Cessna

MORE PEOPLE BUY AND FLY CESSNA AIRPLANES THAN ANY OTHER MAKE

1975

WORLD'S LARGEST PRODUCER OF GENERAL AVIATION AIRCRAFT SINCE 1956

MODEL 177 AND CARDINAL

N35031

OWNER'S MANUAL

As of 1/30/20

PERFORMANCE - SPECIFICATIONS

	* Cardinal
GROSS WEIGHT	2500 lbs
SPEED:	
Top Speed at Sea Level	160 mph
Cruise, 75% Power at 10,000 ft	150 mph
RANGE:	
Cruise, 75% Power at 10,000 ft 49 Gallons, No Reserve	735 mi 4.9 hrs 150 mph
Maximum Range at 10,000 ft 49 Gallons, No Reserve	820 mi 6.5 hrs 126 mph
RATE OF CLIMB AT SEA LEVEL	840 fpm
SERVICE CEILING	14,600 ft
TAKE-OFF:	
Ground Run	750 ft
Total Distance Over 50-Foot Obstacle	1400 ft
LANDING:	
Ground Roll	600 ft
Total Distance Over 50-Foot Obstacle	1220 ft
STALL SPEEDS:	
Flaps Up, Power Off	63 mph
Flaps Down, Power Off	53 mph
EMPTY WEIGHT: (Approximate)	
N35031	1,426 lbs
USEFUL LOAD:	
N35031	1,073 lbs
BAGGAGE	120 lbs
WING LOADING: Pounds/Sq Foot	14.4
POWER LOADING: Pounds/HP	13.9
FUEL CAPACITY: Total	
Standard Tanks	50 gal.
OIL CAPACITY	9 qts
PROPELLER: Constant Speed, Diameter	76 inches
ENGINE:	
Lycoming Engine 180 rated HP at 2700 RPM	O-360-A1F6D

NOTE: Performance data is shown for the Cardinal which is three to four mph faster than a standard-equipped Model 177 (without speed fairings). There is a corresponding difference in range, while all other performance figures are the same for the Model 177 as shown for the Cardinal.

* This manual covers operation of the Model 177/Cardinal which is certificated as Model 177B under FAA Type Certificate No. A13CE.

Speeds for Normal Operations

V_x	*79*	Best Angle of Climb
V_y	*92*	Best Rate of Climb
$V_{best\ l/d}$	*85*	Best Glide
V_s	*63*	Stall Speed, Normal Configuration
V_{so}	*52*	Stall Speed, Landing Configuration
V_{fo1}	*105*	Maximum Flap Extension – 10°
V_{fo2}	*130*	Maximum Flap Extension > 10°
V_a	*117*	Maneuvering Speed @ Gross Weight
V_{no}	*153*	Maximum Structural Cruising Speed
V_{ne}	*186*	Never Exceed Speed
	65	Lift Nose Wheel
	92	Normal Climb Out
	69	Short Field Takeoff, Flaps 15°

C-177B Cardinal – 2,500 lbs

Take Off Speed	Approach Speed
Horton – 47 mph	*Horton* – 50 mph
Normal Operation – 57 mph	*Normal Operation* – 55 mph
Normal Cessna – 65 mph	*Normal Cessna* – 70 mph

Specifications

2500 lbs.	*Maximum Gross Weight*
1426 lbs.	*Basic Empty Weight*
1073 lbs.	*Useful Load*
773 lbs.	*Payload with Full Fuel*
11 gph	*Approximate Fuel Flow*
50 gal.	*Total Fuel Capacity*
49 gal.	*Total Useable Fuel*
100LL (Blue)	*Fuel Octane Rating*
8 qts	*Oil Sump Capacity*
6 qts	*Minimum / Usual Oil Quantity*
180 HP	*Lycoming O-360-A1F6*
12 v	*Battery*
104.02	*Empty C.G.*
148,344.61	*Empty C.G. Moment*

CONGRATULATIONS . . . . .

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

This Owner's Manual has been prepared as a guide to help you get the most pleasure and utility from your Model 177/Cardinal. It contains information about your Cessna's equipment, operating procedures, and performance; and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

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

THE CESSNA WARRANTY -- It is designed to provide you with the most comprehensive coverage possible:

a. No exclusions
b. Coverage includes parts and labor
c. Available at Cessna Dealers world wide
d. Best in the industry

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FACTORY APPROVED SERVICE EQUIPMENT to provide you with the most efficient and accurate workmanship possible.

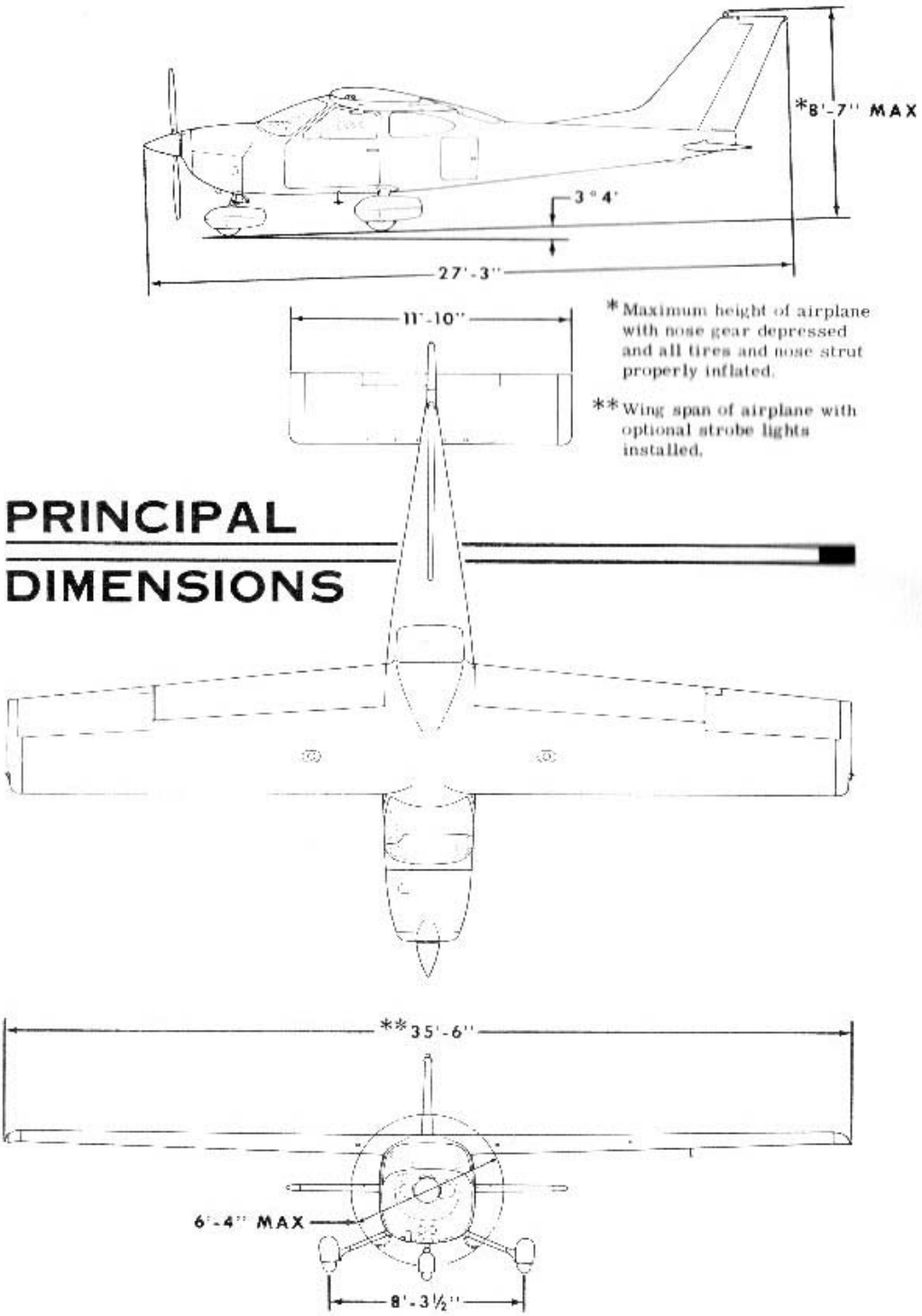
A STOCK OF GENUINE CESSNA SERVICE PARTS on hand when you need them.

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.

PRINCIPAL DIMENSIONS



*Maximum height of airplane with nose gear depressed and all tires and nose strut properly inflated.

**Wing span of airplane with optional strobe lights installed.

TABLE OF CONTENTS

This manual describes the operation and performance of the Model 177, the Cardinal, and the Cardinal II. Equipment described as "Optional" denotes that the subject equipment is optional on the Model 177. Much of this equipment is standard on the Cardinal and Cardinal II.

SERVICING REQUIREMENTS *

FUEL:

GRADE -- 100/130 Minimum Grade Aviation Fuel.
100/130 low lead aviation fuel with a lead content limited to 2 cc per gallon is also approved.
CAPACITY EACH STANDARD TANK -- 25 Gallons.
CAPACITY EACH LONG RANGE TANK -- 30.5 Gallons.

REDUCED CAPACITY, STANDARD AND LONG RANGE (INDICATED BY SMALL HOLES INSIDE FILLER NECK) -- 22 Gallons.

NOTE

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

LANDING GEAR:

NOSE WHEEL TIRE PRESSURE -- 35 PSI on 5.00 - 5, 4-Ply Rated Tire.
35 PSI on 6.00 - 6, 4-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 30 PSI on 6.00 - 6, 6-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --
Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 40 PSI.

* For complete servicing requirements, refer to the aircraft Service Manual.

SERVICING REQUIREMENTS*

ENGINE OIL:

GRADE -- Aviation Grade SAE 50 Above 60°F.
Aviation Grade SAE 10W30 or SAE 30 Between 0° and 70°F.
Aviation Grade SAE 10W30 or SAE 20 Below 10°F.

Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting in cold weather. Detergent or dispersant oil, conforming to Specification No. MIL-L-22851, must be used.

NOTE

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

CAPACITY OF ENGINE SUMP -- 8 Quarts.

Do not operate on less than 6 quarts. To minimize loss of oil through breather, fill to 7 quart level for normal flights of less than 3 hours. For extended flight, fill to 8 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required when the filter element is changed.

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain engine oil sump and oil cooler, clean the oil suction strainer, and change the oil filter element. Refill sump with straight mineral oil (non-detergent) and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to detergent oil. Drain the engine oil sump and oil cooler, change filter element, and clean oil suction strainer each 50 hours thereafter. The oil change interval may be extended to 100-hour intervals, providing the oil filter element is changed at 50-hour intervals. Change engine oil at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

Section I

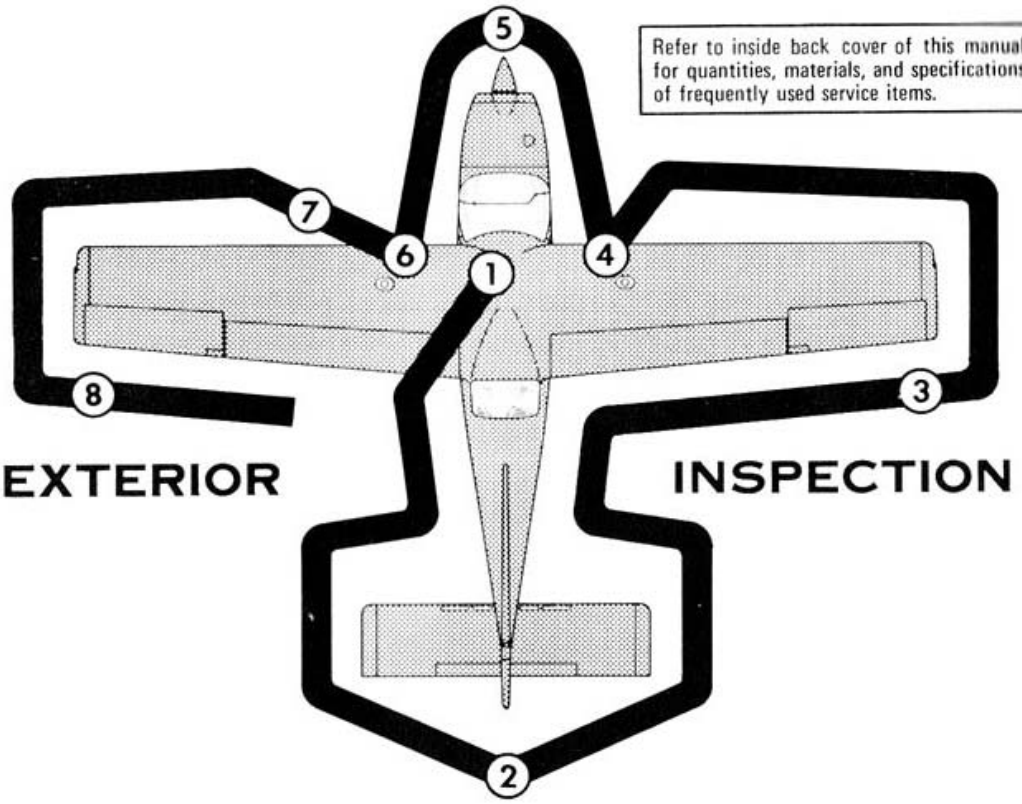
OPERATING CHECKLIST

One of the first steps in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your aircraft's equipment, systems, and controls. This can best be done by reviewing this equipment while sitting in the aircraft. Those items whose function and operation are not obvious are covered in Section II.

Section I lists, in Pilot's Checklist form, the steps necessary to operate your aircraft efficiently and safely. It is not a checklist in its true form as it is considerably longer, but it does cover briefly all of the points that you should know for a typical flight. A more convenient plastic enclosed checklist, stowed in the map compartment, is available for quickly checking that all important procedures have been performed. Since vigilance for other traffic is so important in crowded terminal areas, it is important that preoccupation with checklists be avoided in flight. Procedures should be carefully memorized and performed from memory. Then the checklist should be quickly scanned to ensure that nothing has been missed.

The flight and operational characteristics of your aircraft are normal in all respects. There are no "unconventional" characteristics or operations that need to be mastered. All controls respond in the normal way within the entire range of operation. All airspeeds mentioned in Sections I, II and III are indicated airspeeds. Corresponding calibrated airspeed may be obtained from the Airspeed Correction Table in Section VI.

See APPENDIX 86-19-11: Preflight Fuel System Check



Refer to inside back cover of this manual for quantities, materials, and specifications of frequently used service items.

EXTERIOR INSPECTION

Note

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

(1)

a. Remove control wheel lock.
b. Check ignition switch OFF.
c. Turn on master switch and check fuel quantity indicators, then turn off master switch.
d. Check fuel selector valve handle BOTH ON.
e. Check fuel shutoff valve knob safety-wired to the ON position.
f. Check baggage door for security. Lock with key if children are to occupy child's seat.

(2)
a. Remove rudder gust lock, if installed.
b. Disconnect tail tie-down.
c. Check control surfaces for freedom of movement and security.

(3)
a. Check aileron for freedom of movement and security.
b. Check fuel tank vent opening (at wing tip trailing edge) for stoppage.

(4)
a. Disconnect wing tie-down.
b. Check main wheel tire for proper inflation.
c. Before first flight of 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.
d. Visually check fuel quantity for desired level; then check fuel filler cap secure and vent unobstructed.

(5)
a. Inspect flight instrument static source opening on side of fuselage for stoppage (both sides).
b. Check oil level. Do not operate with less than six quarts. Fill to eight quarts for extended flight.
c. 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, fuel selector valve drain plug, fuel vent line drain plugs, and fuel reservoir quick-drain valve will be necessary.
d. Check propeller and spinner for nicks and security, and propeller for oil leaks.
e. Check carburetor air filter (inside left nose cap opening).
f. Check landing light for condition and cleanliness.
g. Check nose wheel strut and tire for proper inflation.
h. Disconnect tie-down rope.

(6)
a. Check main wheel tire for proper inflation.
b. Before first flight of 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.
c. Visually check fuel quantity for desired level; then check fuel filler cap secure and vent unobstructed.

(7)
a. Check stall warning vent opening for stoppage.
b. Remove pitot tube cover, if installed, and check pitot tube opening for stoppage.
c. Disconnect wing tie-down.

(8)
a. Check fuel tank vent opening (at wing tip trailing edge) for stoppage.
b. Check aileron for freedom of movement and security.

C-177B – N35031 CHECKLISTS

PREFLIGHT – CABIN

1. Cabin Cover ..... REMOVE & STOW
2. Pilot's Handbook ..... AVAILABLE
3. A-R-R-O-W ..... CHECK
4. Parking Brake ..... SET
5. Control Wheel Lock ..... REMOVE
6. Ignition Switch ..... OFF & KEY OUT
7. Avionics ..... ALL OFF
8. Battery Switch ..... ON
9. Fuel Quantity ..... CHECK
10. Flaps ..... DOWN
11. Battery Switch ..... OFF
12. Fuel Selector Valve ..... BOTH
13. Fuel Shutoff ..... IN & SAFETY-WIRED

PREFLIGHT – LEFT WING

1. Fuel Quantity ..... CHECK
2. Fuel Filler Cap ..... SECURE
3. Tie Down ..... DISCONNECT
4. Pitot Tube Cover ..... REMOVE
5. Stall Warning Opening ..... CHECK
6. Wing Tips ..... CHECK
7. Aileron ..... CHECK FREE
8. Aileron ..... CHECK HINGES
9. Aileron ..... CHECK PUSH BAR
10. Flap Guides ..... CHECK
11. Flap Connection ..... CHECK
12. Fuel Tank Sump ..... SAMPLE
13. Main Wheel Tire ..... CHECK
14. Fuel Vent Opening ..... CHECK CLEAR

PREFLIGHT – EMPENNAGE

1. Antennas ..... CHECK
2. Baggage Door ..... CHECK SECURE
3. Stabilator ..... CHECK
4. Trim Taps ..... CHECK
5. Tail Tie-Down ..... DISCONNECT
6. Rudder ..... CHECK

PREFLIGHT – RIGHT WING

1. Fuel Vent Opening ..... CHECK CLEAR
2. Main Wheel Tire ..... CHECK
3. Fuel Tank Sump ..... SAMPLE
4. Flap Connection ..... CHECK
5. Flap Guides ..... CHECK
6. Aileron ..... CHECK FREE
7. Aileron ..... CHECK PUSH BAR
8. Aileron ..... CHECK HINGES
9. Wing Tips ..... CHECK
10. Tie Down ..... DISCONNECT
11. Fuel Quantity ..... CHECK
12. Fuel Filler Cap ..... SECURE

PREFLIGHT – NOSE

1. Engine Oil Level ..... CHECK
2. Fuel Strainer ..... DRAIN
3. Hobbs Time ..... RECORD
4. Owl ..... REMOVE
5. Propeller & Spinner ..... CHECK
6. Blades ..... CHECK
7. Cowl Plugs ..... REMOVE
8. Alternator Belt ..... CHECK
9. Landing Light ..... CHECK
10. Carburetor Air Filter ..... CHECK
11. Nose Strut ..... COMPRESS
12. Tire ..... CHECK
13. Static Source Opening ..... CHECK
14. OAT ..... CHECK CLEAR

As of 1/15/20

ACAMPO FLYING CLUB
AIRCRAFT RENTAL, INSTRUCTION AND SALES

C-177B – N35031 CHECKLISTS

BEFORE STARTING ENGINE

1. Preflight Inspection ..... COMPLETE
2. Seats Belts ..... ADJUST & LATCH
3. Cabin Doors ..... CLOSED & LOCKED
4. Passengers ..... BRIEFED
5. Fuel Selector Valve ..... BOTH
6. Fuel Shutoff Valve ..... IN & WIRED
7. Electrical Equipment / Avionics .... OFF
8. Brakes ..... TEST & SET
9. Circuit Breakers ..... CHECK IN

STARTING THE ENGINE

1. Cowl Flaps ..... OPEN
2. Mixture ..... RICH
3. Propeller ..... HIGH RPM
4. Carburetor Heat ..... COLD
5. Beacon ..... ON
6. Prime ..... AS REQUIRED
7. Throttle ..... OPEN 1/2 INCH
8. Propeller Area ..... CLEAR
9. Master Switch ..... ON
10. Auxiliary Fuel Pump ..... CHECK
11. Ignition Switch ..... START
12. Oil Pressure ..... CHECK
13. Throttle ..... 1000 RPM

BEFORE TAXI

1. Flaps ..... UP
2. Electronics ..... ON
3. Radios / Navigation ..... SET
4. Transponder ..... STANDBY
5. Intercom ..... ON & CHECK VOLUME
6. Taxi Area ..... VERIFY CLEAR
7. Mixture ..... LEAN FOR TAXI
8. Parking Brake ..... RELEASE
9. Brakes ..... TEST
10. Flight Controls ..... POSITIONED FOR ..... WIND

BEFORE TAKE-OFF

1. Nose Wheel ..... STRAIGHT
2. Parking Brake ..... SET
3. Flight Controls ..... FREE & CORRECT
4. Fuel Shutoff Valve ..... IN & WIRED
5. Fuel Selector Valve ..... ON BOTH
6. Mixture ..... RICH *(below 3,000')*
7. Stabilator Trim ..... TAKE-OFF
8. Rudder Trim ..... TAKE-OFF
9. Primer ..... IN & LOCKED
10. Oil Temperature ..... IN GREEN
11. Throttle Setting ..... 1800 RPM
    - **a)** Engine Instruments ..... CHECK
    - **b)** Ammeter ..... CHECK
    - **c)** Propeller ..... CYCLE 3x
        - **a.** Check RPM Drop
        - **b.** Check Oil Pressure Drop
        - **c.** Check MP Drop
    - **d)** Carburetor Heat ..... CHECK
    - **e)** Magnetos ..... CHECK, Max drop 150 RPM; Max differential 50 RPM
    - **f)** Aux Fuel Pump ..... CHECK
    - **g)** Suction Gage ..... CHECK 4.6"– 5.4"
12. Throttle ..... 1,000 RPM
13. Flight Instruments ..... SET
    - **a.** Heading
    - **b.** Altimeter
    - **c.** Transponder Code
    - **d.** Navigation
14. Radios ..... SET
15. Throttle Friction Lock ..... ADJUST
16. Cabin Doors & Windows ..... CLOSED
17. NAV/Strobe Lights ..... AS REQUIRED
18. Transponder ..... ON ALT
19. Parking Brake ..... RELEASE

PASSENGER BRIEFING

1. Expected WX and Flight Conditions
2. Seatbelt Operations – WEAR AT ALL TIMES
3. Headset Operation
4. What NOT TO TOUCH
5. Sterile Cockpit until after Takeoff
6. Sick Sacks
7. Ventilation
8. How to Radio for Help *(PTT Button on panel)*
9. Emergency Situations
10. Foreflight Passenger App on iPhone

C-177B – N35031 CHECKLISTS

NORMAL TAKE-OFF

1. Wing Flaps .....0°-10° *(10° preferred)*
2. Carburetor Heat ..... COLD
3. Throttle .....FULL OPEN
4. Propeller .....2,700 RPM
5. Elevator Control ..... LIFT NOSE AT **60**
6. Climb Speed ..... BEST RATE: **92**
7. Flaps .....RETRACT
8. Power/Prop .....2500 RPM/25”

SHORT FIELD TAKE-OFF

1. Wing Flaps ..... 15°
2. Carburetor Heat ..... COLD
3. Brakes ..... APPLY & HOLD
4. Throttle.....FULL OPEN
5. Propeller.....2,700 RPM
6. Mixture.....LEAN ABOVE 3,000’
7. Brakes ..... RELEASE
8. Elevator Control ..... LIFT NOSE AT **60**
9. Climb Speed..... BEST ANGLE: **69**
10. Flaps.....RETRACT
11. Power/Prop.....2500 RPM/25”
12. Climb Speed..... BEST RATE: **92**

ENROUTE CLIMB

1. Landing Light ..... OFF
2. Airspeed .....90 to 100
3. Power .....24”; 2500-2700 RPM
4. Mixture..... LEAN ABOVE 3,000’
5. Cowl Flaps.....OPEN AS REQUIRED

CRUISE

1. Power .....75% OR LESS
2. Stabilator Trim.....ADJUST
3. Rudder Trim ..... ADJUST
4. Mixture ..... LEAN
5. Cowl Flaps..... ADJUST
   ..... FOR 350° OR LESS

DECENT

1. Fuel Selector Valve.....BOTH
2. Mixture ..... RICH
3. Power..... AS DESIRED
4. Carb Heat.....FULL BELOW GREEN
5. Landing Lights.....ON
6. Airspeed..... 80-90
7. Flaps ..... AS DESIRED

BEFORE LANDING

1. Seats Belts – ADJUST and LATCH
2. Fuel Selector – BOTH
3. Mixture – RICH
4. Propeller – HIGH RPM
5. Carburetor Heat – ON
6. Airspeed – 70-80 MPH (FLAPS DOWN)

As of 1/15/20

ACAMPO FLYING CLUB
AIRCRAFT RENTAL, INSTRUCTION AND SALES

C-177B – N35031 CHECKLISTS

BALKED LANDING

1. Power ..FULL THROTTLE; 2700 RPM
2. Carburetor Heat .....COLD
3. Wing Flaps ..... *(immediately)* 20°
4. Climb.....BEST ANGLE: **69**
5. Wing Flaps (after safe alt & 75) ..... RETACT SLOWLY
6. Climb Speed .....BEST RATE: **92**
7. Cowl Flaps..... OPEN

NORMAL LANDING

1. Airspeed.....80-75 MPH *(flaps up)*
2. Wing Flaps.....10° *(below 130 MPH)*
3. Wing Flaps.... AS DESIRED *(below 105)*
4. Airspeed..... 70-80 MPH (*flaps down)*
5. Touchdown.....MAIN WHEELS FIRST
6. Landing Roll..LOWER NOSE GENTLY
7. Braking ..... MINIMUM REQUIRED

AFTER LANDING

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

CLEAR OF RUNWAY

1. Transponder..... STANDBY
2. Strobe / Nav / Landing Lights ..... OFF

PRIOR TO PARKING

1. Fuel – TOP OFF
2. Purchase – RECORD

SECURING AIRCRAFT

1. Parking Brake ..... SET
2. Tach Time .....RECORD FROM JPI
3. Radios & Electrical Equipment..... OFF
4. Ignition Switch .....GROUND CHECK
5. Mixture.....IDLE CUT OFF
6. Ignition Switch ..... OFF
7. Master/Battery Switch's ..... OFF
8. Control Lock..... INSTALL
9. Fuel Selector Valve.....RIGHT

10. Airplane.....CHOCK, TIE DOWN
11. Cowl Plugs ..... INSTALL
12. Owl..... INSTALL
13. Pitot Tube Cover..... INSTALL
14. Squawks .....RECORD
15. Cabin Doors.....LOCK
16. Baggage Door.....LOCK
17. Cabin Cover..... INSTALL
18. Hobbs ..... RECORD *(next to fuel drain)*
19. Keys ..... RETURN TO OFFICE

C-177B – N35031 CHECKLISTS

ENGINE FAILURE DURING TAKEOFF

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

ENGINE FAILURE AFTER TAKEOFF

1. Airspeed ..... 80 MPH
2. Mixture ..... IDLE CUT-OFF
3. Fuel Selector Valve ..... OFF
4. Fuel Shutoff Valve ..... OUT *(Break Safety Wire)*
5. Ignition Switch ..... OFF
6. Wing Flaps ..... AS REQUIRED
7. Master Switch ..... OFF

ENGINE FAILURE DURING FLIGHT

1. Airspeed ..... 85 MPH
2. Carburetor Heat ..... ON
3. Fuel Selector Valve ..... BOTH
4. Mixture ..... RICH
5. Ignition Switch ..... BOTH or START
6. Primer ..... IN & LOCKED
7. Airspeed ..... 80 MPH

ENGINE FIRE DURING FLIGHT

1. Mixture ..... IDLE CUT-OFF
2. Fuel Shutoff Valve ..... OUT *(Break Safety Wire)*
3. Master Switch ..... OFF
4. Cabin Heat ..... OFF
5. Airspeed **100**

ELECTRICAL FIRE DURING FLIGHT

1. Master Switch ..... OFF
2. All other Switches (except Ignition) ..... OFF
3. Vents / Cabin Air / Heat ..... CLOSED
4. Fire Extinguisher ..... ACTIVATE

(if fire appears out)

- **a.** Master Switch ..... ON
- **b.** Circuit Breakers ..... CHECK ..... *(Do NOT reset faulty circuit)*
- **c.** Electrical/Radios ..... ON . *One at a time, with delay after each*

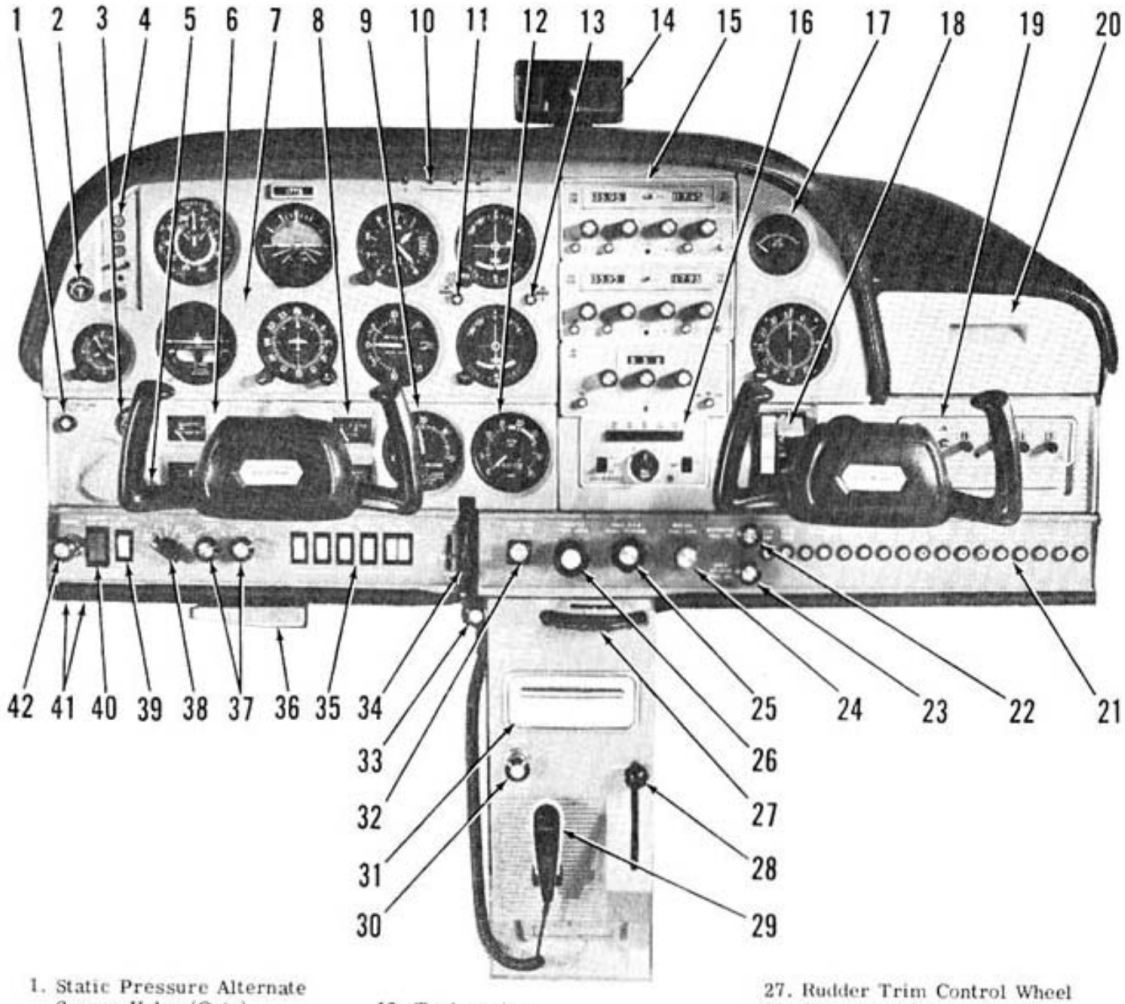
EMERGENCY LANDING

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector Valve ..... OFF
3. Fuel Shutoff Valve ..... OUT *(Break Safety Wire)*
4. Select Field ..... SUITABLE
5. Electrical Switches ..... OFF
6. Wing Flaps (on final) . AS REQUIRED
7. Airspeed ..... **75** MPH
8. Master/Battery Switch ..... OFF
9. Doors ..... UNLATCH
10. Touchdown ..... SLIGHT TAIL LOW
11. Ignition ..... OFF
12. Brakes ..... APPLY HEAVILY

PRECAUTIONARY LANDING

1. Wing Flaps ..... 15°
2. Airspeed ..... 75 MPH
3. Select Field ..... SUITABLE
4. Electronics ..... OFF
5. Wing Flaps (on Final) ..... 30°
6. Airspeed ..... 60 MPH
7. Master/Battery Switch ..... OFF
8. Doors ..... UNLATCH
9. Touchdown ... SLIGHTLY TAIL LOW
10. Ignition Switch ..... OFF
11. Brakes ..... APPLY HEAVILY

INSTRUMENT PANEL



1. Static Pressure Alternate Source Valve (Opt.)
2. Suction Gage (Opt.)
3. Fuel Pressure Gage
4. Marker Beacon Indicator Lights and Switches (Opt.)
5. Over-Voltage Warning Light
6. Cylinder Head Temperature, Left Fuel Quantity Indicator, Ammeter and Oil Pressure Gages
7. Flight Instrument Group
8. Right Fuel Quantity Indicator and Oil Temperature Gage
9. Manifold Pressure Gage
10. Radio Selector Switches (Opt.)
11. No. 1 LOC Reversed Indicator Light (Opt.)
12. Tachometer
13. No. 2 LOC Reversed Indicator Light (Opt.)
14. Rear View Mirror (Opt.)
15. Radios (Opt.)
16. Autopilot Control Unit (Opt.)
17. Economy Mixture Indicator (Opt.)
18. Wing Flap Switch and Position Indicator
19. Transponder (Opt.)
20. Map Compartment
21. Circuit Breakers
22. Defroster Control Knob
23. Cabin Air/Heat Control Knob
24. Mixture Control Knob
25. Propeller Control Knob
26. Throttle (With Friction Lock)
27. Rudder Trim Control Wheel
28. Cowl Flap Control Lever
29. Microphone (Opt.)
30. Cigar Lighter
31. Ashtray
32. Carburetor Heat Control Knob
33. Fuel Shutoff Valve Control Knob
34. Stabilator Trim Control Wheel
35. Electrical Switches
36. Parking Brake Handle
37. Instrument and Radio Dial Light Rheostats
38. Ignition Switch
39. Auxiliary Fuel Pump Switch
40. Master Switch
41. Phone and Auxiliary Mike Jacks
42. Primer

Figure 2-1.

Section II

DESCRIPTION AND OPERATING DETAILS

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

FUEL SYSTEM

Fuel is supplied to the engine from two integral fuel tanks, one in each wing. With the selector on BOTH, the total usable fuel for all flight conditions is 49 gallons for the standard tanks when completely filled. Special wings with long range fuel tanks are available to replace the standard wings and fuel tanks for greater endurance and range. When these are installed, the total usable fuel for all flight conditions is 60 gallons.

NOTE

With full cabin loading with either standard or long range tanks, it will be necessary to reduce the fuel load to keep the aircraft within approved weight limits. Refer to Section IV for weight and balance control procedures.

A 22 gallon capacity mark, in the form of a series of small holes inside the filler neck, is provided on all tanks to facilitate fueling to reduced fuel loads. When both tanks are fueled to this marker, the total usable fuel is 43 gallons with either the standard or long range tank installations.

Fuel from each wing fuel tank flows through a selector valve, small reservoir, and fuel shutoff valve to the fuel strainer. From here, it is routed to an engine-driven pump which delivers the fuel under pressure to the carburetor. An electric auxiliary fuel pump parallels the engine-driven pump and is used when fuel pressure drops below 2 psi. It is not necessary to have the auxiliary pump operating during normal take-off and landing, since gravity feed will supply adequate fuel flow to the carburetor

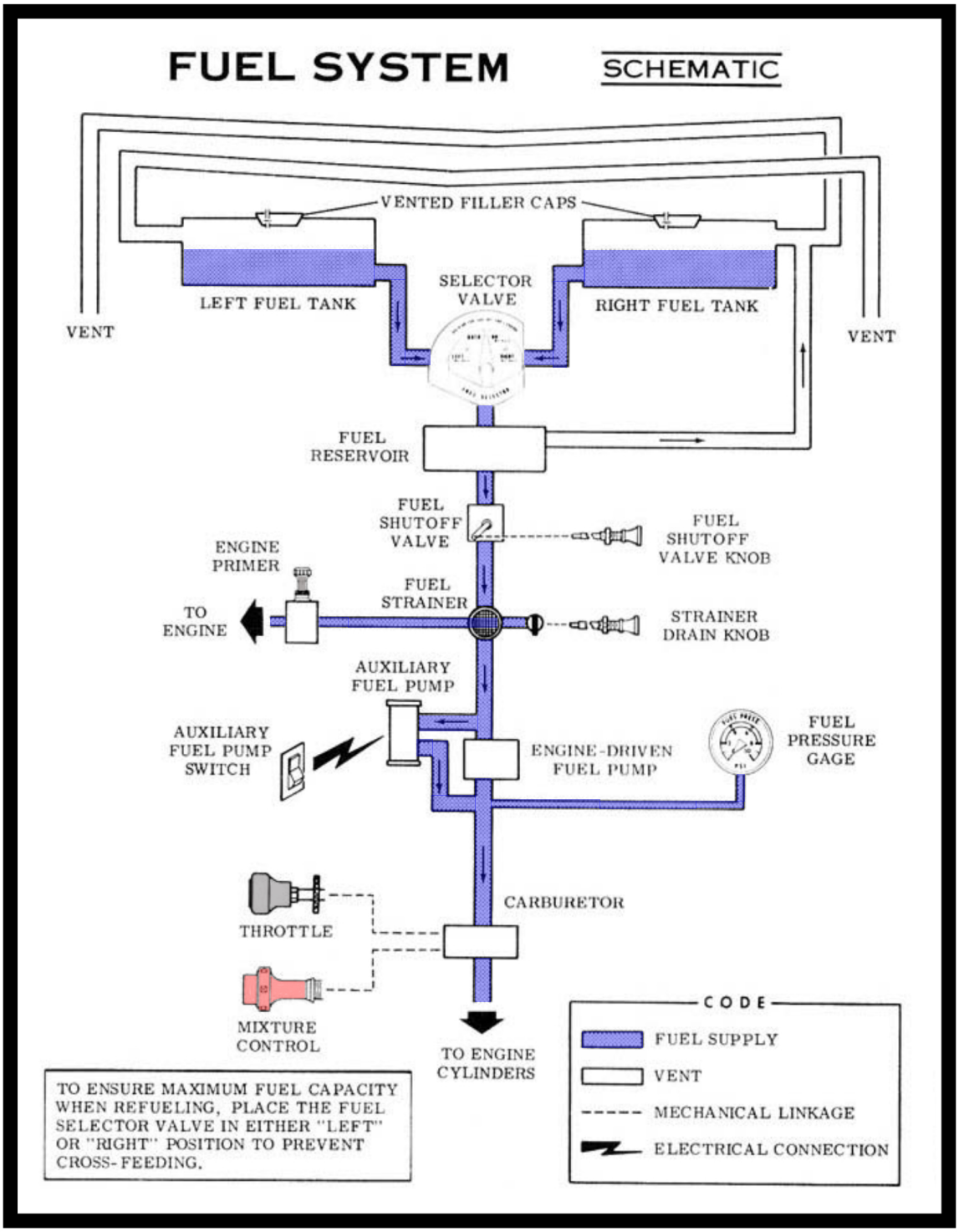

FUEL SYSTEM
SCHEMATIC
VENTED FILLER CAPS
VENT
LEFT FUEL TANK
SELECTOR VALVE
RIGHT FUEL TANK
VENT
FUEL RESERVOIR
FUEL SHUTOFF VALVE
FUEL SHUTOFF VALVE KNOB
ENGINE PRIMER
TO ENGINE
FUEL STRAINER
STRAINER DRAIN KNOB
AUXILIARY FUEL PUMP
AUXILIARY FUEL PUMP SWITCH
ENGINE-DRIVEN FUEL PUMP
FUEL PRESSURE GAGE
CARBURETOR
THROTTLE
MIXTURE CONTROL
TO ENGINE CYLINDERS
TO ENSURE MAXIMUM FUEL CAPACITY WHEN REFUELING, PLACE THE FUEL SELECTOR VALVE IN EITHER "LEFT" OR "RIGHT" POSITION TO PREVENT CROSS-FEEDING.
CODE
FUEL SUPPLY
VENT
MECHANICAL LINKAGE
ELECTRICAL CONNECTION

Figure 2-2.

with the engine-driven pump inoperative. However, gravity flow is considerably reduced at maximum performance take-off and climb attitudes, and the auxiliary fuel pump would be required if the engine-driven pump should fail during these maneuvers.

NOTE

Take off with the fuel selector valve handle in the BOTH ON position to prevent inadvertent take-off on an empty tank. However, during long range flight with the selector valve handle in the BOTH ON position, 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 fuel tank in the "heavy wing". The recommended cruise fuel management procedure for extended flight is to use the left and right tank alternately.

NOTE

With low fuel (1/16th tank or less) a prolonged powered steep descent (1,000' or more) should be avoided with more than 10° flaps to prevent the possibility of fuel starvation resulting from uncovering the fuel tank outlets. If starvation should occur, leveling the nose and turning on the auxiliary fuel pump should restore engine power within 30 seconds.

For fuel system servicing information, refer to Servicing Requirements on the inside back cover.

FUEL SYSTEM QUICK-DRAIN VALVES

The fuel tank sumps and fuel reservoir tank are equipped with quick-drain valves to facilitate draining and/or examination of fuel for contamination and grade. The fuel tank drain valves extend through the lower surface of the wings outboard of the cabin doors, and the fuel reservoir drain valve is accessible through a hole in the belly skin just aft of the firewall on the aircraft centerline. A fuel sampler cup stored in the aircraft is used to examine the fuel. Insert the probe in the sampler cup into the center of the quick-drain valve and push. Fuel will drain from the tank sump or fuel reservoir tank into the sampler cup until pressure on the valve is released.

ELECTRICAL SYSTEM

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven alternator (see figure 2-3). The 12-volt battery is located aft of the rear cabin wall. Power is supplied to all electrical circuits through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. Both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the transistors in the electronic 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. 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 OFF will reduce battery power low enough to open the battery contactor, remove power from the alternator field and prevent alternator restart.

AMMETER

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the aircraft electrical system. When the engine is operating and the master switch is 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 discharge rate of the battery.

OVER-VOLTAGE SENSOR AND WARNING LIGHT

The aircraft is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel

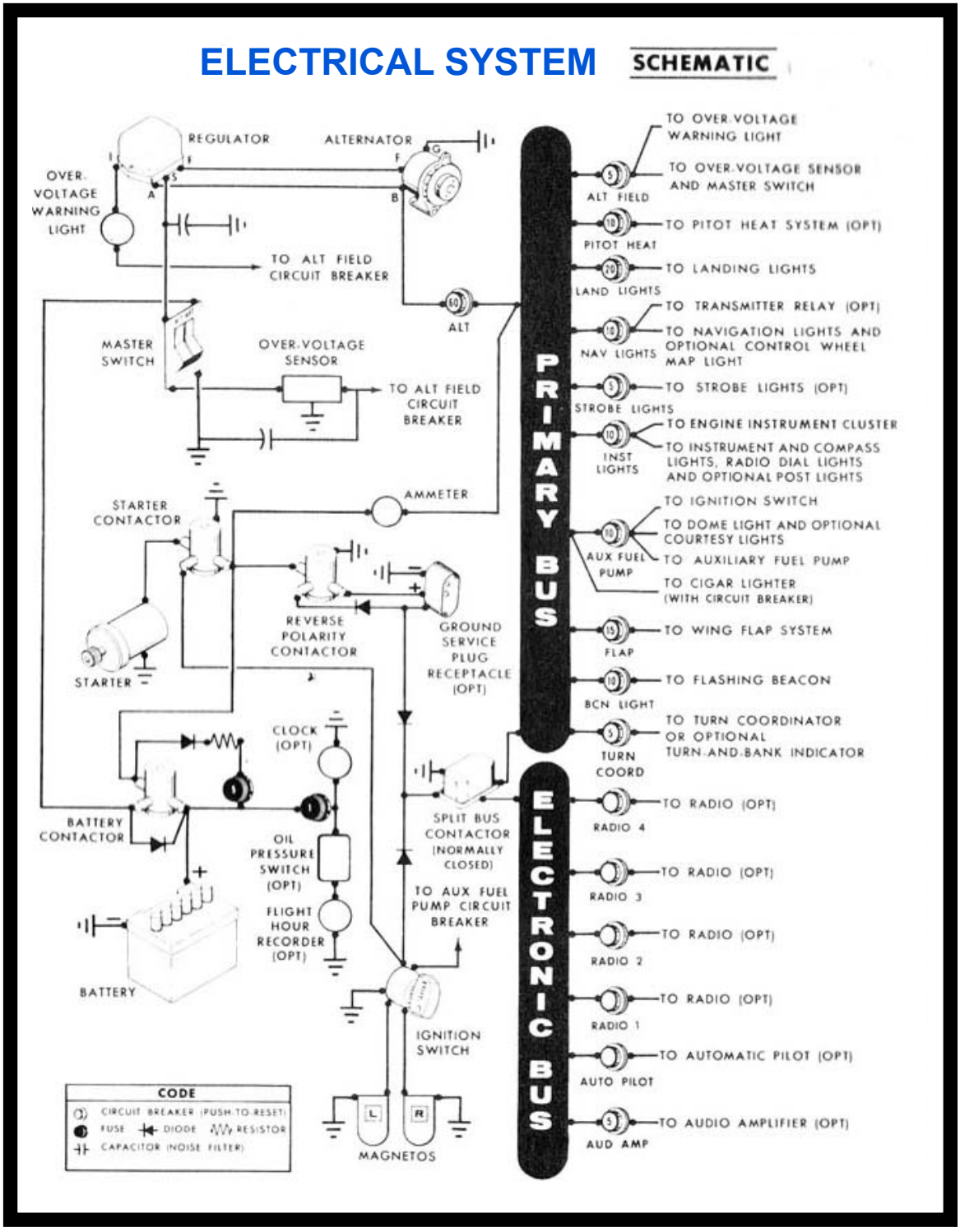

ELECTRICAL SYSTEM
SCHEMATIC
REGULATOR
ALTERNATOR
OVER-VOLTAGE WARNING LIGHT
TO ALT FIELD CIRCUIT BREAKER
ALT
MASTER SWITCH
OVER-VOLTAGE SENSOR
TO ALT FIELD CIRCUIT BREAKER
AMMETER
STARTER CONTACTOR
STARTER
REVERSE POLARITY CONTACTOR
GROUND SERVICE PLUG RECEPTACLE (OPT)
CLOCK (OPT)
BATTERY CONTACTOR
OIL PRESSURE SWITCH (OPT)
FLIGHT HOUR RECORDER (OPT)
BATTERY
SPLIT BUS CONTACTOR (NORMALLY CLOSED)
TO AUX FUEL PUMP CIRCUIT BREAKER
IGNITION SWITCH
MAGNETOS
CODE
CIRCUIT BREAKER (PUSH-TO-RESET)
FUSE
DIODE
RESISTOR
CAPACITOR (NOISE FILTER)
PRIMARY BUS
ELECTRONIC BUS
TO OVER-VOLTAGE WARNING LIGHT
TO OVER-VOLTAGE SENSOR AND MASTER SWITCH
ALT FIELD
TO PITOT HEAT SYSTEM (OPT)
PITOT HEAT
TO LANDING LIGHTS
LAND LIGHTS
TO TRANSMITTER RELAY (OPT)
TO NAVIGATION LIGHTS AND OPTIONAL CONTROL WHEEL MAP LIGHT
NAV LIGHTS
TO STROBE LIGHTS (OPT)
STROBE LIGHTS
TO ENGINE INSTRUMENT CLUSTER
TO INSTRUMENT AND COMPASS LIGHTS, RADIO DIAL LIGHTS AND OPTIONAL POST LIGHTS
INST LIGHTS
TO IGNITION SWITCH
TO DOME LIGHT AND OPTIONAL COURTESY LIGHTS
TO AUXILIARY FUEL PUMP
AUX FUEL PUMP
TO CIGAR LIGHTER (WITH CIRCUIT BREAKER)
TO WING FLAP SYSTEM
FLAP
TO FLASHING BEACON
BCN LIGHT
TO TURN COORDINATOR OR OPTIONAL TURN-AND-BANK INDICATOR
TURN COORD
TO RADIO (OPT)
RADIO 4
TO RADIO (OPT)
RADIO 3
TO RADIO (OPT)
RADIO 2
TO RADIO (OPT)
RADIO 1
TO AUTOMATIC PILOT (OPT)
AUTO PILOT
TO AUDIO AMPLIFIER (OPT)
AUD AMP

Figure 2-3.

and a red warning light, labeled HIGH VOLTAGE, near 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 aircraft battery is supplying all electrical power.

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

The over-voltage 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 aircraft are protected by "push-to-reset" circuit breakers mounted on the right side of the instrument panel. Exceptions to this are the battery contactor closing (external power) circuit and optional clock and flight hour recorder circuits which have fuses mounted near the battery. Also, the cigar lighter is protected by a manually-reset type circuit breaker mounted directly on the back of the lighter behind the pedestal.

When more than one radio is installed, the radio transmitter relay (which is a part of the radio installation) is protected by the navigation lights circuit breaker labeled NAV LIGHTS. It is important to remember that any malfunction in the navigation lights system which causes the circuit breaker to open will de-activate both the navigation lights and the transmitter relay. In this event, the navigation light switch should be turned off to isolate the circuit; then reset the circuit breaker to re-activate the transmitter relay and permit its usage. Do not turn on the navigation lights switch until the malfunction has been corrected.

LIGHTING EQUIPMENT

EXTERIOR LIGHTING

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

the rudder. A flashing beacon is mounted on top of the vertical fin. Optional lighting includes a single landing light or dual landing/taxi lights in the cowl nose cap, 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 a switch located on the left rear door post. All exterior lights, except the courtesy lights, are controlled by rocker type switches on the left switch and control panel. The switches are on in the up position and OFF in the down position.

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

The two high intensity strobe lights will enhance anti-collision protection. However, the lights should be turned off while 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 optional post lighting. Two rheostat control knobs on the left switch and control panel, labeled PANEL LIGHTS and ENG-RADIO LIGHTS, control the intensity of the instrument and control panel lighting. A slide-type switch on the left side of the overhead console, labeled PANEL LTS, is used to select either standard flood lighting in the FLOOD position, optional 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 four red flood lights on the underside of the anti-glare shield, and a single red flood light in the forward part of the overhead console. To use flood lighting, place the PANEL LTS selector switch in the FLOOD position and adjust light intensity with the PANEL LIGHTS rheostat control knob.

The instrument panel may be equipped with optional 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 LTS selector switch in the POST position and adjusting light intensity with the PANEL LIGHTS rheostat control knob. By placing the PANEL LTS selector switch in the BOTH position, the post lights can be used in combination with the standard flood lighting.

The engine instrument cluster, radio equipment, and magnetic com-

pass have integral lighting and operate independently of post or flood lighting. The light intensity of these items is controlled by the ENG-RADIO LIGHTS rheostat control knob.

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

The instrument panel control pedestal may be equipped with an optional courtesy light, mounted at its base, which illuminates the forward cabin floor area. This light is controlled by the courtesy light switch on the left rear door post.

An optional map light may be 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 LIGHTS switch; then adjust the map light's intensity with the knurled disk type rheostat control located at the bottom of the control wheel.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The volume and blending of heated and cool air from the main cabin heat and ventilating system is controlled by a single push-pull control knob labeled CABIN AIR/HEAT. When the knob is positioned full in, no air flows into the cabin. As the knob is pulled out to approximately one inch of travel (as noted by a notch on the control shaft) the volume of un-heated fresh air entering the cabin is increased Further actuation of the control knob (past the notch) toward the full out position blends in heated fresh air in increasing amounts.

Front cabin heat and ventilating air from the main heat and ventilating system is supplied by outlet holes spaced across a cabin manifold located just forward of and above 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 door post at floor level.

Windshield defrost air is supplied from the same manifold which provides cabin air; therefore, the temperature of the defrosting air is the

same as cabin air. A push-pull control knob, labeled DEFROSTER, regulates the volume of air to the windshield. Pull the knob out as needed for defrosting.

Separate adjustable ventilators supply additional air; two mounted in a console in the forward cabin ceiling supply air to the pilot and copilot, and two optional individual ventilators in the rear cabin ceiling provide air to the rear seat passengers.

Additional ventilation is available through an openable ventilation window in each cabin door. Each window can be opened at speeds up to 120 MPH by rotating the crank located below the window.

SHOULDER HARNESSES

Shoulder harnesses are provided as standard equipment for the pilot and front seat passenger, and as optional equipment for the rear seat passengers. Seat belts are standard equipment for all passengers.

Each standard front seat harness is attached to a rear door post just above window line and is stowed behind a stowage sheath mounted above each cabin door. The optional rear seat shoulder harnesses are attached adjacent to the lower corners of the rear window. Each harness is stowed behind a stowage sheath located above the aft side window.

To use a standard front or optional rear seat shoulder harness, faster and adjust the seat belt first. Remove the harness from the stowed position, and lengthen as required by pulling on the end of the harness and the narrow release strap. Snap the harness metal stud firmly into the retaining slot adjacent to the seat belt buckle. Then adjust to length by pulling down on the free end of the harness. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect but is tight enough to prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

Releasing and removing the shoulder harness is accomplished by pulling upward on the narrow release strap and removing the harness stud from the slot in the seat belt buckle. In an emergency, the shoulder harness may be removed by releasing the seat belt first and pulling the harness over the head by pulling up on the release strap.

INTEGRATED SEAT BELT / SHOULDER HARNESSES WITH INERTIA REEL

Optional 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 up automatically to protect the occupants.

NOTE

The inertia reels are located for the 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, adjust the metal buckle half on the harness up far enough to allow it to be drawn across the lap of the occupant and be fastened into the outboard seat belt buckle. Adjust seat belt tension by pulling up on the shoulder harness. To remove the seat belt/shoulder harness, release the seat belt buckle and allow the inertia reel to draw the harness to the inboard side of the seat.

STARTING ENGINE

Ordinarily the engine starts easily with one or two strokes of the primer in warm temperatures to six strokes in cold weather, with the throttle open approximately 1/2 inch. In extremely cold temperatures, it may be necessary to continue priming while cranking. No priming is required when the engine is warm.

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.

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

NOTE

Additional details concerning cold weather starting and operation may be found under "Cold Weather Operation" paragraphs in this seciton.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see taxiing diagram, figure 2-4) to maintain directional control and balance.

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

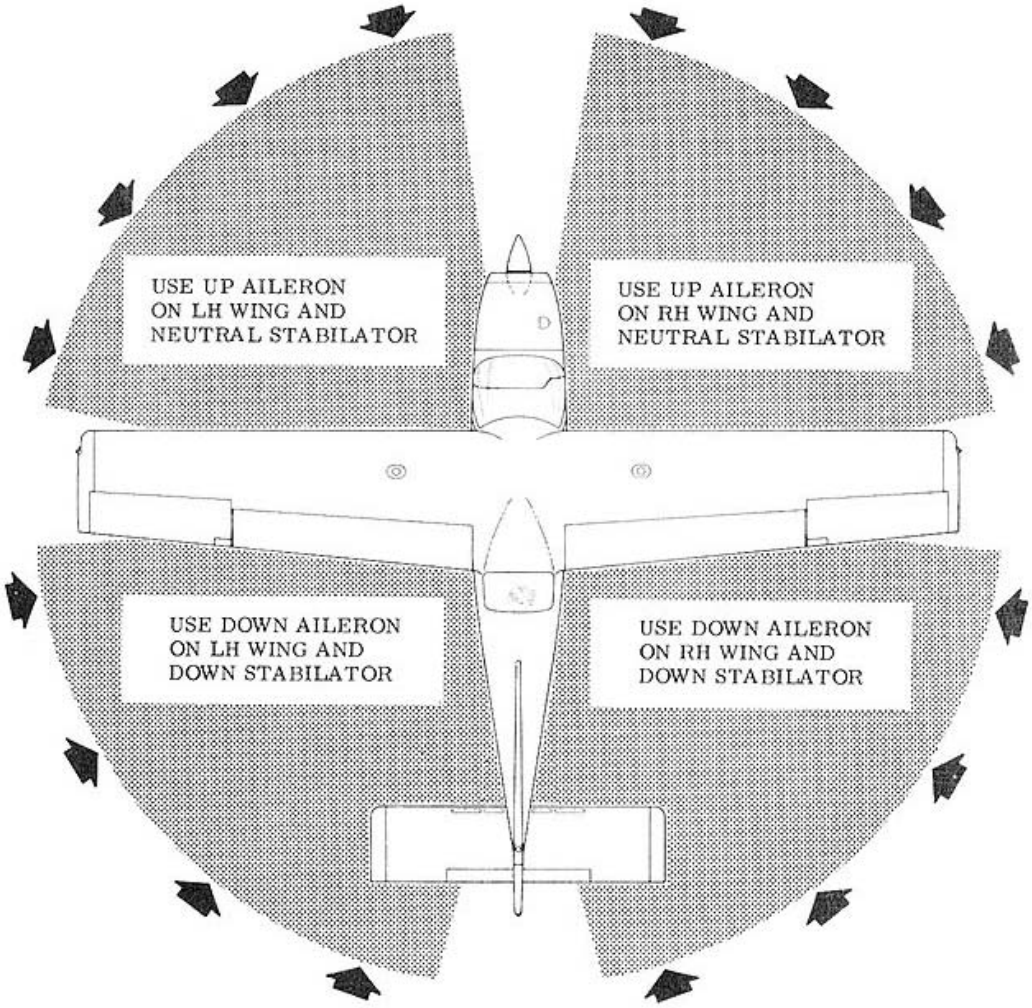
Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKE-OFF

WARM-UP

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

TAXIING DIAGRAM



CODE

WIND DIRECTION

NOTE

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

Figure 2-4.

MAGNETO CHECK

The magneto check should be made at 1800 RPM as follows. Move the 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 L position, note RPM and return the switch to the BOTH position. RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. A smooth drop off past normal is usually a sign of a too lean or too rich mixture. If there is a doubt concerning operation of the ignition system, RPM checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

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

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and 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 optional landing light (if so equipped), or by operating the wing flaps during the engine runup (1800 RPM). The ammeter will remain within a needle width of zero if the alternator and voltage regulator are operating properly.

TAKE-OFF

POWER CHECK

It is important to check full-throttle engine operation early in the take-off run. Any signs of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off.

Smooth and uniform throttle application should be used to insure best engine acceleration and to give long engine life. This technique is important under hot weather conditions which may cause a rich mixture that could hinder engine response if the throttle is applied too rapidly.

Full-throttle runups over loose gravel are especially harmful to propeller tips. When take-offs must be made over a gravel surface, it is

very important that the throttle be advanced slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades, they should be corrected immediately as described in Section V under propeller care.

Prior to take-off from short fields above 3000 feet elevation, the mixture should be leaned to give maximum power.

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 adjustment should be made as required in other flight conditions to maintain a fixed throttle setting.

WING FLAP SETTINGS

Take-offs are accomplished with the wing flaps set in the 0° to 15° position. The preferred flap setting for normal take-off is 10°. This flap setting (in comparison to flaps up) produces a shorter ground run, easier lift-off, shorter total distance over the obstacle, and increased visibility over the nose in the initial climb-out.

For minimum take-off distance, a 15° flap setting should be used. This setting gives approximately 5% shorter ground run and total distance as compared to the 10° flap setting. Flap settings of greater than 15° are not recommended at any time for take-off.

PERFORMANCE CHARTS

Consult the Take-Off Data chart in Section VI for take-off distances with 15° flaps under various gross weight, altitude, headwind, temperature, and runway surface conditions.

CROSSWIND TAKE-OFFS

Take-offs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after take-off. The aircraft 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.

ENROUTE CLIMB.

CLIMB DATA.

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

CLIMB SPEEDS.

Normal climbs are performed at 90 to 100 MPH with flaps up and reduced power (down to 24 inches of manifold pressure and 2500 RPM) for increased passenger comfort due to lower noise level. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother engine operation. The maximum rate-of-climb speeds range from 92 MPH at sea level to 83 MPH at 10,000 feet. If an obstacle dictates the use of a steep climb angle, an obstacle clearance speed of 77 MPH should be used with flaps up and full throttle at all altitudes.

CRUISE.

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

The Cruise Performance table shown on the following page illustrates the true airspeed and 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.

The tachometer is marked with a green arc from 2100 to 2700 RPM with a step at 2500 RPM. The use of 2500 RPM will allow 75% power at altitudes up to 8000 feet on a standard day. For hot day or high altitude conditions, the cruise RPM may be increased to 2700 RPM. Cruise at 2700 RPM permits the use of 75% power at altitudes up to 10,000 feet on a standard day. However, for reduced noise levels it is desirable to select the lowest RPM in the green arc range for a given percent power that will provide smooth engine operation.

CRUISE PERFORMANCE
CARDINAL

	75% POWER		65% POWER		55% POWER	
ALTITUDE	TAS	MPG	TAS	MPG	TAS	MPG
Sea Level	138	13.8	129	15.0	118	16.2
5000 Feet	144	14.4	134	15.6	121	16.6
10,000 Feet	150	15.0	139	16.2	123	16.8
Standard Conditions					Zero Wind	

The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately three-fourths of the normal operating range (green arc).

Cruise performance data in this manual and on the power computer is based on an extended range mixture setting. This mixture setting results in approximately 10% greater range at any particular power setting with a negligible loss in airspeed when compared to a best power mixture setting. An extended range mixture should be established as follows:

(1) Pull mixture control out slowly until engine becomes rough.
(2) Push the mixture control in slightly to obtain smooth engine operation; then further enrichen an equal amount.

A best power mixture is approximated by advancement of the mixture control twice as far from the threshold of roughness as described in step 2.

For best fuel economy at 75% power or less, the engine may be operated at the leanest mixture that results in smooth engine operation. This can result in approximately 10 percent greater range than shown in this manual accompanied by approximately 5 MPH decrease in speed.

Any change in altitude, power or carburetor heat will require a change in the lean mixture setting and a recheck of the EGT setting (if installed).

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

The use of full carburetor heat is recommended during flight in very heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion. The mixture setting should be readjusted for smoothest operation.

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% power or less. To adjust the mixture, using this indicator, lean to establish the peak EGT as a reference point and then enrichen the mixture by a desired increment based on figures in the table below. As noted in this table, operation at peak EGT provides best fuel economy. This can result in approximately 10 percent greater range than shown in this manual accompanied by approximately 5 MPH decrease in speed.

When leaning the mixture under some conditions, engine roughness may occur before peak EGT is reached. In this case, use the EGT corresponding to the onset of roughness as the reference point instead of peak EGT.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE	RANGE INCREASE FROM BEST POWER
BEST POWER	Peak EGT Minus 125°F (Enrichen)	0%
EXTENDED RANGE (Owner's Manual and Computer Performance)	Peak EGT Minus 50°F (Enrichen)	10%
BEST ECONOMY	Peak EGT	20%

SPINS

Intentional spins are prohibited in this airplane except in the Utility Category. To recover from a spin, use the following technique.

(1) Retard throttle to idle position.
(2) Apply full rudder opposite to the direction of rotation.
(3) After one-fourth turn, move the control wheel forward of neutral in a brisk motion.
(4) As rotation stops, neutralize rudder, and make a smooth recovery from the resulting dive.

STALLS

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

Power-off stall speeds at maximum gross weight and aft c. g. position are presented on page 6-2 as calibrated airspeeds since indicated airspeeds are unreliable near the stall.

LANDING

Normal landing approaches can be made with power on or power off at speeds of 80 to 90 MPH with flaps up and 70 to 80 MPH with flaps down. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. Slips are permitted with any desired flap setting. Actual touchdown should be made with power off and on the main wheels first. The nose wheel should be lowered smoothly to the runway as speed is diminished.

Full down stabilator (control wheel positioned full forward) should not be used during the ground roll. This reduces the weight on the main wheels which causes poor braking and increases the possibility of sliding the tires.

SHORT FIELD LANDINGS

For a maximum performance short field landing in smooth air conditions, make an approach at 70 MPH 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 70 MPH 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 full nose-up stabilator, and apply maximum brake pressure without sliding the tires.

CROSSWIND LANDINGS

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

The maximum allowable crosswind velocity is dependent upon pilot capability rather than 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, apply full throttle smoothly, remove carburetor heat, and reduce wing flaps promptly to 20°. Upon reaching an airspeed of approximately 75 MPH, flaps should be slowly retracted to the full up position.

If obstacles are immediately ahead during the go-around, the wing flaps should be left at 20° until obstacles are cleared; and, at field elevations above 3000 feet, the mixture should be leaned for maximum power

COLD WEATHER OPERATION

STARTING

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

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.

In extremely cold (0°F and lower) weather, the use of an external pre-heater and an external power source are recommended whenever possible to obtain positive starting and to reduce wear and abuse to the engine and the electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which probably will be congealed prior to starting in extremely cold temperatures. When using an external power source, the position of the master switch is important. Refer to Section VII, paragraph Ground Service Plug Receptacle, for operating details.

Cold weather starting procedures are as follows:

With Preheat:

(1) With ignition switch turned 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 the locked position to avoid the possibility of the engine drawing fuel through the primer.

(2) Mixture -- FULL RICH.
(3) Propeller -- HIGH RPM.
(4) Propeller Area -- CLEAR.
(5) Master Switch -- ON.
(6) Throttle -- OPEN 1/2 INCH.
(7) Ignition Switch -- START (release to BOTH when engine starts).
(8) Oil Pressure -- CHECK.

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) Mixture -- FULL RICH.
(3) Propeller -- HIGH RPM.
(4) Propeller Area -- CLEAR.
(5) Master Switch -- ON.

(6) Ignition Switch -- START.
(7) Pump throttle rapidly to full open twice. Return to 1/2 inch open position.
(8) Release ignition switch to BOTH when engine starts.
(9) Continue to prime the engine until it is running smoothly, or alternately, pump the throttle rapidly over the first 1/4 of total travel.
(10) Oil Pressure -- CHECK.
(11) Pull carburetor heat knob full on after the engine has started. Leave on until the engine is running smoothly.
(12) Primer -- LOCKED.

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 frosted over. Preheat must be used before another start is attempted.

IMPORTANT

Pumping the throttle may cause a 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 the flames the engine. An outside attendant with a fire extinguisher is advised for cold starts without preheat.

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

FLIGHT OPERATIONS

Take-off is made normally with carburetor heat off. Avoid excessive leaning in cruise. Carburetor heat may be used to overcome any engine roughness due to uneven mixture distribution or ice.

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

conditions.

Refer to Section VII for cold weather equipment.

HOT WEATHER OPERATION

The general warm temperature starting information on page 2 - 10 is appropriate. 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 aircraft 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 2,000 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 take-off 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 judgement, an altitude of less than 2,000 feet is necessary for him ti adequately exercise his duty to see and avoid other aircraft.

Section III

EMERGENCY PROCEDURES

Emergencies caused by aircraft or engine malfunctions are extremely rare if proper pre-flight inspections and maintenance are practiced. En-route weather emergencies can be minimized or eliminated by careful flight planning and good judgement 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.

ENGINE FAILURE

ENGINE FAILURE AFTER TAKE-OFF

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after take-off. 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 following procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

(1) Airspeed -- 80 MPH.
(2) Mixture -- IDLE CUT-OFF.
(3) Fuel Shutoff Valve -- OFF (pull sharply to break safety wire).
(4) Ignition Switch -- OFF.
(5) Wing Flaps -- AS REQUIRED (30° recommended).
(6) Master Switch -- OFF.

ENGINE FAILURE AFTER DURING FLIGHT

While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, and an engine restart is feasible, proceed as follows:

(1) Airspeed -- 85 MPH.

(2) Carburetor Heat -- ON.
(3) Fuel Selector -- BOTH.
(4) Fuel Shutoff Valve -- ON.
(5) Mixture -- RICH.
(6) Auxiliary Fuel Pump -- ON for 3 - 5 seconds with throttle open 1/2 inch; then OFF.
(7) Ignition Switch -- BOTH (or START if propeller is not windmilling).

If the engine cannot be restarted, a forced landing without power must be executed. A recommended procedure for this is given in the following paragraph.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT POWER

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as follows:

(1) Airspeed -- 85 MPH (flaps UP).
75 MPH (flaps DOWN).
(2) Mixture -- IDLE CUT-OFF.
(3) Fuel Shutoff Valve -- OFF (pull sharply to break safety wire).
(4) Ignition Switch -- OFF.
(5) Wing Flaps -- AS REQUIRED (30° 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

Before attempting an "off airport" landing, one should drag the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as follows:

(1) Drag over selected field with flaps 15° and 75 MPH airspeed, noting the preferred area for touchdown for the next landing approach. Then retract flaps upon reaching a safe altitude and airspeed.
(2) Radio, Electrical Switches -- OFF.
(3) Wing Flaps -- 30°.

(4) Airspeed -- 75 MPH.
(5) Master Switch -- OFF.
(6) Doors -- UNLATCH PRIOR TO TOUCHDOWN.
(7) Touchdown -- SLIGHTLY TAIL LOW.
(8) Ignition Switch -- OFF.
(9) Brakes -- APPLY HEAVILY.

DITCHING

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area, and collect folded coats or cushions for protection of occupant's face at touchdown. Transmit Mayday message on 121.5 MHz. giving location and intentions.

(1) Plan approach into wind if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells.
(2) Approach with flaps 30° and sufficient power for a 300 ft/min rate of descent at 70 MPH.
(3) Unlatch the cabin doors.
(4) Maintain a continuous descent until touchdown in level attitude. Avoid a landing flare because of difficulty in judging airplane height over a water surface.
(5) Place folded coat or cushion in front of face at time of touchdown.
(6) Evacuate airplane through cabin doors. If necessary, open window to flood cabin compartment for equalizing pressure so that door can be opened.
(7) Inflate life vests and raft (if available) after evacuation of cabin. The aircraft cannot be depended on for flotation for more than a few minutes.

FIRES

ENGINE FIRE DURING START ON GROUND

Improper starting procedures during a difficult cold weather start can cause a backfire which could ignite fuel that has accumulated in the intake duct. In this event, proceed as follows:

(1) Continue cranking in an attempt to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

(2) If the start is successful, run the engine at 1800 RPM for a few minutes before shutting it down to inspect the damage.
(3) If engine start is unsuccessful, continue cranking for two or three minutes with throttle full open while ground attendants obtain fire extinguishers.
(4) When ready to extinguish fire, discontinue cranking and turn off master switch, ignition switch, and fuel shutoff valve.
(5) Smother flames with fire extinguisher, seat cushion, wool blanket, or loose dirt. If practical, try to remove carburetor air filter if it is ablaze.
(6) Make a thorough inspection of fire damage, and repair or replace damaged components before conducting another flight.

ENGINE FIRE IN FLIGHT

Although engine fires are extremely rare in flight, the following steps should be taken if one is encountered:

(1) Mixture -- IDLE CUT-OFF.
(2) Fuel Shutoff Valve -- OFF (pull sharply to break safety wire).
(3) Master Switch -- OFF.
(4) Cabin Heat and Air -- OFF (except overhead vents).
(5) Airspeed -- 100 MPH. If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture.

Execute a forced landing as outlined in preceding paragraphs.

ELECTRICAL FIRE IN FLIGHT

The initial indication of an electrical fire is usually the odor of burning insulation. The following procedure should then be used:

(1) Master Switch -- OFF.
(2) All Radio/Electrical Switches -- OFF.
(3) Vents/Cabin Air/Heat -- CLOSED.
(4) Fire Extinguisher -- ACTIVATE (if available).

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

(5) Master Switch -- ON.
(6) Circuit Breakers -- CHECK for faulty circuit; do not reset.
(7) Radio/Electrical Switches -- ON one at a time, with delay after

each until short circuit is localized.
(8) Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

DISORIENTATION IN CLOUDS

In the event of a vacuum system failure during flight in marginal weather, the directional gyro and gyro horizon will be disabled, and the pilot will have to rely on the turn coordinator or the turn and bank indicator if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is operative, and that the pilot is not completely proficient in partial panel instrument flying.

EXECUTING A 180° TURN IN CLOUDS

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

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

EMERGENCY LET-DOWNS THROUGH CLOUDS

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-dow 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 stabilator trim tab for a stabilized descent at 90 MPH.
(5) Keep hands off the control wheel.
(6) Monitor turn coordinator and make corrections by rudder alone.
(7) Adjust rudder trim to relieve unbalanced rudder force if present.
(8) Check trend of compass card movement and make cautious corrections with rudder to stop the turn.
(9) Upon breaking out of clouds resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE.

If a spiral is encountered, proceed as follows:

(1) Close the throttle.
(2) Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
(3) Cautiously apply control wheel back pressure to slowly reduce the indicated airspeed to 90 MPH.
(4) Adjust the stabilator trim control to maintain a 90 MPH glide
(5) Keep hands off the control wheel, using rudder control to hol a straight heading. Adjust rudder trim to relieve unbalanced rudder force, if present.
(6) Apply carburetor heat.
(7) Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
(8) Upon breaking out of clouds apply normal cruising power and resume flight.

FLIGHT IN ICING CONDITIONS.

Although flying in known icing conditions is prohibited, an unexpected icing encounter should be handled as follows:

(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 and defroster control full out to obtain maximum windshield defroster effectiveness.
(4) Increase engine speed to 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 manifold pressure could be caused by carburetor ice or air intake filter ice. Lean the mixture 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 stabilator effectiveness.
(9) Perform a landing approach using a forward slip, if necessary, for improved visibility.
(10) Approach at 85 to 95 MPH, depending upon the amount of ice accumulation.
(11) Perform a landing in level attitude.

ROUGH ENGINE OR LOSS OF POWER

CARBURETOR ICING

An unexplained drop in manifold pressure 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 slightly 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 normal lean setting for cruising flight. If the problem does not clear up in several minutes, de-

termine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

MAGNETO MALFUNCTION

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

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility that the oil pressure gage or relief valve is malfunctioning, or a leak has developed in the oil line from the engine to the oil pressure gage transducer on the firewall. A leak in this line is not necessarily cause for an immediate precautionary landing because an orifice in the line will prevent a sudden loss of oil from the engine sump. Low electrical system voltage will also cause low oil pressure gage readings. This can be verified by checking the condition of the electrical system and the indications of the other gages in the engine instrument cluster. As electrical system voltage to the instrument cluster drops, all gage readings will drop proportionally. In the event of a suspected mechanical or electrical malfunction, land as soon as practical to properly identify and correct the problem.

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. Leave the engine running at low power during the approach, using only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is the most likely cause of alterna-

tor failures, although other factors could cause the problem. A damaged or improperly adjusted voltage regulator can also cause malfunctions. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The paragraphs below describe the recommended remedy for each situation.

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate. Electronic components in the electrical system could be adversely affected by higher than normal voltage if a faulty voltage regulator setting is causing the overcharging. To preclude these possibilities, an over-voltage sensor will automatically shut down the alternator and the over-voltage warning light will illuminate if the charge voltage reaches approximately 16 volts. Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system. To do this, 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. 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 light and flaps during landing.

INSUFFICIENT RATE OF CHARGE

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All non-essential equipment should be turned off and the flight terminated as soon as practical. As system voltage deteriorates all of the readings in the engine instrument cluster will drop proportionally. A complete electrical system failure will cause all readings (including oil pressure) to drop to zero.

C-177B – N35031 CHECKLISTS

ENGINE FAILURE DURING TAKEOFF

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

ENGINE FAILURE AFTER TAKEOFF

1. Airspeed ..... 80 MPH
2. Mixture ..... IDLE CUT-OFF
3. Fuel Selector Valve ..... OFF
4. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
5. Ignition Switch ..... OFF
6. Wing Flaps ..... AS REQUIRED
7. Master Switch ..... OFF

ENGINE FAILURE DURING FLIGHT

1. Airspeed ..... 85 MPH
2. Carburetor Heat ..... ON
3. Fuel Selector Valve ..... BOTH
4. Mixture ..... RICH
5. Ignition Switch ..... BOTH or START
6. Primer ..... IN & LOCKED
7. Airspeed ..... 80 MPH

ENGINE FIRE DURING FLIGHT

1. Mixture ..... IDLE CUT-OFF
2. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
3. Master Switch ..... OFF
4. Cabin Heat ..... OFF
5. Airspeed **100**

ELECTRICAL FIRE DURING FLIGHT

1. Master Switch ..... OFF
2. All other Switches (except Ignition) .....
   ..... OFF
3. Vents / Cabin Air / Heat ..... CLOSED
4. Fire Extinguisher ..... ACTIVATE

(if fire appears out)

   a. Master Switch ..... ON
   b. Circuit Breakers ..... CHECK
   .....*(Do NOT reset faulty circuit)*
   c. Electrical/Radios ..... ON
   . *One at a time, with delay after each*

EMERGENCY LANDING

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector Valve ..... OFF
3. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
4. Select Field ..... SUITABLE
5. Electrical Switches ..... OFF
6. Wing Flaps (on final) . AS REQUIRED
7. Airspeed ..... **75** MPH
8. Master/Battery Switch ..... OFF
9. Doors ..... UNLATCH
10. Touchdown ..... SLIGHT TAIL LOW
11. Ignition ..... OFF
12. Brakes ..... APPLY HEAVILY

PRECAUTIONARY LANDING

1. Wing Flaps ..... 15°
2. Airspeed ..... 75 MPH
3. Select Field ..... SUITABLE
4. Electronics ..... OFF
5. Wing Flaps (on Final) ..... 30°
6. Airspeed ..... 60 MPH
7. Master/Battery Switch ..... OFF
8. Doors ..... UNLATCH
9. Touchdown ... SLIGHTLY TAIL LOW
10. Ignition Switch ..... OFF
11. Brakes ..... APPLY HEAVILY

C-177B – N35031 CHECKLISTS

ENGINE FAILURE DURING TAKEOFF

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

ENGINE FAILURE AFTER TAKEOFF

1. Airspeed ..... 80 MPH
2. Mixture ..... IDLE CUT-OFF
3. Fuel Selector Valve ..... OFF
4. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
5. Ignition Switch ..... OFF
6. Wing Flaps ..... AS REQUIRED
7. Master Switch ..... OFF

ENGINE FAILURE DURING FLIGHT

1. Airspeed ..... 85 MPH
2. Carburetor Heat ..... ON
3. Fuel Selector Valve ..... BOTH
4. Mixture ..... RICH
5. Ignition Switch ..... BOTH or START
6. Primer ..... IN & LOCKED
7. Airspeed ..... 80 MPH

ENGINE FIRE DURING FLIGHT

1. Mixture ..... IDLE CUT-OFF
2. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
3. Master Switch ..... OFF
4. Cabin Heat ..... OFF
5. Airspeed **100**

ELECTRICAL FIRE DURING FLIGHT

1. Master Switch ..... OFF
2. All other Switches (except Ignition) .....
   ..... OFF
3. Vents / Cabin Air / Heat ..... CLOSED
4. Fire Extinguisher ..... ACTIVATE

(if fire appears out)

   a. Master Switch ..... ON
   b. Circuit Breakers ..... CHECK
   .....*(Do NOT reset faulty circuit)*
   c. Electrical/Radios ..... ON
   . *One at a time, with delay after each*

EMERGENCY LANDING

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector Valve ..... OFF
3. Fuel Shutoff Valve .....
   ..... OUT *(Break Safety Wire)*
4. Select Field ..... SUITABLE
5. Electrical Switches ..... OFF
6. Wing Flaps (on final) . AS REQUIRED
7. Airspeed ..... **75** MPH
8. Master/Battery Switch ..... OFF
9. Doors ..... UNLATCH
10. Touchdown ..... SLIGHT TAIL LOW
11. Ignition ..... OFF
12. Brakes ..... APPLY HEAVILY

PRECAUTIONARY LANDING

1. Wing Flaps ..... 15°
2. Airspeed ..... 75 MPH
3. Select Field ..... SUITABLE
4. Electronics ..... OFF
5. Wing Flaps (on Final) ..... 30°
6. Airspeed ..... 60 MPH
7. Master/Battery Switch ..... OFF
8. Doors ..... UNLATCH
9. Touchdown ... SLIGHTLY TAIL LOW
10. Ignition Switch ..... OFF
11. Brakes ..... APPLY HEAVILY

C-177B – N35031 CHECKLISTS

ENGINE FAILURE DURING TAKEOFF

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

ENGINE FAILURE AFTER TAKEOFF

1. Airspeed ..... 80 MPH
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 ..... 85 MPH
2. Carburetor Heat ..... ON
3. Fuel Selector Valve ..... BOTH
4. Mixture ..... RICH
5. Ignition Switch ..... BOTH or START
6. Primer ..... IN & LOCKED
7. Airspeed ..... 80 MPH

EMERGENCY LANDING

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector Valve ..... OFF
3. Select Field ..... SUITABLE
4. Electrical Switches ..... OFF
5. Wing Flaps (on final) ..... 30°
6. Airspeed ..... 75 MPH
7. Master/Battery Switch ..... OFF
8. Doors ..... UNLATCH PRIOR TO TOUCHDOWN
9. Touchdown ..... SLIGHT TAIL LOW
10. Ignition ..... OFF
11. Brakes ..... APPLY HEAVILY

PRECAUTIONARY LANDING

1. Wing Flaps ..... 15°
2. Airspeed ..... 75 MPH
3. Select Field ..... SUITABLE
4. Electronics ..... OFF
5. Wing Flaps (on Final) ..... 30°
6. Airspeed ..... 60 MPH
7. Master/Battery Switch ..... OFF
8. Doors ..... UNLATCH
9. Touchdown ... SLIGHTLY TAIL LOW
10. Ignition Switch ..... OFF
11. Brakes ..... APPLY HEAVILY

EDM-900 EMERGENCY PROCEDURES

LOSS OF INDIVIDUAL DISPLAY ELEMENT

1. Continue normal engine operation by referring to the remaining parameters displayed.

NOTE

The RAL will indicate limits even if the display fails and the rest of the unit is functional.

LOSS OF ALL DISPLAYS (Electrical Failure).

1. Avoid high engine power settings and rapid power changes;
2. Enrichen Mixture to maintain smooth engine operation;
3. Arrange to terminate the flight safely and as soon as practicable.
4. Refer to your origional airplane AFM for possible additional engine instrument failure information

EMERGENCY LOCATOR TRANSMITTER (ELT).

The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5g or more as may be experienced in a crash landing. The ELT emits an omnidirectional signal on the international distress frequencies of 121.5 and 243.0 MHz. General aviation and commercial aircraft, the FAA, and CAP monitor 121.5 MHz, and 243.0 MHz is monitored by the military. Following a crash landing, the ELT will provide line-of-sight transmission up to 100 miles at 10,000 feet. The duration of ELT transmissions is affected by ambient temperature. At temperatures of +70° to +130°F, continuous transmission for 115 hours can be expected; a temperature of -40°F will shorten the duration to 70 hours.

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment wall on the right side of the fuselage. To gain access to the unit, grasp the edge of the baggage wall and pull. The ELT is operated by a control panel at the forward facing end of the unit (see figure 3-1).

ELT OPERATION.

(1) NORMAL OPERATION: As long as the function selector switch remains in the ARM position, the ELT automatically activates following an impact of 5 g or more over a short time period.

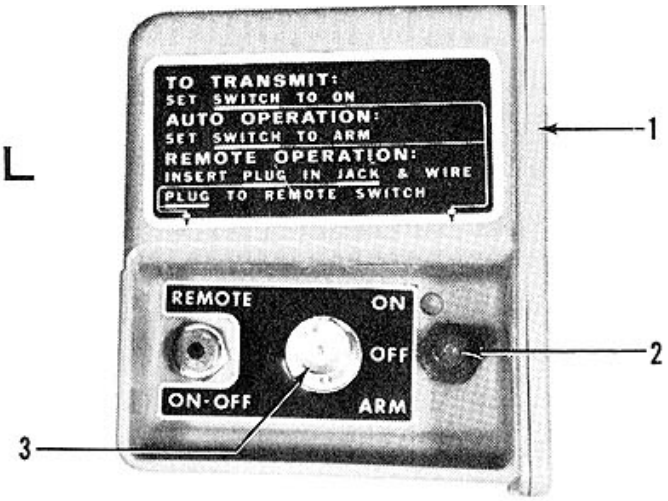
(2) ELT FAILURE: If "g" switch actuation is questioned following a minor crash landing, gain access to the ELT and place the function selector switch in the ON position.

(3) PRIOR TO SIGHTING RESCUE AIRCRAFT: Conserve aircraft battery. Do not activate radio transceiver.

(4) AFTER SIGHTING RESCUE AIRCRAFT: Place ELT function selector switch in the OFF position, preventing radio interference. Attempt contact with rescue aircraft with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, return the function selector switch to ON immediately.

(5) FOLLOWING RESCUE: Place ELT function selector switch in the OFF position, terminating emergency transmissions.

ELT CONTROL PANEL



1. COVER - Removable for access to battery.

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

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

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

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

3. ANTENNA RECEPTACLE - Connection to antenna mounted on top of the tailcone.

Figure 3-1.

(6) INADVERTENT ACTIVATION: Following a lightning strike or an exceptionally hard landing, the ELT may activate although no emergency exists. Select 121.5 MHz on your radio transceiver. If the ELT can be heard transmitting, place the function selector switch in the OFF position; then immediately return the switch to ARM.

OPERATING LIMITATIONS

OPERATIONS AUTHORIZED

Your Cessna exceeds the requirements for airworthiness as set forth by the United States Government, and is certificated under FAA Type Certificate No. A13CE as Cessna Model No. 177B.

The aircraft may be equipped for day, night, VFR, or IFR operation. Your Cessna Dealer will be happy to assist you in selecting equipment best suited to your needs.

Your aircraft must be operated in accordance with all FAA-approved markings and placards in the aircraft. If there is any information in this section which contradicts the FAA-approved markings and placards, it is to be disregarded.

MANEUVERS - NORMAL CATEGORY

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

Gross Weight	2500 lbs	
Flight Load Factor		
*Flaps Up	+3.8	-1.52
*Flaps Down	+3.5	

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

MANEUVERS - 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 connection with the utility category, the following gross weight and flight load factors apply, with maximum entry speeds for maneuvers as shown:

Gross Weight	2200 lbs	
Flight Load Factor		
Flaps Up	+4.4	-1.76
Flaps Down	+3.5	

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

MANEUVER	MAXIMUM ENTRY SPEED*
Chandelles	117 mph (101 knots)
Lazy Eights	117 mph (101 knots)
Steep Turns	117 mph (101 knots)
Stalls (Except Whip Stalls)	Slow Deceleration
Spins (Flaps Retracted)	Slow Deceleration

*Higher speeds can be used if abrupt use of the controls is avoided.

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.

AIRSPEED LIMITATIONS (CAS)

The following is a list of the certificated calibrated airspeed (CAS) limitations for the airplane.

Never Exceed Speed (glide or dive, smooth air)	185 MPH
Maximum Structural Cruising Speed	155 MPH
Maximum Speed	
Flaps 10°	130 MPH
Flaps 10° to 30°	105 MPH
*Maneuvering Speed	117 MPH

*The maximum speed at which you may use abrupt control travel.

AIRSPEED INDICATOR MARKINGS

The following is a list of the certificate calibrated airspeed markings (CAS) for the airplane.

Never Exceed (glide or dive, smooth air)	185 MPH (red line)
Caution Range	155-185 MPH (yellow arc)
Normal Operating Range	66-155 MPH (green arc)
Flap Operating Range (10° to 30°)	56-105 MPH (white arc)

ENGINE OPERATION LIMITATIONS

Power and Speed	180 BHP at 2700 RPM

ENGINE INSTRUMENT MARKINGS

OIL TEMPERATURE GAGE

Normal Operating Range	Green Arc
Maximum Allowable	245°F (red line)

CYLINDER HEAD TEMPERATURE GAGE

Normal Operating Range	200° to 500°F (green arc)
Maximum Allowable	500°F (red line)

OIL PRESSURE GAGE

Minimum Idling	25 psi (red line)
Normal Operating Range	60-90 psi (green arc)
Maximum	100 psi (red line)

FUEL PRESSURE GAGE

Minimum	2 psi (red line)
Normal Operating Range	2-8 psi (green arc)
Maximum	8 psi (red line)

FUEL QUANTITY INDICATORS

Empty (0.5 gallons unusable each tank)	E (red line)

TACHOMETER

Normal Operating Range, SL to 8000 feet	2100-2500 RPM (inner green arc)
Normal Operating Range, 8000 feet and above	2100-2700 RPM (outer green arc)
Caution Range	1700-1900 RPM (yellow arc)
Maximum Allowable	2700 RPM (red line)

MANIFOLD PRESSURE GAGE

Normal Operating Range	15 to 24 in. Hg. (green arc)

CARBURETOR AIR TEMPERATURE GAGE (optional)

Icing Range	-15° to 5°C (yellow arc)

WEIGHT AND BALANCE

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

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

NOTE

The licensed empty weight and moment are recorded on the Weight and Balancer and Installed Equipment Data sheet, or on revised weight and

balance records, and are included in the aircraft file. In addition to the licensed 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 1,000 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, baggage, cargo, and hatshelf is based on seats positioned for average occupants and baggage / cargo or hatshelf items loaded in the center of these areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft c.g. range limitation (seat travel and baggage / cargo or hatshelf 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. A reduced fuel weight may be measured for use with heavy cabin loadings by filling both tanks to the 22 gallon marker for 43 gallons (258 pounds) usable. Both tanks may be filled for maximum range, provided gross weight is not exceeded.

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

BAGGAGE AND CARGO TIE-DOWN

A nylon baggage net is provided as standard equipment to secure baggage in the area aft of the rear seat and on the hatshelf. Four eyebolts serve as attaching points for the net. Two eyebolts for the forward tie-down straps are located on the cabin floor near each sidewall forward of the baggage door, and two eyebolts are located below the side windows

near the aft baggage wall.

An optional cargo tie-down kit consisting of eight tie-down attachments is available if one desires to remove the rear seat (and auxiliary seat, if installed) and utilize the rear cabin area to haul cargo. Two tie-down block attachments clamp to the aft end of the two outboard front seat rails and are locked in place by a bolt which must be tightened to a minimum of fifty inch pounds. Six latch plate tie-down attachments bolt to standard attach points in the cabin floor. The six attach points are located as follows: two are located inboard and approximately 17 inches aft of the rear door posts at station 140; two are located at the forward edge of the baggage door at station 155; and two are located just forward of the aft baggage wall at station 173. The maximum allowable cabin floor loading is 200 pounds/square foot; however, when items with small or sharp support areas are carried, the installation of a 1/4 inch plywood floor is recommended to protect the aircraft structure. The maximum rated load weight capacity for each of the six tie-downs is 140 pounds and is 100 pounds for the two seat rail tie-downs. Rope, strap, or cable used for tie-down should be rated at a minimum of ten times the load weight capacity of the tie-down fittings used. Weight and balance calculations for cargo in the area of the second row seat (CARGO 1) and the baggage area (CARGO 2) can be figured on the Loading Graph using the lines labeled 2nd Row Passengers or Cargo 1 and/or Baggage, Passenger on Auxiliary Seat, or Cargo 2 and Hatshelf respectively. If the position of cargo loads is different from that shown on the Loading Arrangements diagram, the moment must be determined by multiplying the weight by the actual C. G. arm.

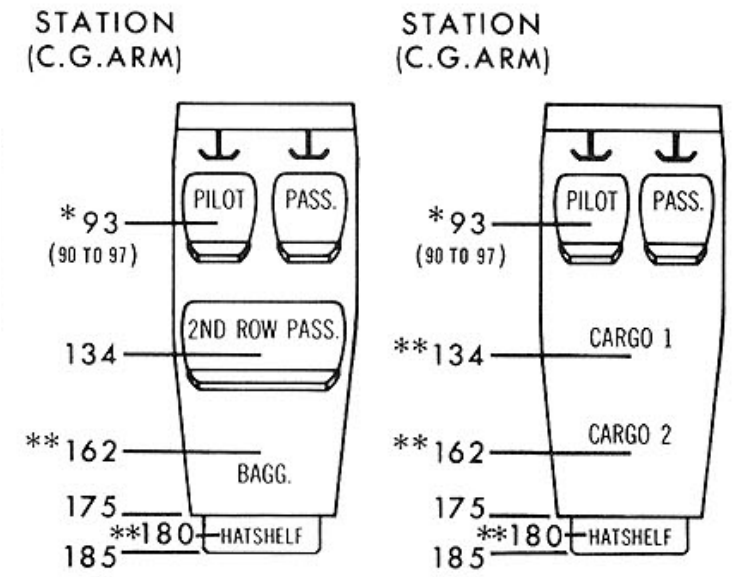
EDM-930 Operating Limitations

A. The EDM-930 may replace any existing RPM, MAP, EGT, CHG, CDT, TIT, O-T O-P, F-P, FF, and Fuel Quantity indicators required by the aircraft type design.

B. The EDM=930 cannot be used as primary if the RAD is not working.

C. This Pilots Guide must be available to the pilot for all flight operations.

LOADING ARRANGEMENTS



STANDARD SEATING

2ND ROW SEAT REMOVED

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

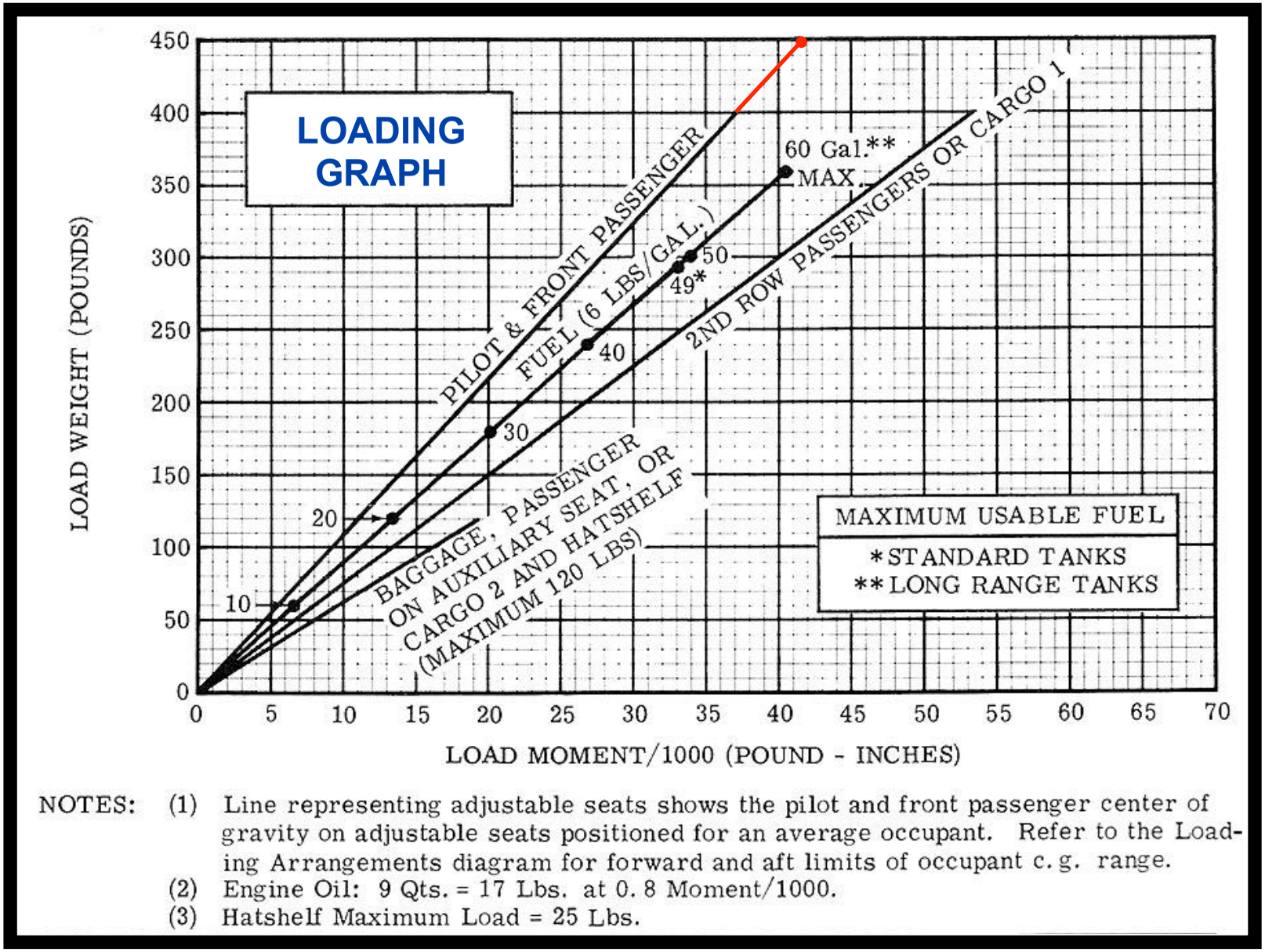
** Arm measured to the center of the area shown.

NOTE: The aft baggage wall (approximate station 175) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.

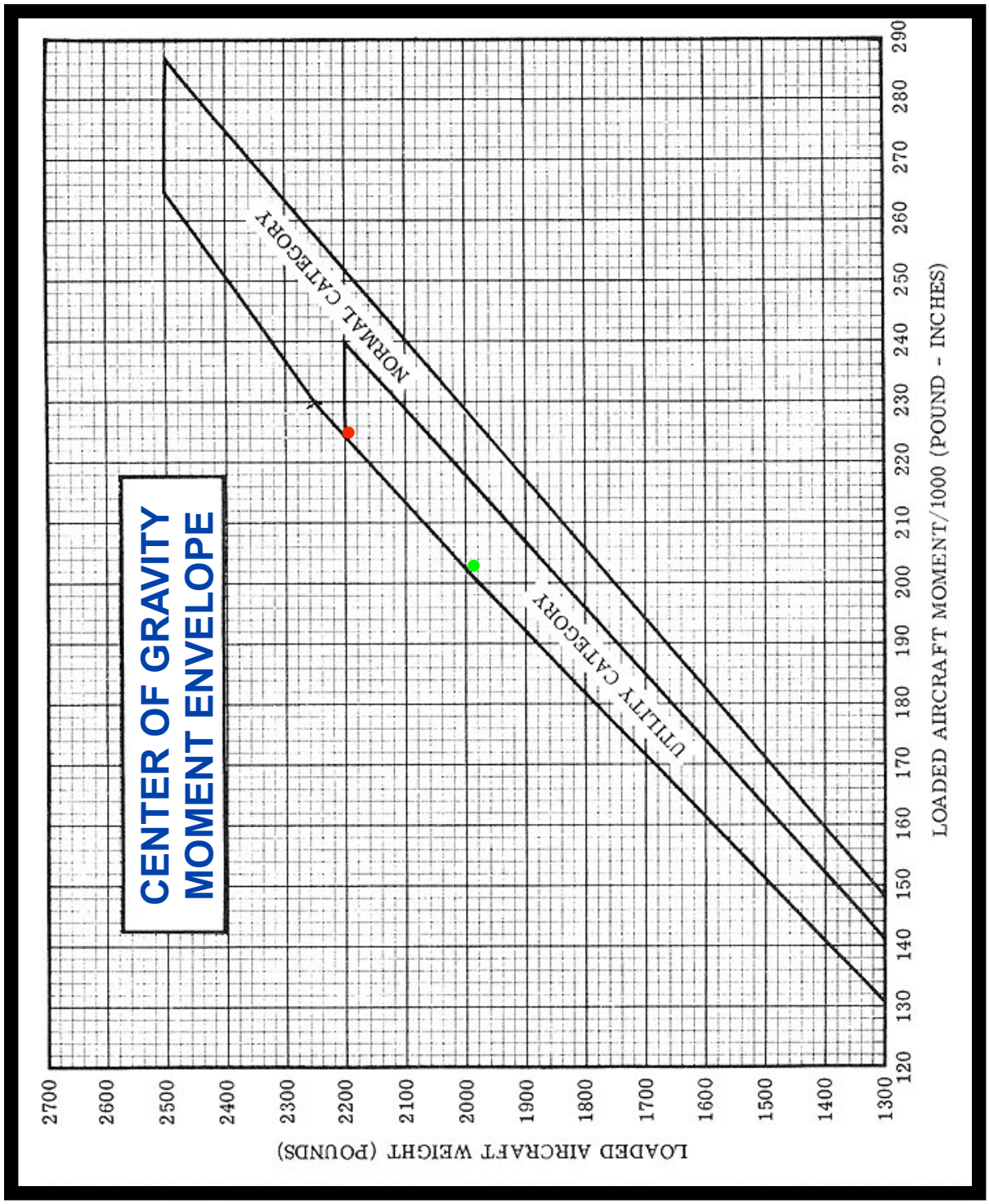
SAMPLE LOADING PROBLEM

		SAMPLE AIRPLANE		N35031	
		Weight (lbs.)	Moment (lb. -ins. /1000)	Weight (lbs.)	Moment (lb. -ins. /1000)
1.	Licensed Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel)	1506	156.7	1,426	148.3
2.	Oil (9 Qts. - The weight of full oil may be used for all calculations. 9 Qts. = 17 Lbs. at 0.8 Moment/1000)	17	0.8	17	0.8
3.	Usable Fuel (At 6 Lbs./Gal.)				
	Standard Tanks (49 Gal. Maximum)			294.0	33.0
	Long Range Tanks (60 Gal. Maximum)				
	Reduced Fuel (43 Gal.)	258	28.9		
4.	Pilot and Front Passenger (Station 90 to 97)	340	31.6	450.0	41.7
5.	Second Row Passengers	340	45.6	10.0	2.0
	Cargo 1 Replacing Second Row Seat (Station 126 to 142)				
6.	Baggage, Passenger on Auxiliary Seat, or Cargo 2 and Hatshelf (Station 142 to 185) 120 Lbs. Maximum	39	6.3		
7.	TOTAL WEIGHT AND MOMENT	2500	269.9	2197	225.8

8. Locate this point (2500 at 269.9) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.



NOTES:
(1) Line representing adjustable seats shows the pilot and front 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.
(2) Engine Oil: 9 Qts. = 17 Lbs. at 0.8 Moment/1000.
(3) Hatshelf Maximum Load = 25 Lbs.


CENTER OF GRAVITY
MOMENT ENVELOPE
NORMAL CATEGORY
UTILITY CATEGORY
LOADED AIRCRAFT WEIGHT (POUNDS)
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
LOADED AIRCRAFT MOMENT/1000 (POUND - INCHES)

CARE OF THE AIRPLANE

If your airplane is to retain that new plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and 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.

GROUND HANDLING

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 45° 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 wheel tire or deflated strut will also increase tail height.

MOORING YOUR AIRPLANE

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

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

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

WINDSHIELD - WINDOWS

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

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

NOTE

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

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

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

PAINTED SURFACES

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

by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which cause corrosion or 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.

ALUMINUM SURFACES

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

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

PROPELLER CARE

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. Small nicks on the propeller, particu-

larly 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.

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.

MAA PLATE / FINISH AND TRIM PLATE

Information concerning the Type Certificate Number (TC), Production Certificate Number (PC), Model Number and Serial Number of your particular aircraft can be found on the MAA (Manufacturers Aircraft Association) plate located on the upper part of the left forward doorpost.

A Finish and Trim plate contains a code describing the interior color scheme and exterior paint combination of the aircraft. The code may be used in conjunction with an applicable Parts Catalog if finish and trim information is needed. This plate is located on the lower forward edge of the left cabin door.

AIRCRAFT FILE

There are miscellaneous data, information and licenses that are a part of the aircraft 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 aircraft 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 aircraft at all times:

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

C. To be made available upon request:

(1) Aircraft 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 exported aircraft should check with their own aviation officials to determine their individual requirements.

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

FLYABLE STORAGE

Aircraft 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.

IMPORTANT

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 aircraft should be flown 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 aircraft is to be stored temporarily, or indefinitely, refer to the Service Manual for proper storage procedures.

INSPECTION REQUIREMENTS

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.

In lieu of the above requirements, an aircraft 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 aircraft inspection requirements of both the 100 HOUR and ANNUAL inspections as applicable to Cessna aircraft.

CESSNA PROGRESSIVE CARE

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your aircraft at a minimum cost and downtime. Under this program, your aircraft is inspected and maintained in four operations at 50-hour intervals during a 200-hour period. The operations are recycled each 200 hours and are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

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

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 aircraft. You will want to thoroughly review your Customer Care Program book and keep it in your aircraft 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 aircraft to you. If you pick up your aircraft at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

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

SERVICING REQUIREMENTS

For quick and ready reference, quantities, materials, and specifications for frequently used service items (such as fuel, oil, etc.) are shown on the inside back cover of this manual.

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

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Dealer concerning these requirements and begin scheduling your aircraft 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 aircraft is being operated.

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

- CUSTOMER CARE PROGRAM BOOK
- OWNER'S MANUALS FOR YOUR
  AIRCRAFT
  AVIONICS AND AUTOPILOT
- POWER COMPUTER
- SALES AND SERVICE DEALER DIRECTORY

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

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

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

OPERATIONAL DATA

The operational data charts on the following pages are presented for two purposes; first, so that you may know what to expect from your airplane under various conditions, and second, to enable you to plan your flights in detail and with reasonable accuracy.

The data in the charts has been compiled from actual flight tests with the airplane and engine in good condition and using average piloting techniques. Note also that the range charts make no allowances for wind, navigational errors, warm-up, take-off, climb, etc. You must estimate these variables for yourself and make allowances accordingly. Other indeterminate variables such as mixture leaning techniques, carburetor metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in maximum range. Speeds shown in the Cruise Performance charts reflect performance of the Cardinal configuration; these speeds are 3 to 4 MPH faster than the standard 177.

Remember that the charts contained herein are based on standard day conditions. In the case of take-off and climb performance, correction factors are included in the footnotes in these charts to show the effect of temperatures hotter than standard. These factors are based on moderate humidity conditions. Under extremely high humidity conditions, these correction factors may be twice as great as those shown. For more precise power, fuel consumption, and endurance information, consult the Cessna Power Computer supplied with your aircraft. With the Power Computer, you can easily take into account temperature variations from standard at any flight altitude.

AIRSPEED CORRECTION TABLE

FLAPS UP										
IAS-MPH	60	70	80	90	100	110	120	130	140	150
CAS-MPH	61	71	80	90	100	108	117	126	136	146
FLAPS 10°										
IAS-MPH	60	70	80	90	100	110	120	130	—	—
CAS-MPH	61	71	81	90	99	108	117	127	—	—
FLAPS 30°										
IAS-MPH	50	60	70	80	90	100	105	—	—	—
CAS-MPH	52	62	72	81	90	99	104	—	—	—

Figure 6-1.

STALL SPEEDS – MPH CAS

GROSS WEIGHT 2500 LBS	ANGLE OF BANK			
CONDITION	0°	20°	40°	60°
FLAPS UP	63	65	72	89
FLAPS 15°	58	60	67	83
FLAPS 30°	53	55	60	75

POWER OFF – AFT CG

Figure 6-2.

TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY WITH FLAPS 15°

GROSS WEIGHT POUNDS	IAS AT 50' MPH	HEAD WIND KNOTS	AT SEA LEVEL & 59°F		AT 2500 FT. & 50°F		AT 5000 FT. & 41°F		AT 7500 FT. & 32°F	
			GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS	GROUND RUN	TOTAL TO CLEAR 50 FT OBS
2500	69	0	750	1400	900	1675	1090	2050	1335	2640
		10	525	1060	635	1280	780	1585	970	2070
		20	335	760	415	935	520	1175	660	1565
2200	64	0	555	1085	665	1265	800	1500	975	1835
		10	380	810	460	950	560	1140	695	1410
		20	230	565	290	675	360	820	455	1035
1900	60	0	400	840	475	955	570	1105	690	1310
		10	260	615	315	710	385	825	475	985
		20	150	420	190	490	235	580	300	700

NOTES:
1. Increase distance 10% for each 20°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft. obstacle" figure.

MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT POUNDS	AT SEA LEVEL & 59°F			AT 5000 FT & 41°F			AT 10,000 FT & 23°F			AT 15,000 FT & 5°F		
	IAS MPH	RATE OF CLIMB FT/MIN	GAL. OF FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED	IAS MPH	RATE OF CLIMB FT/MIN	FROM S. L. FUEL USED
2500	92	840	1.5	88	585	3.4	83	330	5.6	79	80	10.4
2200	89	1020	1.5	84	735	3.0	80	450	4.8	76	165	7.7
1900	86	1205	1.5	81	890	2.8	77	575	4.2	73	260	6.3

NOTES:
1. Flaps up, full throttle, 2700 rpm, and mixture leaned for smooth operation above 3000 ft.
2. Fuel used includes warm up and take-off allowance.
3. For hot weather, decrease rate of climb 30 ft./min. for each 10°F above standard day temperature for particular altitude.

Figure 6-3.

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ↘ Zero Wind ↘ Gross Weight-2500 Pounds

2,500 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	49 GAL (NO RESERVE) ENDR. HOURS	49 GAL (NO RESERVE) RANGE MILES
2500	24	79	144	10.6	4.6	665
	23	74	140	10.0	4.9	690
	22	70	137	9.3	5.3	720
	21	66	133	8.7	5.7	750
2400	24	77	142	10.3	4.7	675
	23	73	139	9.7	5.1	705
	22	68	135	9.1	5.4	730
	21	64	131	8.5	5.8	760
2300	24	75	141	10.0	4.9	690
	23	71	137	9.4	5.2	715
	22	66	133	8.8	5.6	745
	21	62	129	8.2	6.0	770
2200	24	72	138	9.6	5.1	710
	23	68	135	9.0	5.5	735
	22	64	131	8.4	5.8	760
	21	60	126	7.9	6.2	780
2100	24	69	136	9.1	5.4	730
	23	65	132	8.6	5.7	755
	22	61	128	8.1	6.1	775
	21	57	123	7.6	6.4	795
	20	53	117	7.2	6.8	805
	19	50	110	6.7	7.3	800

Figure 6-4 (Sheet 1 of 5).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ↘ Zero Wind ↘ Gross Weight-2500 Pounds

5,000 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	49 GAL (NO RESERVE) ENDR. HOURS	49 GAL (NO RESERVE) RANGE MILES
2500	23	77	146	10.4	4.7	685
	22	73	142	9.7	5.1	720
	21	68	138	9.0	5.4	750
	20	64	133	8.4	5.8	775
2400	24	79	147	10.7	4.6	675
	23	75	144	10.1	4.9	700
	22	71	140	9.4	5.2	730
	21	67	136	8.8	5.6	760
2300	24	77	146	10.4	4.7	690
	23	73	142	9.7	5.0	715
	22	69	138	9.1	5.4	745
	21	65	134	8.5	5.7	770
2200	24	74	143	10.0	4.9	705
	23	70	140	9.4	5.2	735
	22	66	136	8.8	5.6	760
	21	62	131	8.2	6.0	780
2100	24	71	141	9.5	5.2	725
	23	68	137	8.9	5.5	750
	22	64	133	8.4	5.8	775
	21	60	128	7.9	6.2	795
	20	56	122	7.4	6.6	810
	19	52	115	7.0	7.0	810

Figure 6-4 (Sheet 2 of 5).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ↘ Zero Wind ↘ Gross Weight-2500 Pounds

7,500 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	49 GAL (NO RESERVE) ENDR. HOURS	49 GAL (NO RESERVE) RANGE MILES
2500	22	75	147	10.1	4.9	715
	21	71	143	9.4	5.2	745
	20	66	138	8.7	5.6	775
	19	61	132	8.1	6.0	800
2400	22	73	145	9.8	5.0	730
	21	69	141	9.2	5.3	755
	20	65	136	8.6	5.7	780
	19	61	131	8.0	6.1	800
2300	22	71	143	9.5	5.2	740
	21	67	139	8.9	5.5	770
	20	63	134	8.3	5.9	790
	19	59	128	7.8	6.3	810
2200	22	69	141	9.1	5.4	760
	21	65	136	8.5	5.7	780
	20	61	131	8.0	6.1	800
	19	56	125	7.5	6.5	815
2100	22	66	138	8.7	5.6	775
	21	62	133	8.2	6.0	795
	20	58	127	7.7	6.4	810
	19	54	120	7.2	6.8	815
	18	50	112	6.8	7.2	810

Figure 6-4 (Sheet 3 of 5).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ↘ Zero Wind ↘ Gross Weight - 2500 Pounds

10,000 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	49 GAL(NO RESERVE) ENDR. HOURS	49 GAL(NO RESERVE) RANGE MILES
2700	20.5	75	150	10.0	4.9	735
	20	72	147	9.6	5.1	750
	19	68	142	8.9	5.5	780
	18	63	136	8.3	5.9	805
2600	20.5	72	147	9.6	5.1	750
	20	70	145	9.3	5.3	765
	19	65	139	8.6	5.7	790
	18	61	133	8.0	6.1	810
2500	20.5	71	146	9.4	5.2	760
	20	68	143	9.0	5.4	775
	19	64	137	8.4	5.8	800
	18	59	130	7.8	6.3	815
2400	20.5	69	144	9.2	5.3	765
	20	67	142	8.9	5.5	780
	19	63	136	8.3	5.9	800
	18	59	129	7.7	6.3	820
2300	20.5	67	142	8.9	5.5	780
	20	65	139	8.6	5.7	795
	19	61	133	8.0	6.1	810
	18	57	126	7.5	6.5	820
2200	20.5	65	139	8.6	5.7	795
	20	63	136	8.3	5.9	800
	19	59	130	7.8	6.3	815
	18	55	122	7.3	6.7	820
2100	20.5	63	135	8.3	5.9	805
	20	61	132	8.0	6.1	810
	19	56	125	7.5	6.5	820
	18	52	117	7.0	7.0	815

Figure 6-4 (Sheet 4 of 5).

CRUISE PERFORMANCE

EXTENDED RANGE MIXTURE

Standard Conditions ↘ Zero Wind ↘ Gross Weight-2500 Pounds

12,500 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	49 GAL (NO RESERVE) ENDR. HOURS	49 GAL (NO RESERVE) RANGE MILES
2700	18 17 16	65 60 55	141 134 124	8.6 8.0 7.4	5.7 6.2 6.6	805 820 825
2600	18 17 16	63 58 54	138 130 120	8.3 7.7 7.2	5.9 6.3 6.8	810 825 820
2500	18 17 16	61 57 52	135 126 115	8.1 7.5 7.0	6.1 6.5 7.0	820 825 805
2400	18 17 16	61 56 52	135 126 114	8.0 7.5 7.0	6.1 6.6 7.0	820 825 800
2300	18 17	59 54	130 122	7.8 7.3	6.3 6.8	820 825
2200	18 17	57 53	127 116	7.5 7.1	6.5 6.9	825 810
2100	18 17	55 50	122 109	7.3 6.8	6.7 7.2	825 785

Figure 6-4 (Sheet 5 of 5).

LANDING DISTANCE TABLE

LANDING DISTANCE WITH FLAPS 30°, POWER OFF, AND NO WIND ON HARD SURFACE RUNWAY

GROSS WEIGHT POUNDS	IAS AT 50' MPH	AT SEA LEVEL & 59°F		AT 2500 FT. & 50°F		AT 5000 FT. & 41°F		AT 7500 FT. & 32°F	
		GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.	GROUND ROLL	TOTAL TO CLEAR 50 FT. OBS.
2500	72 Horton:50	600	1220 Horton: 540	635	1290	675	1370	715	1450

NOTES:
1. Reduce landing distance 10% for each 4 knots of headwind.
2. For operation on a dry, grass runway, increase distances (both "ground roll" and "total to clear 50 ft. obstacle") by 20% of the "total to clear 50 ft. obstacle" figure.

Figure 6-5.

Section VII

OPTIONAL SYSTEMS

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

COLD WEATHER EQUIPMENT

WINTERIZATION KIT

For continuous operation in temperatures consistently below 20°F, the Cessna winterization kit should be installed to improve engine operation. The kit consists of two baffles to cover the side inlets of the cowling nose cap, and insulation for the crankcase breather line. Once installed, the crankcase breather insulation is approved for permanent use in both cold and hot weather.

GROUND SERVICE PLUG RECEPTICLE

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

NOTE

Electrical power for the aircraft electrical circuits is provided through a split bus bar having all electronic circuits on one side of the bus and the other electrical circuits on the other side of

the bus. When an external power source is connected, a contractor automatically opens the circuit to the electronic portion of the split bus bar as a protection against damage to the transistors in the electronic equipment by transient voltages from the power source. Therefore the external power source can not be used as a source of power when checking electronic components.

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

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

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

STATIC PRESSURE ALTERNATE SOURCE VALVE

A static pressure alternate source valve may be installed in the left side of the instrument panel for use when the external static source is malfunctioning. This valve supplies static pressure from inside the rear fuselage instead of the external static ports. An external condensate drain fitting, located in the alternate source line under the pilot's floorboard, is provided for periodic draining of any moisture accumulation.

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

Pressures within the rear fuselage will vary with open cabin ventilators and vent windows. With the windows closed, the most adverse vent configuration results in minor airspeed and altimeter variations of less

an 4 MPH and 50 feet, respectively. However, opening the vent windows results in large errors which increase with increasing airspeed. For example, at the placarded maximum window open speed of 120 MPH, the airspeed indicator and altimeter will read low by as much as 12 MPH and 90 feet, respectively. To avoid these large errors the windows should not be open when using the alternate static source.

MICROPHONE-HEADSET

A microphone-headset combination is offered as optional equipment. Using the microphone-headset and a microphone keying switch on the left side of the pilot's control wheel, the pilot can 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.

J.P.INSTRUMENTS
PO BOX 7033
HUNTINGTON BEACH, CA 92646

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT OR
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
(FOR THOSE AIRCRAFT WITHOUT A BASIC AIRPLANE FLIGHT MANUAL)

EDM-900 PRIMARY ENGINE DATA MANAGEMENT SYSTEM

Airplane Flight Manual Supplement No. 900-0001 Rev. E

For

Aircraft as listed on STC SA01435SE

REG. NO. N35031

SER. NO. 17702167

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the J.P. Instruments EDM-900 is installed in accordance with Supplemental Type Certificate SA01435SE. For those airplanes without a basic Airplane Flight Manual, this Supplemental AFM must be in the aircraft when the EDM-900 is installed.

The information contained in this Airplane Flight Manual Supplement/ Supplemental Aircraft Flight Manual supplements or supersedes the basic manual/ placards only in those areas listed. For limitations, procedures and performance information not contained in this supplement, consult the basic manuals, markings, and placards.

FAA APPROVED

FOR Manager, Seattle Aircraft Certification Office
Federal Aviation Administration

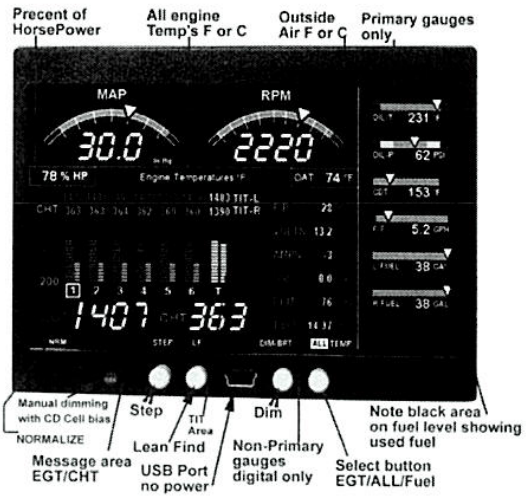
Date: MAR 28 2016

FAA APPROVED Date MAR 28 2016

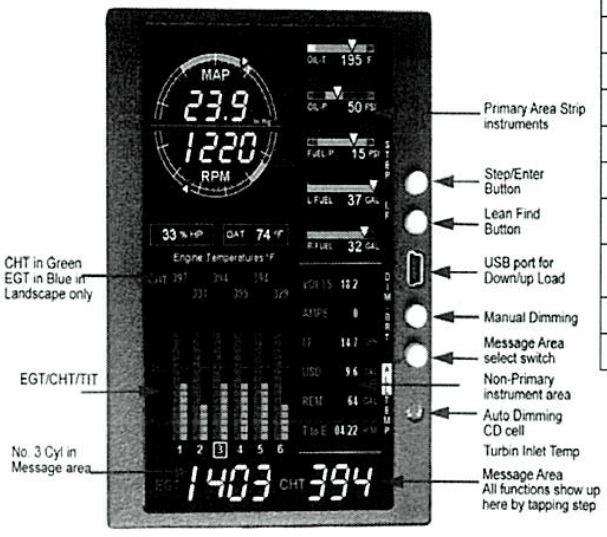
Revision	Description	Affected Pages	Approval
A & B	Pre-release Version	1 thru 6	None, Pre-release
C	Complete Flight Manual Supplement for EDM-900.	1 thru 6	Approval FOR Manager Seattle Aircraft Certification Office Federal Aviation Administration Date DEC 10 2004
D	Complete Flight Manual Supplement for EDM-900.	1 thru 6	FOR Manager, Seattle Aircraft Certification Office Federal Aviation Administrati Date: DEC - 1 2011
E	Added Fuel Level analog or analog and digital.	1 thru 6	FOR Manager, Seattle Aircraft Certification Office Federal Aviation Administration Date: 3-28-16

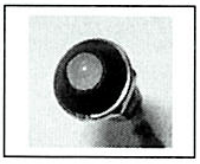
I. GENERAL

The EDM-900 is a combined electronic indicating system, which simultaneously displays to the pilot powerplant and aircraft systems operating parameters. It includes the following indicating systems; replacing previous primary digital and/or analog instruments. (The label of the parameter shown on the EDM-900 display message area is indicated in the second column. The message is located below the CHT/EGT display.



Gauge Function	Message Area Alarm Abbreviation
Primary	**Primary**
Engine rotational speed	RPM xxxx
Engine Manifold Pressure	MAP xx.x in hg
Engine Cylinder Head Temp	CHT2 xxx °F
Engine Oil Temperature	O-T xxx °F
Engine Oil Pressure	O-P xxx °F
Fuel Pressure	F-P xx PSI
Fuel Flow to engine	F-F xx.x GPH
Comp. Discharge Temp.	CDT xxx °F
Turbine inlet Temp. Left side	TIT-L xxxx °F
Turbine Inlet Temp. Right side	TIT-R xxxx °F
Single Turbine Inlet Temp.	TIT xxxx °F
Non-Primary	**Non-Primary**
Exhaust Gas Temp.	EGT2 xxxx °F
Shock Cooling of CHT	CLD xx °/MIN
Differential Temp. of EGT	DIF xx °F
Bus Voltage	Volts xx.x
Amperage Load	AMPS xx
Outside Air Temp.	OAT xx °F
Estimated Time to Empty	Est. T to E xx:xx H:M
Fuel used to date	USED xx.x GAL
Estimated Remaining fuel	Est. REM xx GAL
Estimated Fuel required to Waypoint	Est. WP REQ xx GAL
Estimated Fuel Remaining at Waypoint	Est. WP RES xx GAL
Nautical Miles per Gallon	ECON xx.x MPG
Brightness, Dim control	DIM/BRT





Remote Annunciate Light (RAL)

FAA APPROVED Date MAR 28 2016

Display

Non-primary functions such as: Induction air temperature, carburetor inlet temperature, EGT Span, bus voltage, Amps, Shock Cooling, Fuel Remaining, Fuel Required, Fuel Reserve, MPG, Endurance, and Fuel Used have programmable alarm limits. CHT, TIT, EGT, FP, FF, and MAP may not be primary on some installations. Any of these non-primary functions are programmable by the pilot. Primary functions can not be changed.

Fuel level can be displayed as an analog gauge or as an analog with digital information. This is selectable by the pilot in the Pilot Programmable mode of the instrument. If the digital information is selected the following question will appear. " With fuel flow monitoring" Yes/No. Yes will cause the fuel flow and the Fuel Level readings to be linked so that if the Fuel Flow and Fuel Level do not agree by 5 gallons a yellow alert will be indicated on the display above the fuel level gauge.

The right hand side the EDM-900 has horizontal tape scales with digital values below each scale. The functions: OIL-Temperature (O-T), OIL-Pressure (O-P), FUEL-Pressure (F-P), (or CDT, for engine installations having a primary Compressor Discharge Temperature), Fuel Flow (FF), and two main and two Aux fuel tank quantities (QTY-LF/RT Main, QTY-LF/RT Aux). The engine MAP and RPM are presented in the upper left corner of the instrument with analog-type circular gauges. The EGT, CHT and TIT are presented in the lower left corner. Below the EGT/CHT columns is a "Message area" that displays the digital values of the EGT/CHT/TIT and additional functions like shock cooling and limit alarm messages. OAT is displayed in a box in degrees C or F. A soft switch is located above button 4 and toggles between ALL/TEMP/FUEL

Specific values for each parameter are displayed digitally above the vertical scale displays of EGT, CHT, and TIT, except for the portrait mode where only the CHT and TIT values are shown. The boxed number below the columns indicates which cylinder's digital information is being displayed in the "Message Area" or displayed as an alarm in the Message Area.

Programming

Depressing the LF and STEP buttons simultaneously enters the pilot program mode enabling the pilot enter fuel quantities (for fuel totalizer calculations only), display scan rate, OAT displayed in °F or °C, EGT digital display resolution to 1 or 10° , analog or digital fuel quantity and other setup parameters. Exit by pressing the NEXT button until EXIT is displayed, then press EXIT. If either the STEP or LF buttons are not touched for three minutes, the EDM-900 will revert to automatic scan mode (1 to 9 seconds or 0 no scan). Depressing the STEP button will stop the automatic mode and revert to manual mode. Refer to the EDM-900 Pilot's Guide Rev. IR or later for additional operating information.

Remote Alarm Light (RAL) for EDM 900

The remote alarm light is a red or yellow light depending on the alarm condition. The EDM-900 incorporates a light that alerts the pilot that a parameter has reached a caution range or limit. This light is mounted in front of the pilot, labeled "ENGINE". The light flashes depending on the condition "Warning" (Red) or "Caution" (Yellow). All Alert and Alarms will be displayed in the "Message Area" of the Display.
On initial startup or whenever power is turned on, the words EDM-900 PRIMARY" are displayed in the Message Area, followed by the make and model of the aircraft with STC information for which the primary limits were set.

Alarm Limits

Primary alarm limits for each specific aircraft model are set by JPI and are not programmable by the pilot. The primary functions for your installation are shown on the Primary label on the back of the instrument and are identical to those specified in the FAA Approved (AFM) Airplane Flight Manual or (POH) Pilot's Operating Handbook.

Whenever a parameter reaches an alarm limit, the display and the "RAL" will flash red. Also a soft key label "Clear" will appear. Tapping the CLEAR soft key will acknowledge and extinguish the soft key label, the red display warnings on the main display and on the RAL. If another lower priority alarm exists, it will then be displayed in the Message Area but the offending primary parameter remains red. Each press of the CLEAR button will allow any lower priority alarm to be displayed, thus presenting the pilot with the highest priority alarm condition. If the primary gauge has a yellow caution area it will activate the RAL (yellow) if that parameter is reached. Clear will deactivate this alarm until the parameter is reset and reactivated again.

Alarm hierarchy for the EDM-900

1. OILP_LO.
2. OILT_HI.
3. CHT.
4. TIT.
5. FLVL.
6. MAP.
7. RPM.
8. CDT.
9. FP_LO.
10. REM.
14. CLD.
15. OILT_LO.
16. VOLTS.
17. OILP_HI.
18. AMPS.
19. RES.
20. EGT.
21. Fuel Flow.

CAUTION

Alerts Lights do not indicate high or low, pilots must crosscheck the EDM-900 to determine whether a high limit exceedance has changed to a low limit exceedance or vice versa.

Dimming

Automatic dimming is provided to dim the panel display. Dimming can also be accomplished manually. Tapping the third button (labeled DIM/BRT) puts you in the increase or decrease brightness mode showing LCD % brightness. Manual dimming overrides the automatic dimming feature. When switching electrical power off and on, the system defaults to automatic dimming at full bright.

FAA APPROVED Date MAR 28 2016

II. OPERATING LIMITATIONS

A. The EDM-900 may replace any existing RPM, MAP, EGT, CHT, CDT, TIT, OIL T. OIL P, F-P, FF, CDT and Fuel Quantity indicators required by the aircraft type design.
B. The EDM-900 must not be used as primary if the RAL is not working.
C. This Pilot's Guide must be available to the pilot for all flight operations.

III. EMERGENCY PROCEDURES

A. Loss of individual display parameter:
   1. Continue normal engine operation by referring to the remaining parameters displayed. Note the RAL will indicate limits even if the display fails and the rest of the unit is functional.

B. Loss of all displays (Electrical Failure):
   1. Avoid high engine power settings and rapid power changes;
   2. Enrichen mixtures to maintain smooth engine operation;
   3. Arrange to terminate the flight safely and as soon as practicable.
   4. Refer to your original airplane AFM for possible additional engine instrument failure information.

IV. NORMAL PROCEDURES

a. PRIMARY FUNCTIONS

Before each flight on startup, verify that the RAL is working it should flash Red and Yellow. Whenever main electrical power is turned on the EDM-900 performs a self-test procedure. Gauges not functioning will have a red x across them which identifies as inoperative. The message area, located below the EGT/CHT display will display open probes. The EDM must maintain functionality upon cranking the engine.

b. ENGINE MIXTURE LEANING

Refer to the 'EDM-900 Pilot's Guide' for detailed instructions on 'rich of peak' and 'lean of peak' operation.

After establishing desired cruise-power, depress the LF button to activate the Lean Find Mode. As the mixture is leaned, one cylinder's column will begin blinking; indicating the EGT for that cylinder has peaked. Continue with the leaning procedure, enriching as recommended by the aircraft manufacturer while monitoring the primary engine instruments. Once the leaning procedure has been completed, depress the EXIT button briefly to exit the Lean Find Mode and enter the Monitor Mode.

CAUTION

Comply with manufacturer's Airplane Flight Manual leaning procedures.
Do not exceed applicable engine or aircraft limitations.

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 177B
Make and Model Airplane

Registration Number: **N35031** Serial Number: **17702167**

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: 21-DEC-2017

LOG OF REVISIONS				
	Page			
Revision Number	Date	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.	See cover page

Table of Contents

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.

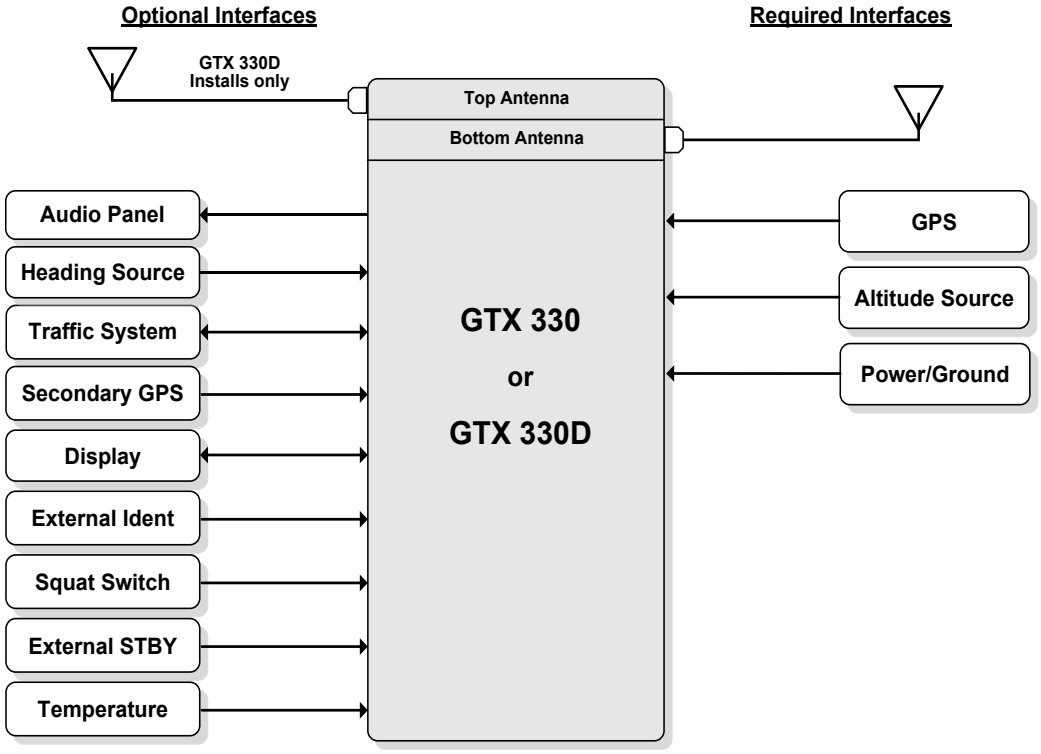


Figure 1 – GTX 330 or GTX 33D Interface Summary

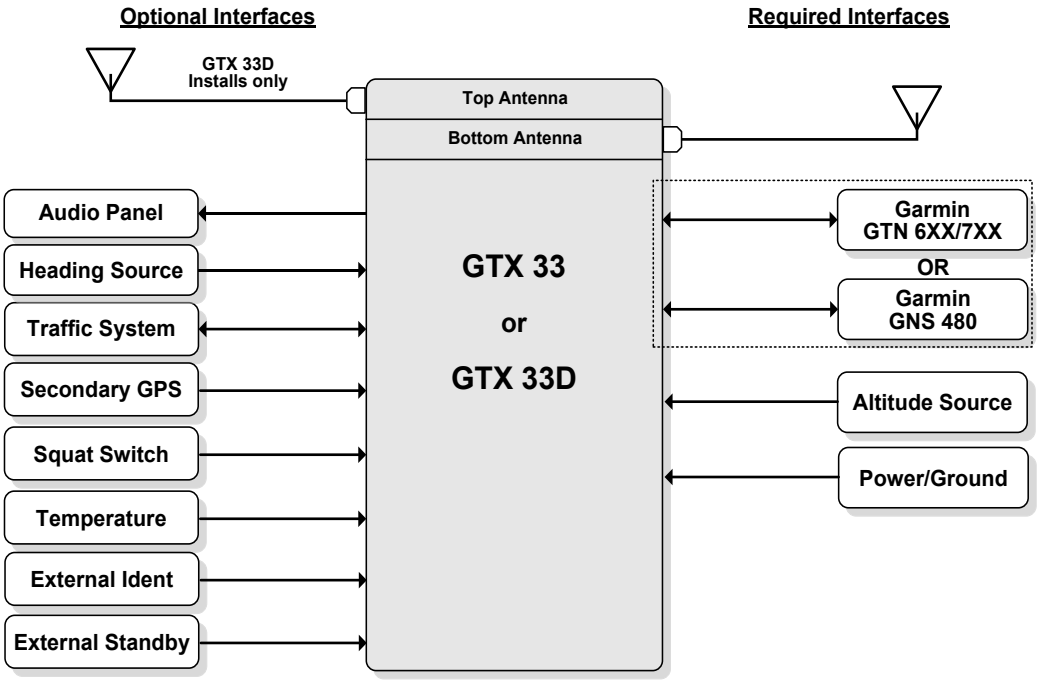


Figure 2 – GTX 33 or GTX 33D Interface Summary

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, 335R, 345, and 345R transponders. The functional differences between each of these transponders are described in Table 1.

Function	GTX 335	GTX 335 w/GPS	GTX 335R	GTX 335R w/GPS	GTX 345	GTX 345 w/GPS	GTX 345R	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.

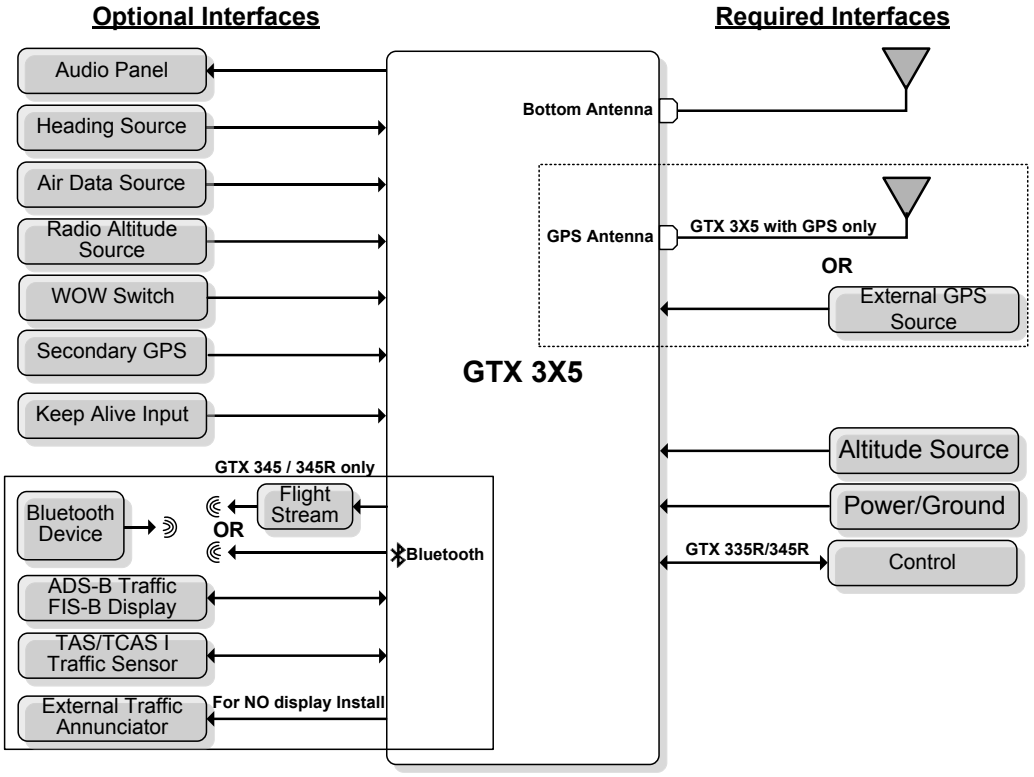


Figure 3 – GTX 3X5 Interface Summary

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 335R	☐ GTX 335R
☒ GTX 345	☐ GTX 345
☐ GTX 345R	☐ GTX 345R

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)

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
☐ Gables 7534 Controller	☐ Gables 7534 Controller

Interfaced Active Traffic System:

☒ None

☐ TCAD

☐ TAS/TCAS

NOTE

If the system includes all of the following components:

- GTX 345R,
- 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 is being used the ADS-B equipment failure condition will be annunciated on the Gables 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	2.12

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 GTX 3X5 Pilot's Guide	190-00207-00 190-01499-00	Rev. G (or later) 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)

7.1 GTX TIS Behavior

The TIS Standby/Operate controls for GTX 33/330 and GTX 335 units only function when the aircraft is airborne.

7.2 GTX 345R 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.

Similarly, whenever a parameter reaches a programmed *limit* value, the display and the RAD will flash the *red colored* word ALERT and the acronym. Tapping the STEP button will extinguish the red display warnings on the main display but the RAD will also continue to flash the acronym until the parameter is not at or beyond the limit value.
FAA APPROVED Date DEC 10 2004

Primary alarm *limits* for each specific aircraft model are set by JPI and are not programmable by the pilot. These include some or all of the following: CHT, CDT, EGT, O-T, O-P, F-P, QTY-LF, QTY-RT, MAP, RPM, FF, IAT, CARB, and TIT. The primary functions for your installation are shown on the Primary label on the back of the instrument and are identical to those specified in the FAA Approved Airplane Flight Manual/Pilot's Operating Handbook.

For caution alarms, primary digits and acronyms are flashed in *amber* at the original manufacturer's published caution points or, if none is specified, at a specific temperature below the programmed limit. For example, O-T and CDT alarms will flash 20°F before the actual factory limit. CHT will flash 40°F below, and TIT 50°F below the programmed limits. Fuel and oil pressure caution alarms will only flash if there is a published caution range

When a *caution* range is reached, the pilot can momentarily depress the STEP button to extinguish the particular flashing alarm acronyms. If another parameter has also reached its limit, that label will then begin to flash. The pilot should continue to monitor the affected functions as he would if a conventional analog display had reached a limit. The bar graph functions of CHT, EGT, and TIT remain displayed at all times.

Dimming

Automatic dimming is provided to dim both the panel display and the remote alarm display. Dimming can also be accomplished manually. Tapping the far right hand button (labeled Brightness) decreases brightness. Continuously holding this button increases brightness. Manual dimming overrides the automatic dimming feature. When switching electrical power off and on, the system defaults to automatic dimming.

II OPERATING LIMITATIONS

A. The EDM-930 may replace any existing RPM, MAP, EGT, CHT, CDT, TIT, O-T. O-P, F-P, FF, and Fuel Quantity indicators required by the aircraft type design.
B. The EDM-930 cannot be used as primary if the RAD is not working.
C. This Pilot's Guide must be available to the pilot for all flight operations.

III. EMERGENCY PROCEDURES

A. Loss of individual display element:
   1. Continue normal engine operation by referring to the remaining parameters displayed.

B. Loss of all displays (Electrical Failure):
   1. Avoid high engine power settings and rapid power changes;
   2. Enrichen Mixture to maintain smooth engine operation;
   3. Arrange to terminate the flight safely and as soon as practicable.

IV. NORMAL PROCEDURES

a. PRIMARY FUNCTIONS

Before each flight, verify that the RAD is working. Whenever main electrical power is turned on the EDM-930 performs a self-test procedure which identifies by the message center any inoperative parameters. During engine start, there may be a power interruption to the EDM-930 while the starter is engaged.

b. ENGINE MIXTURE LEANING

After establishing desired cruise-power depress the LF button to activate the Lean Find Mode. As the mixture is leaned, one cylinder's column will begin blinking; indicating the EGT for that cylinder has peaked. Continue with the leaning procedure, enriching as recommended by the aircraft manufacturer while monitoring the primary engine instruments. Once the leaning procedure has been completed, depress the STEP button briefly to exit the Lean Find Mode and enter the Monitor Mode.

CAUTION

Comply with manufacturer's Airplane Flight Manual leaning procedure.
Do not exceed applicable engine or aircraft limitations.

FAA APPROVED Date: MAR 28 2016

APPENDIX 86-19-11

PILOT OPERATING PROCEDURES
PREFLIGHT FUEL SYSTEM CHECK

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

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

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

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

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

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

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

ALPHABETICAL INDEX

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W

“TAKE YOUR CESSNA HOME

FOR SERVICE AT THE SIGN

OF THE CESSNA SHIELD”

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