
14000	80	132	152	25.8	6.8	503	3.3
14000	70	124	143	22.1	5.8	565	4.0
14000	60	115	132	18.6	4.9	636	5.0
14000	50	104	119	15.3	4.0	714	6.3
16000	80	134	155	25.8	6.8	507	3.2
16000	70	126	145	22.1	5.8	569	3.9
16000	60	117	134	18.6	4.9	641	4.8
16000	50	105	121	15.3	4.0	714	6.1
18000	80	137	157	25.8	6.8	514	3.0
18000	70	128	148	22.1	5.8	573	3.7
18000	60	118	136	18.6	4.9	641	4.7
18000	50	107	123	15.3	4.0	720	5.9

Figure 5-4c Cruise Performance, Range and Endurance
with standard tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with long-range tanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	128	147	33.6	8.9	493	3.9
SL	90	123	141	29.6	7.8	550	4.5
SL	80	117	135	25.8	6.8	613	5.2
SL	70	111	127	22.1	5.8	693	6.2
SL	60	103	119	18.6	4.9	779	7.6
SL	50	94	108	15.3	4.0	879	9.4
2000	100	130	150	33.6	8.9	498	3.8
2000	90	125	144	29.6	7.8	556	4.4
2000	80	119	137	25.8	6.8	620	5.1
2000	70	112	129	22.1	5.8	695	6.1
2000	60	105	120	18.6	4.9	789	7.4
2000	50	96	110	15.3	4.0	892	9.2
4000	100	133	153	33.6	8.9	507	3.7
4000	90	127	146	29.6	7.8	562	4.3
4000	80	121	139	25.8	6.8	627	5.0
4000	70	114	131	22.1	5.8	703	6.0
4000	60	106	122	18.6	4.9	791	7.3
4000	50	97	111	15.3	4.0	895	9.1
6000	100	135	155	33.6	8.9	512	3.6
6000	90	129	149	29.6	7.8	567	4.2
6000	80	123	142	25.8	6.8	633	4.9
6000	70	116	134	22.1	5.8	711	5.9
6000	60	108	124	18.6	4.9	801	7.2
6000	50	98	113	15.3	4.0	898	8.9
8000	100	138	158	33.6	8.9	520	3.5
8000	90	132	152	29.6	7.8	577	4.1
8000	80	125	144	25.8	6.8	640	4.8
8000	70	118	136	22.1	5.8	719	5.8
8000	60	110	126	18.6	4.9	810	7.1
8000	50	100	115	15.3	4.0	910	8.8
10000	90	134	154	29.6	7.8	582	4.0
10000	80	128	147	25.8	6.8	651	4.7

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	726	5.7
10000	60	111	128	18.6	4.9	812	6.9
10000	50	101	116	15.3	4.0	913	8.7
12000	90	137	157	29.6	7.8	592	3.9
12000	80	130	149	25.8	6.8	657	4.6
12000	70	122	140	22.1	5.8	733	5.6
12000	60	113	130	18.6	4.9	821	6.8
12000	50	102	118	15.3	4.0	915	8.5
14000	90	139	160	29.6	7.8	597	3.8
14000	80	132	152	25.8	6.8	663	4.5
14000	70	124	143	22.1	5.8	740	5.4
14000	60	115	132	18.6	4.9	829	6.7
14000	50	104	119	15.3	4.0	926	8.3
16000	80	134	155	25.8	6.8	669	4.4
16000	70	126	145	22.1	5.8	747	5.3
16000	60	117	134	18.6	4.9	838	6.5
16000	50	105	121	15.3	4.0	928	8.2
18000	80	137	157	25.8	6.8	679	4.2
18000	70	128	148	22.1	5.8	754	5.2
18000	60	118	136	18.6	4.9	839	6.4
18000	50	107	123	15.3	4.0	938	8.0

Figure 5-4d Cruise Performance, Range and Endurance with long-range tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with Integraltanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on integral tanks with 196.8 l (52 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	128	147	33.6	8.9	638	5.0
SL	90	123	141	29.6	7.8	709	5.8
SL	80	117	135	25.8	6.8	787	6.7
SL	70	111	127	22.1	5.8	885	8.0
SL	60	103	119	18.6	4.9	990	9.6
SL	50	94	108	15.3	4.0	1114	11.9
2000	100	130	150	33.6	8.9	646	4.9
2000	90	125	144	29.6	7.8	717	5.7
2000	80	119	137	25.8	6.8	796	6.6
2000	70	112	129	22.1	5.8	889	7.9
2000	60	105	120	18.6	4.9	1005	9.5
2000	50	96	110	15.3	4.0	1132	11.7
4000	100	133	153	33.6	8.9	658	4.8
4000	90	127	146	29.6	7.8	726	5.6
4000	80	121	139	25.8	6.8	806	6.5
4000	70	114	131	22.1	5.8	900	7.8
4000	60	106	122	18.6	4.9	1009	9.4
4000	50	97	111	15.3	4.0	1137	11.6
6000	100	135	155	33.6	8.9	665	4.7
6000	90	129	149	29.6	7.8	734	5.5
6000	80	123	142	25.8	6.8	816	6.4
6000	70	116	134	22.1	5.8	912	7.6
6000	60	108	124	18.6	4.9	1023	9.3
6000	50	98	113	15.3	4.0	1143	11.4
8000	100	138	158	33.6	8.9	677	4.6
8000	90	132	152	29.6	7.8	748	5.4
8000	80	125	144	25.8	6.8	825	6.3
8000	70	118	136	22.1	5.8	923	7.5
8000	60	110	126	18.6	4.9	1036	9.1
8000	50	100	115	15.3	4.0	1160	11.3
10000	90	134	154	29.6	7.8	755	5.3
10000	80	128	147	25.8	6.8	840	6.2

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22.1	5.8	933	7.4
10000	60	111	128	18.6	4.9	1040	9.0
10000	50	101	116	15.3	4.0	1165	11.1
12000	90	137	157	29.6	7.8	769	5.2
12000	80	130	149	25.8	6.8	849	6.1
12000	70	122	140	22.1	5.8	944	7.3
12000	60	113	130	18.6	4.9	1053	8.9
12000	50	102	118	15.3	4.0	1170	11.0
14000	90	139	160	29.6	7.8	776	5.1
14000	80	132	152	25.8	6.8	858	6.0
14000	70	124	143	22.1	5.8	954	7.2
14000	60	115	132	18.6	4.9	1065	8.7
14000	50	104	119	15.3	4.0	1186	10.8
16000	80	134	155	25.8	6.8	867	5.9
16000	70	126	145	22.1	5.8	965	7.0
16000	60	117	134	18.6	4.9	1078	8.6
16000	50	105	121	15.3	4.0	1190	10.7
18000	80	137	157	25.8	6.8	882	5.7
18000	70	128	148	22.1	5.8	975	6.9
18000	60	118	136	18.6	4.9	1081	8.4
18000	50	107	123	15.3	4.0	1205	10.5

Figure 5-4e Cruise Performance, Range and Endurance with Integraltanks, Cessna 172P at 1089 kg (2400 lbs)

SECTION 5b
PERFORMANCE

◆ Note:	This chapter applies to aircraft with propellers **MTV-6-A/190-69**. The correct propeller designation can be found on the blades.

◆ Note:	The chapter not relevant to the respective propeller can be omitted.

GROUND ROLL AND TAKE-OFF DISTANCE at 1043 kg (2300 lbs)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1043 kg (2300 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind

Lift Off: .....48 KIAS/ 55 mph

Speed at 15 m / 50 ft: .....54 KIAS/ 62 mph

Notes:

1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additional distances (min. 20%) for wet grass runway, softened ground or snow.

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	153	177	190	204	217	239	269
	50 ft (15 m) obstacle	240	277	297	319	340	375	424
1000	Gnd Roll	164	190	203	218	233	256	289
	50 ft (15 m) obstacle	257	297	318	342	365	402	455
2000	Gnd Roll	176	204	218	234	250	275	309
	50 ft (15 m) obstacle	276	318	341	366	391	431	487
3000	Gnd Roll	189	218	234	251	268	295	332
	50 ft (15 m) obstacle	295	341	366	393	419	462	522
4000	Gnd Roll	203	234	251	269	287	316	356
	50 ft (15 m) obstacle	317	366	392	421	450	496	561
5000	Gnd Roll	218	251	269	289	308	339	382
	50 ft (15 m) obstacle	340	393	421	452	483	532	602
6000	Gnd Roll	234	270	289	310	331	365	410
	50 ft (15 m) obstacle	365	422	452	486	518	572	646
7000	Gnd Roll	256	296	317	340	363	400	450
	50 ft (15 m) obstacle	401	463	495	532	568	627	708
8000	Gnd Roll	281	324	347	373	398	438	493
	50 ft (15 m) obstacle	439	507	543	583	623	687	776
9000	Gnd Roll	311	359	385	413	441	485	546
	50 ft (15 m) obstacle	487	562	602	646	690	761	860
10000	Gnd Roll	344	398	426	457	488	537	605
	50 ft (15 m) obstacle	539	623	667	717	765	844	954

Figure 5-1a Take-Off Distance [m] at take-off weight 1043 kg (2300 lbs)

PRESS ALT	Ground Roll and Take-Off Distance [ft] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	503	581	622	668	713	785	883
	50 ft (15 m) obstacle	787	909	974	1046	1116	1232	1392
1000	Gnd Roll	539	623	667	716	764	841	946
	50 ft (15 m) obstacle	843	974	1043	1120	1196	1319	1491
2000	Gnd Roll	578	668	715	767	819	901	1014
	50 ft (15 m) obstacle	904	1044	1118	1201	1282	1414	1598
3000	Gnd Roll	620	716	766	823	878	967	1088
	50 ft (15 m) obstacle	969	1120	1199	1288	1374	1517	1714
4000	Gnd Roll	665	768	822	883	942	1037	1167
	50 ft (15 m) obstacle	1040	1201	1286	1381	1475	1627	1839
5000	Gnd Roll	714	824	883	948	1011	1113	1253
	50 ft (15 m) obstacle	1116	1290	1381	1483	1583	1747	1973
6000	Gnd Roll	766	885	948	1018	1086	1196	1345
	50 ft (15 m) obstacle	1199	1385	1483	1592	1700	1876	2119
7000	Gnd Roll	840	970	1039	1115	1191	1310	1474
	50 ft (15 m) obstacle	1314	1518	1625	1745	1863	2056	2323
8000	Gnd Roll	921	1064	1139	1223	1305	1436	1616
	50 ft (15 m) obstacle	1440	1664	1782	1913	2042	2253	2546
9000	Gnd Roll	1020	1178	1261	1354	1445	1591	1790
	50 ft (15 m) obstacle	1596	1844	1974	2120	2263	2497	2822
10000	Gnd Roll	1130	1305	1397	1500	1601	1762	1983
	50 ft (15 m) obstacle	1769	2044	2189	2351	2510	2769	3129

Figure 5-1b Take-Off Distance [ft] at take-off weight 1043 kg (2300 lbs)

GROUND ROLL AND TAKE-OFF DISTANCE at 1089 kg (2400 lbs) (Cessna 172P only)

SHORT FIELD TAKE-OFFS

Conditions:

Take-off weight 1089 kg (2400 lbs)
Flaps 10°
Full Power Prior to Brake Release
Paved, level, dry runway
Zero Wind

Lift Off: .....48 KIAS/ 55 mph

Speed at 15 m / 50 ft: .....54 KIAS/ 62 mph

Notes:

1. Short field technique
2. Decrease distances 10% for each 9 Knot headwind. For operation with tailwinds up to 10 Knot increase distances by 10% for each 2 Knot.
3. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.
4. Consider additional distances (min. 20%) for wet grass runway, softened ground or snow.

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	171	198	212	228	243	267	301
	50 ft (15 m) obstacle	268	310	332	356	380	419	474
1000	Gnd Roll	184	212	227	244	260	286	322
	50 ft (15 m) obstacle	287	332	355	381	407	449	508
2000	Gnd Roll	197	227	243	261	279	307	345
	50 ft (15 m) obstacle	308	356	381	409	436	482	544
3000	Gnd Roll	211	244	261	280	299	329	370
	50 ft (15 m) obstacle	330	381	408	438	468	516	583
4000	Gnd Roll	226	262	280	301	321	353	397
	50 ft (15 m) obstacle	354	409	438	470	502	554	626
5000	Gnd Roll	243	281	301	323	344	379	427
	50 ft (15 m) obstacle	380	439	470	505	539	595	672
6000	Gnd Roll	261	301	323	347	370	407	458
	50 ft (15 m) obstacle	408	472	505	542	579	639	722
7000	Gnd Roll	286	330	354	380	405	446	502
	50 ft (15 m) obstacle	447	517	553	594	634	700	791
8000	Gnd Roll	313	362	388	416	444	489	550
	50 ft (15 m) obstacle	490	567	607	651	695	767	867
9000	Gnd Roll	347	401	429	461	492	542	609
	50 ft (15 m) obstacle	543	628	672	722	771	850	961
10000	Gnd Roll	385	444	476	511	545	600	675
	50 ft (15 m) obstacle	603	696	745	800	855	943	1065

Figure 5-1c Take-Off Distance [m] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

PRESS ALT	Ground Roll and Take-Off Distance [m] Outside Air Temperature [°C]							
[ft]	---	-20°C	0°C	10°C	20°C	30°C	40°C	50°C
0	Gnd Roll	562	649	695	746	797	877	986
	50 ft (15 m) obstacle	879	1016	1087	1168	1247	1375	1554
1000	Gnd Roll	602	696	745	800	853	939	1057
	50 ft (15 m) obstacle	942	1088	1165	1251	1336	1474	1665
2000	Gnd Roll	645	746	798	857	915	1007	1133
	50 ft (15 m) obstacle	1009	1166	1249	1341	1431	1579	1785
3000	Gnd Roll	692	799	856	919	981	1080	1215
	50 ft (15 m) obstacle	1082	1251	1339	1438	1535	1694	1914
4000	Gnd Roll	742	858	918	986	1052	1158	1303
	50 ft (15 m) obstacle	1161	1342	1437	1543	1647	1817	2053
5000	Gnd Roll	797	921	986	1058	1130	1243	1399
	50 ft (15 m) obstacle	1246	1440	1542	1656	1768	1951	2204
6000	Gnd Roll	856	989	1059	1137	1213	1335	1502
	50 ft (15 m) obstacle	1339	1547	1656	1779	1899	2095	2367
7000	Gnd Roll	938	1084	1160	1246	1330	1464	1647
	50 ft (15 m) obstacle	1467	1695	1815	1949	2081	2296	2594
8000	Gnd Roll	1028	1188	1272	1366	1458	1604	1805
	50 ft (15 m) obstacle	1608	1858	1990	2137	2281	2517	2844
9000	Gnd Roll	1139	1316	1409	1512	1614	1777	1999
	50 ft (15 m) obstacle	1782	2059	2205	2368	2528	2789	3152
10000	Gnd Roll	1262	1458	1561	1675	1788	1968	2215
	50 ft (15 m) obstacle	1976	2283	2445	2626	2803	3093	3495

Figure 5-1d Take-Off Distance [ft] at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

MAXIMUM RATE-OF-CLIMB at 1043 kg (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power

Notes:

1. For operation in air colder than this table provides, use coldest data shown.
2. For operation in air warmer than this table provides, use extreme caution.

PRESS ALT [FT]	Climb speed [KIAS]	Rate of Climb [ft/min] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	938	924	911	796	659
1000	69	932	917	904	789	651
2000	69	925	910	897	782	644
3000	69	918	903	889	774	636
4000	69	911	896	881	766	628
5000	69	904	888	874	758	620
6000	69	896	881	866	750	611
7000	69	888	873	857	741	603
8000	69	881	864	849	732	594
9000	69	847	830	814	700	563
10000	69	812	796	779	666	533
11000	69	778	761	744	633	502
12000	69	743	726	709	599	471
13000	69	708	691	673	566	439
14000	69	673	655	638	531	408
15000	69	638	619	601	497	376
16000	69	602	583	565	462	343
17000	69	566	547	528	427	311
18000	69	530	510	491	392	278

Figure 5-2a Maximum Rate of Climb at take-off weight 1043 kg (2300 lbs)

MAXIMUM RATE-OF-CLIMB at 1089 kg (2400 lbs) (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up, Full Power

Notes:

1. For operation in air colder than this table provides, use coldest data shown.
2. For operation in air warmer than this table provides, use extreme caution.

PRESS ALT [FT]	Climb speed [KIAS]	Rate of Climb [ft/min] Outside Air Temperature [°C]				
		-20°C	0°C	+20°C	+40°C	+50°C
0	69	876	862	849	738	606
1000	69	870	855	841	731	598
2000	69	863	848	834	723	590
3000	69	856	841	826	715	582
4000	69	849	833	819	707	574
5000	69	841	826	811	699	566
6000	69	834	818	802	690	557
7000	69	826	810	794	682	548
8000	69	818	801	785	673	539
9000	69	785	768	752	641	510
10000	69	751	734	718	608	480
11000	69	718	700	683	576	450
12000	69	684	666	649	543	419
13000	69	650	632	614	510	388
14000	69	616	597	579	476	357
15000	69	581	562	544	443	326
16000	69	546	527	508	409	294
17000	69	511	491	472	374	262
18000	69	476	456	436	340	230

Figure 5-2b Maximum Rate of Climb at take-off weight 1089 kg (2400 lbs) (Cessna 172P only)

TIME, FUEL AND DISTANCE TO CLIMB at 1043 KG (2300 lbs)

Conditions:

Take-off weight 1043 kg (2300 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power
Standard Temperature (ISA)

Notes:

1. Add 4 l (1.1 US gal) of fuel for engine start, taxi and takeoff allowance.
2. Increase time and distance by 10% for 10°C above standard temperature.
3. Distances shown are based on zero wind.
4. Time, distance and fuel required are only valid from the point where the airplane climbs at v_y = 69 KIAS.

Press. Alt. [ft]	OAT [°C]	Vy [KIAS]	ROC [FPM]	Time [MIN]	Distance [NM]	Fuel used [l]	[US Gal]
0	15	69	914	0,0	0,0	0,0	0,0
1000	13	69	908	1,1	1,3	0,6	0,2
2000	11	69	903	2,2	2,6	1,2	0,3
3000	9	69	897	3,3	4,0	1,9	0,5
4000	7	69	891	4,4	5,4	2,5	0,7
5000	5	69	885	5,6	6,9	3,1	0,8
6000	3	69	878	6,7	8,5	3,7	1,0
7000	1	69	872	7,8	10,1	4,4	1,2
8000	-1	69	865	9,0	11,8	5,0	1,3
9000	-3	69	832	10,2	13,5	5,6	1,5
10000	-5	69	800	11,4	15,4	6,1	1,6
11000	-7	69	767	12,7	17,4	6,6	1,7
12000	-9	69	733	14,0	19,5	7,1	1,9
13000	-11	69	700	15,4	21,8	7,6	2,0
14000	-13	69	667	16,9	24,3	8,1	2,1
15000	-15	69	633	18,4	27,0	8,6	2,3
16000	-17	69	599	20,0	29,8	9,1	2,4
17000	-19	69	565	21,7	32,9	9,6	2,5
18000	-21	69	530	23,6	36,3	10,1	2,7

Figure 5-3a Time, Fuel and Distance to Climb at 1043 kg (2300 lbs)

TIME, FUEL AND DISTANCE TO CLIMB at 1089 KG (Cessna 172P only)

Conditions:

Take-off weight 1089 kg (2400 lbs)
Climb speed v_y = 69 KIAS/ 79 mph
Flaps Up
Full Power
Standard Temperature (ISA)

Notes :

1. Add 4 l (1.1 US gal) of fuel for engine start, taxi and takeoff allowance.
2. Increase time and distance by 10% for 10°C above standard temperature.
3. Distances shown are based on zero wind.
4. Time, distance and fuel required are only valid from the point where the airplane climbs at v_y = 69 KIAS.

Press. Alt.	OAT	Vy	ROC	Time	Distance	Fuel used	
[ft]	[°C]	[KIAS]	[FPM]	[MIN]	[NM]	[l]	[US Gal]
0	15	69	852	0,0	0,0	0,0	0,0
1000	13	69	846	1,2	1,4	0,7	0,2
2000	11	69	840	2,4	2,8	1,3	0,3
3000	9	69	834	3,6	4,3	2,0	0,5
4000	7	69	828	4,8	5,9	2,7	0,7
5000	5	69	822	6,0	7,5	3,3	0,9
6000	3	69	815	7,2	9,1	4,0	1,1
7000	1	69	809	8,4	10,9	4,7	1,2
8000	-1	69	802	9,7	12,7	5,4	1,4
9000	-3	69	770	10,9	14,5	6,0	1,6
10000	-5	69	738	12,3	16,6	6,5	1,7
11000	-7	69	706	13,7	18,7	7,1	1,9
12000	-9	69	674	15,1	21,1	7,7	2,0
13000	-11	69	641	16,6	23,6	8,2	2,2
14000	-13	69	609	18,2	26,3	8,7	2,3
15000	-15	69	576	19,9	29,2	9,3	2,5
16000	-17	69	543	21,7	32,3	9,8	2,6
17000	-19	69	510	23,6	35,8	10,4	2,7
18000	-21	69	476	25,6	39,5	10,9	2,9

Figure 5-3b Time, Fuel and Distance to Climb at 1089 kg (2400 lbs) (Cessna 172P only)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard tanks at 1043 kg (2300 lbs)

Conditions:
Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	125	144	33,6	8,9	365	2,9
SL	90	120	139	29,6	7,8	412	3,4
SL	80	115	133	25,8	6,8	465	4,0
SL	70	110	126	22,1	5,8	530	4,8
SL	60	103	119	18,6	4,9	608	5,9
SL	50	95	110	15,3	4,0	698	7,3
2000	100	127	147	33,6	8,9	370	2,8
2000	90	123	141	29,6	7,8	416	3,3
2000	80	118	135	25,8	6,8	470	3,9
2000	70	112	129	22,1	5,8	536	4,7
2000	60	105	121	18,6	4,9	613	5,8
2000	50	97	112	15,3	4,0	702	7,2
4000	100	130	149	33,6	8,9	374	2,7
4000	90	125	144	29,6	7,8	421	3,2
4000	80	120	138	25,8	6,8	475	3,8
4000	70	114	131	22,1	5,8	541	4,6
4000	60	107	123	18,6	4,9	618	5,6
4000	50	98	113	15,3	4,0	707	7,0
6000	100	132	152	33,6	8,9	379	2,6
6000	90	127	147	29,6	7,8	426	3,1
6000	80	122	140	25,8	6,8	480	3,7
6000	70	116	133	22,1	5,8	546	4,5
6000	60	109	125	18,6	4,9	623	5,5
6000	50	100	115	15,3	4,0	711	6,9
8000	100	135	155	33,6	8,9	383	2,5
8000	90	130	150	29,6	7,8	431	3,0
8000	80	124	143	25,8	6,8	485	3,6
8000	70	118	136	22,1	5,8	551	4,4
8000	60	111	127	18,6	4,9	628	5,4
8000	50	101	117	15,3	4,0	714	6,7
10000	90	133	153	29,6	7,8	435	2,9
10000	80	127	146	25,8	6,8	490	3,5

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	556	4,2
10000	60	113	130	18,6	4,9	632	5,2
10000	50	103	118	15,3	4,0	716	6,6
12000	90	135	156	29,6	7,8	440	2,8
12000	80	129	149	25,8	6,8	495	3,4
12000	70	123	141	22,1	5,8	560	4,1
12000	60	115	132	18,6	4,9	636	5,1
12000	50	104	120	15,3	4,0	718	6,4
14000	90	138	159	29,6	7,8	445	2,7
14000	80	132	152	25,8	6,8	500	3,2
14000	70	125	144	22,1	5,8	565	3,9
14000	60	117	134	18,6	4,9	640	4,9
14000	50	105	121	15,3	4,0	718	6,2
16000	80	134	155	25,8	6,8	505	3,1
16000	70	127	146	22,1	5,8	570	3,8
16000	60	118	136	18,6	4,9	643	4,7
16000	50	107	123	15,3	4,0	717	6,0
18000	80	137	158	25,8	6,8	512	2,9
18000	70	130	149	22,1	5,8	577	3,6
18000	60	120	139	18,6	4,9	649	4,5
18000	50	107	124	15,3	4,0	718	5,8

Figure 5-4a Cruise Performance, Range and Endurance with standard tanks, at 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE
with long-range tanks (Cessna 172N) at 1043 kg (2300 lbs)

Conditions:
Take-off weight 1043 kg (2300 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	125	144	33,6	8,9	482	3,9
SL	90	120	139	29,6	7,8	539	4,5
SL	80	115	133	25,8	6,8	605	5,2
SL	70	110	126	22,1	5,8	685	6,2
SL	60	103	119	18,6	4,9	781	7,6
SL	50	95	110	15,3	4,0	893	9,4
2000	100	127	147	33,6	8,9	488	3,8
2000	90	123	141	29,6	7,8	546	4,4
2000	80	118	135	25,8	6,8	612	5,1
2000	70	112	129	22,1	5,8	693	6,1
2000	60	105	121	18,6	4,9	789	7,4
2000	50	97	112	15,3	4,0	900	9,2
4000	100	130	149	33,6	8,9	495	3,7
4000	90	125	144	29,6	7,8	553	4,3
4000	80	120	138	25,8	6,8	620	5,0
4000	70	114	131	22,1	5,8	701	6,0
4000	60	107	123	18,6	4,9	797	7,3
4000	50	98	113	15,3	4,0	907	9,1
6000	100	132	152	33,6	8,9	502	3,6
6000	90	127	147	29,6	7,8	560	4,2
6000	80	122	140	25,8	6,8	628	4,9
6000	70	116	133	22,1	5,8	710	5,9
6000	60	109	125	18,6	4,9	806	7,2
6000	50	100	115	15,3	4,0	914	8,9
8000	100	135	155	33,6	8,9	509	3,5
8000	90	130	150	29,6	7,8	568	4,1
8000	80	124	143	25,8	6,8	635	4,8
8000	70	118	136	22,1	5,8	718	5,8
8000	60	111	127	18,6	4,9	813	7,0
8000	50	101	117	15,3	4,0	920	8,8
10000	90	133	153	29,6	7,8	575	4,0
10000	80	127	146	25,8	6,8	643	4,7

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	726	5,6
10000	60	113	130	18,6	4,9	821	6,9
10000	50	103	118	15,3	4,0	926	8,6
12000	90	135	156	29,6	7,8	583	3,8
12000	80	129	149	25,8	6,8	651	4,6
12000	70	123	141	22,1	5,8	733	5,5
12000	60	115	132	18,6	4,9	828	6,7
12000	50	104	120	15,3	4,0	930	8,4
14000	90	138	159	29,6	7,8	590	3,7
14000	80	132	152	25,8	6,8	659	4,4
14000	70	125	144	22,1	5,8	741	5,4
14000	60	117	134	18,6	4,9	835	6,6
14000	50	105	121	15,3	4,0	933	8,2
16000	80	134	155	25,8	6,8	667	4,3
16000	70	127	146	22,1	5,8	749	5,2
16000	60	118	136	18,6	4,9	842	6,4
16000	50	107	123	15,3	4,0	935	8,0
18000	80	137	158	25,8	6,8	678	4,1
18000	70	130	149	22,1	5,8	760	5,0
18000	60	120	139	18,6	4,9	851	6,2
18000	50	107	124	15,3	4,0	937	7,8

Figure 5-4b Cruise Performance, Range and Endurance with long-range tanks, at 1043 kg (2300 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard tanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on standard tanks with 127.4 l (33.6 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	125	144	33,6	8,9	365	2,9
SL	90	120	138	29,6	7,8	411	3,4
SL	80	115	132	25,8	6,8	464	4,0
SL	70	109	126	22,1	5,8	529	4,8
SL	60	103	118	18,6	4,9	604	5,9
SL	50	95	109	15,3	4,0	691	7,3
2000	100	127	146	33,6	8,9	369	2,8
2000	90	122	141	29,6	7,8	415	3,3
2000	80	117	135	25,8	6,8	469	3,9
2000	70	111	128	22,1	5,8	533	4,7
2000	60	104	120	18,6	4,9	609	5,7
2000	50	96	110	15,3	4,0	695	7,2
4000	100	130	149	33,6	8,9	373	2,7
4000	90	125	144	29,6	7,8	420	3,2
4000	80	119	137	25,8	6,8	473	3,8
4000	70	113	130	22,1	5,8	538	4,6
4000	60	106	122	18,6	4,9	613	5,6
4000	50	97	112	15,3	4,0	698	7,0
6000	100	132	152	33,6	8,9	378	2,6
6000	90	127	146	29,6	7,8	424	3,1
6000	80	122	140	25,8	6,8	478	3,7
6000	70	115	133	22,1	5,8	542	4,5
6000	60	108	124	18,6	4,9	617	5,5
6000	50	99	113	15,3	4,0	700	6,8
8000	100	135	155	33,6	8,9	382	2,5
8000	90	130	149	29,6	7,8	428	3,0
8000	80	124	143	25,8	6,8	482	3,6
8000	70	118	135	22,1	5,8	547	4,3
8000	60	110	126	18,6	4,9	621	5,3
8000	50	100	115	15,3	4,0	701	6,7
10000	90	132	152	29,6	7,8	433	2,9
10000	80	126	145	25,8	6,8	486	3,4

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	551	4,2
10000	60	112	128	18,6	4,9	624	5,2
10000	50	101	116	15,3	4,0	701	6,5
12000	90	135	155	29,6	7,8	437	2,7
12000	80	129	148	25,8	6,8	491	3,3
12000	70	122	140	22,1	5,8	555	4,0
12000	60	113	131	18,6	4,9	627	5,0
12000	50	102	117	15,3	4,0	700	6,3
14000	90	138	158	29,6	7,8	441	2,6
14000	80	131	151	25,8	6,8	495	3,1
14000	70	124	143	22,1	5,8	558	3,9
14000	60	115	133	18,6	4,9	629	4,8
14000	50	103	118	15,3	4,0	697	6,1
16000	80	134	154	25,8	6,8	499	3,0
16000	70	126	145	22,1	5,8	562	3,7
16000	60	117	135	18,6	4,9	631	4,6
16000	50	103	119	15,3	4,0	692	5,9
18000	80	136	157	25,8	6,8	505	2,8
18000	70	129	148	22,1	5,8	568	3,5
18000	60	119	137	18,6	4,9	635	4,4
18000	50	103	119	15,3	4,0	686	5,7

Figure 5-4c Cruise Performance, Range and Endurance
with standard tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with long-range tanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on long-range tanks with 158.6 l (41.9 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	125	144	33,6	8,9	481	3,9
SL	90	120	138	29,6	7,8	538	4,5
SL	80	115	132	25,8	6,8	603	5,2
SL	70	109	126	22,1	5,8	683	6,2
SL	60	103	118	18,6	4,9	777	7,6
SL	50	95	109	15,3	4,0	884	9,4
2000	100	127	146	33,6	8,9	487	3,8
2000	90	122	141	29,6	7,8	544	4,4
2000	80	117	135	25,8	6,8	610	5,1
2000	70	111	128	22,1	5,8	690	6,1
2000	60	104	120	18,6	4,9	784	7,4
2000	50	96	110	15,3	4,0	890	9,2
4000	100	130	149	33,6	8,9	494	3,7
4000	90	125	144	29,6	7,8	551	4,3
4000	80	119	137	25,8	6,8	618	5,0
4000	70	113	130	22,1	5,8	698	6,0
4000	60	106	122	18,6	4,9	791	7,3
4000	50	97	112	15,3	4,0	896	9,0
6000	100	132	152	33,6	8,9	500	3,6
6000	90	127	146	29,6	7,8	558	4,2
6000	80	122	140	25,8	6,8	625	4,9
6000	70	115	133	22,1	5,8	705	5,9
6000	60	108	124	18,6	4,9	799	7,1
6000	50	99	113	15,3	4,0	901	8,9
8000	100	135	155	33,6	8,9	507	3,4
8000	90	130	149	29,6	7,8	565	4,0
8000	80	124	143	25,8	6,8	632	4,8
8000	70	118	135	22,1	5,8	713	5,7
8000	60	110	126	18,6	4,9	805	7,0
8000	50	100	115	15,3	4,0	904	8,7
10000	90	132	152	29,6	7,8	572	3,9
10000	80	126	145	25,8	6,8	639	4,6

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	720	5,6
10000	60	112	128	18,6	4,9	812	6,8
10000	50	101	116	15,3	4,0	907	8,5
12000	90	135	155	29,6	7,8	579	3,8
12000	80	129	148	25,8	6,8	646	4,5
12000	70	122	140	22,1	5,8	727	5,4
12000	60	113	131	18,6	4,9	817	6,7
12000	50	102	117	15,3	4,0	908	8,3
14000	90	138	158	29,6	7,8	586	3,6
14000	80	131	151	25,8	6,8	654	4,4
14000	70	124	143	22,1	5,8	733	5,3
14000	60	115	133	18,6	4,9	823	6,5
14000	50	103	118	15,3	4,0	907	8,1
16000	80	134	154	25,8	6,8	661	4,2
16000	70	126	145	22,1	5,8	740	5,1
16000	60	117	135	18,6	4,9	828	6,3
16000	50	103	119	15,3	4,0	903	7,9
18000	80	136	157	25,8	6,8	670	4,0
18000	70	129	148	22,1	5,8	749	4,9
18000	60	119	137	18,6	4,9	834	6,1
18000	50	103	119	15,3	4,0	897	7,7

Figure 5-4d Cruise Performance, Range and Endurance with long-range tanks, Cessna 172P at 1089 kg (2400 lbs)

CRUISE PERFORMANCE, RANGE AND ENDURANCE with Integraltanks at 1089 kg (2400 lbs) (Cessna 172P)

Conditions:
Take-off weight 1089 kg (2400 lbs)
Flaps Up
Zero wind

Notes:
1. Endurance information is based on integral tanks with 196.8 l (52 US gal) usable fuel.
2. The table assumes 4 l (1.1 US gal) for startup and taxi; time, fuel and distance to climb and 45 min. reserve.
3. Increase true airspeed (KTAS) and maximum range (NM) by 1% per 10°C above ISA temperature.
4. Cruise Power above 75% not recommended. For economic cruise set load 70% or less.

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
SL	100	125	144	33,6	8,9	623	5,0
SL	90	120	138	29,6	7,8	693	5,8
SL	80	115	132	25,8	6,8	774	6,7
SL	70	109	126	22,1	5,8	872	8,0
SL	60	103	118	18,6	4,9	988	9,6
SL	50	95	109	15,3	4,0	1120	11,9
2000	100	127	146	33,6	8,9	632	4,9
2000	90	122	141	29,6	7,8	702	5,7
2000	80	117	135	25,8	6,8	784	6,6
2000	70	111	128	22,1	5,8	883	7,9
2000	60	104	120	18,6	4,9	999	9,5
2000	50	96	110	15,3	4,0	1130	11,7
4000	100	130	149	33,6	8,9	641	4,8
4000	90	125	144	29,6	7,8	712	5,6
4000	80	119	137	25,8	6,8	794	6,5
4000	70	113	130	22,1	5,8	894	7,7
4000	60	106	122	18,6	4,9	1010	9,3
4000	50	97	112	15,3	4,0	1139	11,5
6000	100	132	152	33,6	8,9	651	4,7
6000	90	127	146	29,6	7,8	722	5,4
6000	80	122	140	25,8	6,8	805	6,4
6000	70	115	133	22,1	5,8	905	7,6
6000	60	108	124	18,6	4,9	1020	9,2
6000	50	99	113	15,3	4,0	1147	11,4
8000	100	135	155	33,6	8,9	660	4,6
8000	90	130	149	29,6	7,8	732	5,3
8000	80	124	143	25,8	6,8	816	6,3
8000	70	118	135	22,1	5,8	916	7,5
8000	60	110	126	18,6	4,9	1031	9,0
8000	50	100	115	15,3	4,0	1154	11,2
10000	90	132	152	29,6	7,8	743	5,2
10000	80	126	145	25,8	6,8	826	6,1

Press. Alt.	Load	Speed		Fuel Flow		Distance	Endu-rance Time
[ft]	[%]	[KTAS]	[mph]	[l/h]	[US Gal/h]	[NM]	[Hrs]
10000	70	120	138	22,1	5,8	926	7,3
10000	60	112	128	18,6	4,9	1041	8,9
10000	50	101	116	15,3	4,0	1159	11,0
12000	90	135	155	29,6	7,8	753	5,1
12000	80	129	148	25,8	6,8	837	6,0
12000	70	122	140	22,1	5,8	937	7,2
12000	60	113	131	18,6	4,9	1051	8,7
12000	50	102	117	15,3	4,0	1163	10,8
14000	90	138	158	29,6	7,8	764	4,9
14000	80	131	151	25,8	6,8	848	5,8
14000	70	124	143	22,1	5,8	948	7,0
14000	60	115	133	18,6	4,9	1060	8,5
14000	50	103	118	15,3	4,0	1164	10,6
16000	80	134	154	25,8	6,8	859	5,7
16000	70	126	145	22,1	5,8	958	6,8
16000	60	117	135	18,6	4,9	1068	8,3
16000	50	103	119	15,3	4,0	1161	10,4
18000	80	136	157	25,8	6,8	872	5,5
18000	70	129	148	22,1	5,8	971	6,7
18000	60	119	137	18,6	4,9	1078	8,1
18000	50	103	119	15.3	4.0	1154	10.2

Figure 5-4e Cruise Performance, Range and Endurance
with Integraltanks, Cessna 172P at 1089 kg (2400 lbs)

SECTION 6
HANDLING ON GROUND & MAINTENANCE

▲	**WARNING:**	Do not start the engine in any case when filling levels are below the corresponding minimum marking.

■	CAUTION:	Normally, a refill of coolant or gearbox oil between service intervals is not necessary. In case of low coolant or gearbox oil levels, inform the maintenance company immediately.

ENGINE OIL

The TAE 125-02-114 engine variants are filled with 4.5 - 6 l engine oil (refer to section 1 of this supplement for specification).
A dip stick is used to check the oil level. It is accessible by a flap on the upper right-hand side of the engine cowling.
Notice that on warm engines 5 minutes after engine shut-off there are 80% of the entire engine oil in the oil pan and therefore visible o the oil dip stick. On warm engines oil should be added if the oil dip stick shows oil levels below 50%. After 30 minutes the real oil level is visible on the dip stick.
The drain screw is located on the lower left-hand outside of the oil pan, the oil filter is on the upper left-hand side of the housing.
The oil system has to be checked for sealing after the first 5 operating hours (visual inspection).
Checks and changes of oil and oil filter have to be performed regularly according to the engine Operation and Maintenance Manual, see OM-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

GEARBOX OIL

To ensure the necessary propeller speed, the engine is equipped with a reduction gearbox filled with gearbox oil. (refer to section 1 of this supplement for specification).
The level can be checked through a viewing glass on the lower leading edge of the gearbox. To do so open the flap on the left front side of the engine cowling.
The drain screw is located at the lowest point of the gearbox. A filter is installed upstream of the pump, as well as microfilter in the Constant Speed Unit. Check the gearbox for sealing after the first 5 hours of operation (visual inspection). Regular checks as well as oil and filter changes have to be performed in according with the engine Operation and Maintenance Manual, see OM-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

▲	**WARNING:**	It is not allowed to start the engine with low gearbox oil level.

■	CAUTION:	Between scheduled maintenance topping up gearbox oil should not be necessary. If low gearbox oil level is detected, inform your service centre immediately.

FUEL

The TAE 125-02-114 engine can be operated with kerosene(JET A-1, Jet A, Fuel No.3, JP-8, TS-1) or Diesel fuel. Due to the higher specific density of JET A-1 or Diesel in comparison to aviation gasoline (AVGAS) the permissible capacity for standard tanks was reduced as mentioned in Section 1.
Appropriate placards are attached near the fuel filler connections.
For temperature limitations refer to Section 2 "Limitations" and Section 4 "Normal Operation".

It is recommended to refuel before each flight and to enter the type of fuel into the log-book.

COOLANT

To cool the engine a liquid cooling system was installed with a water/approved radiator protection mixture at a ratio of 1:1.
A heat exchanger for cabin heating is part of the cooling system.
Check the cooling system for sealing after the first 5 hours of operation (visual inspection).
The coolant has to be changed in accordance with the engine Operations and Maintenance Manual, see OM-02-02. The Supplement of the Aircraft Maintenance Manual has to be considered as well, see AMM-20-02.

▲	**WARNING:**	It is not allowed to start the engine with low coolant level.
■	CAUTION:	Between scheduled maintenance topping-up coolant should not be necessary. If low coolant level is detected, inform your service centre immediately.
◆	Note:	The freezing point of the coolant is -36°C.

This page intentionally left blank

SECTION 7
WEIGHT & BALANCE

Item	Weight x Arm = Moment (kg)	(m)	(mkp)
Empty Weight			
plus Engine Oil (6 l to 0.9 kg/l)		-0.31	
plus Gearbox Oil (1 l to 0.9 kg/l)		-0.69	
plus unusable fuel standard tanks (11.4 l to 0.84 kg/l)		1.17	
long-range tanks (15.0 l to 0.84 kg/l)		1.17	
integraltanks (22.8 l to 0.84 kg/l)		1.17	
plus Coolant (6 l to 1.0 kg/l)		-0.26	
Changes in Equipment			
Basic Empty Weight			

Figure 7-1 Calculating the Basic Empty Weight

		Your aircraft	
		Mass kg	Moment mkp
Calculation of the loaded condition	**1. Basic Empty Weight:** Use the values for your airplane with the present equipment. Unusable fuel, engine oil, gearbox oil and coolant are included.		
	2. Usable Fuel (at 0.84 kg/l), Standard tanks (127.4 l max.) Long-range tanks (158.6 l max.) Integral tanks (196.8 l max.)		
	3. Pilot and Front Passenger (Station 0.86 to 1.17 m)		
	4. Rear Passenger		
	5. *Baggage Area 1 or Passenger on the children's seat (Station 2.08 to 2.74; max.54kg)		
	6. *Baggage Area 2 (Station 2.74 to 3.61; max. 23kg)		
	7. Ramp Weight and Moment		
	8. Fuel allowance for engine start, taxi and runup		
	9. Take-off Weight and Moment (Subtract Step 8 from Step 7)		
	10.Locate this point in the weight and balance envelope in the original POH. Check if its within the envelope. *Maximum allowable combinded weight capacity for Baggage Areas 1 and 2 is 54 kg.		

Figure 7-2 Calculating Weight and Moment

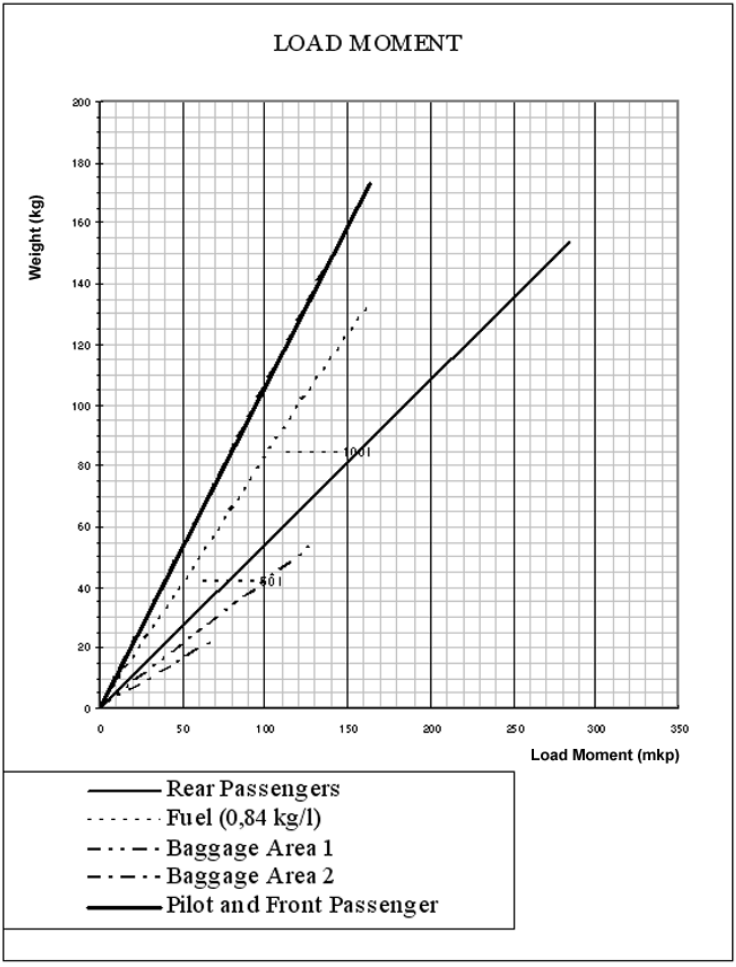


Figure 7-3 Load Moment

This page has been intentionally left blank

SECTION 8
SPECIAL EQUIPMENT
EQUIPMENT LIST

CARBURETOR AIR TEMPERATURE GAGE

N/A

QUICK OIL DRAIN VALVE

N/A

This page has been intentionally left blank

SECTION 9
SUPPLEMENTS

TABLE OF CONTENTS

No supplements

This page has been intentionally left blank

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

EASA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

for the

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

as installed in

C172N

Make and Model Airplane

Registration Number: D-ETKM Serial Number: 172-72198

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate 10037574 for the installation and operation of the Garmin GTN 625, 635, 650, 725, 750, 625Xi, 635Xi, 650Xi, 725Xi, or 750Xi GPS/SBAS Navigation System. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an 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 or markings, or the basic approved Airplane Flight Manual.

Signed By:

Michael Warren
ODA STC Unit Administrator
Garmin International Inc.
ODA-240087-CE

Date: 18 - MAR - 2020

EASA STC No.: 10037574

Matjaž Meze
CA No.: 001
AEROSERVICE LESCE - BLED

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	EASA Approval
1	07-08-13	All	Complete Supplement	Jannes Neumann EASA Approved Date: *07-Aug-2013*
2	09-03-16	5	Added Flight Stream Limitation	Michael Warren [FAA] ODA Approved [on behalf of EASA] Date: *11-Apr-2016*
3	03-06-20	1	Added GTN Xi Series units	See Page 1
		1	Removed Revision Number from reference to EASA STC 10037574 to improve future maintenance	
		4	Added GTN Xi FAA AFMS part numbers	
		4	Changed TSO C146c to C146( )	
		5	Added references to GTN 7XX Xi and GTN 6XX Xi units	
		5	Added Section 2.4 Speed Constraints	

Table of Contents

SECTION	PAGE
Section 1. GENERAL	**4**
Section 2. LIMITATIONS	**5**
Section 3. EMERGENCY PROCEDURES	**6**
Section 4. NORMAL PROCEDURES	**6**
Section 5. PERFORMANCE	**6**
Section 6. WEIGHT AND BALANCE	**6**
Section 7. SYSTEM DESCRIPTIONS	**6**

Section 1. GENERAL

1.1 Garmin GTN Navigators

The information in this supplement is EASA-approved material and must be attached to the FAA Approved STC Airplane Flight Manual Supplement, P/N 190-01007-A2, 190-01007-A5, 190-01007-C2, or 190-01007-C3 when the airplane has been modified by installation of the Garmin GTN Navigation System in accordance with STC 10037574.

This EASA approved Airplane Flight Manual Supplement is required in addition to the FAA approved Airplane Flight Manual Supplement, P/N 190-01007-A2, 190-01007-A5, 190-01007-C2, or 190-01007-C3.

All references to TSO-C146( ) in 190-01007-A2, 190-01007-A5, 190-01007-C2, or 190-01007-C3 are replaced by ETSO-C146.

Electronic Flight Bag section information is pertinent to FAA certified aircraft only.

Additional References:

Temporary Guidance Leaflet 10, Rev 1: Airworthiness and Operational Approval for Precision RNAV Operations in Designated European Airspace

Acceptable Means of Compliance 20-4, Airworthiness Approval and Operational Criteria for the Use of Navigation Systems in European Airspace Designated for the Basic RNAV Operations

Acceptable Means of Compliance 20-27, Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations

Acceptable Means of Compliance 20-28, Airworthiness Approval and Operational Criteria for RNAV GNSS Approach Operation to LPV Minima using SBAS

Section 2. LIMITATIONS

2.1 Display of Distance to Waypoint (for European registered aircraft only)

During installation, the GTN was configured to display distance to current waypoint on the Map Page (GTN 7XX or GTN 7XX Xi) or Default Navigation Page (GTN 6XX or GTN 6XX Xi). The display location of distance to current waypoint must not be altered or removed from these pages.

2.2 Phone/SMS Suppress Visuals Setting (for European registered aircraft only)

During installation, the GTN was configured to suppress visual alerts during approach, missed approach, and terminal operations for the GSR 56 Iridium Phone and SMS features. The Suppress Visuals setting on the Service-Phone page must not be changed from "On During APR/MAPR/TERM".

2.3 Flight Stream with Portable Electronic Devices

The Flight Stream interface and data provided to a portable electronic device is not approved to replace any required or installed aircraft display equipment, including navigation or traffic/weather display equipment. The data presented on the PED may not have the required integrity to be used as the sole source of information to base tactical or strategic decision making.

Use of the Flight Stream for flight plan importing during critical phases of flight by the pilot flying is prohibited.

2.4 Speed Constraints

The GTN does not display speed constraints that may be required on a SID, STAR or Approach. The flight crew is responsible for reviewing charts to identify any speed constraints that may be required and for managing the aircraft speed in compliance with those constraints.

Section 3. EMERGENCY PROCEDURES

No Change.

Section 4. NORMAL PROCEDURES

No Change.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

No Change.

Section 7. SYSTEM DESCRIPTIONS

No Change.

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

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
Garmin GTN 625Xi, 635Xi, 650Xi, 725Xi, or 750Xi
GPS/SBAS Navigation System
as installed in

_____
Make and Model Airplane

Registration Number: _____ Serial Number: _____

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA02019SE-D for the installation and operation of the Garmin GTN 625Xi, 635Xi, 650Xi, 725Xi, or 750Xi GPS/SBAS Navigation System. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the information in the FAA Approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA Approved Airplane Flight Manual, markings, or placards. FAA approved sections of the AFMS are labeled "FAA APPROVED". Sections labeled "NOT FAA APPROVED" are for guidance only.

FAA Approved by: JR Brownell

JR Brownell
ODA STC Unit Administrator
Garmin International Inc.
ODA-240087-CE

Date: 6/20/2025

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
1	01/03/2020	All	Complete Supplement	Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
2	02/19/2020	1 6	Section 1.1 • Fixed Typographical Error Section 1.2 • Fixed Typographical Error	Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
3	12/11/2020	All 6 11 12 13 17	Replaced references to AC 90-105 with AC 90-105A Replaced References to FAA Order 8400.12A and 8400.33 with AC 90-105A Replaced References to AC 90-100A with AC 90-100A CHG 2 Section 1.3 • Updated reference to AC 120-76D Section 2.4 • Replaced references to Garmin WFDE Program with Garmin RAIM Prediction tool. Section 2.5 • Updated software versions Section 2.6 • Removed note Section 2.9 • Removed VOR from list of approaches not approved with GPS guidance	Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		19	Section 2.21 • Changed wording for clarity Section 2.31 • Clarified use of OBS mode	
		31	Added Section 2.33: Glide Range Ring and Best Glide Airport Indicator	
		33	Removed Section 4.8: Database Conflict Resolution	
		48	Section 7.1 • Updated Pilot's Guide revision • Removed sentence to improve clarity Added Section 7.32: Screenshots Added Section 7.33: Knob Control Added Section 7.34: Cross Side Radio Control	
		49	Added Section 7.35: Glide Range Ring and Best Glide Airport Indicator Added Section 7.36: Emergency page Added Section 7.37: Remote Database Confirmation	
4	07/23/2021	4 12	Section 1.2: Added Smart Glide Section 2.5: Updated Software versions	Charles S. Roberts For Manager NW Flight Test Section AIR-715, FAA Seattle, WA

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		19	Replaced Section 2.33 Glide Range Ring and Best Glide Airport Indicator with Section 2.33 Smart Glide	
		21	Section 3: Added Section Table of Contents	
		23	Added Section 3.1.2: Loss of Engine Power or Engine Failure in Flight Added Section 3.1.3: Smart Glide "Maneuver and Land / Disconnect Autopilot"	
		28	Added Section 3.2.16: Smart Glide Failure Added Section 3.2.17: Smart Glide Inadvertent Activation	
		31	Section 4: Added Section Table of Contents	
		38	Section 7.1: Updated Pilot's Guide Revision	
		43	Section 7.11: Added Smart Glide Switch	
		48	Removed previously numbered Section 7.35: Glide Range Ring and Best Glide Airport Indicator	
		49	Removed previously numbered Section 7.37: Remote Database Confirmation	
		52	Section 7.28: Updated VNAV wording for clarification	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		53	Renumbered Section 7.36 to 7.35: Emergency Page	
		54	Added Section 7.36: Smart Glide	
		63	Added Section 7.37: Single Point Database Acknowledgement	
5	12/28/2021	6	Section 1.2: Updated Document Reference	Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
		12	Section 2.5: Updated GTN Xi software versions and instructions to find software version	
		54-63	Section 7.36: Added information about G5 and G3X to smart glide section. Additional corrections and clarifications were made throughout.	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
6	01/25/2023	Section 1	Updated images and layout. New systems capabilities and descriptions. Reorganized. New installer checkboxes for the aircraft. New applicable software versions.	JR Brownell ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
		Section 2	Updated software versions, new limitations, removed systems descriptions, reorganized. RNP limitation update.	
		Section 3	Updated procedures, reorganized.	
		Section 4	Updated procedures, reorganized.	
		Section 7	New systems descriptions, reorganized. GDL 60 systems description.	
		ALL	Added "FAA APPROVED" or "NOT FAA APPROVED" to footers for all pages.	
7	04/05/2023	3	Moved Minimum Software Version Table from Section 2.4 to Section 1.2.	JR Brownell ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
		24	Rewrote Section 3.1.2 GTN Xi Smart Glide procedure for clarity. Combined Section 3.1.3 into Section 3.1.2.	
		Various	Section paragraphs and Table of Contents updated per the above changes.	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
8	04/19/2024	1	Added TSO-C151d Class A TAWS to Table 1-1	Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE
		3	Updated software versions in Table 1-2	
		18	Added installer checkboxes for TAWS-A configurations	
		21	Added TAWS-A limitations	
		22	Added limitation for entry of procedures and altitude entry	
		24	Added note for TAWS operation in cold weather	
		28, 29, 32-35	Added GPWS and TAWS-A procedures and information	
		40	Added TAWS-A Flap and Glide slope inhibit procedures	
		47-51	Added TAWS-A and TAWS-B information and alerts	
		55	Added GWX 8000 description	
		76	Added Core Procedure selection description	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
9	06/20/2025	1	Added display of GDR 66 FAA Data Comm and display of GCO 14 Carbon Monoxide Data to Table 1-1	See page i
		3	Updated software versions in Table 1-2 Added CPDLC and GCO to section 1.3	
		14	Added section 1.4, ATC Data Link System (CPDLC)	
		16	Updated definitions to section 1.7	
		17	Added GDR 66 breaker specifications to 1.8 Added CPDLC as an annunciator to 1.8.1	
		20	Added section 1.8.8 for CPDLC installations Added section 1.8.9 for GCO installations	
		21	Updated section 2.1 description Updated table 2-1 in section 2.2 for minimum equipment	
		25	Updated 2.19 limitations to include speed constraints	
		27	Updated section 3.1.1 to include visual and aural annunciations.	
		29	Updated section 3.2.1 description and visual annunciations.	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		29	Updated section 3.2.2 description and procedure	
		30	Updated section 3.2.4 to include GMA models	
		31	Added section 3.2.5 for Loss of ATC Data Link (CPDLC) Updated section 3.2.6 procedures and included visual and aural annunciations	
		32	Updated section 3.2.10 description and procedures	
		33-34	Updated sections 3.2.13 – 3.2.18 description and procedures	
		35	Added section 3.2.21 for Carbon Monoxide (CO) Caution	
		38	Added Carbon Monoxide (CO) Caution to section 3.4	
		41	Updated section 4 description	
		41-45	Updated sections 4.3 – 4.10 description and procedures	
		45	Added section 4.11 for ATC Data Link Log-On Added section 4.12 for ATC Data Link Responding to Messages Added section 4.13 for GCO Inhibit	

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
		48	Updated section 7.1 Pilot's Guide description	
		49	Updated section 7.2.5 missed approach note	
			Updated section 7.2.6 Descent Baro VNAV description	
		51	Added section 7.2.9 for GPS Approach Downgrade	
		52	Added section 7.2.10 for Loss of GPS/SBAS Navigation Data	
		53	Updated section 7.3.1 description for glideslope warnings	
		56	Updated section 7.3.2 description for GPWS and included alerts in table 7-2	
		60	Added CPDLC to table 7-3 in section 7.6	
		65	Updated section 7.17	
		76	Updated section 7.25 description	
		82	Updated section 7.36 description	
		83	Added section 7.37 for ATC Data Link System (CPDLC)	
		86	Added section 7.38 for GCO 14	

This Page Intentionally Blank

Table of Contents

SECTION		PAGE
1	**GENERAL**	**1**
1.1	GARMIN GTN XI NAVIGATORS	1
1.2	APPLICABLE SYSTEM SOFTWARE	3
1.3	SYSTEM CAPABILITIES	3
1.4	ATC DATA LINK SYSTEM (CPDLC) (OPTIONAL)	14
1.5	ELECTRONIC FLIGHT BAG	15
1.6	ELECTRONIC CHECKLISTS	15
1.7	DEFINITIONS	16
1.8	INSTALLATION DESCRIPTION	17
2	**LIMITATIONS**	**21**
2.1	KINDS OF OPERATION	21
2.2	MINIMUM EQUIPMENT	21
2.3	SYSTEM USE	22
2.4	NAVIGATION DATABASE	22
2.5	GROUND OPERATIONS	22
2.6	RNAV PROCEDURES	22
2.7	QFE BAROMETRIC SETTING	23
2.8	TERRAIN ALERTING FUNCTION (ALL UNITS)	23
2.9	TAWS FUNCTION (OPTIONAL)	23
2.10	POLAR OPERATIONS	24
2.11	DATALINK WEATHER DISPLAY (OPTIONAL)	24
2.12	TRAFFIC DISPLAY (OPTIONAL)	24
2.13	DEMO MODE	24
2.14	WIRE OBSTACLE DATABASE	24
2.15	DATABASE UPDATES	24
2.16	OBS MODE	24
2.17	ADVISORY VISUAL APPROACHES	24
2.18	SMART GLIDE	24
2.19	PROCEDURE ROUTES, ALTITUDES, AND SPEEDS	25
3	**EMERGENCY PROCEDURES**	**26**
3.1	EMERGENCY PROCEDURES	27
3.2	ABNORMAL PROCEDURES	29
3.3	WARNING MESSAGES	36
3.4	CAUTION MESSAGES	37
3.5	FAILURE MESSAGES	39
4	**NORMAL PROCEDURES**	**40**
4.1	UNIT POWER ON	41
4.2	BEFORE TAKEOFF	41
4.3	HSI AND EHSI OPERATION	41
4.4	AUTOPILOT OPERATION	42
4.5	COUPLING THE AUTOPILOT DURING APPROACHES	42
4.6	COUPLING THE AUTOPILOT FOR DESCENT VNAV	44

4.7 COUPLING THE AUTOPILOT DURING SEARCH AND RESCUE OPERATIONS 44
4.8 COLD WEATHER COMPENSATION 44
4.9 TAWS-A FLAP INHIBIT 45
4.10 TAWS-A GLIDESLOPE INHIBIT 45
4.11 ATC DATA LINK (CPDLC) LOG-ON 45
4.12 ATC DATA LINK RESPONDING TO MESSAGES 45
4.13 GCO INHIBIT 45
5 PERFORMANCE 46
6 WEIGHT AND BALANCE 47
7 SYSTEM DESCRIPTIONS 48
7.1 PILOT'S GUIDE 48
7.2 NAVIGATION 48
7.3 TERRAIN PROXIMITY, TERRAIN ALERTING, AND TAWS 52
7.4 GMA 35/35C AUDIO PANEL (OPTIONAL) 58
7.5 STORMSCOPE® (OPTIONAL) 58
7.6 EXTERNAL SWITCHES 59
7.7 AIRSPACE DEPICTION AND ALERTS 60
7.8 GARMIN ADS-B TRAFFIC SYSTEM INTERFACE (OPTIONAL) 60
7.9 GWX 70/75 WEATHER RADAR (OPTIONAL) 61
7.10 GWX 8000 WEATHER RADAR (OPTIONAL) 61
7.11 CHARTS (OPTIONAL) 62
7.12 TRANSPONDER CONTROL (OPTIONAL) 62
7.13 TELEPHONE AUDIO (OPTIONAL) 62
7.14 TERRAIN, WIRES, AND OBSTACLES 62
7.15 MAP PAGE 64
7.16 TIMES AND DISTANCES 64
7.17 GTN XI-GTN (XI) CROSSFILL 65
7.18 AUTOMATIC SPEECH RECOGNITION (ASR) 66
7.19 EUROPEAN VISUAL REPORTING POINTS 67
7.20 SCREENSHOTS 67
7.21 KNOB PAGE NAVIGATION 67
7.22 REMOTE RADIO CONTROL (OPTIONAL) 67
7.23 EMERGENCY PAGE (OPTIONAL) 68
7.24 SMART GLIDE (OPTIONAL) 68
7.25 AUTOPILOT COUPLING 76
7.26 STORMSCOPE® DISPLAY (OPTIONAL) 77
7.27 FLIGHT PLANNER/CALCULATOR FUNCTIONS 77
7.28 FUEL RANGE RINGS 77
7.29 GLOVE USE / COVERED FINGERS 78
7.30 ACTIVE WEATHER RADAR 78
7.31 TELEPHONE AUDIO 78
7.32 MULTI CREW AIRCRAFT (GMA 35 ONLY) 78
7.33 AUTOMATIC SPEECH RECOGNITION 79
7.34 CONNEXT DATA (OPTIONAL) 79
7.35 SYSTEM DATABASES 80
7.36 CORE PROCEDURE SELECTION 82

7.37 ATC DATA LINK SYSTEM (CPDLC) (OPTIONAL) 83
7.38 GCO 14 (OPTIONAL) 86

1 General

1.1 Garmin GTN Xi Navigators

The Garmin GTN Xi navigation system is a GPS system with a Satellite Based Augmentation System (SBAS), comprised of one or more Garmin TSO-C146e GTN 625Xi, 635Xi, 650Xi, 725Xi, or 750Xi navigator(s) and one or more Garmin approved GPS/SBAS antenna(s). The GTN navigation system is installed in accordance with AC 20-138D.

	GTN 625Xi	GTN 635Xi	GTN 650Xi	GTN 725Xi	GTN 750Xi
GPS SBAS Navigation: • Oceanic, enroute, terminal, and non-precision approach guidance • Precision approach guidance (LP, LPV)	X	X	X	X	X
VHF Com Radio, 118.00 to 136.990, MHz, 8.33 or 25 kHz increments		X	X		X
VHF Nav Radio, 108.00 to 117.95 MHz, 50 kHz increments			X		X
LOC and Glideslope non-precision and precision approach guidance for Cat 1 minimums, 328.6 to 335.4 MHz tuning range			X		X
Moving map including topographic, terrain, aviation, and geopolitical data	X	X	X	X	X
Display of datalink weather products, SiriusXM, FIS-B, Connext (all optional)	X	X	X	X	X
Control of GDR 66 FAA Datacomm (optional)				X	X
Control and display of airborne weather radar (optional)				X	X
Display of terminal procedures data (optional)				X	X
Display of traffic data, including ADS-B (optional)	X	X	X	X	X
Display of StormScope® data (optional)	X	X	X	X	X
Display of GCO 14 Carbon Monoxide Data (optional)	X	X	X	X	X
Display of marker beacon annunciators (optional)	X*	X*	X*	X	X
Remote audio panel control (optional)				X	X
Remote transponder control (optional)	X	X	X	X	X
Remote audio entertainment datalink control (optional)	X	X	X	X	X
TSO-C151dClass B TAWS (optional)	X	X	X	X	X
TSO-C151dClass A TAWS (optional)	X	X	X	X	X
Supplemental calculators and timers	X	X	X	X	X
Control of GSR 56 Iridium Satellite Phone and SMS Text	X	X	X	X	X
Control of Flight Stream 210 (optional)	X	X	X	X	X
Control of Flight Stream 510 (optional)	X	X	X	X	X

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

Table 1-1 – GTN Functions

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

Although intuitive and user friendly, the GTN Xi requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid procedures 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 a detailed Pilot's Guide, and a tablet trainer app. Pilots should take full advantage of these tools to enhance their familiarity with the system.

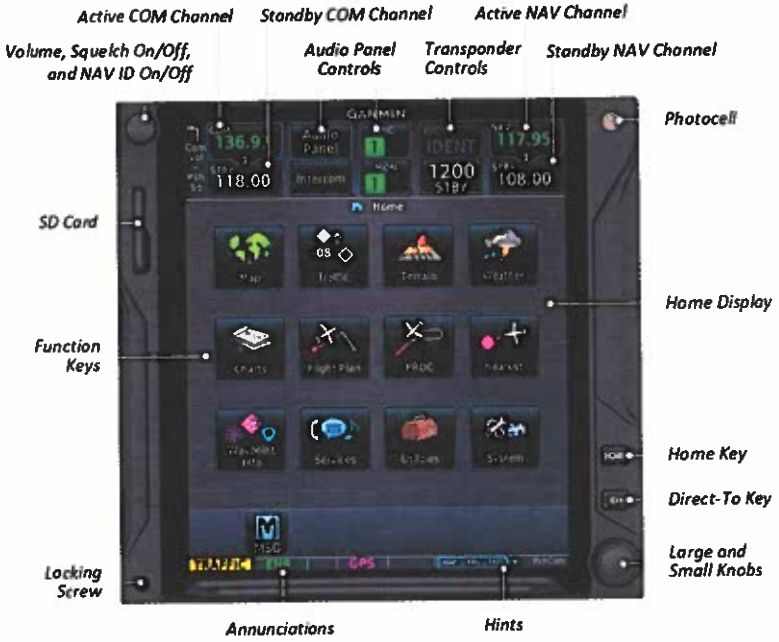


Figure 1 - GTN 750Xi Control and Display Layout



Figure 2 - GTN 635Xi/650Xi Control and Display Layout

1.2 Applicable System Software

All software versions displayed can be viewed on the System – System Status or Connext Setup pages. The following or later software versions must be installed for this AFMS revision to be applicable to the installation.

Software Item	Software Version
Main SW Version	21.02
GPS SW Version	8.6
Com SW Version	2.11
Nav SW Version	2.04
Flight Stream 210	2.90
Flight Stream 510	2.9X
GDL 60	2.50
GDR 66	2.31

Table 1-2 - Software Versions

1.3 System Capabilities

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

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

- VHF Communication Radio
- Primary VHF Navigation
- Primary GPS Navigation (Enroute) and Approach Capability (LP/LNAV) – See below
- Primary GPS Approach Capability with Vertical Guidance (LNAV/VNAV, LPV) – See below
- TSO-C151d Terrain Awareness and Warning System – See section 2.9
- Enroute Baro-VNAV
- Smart Glide
- ATC Data Link System (CPDLC)
- Cabin Carbon Monoxide Levels

GPS/SBAS TSO-C146e Class 3 Operation

The GTN Xi navigator installed in this aircraft is a TSO-C146e Class 3 approved GPS navigator that complies with AC 20-138D and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR enroute, terminal area, and non-precision approach operations (including those approaches titled "GPS", "or GPS", and "RNAV (GPS)" approaches). The Garmin GNSS navigation system is composed of the GTN Xi navigator and antenna and is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV".

The Garmin GTN Xi system as installed in this airplane complies with the equipment, performance, and functional requirements to conduct RNAV operations in accordance with the following table. This table is accurate at the time it was published. However, changes to operational rules, FAA advisory circulars, flight plan formats, etc., are possible. The pilot is responsible to ensure compliance with current operational requirements.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNAV 10 RNP 10 Oceanic and Remote Areas of Operation (Class II Navigation)	GNSS FDE availability must be verified prior to flight. Maximum predicted FDE unavailability is 34 minutes.[1] Two GNSS systems required to be operational, (one GNSS system for those routes requiring only one long range navigation system). No time limit using GNSS as the primary navigation sensor. Part 91, Part 91 subpart K, 121, 125, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A, FAA AC 91-70B, EASA AMC 20-12	R	A1	The GPS equipment as installed requires a second GNSS system for Class II navigation in oceanic and remote airspace. When installed with a second GNSS system, the GTN Xi equipment complies with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with an FDE prediction tool that satisfies the guidance of FAA AC 20-138D and AC 90-105A (or later revision).[1] Additional equipment may be required to obtain operational approval to utilize RNP-10 performance.
B-RNAV / RNAV 5 (Europe)	This does not constitute an operational approval.	FAA AC 90-96A CHG 1, EASA AMC 20-4A	R	B2	
RNP 4 Oceanic and Remote Areas of Operation (Class II	GNSS FDE availability must be verified prior to flight. Maximum predicted FDE unavailability is 25 minutes.[1]	FAA AC 20-138D CHG 2, FAA AC 90-105A, FAA AC 91-70B	R	L1	The GPS equipment as installed requires a second GNSS system for Class II navigation in oceanic and remote airspace. Additional equipment may be required to obtain

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
Navigation)	Two operational long-range nav systems required, (or one navigation system and one GNSS sensor for those routes requiring only one long-range navigation sensor). No time limit using GNSS as the primary navigation sensor. Part 91, Part 91 subpart K, 121, 125, and 135 operators require operational approval.				operational approval to utilize RNP-4 performance.
RNAV 2	The GNSS RNAV system is installed and meets the performance and functional requirements of AC 90-100A. In accordance with AC 90-100A, CHG 2, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-100A CHG 2	R	C2	Includes RNAV Q and T routes.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNAV 1	The GNSS RNAV system is installed and meets the performance and functional requirements of AC 90-100A. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-100A CHG 2	R	D2	Includes RNAV terminal departure, arrival procedures, and approach procedures up to the Final Approach Fix.
P-RNAV (Europe)	This does not constitute an operational approval.	FAA AC 90-96A CHG 1, JAA TGL 10 Rev 1	R	D2	ICAO flight plan code for P-RNAV no longer exists. P-RNAV utilizes RNAV 1 flight plan codes.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNP 0.3	Includes RNP terminal departure and arrival procedures. When flying a RNP procedure with a radius-to fix (RF) leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures with RF legs. In accordance with AC 90-105A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-105A are authorized to fly RNP 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 90-105A	R	TBD	Includes RNP terminal departure and arrival procedures, including procedures with radius-to-fix (RF) legs. Also includes approach procedures to the Final Approach Fix. AC 90-105A states that procedures with RF legs must be flown using either a flight director or coupled to the autopilot. Item 18 PBN flight plan code is still to-be-determined at time of publication of this AFMS. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNP 1	When flying a RNP procedure containing an RF leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures containing radius-to-fix (RF) legs. In accordance with AC 90-105A, Part 91 operators (except subpart K), following the aircraft and training guidance in AC 90-105A are authorized to fly RNP 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A	R	O2	Includes RNP terminal departure and arrival procedures, including procedures with radius-to-fix (RF) legs. Also includes approach procedures to the Final Approach Fix. AC 90-105A states that procedures with RF legs must be flown using either a flight director or coupled to the autopilot. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNP-2 (Oceanic / Remote)	GNSS FDE availability must be verified prior to flight. Maximum predicted FDE unavailability is 5 minutes.[1] Two operational long-range nav systems required, (or one navigation system and one GNSS sensor for those routes requiring only one long-range navigation sensor). No time limit using GNSS as the primary navigation sensor. Part 91, Part 91 subpart K, 121, 125, and 135 operators require operational approval.	FAA AC 20-138D CHG2, FAA AC 90-105A FAA AC 91-70B	R	TBD	The GPS equipment as installed requires a second GNSS system for Class II navigation in oceanic and remote airspace. Additional equipment may be required to obtain operational approval to utilize RNP-2 performance. Item 18 PBN flight plan code is still to-be-determined at time of publication of this AFMS.
RNP-2 (Domestic / Offshore En route)	In accordance with AC 90-105A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-105A are authorized to fly RNP-2 domestic and offshore routes. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A FAA AC 91-70B	R	TBD	Includes RNP-2 domestic and offshore routes. Item 18 PBN flight plan code is still to-be-determined at time of publication of this AFMS.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNP APCH LNAV minima	When flying a RNP procedure with a radius-to-fix (RF) leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures containing RF legs. In accordance with AC 90-105A, Part 91 operators (except subpart K), following the aircraft and training guidance in AC 90-105A are authorized to fly RNP APCH LNAV minima procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A, EASA AMC 20-27A	R	S1	Includes non-precision approaches based on conventional navigation aids with "or GPS" in the title and area navigation approaches titled "GPS", "RNAV-(GPS)", and "RNAV (GNSS)". This includes procedures with radius-to-fix (RF) legs. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
RNP APCH LNAV/VNAV minima	When flying a RNP procedure with a radius-to-fix (RF) leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures containing RF legs. In accordance with AC 90-105A, Part 91 operators (except subpart K), following the aircraft and training guidance in AC 90-105A are authorized to fly RNP APCH LNAV/VNAV minima procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A, EASA AMC 20-27A with CM-AS-002	R	S2	Includes area navigation approaches titled "RNAV (GPS)" and "RNAV (GNSS)." This includes procedures with radius-to-fix (RF) legs. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.
RNP APCH LP minima	When flying a RNP procedure with a radius-to-fix (RF) leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures containing RF legs In accordance with AC 90-107, Part 91 operators (except subpart K),	FAA AC 20-138D CHG 2, FAA AC 90-107	N/A	N/A	Includes area navigation approaches titled "RNAV (GPS)" and "RNAV (GNSS)" including procedures with radius-to-fix (RF) legs. LP minima are available only when within SBAS coverage. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
	following the aircraft and training guidance in AC 90-107 are authorized to fly RNP APCH LP minima procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.				Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.
RNP APCH LPV minima	When flying a RNP procedure with a radius-to-fix (RF) leg, the AFCS must be operational. At a minimum, the flight director must be displayed and utilized when conducting procedures containing RF legs. In accordance with AC 90-107, Part 91 operators (except subpart K), following the aircraft and training guidance in AC 90-107 are authorized to fly RNP APCH LPV minima procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-107, EASA AMC 20-28	B	N/A	Includes area navigation approaches titled "RNAV (GPS)" and "RNAV (GNSS)", including procedures with radius-to-fix (RF) legs. LPV minima are available only when within SBAS coverage. Garmin has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

Navigation Spec.	Operational Requirements/ Authorization	Reference Documents	ICAO Flight Plan Code		Notes
			Item 10a Code	Item 18 PBN/	
Advanced RNP See Notes for specific Advanced RNP functions.	This does not constitute an operational approval.	FAA AC 20-138D CHG 2, FAA AC 90-105A	N/A	N/A	• RNAV Holding: Supported. • RF Legs: Supported. • Parallel Offsets: RNP-4 parallel offsets as defined by AC 20-138D Chapter 10 are supported. Advanced RNP parallel offsets as defined by AC20-138D Appendix 3 are supported. • Higher Continuity: Supported only when a second GNSS system is installed and operating. • Scalable RNP: Not supported. • Fixed Radius Transitions (FRT): Not Supported • Time of Arrival Control (TOAC): Not supported.

FDE/RAIM availability worldwide can be determined via the following:

- An FDE prediction tool that satisfies the guidance of FAA AC 20-138D and AC 90-105A (or later revision), such as the Garmin RAIM/FDE Prediction program (https://fly.garmin.com/fly-garmin/support/raim/)

Also, within the United States:

- Via the FAA's RAIM Service Availability Prediction Tool (SAPT) website: http://sapt.faa.gov.
- Contacting a Flight Service Station (not DUATS) to obtain non-precision approach RAIM.

Within Europe,

- An FDE prediction tool that satisfies the guidance of FAA AC 20-138D and AC 90-105A (or later revision)
- Europe's AUGER GPS RAIM Prediction Tool at http://augur.ecacnav.com/augur/app/home

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

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

1.4 ATC Data Link System (CPDLC) (Optional)

The FAA has approved the optional aircraft data link system meeting the criteria in AC 20-140C for the following datalink capabilities:

	FAA Data Comm
Interoperability Designators	FANS 1/A – CPDLC (with automation)*
Subnetworks	VDL M2 (TSO-C160a)
Aircraft-Allocated Performance	CPDLC: RCP 130, RCP 240, RCP 400

* Push to load is supported

This design approval does not constitute operational authorization.

When filing ICAO flight plans, use the following equipment codes for FAA Data Comm enroute enabled installations:

Field 10a: J4Z
Field 18: DAT/1FANSE [1]
REG/XXXXXX [2]
CODE/YYYYYY [3]

1. DAT/1FANSE2PDC can be used to specify PDC is secondary
2. XXXXXX is the aircraft registration number
3. YYYYYY is the 24 bit HEX ICAO address

1.5 Electronic Flight Bag

The GTN 750Xi/725Xi are operationally suitable as installed equipment, Type B EFB applications in accordance with AC 120-76D when using current FliteChart or ChartView data.

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

1.6 Electronic Checklists

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

1.7 Definitions

The following terminology is used within this document:

ACARS Aircraft Communications Addressing and Reporting System

ADF Automatic Direction Finder

ADS-B Automatic Dependent Surveillance Broadcast

AEG Aircraft Evaluation Group (FAA)

APR Approach

ASR Automated Speech Recognition

ATK Along TracK

ATN Aeronautical Telecommunication Network

ATS Air Traffic Services

CDI Course Deviation Indicator

CPDLC Controller Pilot Datalink Communications

DCL Departure Clearance

DEST Destination

DME Distance Measuring Equipment

ECAC European Civil Aviation Conference

EFB Electronic Flight Bag

EHSI Electronic Horizontal Situation Indicator

FANS Future Air Navigation System

FPA Flight Path Angle

FIS-B Flight Information Services Broadcast

GCO Garmin Carbon Monoxide

GDU Garmin Display Unit

GMA Garmin Multimedia Audio

GNSS Global Navigation Satellite System

GPA Glidepath Angle

GPS Global Positioning System

GPSS GPS Roll Steering

GPWS Ground Proximity Warning System

GTN Garmin Touchscreen Navigator

HOT Hazardous Obstacle Transmission wires

HSI Horizontal Situation Indicator

IFR Instrument Flight Rules

ILS Instrument Landing System

IMC Instrument Meteorological Conditions

LDA Localizer Directional Aid

LNAV Lateral Navigation

LNAV +V LNAV with advisory Vertical Guidance

L/VNAV Lateral/Vertical Navigation

LOC Localizer

LOC-BC Localizer Backcourse

LP Localizer Performance

LPV Localizer Performance with Vertical Guidance

LP +V Localizer Performance with Advisory Vertical Guidance

MLS Microwave Landing System

MMC Multi-Media Card

NOTAM Notice to Air Missions

OBS Omni Bearing Selector

PDC Pre-Departure Clearance

PED Portable Electronic Device

PTC Push-To-Command

RAIM Receiver Autonomous Integrity Monitoring

RF Leg Radius-To-Fix Leg of a Charted Instrument Procedure

RFL Reverse Frequency Lookup

RMT Remote

RNAV Area Navigation

RNP Required Navigational Performance

SAR Search and Rescue

SBAS Satellite Based Augmentation System

SD Secure Digital

SDF Simplified Directional Facility

SUSP Suspend

TACAN Tactical Air Navigation System

TAS Traffic Awareness System

TAWS Terrain Awareness and Warning System

TCAS Traffic Collision Avoidance System

TCH Threshold Crossing Height

TFR Temporary Flight Restriction

TIS Traffic Information Service

VHF Very High Frequency

VFR Visual Flight Rules

VGSI Visual Glide-Slope Indicator

VLOC VOR/Localizer

VMC Visual Meteorological Conditions

VNAV Vertical Navigation

VOR VHF Omnidirectional Range

VRP Visual Reporting Point

WAAS Wide Area Augmentation System

XFR Transfer

1.8 Installation Description

The following describes the GTN installation and configuration for this aircraft. Reference this section when using the Normal or Emergency Procedures in Sections 3 and 4. A function or installed feature is applicable to this aircraft only when the corresponding box is checked.

The major components are protected with resettable circuit breakers available to the pilot. The breakers installed in the aircraft are checked below.

	Description	Derivative	Circuit Breaker Label(s)
☐	GTN #1	☐750 (GPS/COM/NAV) ☐735 (GPS/COM) ☐725 (GPS Only) ☐650 (GPS/COM/NAV) ☐635 (GPS/COM) ☐625 (GPS Only)	☐ GPS 1 ☐ NAV/GPS 1 ☐ COM ☐ COM 1
☐	GTN #2	☐750 (GPS/COM/NAV) ☐735 (GPS/COM) ☐725 (GPS Only) ☐650 (GPS/COM/NAV) ☐635 (GPS/COM) ☐625 (GPS Only)	☐ GPS 2 ☐ NAV/GPS 2 ☐ COM ☐ COM 2
☐	Integrated Audio Panel	GMA 35	AUDIO
☐	Streaming Device	Flight Stream 210	BT LINK
☐	Wireless Access	GDL 60	CNXT CNXT BATT
☐	ATC Data Link (CPDLC)	GDR 66	DATACOMM

1.8.1 Installed Controllers and Annunciators

	Description
☐	Remote TAWS Annunciator
☐	Remote GPS Annunciator
☐	Remote CPDLC Annunciator

1.8.2 Interfaces and Connections

The following describes the functionality present in the aircraft based on the external interfaces to the GTN Xi.

1.8.2.1 Heading

- ☐ This installation *has* a heading source. The GTN Xi will provide roll steering on heading legs for the autopilot.
- ☐ This installation *does not have* a heading source. The crew cannot use the GTN Xi roll steering to fly heading legs with the autopilot.

1.8.2.2 Altitude

- ☐ This installation *has* a barometric corrected altitude source. The GTN Xi will automatically sequence altitude legs.
- ☐ This installation *does not have* a barometric corrected altitude source. The flight crew will be prompted to manually sequence altitude legs.

1.8.2.3 Autopilot

- ☐ This installation prompts the flight crew and requires the pilot to enable the approach outputs just prior to engaging the autopilot in APR mode.
- ☐ This installation supports coupling to the autopilot in approach mode once vertical guidance is available.
- ☐ The installation *does not* support any vertical capture or vertical tracking.
- ☐ This installation is equipped and configured to provide VNAV display and autopilot coupling.
- ☐ This installation is equipped and configured to provide VNAV *display only*.
- ☐ This installation *does not* support VNAV display or coupling.
- ☐ This installation is configured with VNAV Transition to Approach.

1.8.2.4 Traffic Systems

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

1.8.3 Navigation Capabilities

- ☐ This installation is equipped to support autopilot coupled RF leg navigation up to RNP 1.0.
- ☐ This installation is equipped to support hand-flown RF leg navigation at RNP 1.0.
- ☐ This installation is equipped to support autopilot coupled RF leg navigation at RNP 0.3 and has received required installer approval for such procedures.
- ☐ This installation *does not* support RF leg navigation.

1.8.4 Cold Weather Compensation

- ☐ This installation supports cold weather compensated intermediate approach and minimums altitudes.
- ☐ This installation supports cold weather compensated *intermediate approach altitudes and missed approach altitudes only.*
- ☐ This installation does not support cold weather compensation.

1.8.5 Terrain Awareness

- ☐ This installation supports *Terrain Proximity. No aural or visual alerts* for terrain or obstacles are provided. Terrain Proximity *does not* satisfy the TAWS requirement of 91.223.
- ☐ This installation supports *Terrain Alerting*. Aural and visual alerts are provided. Terrain Alerting *does not* satisfy the TAWS requirement of 91.223.
- ☐ This installation supports *TAWS B*. Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.
- ☐ This installation supports TAWS A on GTN 1. Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.
- ☐ This installation supports TAWS A on GTN 1 *and* GTN 2. Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.

1.8.6 Go-Around Functionality

- ☐ This installation *will* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.
- ☐ This installation *will not* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.

1.8.7 Smart Glide Configuration

☐ Smart Glide is configured in this installation with the following parameters:

MAX Desired Gust Speed _____KT

Desired Effective Runway Length _____ft

Supported Runway Surface Type:

- ☐ HARD
- ☐ HARD & SOFT
- ☐ AMPHIBIOUS (ANY)
- ☐ WATER ONLY

☐ Smart Glide is not configured in this installation

1.8.8 ATC Data Link (CPDLC)

☐ CPDLC is configured in this installation.

☐ CPDLC is not configured in this installation.

1.8.9 GCO

☐ This installation *has* a GCO unit.

☐ This installation *does not have* a GCO unit.

2 LIMITATIONS

2.1 Kinds of Operation

Unless placarded as limited to VFR only operations, equipment installed in a certified aircraft is approved for Day and Night / VFR and IFR operations in accordance with 14 CFR Part 91, Part 121, and Part 135 when appropriately maintained. Minimum flight crew is unchanged by this STC.

2.2 Minimum Equipment

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

Interfaced Equipment	Number installed	VFR	IFR
External HSI/CDI/EHSI	1 or more	1*	1
External GPS Annunciator	1	1**	1**
GMA 35(c)	0 or 1	0	0
Flight Stream 510	0 or 1	0	0
Flight Stream 210	0 or 1	0	0
GDL 60	0 or 1	0	0
GDR 66	0 or 1	0	0
GCO 14	0 or 1	0	0

Table 2-1 – Required Equipment

* An external CDI is required for installations using the VOR navigation and glideslope information.

** Certain installations require an external GPS annunciator panel. If installed, this annunciator must be fully functional to use the GTN Xi GPS navigation for VFR or IFR operations.

GTN 625Xi/635Xi/725Xi installations:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Xi Navigator plus a second source of GPS navigation or a separate source of VHF navigation. The separate source of VHF navigation must not be the primary GTN Xi, but it may be a secondary GTN

GTN 650Xi/750Xi installations:
Single engine piston aircraft under 6,000 lbs. maximum takeoff weight:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Xi Navigator

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

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

2.3 System Use

The moving map and CDI depiction on the GTN Xi display must not be used for primary course guidance.

2.4 Navigation Database

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

2.5 Ground Operations

Using SafeTaxi, FliteCharts, and ChartView functions as the sole basis for ground maneuvering is prohibited.

2.6 RNAV Procedures

Instrument flight procedures must be loaded from the GTN Xi navigation database.

When conducting instrument approaches referenced to true North, the NAV Angle on the System -Units page must be set to **True**.

When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions. Pilots are prohibited from flying any approach path that contains manually entered waypoints.

IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the GTN Xi and/or the CDI.

2.6.1 RF Legs

The following limitations apply to RNP 1 procedures with RF legs:

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

The following limitations apply to RNP 0.3 procedures with RF legs:

- Two RF leg RNP 0.3 capable navigators are required and must be crossfilled
- Two installed ADAHRS (or ADC/AHRS combination) sources are required

- The aircraft must have a Garmin GFC 500 or GFC 600 autopilot installed and in use during RNP 0.3 operations
- CDI scaling must be manually set to 0.3NM during RNP 0.3 operations
- Primary navigation guidance on RF legs must be shown on an EHSI indicator with auto-slew capability turned ON
- RNP 0.3 is only approved on RF legs prior to the FAF
- Operational approval is limited to FAA AC 90-105 A-RNP NavSpec only. RNP-AR not allowed.
- Installation must be approved for coupled RF capability by installer
- The operator must obtain the necessary LOA or OpSpec approval from the appropriate regulatory agency

2.7 QFE Barometric Setting

When flying procedures requiring the use of QFE barometric settings, the pilot must ensure that the barometric setting for the source interfaced with the GTN Xi is set to QFE as appropriate. GTN Xi does not support barometric VNAV for QFE operations.

2.8 Terrain Alerting Function (All Units)

Maneuvers and navigation must not be based solely on the display of terrain, obstacles, or wires on the moving map terrain displays.

2.9 TAWS Function (Optional)

For TAWS-A operations, one of the following documents must be immediately available to the flight crew during all phases of flight:

- For installations in the Textron Aviation (Cessna) Model 525A with the Garmin G600 TXi PFD installed under Garmin STC #SA02571SE, Garmin CE525A Cockpit Reference Guide, P/N 190-01717-BF, revision 1 (or later revision).
- For all other installations, Garmin GTN 6XX Xi/7XX Xi TAWS-A Cockpit Reference Guide, P/N 190-01007-C5, revision 1 (or later revision).

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

TAWS must be inhibited when landing at an airport that is not included in the airport database or is not designated as a User Airport in the GTN Xi.

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

The use of the terrain awareness warning and terrain display functions is prohibited during QFE (atmospheric pressure at airport elevation) operations.

Terrain, and Obstacle databases must be current for TAWS-B functionality. Terrain, Obstacle, and Navigation databases must be current for TAWS-A functionality.

2.10 Polar Operations
Use of the GTN Xi for primary navigation or TAWS-A functionality for latitudes above 89.00° N and below 89.00° S is prohibited.

2.11 Datalink Weather Display (Optional)
Use of datalink weather information as the sole means for maneuvering in, near, or around areas of hazardous weather is prohibited. Use of datalink services as the primary means to provide Temporary Flight Restriction (TFR) or Notice to Air Missions (NOTAM) information is prohibited.

2.12 Traffic Display (Optional)
Use of traffic display as the sole basis for maneuvering to avoid traffic is prohibited.

2.13 Demo Mode
Demo mode is prohibited in flight.

2.14 Wire Obstacle Database
Use of the "Obstacle/Wire" database is prohibited.

2.15 Database Updates
In-flight database transfers or updates are prohibited.

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

2.17 Advisory Visual Approaches
Use of advisory visual approaches in IMC is prohibited.

2.18 Smart Glide
Engaging Smart Glide is prohibited for One-Engine Inoperative operations in multi-engine aircraft. Smart Glide usage for multi-engine aircraft is limited to dual engine failure situations.

2.19 Procedure Routes, Altitudes, and Speeds

Procedures loaded into the GTN default to turbojet routes, altitudes, and speeds. The crew must verify the route, altitudes, and speeds when any procedure is loaded into the GTN.

3 EMERGENCY PROCEDURES

3.1 EMERGENCY PROCEDURES 27
3.1.1 TAWS Alerting 27
3.1.2 LOSS OF ENGINE POWER or ENGINE FAILURE IN-FLIGHT 27
3.2 ABNORMAL PROCEDURES 29
3.2.1 LOSS OF GPS/SBAS NAVIGATION DATA 29
3.2.2 GPS APPROACH DOWNGRADE 29
3.2.3 LOSS OF COM RADIO TUNING FUNCTIONS 30
3.2.4 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only) 30
3.2.5 LOSS OF ATC DATA LINK (CPDLC) 31
3.2.6 TAWS CAUTION 31
3.2.7 TAWS INHIBIT 31
3.2.8 GPWS INHIBIT (TAWS-A Only) 32
3.2.9 TER N/A, TER FAIL, TAWS N/A, TAWS FAIL, GPWS N/A, GPWS FAIL 32
3.2.10 DATA SOURCE - HEADING SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE 32
3.2.11 ASR (VOICE COMMAND) SYSTEM FAILURES 33
3.2.12 LOSS OF GTN TOUCH CONTROL 33
3.2.13 DATA SOURCE – PRESSURE ALTITUDE SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE 33
3.2.14 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS 33
3.2.15 IN-AIR RESTART OF GTN 33
3.2.16 BARO-ALT INPUT FAILURE 33
3.2.17 TEMPERATURE INPUT FAILURE 34
3.2.18 SMART GLIDE FAILURE 34
3.2.19 SMART GLIDE INADVERTANT ACTIVATION 34
3.2.20 BLANK SCREEN 34
3.2.21 CARBON MONOXIDE (CO) CAUTION 35
3.3 WARNING MESSAGES 36
3.4 CAUTION MESSAGES 37
3.5 FAILURE MESSAGES 39

3.1 Emergency Procedures

3.1.1 TAWS Alerting

PULL UP			
2 X "Terrain Ahead, Pull Up"	OR	"Terrain, Terrain; Pull Up, Pull Up"	OR
2 X "Obstacle Ahead, Pull Up"	OR	"Obstacle, Obstacle; Pull Up, Pull Up"	OR
2 X "Wire Ahead, Pull Up"	OR	"Wire, Wire; Pull Up, Pull Up"	OR
"[Whoop Whoop]; Pull-Up"			

Red annunciator and aural:
Autopilot..... **DISCONNECT**
Aircraft Controls..... **INITIATE MAXIMUM POWER CLIMB**
Airspeed..... **BEST ANGLE OF CLIMB SPEED**

After Warning Ceases:
Altitude..... **CLIMB AND MAINTAIN SAFE ALTITUDE**
Advise ATC of Altitude Deviation, if appropriate.

NOTE

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

NOTE

Operations in extreme cold temperatures, for example, -30 degrees Celsius, will result in a significant reduction in terrain clearance provided by TAWS alerts.

3.1.2 LOSS OF ENGINE POWER or ENGINE FAILURE IN-FLIGHT

NOTE

This procedure only applies if SMART GLIDE is enabled on the GTN Xi. If it is not, refer to the aircraft POH or AFM for emergency procedures.

If the aircraft cannot maintain altitude:
Smart Glide..... **ACTIVATE IF DESIRED**
If smart glide is activated:
Autopilot..... **AS DESIRED**
Aircraft Emergency Procedures..... **ACCOMPLISH**

NOTE

Some autopilots may be unable to hold best glide speed. Failure to fly at best glide speed may affect glide performance.

Red annunciator and aural "Disconnect Autopilot":

Autopilot ..... **DISENGAGE**

NOTE

When Smart Glide alerts "Maneuver and Land, Disconnect Autopilot" the GTN will no longer provide course guidance to the glide airport.

3.2 Abnormal Procedures

3.2.1 LOSS OF GPS/SBAS NAVIGATION DATA



GPS/SBAS Receiver..... **INOP, NOT AVAILABLE, OR INVALID**

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

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

If No Alternate Navigation Sources Are Available:

DEAD RECKONING (DR) MODE:

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

NOTE

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

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

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

NOTE

All information derived from GPS will be removed.

NOTE

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

3.2.2 GPS APPROACH DOWNGRADE

If GPS Receiver has Reduced Accuracy:

During an LPV, LP +V, LNAV/VNAV, or LNAV +V approach:
Approach .....**DOWNGRADED**
Vertical Deviation Indication.....**REMOVED**
Approach .....**MAY BE CONTINUED WITH LNAV MINIMUMS**

During a VISUAL approach:
Vertical Deviation Indication ..... **REMOVED**

If GPS Receiver has Loss of Accuracy:

During any GPS or VISUAL approach:
CDI Guidance ..... **FLAGGED**
System Message ..... **ABORT APPROACH**
CDI ..... **TERMINAL NAVIGATION MODE LIMITS**

If GPS Receiver Accuracy is Within Terminal Limits:
Missed Approach ..... **EXECUTE USING GPS**

If GPS Receiver Accuracy is Not Restored:
Missed Approach.... **EXECUTE USING ALTERNATE NAVIGATION**

3.2.3 LOSS OF COM RADIO TUNING FUNCTIONS

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

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

NOTE

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

3.2.4 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only)*
Audio Panel Circuit Breaker ..... **PULL**

* Includes GMA 35 and GMA 35c Audio Panels

NOTE

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

3.2.5 LOSS OF ATC DATA LINK (CPDLC)



Communications ..... **USE VOICE**
DATACOMM Breaker ..... **PULL**

3.2.6 TAWS CAUTION

	TERRAIN	OBSTCL	WIRE	GLIDESLOPE	
2 X "Terrain Ahead"		OR	2 X "Caution, Terrain"		OR
2 X "Obstacle Ahead"		OR	2 X "Caution, Obstacle"		OR
2 X "Wire Ahead"		OR	2 X "Caution, Wire"		OR
"Too Low, Terrain"		OR	"Terrain, Terrain"		OR
"Don't Sink"		OR	"Too Low, Gear"		OR
"Too Low, Flaps"					

Pilot Action ..... **INITIATE CLIMB OR TURN OR BOTH**

TERRAIN "Sink Rate"
Vertical Speed ..... **ARREST DESCENT**

GLIDESLOPE "Glideslope"
Pilot Action ..... **RE-INTERCEPT GLIDESLOPE**

NOTE

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

3.2.7 TAWS INHIBIT

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

To Inhibit TAWS:
Home Hard Key ..... **PRESS**
Terrain Button ..... **PRESS**
Menu Button ..... **PRESS**
TAWS Inhibit Button ..... **PRESS TO ACTIVATE**

CAUTION

Inhibiting TAWS function(s) outside those required by limitation in this document is discouraged.

3.2.8 GPWS INHIBIT (TAWS-A Only)

For airplanes equipped with TAWS-A, some GPWS functions may be inhibited to stop alerting if desired. Refer to GTN Xi Series Pilot's Guide for additional information.

To Inhibit GPWS:

Home Hard Key ..... **PRESS**
Terrain Button ..... **PRESS**
Menu Button ..... **PRESS**
GPWS Inhibit Button ..... **PRESS TO ACTIVATE**

CAUTION

Inhibiting GPWS function(s) outside those required by limitation in this document is discouraged.

NOTE

The GPWS INHIBIT feature will not inhibit Altitude Voice Callouts (VCO) or Glideslope Deviation (GSD) alerting.

3.2.9 TER N/A, TER FAIL, TAWS N/A, TAWS FAIL, GPWS N/A, GPWS FAIL

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

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

Autopilot:

Autopilot Roll Steering ..... **UNAVAILABLE**
Autopilot ..... **ACTIVATE HDG MODE FOR HEADING LEGS**

Main Map Page:

Map – Heading Up View ..... **UNAVAILABLE**
TAS/TCAS I or Garmin ADS-B-IN Traffic Data Overlay ..... **UNAVAILABLE**
StormScope® Data Overlay ..... **UNAVAILABLE**
Onboard Weather Radar Data Overlay ..... **UNAVAILABLE**

NOTE

Utilize the dedicated Traffic, StormScope®, and Weather Radar pages when map overlays are unavailable. StormScope® must be operated in accordance with Section 7.26 when no heading is available.

3.2.11 ASR (VOICE COMMAND) SYSTEM FAILURES

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

To Disable ASR:

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

3.2.12 LOSS OF GTN TOUCH CONTROL

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

To Disable ASR:

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

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

If GTN Xi Is Forwarding Pressure Altitude Data to Transponder:

Pressure Altitude Source ..... **INOPERATIVE OR NOT CONNECTED**
Transponder ..... **NO RECEIVED PRESSURE ALTITUDE DATA**

3.2.14 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS

GTN #2 (NAV/GPS 2, COM 2) (if installed) ..... **REMOVE POWER**
Flight Stream 210 (BT LINK) (if installed) ..... **REMOVE POWER**
All Other Non-Essential Flight Equipment ..... **REMOVE POWER**

3.2.15 IN-AIR RESTART OF GTN

Database Update Screen ..... **PRESS CANCEL BUTTON**

3.2.16 BARO-ALT INPUT FAILURE

Enroute Barometric VNAV ..... **UNAVAILABLE**
Altitude Terminated Legs ..... **MANUALLY SEQUENCE**

3.2.17 TEMPERATURE INPUT FAILURE

VNAV Transition Approach ..... **DISREGARD**
Vertical Guidance from Descent VNAV to Approach Guidance..... **VERIFY**
If Autopilot Is in Use:
Intercept Approach Vertical Guidance from Below..... **VERIFY**

3.2.18 SMART GLIDE FAILURE

If AHRS, ADC, Terrain Database, Navigation Database or GPS failure:
Smart Glide ..... **UNAVAILABLE**

If Smart Glide is Active:
System Message..... **SMART GLIDE FAILURE**
Alternate Landing Site ..... **CONSIDER**

3.2.19 SMART GLIDE INADVERTANT ACTIVATION

If Smart Glide activates without pilot action:
Autopilot (GFC 500 or GFC 600 only)..... **DISCONNECT**
Smart Glide ..... **CANCEL**
Smart Glide Activation ..... **DISABLE**
Go to the GTN Emergency Page, press the MENU button and select DISABLE.

If Smart Glide does not disable:
GTN #1 Circuit Breaker..... **PULL**
If GTN#1 is providing audio panel control, the audio panel will revert to reversionary functionality when the GTN power is removed.

Once Smart Glide is disabled:
Autopilot ..... **AS DESIRED**
GTN Flight Plan..... **ACTIVATE DESIRED LEG**
Altitude Preselector (PFD)..... **SET**

3.2.20 BLANK SCREEN

Panel Lighting Dimmer..... **INCREASE BRIGHTNESS**

If the installed equipment in the aircraft includes a GDL 60 Wireless Access unit:
Screen..... **PRESS**
Knobs..... **ROTATE ONE CLICK EACH**
If the display returns:
CNXT and CNXT BATT circuit breakers..... **PULL**

If the display is still blank, consider the GTN and remote transponder and audio panel input inoperative.
If audio panel functions are lost, consider Section 3.2.4.

3.2.21 CARBON MONOXIDE (CO) CAUTION



The carbon monoxide level within the aircraft is unsafe.

Possible Sources of CO.....**OFF**
Cabin Ventilation.....**MAXIMIZE AIRFLOW**
Oxygen Mask (if equipped).....**DON**

3.3 Warning Messages

Alert Type	Alert Annunciation	Aural Message	Pilot Action
FLTA Terrain Warning or Reduced Required Terrain Clearance (RTC) Warning or Imminent Terrain Impact (ITI) Warning	PULL UP	"Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"* or "Terrain, Terrain; Pull Up, Pull Up"	Immediately execute a climb at obstacle clearance speed
FLTA Obstacle Warning or Reduced Required Obstacle Clearance (ROC) Warning or Imminent Obstacle Impact (IOI) Caution	PULL UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"* or "Obstacle, Obstacle; Pull Up, Pull Up"	Immediately execute a climb at obstacle clearance speed
FLTA Wire Warning or Reduced Required Line Clearance (RLC) Warning or Imminent Line Impact (ILI) Warning	PULL UP	"Wire Ahead, Pull Up; Wire Ahead, Pull Up"* or "Wire, Wire; Pull Up, Pull Up"	Immediately execute a climb at obstacle clearance speed
Excessive Descent Rate (EDR) Warning	PULL UP	"[Whoop Whoop]; Pull-Up"	Immediately arrest the descent rate.
Excessive Closure Rate (ECR) Warning	PULL UP	"[Whoop Whoop]; Pull-Up"	Immediately execute a climb at obstacle clearance speed

3.4 Caution Messages

Alert Type	Alert Annunciation	Aural Message	Pilot Action
FLTA Terrain Caution or Reduced Required Terrain Clearance (RTC) Caution or Imminent Terrain Impact (ITI) Caution	TERRAIN	"Terrain Ahead; Terrain Ahead"* or "Caution, Terrain; Caution, Terrain"	Execute a climb at obstacle clearance speed
FLTA Obstacle Caution or Reduced Required Obstacle Clearance (ROC) Caution or Imminent Obstacle Impact (IOI) Caution	OBSTCL	Obstacle Ahead; Obstacle Ahead"* or "Caution, Obstacle; Caution, Obstacle"	Execute a climb at obstacle clearance speed
FLTA Wire Caution or Reduced Required Line Clearance (RLC) Caution or Imminent Line Impact (ILI) Caution	WIRE	"Wire Ahead; Wire Ahead"* or "Caution, Wire; Caution, Wire"	Execute a climb at obstacle clearance speed
Premature Descent Alert (PDA) Caution	TERRAIN	"Too Low, Terrain"	Execute a climb at obstacle clearance speed
Excessive Descent Rate (EDR) Caution	TERRAIN	"Sink Rate"	Arrest the descent rate.
Excessive Closure Rate (ECR) Caution	TERRAIN	"Terrain-Terrain"	Execute a climb at obstacle clearance speed
Negative Climb Rate (NCR) Caution	TERRAIN	"Don't Sink" or "Too Low Terrain"	Execute a climb at obstacle clearance speed

Alert Type	Alert Annunciation	Aural Message	Pilot Action
Flight Into Terrain (FIT) Caution	TERRAIN	"Too Low Terrain" or "Too Low – Gear" or "Too Low – Flaps"	Execute a climb at obstacle clearance speed
Glide Slope Deviation (GSD) Caution	GLIDESLOPE	"Glideslope"	Climb to re-intercept glideslope, or execute missed approach.
Traffic Caution	TRAFFIC	"Traffic"	Visually acquire the traffic to see and avoid.
Carbon Monoxide Caution	CO LEVEL	"Carbon Monoxide"	Turn off possible sources of CO, increase cabin ventilation, don oxygen mask if equipped.

** Alerts with multiple messages are configurable at installation and are installation dependent. Alerts for the default configuration are indicated with asterisks.*

NOTE

The GTN Xi TAWS-A system does not differentiate between a Glideslope associated with a ILS approach or a Glidepath associated with a GPS approach. Both types of approach vertical guidance are referred to as Glideslope for TAWS-A annunciations and aural alerts.

3.5 Failure Messages

Failure Message	Alert Location	Cause	Pilot Action
"No GPS Position"	Displayed on all pages with a moving map	Loss of GPS position	Use other sources of navigation
Dead Reckoning	Displayed on all pages with a moving map	Loss of GPS position	Use other sources of navigation
LOI	Status Bar	Loss of GPS position	Use other sources of navigation
Red "X"	Over affected equipment interface	Loss of data from equipment	Use inoperative equipment procedures
TAWS N/A TAWS FAIL GPWS N/A GPWS FAIL TER N/A TER FAIL	Status Bar	Loss of GPS Position Or Terrain Database Error	Use vigilance, Terrain Alerts no longer provided.

4 NORMAL PROCEDURES

4.1 UNIT POWER ON 41
4.2 BEFORE TAKEOFF 41
4.3 HSI AND EHSI OPERATION 41
4.4 AUTOPILOT OPERATION 42
4.5 COUPLING THE AUTOPILOT DURING APPROACHES 42
4.6 COUPLING THE AUTOPILOT FOR DESCENT VNAV 44
4.7 COUPLING THE AUTOPILOT DURING SEARCH AND RESCUE OPERATIONS 44
4.8 COLD WEATHER COMPENSATION 44
4.9 TAWS-A FLAP INHIBIT 45
4.10 TAWS-A GLIDESLOPE INHIBIT 45
4.11 ATC DATA LINK (CPDLC) LOG-ON 45
4.12 ATC DATA LINK RESPONDING TO MESSAGES 45
4.13 GCO INHIBIT 45

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

4.1 Unit Power On

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

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

4.2 Before Takeoff

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

4.3 HSI and EHSI Operation

HSI:
- Course Pointer ..... **SET**

EHSI GPS Navigation:
- Course Pointer ..... **AUTOSLEW VERIFY**

EHSI VLOC Navigation:
- Course Pointer ..... **SET**

For detailed information about the functionality of the EHSI system, refer to the FAA approved Flight Manual or Flight Manual Supplement for that system.

CAUTION

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

4.4 Autopilot Operation

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

Autopilot NAV Mode Coupling:

CDI ..... **SELECT SOURCE**
Autopilot ..... **NAV / APR SELECT**

Autopilot GPSS or GPS Roll Steering:

CDI ..... **SELECT GPS**
Flight Plan ..... **Activate**
Autopilot ..... **NAV / APR SELECT**

Supported autopilots for GPSS or GPS Roll Steering:

- Garmin
  - GFC 500
  - GFC 600
- Bendix
  - KFC 225
  - KFC 275
  - KFC 325
- S-TEC
  - System 55X

CAUTION

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

4.5 Coupling the Autopilot During Approaches

CAUTION

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

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

To couple an approach using manual APR outputs:

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

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

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

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

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

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

Supported autopilots for Approach Coupling:

- Garmin
  - GFC 500
  - GFC 600
- Bendix
  - M4C
  - M4D
- Century
  - III
  - IV
  - 31/41
  - 2000
  - Triden
- Cessna
  - 300B / 400B / 800B
  - 300 / 400 / 800 IFCS
  - 1000 IFCS
- Collins
  - APC 65 (A / B / C / E / F / G / H / J)
  - FGC-65 / FYD-65
  - APC 65A / 65G
- Honeywell
  - KAP 140
  - KAP150
  - KFC 150
  - KFC 200
  - KFC 225
  - KFC 300
  - KFC 250
  - KFC 275
  - KFC 325
- Sperry
  - SPZ-200A / 500
- S-TEC
  - 55
  - 55X
  - 60 PSS
  - 60-2 / 65

4.6 Coupling the Autopilot for Descent VNAV

Vertical Navigation Setup:

VNAV Altitude Profile ..... **LOAD INTO FLIGHT PLAN**
Flight Plan ..... **ACTIVATE LEG**
Flight Plan → Menu → VNAV:
VNAV Enabled ..... **ACTIVATE**
VS Target or Flight Path Angle ..... **SET DESIRED**
PFD Altitude Preselect ..... **SET TO ATC CLEARED ALTITUDE**
GFC 500:
VNAV Key ..... **PRESS**
GFC 600:
VNV Key ..... **PRESS**

4.7 Coupling the Autopilot during Search and Rescue Operations

Flight Plan SAR Pattern ..... **ACTIVATE**
CDI ..... **GPS**
Autopilot NAV Mode ..... **ACTIVATE**

4.8 Cold Weather Compensation

The GTN Xi can compute altitudes for cold weather compensation for applicable IFR approaches. Approach altitudes provided on the map and flight plan are adjusted based on the pilot entered temperature and the altitudes on the flight plan page are appended with a snowflake icon.

Flight Plan Menu → TEMP COMP:
Temp at Dest ..... **ENTER DEST TEMP**
Flight Plan ..... **LOAD or ACTIVATE APPROACH**
Flight Plan Menu → TEMP COMP:
Temperature Compensation ..... **ACTIVATE**
Destination / FAF / FAF ALT ..... **VERIFY**

NOTE

Pilots must coordinate with ATC when flying temperature compensated procedures. If equipped with a TXi PFD, ensure the TXi "TEMP COMP" minimums are selected.

4.9 TAWS-A Flap Inhibit

For TAWS-A installations and intentional landings with flaps not in landing position, the flight crew must use the flap override function.

Terrain → Menu:

Flap Override ..... **ACTIVATE**

4.10 TAWS-A Glideslope Inhibit

Terrain → Menu:

G/S Inhibit ..... **ACTIVATE**

NOTE

The GTN Xi TAWS-A system does not differentiate between a Glideslope associated with an ILS approach or a Glidepath associated with a GPS approach. Both types of approach vertical guidance are referred to as Glideslope for TAWS-A annunciations and aural alerts.

4.11 ATC Data Link (CPDLC) Log-On

IFR Flight Plan ..... **FILE**
Flight Plan ..... **MATCH FILED ROUTE**
Transponder ..... **MATCH FILED FLIGHT ID**
ATC Datalink Page:
- Flight ID ..... **MATCH FILED FLIGHT ID**
- Facility ..... **KUSA**
- Logon Button ..... **PRESS**

CAUTION

Establishing a CPDLC session with ATC can take a few minutes. Do not cycle the Logon/Logoff button.

4.12 ATC Data Link Responding to Messages

ATC Datalink Page:

New Message ..... **OPEN**
If an importable route is included:
- Proposed Route ..... **PREVIEW**

Response ..... **SELECT**
Send Button ..... **PRESS**

NOTE

A pilot response is expected within 60 seconds. If more time is needed, send STANDBY before the final response.

4.13 GCO Inhibit

Utilities → CO Monitor:

Inhibit CO Alerts ..... **ACTIVATE**

5 PERFORMANCE

No change.

6 WEIGHT AND BALANCE

See current weight and balance data.

7 SYSTEM DESCRIPTIONS

7.1 Pilot's Guide

The Garmin GTN Xi Series Pilot's Guide, part number and revision listed below, contain additional information regarding GTN system description, control, and function.

- GTN Xi Series Pilot's Guide P/N 190-02327-03 Rev G or later

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

7.2 Navigation

The following section describes some of the GTN navigation functionality and provides details on the expected use and limits of the features.

7.2.1 Flight Plan Leg Sequencing

If a barometric corrected altitude source is not interfaced to the GTN Xi, a popup will appear prompting the flight crew to manually sequence the leg once the altitude prescribed in the procedure is reached.

7.2.2 Auto ILS CDI Capture

Auto ILS CDI Capture can automatically switch the CDI from GPS to VLOC before the Final Approach fix. This feature is only available on installations that meet any of the following conditions:

- Equipped with GFC 500 or 600
- GTN CDI key enabled

On these installations the auto-switching will only occur if the following conditions are met:

- ILS Autoswitch setting enabled on GTN
- ILS/LOC approach loaded and activated
- Correct nav frequency tuned on GTN NAV radio
- Aircraft established on the final approach course

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

7.2.3 User Defined Waypoints

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

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

7.2.4 Direct-To Operations

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

7.2.5 Holding Patterns

The GTN can provide holding guidance for user holds or procedure-based holds. For each hold there are two associated waypoints. If there is more than one published altitude for an approach hold, there will be three waypoints associated with the hold. The pilot can edit or activate the hold as needed for user holds. Holds on the initial, intermediate, or final approach cannot be edited except for the hold altitude constraints. Missed approach holds can be edited.

NOTE

If the aircraft position is outside of the depicted GTN hold, the system may not allow lateral NAV captures with certain autopilots. In this case, the pilot should fly the hold manually or with the HDG mode of the autopilot until they are inside the depicted holding pattern in which case normal NAV captures should be available.

NOTE

If the GTN is in the missed approach segment (including the hold), the pilot can change, remove, or replace the approach procedure and the original missed approach will remain the active navigation. If the GTN active navigation is a missed approach segment and the flight plan is deleted, the missed approach will also be removed, removing active navigation. If a new approach is loaded while on a missed approach segment, reverify the missed approach altitude constraints.

7.2.6 Descent BARO VNAV

The GTN can provide multi-waypoint descent baro-VNAV guidance for the enroute and initial approach phases of flight. The GTN Xi outputs VNAV deviations to properly configured Garmin G500/600 GDU, G500/600/700TXi GDU, GI275, or G5 displays. To provide autopilot coupling to the baro VNAV guidance, the interface must also include either a Garmin GFC500 or GFC600 with VNAV capability. If VNAV is enabled on the GTN Xi in these installations, VNAV guidance may be coupled to the autopilot using the VNAV function of the GFC.

Turbojet altitudes associated with instrument procedures are retrieved from the navigation database when the procedure is added to the flight plan. Altitudes in cyan on the GTN Xi are valid VNAV guidance waypoints and the GTN Xi will provide vertical guidance based on the displayed altitude constraints and default flight path angle (FPA). Altitudes in magenta on the GTN Xi are active VNAV guidance waypoints. Altitudes colored white are advisory only (unpublished/interpolated) or published and not used in VNAV calculations.

The following are recommendations for using descent VNAV:

- The pilot should verify all altitudes for procedures after loading the procedure into the flight plan.
- When the GTN Xi is installed with multiple TXi PFDs, it is highly recommended that GDU BARO SYNC be enabled and used during all VNAV operations.

For aircraft with multiple GDUs (TXi software v3.61 or later), a GFC 600, and the Selected Side function enabled, VNAV will use the barometer setting for the selected GDU. For aircraft with multiple GDUs (without Selected Side enabled) and two GTNs, VNAV will use the barometer setting from the pilot's side GDU for both GTNs. In the event the pilot's side GDU has failed, the GTNs will use the co-pilot's GDU barometer setting.

Descent VNAV is limited to flight path angles (FPA) between -1° and -5°, and a vertical speed required (VSR) descending at less than 4000 fpm. If a flight plan change is made during a VNAV descent, VNAV will be recalculated and could result in active VNAV path changes. If the current VNAV FPA is less than -1°, a new VNAV path may be computed during a flight plan change and result in a new Top of Descent point. This can also occur during VNAV Direct-To operations.

VNAV constraints are not allowed inside the FAF. VNAV altitudes are not saved in the flight plan catalog.

When VNAV is disabled by the pilot, it will be automatically re-enabled when the pilot initiates a lateral Direct-To to a waypoint.

7.2.7 Along Track Waypoints

The GTN Xi allows for the creation of flight plan waypoints that are based off an offset distance from a waypoint in the flight and places the new along track waypoint (ATK) in the flight plan. Once placed in the flight plan, the pilot may navigate using that waypoint in the same manner as other flight plan waypoints.

Along track waypoints cannot be created on a Vectors to Final (VTF) approach and are limited to the lateral constraints of the flight plan. This means that the pilot cannot place an ATK before the first waypoint of a flight plan or after the last waypoint of a flight plan.

ATKs are fixed once placed and will not move if the referenced waypoint is changed or removed from the flight plan. ATKs are not saved in the flight plan catalog. ATKs cannot reference another ATK in the flight plan.

7.2.8 Advisory Visual Approaches

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

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

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

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

7.2.9 GPS Approach Downgrade

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

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

7.2.10 Loss of GPS/SBAS Navigation Data

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

If the LOI annunciation is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight. If GPS position is lost, the GTN may display DR depending on flight plan and phase of flight conditions.

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

7.3 Terrain Proximity, Terrain Alerting, and TAWS

CAUTION

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

NOTE

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

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

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

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

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

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

The Garmin GTN Xi Series Pilot's Guide provides additional information regarding terrain and obstacle colors and grouped obstacle icons.

In installations of more than one GTN Xi with TAWS-B or TAWS-A, TAWS should be enabled on both GTN Xi units. If both GTN Xi units are configured for TAWS-B, then failure of a single GTN results in TAWS-B still being available within the cockpit from the other GTN. If TAWS-A is configured and installed for both GTN Xi units, loss of one GTN Xi will result in TAWS-A still being available from the second GTN Xi unit. If TAWS-A is configured on both GTN Xi units, but only installed to one unit, then failure of the TAWS-A unit will result in a downgrade to TAWS-B from the second GTN Xi.

7.3.1 TAWS-A

TAWS-A can be broken down into two types of alerting categories, FLTA and GPWS alerts. The GTN Xi TAWS-A system provides the following functionality:

a) Forward Looking Terrain Avoidance (FLTA)
    a. Required Terrain Clearance (RTC) / Required Obstacle Clearance (ROC) / Required Line Clearance (RLC)
    b. Imminent Terrain Impact (ITI) / Imminent Obstacle Impact (IOI) / Imminent Line Impact (ILI)

b) Premature Descent Alert (PDA)

c) GPWS Mode 1 – Excessive Descent Rate (EDR)

d) GPWS Mode 2 – Excessive Closure Rate (ECR)

e) GPWS Mode 3 – Negative Climb Rate (NCR)

f) GPWS Mode 4 – Flight Into Terrain (FIT)

g) GPWS Mode 5 – Glide Slope Deviation (GSD)

h) GPWS Mode 6 – Voice Call Out (VCO)
i) GPWS Inhibit
j) Glideslope Inhibit
k) Flap Override

TAWS-A installations will provide glideslope warnings for ILS, LPV, or LNAV/VNAV approaches. The GTN Xi TAWS-A system does not differentiate between a Glideslope associated with an ILS approach or a Glidepath associated with a GPS approach. Both types of approach vertical guidance are referred to as Glideslope for TAWS-A annunciations and aural alerts.

With TAWS-A, Voice Callouts are available from 500 ft down through 10 ft. Individual callouts may be turned on and off in the Terrain page menu, under Voice Callouts.

ALERT TYPE	ALERT SEVERITY	AURAL ALERT (TEXT MESSAGE SIMILAR)
RTC Reduced Required Terrain Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" (Optional)
	Warning	"Terrain, Terrain; Pull-Up, Pull-Up" or "Terrain Ahead, Pull-Up; Terrain Ahead, Pull-Up" (Optional)
ITI Imminent Terrain Impact (FLTA Alert) (TAWS)	Caution	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" (Optional)
	Warning	"Terrain, Terrain; Pull-Up, Pull-Up" or "Terrain Ahead, Pull-Up; Terrain Ahead, Pull-Up" (Optional)
ROC Reduced Required Obstacle Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" (Optional)
	Warning	"Obstacle, Obstacle; Pull-Up, Pull-Up" or "Obstacle Ahead, Pull-Up; Obstacle Ahead, Pull-Up" (Optional)

ALERT TYPE	ALERT SEVERITY	AURAL ALERT (TEXT MESSAGE SIMILAR)
IOI Imminent Obstacle Impact (FLTA Alert) (TAWS)	Caution	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead, Obstacle Ahead" (Optional)
	Warning	"Obstacle, Obstacle; Pull-Up, Pull-Up" or "Obstacle Ahead, Pull-Up; Obstacle Ahead, Pull-Up" (Optional)
RLC Reduced Required Line Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Wire; Caution, Wire" or "Wire Ahead, Wire Ahead" (Optional)
	Warning	"Wire, Wire; Pull-Up, Pull-Up" or "Wire Ahead, Pull-Up; Wire Ahead, Pull-Up" (Optional)
ILI Imminent Line Impact (FLTA Alert) (TAWS)	Caution	"Caution, Wire; Caution, Wire" or "Wire Ahead; Wire Ahead" (Optional)
	Warning	"Wire, Wire; Pull-Up, Pull-Up" or "Wire Ahead, Pull-Up; Wire Ahead, Pull-Up" (Optional)
PDA Premature Descent Alert (TAWS)	Caution	"Too Low Terrain"
	Warning	N/A
EDR Excessive Descent Rate (GPWS Alert)	Caution	"Sink Rate"
	Warning	"[Whoop Whoop], Pull-Up"
ECR (GPWS Alert)	Caution	"Terrain-Terrain"
	Warning	"[Whoop Whoop], Pull-Up"
NCR Negative Climb Rate (GPWS Alert)	Caution	"Don't Sink" or "Too Low Terrain"
	Warning	N/A
FIT (GPWS Alert)	Caution	"Too Low Terrain" Or "Too Low – Gear" Or "Too Low – Flaps"
	Warning	N/A
GSD (GPWS Alert)	Caution	"Glideslope"
	Warning	N/A

ALERT TYPE	ALERT SEVERITY	AURAL ALERT (TEXT MESSAGE SIMILAR)
500' 500' Voice Call Out (GPWS Alert)	Advisory	"Five Hundred"
400' 400' Voice Call Out (GPWS Alert)	Advisory	"Four Hundred"
300' 300' Voice Call Out (GPWS Alert)	Advisory	"Three Hundred"
200' 200' Voice Call Out (GPWS Alert)	Advisory	"Two Hundred"
100' 100' Voice Call Out (GPWS Alert)	Advisory	"One Hundred"
50' 50' Voice Fall Out (GPWS Alert)	Advisory	"Fifty"
40' 40' Voice Fall Out (GPWS Alert)	Advisory	"Forty"
30' 30' Voice Fall Out (GPWS Alert)	Advisory	"Thirty"
20' 20' Voice Fall Out (GPWS Alert)	Advisory	"Twenty"
10' 10' Voice Fall Out (GPWS Alert)	Advisory	"Ten"

Table 7-1: TAWS-A Alerts

7.3.2 TAWS-B

The GTN Xi TAWS-B system provides the following functionality:

a) Forward Looking Terrain Avoidance (FLTA)
   a. Required Terrain Clearance (RTC) / Required Obstacle Clearance (ROC)
   b. Imminent Terrain Impact (ITI) / Imminent Obstacle Impact (IOI)

b) Premature Descent Alert (PDA)

c) GPWS Mode 1 – Excessive Descent Rate (EDR)

d) GPWS Mode 3 – Negative Climb Rate (NCR)

ALERT TYPE	ALERT SEVERITY	AURAL ALERT (TEXT MESSAGE SIMILAR)
RTC Reduced Required Terrain Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" (Optional)
	Warning	"Terrain, Terrain; Pull-Up, Pull-Up" or "Terrain Ahead, Pull-Up; Terrain Ahead, Pull-Up" (Optional)
ITI Imminent Terrain Impact (FLTA Alert) (TAWS)	Caution	"Caution, Terrain; Caution, Terrain" or "Terrain Ahead; Terrain Ahead" (Optional)
	Warning	"Terrain, Terrain; Pull-Up, Pull-Up" or "Terrain Ahead, Pull-Up; Terrain Ahead, Pull-Up" (Optional)
ROC Reduced Required Obstacle Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" (Optional)
	Warning	"Obstacle, Obstacle; Pull-Up, Pull-Up" or "Obstacle Ahead, Pull-Up; Obstacle Ahead, Pull-Up" (Optional)
IOI Imminent Obstacle Impact (FLTA Alert) (TAWS)	Caution	"Caution, Obstacle; Caution, Obstacle" or "Obstacle Ahead; Obstacle Ahead" (Optional)
	Warning	"Obstacle, Obstacle; Pull-Up, Pull-Up" or "Obstacle Ahead, Pull-Up; Obstacle Ahead, Pull-Up" (Optional)
RLC Reduced Required Line Clearance (FLTA Alert) (TAWS)	Caution	"Caution, Wire; Caution, Wire" or "Wire Ahead; Wire Ahead" (Optional)
	Warning	"Wire, Wire; Pull-Up, Pull-Up" or "Wire Ahead, Pull-Up; Wire Ahead, Pull-Up" (Optional)

ALERT TYPE	ALERT SEVERITY	AURAL ALERT (TEXT MESSAGE SIMILAR)
ILI Imminent Line Impact (FLTA Alert) (TAWS)	Caution	"Caution, Wire; Caution, Wire" or "Wire Ahead; Wire Ahead" (Optional)
	Warning	"Wire, Wire; Pull-Up, Pull-Up" or "Wire Ahead, Pull-Up; Wire Ahead, Pull-Up" (Optional)
PDA Premature Descent Alert (TAWS)	Caution	"Too Low Terrain"
	Warning	N/A
EDR Excessive Descent Rate (GPWS Alert)	Caution	"Sink Rate"
	Warning	"[Whoop Whoop], Pull-Up"
NCR Negative Climb Rate (GPWS Alert)	Caution	"Don't Sink" or "Too Low Terrain"
	Warning	N/A
500' 500' Voice Call Out (GPWS Alert)	Advisory	"Five Hundred"

Table 7-2: TAWS-B Alerts

7.4 GMA 35/35c Audio Panel (Optional)

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

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

7.5 StormScope® (Optional)

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

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

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

7.6 External Switches

External switches may be installed and interfaced to the GTN Xi. These switches may be stand alone or integrated with a TAWS or GPS annunciator. Table 7-3 lists the switches and function they perform:

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

Switch Label	Function
CPDLC	Provides visual annunciations for CPDLC and opens the ATC Datalink page on the GTN Xi it's connected to when pressed.

Table 7-3 – External Switches

7.7 Airspace Depiction and Alerts

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

NOTE

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

7.8 Garmin ADS-B Traffic System Interface (Optional)

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

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

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

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

Relative motion vectors are always colored green and depict the motion of the traffic target relative to your ownship symbol. The direction the traffic target is

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

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

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

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

7.9 GWX 70/75 Weather Radar (Optional)

The GWX 70/75 Weather Radar uses Doppler technology to optionally provide advanced features to the flight crew such as turbulence detection and ground clutter suppression. Turbulence detection can detect turbulence up to 40nm from the aircraft and will be displayed at radar ranges of 160nm or less.

NOTE

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

7.10 GWX 8000 Weather Radar (Optional)

The GWX 8000 Weather Radar contains the same features as the GWX 70/75, as well as supports predictive lightning and hail detection. Predictive lightning and hail are available out to 100 nm.

The GWX 8000 also contains an Auto mode. Auto mode is a volumetric scanning mode that will process several radar sweeps internally of varying tilts to analyze and compile the data to build a 3D model of the precipitation. The model then displays the system on the radar display as a 2D image. This removes the pilot UI for tilt, bearing, and radar gain.

7.11 Charts (Optional)

The GTN 750Xi/725Xi can display both procedure charts and weather data on the main map page at the same time. When datalink NEXRAD or Precipitation is overlaid on the main map page, the weather data is displayed *below* an overlaid procedure chart. When airborne weather radar is overlaid on the main map page, the radar data is displayed *above* an overlaid procedure chart. SafeTaxi and ChartView functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD).

7.12 Transponder Control (Optional)

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

7.13 Telephone Audio (Optional)

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

7.14 Terrain, Wires, and Obstacles

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

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

7.14.1 Dedicated Terrain Page

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

NOTE

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



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

7.14.2 Map Page

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

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

NOTE

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

NOTE

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



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

7.15 Map Page

7.15.1 Configuration

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

7.15.2 Flight Plan Depiction

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

7.15.3 Fuel Range Ring

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

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

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

7.16 Times and Distances

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

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

7.17 GTN Xi-GTN (Xi) Crossfill

Specific data will sync between GTNs when installed in a dual GTN configuration. If data is not included in this list, it is not crossfilled. The following data will crossfill between the two GTNs with CROSSFILL ON or OFF:

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

The following unit changes will crossfill:

- Temperature
- NAV Angle
- Fuel

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

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

When the GTN is interfaced with other non-GTN Xi Garmin navigators, there will likely be minor discrepancies in the flight plan, course depictions, and turn annunciations based on the differences in the two navigators, even when crossfill is enabled. In such cases it is advisable to utilize the GTN Xi navigator as the primary navigator and if the discrepancy is such that the pilot workload is affected, crossfill should be turned off, and the flight plan on the non-GTN Xi navigator removed.

7.18 Automatic Speech Recognition (ASR)

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

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

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

Audio Panel commands are available to switch audio sources.

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

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

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

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

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

Prior to using ASR, the pilot must complete the ASR Qualification Procedure from the GTN Xi Series Pilot's Guide.

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

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

7.19 European Visual Reporting Points

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

7.20 Screenshots

The GTN Xi can save screenshots to the removable SD card. To take a screenshot, press and hold the dual concentric knob while pressing the home key. A small camera icon will briefly appear in the bottom right corner of the screen indicating that the screenshot was successful.

7.21 Knob Page Navigation

Knob page navigation is a feature which allows quick navigation to select pages using the dual concentric knob. This feature is similar to the page navigation on Garmin G500/G600 TXi displays. Pages shown in the knob control menu can be customized from the "Page Shortcuts" menu found on the System page. Switching between Knob Control and radio tuning is accomplished by pressing the dual concentric knob.

The default knob behavior can be changed from Page Navigation to COM Radio based on pilot preference. Navigate to the System > Setup > COM/NAV menu and change the "Knob Control Default" setting as desired. After 30 seconds of inactivity, the knob function will return to the selected default behavior.

7.22 Remote Radio Control (Optional)

Remote radio control is a feature which allows each GTN in a dual-GTN installation to control all GTN communication and navigation radios. The feature adds a radios page which can be accessed via a user field or via the menu bar when a radio frequency keyboard is selected. If the user selects "Local and Remote" for Knob Control Radios in the System > Setup > COM/NAV menu, all radios can be accessed by pressing the dual concentric knob.

The pilot can send frequencies from Airport and waypoint information pages directly to either the communication or navigation radios.

7.23 Emergency Page (Optional)

The GTN Xi has an emergency page that will only appear if Smart Glide is enabled for the installation or when interfaced with a G500TXi or G600TXi with an emergency page. The emergency page allows emergency modes to be activated from the GTN Xi. Current supported emergency functions are Smart Glide and Emergency Descent Mode.

7.24 Smart Glide (Optional)

Smart Glide is an emergency assistance feature that quickly configures Garmin avionics to assist during an emergency loss of power with a single pilot action.

Overview

The purpose of Smart Glide is to reduce the workload and increase the situational awareness of a pilot during an emergency. The GTN Xi does this by constantly computing the aircraft glide range and best glide airport in the background.

When activated, the system will provide the following functionality:

Aircraft Equipment	Suitable Airport in Glide Range	No Glide Airport
GTN Xi	Provide navigation guidance and information to the nearest suitable airport within the glide range. Declutter the map display. Provide aural alerts upon activation, the airport distance and clock direction. Switch the CDI to GPS for navigator #1. Tune the airport CTAF or TOWER frequency in the standby for COM #1. (if equipped) CDI scale is set to 0.3NM.	Declutter the map display. Provide aural alerts indicating there are no glide airports within range. Tune the emergency frequency 121.5 in the standby for COM #1. (if equipped)
G500/600 TXi - or - GI 275	Annunciate "GLIDE" Altitude preselector is cleared.	Annunciate "GLIDE" Altitude preselector is cleared.
G3X	Annunciate "GLIDE"	Annunciate "GLIDE"

Aircraft Equipment	Suitable Airport in Glide Range	No Glide Airport
	CDI switches to GPS 1	CDI switches to GPS 1
G5	CDI switches to GPS 1	CDI switches to GPS 1
(optional) GFC 500 - or - GFC 600	IAS to greater of published best glide speed or minimum engagement speed GPS lateral mode. Selected altitude capture is disabled If the aircraft is >2NM from the glide airport and autopilot is not engaged an aural alert will announce "Engaging Autopilot" and the AP will engage.	IAS to greater of published best glide speed or minimum engagement speed ROL lateral mode with level attitude reference. Selected altitude capture is disabled If the autopilot is not engaged an aural alert will announce "Engaging Autopilot" and the AP will engage.

Table 7-4: Smart Glide Functional Description

Smart Glide Usage

Smart Glide is intended to be used both in emergency situations and during training. To get the most out of Smart Glide, it is recommended to practice for an emergency using Smart Glide so that the pilot can understand the benefits and limitations of the system prior to an actual emergency.

It is important to remember that Smart Glide is just a tool and the pilot in command is the final authority with respect to the safety of the flight. Therefore, it is the pilot in command's responsibility to decide whether Smart Glide should be used in a given emergency and to deviate from the route suggested by Smart Glide if a better landing area is available.

Smart Glide is designed to be most helpful at altitudes where the pilot has enough time to complete an emergency checklist before landing. Smart Glide is not suggested for use during takeoff or landing phases of flight or for use in the traffic pattern. Smart Glide is disabled on the ground and after takeoff until the aircraft reaches 1000ft AGL.

If at any time the "Maneuver and Land" aural and visual annunciation is presented, the pilot should truncate the emergency procedures and focus on making a safe landing.

If at any time the "Airport out of range" aural and visual annunciation is presented, the pilot should determine the best course of action, whether to divert to an alternate landing field or continue to the suggested glide airport.

Alternate Airport Selection

Alternate glide destination selection for Smart Glide may be done by selecting an airport on the map page and pressing the "Glide to Airport" button. A secondary method is to use the "Alternate Airport" button on the Emergency Glide page. This page displays available airports in a list. The maximum number of glide airports supported is 25. Airports ranked lower than the top 25 will not be available until the number of airports in the glide ring is reduced. Activating any other form of navigation will cause smart glide to cancel. If activating a direct-to, smart glide will automatically cancel and the direct-to will be active. Activating any procedure including a visual approach will prompt the user to cancel smart glide before proceeding.

Smart Glide Activation/Deactivation

The system can be activated by a discrete momentary switch if equipped or by a two-second press of the Direct-To button. These methods of activation are mutually exclusive. The Direct-To press and hold is disabled when a discrete activation switch is installed. All aircraft have a secondary method to activate Smart Glide via a button on the GTN Xi emergency page.

The GTN Xi indicates that smart glide is active by the appearance of the Yellow GLIDE button in the menu bar and by the Smart Glide status bar when viewing the emergency page.

When deactivated, the system will return back to normal operational modes including the flight plan that was in the GTN Xi prior to Smart Glide activation. The pilot will need to verify the active flight plan leg and set autopilot modes, airspeed bug, and altitude pre-selector as desired.

In certain situations, crossfill may be turned on or off when Smart Glide is activated. Verify the crossfill status is set as desired after the system is deactivated.

In aircraft equipped with a Garmin GFC autopilot, autopilot and flight director modes including airspeed references may be changed when activating and cancelling smart glide. Always verify the autopilot modes are set as desired after smart glide is cancelled. In certain situations when Smart Glide is cancelled, re-loading of the previous flight plan may cause the active navigation to change abruptly and in some situations the autopilot may begin following this new navigation immediately.

Map Page

The Glide Range Ring and Best Glide Airport Indicator are overlays on the map page. The Glide Range Ring and Best Glide Airport Indicator can be enabled and disabled individually in normal mode.

The Glide Range Ring provides the pilot with an estimated glide range in the event of a loss of engine power. The Glide Range Ring accounts for terrain, obstacles, and winds if wind data is available. If no wind data is available, the pilot will be notified when the glide range ring is displayed. In some cases, glide range ring may rely on datalink wind data which may not reflect current wind conditions.

Glide Range Ring

In normal operation the Glide Range Ring is displayed in cyan. This indicates that the displayed glide range is based on the published glide ratio for the aircraft. See the POH or AFM for the aircraft configuration and conditions required to achieve this range. In normal operation, the Glide Range Ring and Best Glide Indicator update at approximately 5 second intervals. Because of these limitations, the Glide Range Ring is only an estimate and should only be used for situational awareness.

When Smart Glide is active, the cyan Glide Range Ring is replaced with a yellow Smart Glide Range Ring. This range ring does not use a fixed value for glide ratio but instead updates approximately once per second using real-time glide performance. This range ring also accounts for terrain, obstacles, and wind just like the normal range ring. This ring will dynamically change size to reflect changes in glide performance that occur for any reason. The ring is most accurate when the glide is stabilized. Changes in glide ratio due to changes in aircraft configuration, changes in engine power, or un-accounted for changes in wind can cause the glide range ring to change size more rapidly. Because of these limitations, the Smart Glide Range Ring is only an estimate and should only be used for situational awareness.

Arrival AGL

The arrival AGL flag is automatically displayed when Smart Glide is active. This value is calculated based on the Smart Glide Range Ring data and the direct-to course to the glide airport. If the aircraft is further than 2NM from the glide airport the course and arrival AGL will automatically be recalculated when the CDI reaches ½ scale deflection. If the aircraft is within 2NM of the glide airport, the arrival AGL flag will be removed when the aircraft leaves the direct-to course for landing and the course will not be recalculated. The arrival AGL is updated approximately once per second and has the same limitations as the Smart Glide Range Ring on which the data is based.

Best Glide Airport Indicator

The Best Glide Airport Indicator is depicted as cyan chevrons on the map page which point the pilot toward the "best" airport to glide to in the event of loss of engine power. When the best glide airport indicator is enabled, it will be shown if there are any airports within the glide range ring that meet the configured criteria. If there are no airports that meet the criteria, the indicator will not be displayed even when it is enabled. The "best" glide airport is selected based on runway surface type, distance from present position, runway length, and weather

if weather data is available. Additionally, public airports are prioritized over private airports. Because of this fixed determination and the limited information available to the avionics, the best glide airport is a suggestion, and the pilot is responsible for choosing the most favorable landing site in the event of an emergency.

When Smart Glide is activated, the system will use the same logic as the best glide airport indicator to pick a glide destination. The system may choose a different airport when activated if the solution has changed since the best glide indicator was last updated. However, once the glide destination is selected, it will not change while smart glide is active unless modified by the pilot.

Emergency Glide Page

The emergency page on the GTN Xi, G500/600 TXi, and G3X automatically becomes the emergency glide page when Smart Glide is active. This page can be accessed quickly while Smart Glide is active by pressing the yellow GLIDE icon in the menu bar. This page displays information about Smart Glide status, pertinent airport information, and shortcut buttons for common actions during glide. A map shortcut button is always displayed on the emergency glide page. A Squawk 7700 button will be displayed on the controlling unit if a transponder is being controlled by the GTN or G3X.

Nearest Airport Page

The Nearest Airport Page indicates which airports are within the glide range ring by displaying the word "Glide" with a green checkmark.

The GTN Xi uses data about the airport and installer configured data to determine the best suitable glide airport. The airports within the glide range that are of the surface type designated by the installer will be ranked according to:

1. Weather Category (LIFR, IFR, MVFR, VFR) if available.
2. Distance from the aircraft.
3. Runway length.
4. Public vs Private (Public is preferred)

The highest ranked airport will be selected as the glide destination. If no public airports meet the requirements for desired runway length and weather, airports with shorter runway lengths, airports with IFR/LIFR weather, airports with winds above the max desired gust speed, and private airports may be selected. If no airports within the glide range meet the surface type criteria, the system will advise that there are no airports within glide range.

Glide Prediction

When active, the system will continuously monitor the aircraft glide performance and adjust the yellow Smart Glide Range Ring as necessary. If the currently selected airport falls out of glide range as measured by the system, the system will alert the pilot with visual and aural alerts. The pilot has the option to choose an alternate glide airport from the map or the "Alternate

Airport" button on the Emergency Glide page of the GTN Xi. Only airports that are eligible to be glide airports can be selected. Sudden changes in aircraft performance while the system is active will cause a degradation in the accuracy of the glide range estimation.

System Requirements

Smart Glide requires the following to function:

- Valid GPS position fix
- Valid data from a compatible Garmin PFD
- Terrain and Navigation database installed on GTN Xi

Visual/Aural Alerts

The following describes how the system functions as the aircraft approaches the glide airport or off-airport landing areas.

With a Glide Airport Selected

4NM from the Glide Airport

An "Approaching Airport" aural and visual alert is generated.

2NM from the Glide Airport

A "Maneuver and Land" aural and visual alert is generated along with a distance and clock position callout. If the autopilot is still engaged after 10 seconds and the aircraft altitude is low, another aural alert will remind the pilot to "Disconnect Autopilot". Once the aircraft is within 2NM of the glide airport, the pilot must take full control of the aircraft. At this point Smart Glide will no longer provide range alerts and GPS guidance will not recalculate.

500' AGL

At 500' above the ground, a "500" aural alert is generated as a reminder to prepare for touchdown.

With No Glide Airport

Altitude AGL Callouts

At 2000', 1000', and 500' above the ground, an associated aural alert is generated as a reminder to prepare for touchdown. No GPS course guidance is given.

CAUTION

This system is intended to aid the crew in the initial avionics setup during a glide emergency, and if possible, to aid the pilot in finding and navigating to a suitable airport within the glide range of the aircraft. The pilot must make every effort to ensure the system guidance is as desired. Other or more suitable airports or off-airport landing areas may be available but unknown to the Smart Glide system. The pilot must evaluate all options and choose the most appropriate course of action given the conditions.

Alert	Description
"Smart Glide Disabled. Low Altitude"	Smart glide cannot be activated below 1000' AGL.
"Smart Glide Disabled."	Smart Glide cannot be activated, but the switch was used to attempt to activate. NOTE: If Smart Glide was manually disabled using the Emergency Page menu, this aural alert will not play.
"Smart Glide Active"	Smart Glide is active and functional.
"Smart Glide Canceled"	Smart Glide was canceled by the pilot.
"Engaging Autopilot"	Smart Glide has engaged the autopilot in GLIDE mode.
"Disconnect Autopilot"	Reminder to the crew that the system is no longer navigating, and the crew should take over for the landing or descent maneuver.
"Airport X o'clock X miles	The glide airport distance and bearing are given relative to the aircraft at the time the alert was generated. Distance is given in nautical miles.
Altitude Aurals	Alert the pilot when at specified altitude AGL. A "Five Hundred" callout is standard. Additional "Two Thousand" and "One Thousand" callouts are issued when there is no airport in range.
"No Airports Within Glide Range"	The GTN cannot find an airport for Smart Glide. Consider airports not available in the GTN Xi, or other off-airport landing sites.
"Approaching Airport"	The aircraft is within 4NM of the glide airport.
"Maneuver and Land"	The aircraft is within 2NM of the glide airport. The pilot should maneuver the aircraft for landing.
"Airport Out of Range"	The glide airport is no longer in the predicted glide range.
"Smart Glide Failure, consider alternate landing site."	The Smart Glide system has failed due to loss of data input or system failure. Smart Glide guidance is not available. The pilot should consider all available alternatives, including continuing to the previously chosen airport, and not rely on the GTN Xi for glide information.
"ALTN Airport Out of Range"	If an alternate airport is selected that is on the edge of the glide range ring, the airport may go out of range while the system is recalculating. If this occurs, the guidance to the current airport will be maintained (if available) and the "ALTN Airport Out of Range" message will be displayed for five seconds.

Table 7-5: Smart Glide Alerts

TXi Integration
Smart Glide is fully compatible with the G500/G600 TXi if a PFD or MFD is configured. When Smart Glide is active, a yellow GLIDE button will appear on the MFD or PFD if no MFD is visible. Pressing the GLIDE button will bring up the emergency glide menu. The G500/G600 MFD map page will mirror the information on the GTN map page when smart glide is active. While information can be viewed on TXi, changing the glide airport can only be done on the GTN Xi.

G3X Touch Integration
Smart Glide is fully compatible with the G3X Touch system if a PFD or MFD is installed. When Smart Glide is active, a yellow GLIDE button will appear on the bottom of the PFD and MFD. Pressing the GLIDE button will bring up the emergency glide page. If displayed, the G3X Touch *Glide Range Ring* will be removed when smart glide is active. Refer to GTN Xi glide range ring display. While information can be viewed on G3X Touch, changing the glide airport can only be done on the GTN Xi.

GI 275 Integration
The GI 275 will indicate when smart glide is active by yellow "GLIDE" text on the top of the altitude tape. When the GI 275 controls a GFC 500, this indication will also indicate when IAS glide mode is active.

GFC Integration
When select Garmin GFC autopilots are interfaced to the system, the autopilot will automatically modify its behavior to assist the pilot when Smart Glide is active. The following table describes compatible GFC 500 and 600 software versions that have Smart Glide compatibility:

GFC Model	Software Version
GFC 600	v2.80 or later. Check the GFC 600 AFMS to determine Smart Glide compatibility and configuration.
GFC 500	GI 275 version: v2.40 or later G3X: v9.00 or later G5: v8.00 or later

Table 7-6: Smart Glide Software Compatibility

If the airplane is more than 2NM from the best glide airport when smart glide is activated, the autopilot will automatically engage the servos and set the flight director to GPS and IAS modes. IAS mode will automatically target best glide speed or autopilot minimum engagement speed if best glide is less than the minimum engagement speed. If the airplane is within 2NM of the best glide airport, the flight director will still be activated in GPS and IAS modes but the autopilot servos will not be engaged. If no airport is within glide range when

Smart Glide is activated, the autopilot will engage servos and the flight director will be set to ROL mode with a wings level reference and IAS mode.

When Smart Glide is active, the behavior of IAS mode is modified so that the airspeed reference initially targets best glide speed or autopilot minimum engagement speed if best glide is less than the minimum engagement speed. The airspeed reference and vertical mode may be changed by the pilot at any time, but if IAS mode is selected again, it will set the airspeed reference back to the initial smart glide speed. This behavior is indicated by the presence of the "GLIDE" indication on GTN and on GFC 600 by "GLIDE" being annunciated on the GMC 605. As soon as Smart Glide is cancelled, IAS mode reverts to its normal function.

Smart glide only engages the autopilot servos on initial activation when further than 2NM from the best glide airport. It is the pilot's responsibility to manage the autopilot and disconnect it at the appropriate time. There is no automated autopilot disconnect. If the pilot later selects a new glide destination, the flight director modes will be switched to GPS and IAS modes, however the autopilot servos will not be automatically engaged. The pilot may manually engage the autopilot servos by pressing the AP button on the autopilot mode controller.

When Smart Glide is cancelled, autopilot mode changes may occur. It is the pilot's responsibility to disconnect the autopilot or verify the flight director modes are as desired after cancelling Smart Glide.

7.25 Autopilot Coupling

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

Autopilots coupled to the GTN Xi system in an analog (NAV) mode will follow GPS or VHF navigation guidance as they would with existing VOR receivers. See section 4.4 for autopilots that support NAV mode.

Autopilots that support GPSS or GPS Roll Steering in addition to the analog course guidance will lead course changes, fly arcing procedures, procedure turns, and holding patterns if coupled in a roll steering mode. See section 4.4 for autopilots that support GPSS or GPS Roll Steering.

The GTN Xi supports autopilot roll steering for heading legs when an approved heading source is interfaced to the GTN Xi.

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

7.25.1 RNP 1.0 RF Leg Types

This STC does not grant operational approval for RF leg navigation for those operators requiring operational approval. Additional FAA approval may be required for those aircraft intending to use the GTN Xi to provide RNP 1 or RNP 0.3 navigation in accordance with FAA Advisory Circular AC 90-105A.

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

This STC has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the GTN Xi installation complies with limitation set forth in Section 2.6.1 of this document. It is recommended to couple the autopilot for RNP 1.0 RF procedures, if available, but it is not required to do so.

7.25.2 RNP 0.3 RF Leg Types

This STC has demonstrated acceptable crew workload and Flight Technical Error for coupled procedures with RF legs when the GTN Xi installation complies with limitation set forth in Section 2.6.1 of this document. It is required to couple the autopilot for RNP 0.3 RF procedures.

7.26 StormScope® Display (Optional)

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

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

7.27 Flight Planner/Calculator Functions

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

7.28 Fuel Range Rings

The fuel range rings displayed on the moving map are intended for situational awareness and do not represent a direct indication of endurance or fuel remaining. The distance between the segmented green reserve ring and the

yellow zero fuel ring is 45 minutes by default. The reserve value can be changed from the GTN Xi map setup menu.

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

7.29 Glove Use / Covered Fingers

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

7.30 Active Weather Radar

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

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

CAUTION

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

7.31 Telephone Audio

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

CAUTION

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

7.32 Multi Crew Aircraft (GMA 35 Only)[2]

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

[2] Includes GMA 35 and GMA 35c Audio Panels

Additionally, when the GTN Xi and TXi are installed in the same cockpit, it is recommended that the GTN Xi and TXi have the same chart types and cycles to ensure appropriate lookup and chart syncing/streaming functionality.

7.33 Automatic Speech Recognition

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

7.34 Connext Data (Optional)

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

The Flight Stream 210 is a remotely mounted unit that provides the capability to interface Portable Electronic Devices (PEDs) to the GTN Xi via Bluetooth. The Flight Stream 510 is mounted in the GTN SD card slot and includes a Bluetooth and Wi-Fi transceiver. The GDL 60 is a remote mounted wireless access point that includes Bluetooth and Wi-Fi connectivity to the PED, and LTE or Wi-Fi connectivity to Garmin services on the ground.

Data such as traffic, flight plan, datalink weather, entertainment audio information, and attitude information are sent from the Flight Stream or GDL 60 to the PED. The PED can send flight plans and databases (except Flight Stream 210) to the GTN Xi via the access point. Limitations regarding database operations are found in Section 2.15.

Garmin provides a list of tested and compatible devices that can be used with the Flight Stream or GDL 60. Connection to the Flight Stream or GDL 60 may be possible with devices other than those on the supported device list, but Bluetooth® and/or Wi-Fi stability and wireless data integrity cannot be guaranteed.

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

7.35 System Databases

7.35.1 Database Provided Altitudes

When the GTN Xi provides altitude data for waypoints included in IFR procedures, the altitudes provided are those shown on the procedure chart for "Turbojet" or "Jet" aircraft. If altitudes for other aircraft such as "Turboprop" or "Prop" are required, the crew must manually edit the waypoint altitude.

7.35.2 Database Sync with G500/600 or G500/600/700TXi GDUs

When a GTN Xi hosts a Flight Stream 510 for database syncing to GDUs, the GTN Xi and GDU must be configured for the same chart database type (FliteCharts or ChartView). If the GDU and GTN are not configured for the same chart type, charts database sync and Chart Streaming will not be available.

7.35.3 Databases and Flight Plan Waypoints/Procedures

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

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

Only the Obstacle/HOT Line wire database may be used in accordance with the limitation found in Section 2.14.

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

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

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

7.35.4 Single Point Database Acknowledgement

For GTN Xi units running software version 20.20 or later, the remote database confirmation feature has been replaced by single point database acknowledgement. This feature is available on all GTN Xi installations, and it gives users a quick way to verify databases on Garmin products are up to date before flight.

Upon startup GTN #1 will display a database summary page. Other Garmin products that support this feature will all skip their database confirmation pages. If all databases are up to date, GTN #1 will display a green check on the database summary page. If some databases are missing or out of date, GTN #1 will display the database details page and highlight the offending databases in yellow as before. If a database mismatch warning appears, that means that the databases are not the same on all the Garmin products. If more information is needed, the user can tap on the database mismatch label to see detailed information about a given database.

Recommendations for managing databases:

1. When downloading databases from the Fly Garmin website, always choose to use Database Sync and always choose to reinstall all databases when creating a database card.
2. If using Database Concierge on Garmin Pilot, verify that all database concierge downloads are up to date before attempting to install databases on GTN.
3. Always load databases to GTN #1 in installations with dual GTN Xi or a G500/G600 TXi. Don't load databases onto the SD cards for GTN #2 or TXi unless necessary. If databases are on the SD card, the unit will not skip the database page.
4. If a database mismatch occurs, power on all units to the home page and wait until the database sync is complete. A system message will appear while database sync is in progress. If a database mismatch still occurs check the Terrain database version on each unit and update as necessary. If the issue persists, contact Garmin Support.

7.35.5 GDL 60 (Optional)

The GDL 60 is a wireless access point for your airplane. It provides wireless access for PEDs in the aircraft similar to a FlightStream 510, automatic wireless database updates for aircraft avionics and wireless sensor data query and database downloads over LTE or wireless internet.

If wireless sensor data query is enabled in an installation, certain displays can power on when queried. During a query, the display backlight will be powered off to conserve battery.

The GDL 60 will wake up on battery power to download databases. Wireless sensor data query also uses a small amount of battery to listen for a request to wake up the avionics. It is recommended to install and use a battery tender in conjunction with the GDL 60.

If the aircraft will not be flown for an extended period without a battery tender or you are in a remote location and wish to eliminate the possibility of battery drain, open the "CNXT BATT" breaker to disable the GDL 60 live query functionality. While this breaker is open the GDL 60 will not download databases or respond to sensor queries.

7.35.6 Charts Database (Dual GTN7XX and TXi GDU)

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

7.36 Core Procedure Selection

With GTN 20.41, runway selection may be deferred when loading a SID or STAR, if possible for that procedure. If the runway selection is deferred, this will result in only the procedure core being added to the flight plan. The core of the procedure is the section of the procedure that does not change *route or altitudes* based on the runway transition.

The runway may be selected in the flight plan page on next to the procedure header, in which case the runway transition will be added to the flight plan. If user modified altitudes exist within the route, a popup will be provided asking if the user would like the GTN to attempt to retain user modified data. When selecting a runway transition, verify flight plan and crossing altitudes remain correct per the published procedure.

The runway may also be selected by returning to the procedures page, a popup will be provided asking if the user would like the GTN to attempt to retain user modified data.

7.37 ATC Data Link System (CPDLC) (Optional)

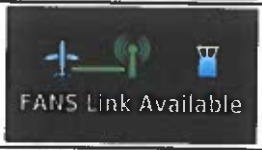
Controller Pilot Data Link Communications (CPDLC) provides data link communication between the flight crew and Air Traffic Control (ATC) facilities. Communication is in the form of text message elements that resemble phraseology used in voice communications with ATC. CPDLC is an application that runs within FAA Data Comm and is a reduced function of FANS 1/A+. CPDLC allows operators to use departure clearances (DCL) at participating airports and enroute services within continental US and above 16,000 ft. DCL is similar to a PDC, but with push-to-load capability for flight plan amendments.

With the proper software enablements, GDR 66 digital radio installed, and service registration through FltPlan.com, FAA Data Comm can be used. The GDR 66 VHF Data Link Transceiver provides the line-of-sight link between the aircraft and ground systems. FltPlan.com allows the user to register for FAA Data Comm service for access to the SITA ACARS network.

Prior to logging on to CPDLC, an ICAO flight plan must have been filed for the system to reference and the information entered into the Log-on display must match the filed flight plan. See Section 1.6, ATC Data Link System, for information regarding FAA Data Comm approvals and ICAO flight plan equipment codes. Refer to the GTN Xi Pilot's Guide Data Comm Addendum (190-02327-A2) for more detailed information regarding the use of CPDLC.

7.37.1 System States

Once a successful logon has been completed by the flight crew, the system will go into a CPDLC waiting state. In this state, the system is waiting for a CPDLC session to be initiated by the ATC facility. When the ATC facility sends a CPDLC session start command and it is accepted by the system, the flight crew will have the ability to send and receive CPDLC messages.

Displayed Connection Status	Description
	The system is waiting for an ACARS connection or has initialized the VHF Data Link router but does not have an air-ground connection.
	The system has established ACARS communication. This state indicates that an AFN (ATS Facilities Notification) logon can be attempted to establish CPDLC communications.
	The system has initiated a network logon with an ATC facility.

Displayed Connection Status	Description
	The system has successfully completed the network logon procedure. During this state the system is waiting for an ATC facility to initiate a CPDLC session. This state will exist during initial connection or if a CPDLC session has been closed and the network logon is still valid.
	The system has successfully established a CPDLC session with a ground facility. CPDLC messages can be exchanged in this state.
	Logon Failed The system was unable to establish a network logon.
	The system has disconnected from a CPDLC connection. This state will exist when ATC ends a session. If the network logon is still valid, the system is capable of another CPDLC session from an ATC facility.

Table 7-7: ATC Data Link Connection Status

7.37.2 Messages

CPDLC downlink messages are messages initiated by the flight crew and sent to ATC. CPDLC uplink messages are messages initiated by ATC and sent to the flight crew

Icon	Text	Description
	Sent	Message sent to ATC.
	Standby	'Standby' message response sent to ATC. The exclamation point notifies the flight crew that an action is needed to close the message.
	Send Fail / Expired	Message failed to send or the message timed out (270 seconds).
	Closed	Message sent to ATC and message thread closed.

Table 7-8: Downlink (Aircraft to ATC) Status Icons

Icon	Text	Description
	Standby (message not opened)	Unopened 'Standby' message response sent by ATC.
	Standby (message opened)	Opened 'Standby' message response sent by ATC.
	Need Response (message not opened)	Unopened message that requires a response to ATC.
	Need Response (message opened)	Opened message that requires a response to ATC.
	Expired (message not opened)	Unopened expired message sent by ATC (100 seconds).
	Expired (message opened)	Opened expired message sent by ATC (100 seconds).
	Closed (message not opened)	Unopened message that closed the message thread.
	Closed (message opened)	Opened message that closed the message thread.

Table 7-9: Uplink (ATC to Aircraft) Status Icons

7.38 GCO 14 (Optional)

The GTN Xi can be interfaced to a Garmin GCO 14 carbon monoxide (CO) monitor. When a GCO 14 is installed on the GTN 6XX/7XX or other interfaced LRU, the GTN can provide a readout of CO concentration in parts per million (PPM), CO alerts, and a separate customizable advisory message to alert the pilot to levels of CO below the alerting threshold. The readout of CO concentration can be selected as a user field on the GTN.

CO alerts will be provided when the CO level meets or exceeds the concentration and duration thresholds shown in table 7-10. The CO alert includes both an amber visual and aural annunciation "Carbon Monoxide".

A customizable advisory message can be set via the GCO settings menu to advise the pilot of CO levels below the alerting threshold. The pilot must select a concentration in PPM as well as a duration for the desired advisory. Once the CO concentration has been above the selected concentration threshold for the selected duration, a system message will be presented alerting the pilot to high CO levels.

Settings and information for the GCO can be found in Utilities > CO Monitor. The GCO 14 sensor has an expiry date. It is recommended to replace the sensor prior to expiration. If the sensor is not replaced prior to expiration, a system message will be issued to notify the pilot that the sensor has expired.

Concentration (PPM)	Alert After (minutes)
≤ 30	No Alert
> 30	120
> 50	60
> 100	10
> 300	*No delay*

Table 7-10 - CO (carbon monoxide) Alert Thresholds

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

EASA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

G3X Touch Electronic Flight Instrument System

Dwg. Number: 190-01754-02 Rev. 1

This Supplement is Applicable to the Following Manuals:

190-01754-01

This Supplement must be attached to the FAA Approved STC Airplane Flight Manual Supplement when the GARMIN G3X Touch Electronic Flight Instrument System is installed in accordance with STC SA01899WI. The information contained herein supplements the information of the STC Airplane Flight Manual Supplement. For Limitations, Procedures, and Performance information not contained in this Supplement consult the basic Pilot's Operating Handbook, FAA Approved Airplane Flight Manual and the FAA Approved STC Airplane Flight Manual Supplement.

Airplane Serial Number: 172-72198

Airplane Registration Number: D-ETKM

Signed By:

Robert G. Murray
ODA STC Unit Administrator
Garmin International Inc.
ODA-240087-CE

Date: JULY 16, 2020

EASA Approval No. 10073816
Revised: –

Matjaž Meze
CA No.: 001
AEROSERVICE LESCE-BLED SLO 2024

© Copyright 2020
GARMIN Ltd. or its subsidiaries
All Rights Reserved

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of GARMIN. GARMIN hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

GARMIN International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Garmin is under license. Other trademarks and trade names are those of their respective owners.

GARMIN International, Inc

Log of Revisions

EASA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

GARMIN G3X Touch Electronic Flight Instrument System
AML STC

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	EASA APPROVED
1	ALL	Original Issue	See Cover	See Cover

Table of Contents

Section 1 - General 5

Section 2 – Limitations 5

Section 3 – Emergency Procedures 5

Section 4 – Normal Procedures 5

Section 5 - Performance 5

Section 6 – Weight and Balance 5

Section 7 – Systems Description 5

Section 1 - General

The information in this supplement is EASA-approved material and must be attached to the FAA Approved STC Airplane Flight Manual Supplement, p/n 190-01754-01 when the airplane has been modified by installation of the Garmin G3X Touch Electronic Flight System in accordance with STC SA01899WI.

This EASA approved Airplane Flight Manual Supplement is required in addition to the FAA approved Airplane Flight Manual Supplement, p/n 190-01754-01.

Section 2 – Limitations

No change except as shown below.

2.23 Portable Electronic Devices
Data Received by Personal Electronic Devices (PED)

The PED is not approved as the sole source of information to base tactical or strategic decision making and is not approved to replace the information provided by the Garmin G3X EFIS. The G3X's Bluetooth interface and data provided to a portable electronic device is not approved to replace any required or installed aircraft display equipment, including navigation or traffic/weather display equipment. The data presented on the PED may not have the required integrity to be used as the sole source of information to base tactical or strategic decision making.

2.24 Kinds of Operations
FAA operational requirements (14 Code of Federal Regulations Part 91, Part 121, and Part 135) do not apply to aircraft operated under European Operational requirements.

Flight Plan Transfer

Use of the G3X's Bluetooth connectivity for flight plan importing during critical phases of flight by the pilot flying is prohibited.

Electronic Flight Bag (EFB)

Use of the G3X's Bluetooth interface and data for the purpose of Electronic Flight Bag (EFB) applications is not approved as part of this STC. Use of any device as an EFB may require separate approvals.

Section 3 – Emergency Procedures

No Change except as shown below

3.7 EIS Failure

2. Land as soon as practical

Section 4 – Normal Procedures

References to "LP" approaches should be disregarded for aircraft operating within European airspace.

Section 5 - Performance

No Change

Section 6 – Weight and Balance

No Change

Section 7 – Systems Description

No Change

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G3X TOUCH ELECTRONIC FLIGHT INSTRUMENT SYSTEM
as installed in

_____

Make and Model Airplane

Registration Number: _____ Serial Number: _____

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01899WI for the installation and operation of the Garmin G3X Touch Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, 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 or markings, or the basic FAA approved Airplane Flight Manual.

FAA approved sections of this supplement are labeled as "FAA Approved". Sections not labeled "FAA Approved" are provided for guidance information only.

FAA APPROVED BY: Paul Mast

Robert Murray
ODA STC Unit Administrator
GARMIN International, Inc
ODA-240087-CE

DATE: 4-21-2023

© Copyright 2019, 2021, 2023
Garmin Ltd. or its subsidiaries
All Rights Reserved

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc
Log of Revisions
FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G3X TOUCH ELECTRONIC FLIGHT INSTRUMENT SYSTEM

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	03/15/19	Robert Murray ODA STC Unit Administrator
2	2-2, 2-5	Added limitation for installations with an autopilot other than GFC500.	04/05/19	Paul Mast ODA STC Unit Administrator
3	1-5, 2-1	Added GPS 175 / GNX 375 as approved IFR navigators.	5/30/19	Paul Mast ODA STC Unit Administrator
4	ALL	Incorporate system software v8.60 and associated hardware changes.	12/20/19	Robert Murray ODA STC Unit Administrator
5	ALL	Formatting changes throughout document. Clarified requirements for IFR vs. VFR navigation, updated emergency procedures, annunciations, and autopilot configuration applicability. Added graphics for deviation indicators. Revised transponder mode description. Addition of Smart Glide.	12/29/21	Robert Murray ODA STC Unit Administrator
6	ALL	Added GI 275 integration, traffic aural alert limitation information, minor clerical and formatting corrections throughout document.	SEE COVER	SEE COVER

This page intentionally left blank

Table of Contents

1 General 1-1
1.1 G3X Touch GNSS (GPS/SBAS) Navigation Equipment Approvals 1-5
1.2 Abbreviations and Terminology 1-7
2 Limitations 2-1
2.1 System Software Requirements 2-1
2.2 Standby Flight Instruments 2-1
2.3 Navigation Systems for IFR Operations 2-1
2.4 Databases 2-2
2.5 AHRS Operational Area 2-2
2.6 Magnetic Variation Operational Area 2-2
2.7 Navigation Angle 2-2
2.8 ADAHRS Systems Status 2-3
2.9 Aerobatic Maneuvers 2-3
2.10 Other Autopilots 2-3
2.11 Synthetic Vision 2-3
2.12 Moving Maps 2-3
2.13 Terrain Display 2-3
2.14 Terrain Alerts 2-3
2.15 Traffic Display and Alerts 2-4
2.16 Surface Operations 2-4
2.17 Glide Range Ring 2-4
2.18 Powerplant Gauge Markings 2-4
2.19 Weight and Balance 2-4
2.20 Data link Products (SiriusXM, FIS-B, and Connext) 2-4
2.21 Glove Usage 2-4
2.22 Service Required 2-5
2.23 Portable Electronic Devices 2-5
2.24 Kinds of Operations 2-6
2.25 Placards 2-7
3 Emergency Procedures 3-1
3.1 ADC Failure (GSU 25) 3-1
3.2 Attitude Failure (GSU 25) 3-1
3.3 Attitude Aligning / Keep Wings Level 3-2
3.4 AHRS ALIGN 3-2

3.5 Autopilot Abnormal Disconnect (GFC 500) 3-2
3.6 Incorrect Barometric Synchronization (Standby to G3X Sync) 3-2
3.7 EIS Failure 3-2
3.8 Erroneous Air Data or Attitude Information on the G3X PFD 3-3
3.9 G3X Touch Failure Annunciations 3-3
3.10 Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error 3-4
3.11 PFD Failure 3-4
3.12 Navigation Data Failure (GPS/VOR/LOC/GS) 3-4
3.13 TERRAIN ALERTS 3-5
3.14 WARNINGS, CAUTIONS, and ADVISORIES 3-6
4 Normal Procedures 4-1
4.1 Before Starting Engine 4-1
4.2 After Starting Engine 4-1
4.3 COM Radio Tuning (Optional) 4-2
4.4 Lateral Navigation 4-2
4.5 Approaches 4-4
4.6 Barometric Minimums Alert 4-15
4.7 Transponder Operation (Optional) 4-15
4.8 Disable Electronic Stability Protection (ESP) 4-15
5 Performance 5-1
6 Weight and Balance 6-1
7 System Description 7-1
7.1 Primary Flight Instruments 7-1
7.2 Vertical Deviation Indicators 7-4
7.3 HSI Annunciations 7-5
7.4 Course Deviation Indicator (CDI) 7-5
7.5 Display of PFD Information on MFD 7-6
7.6 Engine Indication System 7-7
7.7 Communication / Navigation / Surveillance System 7-7
7.8 Remote Transponder Interface 7-7
7.9 Minimum Altitude Display and Alerting 7-8
7.10 AOA Probe 7-8
7.11 GAD 27 Wig Wag 7-8
7.12 EIS Caution / Warning Lights 7-9
7.13 Smart Glide 7-9
7.14 SFD Baro Sync 7-9

1 GENERAL

The information in this supplement is FAA-approved and must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (POH/AFM) when the airplane has been modified by the installation of the Garmin G3X Touch Electronic Flight Instrument System in accordance with STC SA01899WI.

The information in this supplement supersedes or adds to the basic POH/AFM only as set forth below.

Users of the manual are advised to always refer to the supplement for possibly superseding information and placarding applicable to operation of the airplane.

The G3X Touch provides one or more of the following functions:

- Primary Flight Display (PFD) – Provides attitude, air data, heading, and navigation information to the pilot.
- Multi-Function Display (MFD) – Provides pilot awareness of factors that may affect the overall conduct of the flight such as advanced moving map including terrain, obstacle and traffic alerts, georeferenced FliteCharts® or Jeppesen® ChartView™ charts and SafeTaxi® airport diagrams.
- Engine Indication System (EIS) – Provides engine and airframe operating parameters to the pilot.

The G3X Touch is scalable with a variety of configurations made up of the 7" portrait GDU 470 and the 10" landscape GDU 460. Installations may consist of one or both display types in any combination from one to three displays (or up to four displays total in tandem cockpit aircraft). A minimum installation with a single display may be a standalone MFD or a PFD which can be split screened to provide both PFD and MFD functions. EIS can optionally be displayed on any GDU except a 7" portrait PFD. Only one display per cockpit can be installed as a PFD (any second or third display is an MFD).



Single 7" Portrait GDU (PFD with MFD in split mode, No EIS)



Single 10" GDU (PFD & MFD, EIS Optional)



Dual 7" Portrait GDUs (PFD & MFD, EIS Optional)



One 10" + One 7" Portrait GDU (PFD & MFD, EIS Optional)

The PFD has an internal WAAS GPS receiver for VFR operations and a touchscreen interface. The G3X Touch system also can interface with an external, IFR approved navigator for IFR operations. Aircraft without an external, IFR approved navigator are approved for VFR operations only. Refer to equipment requirements for IFR operations in Limitations Section 2.3, *Navigation Systems for IFR Operations*, and the table in Section 2.24, *Kinds of Operations*.

PFD installations require the installation of a GSU 25 ADAHRS, GMU 11 magnetometer, and GTP 59 temperature probe. A GAD 27 voltage stabilizer or TCW IBBS back-up battery is required for 14V airframes with EIS. For all PFD installations in aircraft approved for IFR operations, standby instruments and an IFR approved navigation system are required.

If the installation includes a separate PFD and MFD, reversionary backup is available should a failure of either display occur. In reversionary mode, the remaining G3X Touch display combines critical flight instrumentation with engine readouts (if installed) and navigation information in a single-screen consolidated presentation.

If EIS functions are installed, they require the installation of a remote mounted GEA 24 Engine Airframe unit and associated engine sensors.

MFD functions are supported by an internal GPS receiver or connection to an external, IFR approved GPS navigator. G3X Touch flight displays can be integrated with a variety of systems including VHF radios, transponders, audio panels, ADS-B, SiriusXM® data links, mobile devices via Garmin Connext® and autopilot systems.

Carefully review the contents of this Airplane Flight Manual Supplement before operating the airplane. Also review Pilot's Guide 190-02472-00 Rev A, or later version applicable to the approved software version of the G3X Touch system installed on the aircraft. The Pilot's Guide provides details on the features of the G3X Touch system.

USE OF THE AFMS

The following definitions apply to WARNINGS, CAUTIONS and NOTES found throughout the AFMS:

WARNING

Operating procedures, techniques, etc., which could result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures, techniques, etc., which could result in damage to equipment if not carefully followed.

NOTE

Operating procedures, techniques, etc., which are considered essential to emphasize.

1.1 G3X Touch GNSS (GPS/SBAS) Navigation Equipment Approvals

G3X Touch is capable of IFR operations when an external, IFR approved navigation system is installed and connected to the system and when the pilot selects the **FPL Source** to **External**. Refer to equipment requirements for IFR operations in Limitations Section 2.3, *Navigation Systems for IFR Operations*, and the table in Section 2.24, *Kinds of Operations*.

When no external, IFR approved navigator is connected, or when the pilot selects **FPL Source** to **Internal**, G3X Touch provides VFR flight planning capabilities and guidance on the HSI.

This page intentionally left blank.

1.2 Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

AC	Advisory Circular
ADAHRS	Air Data Attitude Heading Reference System
ADC	Air Data Computer
ADS-B	Automatic Dependent Surveillance-Broadcast
AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AHRS	Attitude Heading Reference System
ALT	Altitude
AML	Approved Model List
AMMD	Airport Moving Map Display
AOA	Angle of Attack
AP	Autopilot
APV	Approach with Vertical Guidance
ATC	Air Traffic Control
ATT	Attitude
Baro	Barometric
BC	Back Course
CAN	Controller Area Network
CB	Circuit Breaker
CDI	Course Deviation Indicator
CFR	Code of Federal Regulations
COM	Communication
DA	Decision Altitude
DG	Directional Gyro
ECS	Electrical Control System
EIS	Engine Indication System
ESP	Electronic Stability and Protection
GA	Go Around
GP	Glide Path
GPSS	GPS Steering
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FD	Flight Director

FIS-B	Flight Information Service – Broadcast
FPL	Flight Plan
FPM	Feet Per Minute
GAD	Garmin Adaptor Device
GDU	Garmin Display Unit
GEA	Garmin Engine and Airframe
GFC	Garmin Flight Control
GMU	Garmin Magnetometer Unit
GNC 255	Garmin Navigation and Communication Transceiver
GNS	Garmin Navigation System
GNSS	Global Navigation Satellite System
GNX	Garmin Navigator Transponder
GP	Glide Path
GPS	Global Positioning System
GS	Glide Slope or Ground Speed
GSU	Garmin Sensor Unit (ADAHRS)
GTN	Garmin Touch Navigation
GTP	Garmin Temperature Probe
HDG	Heading
HSI	Horizontal Situation Indicator
IAF	Initial Approach Fix
IAS	Indicated Airspeed
IDENT	Identification button on Transponder
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INT	Internal
K factor	Fuel flow transducer calibration factor
LNAV	Lateral Navigation
LNAV+V	Lateral Navigation with Vertical Guidance
LP	Localizer Precision
LP+V	Localizer Precision with Advisory Vertical Guidance
LPV	Localizer Precision with Vertical Guidance
LOC	Localizer
LOI	Loss of Integrity
MAX	Maximum
MDA	Minimum Descent Altitude

MFD	Multi-Function Display
MIN	Minimum
MSG	Message
N/A	Not Available
NAV	Navigation
NOTAM	Notice to Airmen
NRST	Nearest
PFD	Primary Flight Display
POH	Pilot's Operating Handbook
PTRIM	Pitch Trim
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
ODA	Organizational Designation Authorization
REV	Revision or Reversion
RNAV	Area Navigation
RPM	Revolutions per Minute
SBAS	Satellite Based Augmentation System
SD Card	Secure Digital Card
SFD	Standby Flight Display
SL30	Garmin nav/com transceiver
STBY	Standby
STC	Supplemental Type Certificate
SYNC	Synchronize
TAS	True Airspeed
TAWS	Terrain Alert and Warning System
VDI	Vertical Deviation Indicator
TFR	Temporary Flight Restriction
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOR	VHF Omni-directional Range
VSI	Vertical Speed Indicator
WAAS	Wide Area Augmentation System
XTK	Cross Track Error
YD	Yaw Damper

This page intentionally left blank.

2 LIMITATIONS

2.1 System Software Requirements

The G3X Touch must use the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G3X Touch System Software	9.15

NOTE

This section is not intended to be a comprehensive list of approved software. It is intended to provide a means to determine if this AFMS revision is applicable to the software that is installed in the aircraft. Do not use this AFMS revision if the installation has a software version less than that shown in the table above.

2.2 Standby Flight Instruments

Standby Instruments are required for aircraft approved for IFR operations. Refer to the table in Section 2.24, *Kinds of Operations*.

2.3 Navigation Systems for IFR Operations

Aircraft approved for IFR operations must use one of the following navigation systems connected to the G3X Touch system, and **FPL Source** on the PFD must be selected to **External**.

- Garmin GNC 300XL / GPS 155XL
- Garmin GPS, GNC, or GNS 4XX(W) / 5XX(W)
- Garmin GNS 480
- Garmin GTN 6XX / 7XX
- Garmin GPS 175 / GNX 375
- Garmin SL30
- Garmin GNC 255
- Garmin GNC 355/355A

OR

- A separate, non-Garmin, IFR approved GPS and/or VHF navigation system along with a dedicated Course Deviation Indicator (CDI) separate from G3X Touch.

Refer to the table in Section 2.24, *Kinds of Operations*.

NOTE

Refer to the approved Airplane Flight Manual Supplement for the non-Garmin navigation system (if installed) for information on IFR operations.

IFR operations are prohibited using G3X Touch while **FPL Source** is selected to **Internal** GPS navigation as the navigation source on G3X Touch. When the internal navigation source is selected, a cyan **INT** and magenta **VFR** annunciation is displayed on the HSI. When **INT** and **VFR** are annunciated, IFR operations are prohibited based solely on guidance provided by G3X Touch.

IFR operations are prohibited using G3X Touch for navigation when the G3X system is not connected to an external, IFR approved navigator. Installations without an external, IFR approved navigator are limited to VFR operations only and have a placard located near the pilot PFD. Refer to Section 2.25, *Placards*.

2.4 Databases

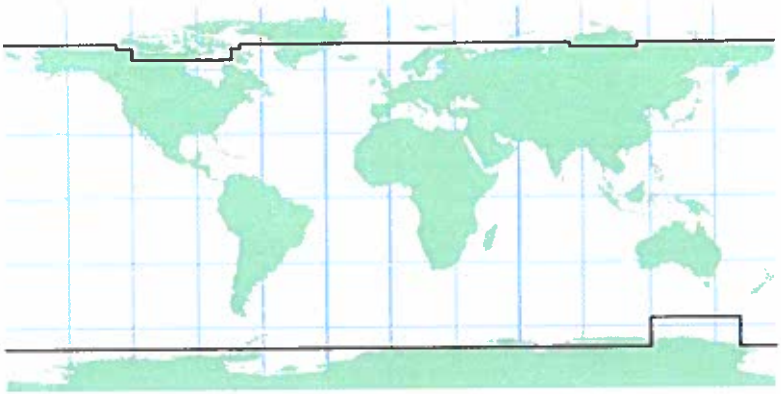
Database updates via SD card must be done while the aircraft is on the ground and stationary. Database transfers or updates are prohibited in flight.

2.5 AHRS Operational Area

IFR operations are prohibited in the following regions:

1) North of 72° North latitude, at all longitudes
2) South of 70° South latitude, at all longitudes
3) North of 65° North latitude between longitude 75° W and 120° W (Northern Canada)
4) North of 70° North latitude between longitude 70° W and 128° W (Northern Canada)
5) North of 70° North latitude between longitude 85° E and 114° E (Northern Russia)
6) South of 55° South latitude between longitude 120° E and 165° E (A region south of Australia and New Zealand)

Loss of heading may occur when operating in these regions.



2.6 Magnetic Variation Operational Area

IFR operations are prohibited in areas where the magnetic variation is greater than 99.9 degrees East or West.

2.7 Navigation Angle

The Magnetic/True Navigation Angle (as selected on the System Units page) must match the navigation angle selected on all interfaced GPS/SBAS navigators.

2.8 ADAHRS Systems Status

Valid air data, attitude, and heading must be displayed on the G3X Touch PFD and Standby Instruments for IFR operations. Refer to Section 2.24, *Kinds of Operations*, for specific equipment requirements for VFR and IFR. IFR operations are prohibited if any of the following System Status Messages are displayed:

AHRS not receiving GPS data

AHRS not receiving air data

AHRS not receiving magnetometer data

AHRS REVERT

ADC REVERT

AHRS FAIL

ADC FAIL

2.9 Aerobatic Maneuvers

Do not conduct aerobatic maneuvers if uninterrupted attitude information is required on the PFD. Refer to Section 3.2, *Attitude Failure (GSU 25)*, if the amber **AHRS ALIGN** caution is displayed on the PFD.

2.10 Other Autopilots

On aircraft with an autopilot other than a GFC 500, the pilot must select **FPL Source** to **External** on the PFD when using the autopilot in navigation (NAV or APR) modes. For those aircraft, it is prohibited to use the autopilot in navigation modes when **FPL Source** is selected to **Internal** on the PFD.

NOTE

Refer to the approved Airplane Flight Manual Supplement for the non-Garmin autopilot system (if installed) for information on modes of operation.

2.11 Synthetic Vision

The synthetic vision presentation must not be used as the sole reference for aircraft control (without reference to the primary flight instruments).

The synthetic vision presentation must not be used as the sole reference for navigation or obstacle/terrain/traffic avoidance.

2.12 Moving Maps

Moving map displays (ownship position relative to map features) must not be used as the primary or sole means of navigation or course guidance.

2.13 Terrain Display

Maneuvers and navigation must not be based solely on the display of terrain or obstacles on the moving map terrain displays.

2.14 Terrain Alerts

Terrain alerts must be inhibited when landing at an airport that is not in the airport database.

2.15 Traffic Display and Alerts

The display of traffic and aural traffic alerts are intended as an aid to visual acquisition and must not be used as the sole basis for aircraft maneuvering.

2.16 Surface Operations

SafeTaxi or Chartview functions shall not be used as the sole basis for ground maneuvering. SafeTaxi and Chartview functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and Chartview use is limited to airport surface orientation to improve flight crew situational awareness during ground operations.

2.17 Glide Range Ring

In the event of engine failure or engine malfunction, the Glide Range Ring must not be used to determine gliding distance. Refer to the airplanes' Pilot's Operating Manual / Airplane Flight Manual for engine failure emergency procedures and glide distance data.

2.18 Powerplant Gauge Markings

Aircraft that were previously equipped with a fuel flow gauge which measured metered fuel pressure may have this gauge replaced by a gauge which measures fuel flow directly. When these gauges are replaced in accordance with this STC, the fuel pressure and fuel flow markings on such gauges are replaced by equivalent fuel flow markings.

Fuel flow values may be in error by as much as 15% if the K factor calibration is improperly set. Do not depend solely on the fuel flow indication or the fuel totalizer to determine fuel used, fuel remaining, or fuel reserves.

The fuel computer functions must not be used as the primary means of determining the quantity of fuel in the tanks.

The Manifold Pressure gauge and the Propeller RPM gauge are the primary means for setting engine power. The Engine Power display is for information purposes only.

2.19 Weight and Balance

Weight and balance data provided by the G3X Touch is for flight planning purposes only. Consult the aircraft's Pilot's Operating Handbook for the official weight and balance data.

2.20 Data link Products (SiriusXM, FIS-B, and Connext)

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

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

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

2.21 Glove Usage

No device or apparel may cover the pilot's fingertips used to operate the G3X Touch display.

2.22 Service Required

It is prohibited to initiate flight when a "Service Required" advisory is present on the PFD, MFD, or EIS display.

2.23 Portable Electronic Devices

This STC does not relieve the operator from complying with applicable requirements regarding the operation of portable electronic devices.

Data provided to a portable electronic device from the G3X Touch Bluetooth interface is not approved to replace any aircraft display equipment, including navigation or traffic/weather display equipment.

2.24 Kinds of Operations

G3X Touch is approved for Day and Night, VFR and IFR operations when the system is appropriately inspected and maintained in accordance with applicable requirements. Aircraft with a placard that reads **AIRCRAFT LIMITED TO VFR** are limited to VFR operations. Refer to Section 2.25, *Placards*.

The tables below list the minimum fully functional equipment required for flight.

This table applicable to aircraft with a G3X PFD Installed			
Equipment	**Number Installed**	**Number Required**	
		VFR	**IFR**
Primary Flight Display	1	1	1
Approved Garmin Navigator (interfaced to a PFD) **OR** Non-Garmin IFR approved navigator with standalone dedicated CDI	1	-	1
Air data and Attitude / Heading Unit (ADAHRS)	1	1a*	1
Magnetometer (GMU)	1	-	1
Standby Attitude Indicator	1	-	1
Standby Airspeed Indicator	1	1b*	1
Standby Altimeter	1	1b*	1
Non-stabilized Magnetic Compass	1	1	1

The following notes apply where indicated:

* FAA approved aircraft operating under 14 CFR Part 91 must have at least one source of altitude and airspeed information functioning for VFR operations. The altitude and airspeed information may be displayed on the PFD or on the standby instruments. The aircraft must have all "1a" items or all "1b" items from the tables above.

NOTE

Operators of aircraft approved by an airworthiness authority other than the FAA are responsible to verify equipment requirements for VFR operations and equip the aircraft accordingly.

Engine Indicating System (EIS):

The table below lists the minimum, fully functional equipment if previously installed engine instruments are replaced by G3X Touch. Refer to Section 7.6, *Engine Indication System*.

Equipment	Number Installed	Number Required
EIS Display	1	1
Engine Adaptor Unit (GEA 24)	1	1

The following engine indications must be functional on the EIS display (if these gauges are present on the EIS display as installed): Tachometer, Manifold Pressure, Oil Pressure, Oil Temperature, Fuel Quantity, and any additional engine instruments required by the aircraft Kinds Of Equipment list as listed in the Aircraft Flight Manual.

2.25 Placards

Installations Limited to VFR

☐ This installation is not limited to VFR.

☐ This installation is limited to VFR and the following placard is required near the PFD:

AIRCRAFT LIMITED TO VFR

This page intentionally left blank.

3 EMERGENCY PROCEDURES

3.1 ADC Failure (GSU 25)

ADC FAIL

ADC failure is indicated by:

- Red X over the airspeed and altitude tapes.
- Red X over the vertical speed tape.
- Red X over the TAS and OAT fields.

1. Use Standby Airspeed Indicator and Altimeter.

NOTE

If a Garmin G5 or GI 275 Electronic Flight Instrument is installed as the Standby Flight Instrument and the primary ADC fails, the G3X Touch will automatically revert and use air data from the G5 or GI 275. An amber ADC REVERT annunciation will automatically be displayed on the PFD and air data from the G5 or GI 275 will be displayed on the G3X Touch.

For G5 installations: If installed, the GFC 500 autopilot will function normally.

For GI 275 installations: If installed, the GFC 500 autopilot will be unavailable.

3.2 Attitude Failure (GSU 25)

AHRS FAIL

Attitude failure is indicated by:

- removal of the sky/ground presentation.
- Red X and ATTITUDE FAIL over the sky/ground presentation.

1. Use Standby Flight Instruments.

NOTE

If a Garmin G5 or GI 275 Electronic Flight Instrument is installed as the Standby Flight Instrument and the primary AHRS fails, the G3X Touch automatically reverts and uses attitude information from the G5 or GI 275. An amber AHRS REVERT annunciation will be displayed on the PFD and attitude information from the G5 or GI 275 will automatically be displayed on the G3X Touch.

For G5 installations: If installed, the GFC 500 autopilot will function normally.

For GI 275 installations: If installed, the GFC 500 autopilot will be unavailable.

3.3 Attitude Aligning / Keep Wings Level

If the ALIGNING KEEP WINGS LEVEL indication occurs during flight, the G3X Touch has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain 1° nose up pitch and wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. Limit aircraft attitude to ±10° bank, ±5° pitch, 200 KTAS or less.
3. If attitude does not return, continue to use the standby flight instruments for aircraft attitude control.

3.4 AHRS ALIGN

The AHRS ALIGN annunciation indicates that the AHRS attitude information is still usable, but the internal sensors are trying to realign themselves. The attitude presentation behind the annunciation is still valid but should be crosschecked using the standby instruments.

1. Crosscheck aircraft attitude with standby attitude display.

3.5 Autopilot Abnormal Disconnect (GFC 500)

Red AP or AFCS flashing on PFD, Continuous high-low aural tone

1. Aircraft Attitude ..... MAINTAIN/REGAIN AIRCRAFT CONTROL
2. AFCS Status Box on PFD ..... PRESS
   (to cancel disconnect tone and extinguish annunciator)

3.6 Incorrect Barometric Synchronization (Standby to G3X Sync)

If the system is incorrectly changing the G5/GI 275 or G3X altimeter setting without the pilot manually changing either setting, disable **SFD Baro Sync** on the G3X Touch PFD using the following procedure:

1. Press MENU twice
2. Scroll down to SETUP and Select.
3. Scroll down to PFD and Select.
4. Scroll down to SFD BARO SYNC and Select.
5. Change the selection from ENABLED to DISABLED.
6. Press and hold the BACK button to return to a normal PFD display.
7. Readjust the Altimeter Barometric Settings on the G5/GI 275 and G3X Touch PFD to the desired setting.
8. If Altimeter Barometric Setting does not remain on the desired value for either the G5/GI 275 or G3X PFD, disregard the affected altimeter and use the other altimeter.

3.7 EIS Failure

EIS failure is indicated by the loss of displayed information on the EIS, including a blank, frozen, red 'X' over the display, or unresponsive display of EIS parameters.

1. Position engine controls to ensure operation within engine limitations.

3.8 Erroneous Air Data or Attitude Information on the G3X PFD

(On installations with a G5 or GI 275 Standby Flight Instrument)

1. PULL the ADAHRS Circuit Breaker
2. PULL the GAD 27 Circuit Breaker

G5 or GI 275 air data and AHRS data will automatically revert to be displayed on the PFD on G3X Touch. ADC FAIL, AHRS FAIL, ADC REVERT, AHRS REVERT, and ECS FAIL * messages will be displayed. This procedure will restore availability of the GFC 500 autopilot and flight director if G5 Standby Flight Instrument is installed.

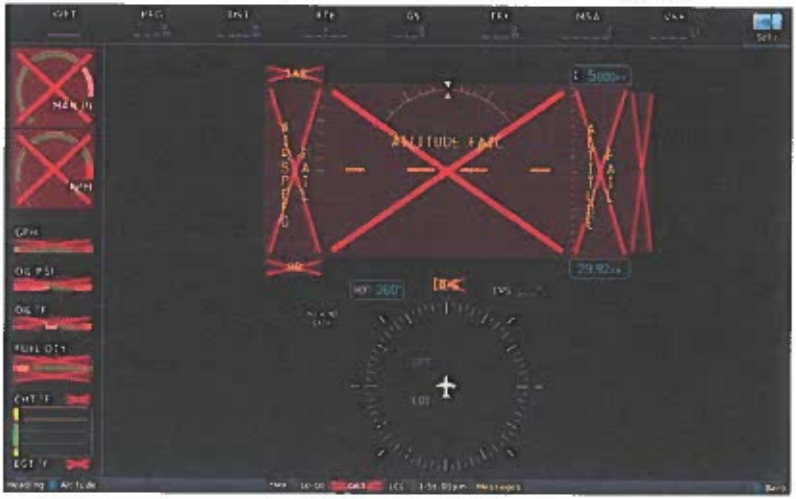
* The ECS FAIL will display when the GAD 27 circuit breaker is pulled out or the GAD 27 fails. This message is applicable only to aircraft with a 14 VDC electrical system or those with flashing (wig-wag) landing and taxi lights.

NOTE

When ECS FAIL is displayed, Landing and Taxi Lights may be inoperative if the aircraft is equipped with flashing (wig-wag) landing and taxi lights.

3.9 G3X Touch Failure Annunciations

If a G3X Touch function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G3X Touch power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged the G3X Touch should be serviced by a Garmin-authorized repair facility.



G3X Failure Annunciations

3.10 Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and an amber "HDG" on the display.

1. Use standby magnetic compass.

NOTE

If the G3X Touch DG/HSI has a valid GPS signal the G3X Touch DG/HSI instrument will display the GPS track information in magenta.

3.11 PFD Failure

PFD failure is indicated by the loss of displayed information on the PFD, including a blank, frozen, or unresponsive display.

1. If IFR, use standby flight instruments for attitude, airspeed, altitude, and heading reference and land as soon as practical.
2. If VFR, use visual references and standby flight instruments (if installed) for attitude, airspeed, altitude, and heading reference and land as soon as practical.
3. Refer directly to the navigation source for navigation information (such as GPS).
4. If the autopilot is engaged, verify autopilot mode and cross check against visual references and standby flight instruments (if installed) and navigation data.

3.12 Navigation Data Failure (GPS/VOR/LOC/GS)

Navigation data failure may be indicated by any or all of the following:

- Loss of course deviation information on PFD
- Loss of glideslope/glidepath information on PFD
- Loss of bearing pointer on HSI

1. Select an alternate navigation source on the external navigator's CDI Key.

Or

2. Use the internal GPS navigator in G3X by changing **FPL Source** from **External** to **Internal** on the PFD. When the external GPS navigation source has failed, an amber **REV** and amber **VFR** annunciation are displayed on the HSI. When **REV** and **VFR** are annunciated, IFR operations are prohibited based solely on guidance provided by G3X Touch. Refer to Limitations, Section 2.3, *Navigation Systems for IFR Operations* for VFR operations using the G3X Touch internal navigator.

If No Alternate Navigation Sources Are Available and 'REV' is Displayed on HSI:

1. Use the CDI for course information.
2. Fly toward known visual conditions.

NOTE

In the event that all configured external GPS navigators fail, the G3X Touch reverts to its internal VFR GPS for navigation and flight plan modifications.

3.13 TERRAIN ALERTS

Aural Alert	Visual Alert	Action
"Terrain Ahead! Pull Up!" "Terrain, Terrain Pull up! Pull Up!" "Obstacle Ahead! Pull Up!" "Obstacle, Obstacle Pull Up! Pull Up!" "Sink Rate, Pull Up!" "Pull Up!"	 -OR-  -OR-  NOTE: The arrow indicates the terrain is outside the Synthetic Vision field of view.	Disconnect autopilot and initiate maximum performance climb (maximum takeoff power and best angle of climb airspeed) NOTE: Only the climb maneuver is recommended, unless operating in VMC or it is determined, based on all available information, that turning in addition climbing is the safest course of action.
"CAUTION, Terrain" "Caution, Terrain Ahead" "CAUTION, Obstacle" "CAUTION, Obstacle Ahead" "CAUTION, Sink Rate"	 -OR-  -OR-  NOTE: The arrow indicates the obstacle is outside the Synthetic Vision field of view.	Take corrective action until the alert ceases. Using all available information to determine the appropriate action, alter the flight path away from the threat by stopping descent, climbing, and/or turning.

3.14 WARNINGS, CAUTIONS, and ADVISORIES

The following tables show the color and significance of the warning, caution, and advisory messages which may appear on the G3X Touch display.

WARNING Annunciations – Red		
Annunciation	*Pilot Action*	*Cause*
Red X	Reference the data source or alternate equipment.	A red X through any display field indicates that display field is not receiving data or is corrupted.
Red Engine Parameter on EIS (if EIS is installed)	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the warning threshold.
AP	Manually fly the airplane. Silence the autopilot disconnect tone and extinguish the annunciation by pressing the AP annunciation in the AFCS Status Box.	GFC 500 Autopilot has failed or is inoperative.
AFCS	Manually fly the airplane.	GFC 500 Flight Director and Autopilot have failed
	Manually fly the airplane.	GFC 500 Autopilot Failure
PTRIM	Manually trim the airplane using the pitch trim wheel.	Electric pitch trim is inoperative. (If installed and interfaced with the GFC 500 autopilot)
	Select full screen mode on display to view WARNING annunciations.	Display is in split screen mode and WARNING annunciations are not displayed.

CAUTION Annunciations – Amber		
Annunciation	*Pilot Action*	*Cause*
AP	Manually fly the airplane	Pilot has disconnected the GFC 500 autopilot
YD	NONE	GFC 500 Yaw Damper has disconnected
↑ TRIM UP ↑	Move the elevator trim in the nose up direction until the annunciation extinguishes.	The GFC 500 autopilot is holding excessive force due to the aircraft being out of trim due to changes in airspeed or power.
↓TRIM DOWN↓	Move the elevator trim in the nose down direction until the annunciation extinguishes.	The GFC 500 autopilot is holding excessive force due to the aircraft being out of trim due to changes in airspeed or power.
MIN SPEED	Add maximum available power. Autopilot will lower aircraft nose to increase airspeed.	Airspeed is too slow, approaching stall speed (GFC 500 autopilot).
MAX SPEED	Reduce power. Autopilot will raise aircraft nose to reduce airspeed.	Airspeed is approaching maximum airspeed limit (GFC 500 autopilot).
HDG (amber background)	Use standby compass	Displayed heading is outside of the internal accuracy limits.
	Select full screen mode on display to view CAUTION annunciations.	Display is in split screen mode and CAUTION annunciations are not displayed.
AHRS ALIGN – Keep Wings Level	Fly aircraft manually and crosscheck attitude indication with standby attitude indicator and other sources of attitude information. Limit aircraft attitude to ±10° bank and ±5° pitch as AHRS Aligns - OK to taxi.	Attitude and Heading Reference System is aligning. AHRS may not align with excessive pitch/bank angles.
AHRS ALIGN	Fly aircraft manually and crosscheck attitude indication with standby attitude indicator and other sources of attitude information (airspeed, heading, altitude, etc.)	The AHRS monitors have detected a possible AHRS malfunction or an error with the attitude presentation. The AHRS is attempting to realign itself. The GFC 500 autopilot may automatically disconnect.
ATT MISCOMP HDG MISCOMP	Cross-check the flagged information against other sources to identify erroneous information.	Difference detected between the G3X Touch attitude or heading display and the G5 attitude or heading display. NOTE G3X will not display miscompare annunciations for GI 275 miscompares. Only the GI 275 will display miscompare annunciations for attitude.

CAUTION Annunciations – Amber		
Annunciation	*Pilot Action*	*Cause*
AHRS FAIL ATTITUDE FAIL	Use standby attitude source, or, if AHRS REVERT message is also displayed, continue to use the G3X Touch. Attitude will be from the Standby Indicator.	The GSU 25 AHRS has failed.
AHRS REVERT	Continue to use the G3X Touch.	The GSU 25 AHRS has failed and attitude from the Standby Indicator is being displayed on the G3X Touch.
ALT MISCOMP IAS MISCOMP	Cross-check the flagged information against other sources to identify erroneous information.	Difference detected between the G3X Touch airspeed or altitude and the G5 airspeed or altitude. NOTE G3X will not display miscompare annunciations for GI 275 miscompares. Only the GI 275 will display the miscompare annunciations.
ADC FAIL	Use standby airspeed and altimeter indicator, or, if ADC REVERT message is also displayed, continue to use the G3X Touch.	The GSU 25 air data computer has failed.
ADC REVERT	Continue to use the G3X Touch.	The GSU 25 air data computer has failed and air data from the Standby Indicator is being displayed on the G3X Touch.
(Flashing) MESSAGE	Press the flashing message annunciation to view a new system message.	A new system message has annunciated.
Amber engine Parameter on EIS (If EIS is installed)	Take appropriate action to correct condition causing engine parameter exceedance.	The engine parameter has exceeded the caution threshold.
GPSS	De-select GPSS on the G3X Touch and select desired alternate autopilot lateral mode.	The GPS Steering command to the autopilot has been lost.
TRAFFIC	Visually acquire the traffic to see and avoid.	The interfaced traffic system has determined that nearby traffic may be a threat to the aircraft.
TAWS N/A, TAWS FAIL	Use vigilance, terrain depiction and TAWS alerting is no longer provided.	Database errors or lack of required GPS position.
ECS FAIL	Landing and Taxi lights may be inoperative if the aircraft is equipped with flashing (wig-wag) landing and taxi lights. At night, consider a well-lighted runway.	The GAD 27 has lost power or has failed.

CAUTION Annunciations – Amber		
Annunciation	*Pilot Action*	*Cause*
GLIDE	Smart Glide is active	Follow the Smart Glide procedures in the GTN Xi AFMS.

ADVISORY Annunciations – White		
Annunciation	*Pilot Action*	*Cause*
NO COMP	Cross check information between the G5 and the PFD to determine which unit is in error.	The unit will not be able to perform the miscompare monitor function. NOTE G3X will not display miscompare or NO COMP annunciations with GI 275 installed as standby indicator. Only the GI 275 will display the miscompare or no compare annunciations.

This page intentionally left blank.

4 NORMAL PROCEDURES

4.1 Before Starting Engine

1. Database Acknowledgement.....(PFD) Press 'CONTINUE' button

NOTE

The data link weather advisory and current database information are displayed during power-up including valid operating dates, cycle number, and database type. When this information has been reviewed for currency (to ensure that no databases have expired), the pilot is prompted to continue.

4.2 After Starting Engine

1. Avionics Master Switch.....ON
2. Database Acknowledgment (All other displays and NAV units) ..... Press "CONTINUE" button
3. Flight Plan Source (FPL) .....Select EXTERNAL or INTERNAL navigation source
4. G3X Touch CDI source .....Touch the HSI display on the PFD. PFD Options window opens.
5. In the CDI Source window.....Select GPS 1 or GPS 2 (if installed) for IFR or VFR flight, or, Select Internal GPS for VFR flight
6. Touch the HSI display on the PFD to return to normal PFD display
7. Enter a Flight Plan..... For IFR or VFR Flight, into the External GPS Navigator, or, For VFR flight only, into the PFD Internal Flight Plan

WARNING

Do not use the approach information provided by the VFR navigation database residing within the G3X Touch as a means of navigating any instrument approach. The G3X Touch VFR navigation database is limited to present only the waypoints for the final approach leg of a published procedure. These waypoints and associated course line are made available for monitoring purposes only.

8. Altimeters.....Set (PFD and Standby Altimeter)
   - Touch the Barometric Pressure Display on the PFD.
   - Enter the desired pressure using the keypad and touch ENTER.
   - Verify Barometric setting on the Standby Altimeter matches the G3X Touch.

4.3 COM Radio Tuning (Optional)

The COM Frequency Box is composed of two fields; one active frequency is on the left side and the standby frequency is on the right.

To tune the COM radio:

1. Touch STBY COM display window
2. Enter the frequency using the keypad or dual concentric knob
3. Touch ENTER to enter the frequency in the STBY window, or,
4. Touch ⇔ to transfer the entered frequency directly into the COM window.

To transfer STBY frequency to Active frequency:

1. Touch the Active COM frequency field

4.4 Lateral Navigation

Procedures below involve the Garmin GFC 500 autopilot. Information regarding a non-Garmin autopilot are provided in the G3X Touch Pilot's Guide and Airplane Flight Manual Supplement for the non-Garmin autopilot.

Changing the Navigation Source

When an external navigator that supports both GPS and VOR/ILS capabilities (i.e., GTN or GNS Series) is selected, the external navigator's CDI Key is used to switch the G3X Touch HSI between GPS and VOR/ILS navigation.

VOR

1. Tune a VOR station in the external navigator.
2. Navigation Source ..... Select VOR on the external navigator
3. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
4. Select the external navigator from the CDI Source window (VOR 1 or 2).
5. Press and Hold **BACK** Button to return to normal PFD display.
6. Set the CDI to the desired course ..... Touch the Selected Course window on the PFD
7. Enter the desired VOR course, press ENTER
8. Establish Intercept Heading
9. Select GFC 500 autopilot modes for intercepting or tracking the selected course ..... VOR will be displayed on the AFCS Status Box.

NOTE

VOR will be annunciated in WHITE if the mode is armed or in GREEN if VOR is the active lateral mode.

GPS DIRECT TO

1. Navigation Source ..... Select GPS on the external navigator
2. Select waypoint and execute the Direct-TO on the external navigator
3. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
4. Select the external navigator from the CDI Source window (GPS).
5. Press and Hold **BACK** Button to return to normal PFD display.

GPS OBS

1. Navigation Source ..... Select GPS on the external navigator
2. Select waypoint and make it the active waypoint.
3. Set external navigator to OBS mode
4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (GPS 1 or 2).
6. Press and Hold **BACK** Button to return to normal PFD display.
7. Set the CDI to the desired course ..... Touch the Selected Course (OBS) window on the PFD.
8. Enter the desired GPS course, press ENTER
9. Establish Intercept Heading
10. Select GFC 500 autopilot modes for intercepting or tracking the selected course ..... GPS will be displayed on the FD mode bar.

4.5 Approaches

ILS

1. Load the approach into the External navigator ..... Verify external navigator tunes the proper frequency. Select it as the active frequency.
2. Navigation Source ..... Select LOC on the external navigator
3. Approach Minimums ..... Set the barometric minimums alert bug
   - On the PFD, Touch the **HSI.**
   - Touch the Highlight Minimums window.
   - Enter Barometric Altitude Minimums and touch ENTER
4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (LOC 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator, verify CDI changes to LOC and slews to the inbound course.

   OR

   - If using a VHF navigation receiver, set the CDI to the desired course ..... Touch the Selected Course window on the PFD.
   - Enter the desired LOC course, press ENTER.

8. Establish Intercept Heading.
9. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
10. Upon reaching the LOC course, turn inbound and follow the ILS course and vertical guidance.
11. Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the missed approach altitude.
12. At Decision Altitude (DA), continue visually for a normal landing.

    OR

    Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator
OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator
9. G3X Touch CDI source ..... Touch the HSI display on the PFD.
   PFD Options window opens.
10. Select the external navigator from the CDI Source window (GPS 1 or 2).
11. Press and Hold BACK Button to return to normal PFD display.
12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure. When the airplane is inbound towards the final approach course, the CDI will automatically switch from GPS navigation to LOC navigation.

13. Verify ..... Course pointer slews to the front course.
14. Upon reaching the LOC course ..... Turn inbound and follow the ILS course and vertical guidance.
15. Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the missed approach altitude.
16. At Decision Altitude (DA), Continue visually for a normal landing,

    OR

    Press GO AROUND button and fly the missed approach procedure.

ILS GLIDE SLOPE INOPERATIVE

1. Load the approach into the External navigator ..... Verify external navigator tunes the proper frequency. Select it as the active frequency.
2. Navigation Source ..... Select LOC on the external navigator
3. Approach Minimums ..... Set the barometric minimums alert bug:
   - On the PFD, Touch the HSI.
   - Touch the Highlight Minimums window.
   - Enter Barometric Altitude Minimums and touch ENTER
4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (LOC 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator, Verify CDI changes to LOC and slews to the inbound course,

OR

- If using a VHF navigation receiver, set the CDI to the desired course ..... Touch the Selected Course window on the PFD.
- Enter the desired LOC course, press ENTER.

8. Establish Intercept Heading.
9. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
10. Upon reaching the LOC course, turn inbound and follow the LOC course.
11. Set Minimum Descent Altitude (MDA)..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
12. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
13. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
14. At Missed Approach Point, Continue visually for a normal landing,

OR

Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator,

OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator
9. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
10. Select the external navigator from the CDI Source window (GPS 1 or 2).
11. Press and Hold BACK Button to return to normal PFD display.
12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure. When the airplane is inbound towards the final approach course, the CDI will automatically switch from GPS navigation to LOC navigation.

13. Verify.....Course pointer slews to the front course.
14. Upon reaching the LOC course, turn inbound and follow the LOC course.
15. Set Minimum Descent Altitude (MDA)..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
16. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
17. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
18. At Missed Approach Point, Continue visually for a normal landing,

    OR

    Press GO AROUND button and fly the missed approach procedure.

RNAV (GPS) OR RNAV (GNSS) – (LPV, LP+V, LNAV/VNAV, or LNAV+V)

NOTE

Some RNAV (GPS) or (GNSS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are NOT considered Approaches with Vertical Guidance (APV). Approaches that are annunciated on the HSI as LP+V, LNAV, or LNAV+V are considered Non-precision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided. LP approaches may not be available outside of the United States.

1. Load the approach into the External navigator.
2. Navigation Source ..... Select GPS on the external navigator
3. Approach Minimums..... Set the barometric minimums alert bug:
   - On the PFD, Touch the HSI.
   - Touch the Highlight Minimums window.
   - Enter Barometric Altitude Minimums and touch ENTER
4. G3X Touch CDI source .....Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (GPS 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator .... Verify CDI slews to the inbound course.

8. Establish Intercept Heading.
9. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
10. Upon reaching the GPS course, turn inbound and follow the GPS course and GP vertical guidance.
11. Verify on the HSI the Navigation mode indicates the approach being flown, (LPV, LP+V, LNAV/VNAV, or LNAV+V)
12. Set Missed Approach Altitude ..... Touch the Reference Altitude display.
    Enter the missed approach altitude.
13. At Decision Altitude (DA or MDA for an LNAV+V), Continue visually for a normal landing.

OR

Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator,

OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator
9. G3X Touch CDI source ..... Touch the HSI display on the PFD.
    PFD Options window opens.
10. Select the external navigator from the CDI Source window (GPS 1 or 2).
11. Press and Hold BACK Button to return to normal PFD display.
12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure. When the airplane is inbound towards the final approach course, the CDI will automatically slew to the inbound course.

13. Verify ..... Course pointer slews to the front course
14. Upon reaching the GPS course, turn inbound and follow the GPS course and GP vertical guidance.
15. Verify on the HSI the Navigation mode indicates the approach being flown, (LPV, LP+V, LNAV/VNAV, or LNAV+V)
16. Set Missed Approach Altitude ..... Touch the Reference Altitude display.
    Enter the missed approach altitude.

17. At Decision Altitude (DA or MDA for a LPV+V or LNAV+V), continue visually for a normal landing.

OR

Press GO AROUND button and fly the missed approach procedure.

RNAV (GPS) OR RNAV (GNSS) – (LNAV, LP)

NOTE

Some RNAV (GPS) or (GNSS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are NOT considered Approaches with Vertical Guidance (APV). Approaches that are annunciated on the HSI as LP+V, LNAV, or LNAV+V are considered Non-precision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided. Approaches that are annunciated on the HSI as LP will not have vertical glidepath (GP) information provided. LP approaches may not be available outside of the United States.

1. Load the approach into the External navigator.
2. Navigation Source ..... Select GPS on the external navigator
3. Approach Minimums ..... Set the barometric minimums alert bug:
   - On the PFD, Touch the HSI.
   - Touch the Highlight Minimums window.
   - Enter Barometric Altitude Minimums and touch ENTER
4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (GPS 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator .... Verify CDI slews to the inbound course.
8. Establish Intercept Heading.
9. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
10. Upon reaching the GPS course, turn inbound and follow the GPS course.
11. Verify on the HSI the Navigation mode indicates the approach being flown, (LNAV or LP)
12. Set Minimum Descent Altitude (MDA)..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
13. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
14. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
15. At Missed Approach Point, Continue visually for a normal landing.

OR

Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator,

OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator
9. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
10. Select the external navigator from the CDI Source window (GPS 1 or 2).
11. Press and Hold BACK Button to return to normal PFD display.
12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure. When the airplane is inbound towards the final approach course, the CDI will automatically slew to the inbound course.

13. Verify ..... Course pointer slews to the front course
14. Upon reaching the GPS course, turn inbound and follow the GPS course.
15. Verify on the HSI the Navigation mode indicates the approach being flown, (LNAV or LP)
16. Set Minimum Descent Altitude (MDA) ..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
17. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
18. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
19. At Missed Approach Point, Continue visually for a normal landing.

OR

Press GO AROUND button and fly the missed approach procedure.

VOR APPROACH

1. Load the approach into the External navigator ..... Verify external navigator tunes the proper frequency. Select it as the active frequency.
2. Navigation Source ..... Select GPS on the external navigator
3. Approach Minimums..... Set the barometric minimums alert bug:
   - On the PFD, Touch the HSI.
   - Touch the Highlight Minimums window.
   - Enter Barometric Altitude Minimums and touch ENTER
4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (GPS 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator, Verify CDI slews to the appropriate course.
8. Navigation Source ..... Select VOR on the external navigator.
9. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
10. Select the external navigator from the CDI Source window (VOR 1 or 2).
11. Verify the selected course ..... Touch the Selected Course window to adjust if needed.
12. Establish Intercept Heading.
13. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
14. Upon reaching the VOR course, turn inbound and follow the VOR course.
15. Set Minimum Descent Altitude (MDA)..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
16. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
17. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
18. At Missed Approach Point, Continue visually for a normal landing,

    OR

    Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator.

OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator
9. G3X Touch CDI source ..... Touch the HSI display on the PFD.
   PFD Options window opens.
10. Select the external navigator from the CDI Source window (GPS 1 or 2).
11. Press and Hold BACK Button to return to normal PFD display.
12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure.

13. When established inbound to the FAF ..... Navigation Source, Select VOR on the external navigator.
14. Verify ..... VOR is annunciated in the HSI.
15. Verify ..... Course pointer is on the FAF inbound course.
16. Set Minimum Descent Altitude (MDA) ..... Touch the Reference Altitude display.
    Enter the Minimum Descent Altitude.
17. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
18. Adjust VOR course if needed inside the FAF.
19. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display.
    Enter the Missed Approach Altitude.
20. At Missed Approach Point, Continue visually for a normal landing.

    OR

    Press GO AROUND button and fly the missed approach procedure.

BACK COURSE (BC)

1. Load the approach into the External navigator ..... Verify external navigator tunes the proper frequency.
   Select it as the active frequency.
2. Navigation Source ..... Select GPS on the external navigator
3. Approach Minimums ..... Set the barometric minimums alert bug:

- On the PFD, Touch the HSI.
- Touch the Highlight Minimums window.
- Enter Barometric Altitude Minimums and touch ENTER

4. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
5. Select the external navigator from the CDI Source window (GPS 1 or 2).
6. Press and Hold BACK Button to return to normal PFD display.

If Flying Vectors-To-Final:

7. Activate Vectors-to-Final on the external navigator, Verify CDI changes slews to the localizer front course.
8. Navigation Source ..... Select LOC on the external navigator.
9. G3X Touch CDI source ..... Touch the HSI display on the PFD. PFD Options window opens.
10. Select the external navigator from the CDI Source window (LOC 1 or 2).
11. Verify the selected front course..... Touch the Selected Course window to adjust if needed.
12. Establish Intercept Heading.
13. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.
14. Upon reaching the BC course, turn inbound and follow the BC course guidance.
15. Set Minimum Descent Altitude (MDA)..... Touch the Reference Altitude display. Enter the Minimum Descent Altitude.
16. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.
17. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display. Enter the Missed Approach Altitude.
18. At Missed Approach Point, Continue visually for a normal landing,

    OR

    Press GO AROUND button and fly the missed approach procedure.

If Flying Full Approach Including Transition:

ACTIVATE THE APPROACH on the External navigator,

OR

ACTIVATE a DIRECT TO the IAF on the External navigator.

7. Navigation Source ..... Select GPS on the external navigator
8. Select IAF waypoint and execute the Direct-TO on the external navigator

9. G3X Touch CDI source ..... Touch the HSI display on the PFD.
PFD Options window opens.

10. Select the external navigator from the CDI Source window (GPS 1 or 2).

11. Press and Hold BACK Button to return to normal PFD display.

12. Verify ACTIVE and ARMED modes on the AFCS Status Box on the PFD, if using the GFC 500 autopilot/FD.

NOTE

The airplane will navigate in GPS mode throughout the intermediate portion of the approach procedure.

13. When established inbound to the FAF ..... Navigation Source, Select LOC on the external navigator.

14. Verify ..... BC is annunciated in the HSI.

15. Verify ..... Course pointer is on the front course.

16. Set Minimum Descent Altitude (MDA) ..... Touch the Reference Altitude display.
Enter the Minimum Descent Altitude.

17. At the Final Approach Fix (FAF), begin descent to an intermediate altitude or the Minimum Descent Altitude.

18. At the Minimum Descent Altitude, Set Missed Approach Altitude ..... Touch the Reference Altitude display.
Enter the Missed Approach Altitude.

19. At Missed Approach Point, Continue visually for a normal landing.

OR

Press GO AROUND button and fly the missed approach procedure.

GO AROUND (GA)

1. Control Wheel ..... GRASP FIRMLY
2. GO AROUND button ..... PUSH
3. Rotate to Go Around attitude
4. Go Around ..... EXECUTE

NOTE

If using a Garmin external navigator and an instrument approach is loaded, the HSI will automatically change to GPS course guidance, and the flight plan will automatically sequence onto the missed approach portion of the flight plan.

5. Verify the HSI changes to the GPS navigation.
6. Verify that leg sequencing has unsuspended. If not, unsuspend leg sequencing.
7. Fly Published Missed Approach Procedure,

7 SYSTEM DESCRIPTION

The G3X Touch EFIS is scalable with a variety of configurations supported. The functions described in this section may not be available in all aircraft depending on installed equipment and interfaces. A minimum installation with a single display may be a standalone MFD or a PFD which can be split screened to provide both PFD and MFD functions. Optional functions include EIS, datalink traffic and weather, AOA, autopilot interface, remote audio panel, GPS/NAV/COM interface, transponder interface, and others.

7.1 Primary Flight Instruments

When a PFD is installed, attitude information is displayed over a virtual blue sky and synthetic ground with a white horizon line. The Attitude Indicator displays the pitch (indicated by the Amber symbolic aircraft on the pitch scale), roll, and slip/skid information.

The horizon line is part of the pitch scale. Pitch markings occur at 2.5° intervals through all pitch ranges.

The inverted white triangle indicates zero on the roll scale. Major tick marks at 30° and 60° and minor tick marks at 10°, 20°, and 45° are shown to the left and right of the zero. Angle of bank is indicated by the position of the pointer on the roll scale.

Slip/skid is indicated by the location of the ball.



Bezel Overview (GDU 460)



Bezel Overview (GDU 470)

NRST Key	Press to display the Nearest Page for viewing the nearest airports, intersections, NDBs, VORs, waypoints, frequencies, and airspaces
Direct-To Key	Press to activate the Direct-To function, enter a destination waypoint establish a direct-to course to the selected destination
MENU Key	Press once to view the Page Menu Press twice to view the Main Menu Press a third time to clear the Main Menu enabled.
BACK Key	Press to return to the previous screen Press and hold to return to the default MFD Page

The Standard Rate Turn Bank Angle Pointers are green pointers displayed on the roll scale that show the bank angle corresponding to a standard rate turn.



Standard Rate Turn Bank Angle Pointers

The Turn Rate Indicator is located at the top of the HSI. Tick marks to the left and right of the displayed heading denote standard turn rates (3 deg/sec). A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 6 seconds, based on the present

turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid.

The Airspeed Indicator may be displayed as a vertical tape or a round dial. When the Airspeed Indicator is displayed as a tape, it displays a range of 70 knots on a rolling number gauge using a vertical tape. Numeric labels and major tick marks are shown at intervals of 10 knots. Minor tick marks are at intervals of 5 knots. The current airspeed is displayed in the black pointer. The True Airspeed (TAS) is displayed above the scale in white digits and the Ground Speed (GS) is displayed below the scale in magenta digits.

The Altimeter may be displayed as a vertical tape or a round dial. When the Altimeter is displayed as a tape, it displays 400 feet of barometric altitude values at a time on a rolling number gauge using a moving tape. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The current altitude is displayed in the black pointer. The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa) when metric units are selected.

The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. A bug corresponding to this altitude is shown on the altimeter; if the Selected Altitude exceeds the range shown on the tape, the bug appears at the corresponding edge of the tape.

The Altitude Alerting function provides the pilot with visual and aural alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The following will occur when approaching the Selected Altitude:

- Passing within 1000 feet of the Selected Altitude, the Selected Altitude (shown above the Altimeter) flashes for 5 seconds and an aural tone is generated.
- When the aircraft passes within 200 feet of the Selected Altitude, the Selected Altitude flashes for 5 seconds and an aural tone is generated to indicate that the aircraft is approaching the selected altitude.
- After reaching the Selected Altitude, if the pilot flies outside the deviation band (±200 feet of the Selected Altitude), the Selected Altitude changes to Amber text on a black background, flashes for 5 seconds, and an aural tone is generated.

The Vertical Speed Indicator (VSI) may be displayed as a tape or an arc segment. The VSI displays the aircraft vertical speed using a non-moving tape labeled at 500, 1000 and every 1000 fpm up to the maximum with minor tick marks every 100 feet up to 1000 fpm. The current vertical speed is displayed using a white arrow along the scale.

7.2 Vertical Deviation Indicators

The Vertical Deviation (Glideslope) Indicator (VDI) appears to the left of the altimeter whenever an ILS frequency is tuned in the active NAV field of an external navigator. A green diamond acts as the VDI indicator. The green 'G' indicates an external glideslope source. If a localizer frequency is tuned and there is no glideslope signal, "NO GS" is annunciated.



Vertical Deviation Indicator (Glideslope – ILS Source)

The Vertical Deviation (Glidepath) Indicator (VDI) also appears to the left of the altimeter during a GPS approach. The glidepath is analogous to the glideslope for GPS approaches supporting WAAS vertical guidance (LNAV+V, L/VNAV, LPV). The Glidepath Indicator appears on the G3X Touch as a magenta diamond. The magenta 'G' indicates a GPS source. If the approach type downgrades past the final approach fix (FAF), "NO GP" is annunciated.



Vertical Deviation Indicator (Glidepath – GPS Source)

An external navigation source is not required to receive VNAV indications. A magenta chevron (VNAV Indicator) to the left of the altimeter on the Vertical Deviation Scale shows the VNAV profile, and a magenta chevron (Required Vertical Speed Indicator (RVSI)) on the Vertical Speed Indicator indicates the required vertical speed to reach the target altitude. The magenta 'V' indicates a VNAV profile is active.



VNAV Indicator

7.3 HSI Annunciations

Some or all HSI annunciations may appear in the four quadrants of the G3X Touch HSI depending on the external navigator(s) configured.

Amber **LOI** – Loss of GPS integrity

Amber or Magenta **VFR** – An external GPS source is configured but there is not enough guidance data for IFR use.

Amber **REV** – External navigation source failed. Reverted to internal VFR GPS for navigation.

Amber **MSG** – External navigation source has a pending message

Cyan **INT** – The pilot has elected to use the internal GPS navigation source instead of the external GPS navigation source.

7.4 Course Deviation Indicator (CDI)

The HSI contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The course pointer is a single line arrow (GPS1, VOR1, and LOC1) or a double line arrow (GPS2, VOR2, and LOC2) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.

The Course Deviation Indicator (CDI) moves left or right from the course pointer along a lateral deviation scale to display aircraft position relative to the course. If the course deviation data is not valid, the CDI is not displayed.

Another Lateral Deviation Scale and combination Course Deviation and To/From Indicator is located below the slip/skid indicator.



CDI and Lateral Deviation Indication

The CDI can display two sources of navigation: GPS or NAV (VOR, localizer) depending on the external navigator(s) configured. Color indicates the current navigation source: magenta (for GPS) or green (for VOR and LOC). The full-scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When coupled to a VOR or localizer (LOC), the CDI has the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while coupled to GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.

In addition to the flight instruments, the PFD also displays supplemental information, including the Outside Air Temperature (OAT), wind data, User Timer, and G-Meter.

7.5 Display of PFD information on MFD

MFDs installed as part of the G3X touch system can display PFD information if manually selected by the pilot, or will automatically do so if the installed PFD display fails. The display of PFD information on an MFD is a duplication of the original PFD information and is not an independent compilation of data from other sources.

To manually display backup PFD information on an MFD:

1. On the MFD, press the MENU button twice.
2. Select Setup.
3. Select Display.
4. On a 7" GDU 470, set Full MFD/PFD Toggle to Enabled. On a 10" GDU 460, set MFD Split Screen Page to PFD.
5. Press and hold the BACK button to close the Display Setup window and return to MFD display.
6. On a 7" MFD, touch the PFD button in the upper corner to select the backup PFD display. On a 10" MFD, touch the Split button in the upper corner to select the backup PFD display.

7.6 Engine Indication System

The G3X Touch EIS (if installed) displays engine, electrical, and other system parameters. Gauges required to be displayed full time are located on the Main Engine Display which is always in view. Additional EIS information can be viewed on the Eng Page which can be selected by touching the Main Engine Display or by turning the 'Select Page' knob to the right on an MFD window.

Green bands on the instruments indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. When unsafe operating conditions occur, the corresponding caution readout will display solid amber and the warning readout will flash red. Most EIS caution and warning conditions also generate an alert message on the PFD, including gauges that may appear only on the Eng Page. An aural alert is also issued with a flashing red warning. If sensor data for an instrument becomes invalid or unavailable, a red "X" is displayed across the instrument.

7.7 Communication / Navigation / Surveillance System

The Communication/Navigation/Surveillance (CNS) system includes the audio interface, communication radios, navigation radios, and Mode S transponder. These functions can be accessed from the boxes that make up the CNS Data Bar located at the top of the PFD and/or MFD.



CNS Data Bar

7.8 Remote Transponder Interface

The G3X Touch is capable of interfacing with several remote transponders providing Mode S interrogation and reply capabilities. Transponder tuning for panel mount transponders is also supported.

Ground and Altitude Modes

Most Garmin transponders automatically transition between on-ground and in-air and operate in the appropriate mode at all times. No pilot action is required to manage modes unless there is a need to manually select STBY or ON modes.

G3X displays a green GND indication and transponder code in the Transponder Data Box while on-ground, and a green ALT indication when in-air, when not set to STBY or ON.

NOTE

Some panel mount transponders may indicate ALT on their dedicated display at all times, even while on-ground. As a result, in some installations, the transponder display and G3X display will indicate different modes while on the ground, although they are functionally equivalent.

Standby Mode (Manual)

When Standby mode is selected, the transponder does not reply to interrogations, but new codes can be entered. A white STBY indication and transponder code appear in the Transponder Data Box. The transponder will not automatically transition from STBY to ALT mode when the aircraft transitions from on-ground to in-air.

On Mode (Manual)

ON Mode can be selected at any time. ON Mode generates Mode A and Mode S replies, but Mode C altitude reporting is inhibited. In ON Mode, a green ON indication and transponder code appear in the Transponder Data Box.

Reply Status

When the transponder sends replies to interrogations, a green R indication appears momentarily in the Transponder Data Box.

IDENT Function

Touching IDENT sends a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identing transponder from all the others on the air traffic controller's screen. After touching IDENT the bar on the button turns green momentarily.

7.9 Minimum Altitude Display and Alerting

When enabled by the pilot, an altitude minimums bug will be displayed in cyan on the barometric altitude tape.

Altitude minimums are accessed under the PFD Options Menu → Minimums sub menu and can be set by touchscreen keypad or dual-concentric knob.

Both visual and aural altitude minimums alerts are provided. During a descent to minimums, the minimums bug will change from cyan to white when the aircraft descends to within 100 ft of minimums. An aural "Minimums, Minimums" alert will be triggered when the aircraft's altitude descends through minimums and the minimums bug will change to Amber. As the aircraft altitude climbs back above minimums, the minimums bug will change to white 50 ft above minimums and cyan 150 ft above minimums. Alerting is rearmed once the aircraft is 150 ft or more above the minimum's altitude.

If a new approach is loaded into the external navigator, the Minimums Altitude display is not automatically updated with the new approach minimums. The pilot must update the Minimums Altitude Display with the MDA/DH for the approach loaded into the navigator.

7.10 AOA Probe

The G3X Touch PFD will display angle of attack from the GAP 26 AOA probe if installed. The GSU 25 uses the pressure from the GAP 26 probe and the pitot/static pressures it already receives from the existing aircraft pitot/static system to determine the aircraft's angle of attack (AOA).

The AOA indications and warnings presented on the G3X system are for reference only and are not intended as replacements for the aircraft's original stall warning system. The AOA stall warning margin and indications may not be the same at different flap settings and are only supported for positive G flight.

7.11 GAD 27 Wig Wag

The GAD 27 module (if installed) provides a feature that provides the ability to flash the Landing and Taxi lights of the airplane in an alternating fashion, otherwise known as "Wig Wag". Two 3-position switches control this feature, one for the landing lights and one for the taxi lights:

- ON – Respective light is on
- FLASH – Respective light will flash
- OFF – Respective light is off

When both switches are in the FLASH position, the landing and taxi lights alternate off and on with each other to produce the 'Wig-Wag' effect.

Before landing, switch to ON for steady landing lights.

7.12 EIS Caution / Warning Lights

If the G3X EIS display is outside the pilot's primary field of view and a PFD is not installed to provide EIS annunciations, discreet Caution/Warning lights are installed. The lights are installed in the primary field of view and are labeled ENGINE. Only a G3X EIS exceedance from a gauge on the Main EIS Display triggers the EIS Caution/Warning lights. EIS gauges that are not on the Main EIS Display do not alert.

7.13 Smart Glide

When installed with a Garmin GTN Xi with Smart Glide enabled, the G3X Touch will provide Smart Glide map indications, annunciation of GLIDE, and Emergency Page data for the Smart Glide feature. For more details on the Smart Glide function, refer to the GTN Xi Pilot's Guide (190-02327-03, revision D or later) and GTN Xi AFMS (P/N 190-01007-C2 or 190-01007-C3, revision 4 or later).

7.14 SFD Baro Sync

Cyan background coloring of the altimeter barometric window on either the G5/GI 275 or G3X PFD altimeters indicates that the altimeter setting is automatically changing to synchronize with the other unit. This feature is called **SFD Baro Sync**.

SFD Baro Sync can be **Enabled** or **Disabled** in the G3X Touch PFD Menu. It defaults to Enabled when the system is powered on. When **SFD Baro Sync** is enabled, and the pilot changes the altimeter setting on one altimeter, the other altimeter setting changes automatically and indicates in inverse video (cyan background with black numbers).

This page intentionally left blank

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

FAA APPROVED

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

Cessna 172N
Make and Model Airplane

Registration Number: D-ETKM Serial Number: 172-72198

This document serves as an FAA Approved Airplane Flight Manual Supplement or Supplemental Airplane Flight Manual when the GTX 33X or GTX 3X5 with ADS-B is installed in accordance with Supplemental Type Certificate SA01714WI. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the FAA approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA approved Airplane Flight Manual, markings, or placards.

FAA Approved By: Erik Frisk

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

Date: 31-MAY-2024

LOG OF REVISIONS				
Revision Number	Date	Page Number	Description	FAA Approved
1	05/01/2013	All	Complete Supplement	*Robert Murray* Robert Murray ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *05/01/2013*
2	03/08/2016	All	New supplement format with GTX 3X5 added.	*Michael Warren* Michael Warren ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *03/08/2016*
3	12/07/2017	All	Updated SW versions and removed section 3.2.3. Updated section 2.2 Corrected PED FAR reference and additional minor corrections.	*Erik Frisk* Erik Frisk ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *12/21/2017*
4	09/09/2019	4, 6, 7, 9, 11, 13, 14, 18	Added GTX diversity units, updated SW versions, expanded allowed remote control panels, and incorporated other minor changes	*JR Brownell* JR Brownell ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *09/09/2019*
5	06/16/2021	10, 11, 14, 18	Updated GTX 3X5 Main software to version 2.60, added GI 275 as a control display and GPS 175/GNC 355 as a GPS source	*JR Brownell* JR Brownell ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *06/16/2021*

LOG OF REVISIONS				
Revision Number	Date	Page Number	Description	FAA Approved
6	05/31/2024	12, 15	Added G3X Touch as a control display, updated GTX 3X5 main software to v3.85.	See cover page 1

Table of Contents

SECTION		PAGE
Section 1. GENERAL		**5**
1.1	GTX 33X	5
1.2	GTX 3X5	7
1.3	Capabilities	10
1.4	Installation Configuration	10
1.5	Definitions	13
Section 2. LIMITATIONS		**14**
2.1	Minimum Equipment	14
2.2	ADS-B Out	14
2.3	TIS Traffic Display with User Navigation Angle	14
2.4	Applicable System Software	15
2.5	Pressure Altitude Broadcast Inhibit (PABI)	15
2.6	Datalinked Weather Display (GTX 345 Only)	15
2.7	Portable Electronic Devices	15
Section 3. EMERGENCY PROCEDURES		**16**
3.1	Emergency Procedures	16
3.2	Abnormal Procedures	16
Section 4. NORMAL PROCEDURES		**17**
4.1	Unit Power On	17
4.2	Before Takeoff	18
Section 5. PERFORMANCE		**18**
Section 6. WEIGHT AND BALANCE		**18**
Section 7. SYSTEM DESCRIPTION		**19**
7.1	GTX TIS Behavior	19
7.2	GTX 345R and G950/1000 No Bearing Traffic Alerts	19

Section 1. GENERAL

1.1 GTX 33X

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

All Garmin GTX 33X transponders are a radio transmitter/receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. Each unit is equipped with IDENT capability to initiate the SPI (special position identification) pulse for 18 seconds and will reply to ATCRBS Mode A, Mode C and Mode S All-Call interrogation. Interfaces to the GTX 33X are shown in the following block diagrams.

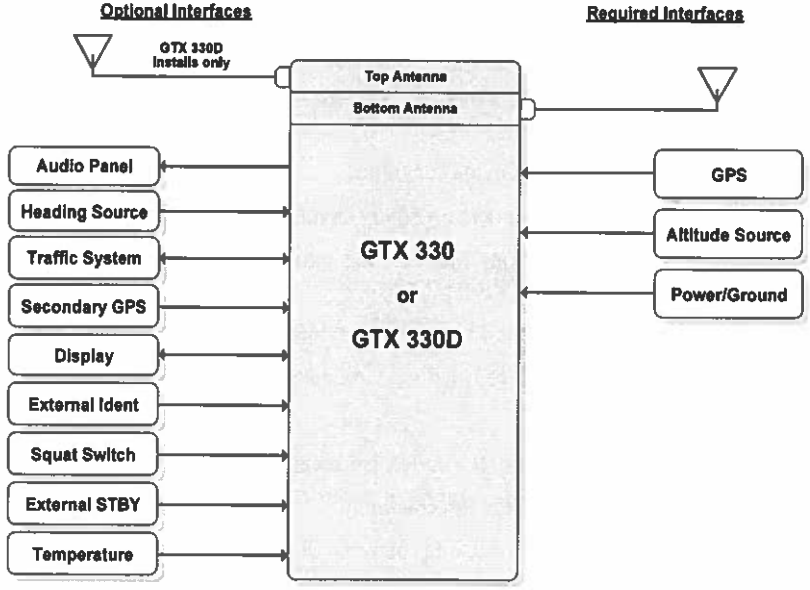


Figure 1 – GTX 330 or GTX 330D Interface Summary

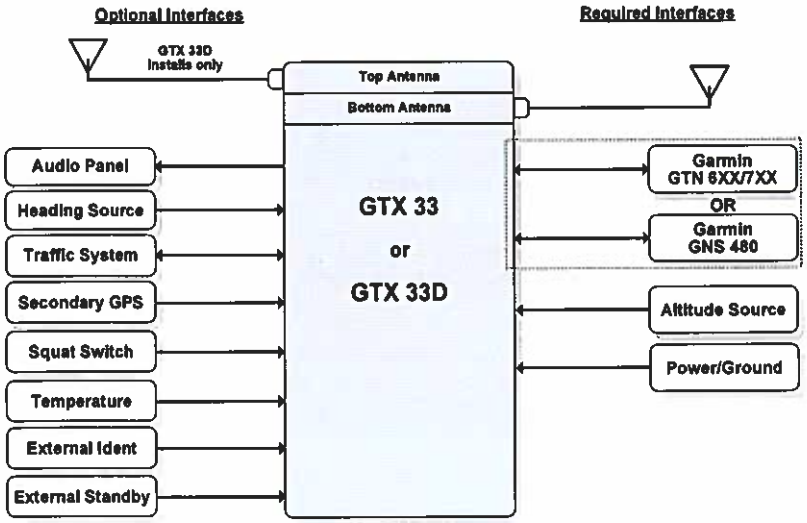


Figure 2 – GTX 33 or GTX 33D Interface Summary

The GTX 33X performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (1090 MHz)
  - Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
    - GPS Position, Altitude, and Position Integrity
    - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
    - Air Ground Status
    - Flight ID, Call Sign, ICAO Registration Number
    - Capability and Status Information
    - Transponder Squawk Codes between 0000-7777.
    - Emergency Status
    - IDENT - initiates SPI (special position identification) pulse for 18 seconds
  - Pressure Altitude Broadcast Inhibit
- Reception of TIS-A traffic data from a ground station
- Provides TIS-A traffic alerting to the pilot via interfaced display and audio output

1.2 GTX 3X5

The Garmin GTX 3X5 family consists of the GTX 335, 335D, 335R, 335DR, 345, 345D, 345R, and 345DR transponders. The functional differences between each of these transponders are described in Table 1. Transponder models with a "D" designation are diversity capable and support both a top fuselage and bottom fuselage antenna.

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

Table 1 – GTX 3X5 Unit Configurations

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

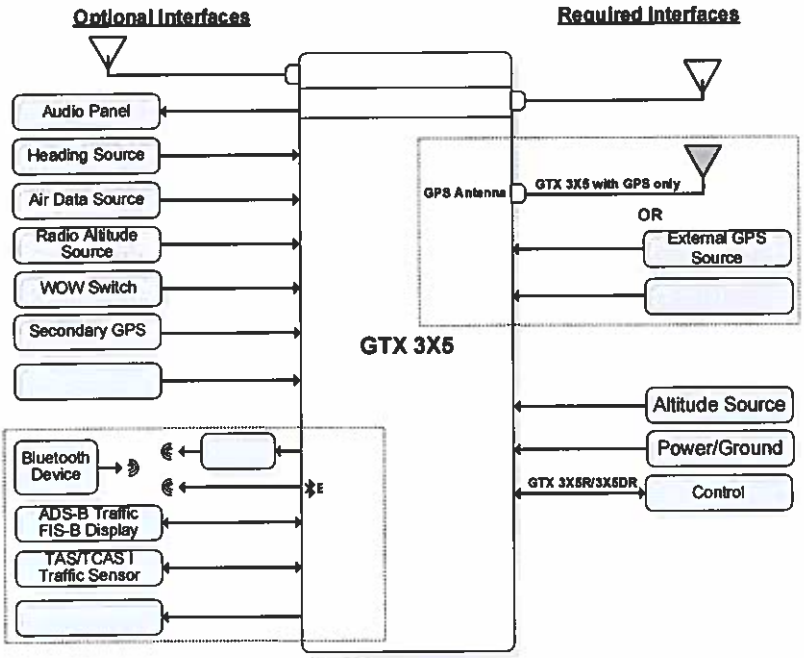


Figure 3 – GTX 3X5 Interface Summary

The GTX 3X5 performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (1090 MHz)
  - Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
    - GPS Position, Altitude, and Position Integrity
    - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
    - Air Ground Status
    - Flight ID, Call Sign, ICAO Registration Number
    - Capability and Status Information
    - Transponder Squawk Codes between 0000-7777.
    - Emergency Status
    - IDENT - initiates SPI (special position identification) pulse for 18 seconds
  - Pressure Altitude Broadcast Inhibit

The GTX 335 performs the following additional functions:

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

The GTX 345 performs the following additional functions:

- Reception of ADS-B In data on 1090 MHz
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
- Reception of ADS-B In data on UAT (978 MHz)
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
  - TIS-B (Broadcast of secondary surveillance radar) (SSR) derived traffic information from a ground station.
  - FIS-B (Broadcast of aviation data from a ground station)
- Provide ADS-B traffic information and alerting to the pilot via an interfaced display
  - Correlation and consolidation of traffic data from multiple traffic sources
  - Aural and visual traffic alerting
- Provide FIS-B data to the pilot via an interfaced display
  - Graphical and textual weather products
    - NEXRAD
    - PIREPs
    - AIRMET/SIGMETs
    - METARs
    - TAFs
    - Winds Aloft
  - Aviation Data
    - TFRs
    - NOTAMs

1.3 Capabilities

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

1.4 Installation Configuration

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

Equipment Installed:

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

Interfaced GPS/SBAS Position Source(s):

GPS #1	GPS #2 (if installed)
☐ Internal	☐ Internal
☐ GTN 6XX/7XX Series	☐ GTN 6XX/7XX Series
☐ GNS 400W/500W Series	☐ GNS 400W/500W Series
☐ GNS 480	☐ GNS 480
☐ GIA 63W	☐ GIA 63W
☐ GDL 88 (GTX 330 only)	☐ GDL 88 (GTX 330 only)
☐ GPS 175/GNC 355	☐ GPS 175/GNC 355

Interfaced Pressure Altitude Source:

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

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

Transponder #1 Remote Control Display	Transponder #2 Remote Control Display (if installed)
☐ GTN 6XX/7XX	☐ GTN 6XX/7XX
☐ GNS 480	☐ GNS 480
☐ G950/1000 Display	☐ G950/1000 Display
☐ GI 275	☐ GI 275
☐ G3X Touch	☐ G3X Touch
☐ Gables 7534 Controller	☐ Gables 7534 Controller
☐ Gables 7614 Controller	☐ Gables 7614 Controller
☐ CTL-92 Controller	☐ CTL-92 Controller
☐ CTL-92E Controller	☐ CTL-92E Controller

Interfaced Active Traffic System:

☐ None

☐ TCAD

☐ TAS/TCAS

NOTE

If the system includes all of the following components:

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

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

1.5 Definitions

The following terminology is used within this document:

ADS-B: Automatic Dependent Surveillance-Broadcast

AFM: Airplane Flight Manual

AFMS: Airplane Flight Manual Supplement

ATCRBS: Air Traffic Control Radar Beacon System

CFR: Code of Federal Regulations

ES: Extended Squitter

GNSS: Global Navigation Satellite System

GNS: Garmin Navigation System

GPS: Global Positioning System

GTX: Garmin Transponder

GTN: Garmin Touchscreen Navigator

ICAO: International Civil Aviation Organization

LRU: Line Replaceable Unit

PABI: Pressure Altitude Broadcast Inhibit

POH: Pilot Operating Handbook

SBAS: Satellite-Based Augmentation System

SW: Software

TCAS: Traffic Collision Avoidance System

TIS: Traffic Information Service

TX: Transmit

Section 2. LIMITATIONS

2.1 Minimum Equipment

The GTX 33X and GTX 3X5 must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Interfaced Equipment	Number Installed	Number Required
Uncorrected Pressure Altitude Source	1	1
GPS SBAS Position Source	1 or more	1
Remote Control Display (for remotely mounted transponders)	1 or more	1

Table 2 – Required Equipment

2.2 ADS-B Out

The GTX 33X and GTX 3X5 only comply with 14 CFR 91.227 for ADS-B Out when all required functions are operational. When the system is not operational, ADS-B Out transmit failure messages will be present on the remote control display interface, or the GTX 330 or GTX 3X5 panel display. If a Gables 7534 controller or Collins CTL-92/92E controller is being used the ADS-B equipment failure condition will be annunciated on the Gables or Collins display "Transponder Fail" while the ADS-B Out Position failure will be annunciated by the remotely installed "ADS-B POSN FAIL" Annunciator.

2.3 TIS Traffic Display with User Navigation Angle

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

2.4 Applicable System Software

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

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

Software Item	Software Version *(or later FAA Approved versions for this STC)*
GTX 33X Main SW Version	8.04
GTX 3X5 Main SW Version	2.85

Table 3 - Software Versions

2.5 Pressure Altitude Broadcast Inhibit (PABI)

Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control while operating within airspace requiring an ADS-B Out compliant transmitter. PABI is enabled by selecting the GTX to ON mode.

2.6 Datalinked Weather Display (GTX 345 Only)

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

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

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

2.7 Portable Electronic Devices

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

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No Change.

3.2 Abnormal Procedures

3.2.1 LOSS OF AIRCRAFT ELECTRICAL POWER GENERATION

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

Transponder and ADS-B Out functions will no longer be available.

NOTE

This guidance is supplementary to any guidance provided in the POH or AFM for the installed aircraft for loss of power generation.

3.2.2 LOSS OF GPS/SBAS POSITION DATA

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GTX will no longer be transmitting ADS-B Out data.

For GTX 330 installations:

NO ADSB annunciator illuminated:

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

For GTX 3X5 installations:

NO 1090ES TX annunciator illuminated:

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

For GTX 33 and GTX 3X5R installations:

Reference Display Device documentation for applicable annunciation:

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

Section 4. NORMAL PROCEDURES

The procedures described below are specific only to the panel mounted GTX 330 or GTX 3X5 transponders. Cockpit Reference Guides and Pilot Guides for interfaced remote control displays will provide additional operating information specific to the displays or other traffic systems.

ADS-B Out functionality resides within the GTX transponders thereby providing a single point of entry for Mode 3/A code, Flight ID, IDENT functionality and activating or deactivating emergency status for both transponder and ADS-B Out functions. Details on performing these procedures are located in the GTX 330/330D Pilot's Guide and GTX 3X5 Series Transponder Pilot's Guide.

4.1 Unit Power On

For GTX 330 installations:

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

For GTX 3X5 installations:

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

NOTE

The NO ADS-B or NO 1090ES TX Annunciation (or associated display annunciations) may illuminate as the unit powers on and begins to receive input from external systems, to include the SBAS position source.

4.2 Before Takeoff

For GTX 330 installations:

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

For GTX 3X5 installations:

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

NOTE

The ADS-B TX or 1090ES TX CTL must be turned on and the NO ADS-B or NO 1090ES TX Annunciation (or associated display annunciations) must be **EXTINGUISHED** for the system to meet the requirements specified in 14 CFR 91.227. This system must be operational in certain airspaces after January 1, 2020 as specified by 14 CFR 91.225.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTION

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

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

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

Title	Part Number	Revision
Garmin GTN 725/750 Pilot's Guide	190-01007-03	Rev. E (or later)
Garmin GTN 625/635/650 Pilot's Guide	190-01004-03	Rev. E (or later)
GNS 480 Pilot's Guide	190-00502-00	Rev. D (or later)
GTX 3X5 Series Transponder G1000 Pilot's Guide	190-01499-01	Rev. A (or later)
Garmin GI 275 Pilot's Guide	190-02246-01	Rev. F (or later)
Garmin GPS 175/GNC 355/GNX 375 Pilot's Guide	190-02488-01	Rev. B (or later)

7.1 GTX TIS Behavior

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

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

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

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

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT
as installed in

Cessna 172N

Make and Model Airplane

Registration Number: D-ETKI Serial Number: 172-72198

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01818WI for the installation and operation of the Garmin G5 Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, 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 or markings, or the basic FAA approved Airplane Flight Manual.

FAA approved sections of this supplement are labeled as "FAA APPROVED." Sections not labeled "FAA APPROVED" are provided for guidance information only.

FAA APPROVED BY: Paul Mast

Paul Mast
ODA STC Unit Administrator
GARMIN International, Inc
ODA-240087-CE

DATE: 5-2-2023

Matjaž Meze
CA No: 001
AEROSPACE DELEGATED SLCAO.024

© Copyright 2019 - 2023
Garmin Ltd. or its subsidiaries
All Rights Reserved

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc

Log of Revisions

FAA Approved AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	7/22/2016	Robert Murray ODA STC Unit Administrator
2	ALL	Added information regarding G5 DG/HSI.	4/28/2017	Robert Murray ODA STC Unit Administrator
3	ALL	Added interface to 3rd party autopilots.	10/18/2017	Robert Murray ODA STC Unit Administrator
4	ALL	Added note to General section.	10/26/2017	Paul Mast ODA STC Unit Administrator
5	ALL	Reformatted document. Updated system messages interface. Added DG/HSI reversion description.	12/20/2017	Robert Murray ODA STC Unit Administrator
6	ALL	Added interface description to GAD 13. Added information regarding multiple NAV source inputs.	7/19/2019	David G. Armstrong ODA STC Unit Administrator
7	ALL	Added information regarding FAA approved content. Updated SW ver. and references to GAD 29B to GAD 29B/GAD29D	9/28/2021	Paul Mast ODA STC Unit Administrator
8	3-4 4-2 4-3	Addition of NO BATT emergency procedure. Update normal procedure: *Prior to Flight in IMC.* Update Roll Steering (GPSS) emulation normal procedure.	12/29/2021	Robert Murray ODA STC Unit Administrator
9	2-1	Update limitations regarding use of secondary instruments.	See Cover	See Cover

This page intentionally left blank.

Table of Contents

Section 1 – General 1-1

Abbreviations and Terminology 1-2

Section 2 – Limitations 2-1

System Software Requirements 2-1

Use of Secondary Instruments 2-1

Kinds of Operations 2-1

Section 3 – Emergency Procedures 3-1

G5 Failure Indications 3-1

Attitude Failure 3-1

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error 3-1

GPS Failure 3-2

Attitude Aligning 3-2

Attitude Aligning / Keep Wings Level 3-2

Loss of Electrical Power to the G5 Display 3-2

Loss of Electrical Power to the GAD 29B/GAD 29D (If Installed) 3-3

Loss of Electrical Power to the GAD 13 (If Installed) 3-3

Internal Battery Failure 3-4

Section 4 – Normal Procedures 4-1

G5 Power Button and Knob 4-1

Backlight Intensity Adjustment 4-1

Prior to Flight in Instrument Meteorological Conditions 4-2

Autopilot Operations with the G5 4-3

Course / NAV Selection Coupling to the Autopilot (If Configured) 4-3

Heading Bug Coupling Capability to the Autopilot (If Configured) 4-3

Roll Steering (GPSS) Emulated via HDG Mode (If Configured) 4-3

HSI Source Selection (If Configured) 4-4

HSI Portable Navigation Device GPS VFR Annunciation (If Configured) 4-4

Section 5 – Performance 5-1

Section 6 – Weight and Balance 6-1

Section 7 – System Description 7-1

System Messages 7-1

This page intentionally left blank.

SECTION 1 – GENERAL

The G5 Electronic Flight Instrument can display the following information to the pilot depending on the installation and location of the G5 instrument.

- Primary attitude
- Primary slip and turn rate information
- Primary heading
- Secondary airspeed
- Secondary altimeter
- Secondary ground track

When installed in place of the attitude indicator, the primary function of the G5 is to provide attitude information to the pilot. When installed in place of the rate of turn indicator, the primary function of the G5 is to provide turn rate and slip ball information to the pilot. When installed in place of the directional gyro, the primary function of the G5 is to provide directional information to the pilot.

NOTE:

The pilot is reminded to perform appropriate flight and navigation instrument cross checks for the type of operation being conducted.

In case of a loss of aircraft electrical power, a backup battery (optional when installed as a DG/HSI) sustains the G5 Electronic Flight Instrument for up to four hours.

An optional GAD 29B/GAD 29D may be installed to provide course and heading datum to an autopilot based on the data selected for display on the HSI.

An optional GAD 13 and OAT probe may be installed to provide measured outside air temperature (OAT) to the G5 for display of true airspeed (TAS), outside air temperature, winds, and density altitude.

This STC allows the removal of the aircraft's vacuum system if it is not required to support any other airframe system.

Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

ADI	Attitude Direction Indicator
AFMS	Airplane Flight Manual Supplement
ATT	Attitude
CDI	Course Deviation Indicator
DG	Directional Gyro
DR	Dead Reckoning
FAA	Federal Aviation Administration
GPS	Global Positioning System
GPSS	GPS Roll Steering
HDG	Heading
HSI	Horizontal Situation Indicator
ILS	Instrument Landing System
LOC	Localizer (no glideslope available)
LOI	Loss of Integrity
OAT	Outside Air Temperature
TAS	True Airspeed
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range

SECTION 2 – LIMITATIONS

System Software Requirements

The G5 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G5 Electronic Flight Instrument	8.00

Use of Secondary Instruments

A G5 Electronic Flight Instrument may not be used as a primary indication of airspeed, attitude, or vertical speed.

If a G5 Electronic Flight Instrument is installed as the primary rate of turn indicator, a second G5 may not be used as a primary indication of aircraft attitude.

A G5 Electronic Flight Instrument installed in place of a directional gyro may not also be used as a primary indication of aircraft attitude. A second G5, in addition to a G5 used as a directional gyro, may be installed as primary indication of aircraft attitude.

NOTE:

For aircraft approved for VFR-only operations, the G5 Electronic Flight Instrument may be installed as an attitude indicator and rate of turn indicator.

Kinds of Operations

No Change except for the following:

- When a portable navigation source is selected on the G5, it shall not be used for the primary means of navigation for IFR operations.

This page intentionally left blank.

SECTION 3 – EMERGENCY PROCEDURES

G5 Failure Indications

If a G5 function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G5 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged and it is not likely an installation related problem, the G5 should be serviced by a Garmin-authorized repair facility.





Attitude Failure

Attitude failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the display.

Rate-of-turn and slip information will not be available.

1. Use standby instruments.
2. Seek VFR conditions or land as soon as practical.

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and a yellow "HDG" on the display.

1. Use standby magnetic compass.

NOTE:

If the G5 DG/HSI has a valid GPS signal the G5 DG/HSI instrument will display the GPS track information in magenta.

GPS Failure

If GPS navigation receivers and/or navigation information are not available or invalid, the G5 will display Dead Reckoning mode (DR) or Loss of Integrity mode (LOI) on the HSI in the lower left corner.

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

1. Use alternate navigation source.

If No Alternate Navigation Sources Are Available:

If DR is Displayed on HSI:

1. Use the amber CDI for course information.
2. Fly toward known visual conditions.

If LOI is Displayed on HSI:

1. Fly toward known visual conditions.

For aircraft equipped with a GAD 29B/GAD 29D interfaced to an autopilot, GPSS will be displayed in amber text when GPSS emulation has been selected from the G5 menu.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.

Attitude Aligning

During system initialization, the G5 displays the message 'ALIGNING' over the attitude indicator. The G5 will typically display valid attitude within the first minute of power-up. The G5 can also align itself while taxiing and during level flight.

If the "ALIGNING" indication occurs during flight and attitude remains displayed, the attitude display is acceptable for use for flight in instrument conditions. The message will clear when the attitude solution is within the systems internal accuracy tolerances. It is recommended to maintain wings level to reduce the time for the system to align.

Attitude Aligning / Keep Wings Level

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G5 has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. If attitude does not return, seek VFR conditions or land as soon as practical.

Loss of Electrical Power to the G5 Display

In the event of a loss of aircraft electrical power to the G5 attitude display, the indicator will continue to function on its internal battery. If an internal battery is installed on the optional G5 HSI, the indicator will continue to function on the internal battery if aircraft power is lost. Internal battery endurance is indicated on the G5 display in hours and minutes. The charging symbol will be removed and the internal battery will not be charged.

In the event the G5 attitude display powers down, the optional G5 HSI will automatically revert to displaying attitude information. It will not revert back to the DG/HSI format if the G5 attitude unit regains power. The DG/HSI presentation may be selected from the G5 menu on the G5 DG/HSI unit after reversion to the attitude display.

Loss of Electrical Power to the GAD 29B/GAD 29D (If Installed)

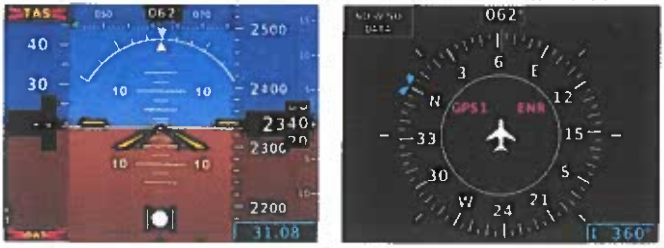
In the event of a loss of aircraft electrical power to the optional GAD 29B/GAD 29D, the heading and course datum will be unavailable to the autopilot and the autopilot may deviate from the intended path or may disconnect. GPS flight plan course information may be displayed on the HSI and VFR will be displayed in amber text on the HSI. GPSS will be displayed in amber text, if GPSS mode is selected.



1. Deselect GPSS from the G5 menu and select a different autopilot mode.
2. Lateral GPS course guidance may only be used in VFR conditions.

Loss of Electrical Power to the GAD 13 (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 13, the OAT and TAS indications will be replaced with a red X. The Density Altitude indication will be removed, and "No Wind Data" will be displayed in the wind field.



1. Use an alternate source of outside air temperature to calculate true airspeed, density altitude, and winds.

Internal Battery Failure

In the event of a failure of the G5 internal battery, "NO BATT" will be displayed with a red X. This indicates that the G5 internal battery is not functional.

1. If "NO BATT" is displayed on the G5 attitude indicator, do not fly in instrument meteorological conditions.





WARNING

If NO BATT is displayed on the G5 attitude indicator, the unit will not function in the event of a loss of aircraft electrical power to the G5 attitude indicator. Do not fly in instrument meteorological conditions if NO BATT is displayed on the G5 attitude indicator.

SECTION 4 – NORMAL PROCEDURES

G5 Power Button and Knob

The G5 display will power on with the application of aircraft power. The G5 power button is used to turn the display on and off. Press and hold the power button to turn the display off.

The knob performs the following functions:

Press	Press to access the Menu. From the Menu, press to select the desired menu item. Press to accept the displayed value when editing numeric data or selecting from a list. Press to sync the heading or track bug for the HSI.
Turn	From the Menu, turn the Knob to move the cursor to the desired menu item. For the ADI, rotate to adjust the baro setting on the secondary altitude display. For the HSI, rotate to adjust the heading or track bug. Turn to select the desired value when editing numeric data or selecting from a list.

Backlight Intensity Adjustment

The power up state of the G5 backlight is in Auto adjustment mode.

To adjust the backlighting:

To select Manual mode from Auto mode:

1. While the unit is turned on, press the Power button.
2. Turn the knob to manually adjust the backlight intensity.
3. Press the knob to close the backlight page.

To select Auto mode from Manual mode:

1. While the unit is turned on, press the Power button.
2. Press the Power button again to select Auto.
3. Press the knob to close the backlight page.

Prior to Flight in Instrument Meteorological Conditions

1. Press the Power button on the G5 attitude indicator.
2. Verify the battery status indicator is green on the G5 attitude indicator.
   (The battery status indicator will change from green to amber or red when battery status has decreased below 41%).



Valid Battery Indication



No Battery Detected

WARNING

If NO BATT is displayed on the G5 attitude indicator, or green battery status is not shown after pressing the power button on the G5 attitude indicator, do not fly in instrument meteorological conditions.

Autopilot Operations with the G5

The G5 and optional GAD 29B/GAD 29D offer various integration capabilities dependent upon the type of autopilot installed in a particular aircraft.

The G5 Electronic Flight Instrument installation in this aircraft provides the following autopilot functions (appropriate boxes will be checked):

- ☐ This installation does not interface with the autopilot (basic wing leveling autopilot or no autopilot is installed in the aircraft).
- ☐ A GAD 29B/GAD 29D Adapter is installed in this aircraft.
  - ☐ Course Selection coupling to the autopilot.
  - ☐ NAV Selection coupling to the autopilot.
  - ☐ Heading Bug coupling capability to the autopilot.
  - ☐ Roll Steering (GPSS) emulated via heading mode.

    OR
  - ☐ Roll Steering capable autopilot (GPSS menu function for emulation not applicable).

Course / NAV Selection Coupling to the Autopilot (If Configured)

When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS or NAV) is switched via the navigation source. The NAV source displayed on the HSI is the NAV source the autopilot is following. Many autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

Heading Bug Coupling Capability to the Autopilot (If Configured)

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more than 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

Roll Steering (GPSS) Emulated via HDG Mode (If Configured)

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS from the G5 menu. If the autopilot is already designed to receive roll steering information, the data is transmitted digitally from the navigator to the autopilot.

When GPSS is selected on the G5 menu, the heading bug on the ADI and HSI changes to a hollow outline and a crossed-out heading bug appears on the G5 ADI and HSI display indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used for reference.





When GPSS is selected on the G5, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS navigator. If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected navigation source on the G5 ADI and HSI is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

HSI Source Selection (If Configured)

For aircraft configured with two navigation inputs to the G5, the desired source may be selected using the G5 knob and menu selection. Press the G5 knob to cycle between the NAV1 and NAV2 input.



HSI Portable Navigation Device GPS VFR Annunciation (If Configured)

For aircraft configured for a portable navigation device input to the G5, a GPS VFR indicated in magenta will be displayed on the HSI. When the G5 with a portable navigation device is interfaced there is not enough guidance data for IFR use.



SECTION 5 – PERFORMANCE

No change.

This page intentionally left blank.

SECTION 6 – WEIGHT AND BALANCE

See current weight and balance data.

This page intentionally left blank.

SECTION 7 – SYSTEM DESCRIPTION

Refer to Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev A (or later approved revisions), for a description of the G5 electronic flight instrument. This reference material is not required to be on board the aircraft but does contain a more in-depth description of all the functions and capabilities of the G5.

The ATT circuit breaker supplies power to the G5 instrument for normal power operation and to charge the internal battery.

The DG circuit breaker supplies power to the G5 instrument for normal power operation when configured as a DG, and to charge the internal battery (if installed).

The HSI circuit breaker supplies power to the G5 instrument for normal power operation when configured as an HSI, and to charge the internal battery (if installed).

The GAD circuit breaker supplies power to the optional GAD 29B/GAD 29D adapter and optional GAD 13 adapter for normal power operation.

System Messages

The G5 has the capability to display system messages to the crew along the bottom of the display. A system message is indicated through a white ⚿ indication on the G5.

Messages can be displayed by pressing the G5 knob and selecting the Message menu item.





(For Reference Only)

The following table shows the meaning of each message. System messages are displayed in white text.

Message	Meaning
External Power Lost	Aircraft power has been removed from the G5.
Critical battery fault! Powering off	Battery has critical fault condition and the unit is about to power off to avoid damage to the battery.
Battery fault	Battery has a fault condition – unit needs service.
Battery charger fault	Battery charger has a fault condition – unit needs service.
Low battery	Battery charge level is low.
Hardware fault	Unit has a hardware fault – unit needs service.
Power supply fault	Unit power supply fault detected – unit needs service.
Unit temperature limit exceeded	Unit is too hot or too cold.
Network address conflict	Another G5 with the same address is detected on the network (most commonly a wiring error on one of the units).
Communication error	General communication error (most commonly appears in conjunction with Network Address Conflict message).
Factory calibration data invalid	Unit calibration data not valid – unit needs service.
Magnetic field model database out of date	Internal magnetic field database is out of date - software update required.
Magnetometer Hardware fault	The magnetometer has detected a fault – unit needs service. Heading data may not be available.
Using external GPS data	GPS data from another network LRU is being used. The unit's internal GPS receiver is enabled, but unable to establish a GPS fix.
Not receiving RS-232 data	The G5 is not receiving RS-232 data from the GPS navigator – system needs service.
Not receiving ARINC 429 data	The G5 is not receiving ARINC 429 data from the navigation source – system needs service.
GPS receiver fault	The G5 on-board GPS receiver has a fault.
ARINC 429 interface configuration error	The G5 ARINC 429 port is receiving information from an incorrect source – system needs service.
Software version mismatch	The G5 attitude indicator and the G5 HSI units have different software. Cross fill of baro, heading and altitude bugs is disabled.

These messages remain while the condition persists.

GARMIN Ltd. or its subsidiaries
c/o GARMIN International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

GFC 500 Autopilot with ESP

Installed in

Textron Aviation 172E / 172F / 172G / 172H / 172I / 172K / 172L / 172M / 172N / 172P / 172Q / 172R / 172S / R172K

And

Cessna F172E / F172F / F172G / F172H / F172K / F172L / F172M / F172N / F172P / FR172K

Dwg. Number: 190-02291-02 Rev. 10

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the GFC 500 Autopilot system is installed in accordance with STC SA01866WI. The information contained herein supplements the information of the basic Airplane Flight Manual. 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 sections of this supplement are labeled as "FAA APPROVED". Sections not labeled "FAA APPROVED" are provided for guidance information only.

Airplane Serial Number: 172-72198

Airplane Registration Number: D-ETKM

FAA Approved By: Paul Mast

Paul Mast
ODA STC Unit Administrator
Garmin International, Inc
ODA-240087-CE

Date: 7-12-2024



© Copyright 2017-2020, 2023, 2024
Garmin Ltd. or its subsidiaries
All Rights Reserved

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
www.garmin.com

Garmin International, Inc

Log of Revisions

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

GFC 500 Autopilot with ESP

Installed in

Textron Aviation 172E / 172F / 172G / 172H / 172I / 172K / 172L / 172M / 172N / 172P / 172Q / 172R / 172S / R172K

And

Cessna F172E / F172F / F172G / F172H / F172K / F172L / F172M / F172N / F172P / FR172K

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	12/21/2017	Robert G. Murray Garmin ODA STC Unit Administrator
2	ALL	Add model 172E	5/11/2018	Robert G. Murray Garmin ODA STC Unit Administrator
3	ALL	Add VNAV Procedures	07/27/2018	Paul Mast Garmin ODA STC Unit Administrator
4	ALL	Correct Typographical errors	01/18/19	Robert G. Murray Garmin ODA STC Unit Administrator
5	ALL	Add G3X Information	03/15/19	Robert G. Murray Garmin ODA STC Unit Administrator
6	ALL	Added R172K/FR172K/F172E	05/30/19	Paul Mast Garmin ODA STC Unit Administrator
7	ALL	Updated various procedures	12/16/19	Robert G. Murray Garmin ODA STC Unit Administrator

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
8	ALL	Add GI 275 Information	9/10/20	Erik Frisk Garmin ODA STC Unit Administrator
9	ALL	Added ESP Disable	4/21/2023	Paul Mast Garmin ODA STC Unit Administrator
10	ALL	Updated to show airspeed in both MPH and KTS	See Cover	See Cover

This page intentionally left blank.

Table of Contents

Section 1 – General 1-1
- USE OF THE SUPPLEMENT 1-1
- ABBREVIATIONS AND TERMINOLOGY 1-2
- INSTALLED EQUIPMENT INTERFACES 1-3
- INSTALLED FEATURES CHECKLIST 1-4

Section 2 – Limitations 2-1

Section 3 – Emergency Procedures 3-1
- AUTOPILOT MALFUNCTION / PITCH TRIM RUNAWAY 3-1
- AUTOPILOT FAILURE / ABNORMAL DISCONNECT 3-2
- PITCH TRIM FAILURE 3-2
- ESP ACTIVATION 3-2
- OVERSPEED PROTECTION (MAXSPD) 3-3
- UNDERSPEED PROTECTION (MINSPD) 3-3

Section 3A – Non-Normal Procedures 3-5
- AUTOPILOT PRE-FLIGHT TEST FAIL 3-5
- LOSS OF NAVIGATION INFORMATION 3-5
- LOSS OF AIRSPEED DATA 3-6
- LOSS OF ALTITUDE DATA 3-6
- LOSS OF GPS INFORMATION 3-6
- HEADING DATA SOURCE FAILURE 3-7
- ELEVATOR MISTRIM (AUTOTRIM) 3-7

Section 4 – Normal Procedures 4-1
- GFC 500 POWER UP 4-1
- FLIGHT DIRECTOR / AUTOPILOT NORMAL OPERATING PROCEDURES 4-1
- MANUAL AUTOPILOT DISCONNECT 4-1
- VERTICAL MODES 4-2
  - VERTICAL SPEED (VS) MODE 4-2
  - INDICATED AIRSPEED (IAS) MODE 4-2
  - ALTITUDE HOLD (ALT) MODE, MANUAL CAPTURE 4-2
  - VERTICAL NAVIGATION (VNAV) 4-3
  - GO AROUND 4-4
  - MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED 4-4
- LATERAL MODES 4-5
  - HEADING MODE (HDG) 4-5
  - TRACK MODE (TRK) 4-5

NAVIGATION (VOR) 4-5
NAVIGATION (GPS) 4-6
APPROACHES **4-7**
ILS APPROACH 4-7
LOC APPROACH (GS out) 4-8
GPS APPROACH (LPV, LNAV/VNAV, LP+V, or LNAV+V) 4-9
GPS APPROACH (LP, LNAV) 4-9
LOC BC APPROACH 4-10
VOR APPROACH 4-11
DISABLING ESP **4-12**
Section 5 – Performance **5-1**
Section 6 – Weight and Balance **6-1**
Section 7 – System Description **7-1**
AFCS OVERVIEW **7-1**
AUTOPILOT CONTROL UNIT AND DISPLAY **7-4**
PREFLIGHT TEST **7-7**
MESSAGES AND ANNUNCIATIONS **7-7**
LIGHTING **7-8**

This page intentionally left blank

SECTION 1 – GENERAL

The information in this supplement is FAA-approved material and must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual (POH/AFM) when the airplane has been modified by installation of the Garmin GFC 500 Autopilot system in accordance with Garmin International, Inc. approved data.

The information in this supplement supersedes or adds to the basic POH/AFM only as set forth below. Users of the manual are advised to always refer to the supplement for possibly superseding information and placarding applicable to operation of the airplane.

USE OF THE SUPPLEMENT

The following definitions apply to WARNINGS, CAUTIONS and NOTES found throughout the supplement:

WARNING

Operating procedures, techniques, etc., which may result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures, techniques, etc., which may result in damage to equipment if not carefully followed.

NOTE

Operating procedures, techniques, etc., which is considered essential to emphasize.

ABBREVIATIONS AND TERMINOLOGY

The following glossary is applicable within the airplane flight manual supplement

AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
ALT	Altitude
AP	Autopilot
APR	Approach
ATC	Air Traffic Control
BC	Back Course Approach
CDI	Course Deviation Indicator
DA	Decision Altitude
DISC	Disconnect
DWG	Drawing
ESP	Electronic Stability and Protection
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FD	Flight Director
GA	Go Around
GFC 500	Garmin Autopilot
GMC 507	Autopilot Mode Control Panel
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GS	Glideslope
GSA	Garmin Servo Actuator
HDG	AFCS heading mode
IAS	Indicated Airspeed
ILS	Instrument Landing System
INT	Interrupt
KIAS	Knots Indicated Airspeed
LNAV	Lateral Navigation
LNAV+V	Lateral Navigation with Advisory Vertical Guidance
LNAV/VNAV	Lateral Navigation / Vertical Navigation Approach
LOC	Localizer (no glideslope available)
LP	Localizer Performance
LP+V	Localizer Performance with Advisory Vertical Guidance
LPV	Localizer Performance with Vertical Guidance
LVL	Level
MDA	Minimum Descent Altitude
PFT	Preflight Test
POH	Pilot's Operating Handbook
STC	Supplemental Type Certificate
TO	Takeoff
TRK	Track
VHF	Very High Frequency
VOR	VHF Omni-directional Range
VS	Vertical Speed

INSTALLED EQUIPMENT INTERFACES

The following is the list of installed equipment and functions associated with the GFC 500 Autopilot installation in this airplane.

Table 1-1: Table of Installed Equipment Interfaces

DEVICE TYPE	Manufacturer / Model If not installed, note N/A	Additional Information
GPS Navigator #1		Is Navigator #1 interfaced to GFC 500? ☐ YES ☐ NO
VHF Nav Radio #1		Is VHF Nav Radio #1 interfaced to GFC 500? ☐ YES ☐ NO
VHF Nav Radio #2		
Pitch Trim Servo		

INSTALLED FEATURES CHECKLIST

The checked autopilot modes and features are available on this aircraft.

Basic AP Features

- ☒ Flight Director
- ☐ Electric Pitch Trim
- ☒ Overspeed Protection
- ☒ Underspeed Protection

Electronic Stability and Protection

- ☒ Pitch/Roll Attitude
- ☒ High Speed Protection
- ☐ Low Speed Protection

Vertical Autopilot Modes

- ☒ Pitch (PIT)
- ☒ Level (Zero vertical speed)
- ☒ Go Around (GA)
- ☒ Altitude Hold
- ☒ Vertical Speed
- ☒ Altitude Capture via Altitude Preselect
- ☒ Indicated Airspeed (IAS)
- ☐ Vertical Navigation (VNAV)
- ☐ GPS Approach Glidepath
- ☐ ILS Glideslope

Lateral Autopilot Modes

- ☒ Roll (ROL)
- ☒ Level (Wings Level)
- ☒ Go Around (GA)
- ☐ Heading
- ☒ Track
- ☐ GPS Navigation
- ☐ VHF Navigation
- ☐ Approach Mode
  - ☐ GPS
  - ☐ VOR/LOC

SECTION 2 – LIMITATIONS

The Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190-01112-12 Rev A (or later approved revisions), must be immediately available to the flight crew (when G5 is installed).

The Garmin G3X Touch Pilot's Guide for Certified Aircraft, part number 190-02472-00, Rev A (or later approved revisions) must be immediately available to the flight crew (when G3X EFIS system is installed).

The Garmin GI 275 Pilot's Guide for Certified Aircraft, part number 190-02246-01, Rev B (or later approved revisions) must be immediately available to the flight crew (when GI 275 system is installed).

This AFMS is applicable to the software versions shown below:

Software Item	Software Version (or later FAA Approved version for this STC)
G5 Software Version	8.20
G3X Software Version	9.15
GI 275 Software Version	2.60

A pilot must be seated in the left pilot's seat, with seatbelt fastened, during all autopilot operations.

Do not use autopilot during takeoff and landing.

The GFC 500 AFCS preflight test must complete successfully prior to use of the autopilot, flight director or manual electric trim.

The maximum fuel imbalance with the autopilot engaged is 10 gallons.

All speeds shown are indicated airspeeds unless otherwise noted.

Autopilot maximum engagement speed is 150 KIAS (172 MPH).

Autopilot engagement is limited to flap positions no greater than 10 degrees.

The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL during all other operations.

The GFC 500 autopilot is approved for Category 1 precision approaches and non-precision approaches only.

This page intentionally left blank.

SECTION 3 – EMERGENCY PROCEDURES

Some emergency situations require immediate memorized corrective action. These steps are printed in bold in the emergency procedures and should be accomplished without the aid of the checklist.

AUTOPILOT MALFUNCTION / PITCH TRIM RUNAWAY

If the airplane deviates unexpectedly from the planned flight path:

1. **Control Wheel** ..... **GRIP FIRMLY**
2. **AP DISC / TRIM INT Button** ..... **PRESS AND HOLD**

CAUTION

Be prepared for high elevator control forces.

3. **Aircraft Attitude** ..... **MAINTAIN / REGAIN AIRCRAFT CONTROL**
4. Elevator Trim ..... RE-TRIM if necessary using Elevator Trim Control Wheel
5. AUTOPILOT Circuit Breaker ..... PULL

NOTE

Do not release the AP DISC / TRIM INT Button until after pulling the AUTOPILOT Circuit Breaker.

Pulling the AUTOPILOT circuit breaker will render the autopilot and ESP inoperative.

6. AP DISC / TRIM INT Button ..... RELEASE

WARNING

In flight, do not overpower the autopilot. The trim will operate in the direction opposing the overpower force, which will result in large out-of-trim forces.

Do not attempt to re-engage the autopilot or use manual electric pitch trim until the cause of the malfunction has been corrected.

AUTOPILOT FAILURE / ABNORMAL DISCONNECT

(Red AP in autopilot status box on display, continuous aural disconnect tone.)

1. AP DISC / TRIM INT Button or:
   - G5 Knob
   - G3X Autopilot Status Bar
   - GI 275 Knob or Autopilot Status Button ..... PRESS AND RELEASE (to cancel disconnect tone)
2. Aircraft Attitude ..... MAINTAIN / REGAIN AIRCRAFT CONTROL

NOTE

The autopilot disconnect may be accompanied by a red AFCS in the autopilot status box, indicating the automatic flight control system has failed. The flight director will not be available and the autopilot cannot be re-engaged with this annunciation present.

If the disconnect is accompanied by an amber AP with a red X, the autopilot will not be available however the flight director will still be functional.

In the event of a GMC failure, pressing the G5 knob, GI 275 knob or autopilot status button, or G3X Autopilot status bar will acknowledge the disconnect tone.

PITCH TRIM FAILURE

(Red PTRIM on G5, GI 275, or G3X display.)

This failure will only occur if the optional pitch trim servo is installed.

1. Indicates a failure of the pitch trim servo.
2. Control Wheel ..... GRIP FIRMLY
3. AP DISC / TRIM INT Button ..... PRESS and RELEASE (Be prepared for high elevator control forces)
4. Elevator Trim ..... AS REQUIRED USING ELEVATOR TRIM CONTROL WHEEL

NOTE

The autopilot may be re-engaged. Refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED.

ESP ACTIVATION

1. **Throttle** ..... **AS REQUIRED**
2. **Aircraft Attitude** ..... **MAINTAIN / REGAIN AIRCRAFT CONTROL**

NOTE

If ESP is active for approximately 10 seconds, the autopilot will automatically engage in LVL mode, an aural 'ENGAGING AUTOPILOT' will be played, (or a Sonalert tone will sound for installations without a supported audio panel) and the autopilot will roll the wings level and fly at zero-vertical speed. Refer to Section 7, System Description for further information.

ESP will be disabled by pressing and holding the AP DISC / TRIM INT button. Releasing the button will allow ESP to function.

OVERSPEED PROTECTION (MAXSPD)

(MAXSPD displayed on G5, GI 275, or G3X, AIRSPEED – AIRSPEED Aural sounds.)

1. **Throttle** ..... **REDUCE**
2. **Aircraft Attitude and Altitude** ..... **MONITOR**

After overspeed condition is corrected:

3. Autopilot ..... RESELECT VERTICAL AND LATERAL MODES (if necessary)
4. Throttle ..... ADJUST as necessary

NOTE

Overspeed protection mode provides a pitch up command to decelerate the airplane at or below the maximum autopilot operating speed.

UNDERSPEED PROTECTION (MINSPD)

(MINSPD displayed on G5, GI 275, or G3X, AIRSPEED – AIRSPEED Aural sounds.)

1. **Throttle** ..... **INCREASE POWER AS REQUIRED TO CORRECT UNDERSPEED**
2. **Aircraft Attitude and Altitude** ..... **MONITOR**

After underspeed condition is corrected:

3. Autopilot ..... RESELECT VERTICAL AND LATERAL MODES (if necessary)
4. Throttle ..... ADJUST as necessary

NOTE

Autopilot Underspeed Protection Mode provides a pitch down command to maintain 50 KIAS (58 MPH).

This page intentionally left blank

SECTION 3A – NON-NORMAL PROCEDURES

AUTOPILOT PRE-FLIGHT TEST FAIL

(Amber AP with a red X in G5, GI 275, or G3X autopilot status box.)

1. Indicates the AFCS system failed the automatic Pre-Flight test.

NOTE

The autopilot, ESP, and electric elevator trim are inoperative.

LOSS OF NAVIGATION INFORMATION

This procedure applies only if the optional GPS and/or VHF navigator is installed.

(Amber GPS, VOR, LOC, or BC flashes for 10 seconds on G5, GI 275, or G3X.)

NOTE

If a navigation signal is lost while the autopilot is tracking it, the autopilot will roll the aircraft wings level and default to roll mode (ROL).

1. GMC 507 Mode Panel ..... SELECT HDG mode and SET desired heading
2. NAV Source ..... SELECT a valid NAV source
3. NAV Key ..... PRESS

If on an instrument approach at the time the navigation signal is lost:

4. Missed Approach Procedure ..... EXECUTE (as applicable)

LOSS OF AIRSPEED DATA

(Red X through airspeed tape on the G5, GI 275, or G3X display, amber AP with a red X in autopilot status box.)

NOTE

If airspeed data is lost while the autopilot is tracking airspeed, the flight director will default to pitch mode (PIT).

1. AP DISC / TRIM INT Button ..... PRESS AND RELEASE (to cancel disconnect tone)
2. Aircraft Attitude ..... MAINTAIN / REGAIN AIRCRAFT CONTROL
3. Manual Elevator Trim ..... TRIM as required

NOTE

The autopilot cannot be re-engaged. The flight director is available however IAS mode cannot be selected. Loss of airspeed will be accompanied by a red PTRIM indication on the G5, GI 275, or G3X (if a pitch trim servo is installed).

LOSS OF ALTITUDE DATA

(Red X through altitude tape on the G5, GI 275, or G3X display.)

NOTE

If altitude data is lost while the autopilot is tracking altitude, the autopilot will default to pitch mode (PIT).

1. Autopilot ..... SELECT different vertical mode

LOSS OF GPS INFORMATION

(GPS position information is lost to the autopilot.)

NOTE

If GPS position data is lost while the autopilot is tracking a GPS, VOR, LOC or BC course, the autopilot will default to roll mode (ROL). The autopilot will default to pitch mode (PIT) if GPS information is lost while tracking an ILS. The autopilot uses GPS aiding in VOR, LOC and BC modes.

1. Autopilot ..... SELECT different lateral and vertical mode (as necessary)

If on an instrument approach:

1. AP DISC / TRIM INT button ..... PRESS, Continue the approach manually

   Or

2. Missed Approach Procedure ..... EXECUTE (as applicable)

HEADING DATA SOURCE FAILURE

1. Autopilot ..... SELECT different lateral mode (as necessary)

NOTE

Track information will be displayed on the G5, GI 275, or G3X.

Without a heading source to the navigator, GPSS will not be provided to the autopilot for heading legs. Navigator map cannot be oriented heading up.

ELEVATOR MISTRIM (AUTOTRIM)

(Amber TRIM UP or TRIM DOWN displayed on the G5, GI 275, or G3X.)

WARNING

Do not attempt to overpower the autopilot in the event of a pitch mistrim. The autopilot servo will oppose pilot input and will cause pitch trim to run opposite the direction of pilot input. This will lead to a significant out-of-trim condition, resulting in large control wheel force when disengaging the autopilot.

NOTE

Indicates a mistrim of the elevator while the autopilot is engaged.

If a pitch trim servo is not installed, refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED. If a pitch trim servo is installed, the autopilot will normally trim the airplane as required. However, during rapid acceleration, deceleration, configuration changes, or near either end of the elevator trim limits, momentary illumination of this message may occur. If the autopilot is disconnected while this message is displayed, high elevator control forces are possible.

If a pitch trim servo is not installed:

1. Refer to the normal procedures section of this AFMS, MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED.

If a pitch trim servo is installed:

NOTE

Momentary display of the TRIM UP or TRIM DOWN message during configuration changes or large airspeed changes is normal.

1. Control Wheel ..... GRIP FIRMLY

WARNING

Be prepared for significant sustained control forces in the direction of the mistrim annunciation. For example, TRIM DOWN indicates nose down control wheel force will be required upon autopilot disconnect.

2. AP DISC / TRIM INT Button ..... PRESS AND RELEASE
3. Manual Elevator Trim ..... RE-TRIM as required

Electric pitch trim should be considered inoperative until the cause of the mistrim has been investigated and corrected.

SECTION 4 – NORMAL PROCEDURES

GFC 500 POWER UP

During the preflight test the G5, GI 275, or G3X will display PFT in the autopilot status box. When the GFC 500 passes preflight test, PFT will be removed from the autopilot status box.

FLIGHT DIRECTOR / AUTOPILOT NORMAL OPERATING PROCEDURES

Autopilot/Flight Director mode annunciations are displayed at the top of the G5 Electronic Flight Instrument, at the top of the G3X Electronic Flight Instrument System PFD, or at the bottom of the GI 275 Electronic Flight Instrument ADI . Green text indicates active autopilot/flight director modes. Armed modes are indicated in white text. Normal mode transitions will flash inverse video for 10 seconds before becoming steady. Abnormal mode transitions will flash for 10 seconds in amber text before the default mode is annunciated as the active mode in green text. Default autopilot/flight director modes are Roll (ROL) and Pitch (PIT) modes.

The autopilot status box displays the autopilot engagement status as well as armed and active flight director modes.

Autopilot Engagement with Flight Director Off — Upon engagement, the autopilot will be set to hold the current attitude of the airplane if the flight director was not previously on. In this case, 'ROL' and 'PIT' will be annunciated.

Autopilot Engagement with Flight Director On — If the flight director is on, the autopilot will smoothly pitch and roll the airplane to capture the FD command bars. The prior flight director modes remain unchanged.

Autopilot Disengagement — The most common way to disconnect the autopilot is to press and release the AP DISC / TRIM INT button located on the control yoke. An autopilot disconnect tone will sound and an amber AP will be annunciated on the G5, GI 275, or G3X autopilot status box. Other ways to disconnect the autopilot include:

- Pressing the AP Key on the GMC 507 Mode Controller
- Operating the Electric Pitch Trim Switch (located on the control wheel)
- Pulling the AUTOPILOT circuit breaker

In the event of unexpected autopilot behavior, press and holding the AP DISC / TRIM INT button will disconnect the autopilot and remove all power to the servos.

MANUAL AUTOPILOT DISCONNECT

If necessary, the autopilot may be manually disconnected using any one of the following methods:

1. AP DISC / TRIM INT Button ..... PRESS and RELEASE (Pilot's control wheel)
2. AP Key ..... PRESS
3. Pitch Trim Switch ..... ACTIVATE
4. AUTOPILOT Circuit Breaker ..... PULL

VERTICAL MODES

VERTICAL SPEED (VS) MODE

1. Altitude Preselect ..... SET to Desired Altitude
2. VS Key ..... PRESS, autopilot synchronizes to the airplane's current vertical speed
3. Vertical Speed Reference ..... ADJUST using UP / DN Wheel
4. Green ALT ..... VERIFY Upon Altitude Capture

INDICATED AIRSPEED (IAS) MODE

1. Altitude Preselect ..... SET to Desired Altitude
2. Press IAS Key, autopilot synchronizes to the airplane's current indicated airspeed.
3. AIRSPEED Reference ..... ADJUST using UP / DN Wheel
4. Throttle ..... ADJUST, INCREASE POWER to climb
   DECREASE POWER to descend
5. Green ALT ..... VERIFY Upon Altitude Capture

ALTITUDE HOLD (ALT) MODE, MANUAL CAPTURE

1. When at the desired altitude ..... PRESS ALT key

NOTE

If climbing or descending at a high rate when the ALT key is pressed, the airplane will overshoot the reference altitude and then return to it. The amount of overshoot will depend on the vertical speed when the ALT key is pressed.

The altitude reference is displayed in the autopilot status box. The reference may be changed by +/- 200 FT using the UP / DN wheel.

VERTICAL NAVIGATION (VNAV)

1. Navigation Source ..... SELECT CDI to GPS
2. Vertical Navigation Profile ..... LOAD into the GPS navigator's flight plan
3. Altitude Preselect ..... SET to the vertical clearance limit
   When ATC clearance received.
4. GMC 507 Mode Panel ..... PRESS VNAV

NOTE

Vertical navigation will not function for the following conditions:

- Selected navigation source is not GPS navigation. VNAV will not function if the navigation source is VOR or Localizer.
- VNAV is not enabled on the GPS Navigator
- If the altitude preselect is not set below the current aircraft altitude.
- No waypoints with altitude constraints in the flight plan
- Glideslope or Glidepath is the active flight director pitch mode.
- OBS mode is active
- Dead Reckoning mode is active
- Parallel track is active
- Aircraft is on the ground

Vertical navigation is not available between the final approach fix (FAF) and the missed approach point (MAP)

ALTV will be the armed vertical mode during the descent if the altitude preselect is set to a lower altitude than the VNAV reference altitude. This indicates the autopilot / flight director will capture the VNAV altitude reference. ALTS will be the armed mode during the descent if the altitude preselect is set at or above the VNAV reference altitude, indicating that the autopilot / flight director will capture the altitude preselect altitude reference.

GO AROUND

1. GO AROUND button ..... PRESS – Verify GA / GA on G5, GI 275, or G3X autopilot will not disengage
2. Autopilot (if engaged) ..... VERIFY airplane pitches up following flight director command bars
3. Throttle ..... APPLY Go Around power
4. GMC 507 Mode Panel ..... PRESS NAV to couple to selected navigation source
   OR
   PRESS HDG to Fly ATC Assigned Missed Approach Heading
5. Altitude Preselect ..... VERIFY Set to appropriate altitude.

NOTE

The pilot is responsible for initial missed approach guidance in accordance with published procedure. When the GA button is pressed the Flight Director command bars will command go-around pitch attitude and wings level. The pilot must select the CDI to the appropriate navigation source and select the desired lateral and vertical flight director modes.

MANUAL PITCH TRIM WITH AUTOPILOT ENGAGED

(Amber TRIM UP or TRIM DOWN displayed on G5, GI 275, or G3X.)

NOTE

If the aircraft is not equipped with a pitch trim servo, the pilot must manually adjust the pitch trim when airspeed and aircraft configuration changes are made.

A message will be displayed on the G5, GI 275, or G3X display to indicate the pitch servo is holding sustained force, and the pilot must manually trim the aircraft.

1. If TRIM UP message is displayed ..... MANUALLY TRIM nose up
2. If TRIM DOWN message is displayed ..... MANUALLY TRIM nose down

LATERAL MODES

HEADING MODE (HDG)

1. HDG Key ..... PRESS
   The autopilot will turn the airplane in the direction of the heading bug.
2. HDG/TRK Knob ..... Rotate to set heading bug to desired heading.

TRACK MODE (TRK)

1. TRK Key ..... PRESS
   The autopilot will turn the airplane in the direction of the track bug.
2. HDG/TRK Knob ..... Rotate to set track bug to desired track.

NAVIGATION (VOR)

1. Navigation Source ..... SELECT CDI to VHF NAV
   Tune and identify the station frequency.
2. Course Pointer ..... SET CDI to the Desired Course
3. Intercept Heading ..... ESTABLISH in HDG, TRK or ROL mode
4. NAV Key ..... PRESS

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the VOR mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV key is pressed.

NAVIGATION (GPS)

1. Navigation Source ..... SELECT CDI to GPS
2. Waypoint ..... SELECT on Navigation Source
3. Course Pointer ..... VERIFY CDI set to the Desired Course
4. Intercept Heading ..... ESTABLISH in HDG or ROL mode
5. NAV Key ..... PRESS

NOTE

If the Course Deviation Indicator (CDI) is greater than one dot from center, the autopilot will arm the GPS mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is one dot or less from center, the autopilot will enter the capture mode when the NAV key is pressed.

APPROACHES

ILS APPROACH

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency.
2. CDI ..... SET to front LOC course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. APR Key ..... PRESS, verify LOC and GS ARMED
4. LOC and GS Mode ..... VERIFY airplane Captures and Tracks LOC and GS
5. Missed Approach Altitude ..... SET in Altitude preselect.

At Decision Altitude (DA),

6. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

7. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
8. Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

If the Course Deviation Indicator (CDI) is greater than half scale deflection, the autopilot will arm the LOC mode. The pilot must ensure that the current heading will result in a capture of the selected course. If the CDI is within half scale deflection, the autopilot will enter the capture mode when the APR key is pressed.

When the selected navigation source is an ILS, glideslope coupling is automatically armed when the APR key is pressed. The glideslope cannot be captured until the localizer is captured. The autopilot can capture the glideslope from above or below the glideslope.

LOC APPROACH (GS out)

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency.
2. Course Pointer ..... SET to front LOC course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. NAV Key ..... PRESS, verify LOC ARMED
4. LOC Mode ..... VERIFY airplane Captures and Tracks LOC Course
5. Altitude Preselect ..... SET to next required step down altitude
6. Missed Approach Altitude ..... SET when in ALT mode at the MDA

At Missed Approach Point,

7. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

8. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
9. Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

GPS APPROACH (LPV, LNAV/VNAV, LP+V, or LNAV+V)

1. Navigation Source ..... SELECT CDI to GPS
2. Course Pointer ..... VERIFY CDI set to the Desired Course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. APR Key ..... PRESS, verify GPS and GP ARMED
4. GPS and GP Mode ..... VERIFY airplane Captures and Tracks GPS and GP
5. ALT Key ..... PRESS to level off at the MDA for a LP+V or LNAV+V approach

At DA (LPV or LNAV/VNAV approach), or MDA and Missed Approach Point (LP+V or LNAV+V),

6. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

7. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
8. Apply GA power.
9. Set missed approach altitude in the altitude preselect.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

GPS APPROACH (LP, LNAV)

1. Navigation Source ..... SELECT GPS on the CDI
2. Course Pointer ..... VERIFY CDI set on the Desired Course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. NAV Key ..... PRESS, verify GPS ARMED
4. GPS Mode ..... VERIFY airplane Captures and Tracks GPS Course
5. Altitude Preselect ..... SET to next required step down altitude
6. Missed Approach Altitude ..... SET when in ALT mode at the MDA

At Missed Approach Point,

7. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

8. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
9. Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

LOC BC APPROACH

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and Identify an ILS station frequency
2. Course Pointer ..... SET CDI to LOC Front Course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. NAV Key ..... PRESS, verify BC ARMED
   (when heading is within 75 degrees of BC course)
4. BC Mode ..... VERIFY airplane Captures and Tracks BC Course
5. Altitude Preselect ..... SET to next required step down altitude
6. Missed Approach Altitude ..... SET when in ALT mode at the MDA

At Missed Approach Point:

7. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

8. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
9. Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

VOR APPROACH

1. Navigation Source ..... SELECT CDI to VHF Nav
   Tune and identify the station frequency
2. Course Pointer ..... SET CDI to the Desired Course

NOTE

Ensure that the current heading will result in a capture of the selected course.

3. NAV Key ..... PRESS, verify VOR ARMED
4. VOR Mode ..... VERIFY airplane Captures and Tracks VOR Course
5. Altitude Preselect ..... SET to next required step down altitude
6. Missed Approach Altitude ..... SET when in ALT mode at the MDA

At Missed Approach Point,

7. AP DISC / TRIM INT button ..... PRESS, Continue visually for a normal landing

   Or

8. GO AROUND (GA) button ..... PRESS, Execute Missed Approach Procedure
9. Apply GA power.

NOTE

Pressing the GA button will not disconnect the autopilot. Select NAV or HDG mode to fly the missed approach procedure.

DISABLING ESP

ESP can be disabled on the G5 attitude indicator with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. G5 Knob ..... PRESS
2. ESP ..... SELECT
3. G5 Knob ..... PRESS

ESP can be disabled on the G3X with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. Autopilot Status Box ..... TOUCH
2. ESP Button ..... TOUCH
3. Back Button ..... PRESS

ESP can be disabled on the GI 275 with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. GI 275 Knob ..... PRESS and HOLD
2. Options ..... SELECT
3. ESP Button ..... SELECT
4. Back Button ..... PRESS and HOLD

ESP can be disabled, but only while in the air, with the following procedure. ESP will default to "Enabled" on the next power cycle.

1. AP DISC switch ..... PRESS and HOLD for 5 seconds

SECTION 5 – PERFORMANCE

No Change.

This page intentionally left blank

SECTION 6 – WEIGHT AND BALANCE

No change to loading information. Refer to current weight and balance report and equipment list for changes to empty weight/moment and installed equipment.

This page intentionally left blank

SECTION 7 – SYSTEM DESCRIPTION

AFCS OVERVIEW

The GFC 500 is a digital Automatic Flight Control System (AFCS). It is a two-axis autopilot and flight director system which provides the pilot with the following features:

G5 Outputs to Autopilot — The G5 flight instrument (when installed) provides attitude, rate, and acceleration information to the servos. Additionally, indicated airspeed, vertical speed, pressure altitude and GPS information are sent to the autopilot for mode control.

G3X Outputs to Autopilot — The G3X electronic flight instrument system provides attitude, rate, and acceleration information to the servos. Additionally, indicated airspeed, vertical speed, pressure altitude and GPS information are sent to the autopilot for mode control.

GI 275 Outputs to Autopilot — The GI 275 electronic flight instrument system provides attitude, rate, and acceleration information to the servos. Additionally, indicated airspeed, vertical speed, pressure altitude and GPS information are sent to the autopilot for mode control. **Flight Director (FD)** — The flight director processing occurs in the G5, GI 275, or G3X instrument. Selected modes for the flight director are displayed on the G5, GI 275, or G3X autopilot status box.

The flight director provides:

- Command Bars showing pitch/roll guidance
- Vertical / lateral mode selection and processing

Autopilot (AP) — Autopilot operation occurs within the pitch, roll, and optional pitch trim servo. It also provides servo monitoring, and automatic flight control in response to flight director steering commands, attitude and rate information, and airspeed.

Optional Electric Pitch Trim — The pitch trim servo provides manual electric pitch trim capability when the autopilot is not engaged. The trim servo provides automatic pitch trim when the autopilot is engaged and the airplane is in the air. Automatic trim functionality is disabled on the ground.

GMC 507 — Pilot commands to the autopilot and flight director are entered through the GMC 507 autopilot mode panel. The GMC 507 contains internal sensors which calculate the aircraft attitude, attitude rate and accelerations. These inertial sensors are completely independent from the sensors within the G5, GI 275, or G3X and the rest of the autopilot system, and are not used for the flight director, autopilot, trim or ESP functions. They are used solely to provide independent monitoring of the GFC 500.

Airspeed and Altitude Information — The GFC 500 requires airspeed and altitude information from the G5 instrument, the GI 275 system, or the G3X system.

Other components of the AFCS include the GSA 28 pitch, roll, and optional pitch trim servo that also contain autopilot processors, control wheel mounted elevator trim switch (if trim servo is installed), control wheel mounted autopilot disconnect and trim interrupt button (AP DISC / TRIM INT), and a Go-Around (GA) button.

Underspeed Protection (USP) — The GFC 500 will provide Underspeed Protection when the autopilot is engaged.

When the minimum airspeed of 60 KIAS (69 MPH) is reached, a visual MINSPD message will appear above the airspeed tape and the autopilot will lower the nose to maintain 60 KIAS (69 MPH). An aural "AIRSPEED, AIRSPEED" voice alert will sound for installations connected to an audio panel.

Underspeed Protection is exited automatically when airspeed exceeds 65 KIAS (75 MPH).

Overspeed Protection (OSP) — The GFC 500 will provide Overspeed Protection when the autopilot is engaged.

When the maximum airspeed of 150 KIAS (172 MPH) is reached, visual MAXSPD message will appear above the airspeed tape and the autopilot will raise the nose of the aircraft to avoid exceeding the maximum configured airspeed. An aural "AIRSPEED, AIRSPEED" voice alert will sound for installations connected to an audio panel.

Overspeed Protection is exited automatically when airspeed is reduced below 145 KIAS (167 MPH).

Coupled Go-Around — Pressing the GA button will not disengage the autopilot. Instead, the autopilot will attempt to capture and track the flight director command bars. If insufficient airplane performance is available to follow the commands, the autopilot will enter Underspeed Protection mode at the minimum airspeed.

Electronic Stability and Protection (ESP) — The GFC 500 will provide Electronic Stability and Protection when the autopilot is not engaged.

Electronic Stability and Protection (ESP) uses the autopilot servos to assist the pilot in maintaining the airplane in a safe flight condition within the airplane's normal pitch, roll and airspeed envelopes.

Electronic Stability and Protection is invoked when the pilot allows the airplane to exceed one or more conditions beyond normal flight defined below:

- Pitch attitude beyond normal flight (+20°, -15°)
- Roll attitude beyond normal flight (45°)
- High airspeed beyond normal flight (above 161 KIAS (185 MPH))
- Low airspeed below normal flight (below 50 KIAS (58 MPH))

The conditions that are required for ESP to be available are:

- Pitch and Roll servos available
- Autopilot not engaged
- The GPS altitude above ground is more than 200 feet (for low airspeed mode)
- Aircraft is within the autopilot engagement envelope (+/-50° in pitch and +/-75° in roll)

Protection for excessive Pitch, Roll, and Airspeed is provided when the limit thresholds are first exceeded, which engages the appropriate servo in ESP mode at a nominal torque level to bring the airplane back within the normal flight envelope. If the airplane deviates further from the normal flight envelope, the servo torque will increase until the maximum torque level is reached in an attempt to return the airplane into the normal flight envelope. Once the airplane returns to within the normal flight envelope, ESP will deactivate the autopilot servos.

When the normal flight envelope thresholds have been exceeded for more than 10 seconds, ESP Autolevel Mode is activated. Autolevel Mode engages the autopilot to bring the airplane back into straight and level flight based on 0° roll angle and 0 FPM vertical speed. An aural "ENGAGING AUTOPILOT" alert (or a Sonalert tone) sounds and the Flight Director mode annunciation will indicate LVL for the pitch and roll modes.

Anytime an ESP mode is active, the pilot can interrupt ESP by using the Autopilot Disconnect (AP DISC / TRIM INT) switch, or simply override ESP by overpowering the autopilot servos. The pilot may also disable ESP through the G5, GI 275, or G3X menu.

The engagement and disengagement attitude limits are displayed with double hash marks on the roll indicator depending on the airplane attitude and whether or not ESP is active in roll. When ESP is inactive (roll attitude within nominal limits) only the engagement limit indications are displayed in order to reduce clutter on the roll indicator.

Display symbology implemented for ESP is illustrated in the following figures.

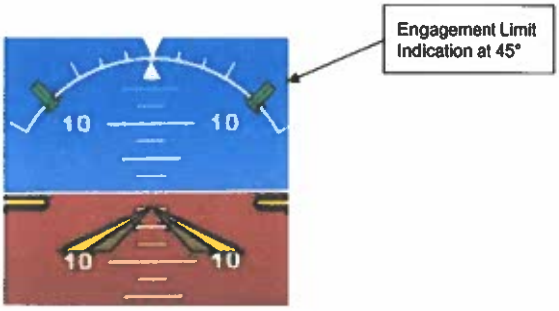


Figure 7-1: Nominal Roll Attitude ESP Engagement Limit Indications

Once ESP becomes active in roll, the engagement limit indication that was crossed (either Left or Right) will move to the lower disengagement limit indication. The opposite roll limit remains at the engagement limit.

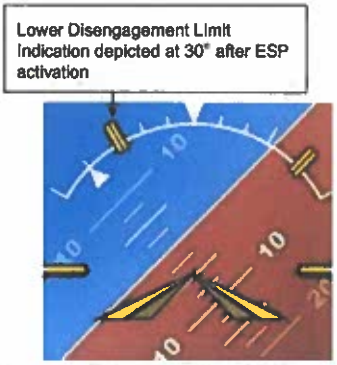


Figure 7-2: Engagement Limit Indications Upon ESP Activation

Disconnect Methods

The following conditions will cause the autopilot to automatically disconnect:

- Electrical power failure, including pulling the AUTOPILOT circuit breaker.
- Internal autopilot system failure (including internal AHRS failure).

The following pilot actions will cause the autopilot to disconnect:

- Pressing the red AP DISC / TRIM INT button on the pilot's control wheel.
- Actuating the manual electric trim switch (if installed).
- Pushing the AP Key on the GMC 507 mode controller when the autopilot is engaged.
- Pulling the AUTOPILOT circuit breaker.

The red AP DISC / TRIM INT button on the pilot's control wheel will interrupt power to the manual electric trim for as long as the switch is depressed.

AUTOPILOT CONTROL UNIT AND DISPLAY

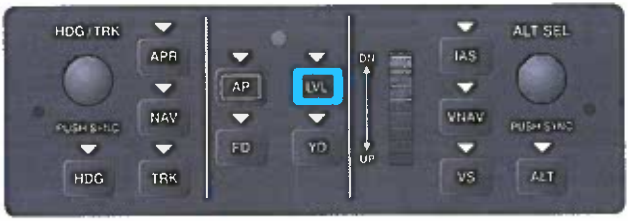


Figure 7-3: GMC 507 Control Unit (Reference Only)



Figure 7-4: G5 Display (Reference Only)

The following tables list the available AFCS vertical and lateral modes with their corresponding controls and annunciations. The UP/DN wheel can be used to change the vertical mode reference while operating in Pitch Hold, Vertical Speed, Altitude Hold, or IAS mode. Increments of change and maximum ranges of values for each of these references using the UP/DN wheel are also listed in the table.

AFCS VERTICAL MODES

Vertical Mode	Control	Annunciation	Reference Range	Reference Change Increment
Pitch Hold	(default)	PIT	20° Nose Up 15° Nose Down	0.5°
Selected Altitude Capture	*	ALTS		
Altitude Hold	ALT Key	ALT nnnnn		10 FT
Vertical Speed	VS Key	VS nnnn	-2000 to +2000 FPM	100 FPM
IAS Hold	IAS Key	IAS nnn	60 to 150 KT (69 to 172 MPH)	1 KT (1 MPH)
Vertical Path Tracking (VNAV)	VNV Key	VNAV		
VNAV Target Altitude Capture	**	ALTV		
Glidepath	APR Key	GP		
Glideslope		GS		
Takeoff or Go Around	GA Button	TO or GA	7°	
Level (LVL)	LVL Key	LVL	Zero Vertical Speed	
ESP High Pitch Engagement			ESP High Pitch Attitude engages at 20° nose up	
ESP Low Pitch Engagement			ESP Low Pitch Attitude engages at 15° nose down	
ESP High Airspeed Engagement			ESP High Airspeed engages at 161 KIAS (185 MPH)	
ESP Low Airspeed Engagement			When above 200 FT AGL, ESP Low Airspeed engages at 50 KIAS (58 MPH). (This mode only available if height above terrain is available from a compatible Garmin GPS).	

* ALTS arms automatically when PIT, VS, IAS, or GA is active.

** ALTV arms automatically if the VNAV Target Altitude is to be captured instead of the Selected Altitude.

AFCS LATERAL MODES

Lateral Mode	Control	Annunciation	Maximum Roll Command Limit
Roll Mode	(default)	ROL	30°
Heading Select	HDG Key	HDG	30°
Track Select	TRK Key	TRK	30°
Navigation, GPS Arm/Capture/Track	NAV Key	GPS	30°
Navigation, VOR Enroute and Approach Arm/Capture/Track		VOR	30°
Navigation, LOC Arm/Capture/Track (No Glideslope)		LOC	30°
Backcourse Arm/Capture/Track		BC	30°
Approach, GPS Arm/Capture/Track (Glidepath Mode Automatically Armed, if available)	APR Key	GPS	30°
Approach, ILS Arm/Capture/Track (Glideslope Mode Automatically Armed)		LOC	30°
Takeoff or Go Around	GA Button	TO or GA	Wings Level
LVL (Level)	LVL Key	LVL	Wings Level
ESP Roll Attitude Engagement	ESP Roll Attitude engages at 45°		

The autopilot may be engaged within the following ranges:

Pitch 50° nose up to 50° nose down

Roll ±75°

If the above pitch or roll limits are exceeded while the autopilot is engaged, the autopilot will disconnect. Engaging the autopilot outside of its command limits, but within its engagement limits, will cause the autopilot to return the aircraft within command limits. The autopilot is capable of commanding the aircraft in the following ranges:

Pitch 20° nose up to 15° nose down

Roll ±30°

PREFLIGHT TEST

During the preflight test the G5, GI 275, or G3X will display PFT in the autopilot status box. The PFT annunciation is removed at the completion of the preflight test. If GFC 500 fails the PFT, a yellow AP with a red X is displayed in the autopilot status box on the G5, GI 275, or G3X.

MESSAGES AND ANNUNCIATIONS

Autopilot Messages	
AFCS Controller Key Stuck	The system has sensed a key input on the GMC 507 for 30 seconds or longer.
AFCS Controller Audio Database Missing	The audio database is missing from the GMC 507. The aural voice alerts will not be heard.
Servo Clutch Fault	One or more autopilot servos has a stuck clutch. The servo needs service.
Servo Trim Input Fault	The inputs to the trim system are invalid. The trim system needs service.
Autopilot Annunciations	
AFCS	Autopilot has failed. Autopilot and trim are inoperative and flight director is not available.
AP	Autopilot normal disconnect.
AP	Autopilot abnormal disconnect.
AP	Autopilot has failed. The autopilot is inoperative. FD modes may still be available.
MAXSPD	Autopilot Overspeed Protection mode is active. Autopilot will raise the nose to limit the aircraft's speed.
MINSPD	Autopilot Underspeed Protection mode is active. Autopilot will lower the nose to prevent the aircraft's speed from decreasing.
PFT	Autopilot preflight test is in progress.
PTRIM	Pitch Trim Fail – Manual Electric Pitch Trim is inoperative.
TRIM DOWN	Elevator Trim Down – Autopilot is holding elevator nose down force. The pitch trim needs to be adjusted nose down.
TRIM UP	Elevator Trim Up – Autopilot is holding elevator nose up force. The pitch trim needs to be adjusted nose up.

LIGHTING

When the aircraft's dimming bus is selected off, or full dim, GMC 507 mode control panel lighting is controlled by integrated photocells which sense the ambient cockpit lighting.

EASA Approved Flight Manual Supplement

TRX Collision Avoidance System
AIR Traffic Collision Avoidance System

Aircraft Make:	**Cessna Aircraft Company**
Aircraft Model:	**172N**
Aircraft S/N:	**172-72198**

This document is approved under EASA Minor Change Approval #100 487 04 – Rev. 1.

This document must be carried in the aircraft at all times. It describes the operating procedures for the Garrecht collision avoidance system when it has been installed in accordance with Garrecht Avionik installation manual GAV-MC003 and the related EASA Minor Change Approval.

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

The use of this minor change requires a written permission letter, which is solely provided by Garrecht Avionik or its authorized subsidiaries.



Johannes Garrecht
Garrecht Avionik GmbH
26 March 2014

General

The gliding scene has been confronted since years to dramatic mid air collision accidents. With the extreme fine shape and relatively high cruise speed of modern gliders, the human vision has reached its limit of detection. Another aspect is the airspace restrictions to VFR that creates an augmentation of traffic density in certain areas and the associated airspace complexity that request more pilot attention on the navigation material. These have a direct impact on the probability of collision also affecting powered aircraft or rotorcraft operations.

These equipments in the general aviation are not required by technical specifications or by operation regulations, but are recognized by the regulators as an important step toward improved aviation safety. Therefore they are *not* considered as essential for flight and may be used for "situational awareness only" on basis of non interference to certified equipment necessary for safe flight/landing and no hazard to the persons on board.

Correct antenna installation has a great effect on the transmission/receiving range. The pilot shall care that no masking of the antenna occurs especially when the antennas (GPS + 868 MHZ + ADS-B 1090) are located in the cockpit.

The system will give warnings of other aircraft that are equipped with a FLARM compatible unit or Mode-S transponders or ADS-B 1090 ES out equipment. It will not be detected by ACAS/TCAS/TPAS or Air Traffic Control. Likewise it does not communicate with FIS-B, TIS-B systems.

The software version must be regularly updated as per the instructions given in the installation manual. If a version mismatch exists, error information is displayed during the equipment power ON and the system will not become operational.

A unique switch provides ready disconnection of all equipments connected to the Collision Avoidance function from the electrical bus in case of fume, fire, interferences or when flying over territories where the SRD frequency is not available for air-air communication. This switch is labeled adequately.

1 Operating Limitations

1. The installation of the *TRX* or *AIR Traffic* is compliant with installation for "situational awareness only". The following placard must be installed on the instrumental panel, at the proximity of the display:

   For Situation Awareness only

2. *Maneuvering must not be based solely on the use of the information presented on the system's displays or displays connected to the device or aural annunciations.* FLARM does not give any guidance on avoiding action. The azimuth and height accuracy of the computed traffic cannot always provide reliable warnings and only the most threatening traffic is announced. Therefore it is the pilot responsibility to evaluate by any means the real traffic position and altitude, the obstacle shape, the terrain and the meteorological situation prior executing any evasion maneuver. *Under no circumstances should a pilot or crew member adopt different tactics or deviate from the normal principles of safe airmanship.*
3. *It is the pilot's responsibility to verify prior entering any states territory that the SRD frequency is permitted for use in air-air communication.* When such an acceptance does not explicitly or implicitly exist, the equipment shall be turned OFF. This verification is part of the flight planning.
4. *The pilot shall not intentionally generate uncoordinated warnings that might frighten other aircraft's pilot.* Any intentional maneuver of this kind has to be carefully coordinated and agreed in advance. Unexpected reactions might be especially hazardous when lateral, vertical or time separations are small.
5. During aerobatics, the system must be switched off.
6. To avoid blinding during night conditions, systems or connected displays without brightness control must be switched off.

2 Emergency Procedures

In case of *fire, smoke, electrical burning smells or electromagnetic interferences* follow the emergency procedure of the basic AFM.

The system is normally installed on a non-essential bus. But on ancient aircraft it is possible that only an avionics bus or even only a main bus is available for all electrical consumers. The basic Emergency procedure might require this bus disconnection that will generate a total loss of Navigation, Communication and ATC detection. This is classified as a catastrophic failure condition under IMC condition.

The dedicated system switch will help to rapidly determine if the installation is faulty or not, allowing to resume essential equipments as per the Emergency procedure of the basic Aircraft Flight Manual.

3 Normal Procedures

No change to the basic flight manual. Relate to the system operating manual for features and operation.

4 Performance

No change to the basic flight manual

5 Weight and Balance

Refer to weight & balance report created after installation of the device.

6 Description and Operation of the Airplane and its Systems

Refer to the system user manual

7 Airplane Handling, Servicing, and Maintenance

No regular maintenance is required, maintenance is on condition only. The integrated FLARM subsystem requires periodical software and obstacle database updates. Follow the instructions in the manuals supplied with the device for detailed information. In case of poor system performance, follow the instructions provided by the manual.

GMA 350/350c

pilot's guide



GARMIN

Copyright © 2011, 2015-2017 Garmin Ltd. or its subsidiaries. All rights reserved.

This manual reflects the operation of GMA 350/350c units. Some differences in operation may be observed when comparing the information in this manual to earlier or later Mod status levels.

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

Garmin AT, Inc.,2345 Turner Road SE, Salem, OR 97302, U.S.A.

Garmin (Europe) Ltd., Liberty House, Hounsdown Business Park, Southampton, Hampshire SO40 9LR U.K.

Garmin Corporation, No. 68, Zhangshu 2nd Road, Xizhi District, New Taipei City, Taiwan

Web Site Address: www.garmin.com

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express written permission of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed for personal use, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin® is a registered trademark of Garmin Ltd. or its subsidiaries. These trademarks may not be used without the express permission of Garmin.

©2017 The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Garmin is under license. Other trademarks and trade names are those of their respective owners.

June, 2017 190-01134-12 Rev. L Printed in the U.S.A.

AVIATION LIMITED WARRANTY

All Garmin avionics products are warranted to be free from defects in materials or workmanship for the earlier of: 2 years or 800 flight hours from the date of purchase for new TSO remote-mount and TSO panel-mount products; 1 year or 400 flight hours from the date of purchase for new Non-TSO remote-mount* and Non-TSO panel-mount*, portable products and any purchased newly-overhauled products; 6 months or 200 flight hours for factory repaired or newly-overhauled products exchanged through a Garmin Authorized Service Center. Within the applicable period, Garmin will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This Limited Warranty does not apply to: (i) cosmetic damage, such as scratches, nicks and dents; (ii) consumable parts, such as batteries, unless product damage has occurred due to a defect in materials or workmanship; (iii) damage caused by accident, abuse, misuse, water, flood, fire, or other acts of nature or external causes; (iv) damage caused by service performed by anyone who is not an authorized service provider of Garmin; or (v) damage to a product that has been modified or altered without the written permission of Garmin. In addition, Garmin reserves the right to refuse warranty claims against products or services that are obtained and/or used in contravention of the laws of any country.

This Limited Warranty also does not apply to, and Garmin is not responsible for, any degradation in the performance of any Garmin navigation product resulting from its use in proximity to any handset or other device that utilizes a terrestrial broadband network operating on frequencies that are close to the frequencies used by any Global Navigation Satellite System (GNSS) such as the Global Positioning Service (GPS). Use of such devices may impair reception of GNSS signals.

TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE WARRANTIES AND REMEDIES CONTAINED IN THIS LIMITED WARRANTY ARE EXCLUSIVE AND IN LIEU OF, AND GARMIN EXPRESSLY DISCLAIMS, ALL OTHER WARRANTIES AND REMEDIES, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY REMEDY OR OTHERWISE. THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER LEGAL RIGHTS WHICH VARY FROM STATE TO STATE. IF IMPLIED WARRANTIES CANNOT BE DISCLAIMED, THEN SUCH WARRANTIES ARE LIMITED IN DURATION TO THE DURATION OF THIS LIMITED WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Garmin retains the exclusive right to repair or replace (with a new or newly-overhauled replacement product) the product or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

Online auction purchases: Products purchased through online auctions are not eligible for warranty coverage. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Garmin will not replace missing components from any package purchased through an online auction.

International purchases: A separate warranty may be provided by international distributors for devices purchased outside the U.S., depending on the country. If applicable, this warranty is provided by the local in-country distributor and this distributor provides local service for your device. Distributor warranties are only valid in the area of intended distribution. Devices purchased in the U.S. or Canada must be returned to the Garmin service center in the U.K., the U.S., Canada or Taiwan for service.



CAUTION: *Incorrect aircraft wiring could short the left channel or both channels to ground if a monaural headset is plugged into the stereo jacks. If wired incorrectly, fail-safe operation will not work.*

Transmitter Grant of Equipment Authorization

FCC ID: IPH-0163700
IC: 1792A-0163700
IC M/N: GMN-00871

NOTE

This device complies with Part 15 of the FCC rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference which may cause undesired operation

NOTE

This device does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could result in permanent damage to the equipment, and void your warranty and your authority to operate this device under Part 15 regulations.

Industry Canada Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux normes RSS sans licence d'Industrie Canada. Son fonctionnement est soumis aux conditions suivantes: (1) cet appareil ne doit pas causer d'interférences et (2) doit accepter toute interférence,y compris les interférences pouvant entraîner un fonctionnement indésirable de l'appareil.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

FCC Statement for Mobility Device

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Declaration of Conformity

Hereby, Garmin declares that this product is in compliance with the Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address www.garmin.com/compliance.

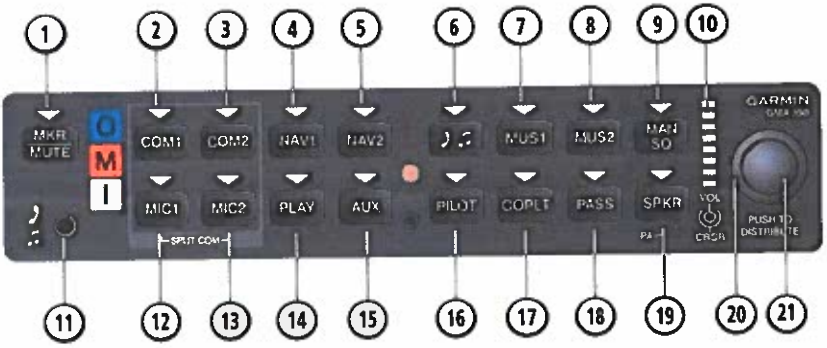
CE

Anatel Warning

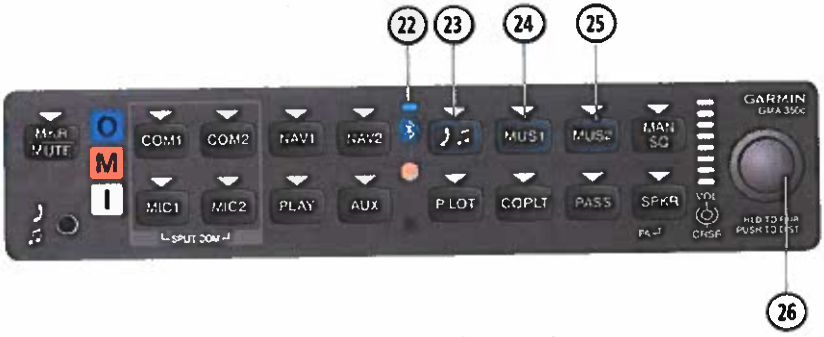
Este equipamento opera em caráter secundário, isto é, não tem direito a proteção contra interferência prejudicial, mesmo de estações do mesmo tipo, e não pode causar interferência a sistemas operando em caráter primário.

Controls 8
Features and Operation 12
Power-UP 12
Mono/Stereo Headsets 13
Transceivers 13
Enabling/Disabling Monitored COM Muting 13
Split-COM Mode 14
Transmit Indications 15
Receivers 15
Marker Beacon Receiver 16
Intercom System (ICS) 17
Copilot Configured as Crew or Passenger 18
Intercom MODES 18
Intercom Volume and Squelch 23
Speaker 25
3D Audio 26
Clearance Recorder and Player 28
Voice Recognition 29
Entertainment Inputs 35
Telephone and Entertainment Muting 35
Bluetooth® (GMA 350c Only) 36
Pairing a Bluetooth Device with the GMA 350c 36
Assigning an Audio Source to the Bluetooth Device 36
Additional Bluetooth Control Functions 37
Connecting Bluetooth to a Garmin VIRB 37
Bluetooth® Recording Mode 38
Fail-Safe Operation 38

CONTROLS



GMA 350 Controls



GMA 350c (Bluetooth®) Controls

***NOTE:** When a key is selected, a triangular annunciator above the key is illuminated.*

(1) **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Deactivates automatically and marker beacon audio is heard when the next marker beacon signal is received. Also, stops play of recorded COM audio.

(2) **COM1** – When selected, audio from the #1 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.

(3) **COM2** – When selected, audio from the #2 COM receiver can be heard. Press and hold to enable/disable monitored COM muting during primary COM reception.

(4) **NAV1** – When selected, audio from the #1 NAV receiver can be heard.

(5) **NAV2** – When selected, audio from the #2 NAV receiver can be heard.

(6)  – Selects and deselects audio from a telephone or entertainment device connected to the Front Panel Jack. Audio from a telephone connected to the rear of the audio panel is used if a device is not connected to the Front Panel Jack. Press and hold to enable/disable  muting during reception.

(7) **MUS1** – Selects and deselects music entertainment audio. Press and hold to enable/disable **MUS1** muting during reception.

(8) **MUS2** – Selects and deselects music entertainment audio. Press and hold to enable/disable **MUS2** muting during reception.

(9) **MAN SQ** – Manual Squelch annunciator. When lit, squelch is controlled manually.

(10) **Volume Indicator** – Indicates volume/squelch setting relative to full scale.

(11) **Front Panel Jack** – Used for an entertainment or telephone input.

(12) **MIC1** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receive can be added by pressing the **COM2** Key. Selection of a second MIC button initiates Split-COM mode. When in Split-COM mode, the pilot is using COM1, the copilot is using the COM2.

(13) **MIC2** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 receive can be added by pressing the **COM1** Key. Selection of a second MIC button initiates Split-COM mode. When in Split-COM mode, the pilot is using COM1, the copilot is using the COM2.

(14) **PLAY** – Press once to play the latest recorded memory block. Press while audio is playing begins playing the previously recorded memory block. Each subsequent press thereafter plays the previous block of memory.

(15) **AUX** – When selected, audio from the AUX inputs can be heard.

(16) **PILOT** – Controls the pilot intercom system. Press and hold to toggle 3D Audio on/off for all headset positions.

(17) **COPLT** – Controls the copilot intercom system. Press and hold to toggle copilot configuration between crew and passenger.

(18) **PASS** – Controls the passenger intercom system. Press and hold to enable/disable passenger muting during reception.

(19) **SPKR** – Selects and deselects the cabin speaker. COM, NAV, AUX, and MKR receiver audio can be heard on the speaker. Press and hold for 2 seconds for Passenger Address (PA). The **SPKR** key flashes during PA.

(20) **Cursor (CRSR) Control Knob** – Turn to move the cursor (flashing white or blue annunciator) to the desired source.

(21) **Volume (VOL) Control Knob** – Turn the smaller knob to control volume or squelch of the selected source (indicated by the flashing white or blue annunciator). When the volume control cursor is not active press to switch to Blue-Select mode. If the volume control cursor is active, press twice (once to cancel the cursor, twice to activate Blue-Select mode).

(22) **Bluetooth® Connection Annunciator** – (GMA 350c only) A flashing blue annunciator indicates the unit is discoverable. A solid blue annunciator indicates an active Bluetooth connection.

(23) **♪♫ Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the ♪♫ audio source. Press the ♪♫ key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(24) **MUS1 Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the **MUS1** audio source. Press the **MUS1** key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(25) **MUS2 Key Annunciator** – (GMA 350c only) Assigns the Bluetooth device to the **MUS2** audio source. Press the **MUS2** key until the annunciator turns blue. The key annunciator will cycle from OFF to WHITE to BLUE. WHITE selects the wired audio source and BLUE selects the Bluetooth audio source. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

(26) **Control Knob** Press and Hold – (GMA 350c only) Press and hold for two seconds to enable the GMA 350c as discoverable for pairing. The Bluetooth Annunciator will flash to indicate that the unit is discoverable. The unit will remain discoverable for 90 seconds or until a successful pair is established. Once a successful pair is established, the audio "Bluetooth paired" is played.

FEATURES AND OPERATION

The GMA 350/350c Audio Panel provides the traditional audio selector functions of microphone and receiver audio selection. The Audio Panel includes an intercom system (ICS), a marker beacon receiver, and a COM clearance recorder. Ambient noise from the aircraft radios is reduced by Avionics Squelch (ASQ). When no audio is detected, ASQ processing further reduces the amount of background noise. The **MAN SQ** Key toggles between manual and automatic intercom system (ICS) squelch. In automatic ICS squelch mode, threshold adjustments are handled automatically by the system. In manual ICS squelch mode, individual threshold adjustments can be made for the pilot, copilot, and passenger microphones by the crew. The ability to adjust individual thresholds for each ICS position further reduces the amount of background noise from the radios.

Pushbutton keys control audio selection. When a key is selected, a triangular annunciator above the key is illuminated. Annunciator brightness is adjusted automatically by photocell dimming. Key brightness is adjusted by the radio dimming bus control. Three Aux inputs are available for additional avionics or audio devices.

Upon installation, the unit may be configured in various ways depending on aircraft type and the needs of the pilot.

POWER-UP

The GMA 350/350c performs a self-test during power-up. During the self-test all Audio Panel annunciator lights illuminate for approximately two seconds. Once the self-test is completed, most of the settings are restored to those in use before the unit was last turned off.

MONO/STEREO HEADSETS

Stereo headsets are recommended when using the GMA 350/350c. Using a monaural headset in a stereo jack shorts the right headset channel output to ground. While this does not damage the Audio Panel, a person listening on a monaural headset hears only the left channel in both ears. If a monaural headset is used at one of the passenger positions, any other passenger using a stereo headset hears audio in the left ear only.

TRANSCEIVERS

***NOTE:** Transceiver functions may also be accessed via Voice Recognition commands. Refer to the Voice Recognition section for more information.*

Audio from the #1 or #2 COM receiver can be selected independently by pressing the respective Key(s) (**COM1** or **COM2**).

Pressing MIC1 or MIC2 selects the #1 or #2 transmitter and simultaneously selects the related COM receiver (COM1 or COM2) allowing received audio to be heard. The other COM receiver can be added by pressing the respective key. During reception of audio from the COM radio selected for transmission, audio from the other COM radio is muted.

ENABLING/DISABLING MONITORED COM MUTING

Press and hold **COM1** or **COM2** to enable/disable monitored COM muting during reception of audio from the COM radio selected for transmission. The aural message **"Monitor Mute Enabled/Disabled"** is heard.

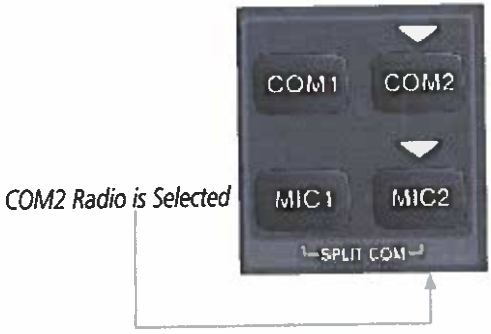
SPLIT-COM MODE

NOTE: *Split COM performance is affected by the distance between the COM antennas and the separation of the tuned frequencies. If the selected COM frequencies are too close together, interference may be heard during transmission on the other radio.*

During Split-COM operation, both the pilot and the copilot can transmit simultaneously over separate radios.

Pressing both **MIC** Keys simultaneously initiates Split-COM Mode (i.e., COM1/COM2). The respective COM1/MIC1 or COM2/MIC2 annunciators are illuminated indicating Split-COM operation. Split-COM operation is cancelled by pressing one of the selected MIC Keys again.

In Split-COM mode, the pilot uses COM1 and the copilot uses COM2.

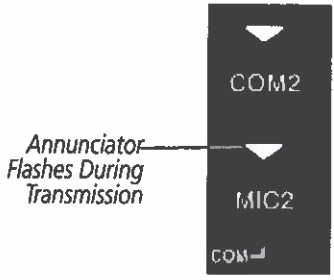


Selecting a COM Radio for Transmit

TRANSMIT INDICATIONS

During COM transmission, the active transceiver (MIC1 or MIC2) Key Annunciator flashes approximately once per second.

During Split-COM transmission, the MIC1 annunciator flashes when the pilot's microphone PTT is pressed. The MIC2 annunciator flashes when the copilot's microphone PTT is pressed.



COM Radio Transmit Indication

RECEIVERS

NOTE: *Receiver functions may also be accessed via Voice Recognition commands. Refer to the Voice Recognition section for more information.*

Pressing the **NAV1** and/or **NAV2** Key(s) selects/deselects the receiver audio for the corresponding navigation radio source. The selected audio source can be heard over the headset and the speaker (if selected). All radios can be selected individually or simultaneously.



Selecting a NAV Radio Receiver

MARKER BEACON RECEIVER

The marker beacon receiver detects any marker beacon signal within the reception range of the aircraft.

When a marker beacon signal is detected, the lamps illuminate, and an associated keyed-tone is heard when MKR audio is selected. Marker beacon lamps operate independently of any audio selection and cannot be turned off.



Marker Beacon Key & Lamps

The marker beacon signal sensitivity threshold can be set to High, Low, or User Selectable (toggle switch required).

The receiver detects the three marker tones (outer, middle, and inner).

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

The GMA 350/350c provides three states of marker beacon operation; On, Muted, and Deselected. The **MKR/MUTE** key annunciator indicates when marker beacon audio is selected. Marker beacon audio is not heard when the annunciator is off or when the annunciator is on with the marker beacon audio muted.

Turning Marker Beacon Audio On

With the MKR/MUTE annunciator off, press the **MKR/MUTE** Key to activate marker beacon audio and illuminate the MKR/MUTE annunciator.

Muting Marker Beacon Audio

During marker beacon audio reception, press the **MKR/MUTE** Key to mute the audio. The MKR/MUTE annunciator remains lit, but the current marker tone is silenced. Audio muting deactivates automatically and marker beacon audio is heard when the next marker beacon signal is received.

Deselecting Marker Beacon Audio

To deselect marker beacon audio, press the **MKR/MUTE** Key twice during marker beacon reception or once if a marker beacon signal is not detected.

INTERCOM SYSTEM (ICS)

NOTE: *Intercom functions may also be accessed via Voice Recognition commands. Refer to the Voice Recognition section for more information.*

The GMA 350/350c includes a six-position intercom system (ICS), two MUSIC inputs, and one telephone/entertainment input for the pilot, copilot and passengers. The intercom provides Pilot, Copilot, and Passenger audio isolation.



Intercom Controls

Press the **PILOT**, **COPLT**, and/or **PASS** Keys to distribute as required. If the annunciators are lit, those positions will share intercom audio. If an annunciator is NOT lit that position is isolated from the others.

COPILOT CONFIGURED AS CREW OR PASSENGER

NOTE: *When the copilot position is configured as a passenger, the COPLT Key is disabled and the copilot headset is treated as a 'passenger' for intercom and entertainment audio distribution.*

The copilot position can be configured as crew (**COPLT** Key enabled) or as a passenger (**COPLT** Key disabled). Pressing and holding the **COPLT** Key toggles the copilot position configuration between passenger and crew. The aural message **"Copilot as Passenger"** or **"Copilot as Crew"** is heard.

INTERCOM MODES

NOTE: *In the following modes the copilot position is configured as crew.*

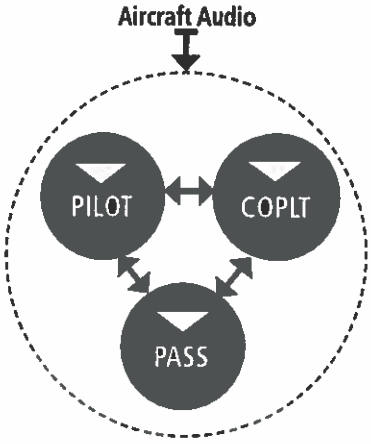
NOTE: *In the default ICS configuration, only the pilot and copilot positions can hear aircraft alerts.*

All Intercom Mode

In 'All Intercom' mode the Pilot, Copilot, and Passengers hear each other and hear the aircraft audio.



ICS Keys



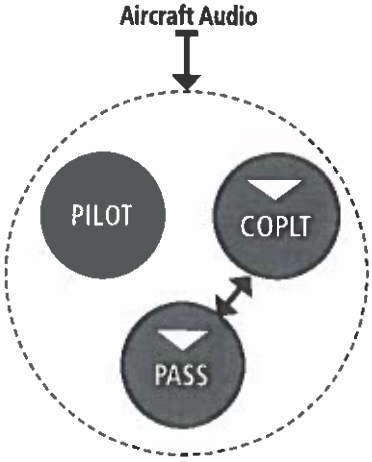
Mode Operation

Pilot Isolate Mode

In 'Pilot Isolate' mode the Pilot, Copilot, and Passengers hear the aircraft audio. The Copilot and Passengers also hear each other.



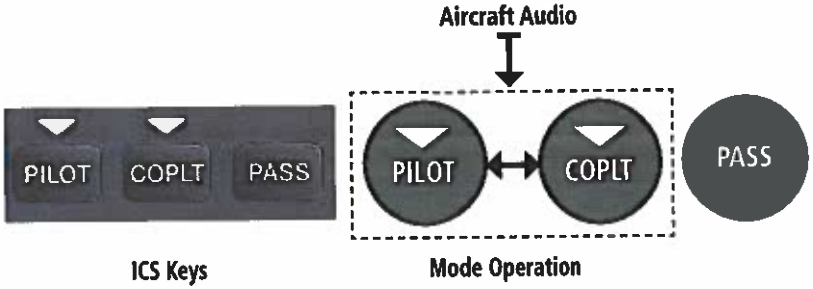
ICS Keys



Mode Operation

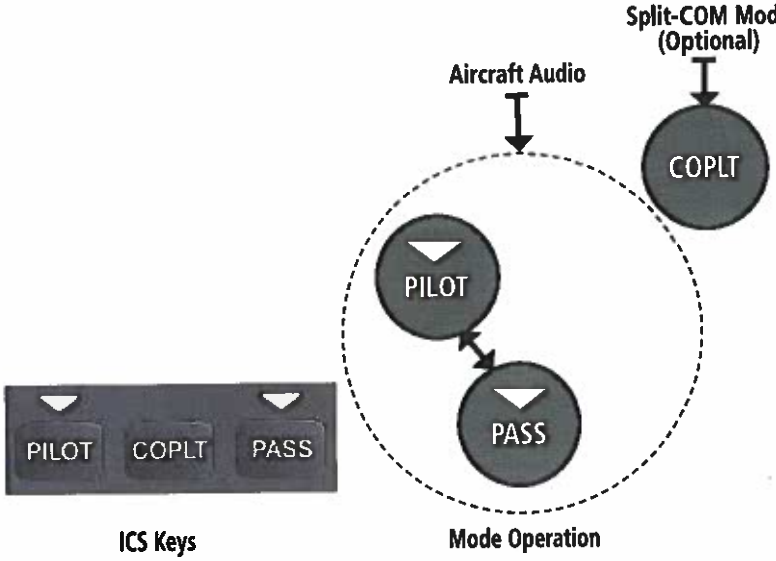
Passenger/Crew Isolate Mode

In 'Passenger/Crew Isolate' mode the Pilot and Copilot hear the aircraft audio and each other. The Passengers hear each other.



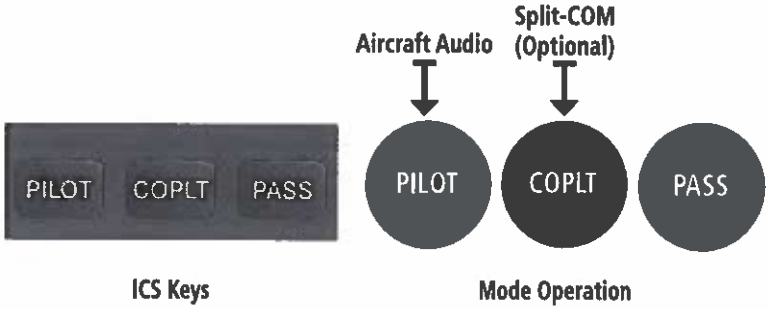
Copilot Isolate Mode

In 'Copilot Isolate' mode the Pilot and Passengers hear the aircraft audio and each other. The Copilot has the option to use Split-COM mode.



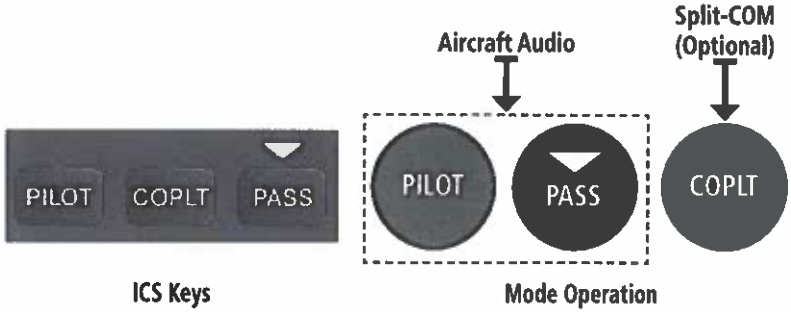
All Isolate Mode

In 'All Isolate' mode the Pilot hears the aircraft audio. The Copilot has the option to use Split-COM mode. The Passengers hear each other.



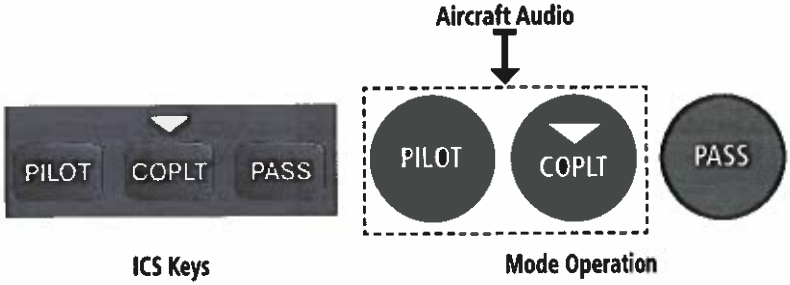
Pilot & Copilot Isolate Mode

In 'Pilot & Copilot Isolate' mode the Pilot and Passengers hear the aircraft audio. The Copilot has the option to use Split-COM mode.



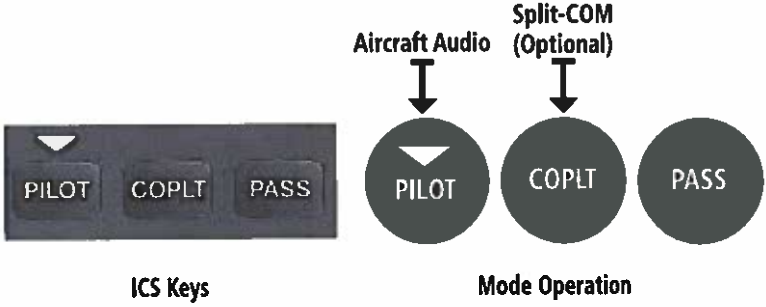
Pilot & Passenger Isolate Mode

In 'Pilot & Passenger Isolate' mode the Pilot and Copilot hear the aircraft audio. The Passengers hear each other.



Copilot & Passenger Isolate Mode

In 'Copilot & Passenger Isolate' mode the Pilot can hear the aircraft audio. The Copilot has the option to use Split-COM mode. The Passengers hear each other.

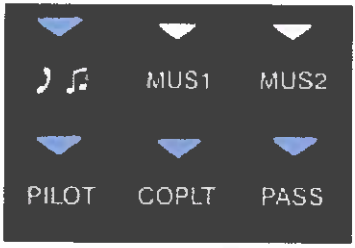


INTERCOM VOLUME AND SQUELCH

The **VOL/CRSR** Knob controls selection and volume or manual squelch adjustment for audio sources that may not be adjustable anywhere else in the system. The small knob controls the volume or squelch. Turning the large knob activates and/or moves the cursor (flashing white annunciator/ or flashing blue annunciator in Blue-Select Mode) to select the audio source to adjust. The cursor will time-out after a few seconds and the position of the cursor will always default back to the **PILOT** Key. Pressing the small knob cancels the cursor.

BLUE-SELECT MODE (TELEPHONE/ENTERTAINMENT DISTRIBUTION)

The music (MUS1/MUS2) and telephone/entertainment ( ) audio are distributed using the Blue-Select Mode. The following example indicates that the pilot, copilot, and passengers will all hear the telephone/entertainment audio.



Blue-Select Mode (Telephone/Entertainment Distribution)

The Blue-Select Mode is entered by pressing the small knob when the volume control cursor (flashing white annunciator) is not active. If the volume control cursor is active, press the small knob twice. The first press will cancel the volume control cursor, the second will activate Blue-Select Mode.

The annunciator over the ♪♫ Key will be flashing blue. Any combination of the annunciators over the **PILOT**, **COPLT**, and **PASS** buttons may be blue. Select the desired button to turn the blue annunciator on or off to distribute the telephone/entertainment audio to selected crew/passenger positions. Turn the large knob to select **MUS1** or **MUS2** and select the crew positions to receive the music audio.

Selecting any key other than **PILOT**, **COPLT**, **PASS**, **MUS1**, **MUS2**, or ♪♫ will cancel Blue-Select Mode. Pressing the small knob will also cancel Blue-Select Mode. After approximately 20 seconds with no input, the Blue-Select Mode will automatically cancel.

Adjusting Intercom Volume

When the cursor is on PILOT, COPLT, or PASS, the Volume Control Knob adjusts the intercom volume for the listener.

Adjusting Manual Squelch

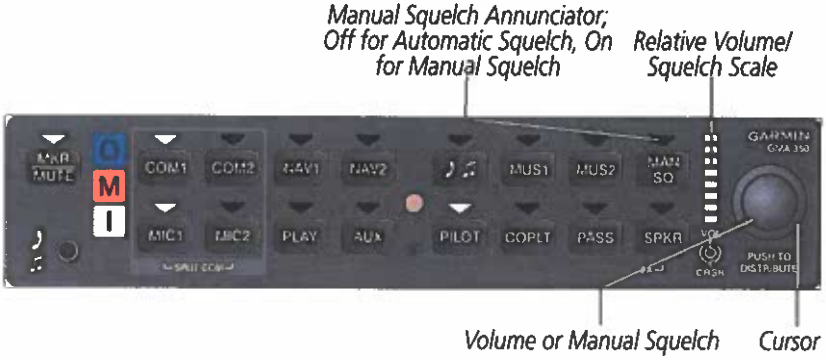
When the cursor is on MAN SQ, the Volume Control Knob adjusts the ICS Squelch Threshold (the volume level that must be exceeded to be heard over the intercom).

Adjusting Speaker Volume

When the cursor is on SPKR, the Volume Control Knob adjusts the speaker volume of the selected sources (COM, NAV, AUX, MKR).

Adjusting MKR, AUX, ♪♫, and MUSIC Volume

When the cursor is on MKR, AUX, ♪♫, MUS1 or MUS2, the Volume Control Knob adjusts the individual volume of the selected source.



Volume/Squelch Control

SPEAKER

All of the radios can be heard over the cabin speaker. Pressing the **SPKR** Key selects and deselects the cabin speaker. Speaker audio is muted when the PTT is pressed. Certain aural alerts and warnings (autopilot, traffic, altitude) are always heard on the speaker, even when the speaker is not selected.



Speaker Key

Passenger Address Mode (PA Mode)

Press and hold the **SPKR** Key for 2 seconds to initiate Passenger Address Mode. PA Mode is annunciated by a rapid blinking of the SPKR annunciator. When in PA Mode the crew can use the PTT "Push-to-Talk" button to deliver announcements over the speaker, to the passenger headsets, or both depending on configuration.

Split-PA Mode

During Split-PA Mode the pilot can continue to use the radio(s) while the copilot delivers PA announcements. To initiate Split-PA Mode, first enter Split-COM Mode by pressing both **MIC** Keys simultaneously, then press and hold the **SPKR** Key for 2 seconds.

3D AUDIO

3D Audio is useful when multiple audio sources are present. By using different responses in each ear, 3D audio processing creates the illusion that each audio source is coming from a unique location or seat position.

Because this feature uses different signals for left and right channels, it requires wiring for stereo intercom and stereo headsets. If 3D audio is activated when mono headsets are in use, the listener will still hear all audio sources; however, there is no benefit from location separation.

With a single COM selected and 3D Audio enabled, the listener hears the audio source at the 12 o'clock position. If both COMs are selected, the listener hears COM1 at 11 o'clock and COM2 at the 1 o'clock position. All other intercom positions are processed to sound like their relative seat location. By default, the GMA 350/350c assumes the pilot sits in the left seat. A Garmin authorized service center can make changes to the default configuration.

Enabling 3D Audio

Press and hold the **PILOT** Key to toggle 3D audio processing on and off for all headset positions. When 3D Audio is enabled, the aural message "3D audio left" is heard in the left ear followed by "3D audio right" in the right ear. If the aural messages are not heard in only the left and then the right ear respectively, the cause may be aircraft wiring or headset settings. Refer to the following table if a headset or aircraft wiring problem is suspected.

3D Audio Troubleshooting		
Symptom(s)	**Cause(s)**	**Solution(s)**
"3D audio left" message heard in both ears. "3D audio right" message not heard	1) Mono headset in use	1) Use a stereo headset
	2) Stereo headset in use with mono/stereo switch set to 'mono'	2) Set mono/stereo switch on headset to 'stereo'
	3) Aircraft wiring has left audio wired to both left and right channels of stereo headset jack	3) If after checking solutions #1 and #2 see a service center as soon as possible to inspect/ correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in both ears, followed by "3D audio right" message heard in both ears	1) Mono headset in use	1) Use a stereo headset
	2) Stereo headset in use with mono/stereo switch set to mono	2) Set mono/stereo switch on headset to 'stereo'
	3) Incorrect aircraft wiring (left/right shorted together)	3) If after checking solutions #1 and #2 see a service center as soon as possible to inspect/ correct wiring. This wiring fault can cause fail-safe audio not to function.
Symptom(s)	**Cause(s)**	**Solution(s)**
"3D audio right" message heard in both ears. "3D audio left" not heard	1) Incorrect aircraft wiring (right channel used for mono instead of left or left/ right swapped)	1) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

3D Audio Troubleshooting		
"3D audio left" message heard in right ear only followed by "3D audio right" message heard in left ear only	1) Stereo headset is on backwards	1) Verify correct orientation from the left/right indication on each side of the headset or the position of the boom MIC (usually attached on left side). If the headset is backwards, the left/right position information will be swapped.
	2) Incorrect aircraft wiring (left/right channels swapped)	2) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.
"3D audio left" message heard in left ear only, no audio heard in right ear.	1) Aircraft wired for mono intercom	1) See a service center to wire the installation for stereo headsets.
"3D audio right" message heard in right ear only, no audio heard in left ear	1) Incorrect aircraft wiring (right channel used for mono instead of left, or left/right swapped)	1) See a service center as soon as possible to inspect/correct wiring. This wiring fault can cause fail-safe audio not to function.

3D Audio Troubleshooting

CLEARANCE RECORDER AND PLAYER

The GMA 350/350c contains a digital clearance recorder that records up to 2.5 minutes of the selected COM radio signal. Recorded COM audio is stored in separate memory blocks. Once 2.5 minutes of recording time have been reached, the recorder begins recording over the stored memory blocks, starting from the oldest block.

Pressing the **PLAY** Key once plays the latest recorded memory block. The Play function can also be accessed via Voice Recognition commands. Refer to the 'Voice Recognition' section for more information.

Pressing the **MKR/MUTE** Key during play of a memory block stops play. If a COM signal is detected during play of a recorded memory block, play is halted.

Pressing the **PLAY** Key while audio is playing begins playing the previously recorded memory block. Each subsequent press of the **PLAY** Key selects the previously recorded memory block.

Powering off the unit automatically clears all recorded blocks.



Marker Mute Key

VOICE RECOGNITION

Voice Recognition allows the pilot (and optionally copilot) to control the GMA 350/350c using spoken commands. To activate Voice Recognition, push and hold the Push-to-Command (PTC) button while speaking a command. When the Push-to-Command button is released, the GMA 350/350c will respond.

If a command is correctly interpreted by the GMA 350/350c, a positive acknowledgement chime will be played, and the pilot should verify that the correct button selection is indicated by the triangular annunciator lights. Alternatively, some commands will be indicated by a voice response from the GMA 350/350c. If the desired modes are not indicated by annunciator lights or a voice response, the pilot should repeat the command by using the Push-to-Command button, or by manually using the front panel controls of the GMA 350/350c.

If a command is incorrectly interpreted by the GMA 350/350c, a negative acknowledgement tone will be played. The pilot should repeat the command by using the Push-to-Command button, or by manually using the front panel controls of the GMA 350/350c. In the event of any abnormal Voice Recognition operation, the front panel controls may be used to override Voice Recognition and manually control the GMA 350/350c.

The following table lists the available Voice Recognition commands, the associated actions, and the voice response if applicable:

Control	Example Phrase	Action
COM	"COM one"	Toggles COM1 audio
	"MIC one"	Selects MIC1/COM1 audio
	"COM one MIC"	Selects MIC1/COM1 audio
	"COM two"	Toggles COM2 audio
	"MIC two"	Selects MIC2/COM2 audio
	"COM two MIC"	Selects MIC2/COM2 audio
	"Split COM"	Selects split COM mode
	"Monitored COM mute" OR "Mute Monitored COM"	Mutes monitored COM on primary COM reception (refer to Page 8). Voice Response: "Monitor mute enabled".
	"Disable monitored COM mute" "Monitored COM mute disable" "Disable mute monitored COM" OR "Mute monitored COM disable"	Disables monitored COM mute on primary COM reception (refer to Page 8). Voice Response: "Monitor mute disabled".
NAV	"NAV one"	Toggles NAV1 audio
	"NAV two"	Toggles NAV2 audio
AUX	"AUX" OR "Auxiliary"	Toggles AUX audio

Control	Example Phrase	Action
	"Telephone" "Phone" OR "Jack"	Toggles ♪ (TEL/JACK) input
	"Telephone mute" "Mute telephone" "Phone mute" "Mute phone" "Jack mute" OR "Mute Jack"	Mutes TEL/JACK on radio reception. Voice Response: "Tel and jack mute enabled".
♪	"Disable telephone mute" "Mute telephone disable" "Disable phone mute" "Mute phone disable" "Disable jack mute" "Mute jack disable" "Telephone mute disable" "Disable mute telephone" "Phone mute disable" "Disable mute phone" "Jack mute disable" OR "Disable mute jack"	Disables TEL/JACK mute on radio reception. Voice Response: "Tel and jack mute disabled".
MUSIC	"MUSIC one"	Toggles MUS1 input
	"MUSIC two"	Toggles MUS2 input
	"MUSIC one mute" OR "Mute MUSIC one"	Mutes MUS1 on radio reception Voice Response: "Music one mute enabled"
	"Disable MUSIC one mute" "MUSIC one mute disable" "Disable mute MUSIC one" OR "Mute MUSIC one disable"	Disables MUS1 mute on radio reception. Voice Response: "Music one mute disabled".

Control	Example Phrase	Action
MUSIC	"MUSIC two mute" OR "Mute MUSIC two"	Mutes MUS2 on radio reception. Voice Response: "Music two mute enabled".
	"Disable MUSIC two mute" "MUSIC two mute disable" "Disable mute MUSIC two" OR "Mute MUSIC two disable"	Disables MUS2 mute on radio reception. Voice Response: "Music two mute disabled".
ICS Isolation	"Pilot"	Toggles PILOT button
	"Copilot"	Toggles COPLT button
	"Passenger" OR "Pass"	Toggles PASS button
	"Passenger mute" "Pass mute" "Mute passenger" OR "Mute pass"	Mutes passengers during radio reception. Voice Response: "Passenger mute enabled".
	"Disable passenger mute" "Disable pass mute" "Disable mute passenger" "Disable mute pass" "Passenger mute disable" "Pass mute disable" "Mute passenger disable" OR "Mute pass disable"	Disables muting of passengers during radio reception. Voice Response: "Passenger mute disabled".
Copilot Configuration	"Copilot is passenger" OR "Copilot is pass"	Configures Copilot as a passenger. Voice Response: "Copilot as passenger".
	"Copilot is crew"	Configures Copilot as flight crew. Voice Response: "Copilot as crew".

Control	Example Phrase	Action
Manual Squelch	"Manual squelch" OR "Man squelch"	Toggles manual squelch mode
	"Manual squelch threshold up" "Man squelch threshold up" "Manual squelch volume up" OR "Man squelch volume up"	Increases manual squelch threshold
	"Manual squelch threshold down" "Man squelch threshold down" "Manual squelch voume down" OR "Man squelch volume down"	Decreases manual squelch threshold
NOTE: Finer manual squelch adjustment may be made using the dual concentric knobs on the GMA 350/350c. The voice command "Up" or "Down" is equivalent to three clicks of the inner knob.		
Speaker (SPKR)	"Speaker"	Toggles SPKR on/off
PA	"P - A"	Toggles PA on/off
Marker Beacon (MKR/MUTE)	"Marker" "Mute marker" OR "Marker mute"	Same action as pressing MKR/ MUTE (refer to page 4).
COM Clearance Recorder	"Play" "Read back" OR "Say again"	Same action as pressing PLAY (refer to page 5).
Cursor	"Cursor off" "Cursor cancel" OR "Cancel cursor"	Cancels cursor when cursor is flashing
Volume Adjustments	"(Desired selection*) volume up"	Increases volume of desired selection
	"(Desired selection*) volume down"	Decreases volume of desired selection

Control	Example Phrase	Action
Volume Adjustments	"(Desired selection*) volume	Displays the current volume but does not change it
* Desired selection = "Speaker", "pilot", "copilot", "passenger", "pass", "marker", "aux", "auxiliary", "telephone", "phone", "jack", "music one", or "music two". **NOTE**: Finer volume adjustment may be made using the dual concentric knobs on the GMA 350/350c. The voice command "Up" or "Down" is equivalent to three clicks of the inner knob.		
Distribution (Blue Mode)	"Distribute telephone to (desired position(s) **)" OR "Distribute phone to (desired position(s) **)" OR "Distribute jack to (desired position(s) **)"	Distributes TEL/JACK to desired positions.
	"Distribute music one to (desired position(s) **)"	Distributes MUS1 to desired position(s)
	"Distribute music two to (desired position(s)**)"	Distributes MUS2 to desired position(s)
** Desired position(s) = "All", "none", "pilot", "copilot", "passenger", "pass", or any combination of pilot, copilot, passenger, or pass. **NOTE**: The word "to" may be omitted from distribution phrases.		
3D Audio	"Three-D audio"	Enables 3D audio (refer to page 21) Voice Response: "Three-D audio left, three-D audio right"
	"Standard audio"	Enables standard audio (disables 3D audio) Voice Response: "Standard Audio"

Voice Recognition Commands

ENTERTAINMENT INPUTS

The GMA 350/350c provides three stereo telephone/entertainment inputs:

- The telephone/entertainment (♪♫) Key controls a telephone or entertainment device connected to the rear of the audio panel or to the Front Panel Jack.
- The **MUS1** and **MUS2** Key controls the Entertainment Music audio input.

The Front Panel Jack can be used as an entertainment input or a telephone input (in which case, it operates simultaneously with the rear telephone interface). The Front Panel Jack is a 3.5-mm stereo jack that is compatible with popular portable entertainment devices such as MP3s, CD players, and cell phones. The headphone outputs of the entertainment devices are plugged into the Front Panel Jack.

Distribution of the entertainment inputs are configured in Blue-Select Mode.

TELEPHONE AND ENTERTAINMENT MUTING

Telephone and entertainment muting can be enabled or disabled by the user, however it is always muted during alerts.

Enabling/Disabling Muting

Press and hold the **MUS1**, **MUS2**, or (♪♫) Key for two seconds to toggle muting on and off. The aural message **"Music 1 Mute Enabled/Disabled"**, **"Tel Mute Enabled/Disabled"**, or **"Bluetooth Mute Enabled/Disabled"** is heard.

BLUETOOTH® (GMA 350c ONLY)

NOTE: *Pairing is only necessary during the first attempt to connect a Bluetooth device to the GMA 350c. Once paired, the GMA 350c and the device will connect automatically.*

PAIRING A BLUETOOTH DEVICE WITH THE GMA 350c

Press and hold the inner knob for two seconds. The Bluetooth Annunciator flashes to indicate the unit is discoverable and the aural message "**Bluetooth discoverable**" is heard. The GMA 350c will remain discoverable for 90 seconds or until a successful pair is established. Once paired, the Bluetooth Annunciator turns steady blue and the aural message "**Bluetooth paired**" is heard.

ASSIGNING AN AUDIO SOURCE TO THE BLUETOOTH DEVICE

Press the ♪♫, **MUS1**, or **MUS2** key until the annunciator turns blue (the audio from the Bluetooth source will not be heard until this step is complete). The key annunciator cycles OFF-WHITE-BLUE. WHITE selects the wired audio source. BLUE selects the Bluetooth audio source. The BLUE source assignment will persist through Bluetooth audio connection disruptions. **NOTE**: The Bluetooth audio can only be assigned to one source at a time. Once the Bluetooth audio is assigned to an audio source, the remaining entertainment audio sources will only cycle between OFF and WHITE.

Bluetooth audio will maintain a separate volume level and Blue Select distribution from the wired audio source. If the Bluetooth connection is supporting a phone call, all intercom positions listening to that source can also speak on the call through the headset MICs.

ADDITIONAL BLUETOOTH CONTROL FUNCTIONS

In addition to the 2 second press and hold of the inner knob discussed above, the knob has two additional functions that are intended to be seldom or never used. The following functions are available if needed for troubleshooting:

- Press and hold the inner knob for 5 seconds to turn off the Bluetooth radio. The aural message "**Bluetooth off**" is heard. This function electrically turns off the radio, not just the audio source selection. In the event that Bluetooth radio interference with communication or navigation equipment is suspected, the Bluetooth radio can be powered off without powering off the entire audio panel. A subsequent 5 second press and hold turns the radio back on.
- Press and hold the inner knob for 10 seconds to clear the memory of paired devices (up to 10 are stored). Once cleared, the aural message "**Bluetooth list cleared**" is heard. This function is used as a troubleshooting method when a device is not pairing, or to remove a device that is no longer needed.

CONNECTING BLUETOOTH TO A GARMIN VIRB

The GMA 350c supports Bluetooth wireless delivery of pilot headphone audio to versions of the Garmin VIRB action camera that support Bluetooth mic audio input for recording.

Pairing a Garmin VIRB to the GMA 350c works like pairing other Bluetooth audio devices. Once connected, pilot headphone audio will be delivered to the VIRB via Bluetooth. In a connection to the Garmin VIRB, the GMA is the source. Therefore, selecting an entertainment button is not required. The PILOT annunciator turns blue to indicate this connection.

BLUETOOTH® RECORDING MODE

Bluetooth® Recording Mode enables the option to record pilot headphone audio to a Bluetooth® recording device, such as an action camera, personal digital audio recorder, or a smart phone or tablet app. Bluetooth® Recording Mode takes all audio routed to the pilot's headphones (such as radio, music and intercom audio) and also outputs that audio to a paired Bluetooth® device. Bluetooth® Recording Mode requires a device that supports HFP.

To enable Bluetooth® Recording Mode, first connect the Bluetooth® digital recorder to the GMA. Then press the **PILOT** key and the small knob simultaneously. The PILOT annunciator will turn blue to indicate Bluetooth® Recording Mode is enabled, and the audio clip "**Bluetooth Recording Mode Enabled**" will play.

This setting is persistent. Once enabled for a device, the GMA will automatically enable Bluetooth® Recording Mode for future connections to that device (until disabled). The same process for enabling Bluetooth® Recording Mode is used for disabling it. When disabled, the audio clip "**Bluetooth Recording Mode Disabled**" will play.

***NOTE:** When connected to a Garmin VIRB X, Bluetooth Recording Mode will always be enabled (does not require manual enabling).*

FAIL-SAFE OPERATION

If there is a failure of the GMA 350/350c or when power is not applied, a fail-safe circuit connects the pilot's headset and microphone directly to the COM1 transceiver. Audio is not available on the speaker during Fail-safe operation.







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

Garmin AT, Inc.
2345 Turner Road SE
Salem, OR 97302, U.S.A.

Garmin (Europe) Ltd.
Liberty House, Hounsdown Business Park
Southampton, Hampshire SO40 9LR U.K.

Garmin Corporation
No. 68, Zhangshu 2nd Road
Xizhi District, New Taipei City, Taiwan

Contact Garmin Product Support at **www.flygarmin.com**

www.garmin.com

© 2011, 2015-2017 Garmin Ltd. or its subsidiaries

190-01134-12 Rev. L

GARMIN.

GTR 205

GNC 215

Pilot's Guide



Matjaž Meze
CA No.: 001
AEROSERVICE LESCE-BLED SI.CAO.024

COPYRIGHT & TRADEMARKS

© 2024 Garmin International, Inc., or its subsidiaries. All rights reserved.

Except as expressly provided herein, no part of this manual may be reproduced, copied, transmitted, disseminated, downloaded or stored in any storage medium, for any purpose without the express prior written consent of Garmin. Garmin hereby grants permission to download a single copy of this manual and of any revision to this manual onto a hard drive or other electronic storage medium to be viewed and to print one copy of this manual or of any revision hereto, provided that such electronic or printed copy of this manual or revision must contain the complete text of this copyright notice and provided further that any unauthorized commercial distribution of this manual or any revision hereto is strictly prohibited.

Garmin®, flyGarmin®, and flyGarmin.com® are registered trademarks of Garmin International or its subsidiaries. GFC™ and GI 275™ are trademarks of Garmin International or its subsidiaries. These trademarks may not be used without the express permission of Garmin.

Mac®, Macintosh®, and macOS® are registered trademarks of Apple Inc.

NavData® is a registered trademark of Jeppesen, Inc.

© 2024 microSD® is a registered trademark of SD-3C, LLC. All rights reserved.

All other marks and logos are property of their respective owners. All rights reserved.

SOFTWARE VERSION

This manual reflects the operation of system software v2.10. Some differences in operation may be observed when comparing the information in this manual to later software versions.

INFORMATION & SUPPORT

For information regarding the Aviation Limited Warranty, refer to Garmin's website.

For aviation product support, visit flyGarmin.com.

WARNING

Do not learn operational procedures for this product in the air. For safety reasons, thoroughly practice basic operation of this product on the ground before use during flight.

WARNING

Review and understand all aspects of this pilot's guide. Doing so reduces the risk of unsafe operation.

WARNING

Never use expired databases. Update databases regularly to ensure currency. Use out of date database information at your own risk.

WARNING

Always resolve any discrepancies between the display and other navigation sources when they occur. During flight operations, compare display indications to information from other NAVAIDs, visual sightings, charts, and other available sources before continuing navigation.

WARNING

Be aware that this product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our website at www.garmin.com/prop65.

CAUTION

Do not clean display surfaces with abrasive cloths or cleaners containing ammonia. They will harm the anti-reflective coating. Use a clean, lint-free cloth and anti-reflective lens cleaner.

CAUTION

Ensure that any unit repairs are made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and affect the airworthiness of the aircraft.

NOTE

The COM application supports channel tuning for both 8.33 kHz and 25 kHz channels within radio-frequency range. If flying in a region where 8.33 kHz channel spacing is available, set the COM radio to 8.33 kHz to prevent the loss of any stored or recently used frequencies.

NOTE

The COM transceiver antenna(s) of the device is (are) intended to be mounted along the fuselage of the aircraft and accessible only to aircraft maintenance personnel. To reduce RF exposure, avoid installation of antenna(s) in areas of the aircraft that provide crew or passengers direct exposure to antenna radiation. For installations that may provide direct exposure, the limits specified by FCC regulations 47 CFR 1.1310 should be referenced by the installer.

NOTE

All visual depictions contained within this document, including screen images of the system panel and displays, are subject to change and may not reflect the most current system software and aviation databases. Depictions of equipment may differ slightly from the actual equipment. Feature depictions may differ from actual unit features depending on configuration.

NOTE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE

Use of polarized eye wear may cause the flight displays to appear dim or blank.



NOTE

Canadian installations: In accordance with Canadian Radio Specifications Standard 102 (RSS 102), RF field strength exposure to persons from an antenna connected to this device should be limited to 51 V/m for controlled environment and 22 V/m for uncontrolled environment.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.



NOTE

The pilot/operator must review and be familiar with Garmin's database exclusions list, as discussed in SAIB CE-14-04, to determine what data may be incomplete. Visit flyGarmin.com and select "Database Exclusions List."



NOTE

The pilot/operator must have access to Garmin and Jeppesen database alerts and consider their impact on the intended aircraft operation. To view these alerts, visit flyGarmin.com and select "Aviation Database Alerts."



NOTE

Contact Garmin Product Support if you want or need to adjust the database.



NOTE

Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of any displayed item used for navigation or communication in the air or on the ground. Visit flyGarmin.com and select "Aviation Data Error Report."



NOTE

This unit has a very high degree of functional integrity. However, the pilot must realize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without fault indication. It is the responsibility of the pilot to detect such occurrences by cross-checking with all redundant or correlated information available in the cockpit.

Record of Revision

REVISION	DATE	CHANGE DESCRIPTION
A	01.11.24	Production Release.

Available for Download

Electronic Pilot's Guide

A version of this guide saved in Adobe Acrobat. Available for viewing on your computer or portable device.

Go to garmin.com/manuals.

Product Descriptions

This guide covers the operation of the following Garmin product series.

GTR 205 GNC 215

When you see	It means
a product name in bold (e.g., **GNC 215**)	the information pertains to that specific model only
product names separated by a forward slash (e.g., GTR 205/GNC 215)	the information pertains to both products

Unless otherwise stated, information pertaining to *the unit* is applicable to both products: GTR 205 and GNC 215

Feature Depictions

Except for cases when operational differences dictate, the GNC 215 display is shown as typical.

Special Notations

This guide uses the following message types when applicable.



WARNING

Indicates when serious injury or death will occur.



CAUTION

Indicates when equipment damage is possible.



NOTE

Emphasizes a point about a specific feature, function, or operation.

Insets

These boxes may include a list of features or application functions, references to additional information, or a useful pilot's tip.

Reference Websites

WEBSITE	QR CODE (SCAN/GO)
Aviation Limited Warranty https://www.garmin.com/en-US/legal/aviation-limited-warranty	
Declarations of Conformity https://www.garmin.com/compliance	

INTENTIONALLY LEFT BLANK

1 SYSTEM AT A GLANCE 1-1
Overview **1-2**
Unit Configurations 1-2
Unit Features 1-3
Pilot Interface **1-4**
Bezel 1-4
microSD Card Slot 1-5
Display Features 1-6
Soft Keys 1-6
Menu Tabs 1-7
Pop-ups 1-7
Control Knobs 1-8
Knob Function Indicators 1-9
Knob Shortcuts 1-12
Screenshots 1-17
Color Conventions 1-18
Compatible Equipment **1-19**
Line Replaceable Units 1-19
2 GET STARTED 2-1
Power Up the Unit **2-2**
Power Off the Unit 2-2
Load Database **2-3**
Active and Standby Databases 2-3
Load Database from a microSD Card 2-5
Automatic Updates 2-6
Manual Updates 2-6
Database Errors 2-7
Revert to Previous Database Version 2-8
View Database Information 2-9
Active Database 2-9
Standby Database 2-10
Understand Database Effective Cycles 2-11
Customize Pilot Settings **2-12**
Customize Display Layout 2-13
Customize Unit Settings 2-15
Adjust Display Brightness 2-16
Automatic Brightness Control 2-16
Manual Brightness Control 2-16
View System Information **2-17**
3 COM 3-1
Set Up COM Radio **3-2**
Set COM Channel Spacing 3-3
Adjust Sidetone Volume Offset 3-4
Link To COM Volume 3-4
Adjust COM Radio Volume & Squelch **3-5**
Open Squelch 3-5
Tune a COM Frequency **3-6**
Tune a Standby Frequency 3-7
Transfer Frequency to Active (Flip-Flop) 3-8

Monitor a COM Frequency **3-9**
Find a COM Frequency **3-10**
Reverse Frequency Look-up 3-13
Remote Frequency Selection 3-15
Emergency Frequency Selection 3-15
Create COM User Frequencies **3-16**
Edit a COM User Frequency 3-17
Delete a COM User Frequency 3-18
View COM Status **3-19**
Respond to a COM Alert **3-20**
Stuck Microphone 3-20
4 NAV **4-1**
Adjust NAV Radio Volume **4-2**
Activate NAV IDENT **4-2**
Tune a NAV Frequency **4-3**
Monitor a NAV Frequency **4-6**
Find a NAV Frequency **4-7**
View Navigation Data **4-9**
VOR Info & Distance Data 4-9
CDI 4-10
Specify an OBS Course **4-11**
Respond to a NAV Alert **4-13**
5 TIMERS **5-1**
Enable & View Timers **5-2**
Activate Timer 5-2
Set Countdown Timer **5-4**
Set Count Up Timer **5-4**
6 MESSAGES **6-1**
View System Messages **6-2**
Active Message Indication 6-2
COM Radio Advisories 6-3
Database Advisories 6-5
Navigation Advisories 6-5
Pilot Specified Advisories 6-6
System Hardware Advisories 6-7
VLOC/GS Advisories 6-9
7 GLOSSARY **7-1**
8 REGULATORY INFORMATION **8-1**
Compliance **8-2**
FCC Compliance Statement 8-2
Declarations of Conformity 8-2
Software License Agreement **8-3**

1 System at a Glance

OVERVIEW.....1-2
PILOT INTERFACE.....1-4
COMPATIBLE EQUIPMENT.....1-19

Overview

GTR 205 and GNC 215 are panel-mount COM radio transceivers that employ a 3.2" high-resolution color liquid-crystal display. They comprise the Slimline series of 1.35" by 6.25" COM radio products.

GNC 215 shown as typical.



Each unit has 10 W of transmit power. Optional 16 W of transmit power is available with the purchase of a feature enablement.

Unit Configurations

GTR 205



COM

GNC 215



COM/NAV

Unit Features

Features vary depending on model and unit configuration.

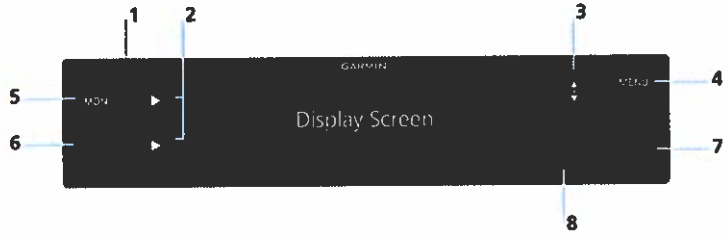
GTR 205 COM TRANSCEIVER	GNC 215 NAV/COM TRANSCEIVER
• 8.33 kHz or 25 kHz channel spacing • 16 W transmit power capability[1] • Bearing and distance to NAVAID[2] • Find frequency • Flight timers • NVIS[1] • Remote COM radio frequency tuning[3] • Reverse frequency look-up[2] • System messages • VHF radio transceiver	• 8.33 kHz or 25 kHz channel spacing • 16 W transmit power capability[1] • Bearing and distance to NAVAID[2] • CDI • Provide NAV frequency for DME tuning[3] • Find frequency • Flight timers • NAV radio receiver • NVIS[1] • Remote COM/NAV radio frequency tuning[3] • Reverse frequency look-up[2] • System messages • VHF radio transceiver

[1] Optional. Requires feature enablement.
[2] Requires Navigation database and input from a GPS navigator for location-based information.
[3] Availability dependent upon aircraft interfaces.

Pilot Interface

Bezel

The bezel provides a combination of mechanical knobs and push-keys. Soft keys correspond to selectable features on the display screen.



1 **microSD Card Slot**
Interface for loading database, exporting log files, and updating software.

2 **Soft Keys**
Controls for navigating display pages and executing onscreen commands.

3 **Transfer (Flip-Flop) Key**
Swaps active and standby frequency values for the active radio.

4 **Menu Key**
Provides direct access to customization options and system information.

5 **Monitor Key**
Allows monitoring of the active frequency while listening to the standby frequency.

6 **Volume/Power Knob**
Allows audio volume adjustment for the active COM radio. COM squelch functionality is accessible via knob push. Turning the knob past the detent powers the unit on/off.

7 **Inner & Outer Knobs**
Multipurpose dual concentric knob allows data entry, list scrolling, frequency look-up, NAV ident, and NAV/COM direct tuning.

8 **Photocell**
Measures cockpit ambient light level to automatically adjust display brightness for day and night.

Bezel Shortcuts



Pushing and holding either the volume knob or **Flip-Flop** key for 0.5 seconds automatically tunes the COM emergency frequency (121.50 MHz).

Pushing and holding the dual concentric knob for 0.5 seconds provides direct access to frequency search options.

Read more about these features in Section 3.

microSD Card Slot

NOTE

Do not remove or insert a microSD card while in flight. Always verify the system is powered off before inserting or removing an SD card.

FEATURE LIMITATIONS

- *Use only microSD cards in the FAT32 format, with memory capacity between 8 GB and 32 GB*

The unit uses the microSD card slot for the following tasks.

- Capturing screen images
- Exporting data logs and configuration summary
- Updating the database
- Upgrading software

Insert Card

1. Verify unit power is off and the slot is empty.
2. Hold card such that label faces the top edge of display screen.
3. Ensure back edge of card is flush with display bezel after insertion.

Eject Card

1. Power off the unit.
2. Release the spring latch by pressing lightly on exposed edge of card.

For Mac Users

Do not use macOS to format a microSD card if you plan to use the card as a media storage device for updating databases.

In the event there is a file corruption problem with the microSD card, it may be necessary to reformat the card. This can cause an issue when formatting the microSD card using macOS, where the newly formatted card will not be recognized by the avionics system. When using a Macintosh computer to format the microSD card, Garmin recommends using the SD Memory Card Formatter application available as a download from SDcard.org. When running the application, use the Quick Format option.

Display Features

A high-resolution color LCD display provides onscreen controls that correspond to the mechanical knobs and push-keys on the bezel. Optional night vision capability (NVIS) is available with the purchase of a feature enablement.

Soft Keys

Selections change based on the active page or function.

COMMON COMMANDS

MSG	Open the system messages list. A flashing icon indicates unread messages.	Find COM	Display COM frequency search options.
Home	Return to the home page.	Back	Return to the previous page.
Cancel	Cancel an active function without inputting data.	Reset	Reset timer.
Start	Start timer.	Stop	Stop timer.
NAV VOL	Adjust NAV radio volume.[1]	Find NAV	Display NAV frequency search options.[1]
Edit	Edit a selected user frequency.	Direct CRS	Set the manual CDI OBS selector on direct course to the VOR station.[1]

[1] GNC 215 only.

Menu Tabs

Tabs group information and related controls into individual panes. Contents may include scrolling lists, data fields, function keys, or a combination of controls.

Tabs are located along the left side of the menu pane.

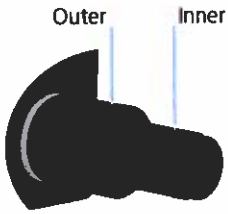


Pop-ups

Pop-ups present messages related to a function or setting that require confirmation.



Control Knobs





Dual Concentric Knob

Inner and outer control knobs offer the ability to select and modify data and settings.

Volume/Power Knob

A single volume knob controls audio volume for the COM radio and powers the unit on/off.

Pushing these knobs momentarily performs additional functions.

VOLUME/POWER KNOB FUNCTIONS	
Knob Turn	• Adjusting COM radio volume • Powering on/off the unit (turn past the detent)
Knob Push	• Enabling/disabling the COM automatic squelch function • Tuning the emergency COM frequency (push & hold).

DUAL CONCENTRIC KNOB FUNCTIONS	
Outer Knob Turn	• Moving cursor forward or backward within data field • Scrolling menu tabs • Tuning major frequency digits
Inner Knob Turn	• Modifying individual characters in data entry field • Scrolling lists • Tuning minor frequency digits
Knob Push	• Entering current or specified numerical value • Selecting a menu item • Initiating frequency look-up options (push & hold) • Enabling/disabling the ident tone for the NAV radio[1] • Switching between COM, Timer/OBS, and NAV functions[2]

[1] GNC 215 only. [2] OBS and NAV functions available with GNC 215 only.

Knob Function Indicators

Available knob functions annunciate at the bottom of the display. Icons indicate the associated pilot actions: knob turn and/or push.



Outer Knob Turn Only



Single or Inner Knob Turn & Push

Indications include, but are not limited to:

COM Standby Frequency Active, GTR 205



Available knob functions:

- Adjust COM radio volume
- Override automatic squelch
- Tune COM standby frequency
- Access frequency search options

COM Standby Frequency Active, GNC 215



Available knob functions:

- Adjust COM radio volume
- Override automatic squelch
- Tune active standby frequency
- Set knob focus to NAV standby frequency
- Access frequency search options

Find Frequency Active



Available knob functions:

- Scroll search categories
- Select frequency
- Add user frequency

Menu Active



Available knob functions:

- Scroll menu tabs
- Select list items

NAV Volume Active[1]



Available knob functions:

- Adjust NAV radio volume
- Activate NAV ident

System Message List Active



Available knob functions:

- Scroll message list

Timer Active



Available soft key functions:

- Reset timer
- Start/Stop timer

Available knob functions:

- Select timer type
- Set countdown timer
- Set knob focus to COM/NAV standby frequency[1]
- Access frequency search options

[1] NAV radio options available with GNC 215 only.

KNOB FOCUS INDICATIONS

A cyan border around the active feature window indicates changes in knob focus. This is useful when transitioning between different control modes.



Text within the active window turns cyan to indicate that it is selectable.

Knob Focus Indicator (COM STBY Selected)

Timer Function Not Selected

Knob Shortcuts

For convenience, the unit allows you to access certain controls quickly via knob push.

TUNE A COM FREQUENCY

From the Home page:

Pushing the dual concentric knob once switches knob focus between the COM radio and right side features (if available). When knob focus is set to the COM radio (default), turn the inner and outer knobs to tune the COM standby frequency.



TUNE THE COM EMERGENCY FREQUENCY

Pushing and holding the volume/squelch knob for 1.5 seconds automatically tunes the COM emergency frequency (121.50 MHz) from any page or tab. The frequency automatically loads to the COM standby window and then transfers to the active COM frequency.



Prior to activation, the "Hold for 121.50" control label appears in the annunciator bar.

FIND A COM FREQUENCY

From any page or tab:

Pushing and holding the dual concentric control knob for 1.5 seconds automatically displays frequency search options. The Select Frequency menu opens from the last viewed search result.



Prior to activation, the "Hold for Find" control label appears in the annunciator bar.

Turn the outer knob to select a search category. Turn the inner knob to select a frequency, waypoint, or station.



COM volume and squelch controls remain available via the volume/power knob when a page is active.

TUNE OR FIND NAV FREQUENCY

AVAILABLE WITH: GNC 215

From the Home page:

Pushing the dual concentric knob once enables standby NAV frequency tuning. Turn the inner and outer knobs to tune the NAV standby frequency.



Find a NAV Frequency

With standby NAV frequency tuning enabled, push and hold the dual concentric knob for 1.5 seconds to display NAV frequency search options. Turn the outer and inner knobs to select a search category and frequency.

ACTIVATE TIMER

From the Home page:

If enabled, pushing the dual concentric knob once activates the timer function. Turn the outer knob to toggle between timer types. Turn the inner and outer knobs to specify a countdown time. Push knob to enter value.

GTR 205



SET AN OBS COURSE

AVAILABLE WITH: GNC 215

From the Home page:

If enabled, pushing the dual concentric knob once activates the OBS entry field. Turn the inner and outer knobs to set a course.



Three-way Toggle Indication



Locater bars work in conjunction with the inner control knob, providing a quick indication of current knob focus as you transition between multiple functions (e.g., COM standby frequency tuning > CDI/Timer > NAV standby frequency tuning).



A cyan locater bar indicates active function and knob focus.

Pushing the inner knob moves the locater through the available functions. The COM standby frequency window is active by default.

COM Active



Push to activate OBS/timer control.

OBS/Timer Active



Push to activate NAV frequency control.

NAV Active



Push to activate COM frequency control.

Screenshots

FEATURE REQUIREMENTS

- *A microSD card in the FAT32 format, with memory capacity between 8 GB and 32 GB*

Save images to a microSD card at any time using Screenshot.

1. Verify that a microSD card is present in the slot.
2. Go to the page of interest.
3. Push and hold the **MON** key.
4. With the **MON** key depressed, push and release the top soft key.



A camera icon momentarily shows in the annunciator bar indicating that Screenshot was successful.

The image automatically saves to the *print* folder in the microSD card root directory. To view saved images, remove the card and open the *print* folder on a computer.

For more about proper microSD card installation, read *microSD Card Slot*.

Color Conventions



Red

- Radio failure

Green

- Active radio frequency, function
- Valid station ID (decoded from Morse code)
- VOR/localizer data

White

- Active system message, mode
- Current data and values
- Menu options
- Scales and markings
- Standby radio frequency (non-selected radio)
- Station ID (from database)



Magenta

- GPS data



Cyan

- Active selection, display feature (e.g., timer)
- Standby radio frequency



Gray

- Missing or expired data
- Product unavailable
- Inactive display feature

Compatible Equipment

Line Replaceable Units

SYSTEM REQUIRED LRUs
COM radio antenna
NAV radio antenna[1]
OPTIONAL LRUs
DME
G500/G600
G500(H)/G600/G700 TXi
GFC 500/600(H)
GI 275
GMX 200
Garmin GPS navigator
MX20
Non-Garmin Autopilot

[1] GNC 215 only.

The system consists of multiple LRUs, which are installed behind the instrument panel or in a separate avionics bay. Their modular design aids system maintenance and unit replacement.

Optional LRUs may include compatible equipment from either Garmin or a third party manufacturer. These vary by unit and installation type (VFR or IFR).

Some LRUs provide features that require registration and/or enablement prior to activation.

Compatible LRUs are not limited to the devices shown here. Check unit software version for compatibility.

INTENTIONALLY LEFT BLANK

2 Get Started

POWER UP THE UNIT 2-2
LOAD DATABASE 2-3
CUSTOMIZE PILOT SETTINGS 2-12
VIEW SYSTEM INFORMATION 2-17

Power Up the Unit

The unit receives power directly from the aircraft's electrical system. Upon power-up:

- Bezel key backlight momentarily illuminates
- Navigation database automatically updates if a newer version is available

Splash Page



Garmin logo displays as the unit checks for an available database update.

Read more about database update methods in *Load Database*.

Power Off the Unit

WARNING

Never attempt to power off the unit while airborne unless operational procedures dictate.



Turning the **Volume/Power** knob past the detent for 0.5 seconds initiates the power off sequence.

Shutdown occurs once the timer reaches zero.

Load Database

Supported Database

This system uses the Navigation database for frequency related information (Garmin or Jeppesen).

Databases are stored in the unit's internal memory. To view update cycles, or to purchase individual databases or database packages, go to flyGarmin.com.

Active and Standby Databases

The unit uses two types of databases. Both transfer to the unit's internal storage.

Active Database	Standby Database
• Database currently in use by the system	• Database that has not reached the effective date • Database that was installed prior to the last update

To view active and standby databases once they are installed, read *View Database Information*.

DATABASE TRANSFER & ACTIVATION

The Navigation database automatically transfers from the microSD card to the unit's internal Standby storage if it is newer than the database currently in standby. Total transfer time depends on the microSD card type.

Activation of the standby database is required to complete the update. The manner in which this occurs depends on whether or not a GPS source is present.

If	Then
The unit is configured to receive GPS data	The database automatically updates at the next unit power cycle once the database reaches its effective date and the existing database expires.
A GPS source is absent	The database automatically updates at the next unit power cycle

Installations Equipped with a GPS Source

In some cases, automatic database updates may occur in two steps:

1. The database transfers to the internal Standby storage but is deemed not yet effective. At this point, the pilot may remove the card. The database will remain in standby until the effectivity date is reached and automatic activation can occur.
2. The unit automatically activates the standby database based on current date and database effectivity.

The unit determines effectivity status using the current date and time from the configured GPS source (if present). Read more about database effective status in *Understand Database Effective Cycles*.

Load Database from a microSD Card

NOTE

The unit supports microSD cards in the FAT32 format only, with capacities ranging between 8 GB and 32 GB.

The unit stores all databases it receives in its internal storage. After a database updates, the microSD card is no longer required.

Do not attempt to load or update the database while in flight (on ground only).

Install or update a database using a micro SD card:

1. Download a database onto a microSD card.
2. Insert the card with the most recent database into the card slot.
3. Power on the unit.

Once loading completes, you may power off the unit and remove the card.

A unit restart is required to complete installation.

The available database is indicated in the Standby tab.

Automatic Updates

Automatic updates occur when:

- A newer database is detected on the microSD card or in the internal Standby storage
- A newer database is within its effective dates[1]

[1] Applicable only if a GPS source is present.

Updates occur during power up when a newer version of the database is available. The same process occurs when you load a new database for the first time.

Manual Updates



You can access the Update tab at any time for review purposes or to perform a manual database transfer.

MENU > System > Database > Update > Start DB Update



The unit automatically restarts once the update is complete.

Database Errors



If a database error occurs:

- An advisory appears in the message list
- Details regarding the state of the database display on the appropriate information tab

Aviation Database Errors

Visit flyGarmin.com to report any discrepancies in database information. These may include incorrect procedures, inaccurate depictions of terrain, obstacles and fixes, or errors with any other screen element used for navigation or communication purposes.

For information regarding third-party navigation databases, go to jeppesen.com.

Revert to Previous Database Version

Updating a database does not overwrite its previous version. Once the update process completes, the previously active version of the database transfers to the unit's internal Standby storage. In the event that an automatic update is undesirable, you can revert to the previous version using the manual update feature.



Source field displays "Internal" for the previous database version.

The previous database version appears in the Standby tab. It remains available for manual install until a newer version transfers to the unit's internal Standby storage.

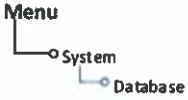
To revert to a previous database version:

1. Ensure that the card slot is empty.
2. Verify that the previous database version is in standby (**Menu** > **System** > **Database** > **Standby**).
3. Open the Update tab.
4. Select **Start DB Update**.

The unit restores the previous database version and transfers the newer database to the standby storage. The unit automatically restarts once the swap is complete.

View Database Information

WHERE TO FIND IT



During normal operation, you can view information about active and standby databases from the Database Information page.

MENU > System > Database

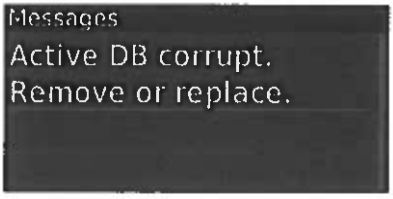
Select the appropriate menu tab to view information about active and standby databases.

Active Database



Selecting **Active** displays information about the database version currently in use.

ACTIVE DATABASE CORRUPT

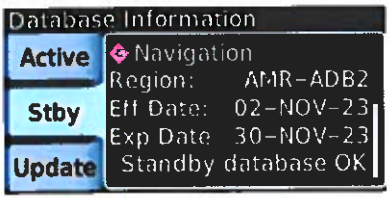


A message informs you when the active database is corrupt and requires removal or replacement.

Active Database Info

- Database name
- Cycle number
- Region
- Effective & expiration dates
- Copyright information

Standby Database



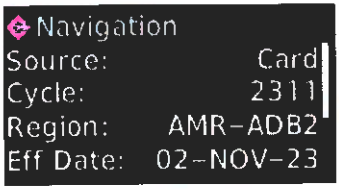
"Standby database OK" appears at the bottom of the Standby tab whenever a valid database is present on the installed microSD card or in the internal memory.

Selecting **Standby** displays information about the database that is not currently in use by the system.

The previously installed database also appears here once an update completes.

DATABASE AVAILABLE ON CARD

The Standby tab informs you when a valid database is available on the installed microSD card.



Check the Source field for the current location of the standby database: "Card" or "Internal."



Scroll to the bottom of the tab to see if a standby database is available.

To view and update the database from the internal standby:

1. Ensure that the card slot is empty.
2. Verify that a valid database version is in standby (**Menu > System > Database > Standby**).
3. Open the Update tab.
4. Select **Start DB Update**.

Standby Database Info

- Database name
- Source (e.g., Internal)
- Cycle
- Region
- Effective & expiration dates
- Status

Understand Database Effective Cycles

	DATABASE EFFECTIVE STATUS
Database with specified effective dates	• Effective during a specific period • Unit determines database status using the current date and time from GPS • Automatic activation occurs on the effective date during unit power cycle

NO VALID DATABASE



A message informs you when no valid database is available.

When the Navigation database is absent, the radio is still usable but with reduced functionality. Lost features include:

- Waypoint names
- GPS-based distance to station
- Frequency lookup for tuning

Overwriting microSD Card Database Files

When database files are loaded to the microSD card, any previously loaded database files of the same type residing on the card are overwritten. This includes loading a database of a different coverage area or data cycle than that currently residing on the microSD card.

Customize Pilot Settings



Unit customization options are accessible via the **MENU** key. For details about specific radio settings and timer functions, refer to the respective section.

MENU SELECTIONS	
Display Tab	• Enable flight timer • Return to basic display format[1] • Enable CDI option[2]
Setup Tab	• Set the display units • Access COM radio settings
System Tab	• Adjust display brightness • Access database information and update/sync options • View system messages • View system information and COM status

[1] GTR 205 only. [2] GNC 215 only. CDI and flight timer functions are mutually exclusive; enabling one automatically disables the other.

Customize Display Layout

AVAILABLE WITH: GNC 215



Knob focus is set to Off by default.

Choose any combination of features for display in the active and/or standby areas of the NAV radio. Options are accessible from the Display tab (**MENU** > **Display**).

To enable a display feature, select it from the menu. Features that require pilot interaction are active by default (e.g., timer).

Re-open the Display tab to choose a feature for the other area.

AREA	AVAILABLE DISPLAY FEATURES
VOR Info	• To • Off • From
Standby	• CDI[1] • TMR • STBY (with Reverse Frequency Look-up)

[1] Availability dependent upon configuration.

To



Adds decoded "to" bearing information to the active NAV frequency.

From



Adds decoded "from" radial information to the active NAV frequency.

"To" and "from" information includes distance to station when an internal database and GPS source are present.

TMR



Adds an active timer to the lower right of the display. Use the outer knob to select timer type or select **Start**. Select **Reset** to stop and clear the timer.

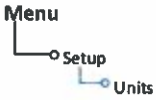
CDI



Replaces NAV STBY window with a CDI scale. COM radio is active by default when the frequency is a LOC/ILS or a VOR with decoded OBS heading. OBS field is active when manual entry is required.

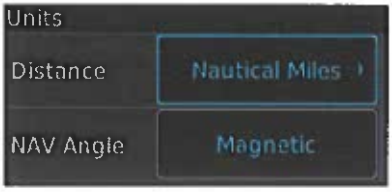
Customize Unit Settings

WHERE TO FIND IT



Customize the display unit settings. Selecting **Units** opens a menu of available unit types.

MENU > Setup > Units



To specify unit type:

1. Review the current unit selections.
2. Select a parameter using the outer control knob.
3. Select a unit type using the inner control knob.

PARAMETER	UNIT SETTINGS	
Distance	• Nautical Miles (NM/kt) • Statute Miles (sm/mph)	• Kilometers (km/kph)
NAV Angle	• Magnetic (°)	• True (°T)

Adjust Display Brightness

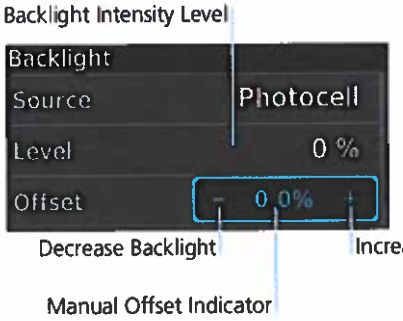
WHERE TO FIND IT

Menu
└ System
└ Backlight

Depending on configuration, display brightness is controlled using inputs from the built in photocell, aircraft dimmer bus, or both.

Automatic Brightness Control

Dimming is limited to prevent on-screen indications from becoming unreadable. The built-in photocell automatically controls display brightness based on ambient light levels.



During automatic control, you may still adjust brightness using the manual offset controls in the Backlight page.

The unit retains manual offset settings over power cycles.

Manual Brightness Control

Optionally, the unit is configurable to use an aircraft dimming bus for display brightness control. Upon reaching minimum input level, display brightness reverts to the photocell. This prevents the display from going black in the event of a dimmer input failure.

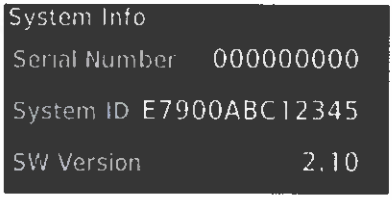
Installer configured curves determine the amount of change in brightness that occurs in response to a control adjustment. If brightness control is not satisfactory, contact a Garmin dealer to adjust the lighting curves.

View System Information

WHERE TO FIND IT

Menu
└ System
└ System Info

View information specific to the unit and its software.



Refer here when contacting customer service.

System Info

- Serial number
- System ID
- Main software version

INTENTIONALLY LEFT BLANK

3 COM

SET UP COM RADIO 3-2
ADJUST COM RADIO VOLUME & SQUELCH 3-5
TUNE A COM FREQUENCY 3-6
MONITOR A COM FREQUENCY 3-9
FIND A COM FREQUENCY 3-10
CREATE COM USER FREQUENCIES 3-16
VIEW COM STATUS 3-19
RESPOND TO A COM ALERT 3-20

Set Up COM Radio

WHERE TO FIND IT



VHF COM radio customization options are accessible via the Setup tab.

MENU > Setup > COM Settings

COM RADIO SETTINGS	
COM Squelch	Set transceiver squelch to Auto or adjust the threshold manually.
COM Spacing	Set transceiver channel spacing. Options: • 8.33 kHz • 25 kHz (default)
Sidetone Volume	Enable offset adjustments from the COM receiver volume. Options: • Fixed+Offset • Link to COM
Sidetone Offset	Adjust sidetone volume offset. Default setting: 0%

Set COM Channel Spacing

The unit supports channel tuning for both 8.33 kHz and 25 kHz channels within radio-frequency range. Channel spacing is set to 25.0 kHz by default.



Turning the inner knob toggles the transceiver channel spacing between 8.33 kHz and 25.0 kHz.

8.33 kHz



8.33 kHz step configuration is available for European operations.

25.0 kHz



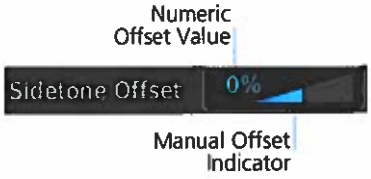
COM radio operates in the aviation voice band, between 118.000 and 136.975 MHz, in 25.0 kHz steps.

If flying in a region where 8.33 kHz channel spacing is available, set the COM radio to 8.33 kHz to prevent the loss of any stored or recently used frequencies.

Adjust Sidetone Volume Offset

FEATURE LIMITATIONS

- *Availability dependent upon configuration*
- *Offset range: +/-25% of total COM audio volume range*



If the unit is wired for audio output, set the sidetone volume offset to the preferred level. By default, the offset value is set to zero percent.

The unit retains manual offset settings over power cycles.

COM sidetone is audio spoken into the microphone that is played back in real time over the headset. The offset setting determines sidetone volume for the COM during radio transmission. Adjustments determine the amount that the sidetone volume level is offset from the COM receiver volume or the configured sidetone volume.

Link To COM Volume



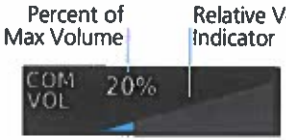
Enabling this function allows you to adjust the amount that the sidetone volume level is offset from the COM receiver volume. These adjustments are dynamic in that they vary with the COM receiver volume level.

To adjust the offset from the COM receiver volume:

1. Enable **Link to COM**.
2. Adjust the offset as necessary.

To adjust the offset from the configured sidetone volume, disable the Link to COM function by selecting **Fixed+Offset** and then adjust the offset as necessary. These adjustments are fixed as they are relative to the configured sidetone volume.

Adjust COM Radio Volume & Squelch



Adjust radio volume with the small knob according to your preference.

The unit retains volume settings over power cycles.

Open Squelch



Push the volume/squelch knob to override the automatic squelch function. Push it again to return the squelch to automatic operation.

"SQ" annunciates in the COM active frequency window to show when the squelch is overridden (i.e., when the squelch is open).

The automatic squelch function rejects many localized noise sources. Overriding this function may be helpful when listening to a distant station or setting the volume level.

Volume/Squelch Knob Adjustments



Pushing the volume knob disables automatic squelch control.

Turning the knob adjusts the COM volume percentage.

Tune a COM Frequency

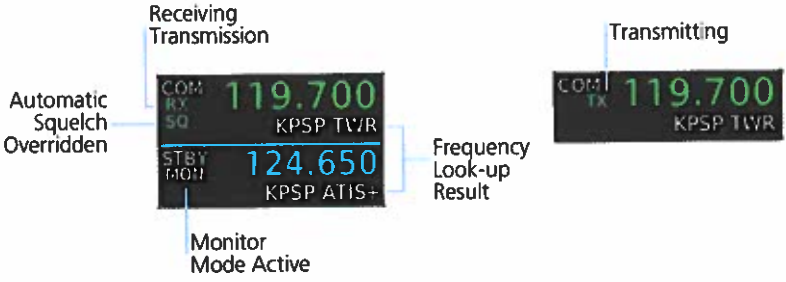
Communication frequencies are split between two selectable windows:

- The upper window presents the active COM radio frequency. This is the frequency currently in use for transmit and receive operations.
- The lower window presents the standby radio frequency. This frequency may be set and activated at any time.



COM STATUS INDICATIONS

Status annunciations denote active functions, modes, and frequency types.



RX	Receiving transmission
TX	Transmitting
SQ	Automatic squelch is overridden (i.e., squelch is open)
MON	Monitor mode active
MON	Standby frequency is receiving
KPSP ATIS+	Reverse frequency look-up information (sample text)

Tune a Standby Frequency



The dual concentric control knob allows you to enter a standby frequency. Pushing and holding the dual concentric control knob for 0.5 seconds automatically displays frequency search options.



The selected STBY window turns cyan when you use the control knob to change the standby COM frequency.



If no action occurs, the STBY window reverts to cyan text after 3 seconds. This indicates that the standby COM frequency is still adjustable using the control knob.

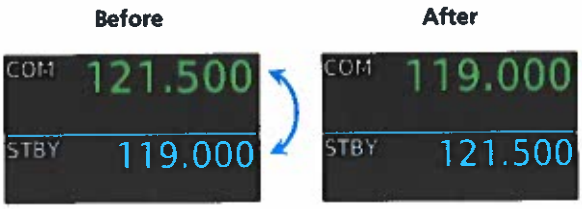


When the STBY COM frequency is no longer selected, it reverts to white text.

Transfer Frequency to Active (Flip-Flop)



The transfer (or *flip-flop*) function allows you to swap the active and standby frequency values.



Monitor a COM Frequency

MON

Enabling monitor mode allows you to listen to the standby frequency while the unit continues monitoring the active COM channel.

When the COM active frequency receives a signal, the unit automatically switches back to the active frequency. Once activity on the COM active channel ceases, the unit returns to listening to the standby frequency.



Monitor mode is useful when you want to listen to a recorded broadcast (e.g., ATIS) on the standby channel, but still receive control tower transmissions on the active channel.

Find a COM Frequency



Find and select a standby COM frequency from a list of available database frequencies.

Pushing the **Find COM** soft key while the COM radio is active provides access to multiple search options. Each category displays a list of selectable identifiers based on specific criteria.

FEATURE REQUIREMENTS

- *GPS source for Nearest waypoint search options*

FEATURE LIMITATIONS

- *Database search option available only when Navigation database is present*

FREQUENCY SEARCH OPTIONS	
Recent	Lists up to 20 of the most recently tuned frequencies.
User	Lists up to 20 user-defined frequencies.
Database	Lists the frequencies associated with the specified 5-character facility identifier.
Nearest Airport	Lists up to 20 airport frequencies within a 200 NM radius.
Nearest ARTCC	Lists up to 20 area control center frequencies within a 200 NM radius.
Nearest FSS	Lists up to 20 flight service center frequencies within a 200 NM radius.
Nearest WX	Lists up to 20 weather frequencies within a 200 NM radius.

Find Frequency via Control Knob



Pushing and holding the dual concentric control knob for 0.5 seconds automatically displays frequency search options from any page or tab.

- "Hold for Find" control label appears in the annunciator bar
- Select Frequency menu opens from the last viewed search result



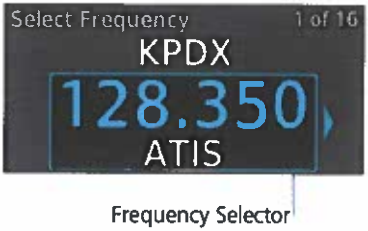
SEARCH RESULTS

Each frequency includes general information about the associated waypoint.



Nearest airports include bearing and distance to field information based on GPS data.

MULTIPLE FREQUENCIES



A selector appears when more than one frequency type is available at the indicated identifier.

Applicable to search options displaying information only (ARTCC, FSS, and Nearest Airports).

FREQUENCY SEARCH ERRORS

Search errors may display if any one of the following conditions exist.

Nearest Frequency Search Options



The unit is configured for GPS but is not receiving a position.



The unit is configured for GPS but no database is present.

Database Search Option

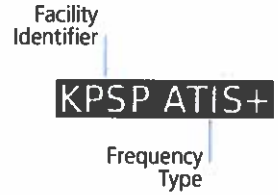


No database is present.

Reverse Frequency Look-up



This function automatically displays the facility identifier and frequency type for active and standby frequencies. The unit verifies the displayed frequency against the database at least once per minute.



"+" denotes more than one type associated with the frequency.

Reverse frequency look-up results are based on GPS position and database information. If no GPS navigator is present in the system, reverse frequency look-up text will only appear if the frequency was recently loaded via the Find function.

When Reverse Frequency Look-up is active, COM displays:

- Nearest facility identifier (if available)
- Multiple facility indication (if more than one)
- Frequency type
- Approach or Departure indications (if applicable)

When flying between airports that use the same frequency, it may take up to 2 minutes for look-up information to change after crossing the halfway point.

DATA SIZE & POSITION

The size and location of Reverse Frequency Look-up text is dependent upon the status of right side features.

Default View



Text is larger for easier viewing.

Timer Enabled



Text shifts beneath the frequency value when you enable right side features.

DATA SOURCE PRIORITY

RFL information is received from the following sources in order of priority, from highest (1) to lowest (3), and dependent upon certain required conditions.

	SOURCE	REQUIRED CONDITIONS
1	Proximity search of database	Navigation database and GPS are present.
2	Recent database selection	Navigation database present; no GPS.
3	User frequency list	No required conditions.

Remote Frequency Selection

FEATURE LIMITATIONS

- *Availability dependent upon configuration*

On units configured for remote frequency recall, COM user frequencies are selectable via a remote switch.

- Pressing the switch once loads the next user frequency into the STBY window
- Pressing the switch repeatedly scrolls through the list of presets
- Some installations may have two dedicated recall switches: one to scroll up, one to scroll down
- Selections do not activate until transfered to active

Emergency Frequency Selection

Pushing and holding either the volume knob or **Flip-Flop** key for 0.5 seconds provides a quick method for remotely tuning the emergency frequency (121.50 MHz). This feature is available any time the unit is on, regardless of GPS or display status.

Volume/Squelch Knob Shortcut



Pushing and holding the volume knob for 0.5 seconds automatically tunes the COM emergency frequency (121.50 MHz).

- "Hold for 121.50" control label appears in the annunciator bar
- Frequency automatically loads to the COM standby window and then transfers to the active COM frequency



Create COM User Frequencies

FEATURE LIMITATIONS

- *Names may be up to 10 characters in length*
- *Maximum number of 20 user frequencies*

Add a frequency to the user frequency list. Controls are accessible via the Select Frequency menu.







1. Open the Select Frequency menu.
2. Scroll to the User category.
3. Push the inner control knob to add a new frequency.
4. Specify a frequency value.
5. Assign the frequency a unique identifier.
6. Select **Save**.

To cancel the request and close without saving, select **Cancel**.

User frequencies remain in the list until you delete them.

Edit a COM User Frequency



Modify an existing user frequency. Selecting a user frequency gives you the EDIT option.



1. Select the user frequency from the list.
2. Push the **Edit** soft key.
3. Modify the current frequency name and/or value using the dual concentric knob.
4. Select **Save**.

Delete a COM User Frequency



Selecting **Delete** opens a confirmation page. From here you can delete the selected user frequency or all user frequencies in the list.

Confirm the request to remove the selected user frequency from the list.

Selecting **Delete All Frequencies** opens a pop-up. Confirming the request removes all COM user frequencies from the list.



DELETE A COM USER FREQUENCY

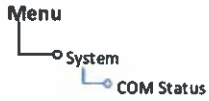
1. Select a COM user frequency from the list.
2. Push the **EDIT** soft key.
3. Select **Delete**.

From here you may:

- *Confirm deletion of the selected user frequency:* Select **Delete**.
- *Delete all COM user frequencies:* Select **Delete All Frequencies** > **Delete All**.
- *Cancel the request:* Select **Cancel**.

View COM Status

WHERE TO FIND IT



View COM radio transmit voltage and received noise. This information is accessible via the System tab.

MENU > System > COM Status



This page is for reference only. Information includes:

- Receiver noise
- Transmit power

Respond to a COM Alert



Radio failures are indicated by one or more of the following:

- Red "X" displays over the COM radio control
- Advisory message alerts
- COM control options are not available

COM radio fail annunciations are designed to be immediately recognizable.

For information regarding pilot response to a COM radio failure, consult the AFMS.

Stuck Microphone

The COM transmitter automatically times out after 30 seconds of continuous broadcasting. This may occur when:

- Push-to-talk key on the microphone is stuck or accidentally left in the keyed position
- Push-to-talk function continues to transmit after releasing the key

The advisory message "COM MIC <1/2> key is stuck" alerts for as long as the condition exists.

GNC 215 ONLY

4 NAV

ADJUST NAV RADIO VOLUME 4-2

ACTIVATE NAV IDENT 4-2

TUNE A NAV FREQUENCY 4-3

MONITOR A NAV FREQUENCY 4-6

FIND A NAV FREQUENCY 4-7

VIEW NAVIGATION DATA 4-9

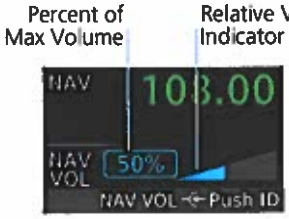
SPECIFY AN OBS COURSE 4-11

RESPOND TO A NAV ALERT 4-13

Adjust NAV Radio Volume



Pushing the **NAV VOL** soft key while the NAV or COM radio is selected provides access to volume controls. Adjust radio volume with the inner and outer control knobs according to your preference.



You can adjust the volume by increments of ten (outer control knob) or one (inner control knob).

Activate NAV IDENT



Activate the NAV IDENT function by pushing the **NAV VOL** soft key then the inner control knob.

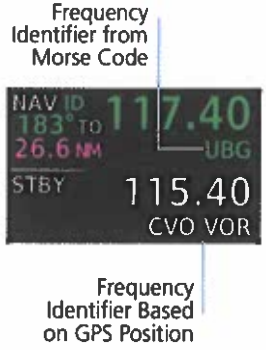
- "ID" annunciates in the active NAV frequency window
- Morse code tones are audible

Tune a NAV Frequency



Navigation frequency tuning, transfer, and selection functions are identical to those used for communication frequencies.

NAV STATUS INDICATIONS



The unit automatically decodes Morse code and displays the Ident for the active frequency above it.

The reverse frequency look-up identifier displays below the frequency value. Reverse frequency look-up results are based on GPS position and database information. If no GPS navigator is present in the system, reverse frequency look-up text will only appear if the frequency was recently loaded via the Find function.

Identifier information received via Morse code has display priority over reverse frequency look-up results.

Received from Database & GPS



Station information appears white when the identifier is inferred from the database and current location.

Received from Morse Code



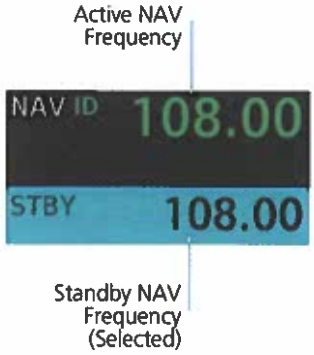
The identifier turns green when a valid ID is decoded from Morse code.

Custom User NAV Frequencies



User stored NAV frequencies may display in the absence of a remote source or internal database. These custom user NAV frequencies receive the "FARM VOR" identifier.

STANDBY NAV FREQUENCY ENTRY



To change the standby NAV frequency:

1. Activate the standby NAV frequency window by selecting **Home**, then pushing the dual concentric control knob once or twice depending on pilot settings. Upon selection, the standby NAV frequency window remains active for approximately 30 seconds.
2. Enter a standby frequency by turning the inner and outer control knobs.
3. Assign the standby value as the active frequency by pushing the **Flip-Flop** key.

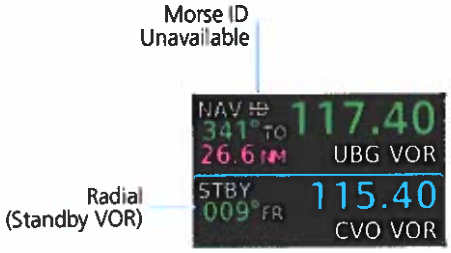
Navigation frequencies include:

- Glideslope (ILS)
- Localizer (LOC)
- VOR

Monitor a NAV Frequency

MON

Pushing the **MON** key while the NAV standby frequency is selected allows you to listen to the standby frequency while the unit continues monitoring the active NAV channel.



During monitor mode:

- A gray "ID" with strike-through indicates that Morse ID is unavailable on the active frequency
- The current radial of the standby VOR station appears next to the standby frequency

Find a NAV Frequency



Find and select a standby NAV frequency from a list of available database frequencies.

Pushing the **Find NAV** soft key while the NAV radio is selected provides access to multiple search options. Each category displays a list of selectable identifiers based on specific criteria.

FEATURE REQUIREMENTS

- *GPS source for Nearest waypoint search options*

FEATURE LIMITATIONS

- *Database search option available only when Navigation database is present*

FREQUENCY SEARCH OPTIONS	
Recent	Lists up to 20 of the most recently tuned frequencies.
User	Lists up to 20 user-defined frequencies.
Database	Lists the frequencies associated with the specified 5-character facility identifier.
Nearest VOR	Lists up to 20 VOR frequencies within a 200 NM radius when interfaced with a GPS receiver.
Nearest LOC	Lists up to 20 localizer frequencies within a 200 NM radius when interfaced with a GPS receiver.

Magenta bearing info displayed for the purpose of Find NAV is based on GPS and the Navigation database, not the VHF NAV function. For more about data color indications, read *Color Conventions*.

FREQUENCY SEARCH ERRORS

Search errors may display if any one of the following conditions exist.

Nearest Frequency Search Options



The unit is configured for GPS but is not receiving a position.



The unit is configured for GPS but no database is present.

Database Search Option



No database is present.

View Navigation Data

Navigation data include:

- Decoded From radial and To bearing
- Distance to station
- Lateral deviation and to/from indication on a CDI scale
- OBS course heading

Depending on configuration, you may view supplemental navigation data in the active and standby areas of the NAV radio.

Data options are selectable from the Display tab (**MENU > Display**).

Read more about data display options in *Customize Display Layout*.

NOTE

Information provided by the onscreen CDI is for backup purposes only. Do not use for primary navigation.

FEATURE LIMITATIONS

- *Data availability dependent upon configuration*
- *OBS heading course data not available when the system is configured with a composite external indicator*

VOR Info & Distance Data

To/From/Off



When enabled, the "from" (FR) radial or "to" (TO) bearing decoded from the active NAV frequency.

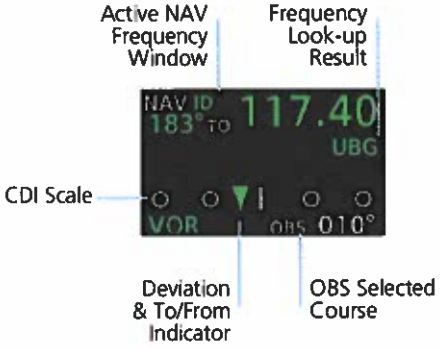
Distance to Station



Distance to station appears for VORs only (not for LOC/ILS) if an internal database is present and the unit is receiving GPS position.

CDI

When enabled, a CDI replaces the NAV STBY window. It appears between the active and standby windows when you are actively monitoring the NAV standby frequency.



The CDI presents a sliding lateral deviation indicator on a horizontal scale.

A pointer moves left or right to portray aircraft position relative to the selected course. Pointer direction indicates the current leg type: To (up) From (down).

An OBS selected course field accompanies the CDI scale. Manual course adjustments are not available while receiving selected course input from the external CDI/HSI.

STBY window replaces the CDI when you tune the standby NAV frequency. The CDI is absent when course deviation data are invalid.

Each circle on the CDI scale represents 5 degrees deflection with 11 degrees full deflection to each side. Fly toward the center bar to be on-course.

TO/FROM LEGS ON THE CDI

These legs are depicted as an upright or inverted triangle based on CDI data.

"To" Legs



- Upward pointing indicator indicates "to"
- Distance to station decreases as you navigate the leg

"From" Legs



- Downward pointing indicator indicates "from"
- Distance to station increases as you navigate the leg

Specify an OBS Course

The unit allows manual entry of the OBS selected course in the absence of an external CDI/HSI selected course input.



Specify a selected course using the dual concentric knob.

Exit entry mode by doing one of the following:

- Push the dual concentric knob.
- Allow entry mode to expire.

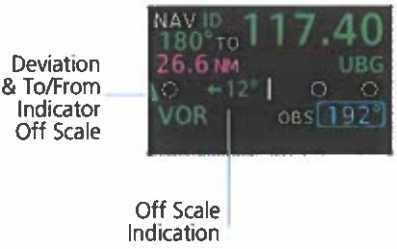
Entry mode expires after approximately 30 seconds of inactivity. The unit retains the bearing setting until you enter a new one.

DIRECT COURSE OPTION



Selecting the **Direct CRS** soft key while the OBS entry field is active sets the OBS on a direct course to the VOR station based on the current bearing.

OFF SCALE INDICATION



An arrow and value display when the deviation & to/from indicator exceeds 11 degrees. The indicator parks on the side nearest to its actual position (a partial indicator is visible at the left or right of the display).

OBS SOURCE LOST



A message informs you when GNC 215 loses selected course input from the external NAV indicator. When this occurs, you may select OBS.

Respond to a NAV Alert



Radio failures are indicated by one or more of the following:

- Red "X" displays over the NAV radio control
- Advisory message alerts
- NAV control options are not available

NAV radio fail annunciations are designed to be immediately recognizable.

Use an alternate method of navigation in response to a NAV radio failure.

INTENTIONALLY LEFT BLANK

5 Timers

ENABLE & VIEW TIMERS.....5-2
SET COUNTDOWN TIMER.....5-4
SET COUNT UP TIMER.....5-4

Enable & View Timers

Set a generic timer for general timing needs. Two stopwatch style counters allow you to count up or count down.

WHERE TO FIND IT



Enable timers by selecting the Timer function on the Display tab.

MENU > Display > Timer

Activate Timer

TIMER TYPE ANNUNCIATIONS	
CNT UP	Count up timer
CNT DN	Countdown timer

Once enabled, timer appears to the right of the COM display. The timer type annunciates at the left of the timer display



Timer is grayed out until you activate the function. Count up (CNT UP) is the default timer selection.



Activate timer controls by pushing the dual concentric knob.

Activation sets the dual concentric knob focus to timer. Toggle between timer types by turning the outer control knob.

TIMER CONTROLS

ACTION	SOFT KEY
Cancel start value entry[1]	Cancel
Start timer	Start
Stop timer	Stop
Reset timer	Reset

[1] Countdown timer only.

Basic timer functions are accessible via dual concentric knob push.

Control options change according to the current timer state.

Set Countdown Timer

The unit retains the most recent count down value following a power cycle.



1. Set direction to count down (CNT DN) using the outer control knob.



2. Specify countdown time using the inner and outer control knobs.
   - Move cursor between hours, minutes, and seconds using the outer knob.
   - Set timer value using the inner knob. Pushing the knob enters the timer value.



3. Select **Start**.



Timer flashes as the value reaches zero (00:00:00).



Upon reaching zero, timer continues counting as a negative value until you select **Stop**.

To reset timer, push the **Reset** soft key.

Set Count Up Timer



1. Set direction to count up (CNT UP) using the outer control knob (if necessary).
2. Select **Start**.

To reset timer, push the **Reset** soft key.

6 Messages

VIEW SYSTEM MESSAGES 6-2

View System Messages

WHERE TO FIND IT

Menu
└ System
└ Messages

Advisories are system-related messages relative to the display. A list of active advisories is viewable from the System tab:

MENU > System > Messages

You can open the list directly by pushing the **MSG** soft key when an active message is present.

Message List



- Most recent advisories appear at the top of the message list
- View-once advisories remain in queue until viewed by the pilot
- Persistent (or conditional) advisories remain active until the indicated condition is resolved

Active Message Indication



Flashing "MSG" annunciation appears adjacent to the bottom soft key when a new advisory is present.

Selecting **MSG** displays the advisory list. Selecting it again acknowledges all active advisories and closes the list.

It no longer displays after all active advisories are cleared.

COM Radio Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
COM radio needs service.	COM radio is reporting that it requires service. Functionality may be unavailable.	Cycle radio power. Contact dealer for service.
COM over temperature. Reducing transmit power.	COM radio is in overtemp mode. Transmitting power automatically reduces to prevent damage to the COM radio. Radio range is reduced as a result.	• Decrease length of COM transmissions. • Decrease cabin temperature and increase cabin airflow, especially near the unit. • Contact dealer for service if message persists.
COM under voltage. Reducing transmit power.	COM radio is in undervoltage mode. Transmitting power automatically reduces to prevent damage to the COM radio. Radio range is reduced as a result.	• Decrease length of COM transmissions. • Check aircraft voltage and reduce electrical load as necessary. • Contact dealer for service if message persists.
TX Interlock discrete input is stuck active.	Unit detects the TX Interlock discrete input has been active for 60 seconds.	Contact dealer for service.
COM MIC <1/2> key is stuck.	Unit detects the specified key in the pressed position for 30 seconds. The input is ignored as a result. Radio stops transmitting.	Verify that the key is not stuck. Contact dealer for service if message persists.

ADVISORY	CONDITION	CORRECTIVE ACTION
COM <name> switch is stuck.	Unit detects the specified switch is active for 30 seconds. The input is ignored as a result. Radio stops transmitting. Includes: • Standby monitor remote switch • Remote transfer switch • Remote tune up switch • Remote tune down switch	Verify that the switch is not stuck. Contact dealer for service if message persists.

Database Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
Active DB corrupt. Remove or replace.	The active database is unavailable or corrupt.	Re-download and install database. Contact a Garmin dealer for support.
Database will update on next power cycle.	The standby database completed transfer and is ready for activation at the next power cycle.	No action necessary.
Database updated successfully.	The database successfully activated upon system start-up.	

Navigation Advisories

AVAILABLE WITH: GNC 215

ADVISORY	CONDITION	CORRECTIVE ACTION
Navigation receiver needs service.	NAV radio is reporting that it requires service. Functionality may be unavailable.	Service required. Contact dealer for support.
OBS source lost. Select CDI from Display Menu.	Loss of OBS source data.	Verify that the interfaced CDI/HSI is powered on. Contact dealer for service.
Unit needs service.	The system reports one of the following conditions. • CDI interface failure • Internal failure	

Pilot Specified Advisories

These advisories display when the associated timer expires or reaches a preset value. They are informational only. Other than acknowledging the message, no action is necessary.

ADVISORY	CONDITION
Timer has expired.	Countdown timer is reaching zero.

System Hardware Advisories

ADVISORY	CONDITION	CORRECTIVE ACTION
Configuration module needs service.	The unit cannot communicate with its configuration module. Unit configuration may still be valid.	Contact dealer for service.
Unit over temperature. Limit Backlight.	Unit temperature exceeds the over temperature threshold. Backlight dims to reduce power and heat.	Decrease cabin temperature and increase cabin airflow near the unit. If the problem persists, contact dealer for service.
Unit under temperature.	The system reports that its internal temperature is below the normal operating threshold.	If the problem persists, contact dealer for service.
Pilot stored data was lost. Recheck settings.	An error occurred in the pilot stored data. The following user settings may be lost.	Recheck settings. Contact dealer for service.
MicroSD card is invalid or failed.	The microSD card has an error and is unreadable.	1. Reformat the microSD card using an external computer. 2. Re-insert the SD card in the slot. 3. Contact dealer if the problem persists.
Unit needs service.	The system reports one of the following conditions. • Volume knob failure • Light sensor failure • Invalid display calibration • Invalid main board calibration	Contact dealer for service.

ADVISORY	CONDITION	CORRECTIVE ACTION
<Name> key is stuck.	System detects the indicated bezel key is depressed for at least 30 seconds. It will now ignore this input. Includes: • Bottom soft key • Flip-flop key • Menu key • MON key • Top soft key	Push the indicated key again. If it remains stuck, contact dealer for service.
<Dual concentric inner/Volume> knob push is stuck.	System detects the indicated knob is depressed for at least 30 seconds. It will now ignore this input.	Push the knob again. If it remains stuck, contact dealer for service.

VLOC/GS Advisories

AVAILABLE WITH: GNC 215

ADVISORY	CONDITION	CORRECTIVE ACTION
Glideslope receiver needs service.	Glideslope board is reporting that it requires service. Functionality may be unavailable.	Verify glideslope deviation indications with another source and cross-check final approach fix crossing altitude. If another source is not available, fly a GPS based approach. Contact dealer for service.
VLOC remote transfer switch is stuck.	System detects the indicated remote switch is active for at least 30 seconds. It will now ignore this input.	Push the remote key again. If it remains stuck, contact dealer for service.

INTENTIONALLY LEFT BLANK

7 Glossary

A

AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
ARTCC	Air Route Traffic Control Center
ATIS	Automatic Terminal Information Service

C

CDI	Course Deviation Indicator

D

DB	Database
DME	Distance Measuring Equipment

F

FAA	Federal Aviation Administration
FCC	Federal Communication Commission
FREQ	Frequency
FSS	Flight Service Station

G

GFC	Garmin Flight Controller
GNC	Garmin NAV/COM
GPS	Global Positioning System
GS	Glideslope
GTR	Garmin Transceiver Radio

H

HSDB	High Speed Data Bus
HSI	Horizontal Situation Indicator

I

IFR	Instrument Flight Rules
ILS	Instrument Landing System

L

LCD	Liquid Crystal Display
LOA	Letter of Authorization
LOC	Localizer
LRU	Line Replaceable Unit

M

MSG	Message

N

NAV	Navigation
NAVAID	Navigation Aid
NVIS	Night Vision Imaging System

O

OBS	Omni Bearing Selector

R

RF	Radius to Fix
RX	Receive, Receiver

S

SD	Secure Digital
STBY	Standby

T

T	True
T/F	To/From
TX	Transmit

V

VFR	Visual Flight Rules
VHF	Very High Frequency
VLOC	VOR/Localizer
VOR	Very High Frequency Omnidirectional Range

W

WX	Weather

INTENTIONALLY LEFT BLANK

8 Regulatory Information

COMPLIANCE.....8-2
SOFTWARE LICENSE AGREEMENT.....8-3

Compliance

FCC Compliance Statement

This device complies with Part 15 of the FCC limits for Class B digital devices. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Furthermore, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference, the user is encouraged to try to correct the interference by relocating the equipment or connecting the equipment to a different circuit than the affected equipment. Consult an authorized dealer or other qualified avionics technician for additional help if these remedies do not correct the problem.

Operation of this device is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Declarations of Conformity

Declaration of Conformity

Hereby, Garmin declares that this product is in compliance with the Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: www.garmin.com/compliance.

UK Declaration of Conformity

Hereby, Garmin declares that this product is in compliance with the relevant statutory requirements. The full text of the declaration of conformity is available at the following internet address: www.garmin.com/compliance.

Radio Frequency/Output Power

2.4 GHz @ 11 dBm nominal.

Software License Agreement

BY USING THE DEVICE, COMPONENT OR SYSTEM MANUFACTURED OR SOLD BY GARMIN ("THE GARMIN PRODUCT"), YOU AGREE TO BE BOUND BY THE TERMS AND CONDITIONS OF THE FOLLOWING SOFTWARE LICENSE AGREEMENT. PLEASE READ THIS AGREEMENT CAREFULLY. Garmin Ltd. and its subsidiaries ("Garmin") grants you a limited license to use the software embedded in the Garmin Product (the "Software") in binary executable form in the normal operation of the Garmin Product. Title, ownership rights, and intellectual property rights in and to the Software remain with Garmin and/or its third-party providers. You acknowledge that the Software is the property of Garmin and/or its third-party providers and is protected under the United States of America copyright laws and international copyright treaties. You further acknowledge that the structure, organization, and code of the Software are valuable trade secrets of Garmin and/or its third-party providers and that the Software in source code form remains a valuable trade secret of Garmin and/or its third-party providers. You agree not to reproduce, decompile, disassemble, modify, reverse assemble, reverse engineer, or reduce to human readable form the Software or any part thereof or create any derivative works based on the Software. You agree not to export or re-export the Software to any country in violation of the export control laws of the United States of America.

INTENTIONALLY LEFT BLANK







190-02766-02 Rev. A