Pilot's Operating Handbook

RV-8 C-GNHK

Ser. No. 80427

Kevin Horton

10 Nov 2014

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SECTION 1

GENERAL

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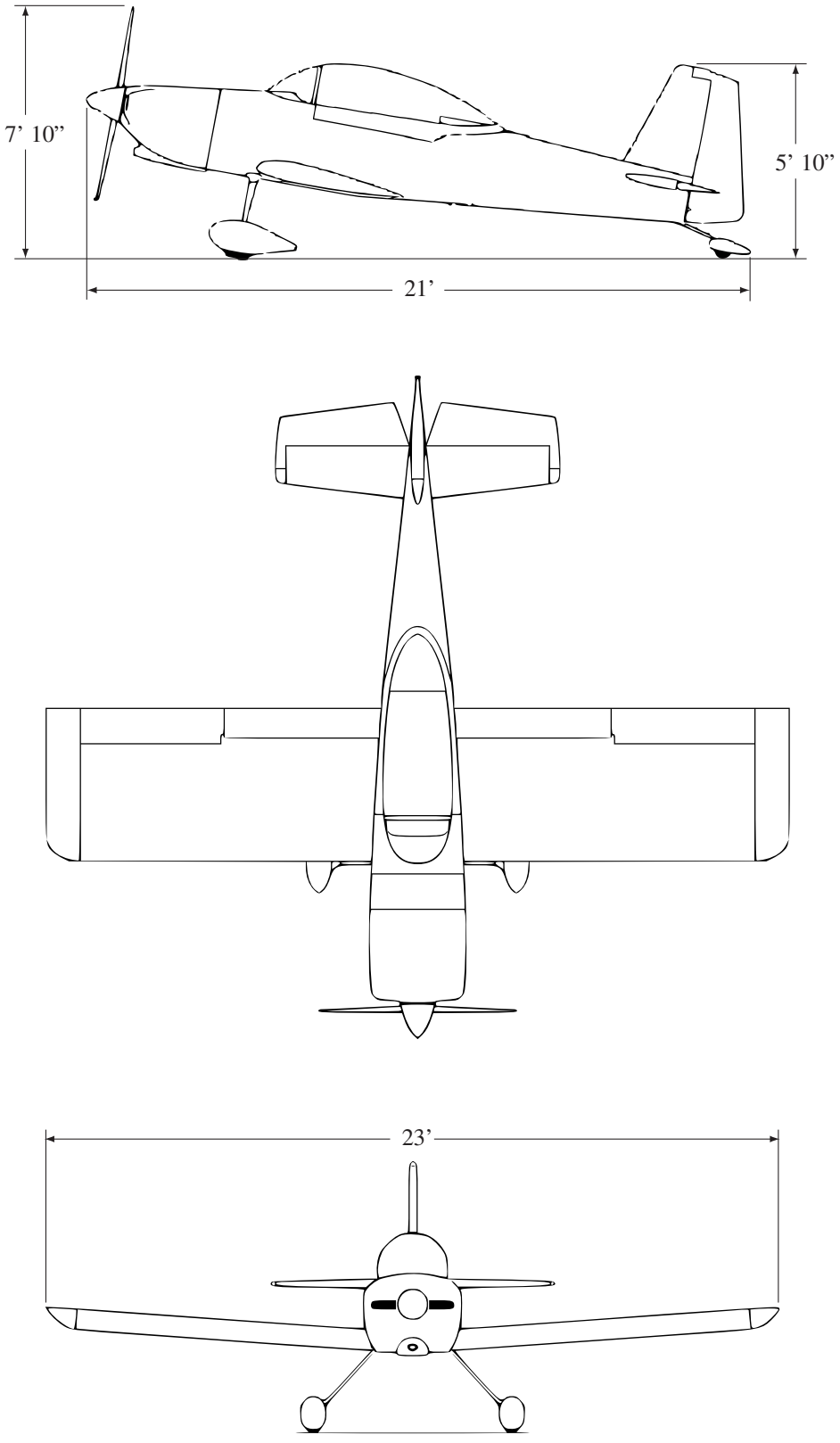

Figure 1.1: Three View

INTRODUCTION

This Pilot's Operating Handbook contains nine sections with all the information required to operate the aircraft.

Items in red text are preliminary, and are subject to change pending the results of ground and flight tests.

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

This aircraft is certificated in the Amateur-Built category. The regulations governing the Amateur-Built category contain only very limited performance requirements, and no flight characteristics requirements. By virtue of its amateur-built status, all persons entering this aircraft do so at their own risk.

DESCRIPTIVE DATA

ENGINE

Engine Manufacturer:	Lycoming
Engine Assembler:	Aerosport Power, Kamloops, B.C.
Engine Model Number:	IO-360-A1B6
Engine Type:	Four cylinder, Direct Drive Horizontally Opposed, Air-Cooled, Fuel-Injected with Inverted Oil System
Horsepower Rating:	200 BHP
Maximum Engine Speed:	2700 RPM
Displacement:	361 in^3
Compression Ratio:	8.7:1
Time Between Overhaul:	2000 hr

PROPELLER

Manufacturer:	MT
Model:	MTV-12-B-C/C183-59b
Number of blades:	3 wood core blades with stainless steel leading edges
Diameter:	72.05 inches (183 cm)
Type:	Hydraulically Actuated Constant Speed
Time Between Overhaul:	1800 hr or 72 months

FUEL

Total Fuel Capacity:	163.5 l (43.2 USG)
Usable Fuel Capacity:	162.8 l (43 USG)
Approved Fuel Grades:	100/130 100 (Green) 100LL (Blue)

OIL

Oil Capacity:	8 US qts	
Specification:	Ref Lycoming Operator's Manual Pg 3-12B	
Approved Grades	MIL-L-6082B	MIL-L-22851 Ashless Dispersant Grades
All Temperatures	–	SAE 15W50 or SAE 20W50
Above 27°C (80°F)	SAE 60	SAE 60
Above 16°C (60°F)	SAE 50	SAE 40 or 50
-1°C to 32°C (30°F to 90°F)	SAE 40	SAE 40
-18°C to 21°C (0°F to 70°F)	SAE 30	SAE 40, 30 or 20W40
Below -12°C (10°F)	SAE 20	SAE 30 or 20W30

MAXIMUM WEIGHTS

Max Take-Off Weight:	1900 lb (861.8 kg)
Max Landing Weight:	1900 lb (861.8 kg)
Empty Weight :	1194 lb (542 kg) (Incl full oil) - Weighed 27 Apr 2010, corrected for autopilot installation
Max Useful Load:	706 lb (320 kg) (subject to Weight & Balance)

SPECIFIC LOADINGS

Wing Loading:	17.3 lb/ft^2
Power Loading:	9.5 lb/hp

NOTES, CAUTIONS AND WARNINGS

Specific items requiring emphasis are expanded upon and ranked in increasing order of importance in the form of a NOTE, CAUTION or WARNING.

NOTE

Expands on information which is considered essential to emphasize. Information contained in notes may also be safety related.

CAUTION

Provides information that may result in damage to equipment if not followed.

WARNING

Emphasizes information that may result in personal injury or loss of life if not followed.

TERMINOLOGY AND ABBREVIATIONS

GENERAL AIRSPEED TERMINOLOGY

KIAS	**Knots Indicated Airspeed** is the speed shown on the airspeed indicator assuming no instrument error, expressed in knots.
KCAS	**Knots Calibrated Airspeed** is indicated airspeed corrected for position and instrument error, expressed in knots. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.

KTAS	**Knots True Airspeed** is the airspeed relative to undisturbed air, expressed in knots, which is KCAS corrected for altitude, temperature and compressibility.
GS	**Ground Speed** is the speed of the aircraft relative to the ground.
V_A	**Manoeuvring Speed** is the maximum speed at which abrupt full control deflection will not overstress the aircraft.
V_{FE}	**Maximum Flap Extension Speed** is the highest speed permissible with wing flaps in a prescribed extended position.
V_{NO}	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, and then only with caution.
V_{NE}	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.
V_S	**Stalling Speed** is the minimum steady flight speed at which the aircraft is controllable in a specified configuration.
V_{S_0}	**Stalling Speed in the landing configuration** at the most forward centre of gravity.
V_X	**Best Angle of Climb Speed** is the speed which results in the greatest altitude gain in a given horizontal distance.
V_Y	**Best Rate of Climb Speed** is the speed which results in the greatest altitude gain in a given time.

METEOROLOGICAL TERMINOLOGY

ISA	**International Standard Atmosphere** is a nominal atmosphere where air is a dry perfect gas with a temperature of 15°C (59°F) at sea level. The pressure at sea level is 29.92 in. Hg. The temperature gradient from sea level to 36,089 ft is -1.98°C per 1000 ft.
OAT	**Outside Air Temperature** is the free static air temperature. It is obtained from meteorological sources or in-flight instruments adjusted for instrument error and compressibility effects.
Pressure Altitude	**Pressure Altitude** is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 in. Hg, assuming zero position and instrument error (instrument error is assumed to be zero in this POH except where indicated).

POWER TERMINOLOGY

BHP	**Brake Horsepower** is the power developed by the engine.
RPM	**Revolutions Per Minute** is engine speed.
MP	**Manifold Pressure** is the absolute pressure measured in the engine's induction system, expressed in inches of mercury (in. Hg).

AIRCRAFT PERFORMANCE TERMINOLOGY

Climb Gradient	**Climb Gradient** is the ratio of the change in height during a climb, to the horizontal distance covered in the same time interval.
Demonstrated Crosswind Velocity	**Demonstrated crosswind velocity** is the velocity of the crosswind component for which adequate control of the aircraft during takeoff and landing has been demonstrated during flight tests. The value shown is not considered to be limiting.
Usable Fuel	**Usable Fuel** is the fuel that can be safely used in flight.
Unusable Fuel	**Unusable Fuel** is the fuel that can not be safely used in flight.
GPH	**Gallons Per Hour** is the amount of fuel (in US gallons) consumed per hour.
g	**g** is acceleration due to gravity.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	**Station** is a location along fuselage given in terms of distance from the reference datum.
Arm	**Arm** is the horizontal distance from the reference datum to the centre of gravity of an item.
Moment	**Moment** is the product of weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.)
Centre of Gravity (CG)	**Centre of Gravity** is the point at which an aircraft, or item, would balance if suspended.
CG Arm	**Centre of Gravity Arm** is the am obtained by adding the aircraft individual moments and dividing the sum by the total weight.
CG Limits	**Centre of Gravity Limits** are the extreme centre of gravity locations within which the aircraft must be operated at a given weight.
Empty Weight	**Empty Weight** is the weight of aircraft including unusable fuel and full engine oil.
Useful Load	**Useful Load** is the difference between takeoff weight and empty weight.
Payload	**Payload** is the weight of occupants, cargo, and baggage.
Gross Weight	**Gross Weight** is the loaded weight of the aircraft.
Maximum Takeoff Weight	**Maximum Takeoff Weight** is the maximum weight approved for start of the takeoff run.
Maximum Landing Weight	**Maximum Landing Weight** is the maximum weight approved for the landing touch-down.
Tare	**Tare** is the weight of chocks, blocks, stands, etc. used when weighing an aircraft, and is included in the scale readings. Tare is deducted from the scale readings to obtain the actual (net) aircraft weight.

ABBREVIATIONS

To be added

SECTION 2

LIMITATIONS

TABLE OF CONTENTS

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INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the aircraft, its engine, systems and equipment.

NOTE

The airspeeds listed in this section are based on the use of the normal static source. If the alternate static source is used, the airspeeds should be corrected using the information in Section 5.

AIRSPEED LIMITATIONS

	SPEED	KIAS	KCAS	REMARKS
V_{NE}	Never Exceed Speed	203	200	Do not exceed this speed in any operation. Reduce by 3 kt per 1000 ft above 10,000 ft.
V_{NO}	Maximum Structural Cruising Speed	170	168	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Manoeuvring Speed 1550 lb (703.1 kg) or greater: 1300 lb (589.7 kg):	 TBD TBD	 120 110	Do not make full or abrupt control movements above this speed. These speeds are estimates based on CAFE data. To be updated after flight testing.
V_{FE}	Maximum Flap Extended Speed 0° to 20° Flaps: 20° to 40° Flaps:	 TBD TBD	 96 87	Do not exceed these speeds with the given flap settings.

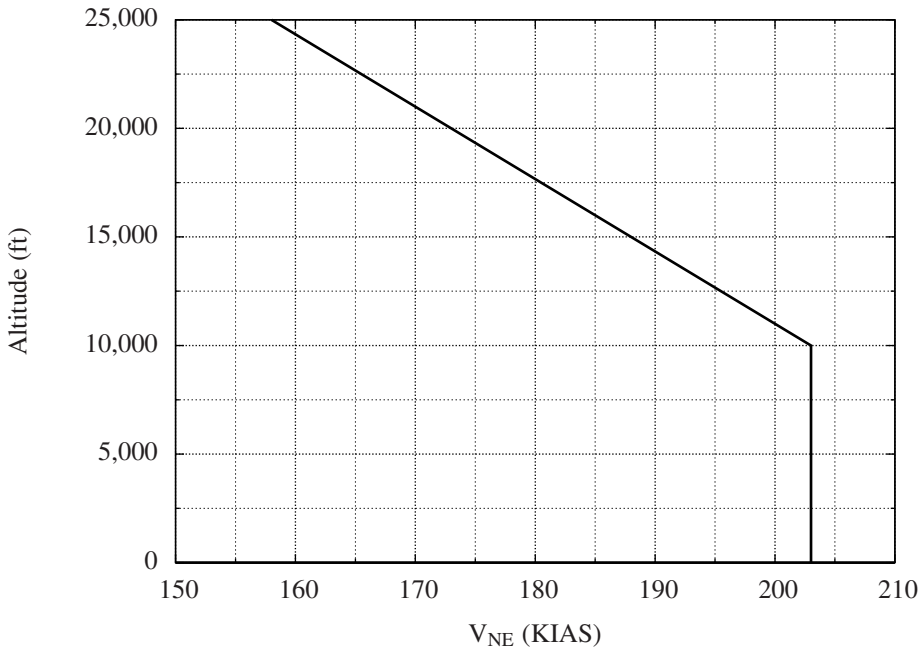

Figure 2.1: V_{NE} vs Altitude

AIRSPEED INDICATOR MARKINGS

MARKING	ANALOG ASI (KIAS)	EFIS (KIAS)	SIGNIFICANCE
White Arc	48—87	48—87	Full Flap Operating Range. Lower limit is maximum weight stall speed in landing configuration. Upper limit is maximum speed permissible with flaps fully extended.
Green Arc	50—168	50—170	Normal Operating Range. Lower limit is maximum weight stall speed with flaps retracted. Upper limit is the maximum structural cruising speed.
Yellow Arc	168—200	170—203	Operations must be conducted with caution, and only in smooth air.
Red Line	200	203	Maximum speed for all operations.

NOTES

1. The analog airspeed indicator markings are based on position error estimates provided by Van's Aircraft. These markings do not account for the analog ASI instrument error (see Figure 5.6).
2. The EFIS airspeed tape markings are to be revised to incorporate actual position errors once these have been determined.

POWER PLANT LIMITATIONS

The following limitations are for the Lycoming IO-360-A1B6

Maximum Engine Speed		2700 rpm
Oil Temperature	Maximum	245°F
	Desired	180°F
	Minimum for continuous operation	140°F
Cylinder Head Temperature (CHT)		
	Maximum	500°F
	75% power cruise (Recommend max.)	435°F
	Economy cruise (Recommended maximum)	400°F
	Recommended minimum for max. engine life	150°F
Oil pressure	Maximum (start, warm-up, taxi and takeoff)	115 psi
	Maximum (normal operations)	95 psi
	Minimum (normal operations)	55 psi
	Minimum (idle)	25 psi
Oil sump capacity	Maximum	8 US Qts
	Minimum safe quantity	2 US Qts
Fuel pressure	Maximum (at injector inlet)	45 psi
	Minimum	14 psi
Fuel grade	Minimum Octane	100/100LL Blue
Propeller Diameter	Minimum	72 inches

ENGINE INSTRUMENT MARKINGS

Tachometer	Green Arc — Normal operating range.	500 to 2700 rpm
	Red Line — Maximum RPM	2700 rpm

EIS 4000 WARNING THRESHOLDS

Oil Temperature	High Warning	225°F
Oil Pressure	High Warning	95 psi
	Low Warning	25 psi
Fuel Pressure	High Warning	45 psi
	Low Warning	14 psi
CHT	High Warning	450°F
RPM	High Warning	2710 rpm
Voltage	High Warning	15 v
	Low Warning	12 v
Fuel Quantity	Low Level Warning	10 USG

STARTER CRANKING LIMITATIONS

The following limitations are for the SkyTec 149-12LS starter. Starter cranking is limited to six 10 second cranking cycles with 20 second cool down between cranking attempts, then 30 minutes cooling.

WEIGHT LIMITATIONS

Maximum Takeoff Weight . . . . . 1900 lb (861.8 kg)
Maximum Landing Weight . . . . . 1900 lb (861.8 kg)
Maximum weight for operations from non-paved runways . . . . . 1800 lb (816.5 kg)

Aerobatic Gross weight (full 6g envelope available) . . . . . 1550 lb (703.1 kg)
Restricted Aerobatic Gross weight (5g envelope available) . . . . . 1800 lb (816.5 kg)

Maximum passenger weight . . . . . 300 lb (136 kg)
(Subject to Weight & Balance)

Maximum weight in forward baggage compartment . . . . . 50 lb (22.7 kg)
(Subject to Weight & Balance)

Maximum weight in rear baggage compartment . . . . . 75 lb (34 kg)
(Subject to Weight & Balance)

CAUTION

The maximum weight recommended by Van's Aircraft is 1800 lb (816.5 kg). Operations at higher weights must be conducted with caution.

WARNING

The maximum weight recommended by Van's Aircraft for aerobatics is 1550 lb (703.1 kg). Aerobatic operations at higher weights must respect reduced load factor limits.

NOTE

The maximum passenger weight that is possible with the currently cleared aft CG of 85.3" aft of datum (aerobatic aft CG limit) is 250 lb (113.4 kg).

CENTRE OF GRAVITY LIMITS

Forward limit . . . . . 15% MAC = 78.7" aft of datum
Aft limit . . . . . 29% MAC = 86.82" aft of datum
Aft limit for aerobatic flight . . . . . 26.5% MAC = 85.3" aft of datum

NOTES

1. The datum is 70" forward of the leading edge of the wing.
2. The aft CG limit is currently restricted to 85.3" aft of datum (aerobatic aft CG limit) pending flight test validation of further aft CGs.

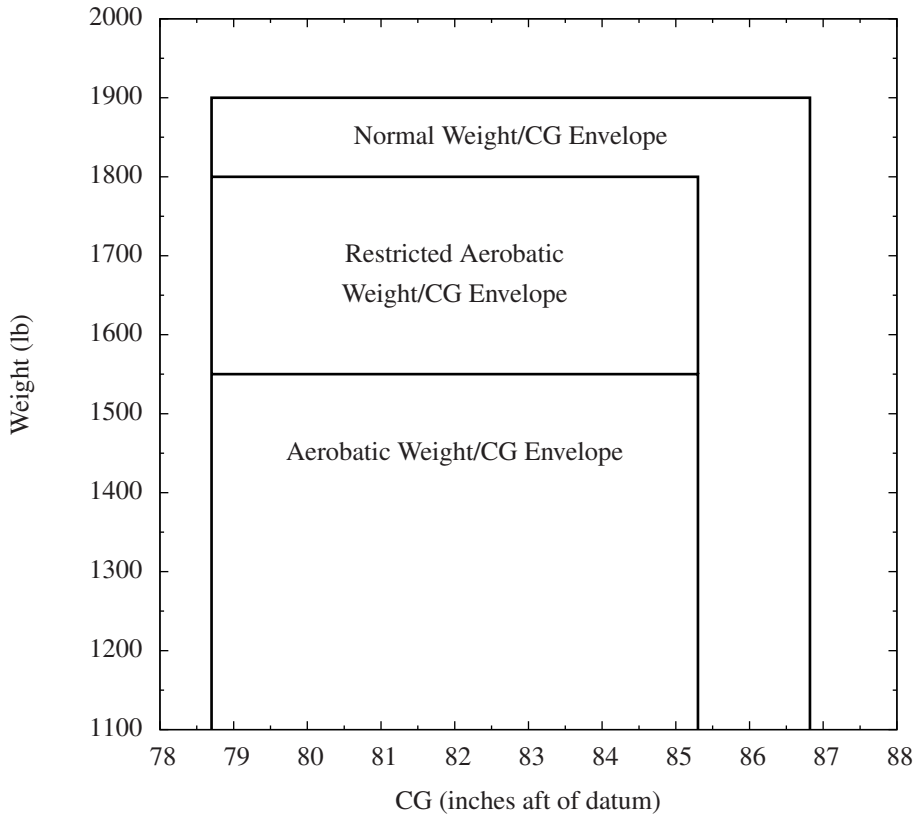

Figure 2.2: Centre of Gravity Limits

MANOEUVRE LIMITS

The following list of manoeuvres is approved when operating within the Restricted Aerobatic Weight/CG Envelope.

- Upright spins,
- Loops,
- Cuban Eights,
- Immelmann turns,
- Aileron Rolls, and
- Barrel rolls.

LOAD FACTOR LIMITS

Load Factor Limits

Flaps Up

weight 1550 lb (703.1 kg) and below: . . . . . +6g to -3g

reducing linearly to - weight 1800 lb (816.5 kg): . . . . . +5g to -2.5g

weight above 1800 lb (816.5 kg): . . . . . +4.4g to -2g

Flaps Down . . . . . +2g to 0g

NOTE

The load factor limit varies linearly between 1800 lb (816.5 kg) and 1550 lb (703.1 kg) weight.

Caution

While the airframe is stressed for negative g, the engine does not have an inverted oil system.

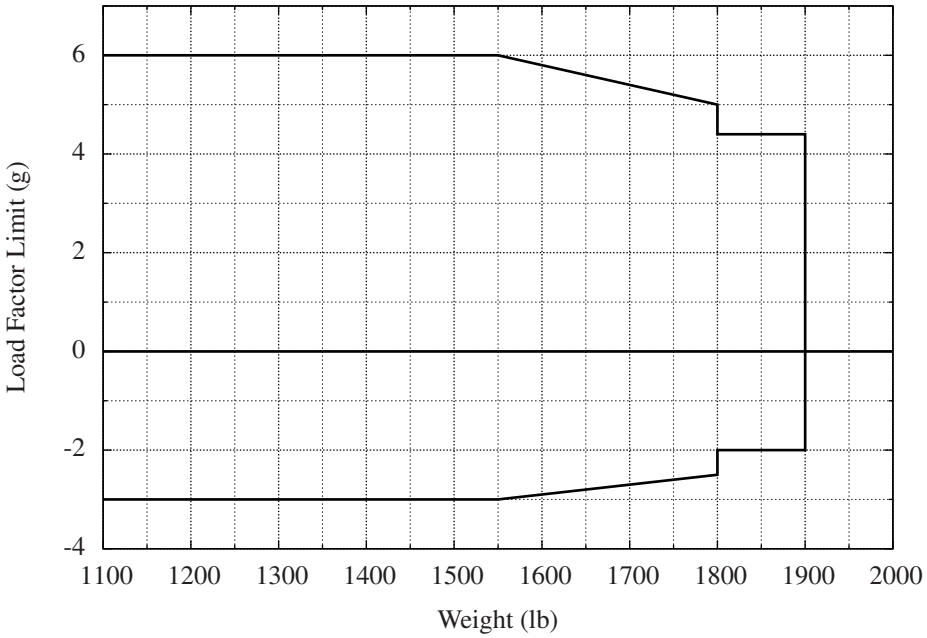

Figure 2.3: Load Factor Limit vs Weight

NOTES

1. The load factor limits for weights above 1550 lb (703.1 kg) are not published by Van's Aircraft, but are established based on conservative engineering analysis of wing bending moment vs load factor.

2. The load factor limits for flaps down are based on FAR 23 structural design criteria, which the RV-8 is designed to.

KINDS OF OPERATION LIMITS

The airplane is approved for:

- Day VFR,
- Night VFR (subject to flight test validation of night lighting),
- Day IFR, and
- Night IFR (subject to flight test validation of night lighting).

Flight in known or forecast icing conditions is prohibited.

FUEL LIMITATIONS

Total capacity	163.5 l (43.2 USG)
Usable fuel	43 USG
Unusable fuel	0.2 USG
Approved fuels	100/130 - Green
	100 - Green
	100LL - Blue

It is prohibited to select the left tank for takeoff or landing unless there are at least 10 USG of fuel remaining in the selected tank.

GNS 430W LIMITATIONS

IFR enroute and terminal navigation predicated upon the GNS 430W's GPS receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

Operations on RNAV STARs are prohibited unless the autopilot is engaged in TRK mode (TC AIM RAC 9.2.2 & FAA AC 90-100A para 10(b)(9)).

Instrument approach navigation predicated upon the GNS 430W's GPS receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GNS 430W's data base. The GNS 430W's database must incorporate the current update cycle.

1. Instrument approaches utilizing the GPS receiver must be conducted in the Approach Mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
2. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 430W's GPS receiver is not authorized.
3. Use of the GNS 430W's VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be displayed on the external indicator.
4. VNAV information may be utilized for advisory information only. Use of VNAV information for instrument approach procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land.

If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS 430W prior to operation (refer to GNS 430W Pilot's Guide for procedure if necessary):

dis, spd	nm, kt (sets navigation units to "nautical miles" and "knots")
alt, vs	ft, fpm (sets altitude units to "feet" and "feet per minute")
map datum	WGS 84 (sets map datum to WGS-84)
posn	deg-min (sets navigation grid units to decimal minutes)

AUTOPILOT LIMITATIONS

Minimum engage height: 400 ft AGL.

Use of the autopilot in-flight is prohibited unless pre-flight override tests were conducted on both pitch and roll axis.

PLACARDS

The following information is displayed by placards:

Location	**Placard**
Front Seat	THE FOLLOWING AEROBATIC MANOEUVRES, AND COMBINATIONS THEREOF, MAY BE PERFORMED IN THIS AEROPLANE: • UPRIGHT SPINS, • LOOPS, • CUBAN EIGHTS, • IMMELMANN TURNS, • AILERON ROLLS, AND • BARREL ROLLS.
Ahead of Throttle Quadrant	MAXIMUM POWER MIXTURE ALTITUDE S.L. 4000 8000 12,000 US GAL/HR 17 15 13 10
Rear Seat	YOU FLY IN THIS AIRCRAFT AT YOUR OWN RISK. THIS AIRCRAFT DOES NOT COMPLY WITH INTERNATIONALLY RECOGNIZED STANDARDS. VOUS VOLEZ À BORD DE CET AÉRONEF À VOS PROPRES RISQUES. CET AÉRONEF NÕEST PAS CONFORME AUX NORMES RECONNUES À LÕÉCHELLE INTERNATIONALE.
Rear Seat	MAXIMUM PASSENGER LOAD 136 KG (300 LB)
Forward Baggage Area	MAXIMUM BAGGAGE LOAD 23 KG (50 LB)
Aft Baggage Area	MAXIMUM BAGGAGE LOAD 34 KG (75 LB)

SECTION 3

EMERGENCY PROCEDURES

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INTRODUCTION

Section 3 provides procedures to address emergencies that may occur. Should an emergency arise, the basic guidelines in this section should be considered and applied as necessary to correct the problem.

Some emergency procedures receive additional discussion in the Amplified Procedures section which follows the Emergency Checklists.

AIRSPEEDS FOR EMERGENCY OPERATION

(Red text indicates provisional information, based on the RV-8A Aircraft Performance Report published by the CAFE Foundation. This data has not yet been validated by flight test.)

Engine Failure After Takeoff
- Flaps UP . . . . . 115 KIAS
- Flaps DOWN . . . . . 80 KIAS

Manoeuvring Speed
- 1550 lb (703.1 kg) or greater . . . . . 120 KIAS
- 1300 lb (589.7 kg) . . . . . 110 KIAS

Maximum Glide
- 1900 lb (861.8 kg) . . . . . 115 KIAS
- 1600 lb (725.7 kg) . . . . . 105 KIAS
- 1300 lb (589.7 kg) . . . . . 95 KIAS

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

Landing Without Engine Power
- Flaps UP . . . . . 115 KIAS
- Flaps DOWN . . . . . 80 KIAS

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ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle ..... IDLE
2. Brakes ..... APPLY
3. Flaps ..... RETRACT
4. *If insufficient runway remains:*
   - Fuel Selector ..... OFF
   - Ignition Switches (Both) ..... OFF
   - BATT/ALT ..... OFF

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. Airspeed ..... 115 KIAS (Flaps UP)
   80 KIAS (Flaps DOWN)
2. Mixture ..... IDLE CUT-OFF
3. Prop ..... MIN RPM
4. Fuel Selector ..... OFF
5. Ignition Switches (Both) ..... OFF
6. Flaps ..... AS REQUIRED
7. BATT/ALT ..... OFF

ENGINE FAILURE DURING FLIGHT

1. Airspeed ..... 115 KIAS
2. Fuel Selector ..... SWITCH TANKS
3. Boost Pump ..... ON
4. Mixture ..... RICH
5. Alternate Air ..... ON
6. IGNITION, ELEC ..... ON, OFF, ON
7. IGNITION, MAG ..... ON, OFF, ON
8. Starter ..... START (if propeller is stopped)
9. Transponder 7700

ROUGH RUNNING ENGINE

1. Mixture ..... ADJUST
2. Throttle ..... ADJUST
3. Boost Pump ..... ON
4. Fuel Selector ..... CHANGE TANKS
5. Alternate Air ..... ON

CAUTION

If engine quits when ignition selected OFF, select the mixture to ICO, wait 10 seconds, then select the ignition back ON. Advance mixture slowly until engine restarts.

6. IGNITION, ELEC ..... ON, OFF, ON
7. IGNITION, MAG ..... ON, OFF, ON
8. Prepare for power off landing

HIGH OIL TEMPERATURE

1. Oil Cooler Door ..... OPEN
2. Oil temperature and pressure ..... MONITOR

LOW FUEL PRESSURE

1. Boost Pump ..... ON
2. Fuel Selector ..... CHANGE TANKS

LOW OIL PRESSURE

1. OIL PRESS light ..... CHECK
2. EIS Oil Pressure Indication ..... CHECK

NOTE

In case of discrepancy between indications, suspect false warning.

3. *If both indications confirm low oil pressure:*
   - Land ASAP

AIR-START

1. Throttle ..... 1/4 OPEN
2. Prop ..... MAX RPM
3. Fuel Pressure ..... CHECK
4. *If fuel pressure less than 14 psi:*
   - Boost Pump ..... ON
   - Fuel Selector ..... CHANGE TANKS
5. Ignition Switches ..... BOTH ON
6. Mixture ..... IDLE CUT-OFF
7. Mixture ..... ADVANCE SLOWLY UNTIL ENGINE STARTS
8. *When engine starts:*
   - Throttle ..... A/R
   - Boost Pump ..... OFF

FORCED LANDINGS

EMERGENCY LANDING WITHOUT POWER

1. Airspeed ..... 115 KIAS (Flaps UP)
   80 KIAS (Flaps DOWN)
2. Throttle ..... CLOSED
3. Mixture ..... IDLE CUT-OFF
4. Prop ..... MIN RPM
5. Fuel Selector ..... OFF
6. Ignition Switches (Both) ..... OFF
7. Radio ..... TRANSMIT MAYDAY
8. Flaps ..... A/R
9. BATT/ALT ..... OFF

EMERGENCY LANDING WITH POWER

1. Radio ..... TRANSMIT MAYDAY
2. Airspeed ..... 85 KIAS
3. Flaps 50%
4. Selected Field ..... FLY OVER
5. Flaps ..... FULL
6. Airspeed ..... 70 KIAS
7. BATT/ALT ..... OFF
8. Ignition Switches (Both) ..... OFF (after touchdown)

DITCHING

1. Radio ..... TRANSMIT MAYDAY
2. Flaps ..... FULL
3. Airspeed ..... 70 KIAS
4. Power ..... 300 FT/MIN DESCENT
5. Approach ..... High Wind - INTO WIND
   Light Wind - PARALLEL TO SWELLS
6. Face ..... CUSHION with folded coat
7. *Leaving Aircraft*
   - Seat Belts ..... RELEASE
   - Canopy ..... OPEN
   - Aircraft ..... EXIT
   - Life Jacket ..... INFLATE

FIRES

FIRE DURING START ON GROUND

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector ..... OFF
3. Starter ..... OFF
4. BATT/ALT ..... OFF
5. Fire Extinguisher ..... OBTAIN
6. Aircraft ..... EVACUATE
7. Fire ..... EXTINGUISH

ENGINE FIRE IN FLIGHT

1. Mixture ..... IDLE CUT-OFF
2. Fuel Selector ..... OFF
3. Boost Pump ..... OFF
4. Cabin Heat and Air ..... OFF
5. ESS BUS FEED ..... EMER
6. BATT/ALT ..... OFF
7. Forced Landing ..... COMPLETE

ELECTRICAL FIRE IN FLIGHT

1. BATT/ALT ..... OFF
2. STBY ALT ..... OFF
3. ESS BUS FEED ..... NORM
4. EFIS auto-shutdown ..... OVERRIDE (if EFIS required)
5. Avionics ..... OFF
6. All Other Switches (except Mag and TURN COORD) ..... OFF
7. Vents/ Cabin Air/ Heat ..... CLOSED
8. Fire Extinguisher ..... ACTIVATE
9. Cabin ..... VENTILATE

WARNING

Ventilate the cockpit ASAP after discharging the fire extinguisher.

CABIN FIRE

1. BATT/ALT ..... OFF
2. STBY ALT ..... OFF
3. ESS BUS FEED ..... NORM
4. EFIS auto-shutdown ..... OVERRIDE (if EFIS required)
5. Vents/ Cabin Heat ..... CLOSED
6. Fire Extinguisher ..... ACTIVATE
7. Cabin ..... VENTILATE

WARNING

Ventilate the cockpit ASAP after discharging the fire extinguisher.

WING FIRE

1. Nav/Strobe Light Switch ..... OFF
2. Landing & Taxi Lights ..... OFF
3. PITOT HEAT ..... OFF

NOTE

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

OTHER

STATIC SOURCE BLOCKAGE

1. Vents/ Cabin Air/ Heat ..... CLOSED
2. Alternate Static Source Valve ..... OPEN
3. Airspeed and altitude corrections ..... APPLY

ALTERNATOR FAILURE

1. BATT/ALT ..... BATT, then BATT + ALT
2. *If failure continues:*
   - ESS BUS FEED ..... EMER
   - *If instrument lighting required:*
     - Map Light ..... ON
   - Radios ..... SELECT COM 1 (GNS 430)
   - BATT/ALT ..... OFF
   - STBY ALT ..... ON
   - EFIS BU ..... ON
   - Voltage ..... MONITOR
   - The following Main Bus powered equipment is inoperative:

COM 2	Landing and Taxi Lights
Intercom	CDI Lighting
Pitot Heat	Eng. Instrument Lighting
Flaps	Strobe Lights
Boost Pump	Position Lights
Analog Tach and MP	Low Oil Press. Light
Autopilot	Defrost Fan

   - *Prior to landing, if equipment powered from Main Bus is required:*
     - BATT/ALT ..... ON

STARTER ENGAGED LIGHT ILLUMINATED

1. BATT/ALT ..... OFF
2. Aircraft ..... LAND ASAP

AUTOPILOT MALFUNCTION

1. Trim/Autopilot Cut-out ..... PRESS AND HOLD
2. Autopilot Power Switch (Autopilot Control Head) ..... OFF
3. WING LVLR Switch (Right Console) ..... OFF
4. Trim/Autopilot Cut-out ..... RELEASE

RUNAWAY TRIM

1. Trim/Autopilot Cut-out ..... PRESS AND HOLD
2. TRIM Switch ..... OFF
3. Trim/Autopilot Cut-out ..... RELEASE

AIRBORNE EGRESS

1. Helmet Jacks ..... UNPLUG
2. Canopy Jettison Pins ..... REMOVE
3. Canopy ..... UNLATCH & PULL AFT
4. Canopy ..... PUSH UP (lower head)
5. Seat Belt ..... RELEASE
6. Aircraft ..... EGRESS

CO MONITOR ALARM

1. Power ..... REDUCE
2. Mixture ..... WELL LEAN OF PEAK
3. Cabin Heat (Both) ..... CLOSED
4. Fresh Air Vents (Both) ..... OPEN
5. CO Monitor ..... MONITOR READINGS
6. *If red light on CO Monitor remains illuminated:*
   - Airspeed ..... 80 KT MAX
   - Canopy ..... OPEN SLIGHTLY

AMPLIFIED EMERGENCY PROCEDURES

ENGINE FAILURES

ENGINE POWER LOSS DURING TAKEOFF

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

The first response to an engine failure after takeoff is to promptly lower the nose to maintain airspeed and to establish a glide. Pulling the prop control full aft may significantly reduce windmilling drag if oil pressure is available. In most cases, the landing should be made straight ahead with only small changes in direction to avoid obstructions. A turn back to the runway should not be attempted below 1,000 ft AGL, as the aircraft must be turned through more than 180° to align with the runway. The checklist procedures assume that sufficient time is available to secure the fuel and ignition systems prior to touchdown. Flaps should normally be fully extended prior to touchdown.

ENGINE POWER LOSS IN FLIGHT

Complete power loss is usually due to fuel interruption, if this is so, power will be restored when fuel flow is itself restored. The first action is to trim for best glide 95 - 115 KIAS, depending on weight, and decide if there is time to attempt restart or whether to immediately prepare for an emergency “Power Off” landing.

Select throttle CLOSED and prop control FULL AFT to reduce drag from the windmilling prop. The prop will continue to windmill, even if the speed is slowed to the stall with flaps UP, unless the engine has sustained internal damage. While it is possible to get the prop to stop if the aircraft is slowed just above the stall for about 2 minutes with flaps DOWN, throttle FULL OPEN, significant altitude is lost during this time. Flight testing showed that by the time the prop stops, the aircraft will be about 900 ft lower than it would have been if it had been gliding with the prop windmilling. Over 10,000 ft of further descent will be required before the improved glide performance with prop stopped would allow the aircraft to better the performance with prop windmilling. No attempt should be made to stop the prop unless the aircraft is at least 15,000 ft AGL. If the prop is stopped with an undamaged engine, except it to start turning again if the airspeed ever exceeds 95 KIAS.

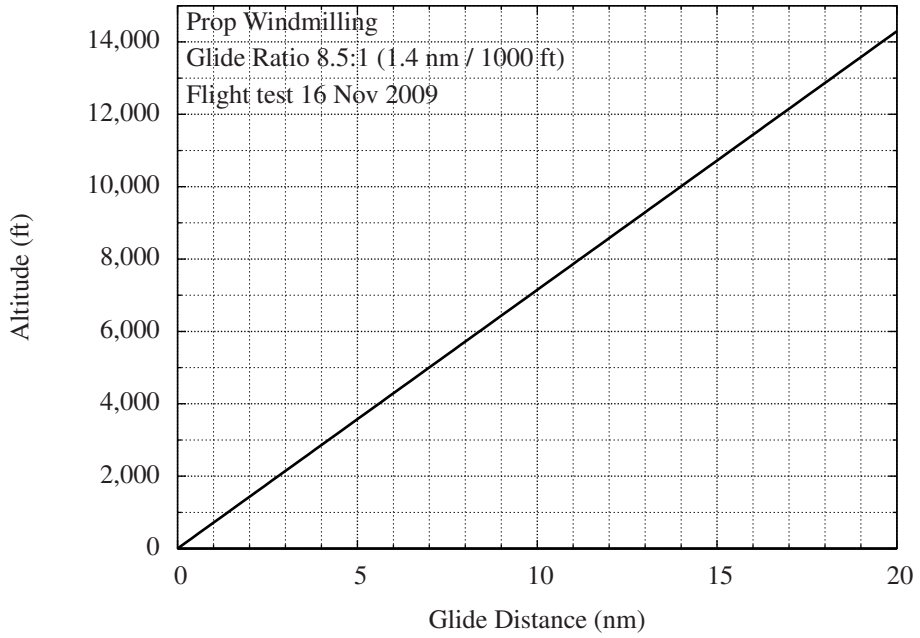

Figure 3.1: Engine-Out Glide Distance

If there is sufficient altitude to attempt to restart the engine, the procedure is to select Boost Pump ON, switch to the other tank (provided it has fuel), select mixture to RICH and Alternate Air ON. Check engine gauges for an indication of cause and if no fuel pressure is indicated change tank selection. When power is restored and at a safe altitude, select Alternate Air to OFF and turn Boost Pump OFF.

If engine still fails to restart and time permits, turn each ignition OFF, then ON to isolate a potentially bad ignition system. Try moving the throttle and/or mixture to different settings. This may restore power if mixture is too rich or too lean or if there is a partial fuel blockage. Try the other tank, as water in the fuel may take time to clear the system. Allowing the engine to windmill may restore power. If failure is due to water then fuel pressure will be normal. Empty fuel lines may take ten seconds to refill.

ROUGH RUNNING ENGINE

A slight engine roughness during flight may be caused by carbon or lead deposits fouling one or more spark plugs. This may be verified by selecting one ignition system OFF at a time. A significant power loss in single ignition operation is evidence of either spark plug fouling or an ignition system failure. Assuming that fouled spark plugs is the more likely cause, set cruise power and lean the engine to the recommended cruise fuel flows for several minutes. If the problem does not clear up after several minutes, determine if a richer mixture setting will result in smooth running.

A sudden engine roughness or misfiring may be evidence of an ignition problem. Switching one ignition system off in turn will identify which one is malfunctioning. Select different power settings and enrichen the mixture to determine whether continued operation on both ignition systems is possible.

If the problem continues, try different mixture and throttle settings. Select Boost Pump ON, change fuel tanks and select Alternate Air ON. Select each ignition system OFF then ON.

CAUTION

The engine may quit completely when one ignition is selected OFF, if the other ignition is faulty. If this occurs, to prevent a severe afterfire (unburnt fuel exploding in exhaust system), select the mixture to ICO, wait 10 seconds, then select the ignition back ON. Advance the mixture slowly until engine restarts.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility that there is a leak in the line from the engine to the oil pressure transducer manifold, or that the oil pressure relief valve has malfunctioned. The EIS 4000 will flash the ENGINE WARN light if the oil pressure decreases below limits. The LOW OIL PRESS light is driven by a different transducer on the same external manifold. If only one system indicates low oil pressure it is almost certainly a false indication.

A leak in the line to oil pressure transducer manifold is not necessarily cause for immediate precautionary landing, as an orifice in the line will prevent sudden loss of oil from the sump. However the aircraft should be landed at the nearest airport for inspection.

A total loss of oil pressure accompanied by increasing oil temperature may indicate an impending total engine failure. An off airfield landing while power is available is strongly recommended, especially in the presence of additional indicators such as a rise in engine CHT or oil temperature, oil and/or smoke apparent.

HIGH OIL TEMPERATURE

High oil temperature may be caused by the oil cooler door being closed too far. High oil temperature may also be due to a low oil level, obstruction in oil cooler (internal or external), damaged baffle seals, a defective gauge, or other causes. The EIS 4000 ENGINE WARN light will flash if the oil temperature becomes higher than 225°F. A steady rise in oil temperature is a particular sign of trouble.

Always land as soon as possible at an appropriate airport/airfield and investigate and be prepared for an engine failure. Open the oil cooler door. Keep the airspeed up to maximize airflow over the engine. Watch the oil pressure and CHT (Cylinder Head Temperature) gauge to identify impending failure.

FORCED LANDINGS

POWER OFF LANDING

The initial action is ALWAYS TRIM FOR BEST GLIDE, 95 to 115 KIAS, depending on weight. If engine power is not restored and time allows check for airports/strips available and notify of problem/intent if possible. Select Mixture to IDLE CUT OFF. Closing the throttle and pulling the prop control full aft will significantly reduce windmilling drag if oil pressure is available. Select Fuel Selector to OFF and Ignition Switches to OFF. Transmit a MAYDAY.

Identify a suitable field, planning an into wind landing. Try to be 1000 ft AGL at the end of the downwind leg to make a normal landing. Aim initially for the centre of the field (drag with a wind milling propeller may be higher than expected) and only lower final stages of flap when there is no doubt the field can be reached. Sideslip as required to lose excess altitude. Plan for slowest short field landing but above all else do not stall.

When committed to landing extend Flaps to FULL then select BATT/ALT switch to OFF. Seat belts should be tight and touchdown made at the slowest speed possible.

Add Power-On Landing and Ditching

FIRES

ENGINE FIRE IN FLIGHT

The key to dealing with an engine fire is to stop the flow of fuel to the engine compartment. Put the mixture to IDLE CUT-OFF, switch Fuel Selector OFF, and select Boost Pump OFF. Close cabin heat and air vents. All electrical power can be removed ahead of the firewall by selecting the ESS BUS FEED switch to EMER (to keep the avionics powered to allow a Mayday call) and the BATT/ALT switch to OFF.

ELECTRICAL FIRE

The EFIS internal battery will power it for 3 hours (if it is fully charged), so the aircraft's entire electrical system may be shutdown if required due to electrical smoke or fire. The EFIS will automatically shutdown 30 seconds after the electrical power is cut, but the automatic shutdown sequence may be cancelled by a momentary press of the left-most EFIS button. The Turn Coordinator is powered from the Battery Bus, and will continue to be powered even if the whole electrical system is shutdown.

Fight the fire with the fire extinguisher, if required. Close the vents prior to using the fire extinguisher, to increase its effectiveness. Open the vents after using the fire extinguisher to ventilate the cockpit.

OTHER

STATIC SOURCE BLOCKAGE

If erroneous readings of the static system instruments (airspeed, altimeter and rate of climb) are suspected, the alternate static source valve should be opened, thus supplying air to those instruments from inside the cockpit.

To avoid the possibility of large errors, the fresh air vents and cockpit heat should be closed. The maximum errors will be ???? Adjust the altitude and airspeed readings by the corrections shown in Section 5.

INADVERTENT ICING ENCOUNTER

1. Confirm pitot heat is selected ON.
2. Turn back or change altitude to obtain an outside air temperature that is less conducive to icing.
3. Increase RPM to minimize ice build-up on the propeller blades.
4. Plan a landing at the nearest airport. With extremely rapid ice build-up, select a suitable "off-airport" landing site.

5. Minimize flap extension if there is an ice build-up on the horizontal stabilizer, to reduce the risk of tail plane stall.
6. Use sideslip as required to improve forward visibility if the windscreen is obscured by ice.
7. Increase the approach speed by at least 10 kt, to reduce the risk of wing stall.

ALTERNATOR FAILURE

Alternator failure is identified by a low voltage indication from the EIS 4000, which will cause the ENG WARN light to flash.

The root fault may have been an over-voltage condition, in which case the over-voltage protection system will cause the ALT CB to trip, leading to a low voltage condition. While it is possible to put the alternator back on line by resetting the ALT CB, this is not recommended unless necessary for safety of flight.

The BATT/ALT switch should be selected to BATT, then BATT + ALT to attempt to reset the alternator. If the alternator cannot be brought back on line the Standby Alternator can be used to provide up to 8 amps of power. Select the ESS BUS FEED to EMER, which provides power to the Essential Bus directly from the Battery Bus, bypassing the Battery Contactor. The Main Bus can then be shed by selecting the BATT/ALT switch to OFF. The EFIS will continue to run using its internal battery, however it can be restored to aircraft power by selecting the EFIS BU switch to ON. The loads on the Essential Bus and Battery Bus total less than 8 amps.

The following systems are unpowered in this configuration:

- Boost Pump
- Pitot Heat
- Landing Light
- Taxi Light
- Position Lights
- Strobe Lights
- Engine Instrument Lighting (Map light on goose neck may be used to illuminate instrument panel)
- CDI Lighting
- Flaps
- Starter
- Wing Leveler
- Microair 760 Com (COM 2)
- Intercom
- Low Oil Pressure Warning Light
- Analog Tach and MP
- Defrost Fan

The BATT/ALT switch may be selected to ON prior to landing to restore power to all systems.

STARTER ENGAGED LIGHT ILLUMINATED

The STARTER ENGAGED caution light illuminates whenever the starter is engaged. If this light remains illuminated after the starter switch has been released, it indicates that the starter relay is stuck closed, and the starter is still powered. Continuing to supply power to the starter will eventually result in complete loss of electrical system power, substantial starter damage, and possible damage to other electrical system components. If the starter is stuck closed, the only way to remove power from the starter is to select the BATT/ALT switch to OFF.

WING-LEVELER MALFUNCTION

Press the red Wing-Leveler/Trim Disconnect button on the control stick, and hold it. This removes power from the servo, and should cause it to release. Select the Wing-Leveler Power switch OFF (RH console), then release the Wing-Leveler/Trim Disconnect button.

RUNAWAY TRIM

Press the red Wing-Leveler/Trim Disconnect button on the control stick, and hold it. Select the Trim Power switch OFF (RH console), then release the Wing-Leveler/Trim Disconnect button.

HIGH CO

Decrease power. Set mixture well lean of peak (stops CO production). Close both cabin heat controls. Open the vents. Monitor the CO Monitor readings. Immediate action is required if the red light is illuminated. Consider slowing the aircraft and cracking the canopy open if there is not an immediate decrease in the CO levels.

LANDING WITH NO ELEVATOR CONTROL

Add this item after in-flight assessment

SPIN RECOVERY

Upright spin - The upright spin recovery procedure is:

1. Retard throttle to idle.
2. Retract flaps, if extended.
3. Place ailerons to neutral position.
4. Apply and hold full rudder opposite to spin direction. If the visibility of the ground does not allow the spin direction to be determined, use the turn needle — depress the rudder on the opposite side to that of the turn needle.
5. Just after the rudder reaches the stop, move the stick briskly forward far enough to break the stall.
6. Hold these control inputs until rotation stops. Premature relaxation of the recovery control inputs may prevent spin recovery.
7. As rotation stops, neutralize the rudder, and recover from the dive, using g as required to stay below V_{NE} without exceeding the load factor limit. Aggressive use of g early in the recovery will minimize the airspeed build-up.

NOTE

The inverted spin recovery procedure has not been validated via flight test.

Inverted spin - The inverted spin recovery procedure is:

1. Retard throttle to idle.
2. Retract flaps, if extended.
3. Place ailerons to neutral position.
4. Confirm spin direction by reference to the turn needle — the turn needle moves to the side of the spin direction. Apply and hold full rudder opposite to spin direction.
5. Just after the rudder reaches the stop, move the stick briskly **aft** far enough to break the stall.
6. Hold these control inputs until rotation stops. Premature relaxation of the recovery control inputs may prevent spin recovery.
7. As rotation stops, neutralize the rudder, and recover from the dive, using g as required to stay below V_{NE} without exceeding the load factor limit. Aggressive use of g early in the recovery will minimize the airspeed build-up.

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SECTION 4

NORMAL PROCEDURES

TABLE OF CONTENTS

GENERAL

Pilots should familiarize themselves with the procedures in this section to become proficient with the normal safe operation of the aircraft.

AIRSPEEDS FOR NORMAL OPERATION

(Red text indicates provisional information, based on the RV-8A Aircraft Performance Report published by the CAFE Foundation.)

V_R	Takeoff rotate speed	60
	Normal Takeoff, speed at 50 ft	70
	Short Field Takeoff, speed at 50 ft	TDB
V_Y	Best rate of climb speed, Sea Level	102 KIAS
V_X	Best angle of climb speed, Sea Level	65 KIAS
V_{BG}	Best glide angle	115 KIAS
V_A	Manoeuvring speed	120 KIAS
V_{S_0}	Stall Full Flap	51 KIAS
V_S	Stall Flaps UP	65 KIAS
V_{FE}	Maximum speed with flaps extended	87 KIAS
V_{REF}	Final approach speed (full flap)	70
V_{REF0}	Final approach speed (zero flap)	80
	Demonstrated crosswind velocity	12

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PREFLIGHT INSPECTION

COCKPIT

1. Ignition Switches ..... OFF
2. BATT/ALT ..... BATT
3. Fuel Gauges ..... CHECK
4. Fuel Selector ..... LOWEST TANK
5. Landing & Taxi Lights ..... CHECK A/R
6. Flaps ..... EXTEND
7. BATT/ALT ..... OFF
8. Alternate Static Source Hose ..... SECURE
9. Rear Stick ..... A/R
10. Rear Seat Belts ..... A/R
11. Rear Cockpit Side Pockets ..... A/R
12. ELT Antenna ..... SECURE
13. Rear Baggage Area ..... SECURE
14. ELT ..... ARM

LEFT WING

1. Flap Pushrod End ..... SECURE
2. Aileron Pushrod ..... SECURE
3. Aileron Hinge ..... SECURE
4. Nav Light Cover ..... SECURE
5. Taxi Light ..... SECURE
6. Pitot Tube ..... CLEAR
7. Fuel Quantity ..... VISUAL CHECK
8. Fuel Tank Drain ..... H_2O CHECK
9. Gascolator Drain ..... H_2O CHECK

FORWARD FUSELAGE

1. L Tire & Wheel Pant ..... CHECK COM
2. Antenna ..... SECURE
3. Fuel vents ..... CLEAR
4. Exhaust Pipes ..... SHAKE ENDS
5. Cowl ..... SECURE
6. Air Inlets ..... CLEAR
7. Air Filter ..... CHECK
8. Spinner ..... SECURE
9. Prop ..... CHECK
10. Oil Quantity ..... CHECK
11. Oil Door ..... SECURE
12. Fwd Baggage ..... ITEMS CHECK
13. Windshield ..... CLEAN
14. Transponder Antenna ..... SECURE
15. R Tire & Wheel Pant ..... CHECK

RIGHT WING

1. Fuel Tank Drain ..... H_2O CHECK
2. Fuel Quantity ..... VISUAL CHECK
3. Landing Light ..... SECURE
4. Nav Light Cover ..... SECURE
5. Aileron Hinge ..... SECURE
6. Aileron Pushrod ..... SECURE
7. Flap Pushrod End ..... SECURE

RIGHT REAR FUSELAGE

1. GPS Antenna ..... SECURE
2. Canopy ..... CHECK
3. Static Port ..... CLEAR

EMPENNAGE

1. Empennage Fairing Top ..... SECURE
2. Empennage Fairing Bottom ..... SECURE
3. Empennage Fairing ..... SECURE AROUND ELEV.

LEFT REAR FUSELAGE

1. Static Port ..... CLEAR
2. Canopy ..... CHECK

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IN-FLIGHT CHECKLISTS

BEFORE START

1. Seat Belts ..... SECURE
2. Controls ..... FREE & CORRECT
3. Throttle ..... FULL OPEN
4. Prop ..... LO RPM
5. Mixture ..... ICO
6. Alternate Air ..... CLOSED
7. Oil Cooler Door ..... A/R
8. Ignition Switches ..... OFF
9. All Switches and Avionics ..... OFF or NORM
10. ESS BUS FEED ..... EMER
11. ENG INST ..... ON
12. TRIM ..... FRONT or FRONT + REAR
13. Trim ..... CHECK
14. Trim Cut-out ..... CHECK
15. EIS 4000 ..... ENTER FUEL QTY
16. BATT/ALT ..... BATT + ALT
17. ESS BUS FEED ..... NORM
18. Engine Warn Light ..... CHECK ON
19. Oil Press Light ..... CHECK ON
20. Nav Lights ..... A/R

ENGINE START (Cold /Warm)

1. Fuel Selector ..... LEFT or RIGHT
2. IGNITION, MAG ..... ON
3. Starter Switch ..... ENABLE
4. Boost Pump ..... ON
5. Mixture ..... FULL RICH 4-5 SEC - COLD
   ..... FULL RICH 2-3 SEC WARM
6. Mixture ..... ICO
7. Boost Pump ..... OFF
8. Throttle ..... 1/2" OPEN
9. Call ..... CLEAR
10. Starter ..... ENGAGE
11. IGNITION, ELEC ..... ON (after two blades)

CAUTION

Do not select Electronic Ignition ON until the engine has turned two blades. Failure to observe this restriction may result in engine kick-back and starter damage.

12. Mixture ..... RICH WHEN ENG FIRES
13. Engine ..... 1000 RPM
14. Oil Pressure ..... CHECK (30 s)

ENGINE START (Hot)

1. Fuel Selector ..... LEFT or RIGHT
2. IGNITION, MAG ..... ON
3. Starter Switch ..... ENABLE
4. Mixture ..... ICO
5. Boost Pump ..... ON
6. Call ..... CLEAR
7. Starter ..... ENGAGE
8. IGNITION, ELEC ..... ON (after two blades)

CAUTION

Do not select Electronic Ignition ON until the engine has turned two blades. Failure to observe this restriction may result in engine kick-back and starter damage.

9. Mixture ..... RICH WHEN ENG FIRES
10. Throttle ..... RETARD
11. Engine ..... 1000 RPM
12. Oil Pressure ..... CHECK (30 s)
13. Boost Pump ..... OFF

AFTER START

1. OIL PRESS Light ..... OUT
2. STARTER ENGAGED Light ..... OUT
3. STARTER Switch ..... OFF & Guarded
4. FLAPS ..... UP
5. Voltage ..... CHECK
6. Fuel Pressure ..... CHECK
7. Avionics ..... ON
8. TURN COORD ..... ON
9. WING LVLR ..... ON
10. CO Monitor Self Test ..... CHECK
11. ATIS/Clearance ..... OBTAIN
12. Altimeter ..... SET

TAXI

1. Brakes ..... CHECK
2. Flight Instruments ..... CHECK
3. *For IFR or Night Operations ...*
   - Autopilot Override ..... CHECK

RUNUP

1. Fuel Selector ..... CHANGE TANKS
2. Mixture ..... RICH
3. Throttle ..... 1800 RPM
4. Prop ..... CYCLE
5. IGNITION, ELEC ..... OFF/ON
6. IGNITION, MAG ..... OFF/ON
7. *For IFR or Night Operations ...*
   - ESS BUS FEED ..... EMER
   - BATT/ALT ..... OFF
   - STBY ALT ..... ON
   - Voltage ..... CHECK
   - STBY ALT ..... OFF
   - BATT/ALT ..... BATT + ALT
   - ESS BUS FEED ..... NORM
8. Voltage ..... CHECK
9. Throttle ..... IDLE CHECK
10. Mixture ..... LEAN

BEFORE TAKEOFF

1. SPOT ..... TRACK MODE
2. Seat Belts ..... SECURE
3. Flight Controls ..... FREE
4. Trims ..... SET
5. Flaps ..... SET
6. Prop ..... FULL FWD
7. Ignition Switches ..... BOTH ON
8. Alternate Air ..... CLOSED
9. Oil Cooler Door ..... A/R
10. Radios/Navaids ..... SET
11. Transponder ..... CODE SET + ALT
12. Altimeter ..... SET/CHECK
13. Engine Instruments ..... CHECK
14. MSTR WARN Light ..... OUT
15. Fuel Selector ..... FULLEST TANK
16. T/O Brief ..... COMPLETE

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17. Canopy ..... LATCHED
18. PITOT HEAT ..... A/R
19. LDG LT & TAXI LT ..... ON or FLASH
20. NAV/STR ..... NAV + STR
21. Mixture ..... RICH
22. Boost Pump ..... ON
23. Compasses ..... CHECK

AFTER TAKEOFF

1. Flaps ..... UP
2. LDG LT & TAXI LT ..... A/R
3. Boost Pump ..... OFF
4. Power ..... 2500 rpm/Full Throttle

CRUISE

1. Power ..... SET
2. Mixture ..... SET
3. Fuel ..... CHECK
4. Oil Cooler Door ..... A/R

AEROBATICS

1. Fuel ..... LEFT TANK
2. Mixture ..... RICH
3. Harness ..... TIGHT
4. Loose Items ..... STOW
5. Area ..... CLEAR

DESCENT

1. Parking Brake ..... OFF
2. Altimeter ..... SET
3. Approach ..... BRIEF
4. Oil Cooler Door ..... A/R
5. LDG LT & TAXI LT ..... A/R

BEFORE LANDING

1. Seat Belts ..... SECURE
2. Fuel Selector ..... FULLEST TANK
3. Mixture ..... RICH
4. Boost Pump ..... ON
5. Prop ..... FULL FWD
6. Flaps ..... A/R

AFTER LANDING

1. PITOT HEAT ..... OFF
2. Mixture ..... LEAN
3. Oil Cooler Door ..... OPEN
4. Boost Pump ..... OFF
5. External Lights ..... A/R
6. Transponder ..... STBY
7. Flaps ..... 90% DOWN

SHUTDOWN

1. Avionics ..... OFF
2. Throttle ..... IDLE
3. Dead Mag ..... CHECK
4. Mixture ..... ICO
5. Ignition Switches ..... BOTH OFF
6. Fuel Selector ..... OFF
7. All Switches ..... OFF or NORM
8. SPOT ..... OFF

EIS 4000

CHANGE FUEL QUANTITY TO FULL FUEL

1. L and R Buttons . . . . . PRESS AND HOLD
2. INC and DEC Soft Keys . . . . . PRESS (to set 42 USG)
3. NEXT Soft Key . . . . . PRESS (to return to normal display)

CHANGE FUEL QUANTITY TO ANY VALUE

1. L and R Buttons . . . . . PRESS AND HOLD
2. INC or DEC Soft Keys . . . . . PRESS (to set desired quantity)
3. NEXT Soft Key . . . . . PRESS (to return to normal display)

SET ALARM LIMITS

1. L and C Buttons . . . . . PRESS AND HOLD FOR 10S
2. UP or DOWN Soft Keys . . . . . PRESS (to modify parametres)
3. NEXT Soft Key . . . . . PRESS (to advance to next parametre)
4. NEXT Soft Key . . . . . PRESS REPEATEDLY (to return to normal display)

ACCESS CONFIGURATION MENUS

1. C and R Buttons . . . . . PRESS AND HOLD FOR 10S
2. UP or DOWN Soft Keys . . . . . PRESS (to modify parametres)
3. NEXT Soft Key . . . . . PRESS (to advance to next parametre)
4. EIS Power . . . . . OFF-ON (to return to normal display)

LEANING MODE

1. Centre and R Buttons . . . . . PRESS AND HOLD

GNS 430W

REVIEW FLT PLAN LATS & LONGS

1. FPL Page . . . . . SELECT
2. Cursor . . . . . ACTIVATE
3. Waypoint Name . . . . . SELECT
4. ENT Button . . . . . PUSH (to see wpt info)
5. Lat/Long . . . . . REVIEW
6. ENT Button . . . . . PUSH (to move to next wpt)

SPOT

START TRACKING

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. Footprint Button . . . . . PRESS AND HOLD (until light flashes)

SEND CHECK-IN MESSAGE

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. Checkmark/OK Button . . . PRESS AND HOLD (until light flashes)

SEND CUSTOM MESSAGE

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. Text Bubble Button . . . . . PRESS AND HOLD (until light flashes)

SEND REQUEST FOR ASSISTANCE (non life threatening)

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. Holding Hands Button . . . PRESS AND HOLD (until light flashes)

SEND EMERGENCY REQUEST FOR ASSISTANCE

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. SOS Button . . . . . LIFT TAB
3. SOS Button . . . . . PRESS AND HOLD (until light flashes)

CANCEL EMERGENCY REQUEST FOR ASSISTANCE

1. Power Button . . . . . PRESS AND HOLD (until lights flash)
2. SOS Button . . . . . LIFT TAB
3. SOS Button . . . . . PRESS AND HOLD (until light flashes red)
4. SPOT . . . LEAVE POWERED (until SOS button stops flashing red)

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AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

The following items should receive particular emphasis during the preflight inspection.

Propeller — Check the amount of free play in the propeller blades, moving the blade tips in the plane of rotation. 1/8" of free play is acceptable. 2 degrees of blade rotation angle free play is acceptable. Check that the stainless steel erosion strips on the outer portion of the blade leading edges is secure. The inner PU-strip self-adhesive shield may be missing, but should be replaced within 10 hours.

Check the fibreglass blade covers for cracks. Cracks along the leading edge and at the edge of the erosion shield are acceptable, as long as the erosion shield is not loose. Cracks in the painted surface are acceptable, as long as no moisture can enter the wooden blade core. Blisters or delaminations up to one square inch are acceptable. Cracks in the stainless steel erosion shield require immediate repair.

Fuel Tank Vents — The fuel vent plugs are easily missed, as the fuel vents are below the forward fuselage. Ensure that they are removed.

Flaps

CAUTION

With the flaps fully extended, there is a risk that someone standing behind the wing could press on flap trailing edge, and force the flaps to move far enough that the forward edge of the upper flap skin could move aft of the aft edge of the upper wing skin. If this condition is not detected significant flap and/or upper wing skin damage may occur when the flaps are retracted. During the preflight inspection, carefully inspect the transition between the upper wing skin and the flaps to confirm that the forward edge of the upper flap skin has not come out from under the aft edge of the upper wing skin. When boarding the aircraft after the preflight inspection, be careful not to push forward on the trailing edge of the flap.

The risk of forcing the flaps far enough to trigger this issue is mitigated by slightly retracting the flaps after landing.

Tires — The tires are almost completely hidden beneath the wheel pants, so it can be difficult to see if the tire pressure is low. Carefully check the clearance between the tire sidewalls and the wheel pant openings.

Pitot-Static System — Ensure that the pitot cover is removed from the pitot tube, which is hidden beneath the left wing. The static system hose connected to the alternate static valve is easily knocked loose (mounted on the side of the right landing gear box in the cockpit). Check it for security, and be careful not to knock that area with the feet.

COCKPIT ENTRY AND EGRESS

Front Seat Entry — Stand on the left wing walk area. Place the right foot on the gold coloured wing spar centre section to the right of the front seat cushion. Support the weight of the upper body by placing the hands on the sides of the cockpit, or on the tubular structure behind the front seat back. Place the left foot on the cockpit floor ahead of the seat cushion.

Rear Seat Entry — Stand on the left wing walk area. Place a towel on the rear seat cushion. Hang onto the tubular framework just behind the front seat back. Place the right foot on the seat cushion. Place the left foot on the floor ahead of the seat. Place the left hand on the canopy rail. Place the right foot on the floor ahead of the seat. Sit down.

CAUTIONS

Flaps — Extend the flaps 90% for cockpit entry and egress, to ensure that the flaps are not stepped upon.

Front Seat — Do not use the edge of the windscreen as a handhold when entering or exiting the cockpit. The windscreen fairing that extends past the edge of the windscreen may be damaged if it is subjected to too much force. Be careful to not kick the intercom system volume knobs on the lower edge of the instrument panel with the feet. Be careful to not kick the alternate static valve on the inboard side of the right landing gear box.

Rear Seat — Warn all passengers to be careful not to lean back against the sliding canopy when they enter or leave the aircraft.

STARTING ENGINE

In cold weather, the engine compartment temperature falls rapidly following engine shutdown, and the injector nozzle lines remain nearly full of fuel. Cold weather starting procedures are therefore relatively simple, with highly predictable results. However, in extremely hot weather, engine compartment temperatures increase rapidly following engine shutdown, and fuel in the lines will vapourize and escape into the intake manifold.

Hot weather starting procedures depend considerably on how soon the next engine start is attempted. Within the first 20 to 30 minutes after shutdown, the fuel manifold is adequately primed, and the empty injector nozzle lines will fill before the engine dies. However, after approximately 30 minutes, the vapourized fuel in the manifold will have nearly dissipated, and some slight "priming" could be required to refill the nozzle lines and keep the engine running after the initial start. Starting a hot engine is facilitated by advancing the mixture control promptly to one third open when the engine fires, and then smoothly to full rich as power develops.

Should the engine tend to die after starting, temporarily select the boost pump ON and adjust throttle as necessary to keep the engine running.

In the event of over-priming or flooding, select the boost pump OFF, open the throttle from one half to full open, and continue cranking with the mixture at CUT-OFF. When the engine fires, smoothly advance the mixture control to FULL RICH and retard the throttle to the desired idle speed.

If the engine is under-primed (most likely in cold weather with a cold engine) it will not fire at all, and additional priming will be necessary.

After starting, if the oil pressure gauge does not begin to show oil pressure within 30 seconds in the summertime, and 60 seconds in very cold weather, stop the engine and investigate.

NOTE

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

TAXIING

AUTOPILOT

Pre-Flight Test — A preflight override and disengagement test should be conducted if the autopilot is to be used in IMC or at night.

1. WING LVLR — ON (Right Console)
2. Autopilot — ON
3. H NAV and V NAV — Engage
4. Controls — Override. Confirm that the autopilot servo clutches will slip to allow the stick to be moved in both axis when the autopilot is engaged.
5. Trim/Wing-Leveler Disconnect Switch on control stick — Press and Release. Confirm both servos release while disconnect switch is pressed. Release the Disconnect switch.

CONTROL USE DURING TAXIING

When taxiing, it is important that aileron and elevator be used as appropriate to the wind direction (see Figure 4.1. Taxiing over loose gravel should only be done at low engine speed to avoid abrasion and stone damage to propeller tips.

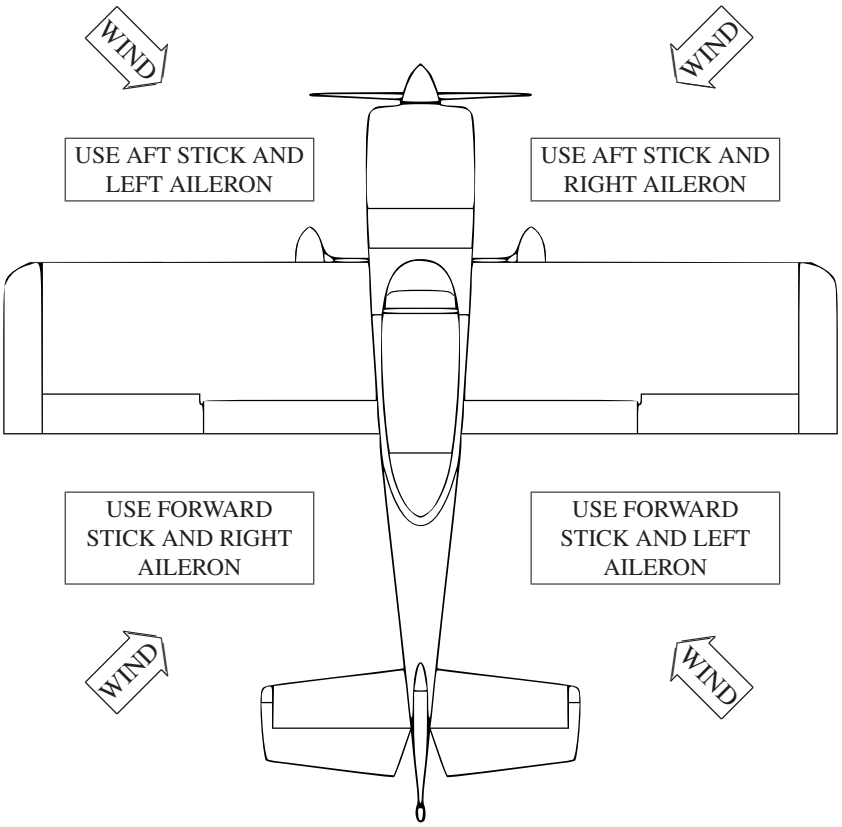

Figure 4.1: Control Use During Taxiing

BEFORE TAKEOFF

WARM-UP

Since the engine is closely cowled, care should be taken to avoid over-heating during prolonged engine operation on the ground. Long periods of idling at low RPM may caused fouled spark plugs. It is advisable to lean aggressively while at low power on the ground. If the mixture is leaned, it must be leaned far enough that the engine would run noticeably rough during the higher power setting of the ignition check.

IGNITION CHECK

The ignition check should be done at 1800 RPM as follow:

1. Select the IGNITION, MAG switch to OFF. There should be approximately 20 rpm drop. The engine should run smoothly on the Light Speed electronic ignition.
2. Select the IGNITION, MAG switch to ON.

3. Select the IGNITION, ELEC switch to OFF. The RPM drop should be approximately 70 RPM, and the engine should run smoothly on the PMag electronic ignition.
4. Pull the PMag CB, to force the PMag to rely on its own internal alternator to provide ignition power, confirming proper operation on this power source.
5. Reset the PMag CB.
6. Select the IGNITION, ELEC switch to ON.

ELECTRICAL SYSTEM CHECK

The following should be conducted prior to night or IFR flight:

1. Select ESS BUS FEED switch to EMER.
2. Select BATT/ALT switch to OFF. The low voltage condition should cause the"ENGINE MONT." light to flash, and the EIS 4000 should switch to a page showing the voltage. The GNS 430W should still be operating, indicating that the Essential Bus is powered.
3. Select STBY ALT switch to ON.
4. Increase engine speed to 1800 rpm.
5. Check the Voltage — it should be approximately 12.8 volts, indicating that the standby alternator is operative.
6. Select STBY ALT switch to OFF
7. Select BATT/ALT switch to BATT + ALT
8. Select ESS BUS FEED switch to NORM.

STABILITY AND CONTROL

STATIC LONGITUDINAL STABILITY

The aircraft has an unusually large range between the forward and aft CG limits, which leads to substantial differences in stability and control characteristics between forward and aft CG loadings. At forward CG, the stick forces are relatively high, and the aircraft has strong static longitudinal stability. The stick forces required for a given manoeuvre decrease significantly as the CG moves aft, and the static longitudinal stability becomes much weaker.

The low speed, power off, stick free static longitudinal stability is neutral to slightly negative at the aerobatic aft CG limit. If the aircraft is trimmed at a particular speed, and the speed is changed, the aircraft has no natural tendency to return to the trimmed speed.

The stick free static longitudinal stability is degraded as engine power is increased, and becomes noticeably negative at high power at low speed at aft CG. If the aircraft is trimmed for a climb speed, and the speed is reduced, a push force is needed to stabilize at a lower speed, and the speed will reduce to the stall if the stick is released. At higher speeds, as in for cruise or descent, the stick free static longitudinal stability is positive, even at aft CG and high power.

WARNING

The aircraft will diverge from the trimmed speed at high power at low speed at aft CG. It will decelerate to the stall if left to its own devices. Particular attention should be paid to airspeed control during climbs in IMC conditions, or at climbs at low altitude in any weather conditions.

TAKEOFF

POWER CHECK

It is important to check full-throttle engine operation early in the takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for rejecting the takeoff.

Full throttle operation over loose gravel is especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly, to allow the aircraft to start rolling before high RPM is developed. The tail should be kept down longer than normal to increase the propeller ground clearance.

Prior to takeoffs from airfields above 3,000 feet elevation, the mixture should be leaned to the value on the placard located ahead of the throttle quadrant.

FLAP SETTING

Normal takeoffs are performed with flaps retracted. Short field takeoffs are performed with one-third flap, which is set by deflecting the ailerons fully, and extending the flaps so that the flap angle matches the angle of the down aileron.

CROSSWIND TAKEOFF

Takeoffs have been demonstrated with crosswinds of 12 knots from the left and 8 knots from the right, with flaps retracted.

CLIMB

Note the highest EGT on the bottom right corner of the EIS 4000 default display page immediately after selecting climb power following take-off. Reduce the mixture as required during climb to keep the highest EGT close to this value without exceeding it.

If there are obstacles to clear, climb at V_X (65 KIAS at sea level and 77 KIAS at 10,000 ft). Use full throttle and 2700 RPM, with mixture adjusted to maintain the target EGT and flaps retracted.

If maximum rate of climb is needed, use the climb speed from Figure 5.16, full throttle and 2700 RPM, with mixture adjusted to maintain the target EGT and flaps retracted.

Normal climbs should be made at the speed from Figure 5.22, using full throttle and 2700 RPM.

CRUISE

Normal cruise power is between 55% and 75% power. Adjust the mixture to achieve the fuel flow given in Figure 5.23. Adjust the oil cooler door to obtain an oil temperature of approximately 190°F.

STALLS AND SPINS

STALLS

The aircraft has very little natural stall warning in wings level and 30° bank stalls. There is a small amount of buffet approximately one kt prior to the stall. The nose drops at the stall. A small wing drop may occur if the ball is not centred. There is a sharp left wing drop at stalls with high power settings.

There is significant, progressively increasing aerodynamic buffet prior to stalls with 2g or higher load factor.

SPINS

Complete this section following flight test. Add info on susceptibility to inadvertent spin, intentional spin entry procedure, spin recovery procedure, altitude loss during spin recovery and any relevant info on inverted spins.

There is insufficient nose up elevator authority to keep in the aircraft in a spin at mid or forward CG with the power at idle. The angle of attack, pitch rate and roll rate are oscillatory. If pro-spin controls are held, the IAS, load factor and rotation rate increase, indicating a spiral dive. One wing may stall during one of the pitch rate oscillations, leading to a very sharp snap roll.

Caution

If the IAS increases during a spin, recover immediately, as the aircraft is in a spiral dive. If pro-spin controls are held, the aircraft may do a violent high g snap roll which could damage the structure.

AEROBATICS

Refer to manoeuvring speed and weight and balance limitations when contemplating aerobatics. The manoeuvring speed is the highest speed at which full and abrupt control can be applied without exceeding design loads. This is not the highest permissible aerobatic entry speed, but control inputs must be limited to less than full at any speed above manoeuvring speed.

The entry speeds for some manoeuvres can vary over a wide range due to the large ratio of maximum speed to stall speed. For vertical manoeuvres (e.g. loops, Immelmann turns and Cuban eights) entry speed has an inverse relationship to G forces required to complete the manoeuvre. An entry speed at lower speeds will require a higher G pull up than for entry near top end of speed range.

WARNING

Excessive speed build up can occur very quickly, particularly in a dive. The RV-8 is a pilot limited aircraft due to the light control forces and aerodynamic cleanliness — it is the pilot's responsibility to not overstress the aircraft. The stick forces vary considerably with CG position — stick forces at aft CG are much lighter then stick forces at forward CG.

NOTE

The following list of manoeuvres are approved when operating at weights less than 703.1 kg (1550 lb) and with the CG in the aerobatic envelope.

Manoeuvre	Entry Speed (KIAS)
Upright spins	55 (at stall)
Loops, Cuban eights	100 – 180
Immelmann turns	130 – 180
Aileron Rolls, Barrel rolls	105 – 165
Hammerheads	155 – 165
Vertical rolls	155 – 165
Split–S	85 – 120

DESCENT

Close the oil cooler door during descent to keep the oil warm.

NOTE

Attempt to manage power and airspeed during descent to keep the CHT cooling rate no greater than 50°F/min to avoid shock cooling, preferably 30°F/min or less.

BEFORE LANDING

LANDING

Landings may be made with any flap angle. Landings in strong crosswind should be made with flaps retracted. Landings have been demonstrated with winds of 12 knots from the left and 8 knots from the right, with flaps retracted. Wheel landings are preferred, but three-point landings may be made if a shorter landing distance is required.

SHUTDOWN

CAUTION

With the flaps fully extended, there is a risk that someone standing behind the wing could press on the flap trailing edge, and force the flaps to move far enough that the forward edge of the upper flap skin could move aft of the aft edge of the upper wing skin. If this condition is not detected significant flap and/or upper wing skin damage may occur when the flaps are retracted. To reduce the probability of this happening, the flaps should not be left in the fully extended position on the ground. Instead, leave them approximately 90% extended.

COLD WEATHER OPERATION

Engine Preheat

The engine should be preheated prior to start if the temperature has been below 0°C. The Reiff preheater plug is clamped to the back of the rear baffle and can be accessed through the oil filler door. An engine blanket is required to allow the 300W preheat to increase the engine temperature to adequate levels if the temperature is -15°C or colder.

Wheel Pants

The wheel pants must be removed for operations in loose snow, as snow will collect in the pants. The heat from the brakes will melt snow and the resulting water will later freeze on the brakes.

HOT WEATHER OPERATION

Hot weather operations section to be added.

AUTOPILOT

Altimeter Setting

The autopilot does not have a means to directly enter an altimeter setting. Instead, the current altitude is entered whenever the "BARO SET" message is displayed, which allows the system to determine the needed offset to the pressure altitude sensed from the static input. The "BARO SET" message will appear following initial power up and any time a selected altitude is entered.

The autopilot will normally engage in ALT HLD mode, with the current altitude as the reference. The ALT HLD reference altitude may be adjusted by pressing the "V MODE" button until "ALT ADJ UP/DN" is displayed, then turning the rotary knob. CW rotation increases the altitude by 5 ft/click, and CCW rotation decreases it by 5 ft/click. Alternatively, the red AP/TRIM Disconnect switch on the control stick may be pressed and held for a minimum of 5 seconds, which releases the servos and allows the pilot to manoeuvre to the desired altitude, which resets the ALT HLD reference.

ALT HLD Performance

ALT HLD mode works well in straight and level flight, but up to 200 ft altitude will be lost in turns at 30° bank at forward CG. Performance at aft CG is much better, with 50 ft of altitude loss typically seen. The pitch servo should be disengaged and the altitude controlled manually during turns with more than 30° of heading change when flying IFR at forward CG. Alternatively, when following radar vectors, the red AP/TRIM Disconnect switch on the control stick may be pressed and held while the aircraft is manually manoeuvred to the new heading. The current course and altitude will be maintained once the disconnect switch is released.

NOTE

The autopilot lateral mode will switch to CRS when the red AP/TRIM Disconnect switch on the control stick is pressed and held.

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SECTION 5

PERFORMANCE

TABLE OF CONTENTS

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INTRODUCTION

Most of the information in the Performance Section is preliminary, based on analysis of data from Van's Aircraft or the CAFE Foundation. The section will be completely revised once performance flight testing has been completed.

TEMPERATURE CONVERSION CHART

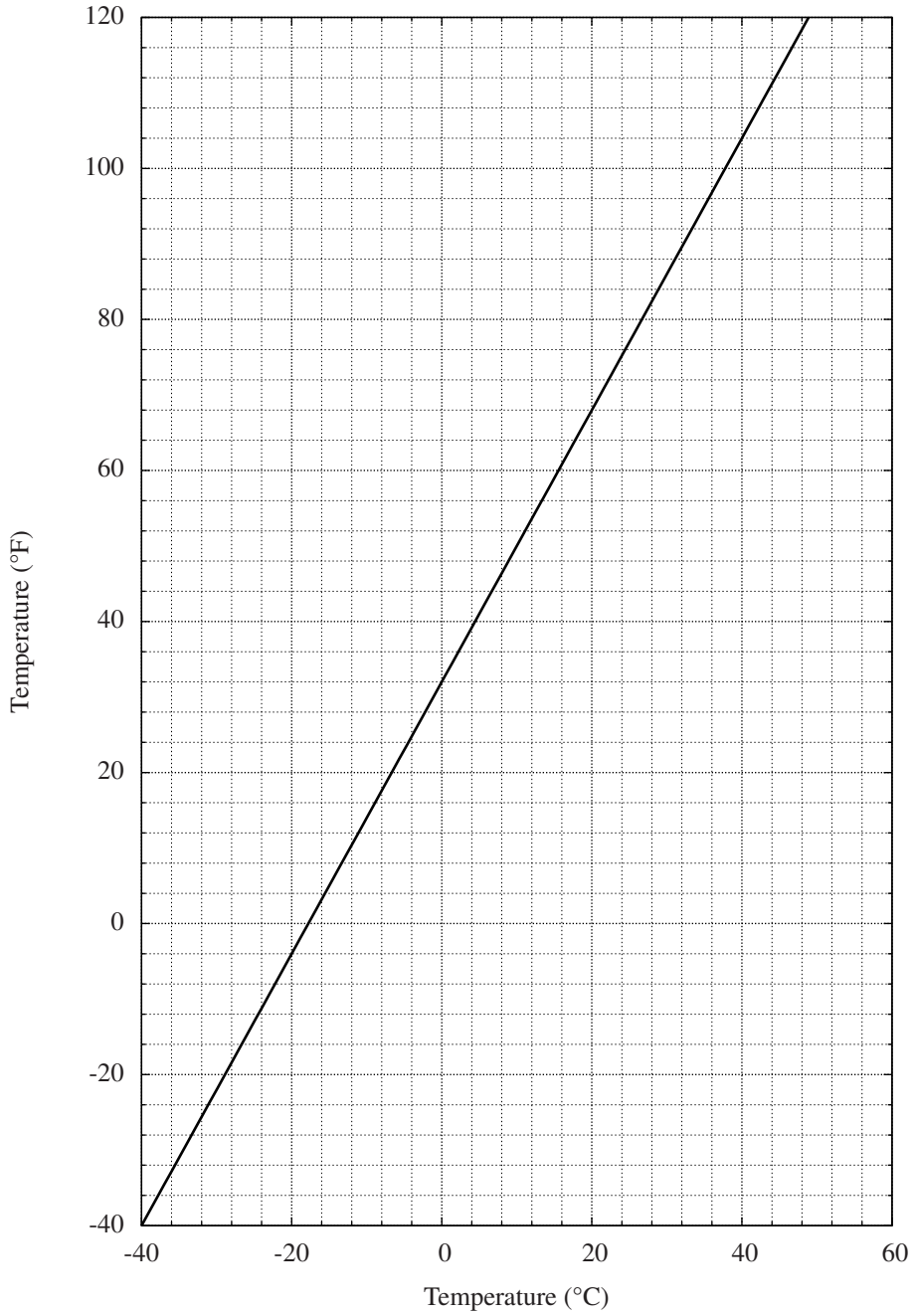

Figure 5.1: Temperature Conversion Chart

WEIGHT CONVERSION CHART

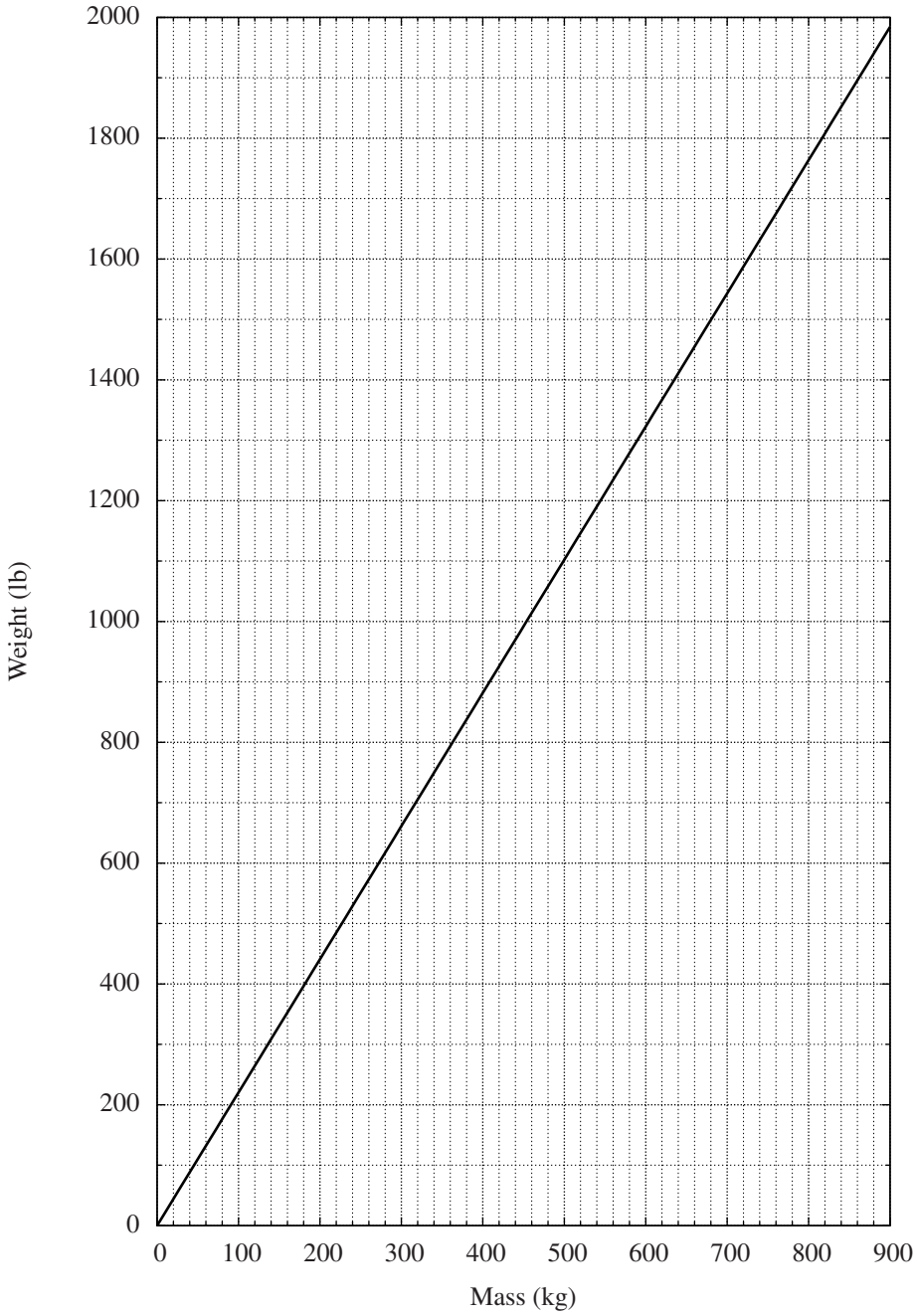

Figure 5.2: Weight Conversion Chart

VOLUME CONVERSION CHART

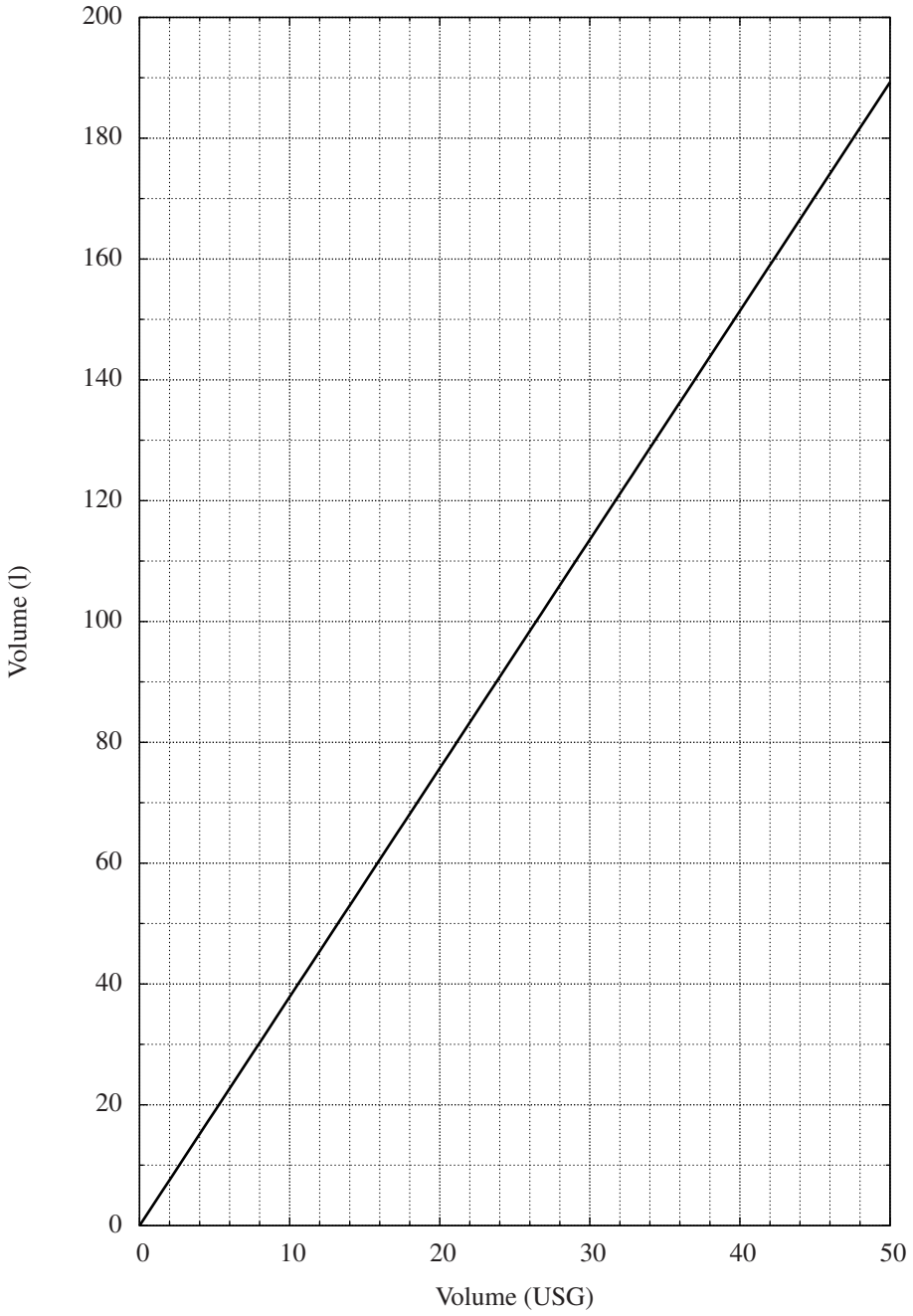

Figure 5.3: Volume Conversion Chart

POSITION ERROR — AIRSPEED
FLAPS RETRACTED

Weight:	1400 lb
Flaps:	Retracted
Date of flight tests:	14 & 19 Nov 2008

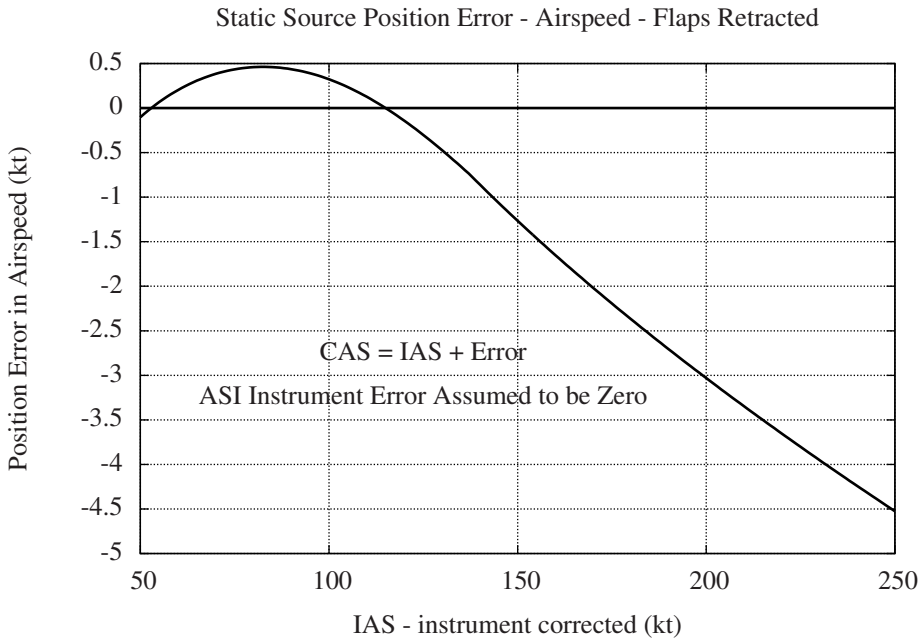

Figure 5.4: Position Error — Airspeed — Flaps Retracted

POSITION ERROR — ALTITUDE
FLAPS RETRACTED

Weight:	1600 lb
Flaps:	Retracted
Date of flight tests:	14 & 19 Nov 2008

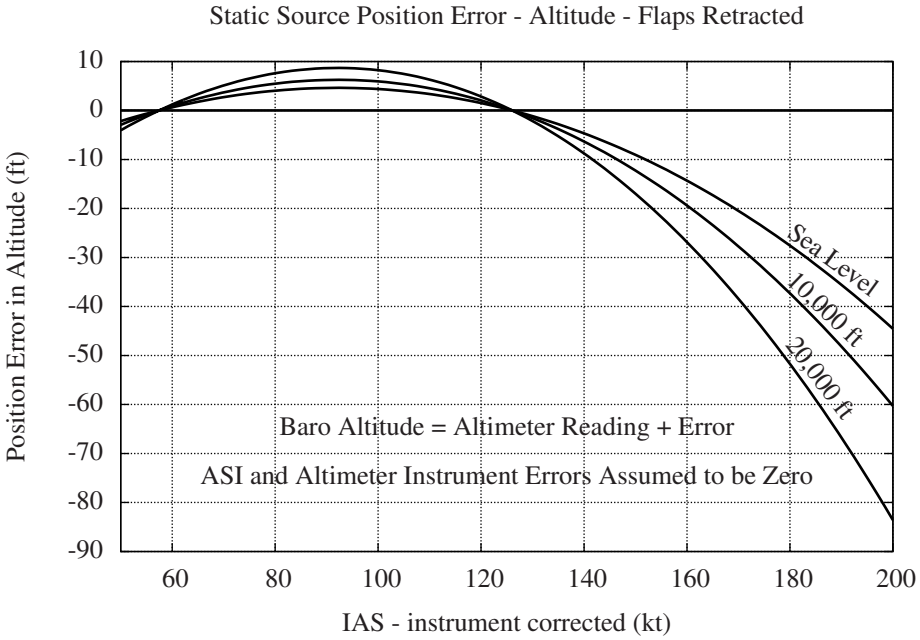

Figure 5.5: Position Error — Altitude — Flaps Retracted

AIRSPEED INDICATOR INSTRUMENT ERROR

ASI Make & Model:	UMA 16-311-241
Serial #:	B0171
Date of ground test:	27 Apr 2004

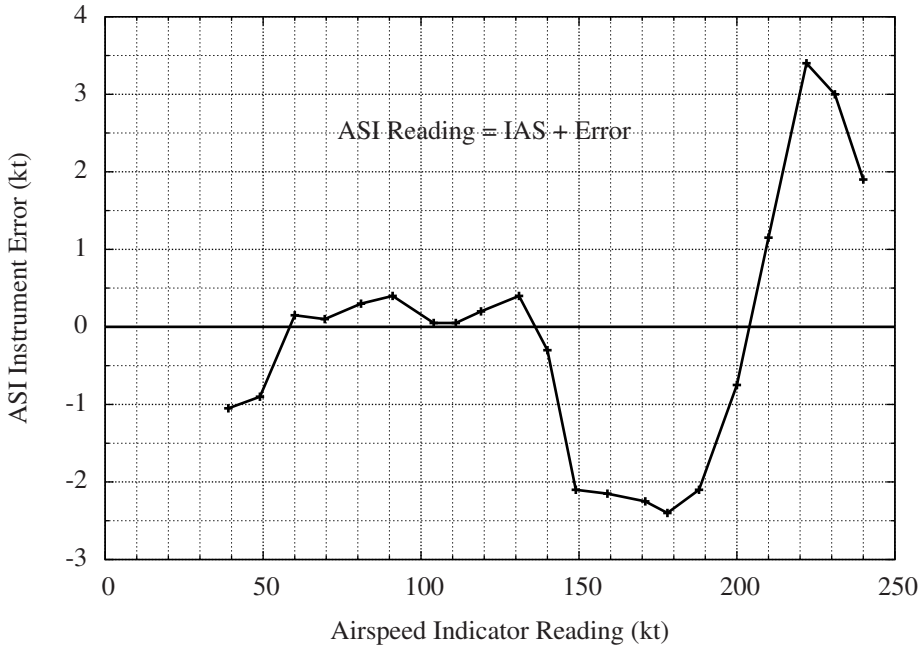

Figure 5.6: Airspeed Indicator Instrument Error

EFIS AIRSPEED INSTRUMENT ERROR

EFIS Make & Model:	Dynon Development D-10A
Part #:	100321- Rev 0
Serial #:	004439
Date of ground test:	27 Apr 2004

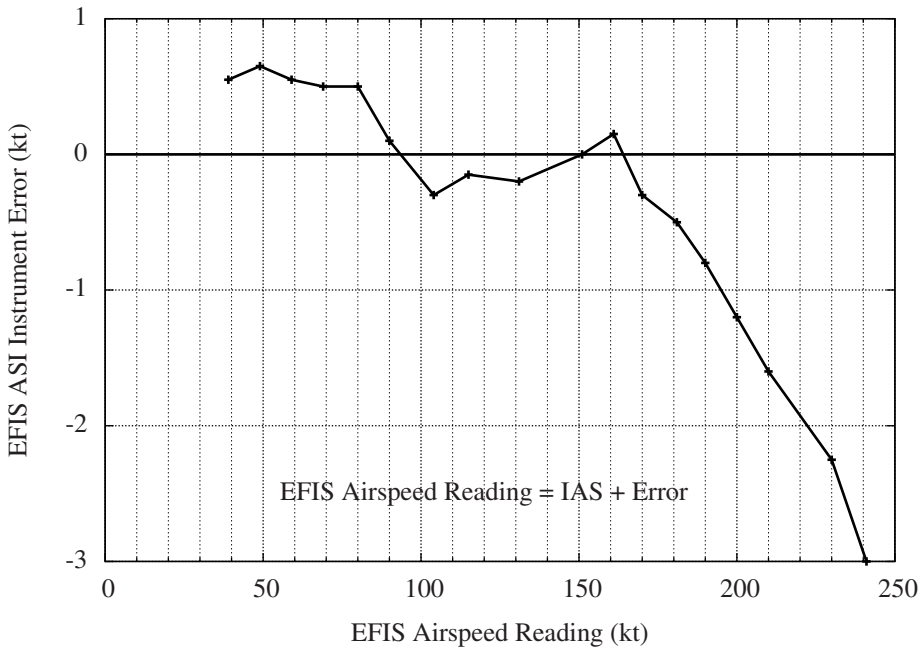

Figure 5.7: EFIS Airspeed Instrument Error

EFIS AIRSPEED ERROR
FLAPS RETRACTED

EFIS Make & Model:	Dynon Development D-10A
Part #:	100321- Rev 0
Serial #:	004439
Date of ground test:	27 Apr 2004
Weight:	1400 lb
Flaps:	Retracted
Date of flight tests:	14 & 19 Nov 2008

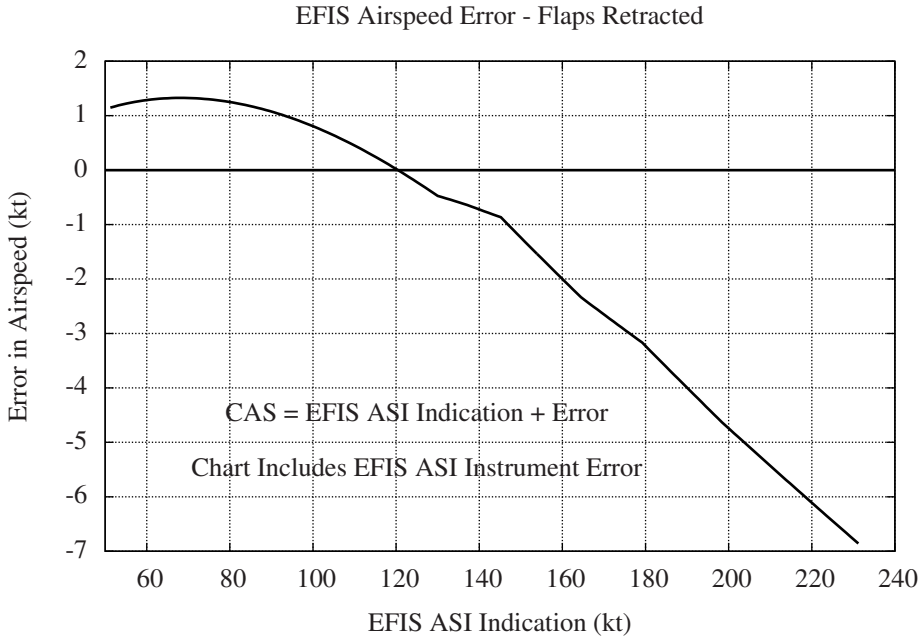

Figure 5.8: EFIS Airspeed Error — Airspeed — Flaps Retracted

EFIS ASI TAS CORRECTION
1800 LBS

NOTES:

1. Table provides TAS correction as a function of altitude and IAS.
2. Corrected TAS = TAS displayed on EFIS + correction.
3. Table includes static source position error, EFIS ASI instrument error and OAT ram temperature rise.

ALTITUDE (FT)	IAS (KT)										
	80	90	100	110	120	130	140	150	160	170	180
0	+1.2	+1.0	+0.8	+0.4	+0.0	-0.5	-0.7	-1.3	-2.1	-2.9	-3.6
5,000	+1.3	+1.1	+0.8	+0.4	-0.0	-0.6	-0.9	-1.5	-2.4	-3.2	-4.0
10,000	+1.3	+1.1	+0.8	+0.4	-0.1	-0.7	-1.0	-1.7	-2.7	-3.6	-4.5
15,000	+1.4	+1.2	+0.9	+0.4	-0.2	-0.8	-1.3	-2.0	-3.1	-4.2	-5.1
20,000	+1.5	+1.3	+0.9	+0.3	-0.3	-1.1	-1.5	-2.4	-3.6	-4.8	-5.8
	TAS CORRECTION (KT)										

Figure 5.9: EFIS ASI TAS Correction

STALL SPEED — KCAS

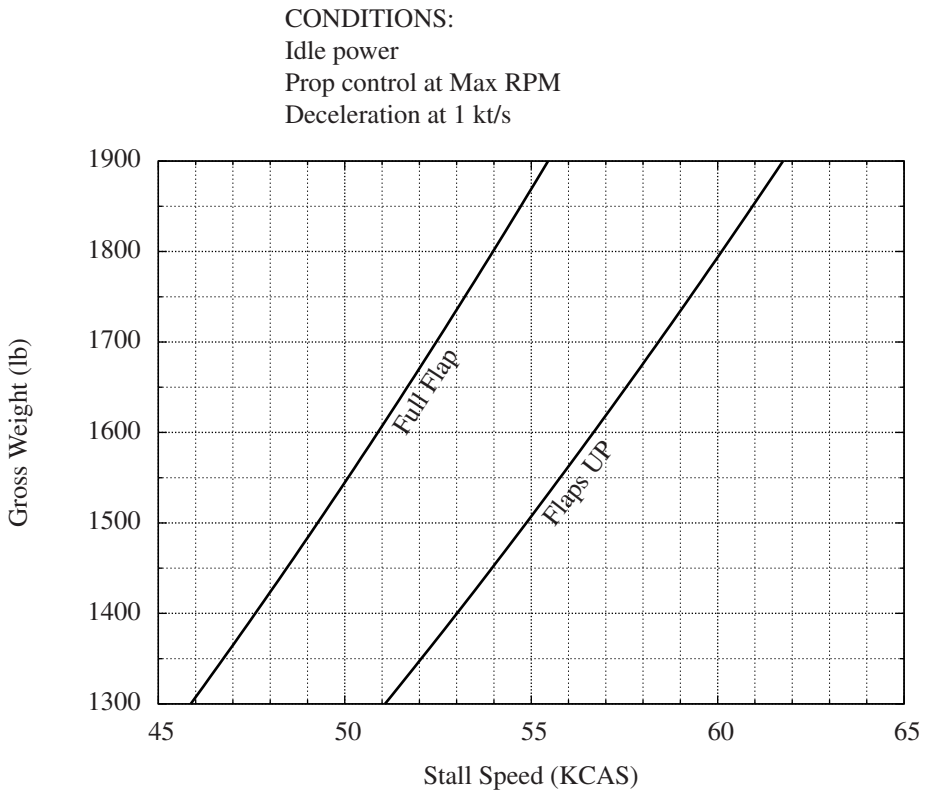

Figure 5.10: Stall Speed — KCAS

NORMAL TAKEOFF DISTANCE
1800 LBS

PREDICTED PERF TO BE CONFIRMED BY FLIGHT TEST

CONDITIONS:
Flaps Retracted 2700 RPM, Full Throttle and Mixture Set prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	17
2000	16
4000	15
6000	14
8000	13

NOTES:

1. Set mixture at placard fuel flow.
2. Decrease distance by 10% for each X knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10%.
3. For operation on a dry, grass runway, increase distances by 10% of the ground roll figure.

WEIGHT (LB)	TAKEOFF SPEED (KIAS)		PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT
1,800	62	68	S.L.	530	730	560	770	590	810	620	850	650	890
	62	68	2,000	630	850	660	900	700	940	740	990	770	1,040
	62	68	4,000	740	1,000	780	1,050	830	1,110	870	1,170	920	1,220
	62	68	6,000	880	1,180	930	1,240	980	1,310	1,040	1,380	1,090	1,450
	62	68	8,000	1,050	1,400	1,120	1,490	1,180	1,570	1,250	1,660	1,320	1,750
	62	68	10,000	1,270	1,690	1,350	1,790	1,430	1,900	1,510	2,010	1,600	2,130
	62	68	12,000	1,540	2,050	1,640	2,190	1,740	2,320	1,850	2,470	1,960	2,620

Figure 5.11: Normal Takeoff Distance — 1800 lb

NORMAL TAKEOFF DISTANCE
1900 LBS

PREDICTED PERF TO BE CONFIRMED BY FLIGHT TEST

CONDITIONS:
Flaps Retracted 2700 RPM, Full Throttle and Mixture Set prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	17
2000	16
4000	15
6000	14
8000	13

NOTES:

1. Set mixture at placard fuel flow.
2. Decrease distance by 10% for each X knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10%.
3. For operation on a dry, grass runway, increase distances by 10% of the ground roll figure.

WEIGHT (LB)	TAKEOFF SPEED (KIAS)		PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT
1,900	64	70	S.L.	610	820	640	860	670	910	710	950	740	1,000
	64	70	2,000	710	960	750	1,010	790	1,070	840	1,120	880	1,180
	64	70	4,000	840	1,130	890	1,190	940	1,250	990	1,320	1,040	1,390
	64	70	6,000	1,000	1,330	1,060	1,410	1,120	1,490	1,180	1,570	1,250	1,650
	64	70	8,000	1,200	1,600	1,270	1,690	1,350	1,790	1,430	1,900	1,510	2,000
	64	70	10,000	1,450	1,930	1,540	2,050	1,640	2,180	1,740	2,310	1,840	2,450
	64	70	12,000	1,770	2,360	1,880	2,520	2,000	2,690	2,130	2,860	2,260	3,050

Figure 5.12: Normal Takeoff Distance — 1900 lb

SHORT FIELD TAKEOFF DISTANCE
1800 LBS

VANS CLAIMED PERF EXPANDED TO OTHER CONDITIONS

CONDITIONS:
Flaps 17° (set flap angle to match down aileron angle at full aileron)
2700 RPM, Full Throttle and Mixture Set prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	17
2000	16
4000	15
6000	14
8000	13

NOTES:

1. Short field technique as specified in Section 4.
2. Set mixture at placard fuel flow.
3. Decrease distance by 10% for each X knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10%.
4. For operation on a dry, grass runway, increase distances by 10% of the ground roll figure.

WEIGHT (LB)	TAKEOFF SPEED (KIAS)		PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT
1,800	58	64	S.L.	460	660	490	690	510	720	540	760	560	790
	58	64	2,000	540	770	570	810	600	850	630	890	670	930
	58	64	4,000	640	900	670	940	710	990	750	1,040	790	1,100
	58	64	6,000	760	1,050	800	1,110	840	1,170	890	1,230	940	1,300
	58	64	8,000	900	1,260	960	1,330	1,010	1,400	1,070	1,480	1,120	1,560
	58	64	10,000	1,080	1,510	1,150	1,600	1,220	1,690	1,290	1,790	1,360	1,890
	58	64	12,000	1,310	1,830	1,390	1,950	1,480	2,070	1,560	2,200	1,660	2,330

Figure 5.13: Short Field Takeoff Distance — 1800 lb

SHORT FIELD TAKEOFF DISTANCE
1900 LBS

VANS CLAIMED PERF EXPANDED TO OTHER CONDITIONS

CONDITIONS:
Flaps 17° (set flap angle to match down aileron angle at full aileron)
2700 RPM, Full Throttle and Mixture Set prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	17
2000	16
4000	15
6000	14
8000	13

NOTES:

1. Short field technique as specified in Section 4.
2. Set mixture at placard fuel flow.
3. Decrease distance by 10% for each X knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10%.
4. For operation on a dry, grass runway, increase distances by 10% of the ground roll figure.

WEIGHT (LB)	TAKEOFF SPEED (KIAS)		PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT	GRND ROLL (FT)	TOTAL DIST TO 50 FT
1,900	60	66	S.L.	520	740	550	780	580	810	610	850	640	900
	60	66	2,000	620	860	650	910	680	950	720	1,000	760	1,050
	60	66	4,000	730	1,010	770	1,070	810	1,120	850	1,180	890	1,240
	60	66	6,000	860	1,190	910	1,260	960	1,330	1,010	1,400	1,070	1,480
	60	66	8,000	1,030	1,430	1,090	1,510	1,150	1,600	1,220	1,690	1,290	1,780
	60	66	10,000	1,240	1,720	1,310	1,830	1,390	1,940	1,470	2,060	1,560	2,180
	60	66	12,000	1,500	2,100	1,600	2,250	1,700	2,400	1,800	2,550	1,900	2,720

Figure 5.14: Short Field Takeoff Distance — 1900 lb

RATE OF CLIMB — 1800 lb

CONDITIONS:
1800 lb gross weight
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give EGT 25°F less than EGT during take-off

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)			
			-20°C	0°C	20°C	40°C
1,800	0	102	2,090	1,930	1,770	1,600
1,800	2,000	100	1,890	1,730	1,550	1,390
1,800	4,000	98	1,720	1,530	1,360	1,210
1,800	6,000	96	1,510	1,330	1,170	1,030
1,800	8,000	94	1,290	1,120	970	840
1,800	10,000	92	1,080	920	780	660
1,800	12,000	90	880	730	590	480
1,800	14,000	90	680	540	410	310
1,800	16,000	90	480	350	240	140
1,800	18,000	90	280	160	70	-20
1,800	20,000	90	90	-10	-100	-180

Figure 5.15: Rate of Climb — Maximum Power — 1800 lb

RATE OF CLIMB — 1900 lb

CONDITIONS:
1900 lb gross weight
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give EGT 25°F less than EGT during take-off

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)			
			-20°C	0°C	20°C	40°C
1,900	0	102	1,930	1,780	1,630	1,470
1,900	2,000	100	1,740	1,590	1,420	1,270
1,900	4,000	98	1,580	1,400	1,240	1,100
1,900	6,000	96	1,380	1,210	1,060	930
1,900	8,000	94	1,170	1,010	870	750
1,900	10,000	92	970	820	690	570
1,900	12,000	90	770	630	510	400
1,900	14,000	90	580	450	330	240
1,900	16,000	90	390	270	170	80
1,900	18,000	90	200	90	0	-80
1,900	20,000	90	20	-80	-160	-230

Figure 5.16: Rate of Climb — Maximum Power — 1900 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1800 lb MAXIMUM CLIMB

CONDITIONS:
1800 lb gross weight
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.0 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 102 KIAS at sea level, decreasing by 1 kt per 1000 ft.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESS. ALT. (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,800	0	15	102	1,880	0	0	0
	2,000	11	100	1,660	1	0.3	2
	4,000	7	98	1,470	2	0.7	4
	6,000	3	96	1,290	4	1.0	7
	8,000	-1	94	1,100	6	1.4	10
	10,000	-5	92	930	7	1.9	13
	12,000	-9	90	770	10	2.3	17
	14,000	-13	90	610	13	2.9	23
	16,000	-17	90	450	17	3.6	30
	18,000	-21	90	310	22	4.5	40
	20,000	-25	90	160	30	5.9	57

Figure 5.17: Time, Fuel and Distance to Climb — Maximum Climb — 1800 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1900 lb MAXIMUM CLIMB

CONDITIONS:
1900 lb gross weight
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.0 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 102 KIAS at sea level, decreasing by 1 kt per 1000 ft.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESS. ALT. (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,900	0	15	102	1,740	0	0	0
	2,000	11	100	1,530	1	0.3	2
	4,000	7	98	1,350	3	0.7	4
	6,000	3	96	1,170	4	1.1	7
	8,000	-1	94	1,000	6	1.5	10
	10,000	-5	92	830	8	2.0	14
	12,000	-9	90	670	11	2.6	19
	14,000	-13	90	520	14	3.2	25
	16,000	-17	90	370	19	4.1	34
	18,000	-21	90	230	25	5.2	47
	20,000	-25	90	90	38	7.2	72

Figure 5.18: Time, Fuel and Distance to Climb — Maximum Climb — 1900 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1800 lb CRUISE CLIMB

CONDITIONS:
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.5 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 120 KIAS from sea level to 10,000 ft, then decreasing by 4 kt per 1000 ft above 10,000 ft.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,800	0	15	120	1,800	0	0	0
	2,000	11	120	1,550	1	0.3	2
	4,000	7	120	1,330	3	0.7	5
	6,000	3	120	1,110	4	1.1	9
	8,000	-1	120	900	6	1.6	13
	10,000	-5	120	690	9	2.1	19
	12,000	-9	112	610	12	2.8	26
	14,000	-13	104	520	15	3.5	34
	16,000	-17	96	430	20	4.2	43
	18,000	-21	90	310	25	5.2	54
	20,000	-25	90	160	34	6.6	71

Figure 5.19: Time, Fuel and Distance to Climb — Cruise Climb — 1800 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1900 lb CRUISE CLIMB

CONDITIONS:
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.5 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 120 KIAS from sea level to 10,000 ft, then decreasing by 4 kt per 1000 ft above 10,000 ft.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,900	0	15	120	1,670	0	0	0
	2,000	11	120	1,430	1	0.4	3
	4,000	7	120	1,220	3	0.8	6
	6,000	3	120	1,020	5	1.2	10
	8,000	-1	120	810	7	1.7	14
	10,000	-5	120	610	10	2.4	21
	12,000	-9	112	530	13	3.1	29
	14,000	-13	104	450	17	3.9	38
	16,000	-17	96	350	22	4.8	48
	18,000	-21	90	230	29	6.0	62
	20,000	-25	90	90	42	8.0	87

Figure 5.20: Time, Fuel and Distance to Climb — Cruise Climb — 1900 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1800 lb HIGH SPEED CLIMB

CONDITIONS:
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.5 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 130 KIAS, until the rate of climb reduces to 500 ft/mn. Then hold 500 ft/mn until the speed reduces to V_Y.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,800	0	15	130	1,680	0	0	0
	2,000	11	130	1,410	1	0.4	3
	4,000	7	130	1,180	3	0.8	6
	6,000	3	130	960	5	1.2	11
	8,000	-1	130	730	7	1.8	16
	10,000	-5	130	510	10	2.5	24
	12,000	-9	119	500	14	3.4	34
	14,000	-13	106	500	18	4.1	43
	16,000	-17	90	450	22	4.9	52
	18,000	-21	90	310	28	5.8	62
	20,000	-25	90	160	36	7.1	79

Figure 5.21: Time, Fuel and Distance to Climb — High Speed Climb — 1800 lb

TIME, FUEL AND DISTANCE TO CLIMB — 1900 lb HIGH SPEED CLIMB

CONDITIONS:
Flaps UP
2650 RPM
Full Throttle
Mixture Set to give Take-off EGT
Standard Temperature

NOTES:

1. Add 1.5 USG of fuel for engine start, taxi and takeoff.
2. Climb speed is 130 KIAS, until the rate of climb reduces to 500 ft/mn. Then hold 500 ft/mn until the speed reduces to V_Y.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperatures.
4. Distances shown are based on zero wind.

WEIGHT (LB)	PRESSURE ALTITUDE (FT)	TEMP (°C)	CLIMB SPEED (KIAS)	RATE OF CLIMB (FT/MN)	FROM SEA LEVEL		
					TIME (MN)	FUEL USED (USG)	DIST. (NM)
1,900	0	15	130	1,560	0	0	0
	2,000	11	130	1,310	1	0.4	3
	4,000	7	130	1,090	3	0.8	7
	6,000	3	130	870	5	1.4	12
	8,000	-1	130	650	8	2.0	18
	10,000	-5	127	500	11	2.8	27
	12,000	-9	115	500	15	3.6	36
	14,000	-13	96	500	19	4.4	45
	16,000	-17	90	370	24	5.2	53
	18,000	-21	90	230	30	6.3	66
	20,000	-25	90	90	43	8.3	92

Figure 5.22: Time, Fuel and Distance to Climb — High Speed Climb — 1900 lb

CRUISE POWER

NOTES:

1. Add 0.4" M.P. for each 10°C above standard temperature.
2. Subtract 0.4" M.P. for each 10°C below standard temperature.
3. If above standard temperature precludes obtaining the desired M.P., use the next higher RPM/M.P. with appropriate temperature correction to M.P.

NOTE
Mixture must be full rich when above 75% power. Lean using fuel flow meter at 75% power or less.

			75% POWER 150 HP				65% POWER 130 HP				55% POWER 110 HP				
PRESSURE ALTITUDE (FT)		RPM	2400	2500	2600	2700	2300	2400	2500	2600	2200	2300	2400	2500	2600
	FUEL FLOW	BEST ECON.	9.9	10.0	10.2	10.3	8.7	8.8	8.9	9.0	7.4	7.5	7.6	7.8	7.9
		BEST POWER	11.8	11.9	12.1	12.2	10.3	10.4	10.6	10.7	8.9	9.0	9.2	9.4	9.6
	STD. TEMP		MANIFOLD PRESS.				MANIFOLD PRESS.				MANIFOLD PRESS.				
0	15 °C		25.4	24.5	23.6	22.8	23.7	22.8	22.0	21.2	22.0	21.0	20.2	19.5	18.9
2,000	11 °C		24.9	23.9	23.1	22.3	23.2	22.3	21.5	20.7	21.5	20.5	19.7	19.0	18.4
4,000	7 °C		24.4	23.4	22.6	21.9	22.7	21.8	21.0	20.3	21.0	20.0	19.3	18.5	17.9
6,000	3 °C		23.9	23.0	22.1	21.5	22.3	21.4	20.5	19.8	20.5	19.6	18.9	18.1	17.5
8,000	-1 °C		23.5	22.5	21.7	21.1	21.9	21.0	20.1	19.4	20.1	19.2	18.5	17.7	17.1
10,000	-5 °C		–	–	–	–	21.5	20.6	19.7	19.0	19.7	18.9	18.1	17.3	16.7
12,000	-9 °C		–	–	–	–	–	20.2	19.3	18.7	19.3	18.5	17.7	16.9	16.4

Figure 5.23: Cruise Power

CRUISE SPEED

CONDITIONS:
Wheel Pants and Gear Leg Fairings ON
Standard atmosphere.
Mixture set to best power for 75% power.
Mixture set to 50°F lean of peak EGT for 65% and 55% power, except mixture set to best power if more than 2600 rpm required with mixture set lean of peak EGT.
Full throttle, but no less than 2100 rpm.
Speed vs RPM lines are at full throttle, with mixture set to best power or 50 deg F Lean of Peak EGT.

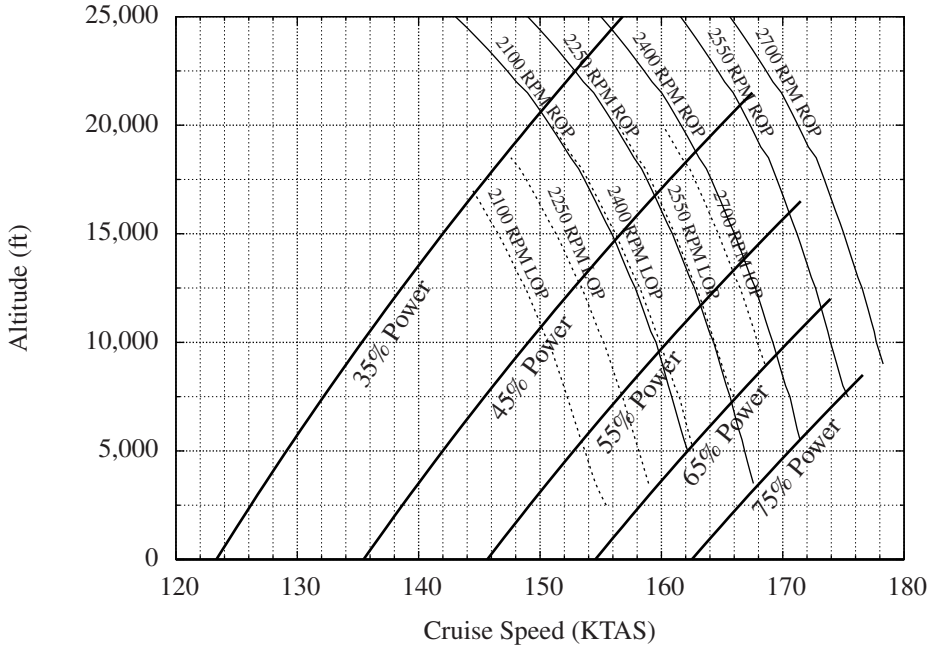

Figure 5.24: Cruise Speed

CRUISE SPEED - WHEEL PANTS OFF

CONDITIONS:
Wheel Pants OFF, Gear Leg Fairings ON
Standard atmosphere.
Mixture set to best power for 75% power.
Mixture set to 50°F lean of peak EGT for 65% and 55% power, except mixture set to best power if more than 2600 rpm required with mixture set lean of peak EGT.
Full throttle, but no less than 2100 rpm.

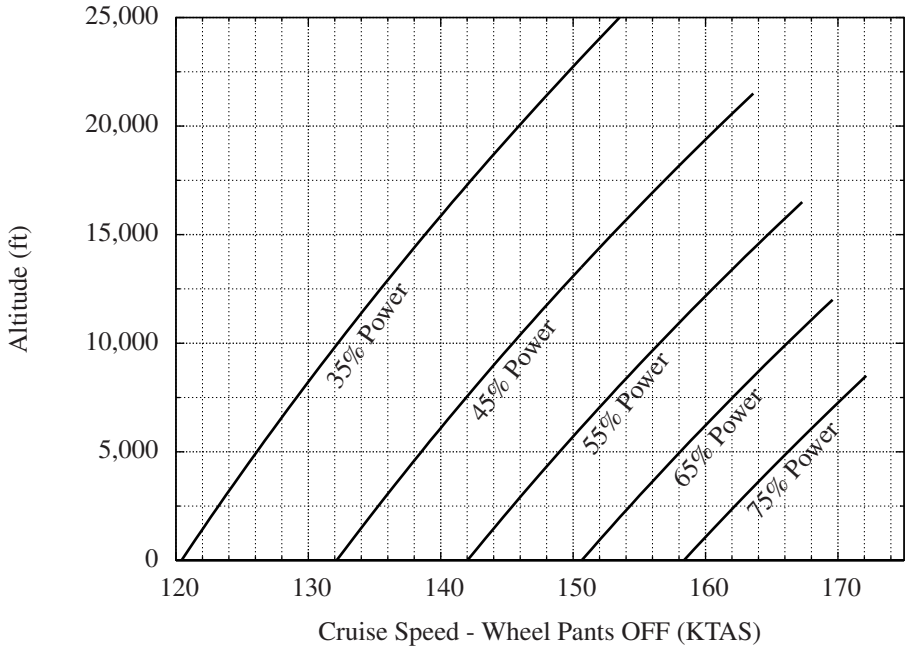

Figure 5.25: Cruise Speed - Wheel Pants OFF

CRUISE RANGE

CONDITIONS:
Wheel Pants and Gear Leg Fairings ON
43 USG Usable Fuel.
Standard atmosphere.
No wind.
Includes 1.0 USG fuel for start, taxi and takeoff and 8 USG or 45 mn reserve.
Climb at full power and best climb speed as defined on the Maximum Climb Chart
Lean during climb for best power.
Cruise with mixture set to best power for 75% power.
Cruise with mixture set to 50°F lean of peak EGT for 65% power or less, except mixture set to best power if more than 2600 rpm required with mixture set lean of peak EGT.
Full throttle, but no less than 2100 rpm.
Descend at cruise TAS at 6 nm per 1000 ft.

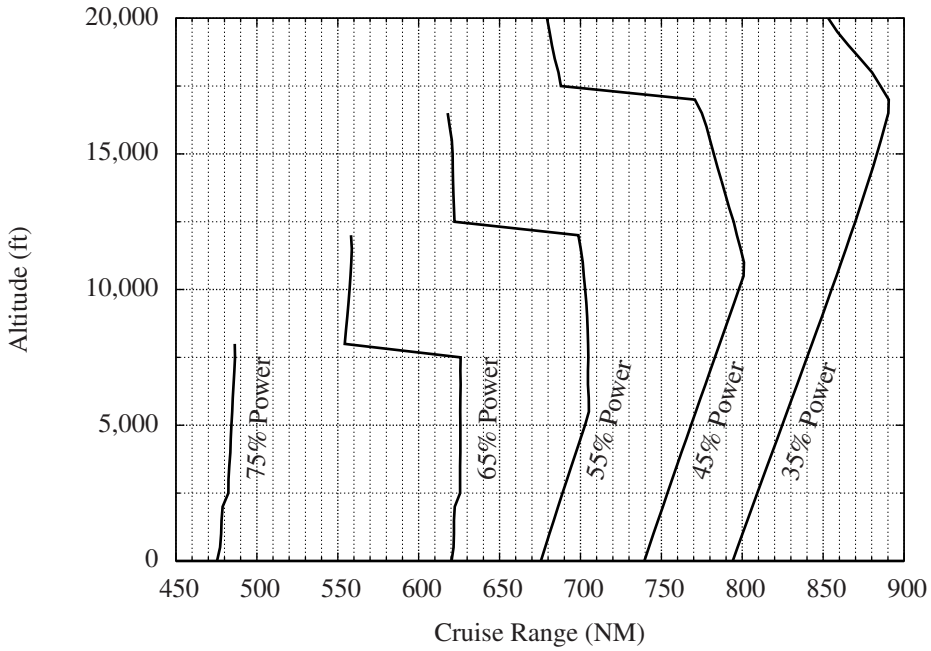

Figure 5.26: Cruise Range

CRUISE RANGE - WHEEL PANTS OFF

CONDITIONS:
Wheel Pants OFF, Gear Leg Fairings ON
43 USG Usable Fuel.
Standard atmosphere.
No wind.
Includes 1.0 USG fuel for start, taxi and takeoff and 8 USG or 45 mn reserve.
Climb at full power and best climb speed as defined on the Maximum Climb Chart
Lean during climb for best power.
Cruise with mixture set to best power for 75% power.
Cruise with mixture set to 50°F lean of peak EGT for 65% power or less, except mixture set to best power if more than 2600 rpm required with mixture set lean of peak EGT.
Descend at cruise TAS at 6 nm per 1000 ft.

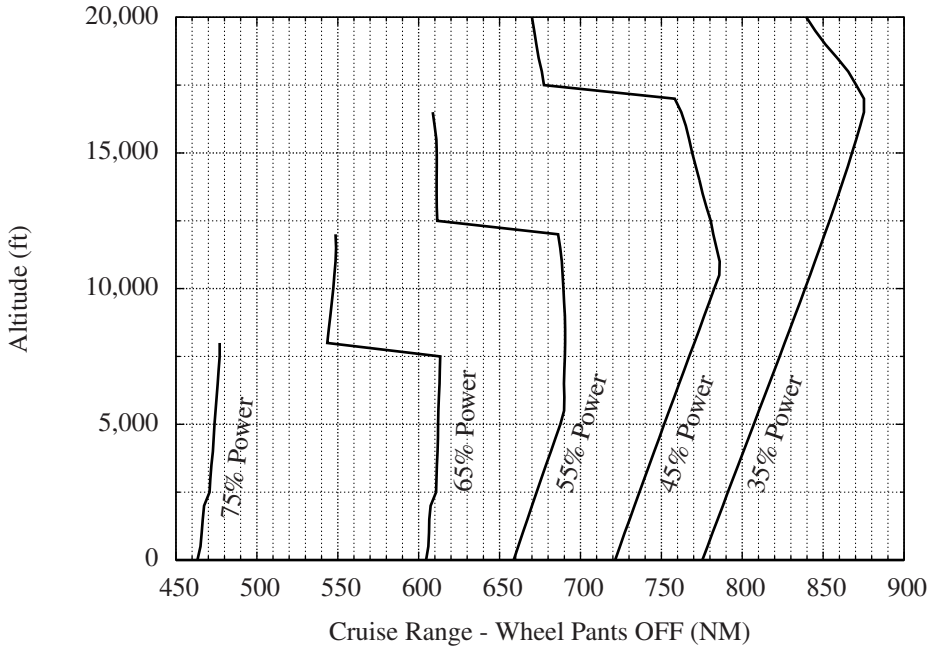

Figure 5.27: Cruise Range - Wheel Pants OFF

NORMAL LANDING DISTANCE
1800 LBS

PREDICTED PERF TO BE CONFIRMED BY FLIGHT TEST

CONDITIONS:
Full Flaps
Power for smooth wheel landing, then idle
Moderate Braking
Paved, Level, Dry Runway
Zero Wind
NOTES:

1. Normal field technique as specified in Section 4.
2. Decrease distances by 10% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 20% of the ground roll figure.
4. For operation on a wet, grass runway, increase distances by 60% of the ground roll figure.

WEIGHT (LB)	SPEED AT 50 FT (KIAS)	PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT
1,800	70	S.L.	690	1,640	710	1,670	740	1,700	770	1,720	790	1,750
	70	2,000	740	1,700	770	1,720	800	1,750	820	1,780	850	1,810
	70	4,000	800	1,750	830	1,780	860	1,810	890	1,840	910	1,870
	70	6,000	860	1,810	890	1,850	920	1,880	950	1,910	990	1,940
	70	8,000	930	1,880	960	1,920	1,000	1,950	1,030	1,980	1,060	2,020
	70	10,000	1,000	1,960	1,040	1,990	1,070	2,030	1,110	2,070	1,150	2,100
	70	12,000	1,080	2,040	1,120	2,080	1,160	2,120	1,200	2,160	1,240	2,200

Figure 5.28: Normal Landing Distance

SHORT FIELD LANDING DISTANCE
1800 LBS

VANS CLAIMED PERF EXPANDED TO OTHER CONDITIONS
TO BE CONFIRMED BY FLIGHT TEST

CONDITIONS:
Full Flaps
Power OFF
Maximum Braking
Paved, Level, Dry Runway
Zero Wind
NOTES:

1. Short field technique as specified in Section 4.
2. Decrease distances by 10% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 20% of the ground roll figure.
4. For operation on a wet, grass runway, increase distances by 60% of the ground roll figure.

WEIGHT (LB)	SPEED AT 50 FT (KIAS)	PRESS ALT (FT)	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT	GRND ROLL (FT)	TOTAL DIST FROM 50 FT
1,800	65	S.L.	470	1,190	490	1,210	510	1,230	530	1,240	540	1,260
	65	2,000	510	1,230	530	1,240	550	1,260	570	1,280	580	1,300
	65	4,000	550	1,270	570	1,290	590	1,310	610	1,330	630	1,350
	65	6,000	590	1,310	610	1,330	630	1,350	660	1,370	680	1,390
	65	8,000	640	1,350	660	1,380	680	1,400	710	1,420	730	1,450
	65	10,000	690	1,400	710	1,430	740	1,460	760	1,480	790	1,510
	65	12,000	740	1,460	770	1,490	800	1,520	830	1,540	850	1,570

Figure 5.29: Short Field Landing Distance

To be added once flight test data is available:

1. Airspeed Calibration — Normal Static Source — Flaps Extended
2. Airspeed Calibration — Alternate Static Source — All Flap Positions
3. Altitude Calibration — Normal Static Source — Flaps Extended
4. Altitude Calibration — Alternate Static Source — All Flap Positions
5. Stall Speeds — IAS
6. Holding Speed and Fuel Flow
7. Endurance Profile

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SECTION 6

WEIGHT & BALANCE

TABLE OF CONTENTS

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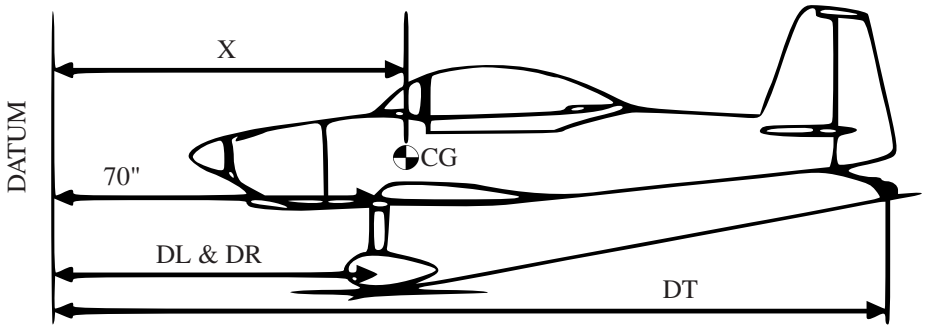
INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the aircraft. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided.

AIRCRAFT WEIGHING PROCEDURES

1. Preparation:
    a) Inflate tires to recommended operating pressures.
    b) Drain all fuel from the fuel tanks.
    c) Ensure the oil sump is filled to 8 US quarts.
    d) Remove all items from forward and aft baggage area and cockpit pockets.
    e) Raise flaps to the fully retracted position.
    f) Place all control surfaces in the neutral position.
2. Levelling:
    a) Place scales under each wheel (minimum capacity, 600 lb for main gear, 200 lb for tail wheel).
    b) Place shims under main wheels as necessary to level aircraft laterally.
    c) Raise tail wheel with support until a level on the canopy rail indicates level.
    d) Close and lock the canopy.
3. Weighing:
    a) With the aircraft level, record weight shown on each scale. Deduct the tare weight from each reading.
4. Measuring:
    a) Drop a plumb bob from the wing leading edge behind each main gear and mark the floor. Measure 70 inches forward of this line and mark the floor for the location of the datum.
    b) Measure the horizontal distance from the datum (parallel to the aircraft centre line) to each main wheel centre.
    c) Measure the horizontal distance (along the aircraft centre line) from the datum to the centre of the tail wheel axle.
5. Using weights from item 3 and measurements from item 4, the aircraft weight and CG can be determined.
6. Basic Empty Weight may be determined by completing Figure 6.1.

SAMPLE AIRCRAFT WEIGHING RECORD



Scale Position	Arm (in)	Scale Reading (lb)	Tare (lb)	Net Weight (lb)	Moment/1000 (Arm x Net Weight/1000) (lb-in)
Left Wheel	DL=			L=	
Right Wheel	DR=			R=	
Tail Wheel	DT=			T=	
Sum of Net Weights and Moments				W=	M=

$CG(X) = ARM = \frac{M}{W}$ CG(X)=_____ in

Item	Weight (lb)	CG Arm (in)	Moment/1000 (lb-in)
Aircraft Weight (From Item 5, page 6-3)			
Add Unusable Fuel: (0.2 USG at 6.01 lbs/Gal)		XX in	
Equipment Changes			
Aircraft Basic Empty Weight			

Figure 6.1: Sample Aircraft Weighing Record

SAMPLE WEIGHT AND BALANCE RECORD

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

AIRCRAFT MODEL: RV-8				SERIAL NUMBER: 80427						PAGE NUMBER:	
DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (-)				
	In	Out		Wt. (lb.)	Arm (In.)	Moment /1000	Wt. (lb.)	Arm (In.)	Moment /1000	Wt. (lb.)	Moment /1000

Figure 6.2: Sample Weight and Balance Record

WEIGHT AND BALANCE

The following information will explain how to load and operate the aircraft so that the weight and centre of gravity remain with the prescribed limits. The weight and balance is determined as follows:

1. Take the basic empty weight and moment from the appropriate weight and balance records and enter them in the column "YOUR AIRCRAFT" on the Sample Loading Problem.

NOTE

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

2. 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 forward and aft baggage areas and hat shelf is based on the load being located in the centre of these areas, as shown on the Loading Arrangements Diagram. For loadings which differ from these, the Sample Loading Problem lists the range of fuselage stations for these areas. The actual fuselage station of the load in question must be entered on the Sample Loading Problem, and the moment must be calculated.

3. Total the weights and moments/1000 and plot the values for zero fuel on the Centre of Gravity Moment Envelope to determine whether the point falls within the envelope.

4. Add the fuel weight and moment/1000 and plot the values for the loaded aircraft on the Centre of Gravity Moment Envelope to determine whether the point falls within the envelope.

BAGGAGE TIE-DOWNS

There are four removable tie down rings on the floor of the aft baggage compartment.

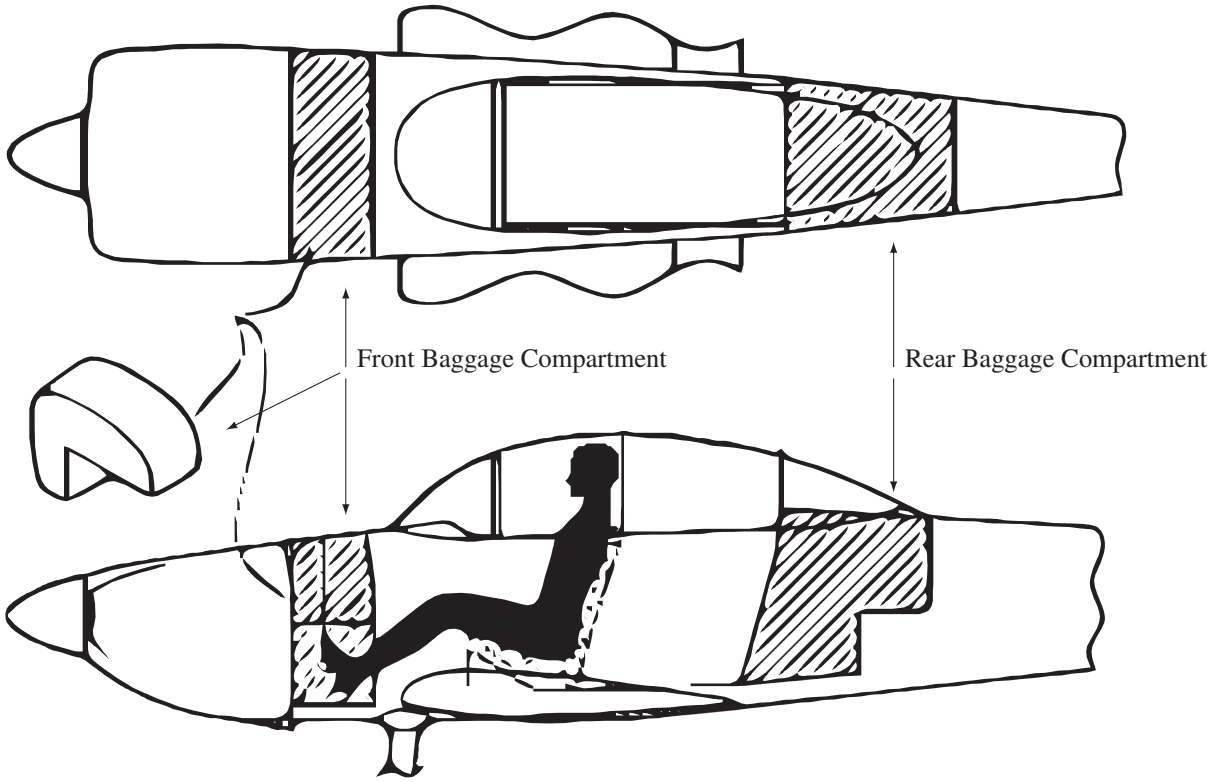


Figure 6.3: Baggage Compartments

ITEM	WEIGHT (LB)	ARM (IN)	MOMENT/1000 (LB-IN)
EMPTY AIRCRAFT			
FWD BAGGAGE		58.51	
FUEL (258.4 LB MAX)		80.00	
PILOT		91.78	
PASSENGER		119.12	
AFT BAGGAGE FLOOR		138.00	
AFT BAGGAGE SHELF		152.91	
OTHER			
TOTAL		- -	
CG			

Figure 6.4: Loading Form

ITEM	WEIGHT (LB)	ARM (IN)	MOMENT/1000 (LB-IN)
EMPTY AIRCRAFT	1,069	76.26	81.52
FWD BAGGAGE	25	58.51	1.46
FUEL (258.4 LB MAX)	232	80.00	18.56
PILOT	170	91.78	15.60
PASSENGER	230	119.12	27.39
AFT BAGGAGE FLOOR	50	138.00	6.90
AFT BAGGAGE SHELF	24	152.91	3.66
OTHER			
TOTAL	1,800	- -	155.11
CG	86.18	CG WITHIN LIMITS	

Figure 6.5: Sample Loading Problem

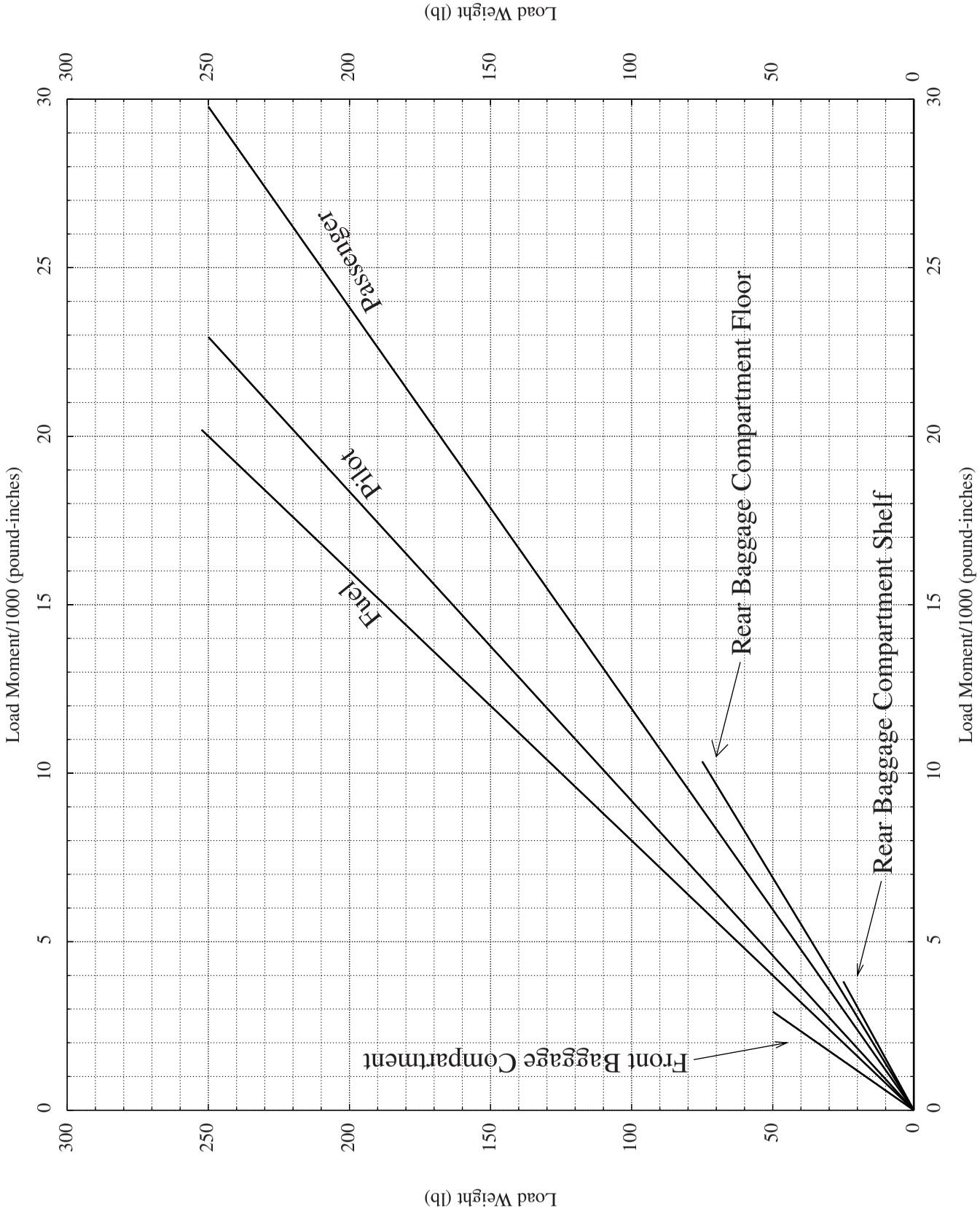


Figure 6.6: Loading Graph

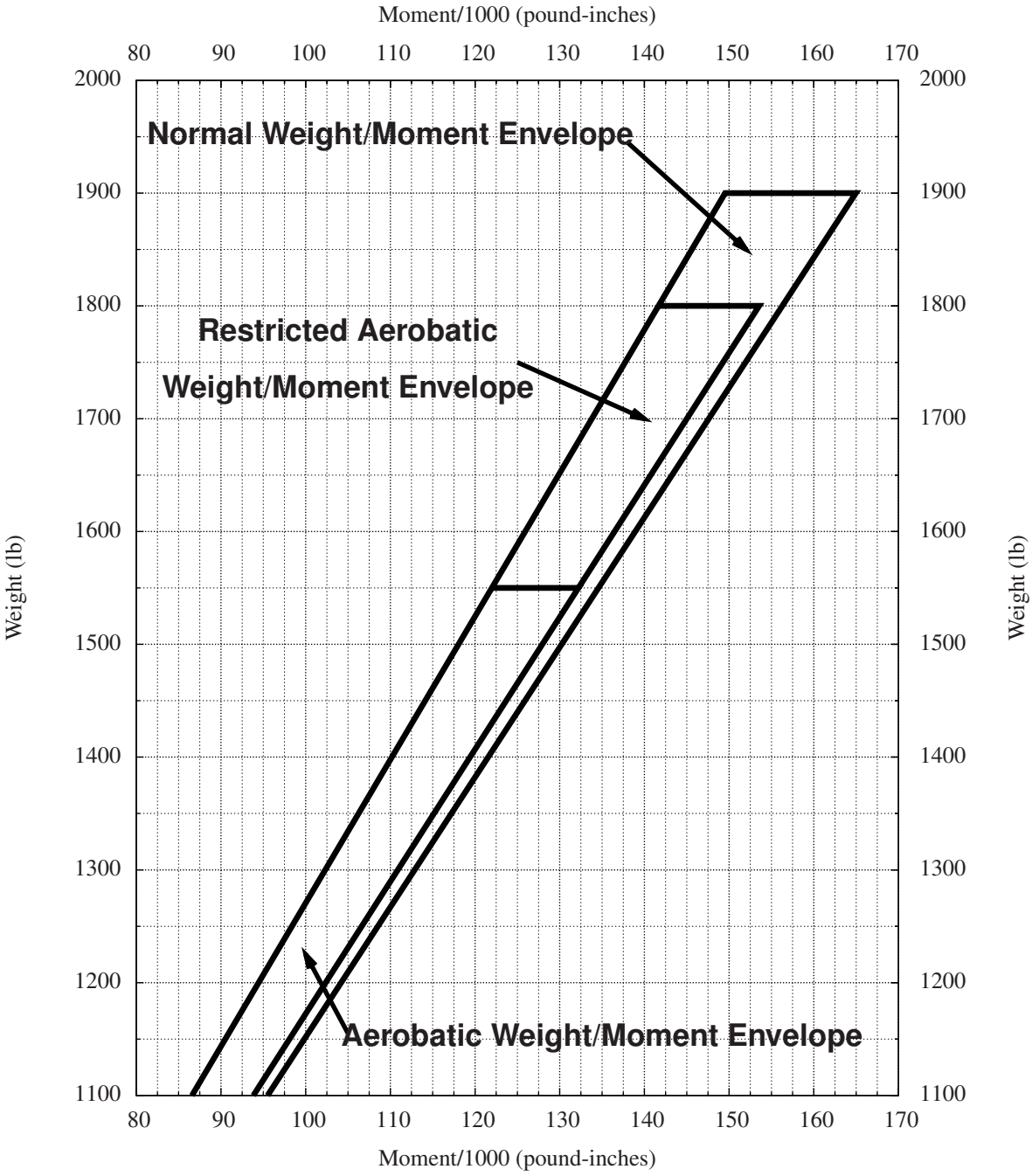


Figure 6.7: CG Moment Envelope

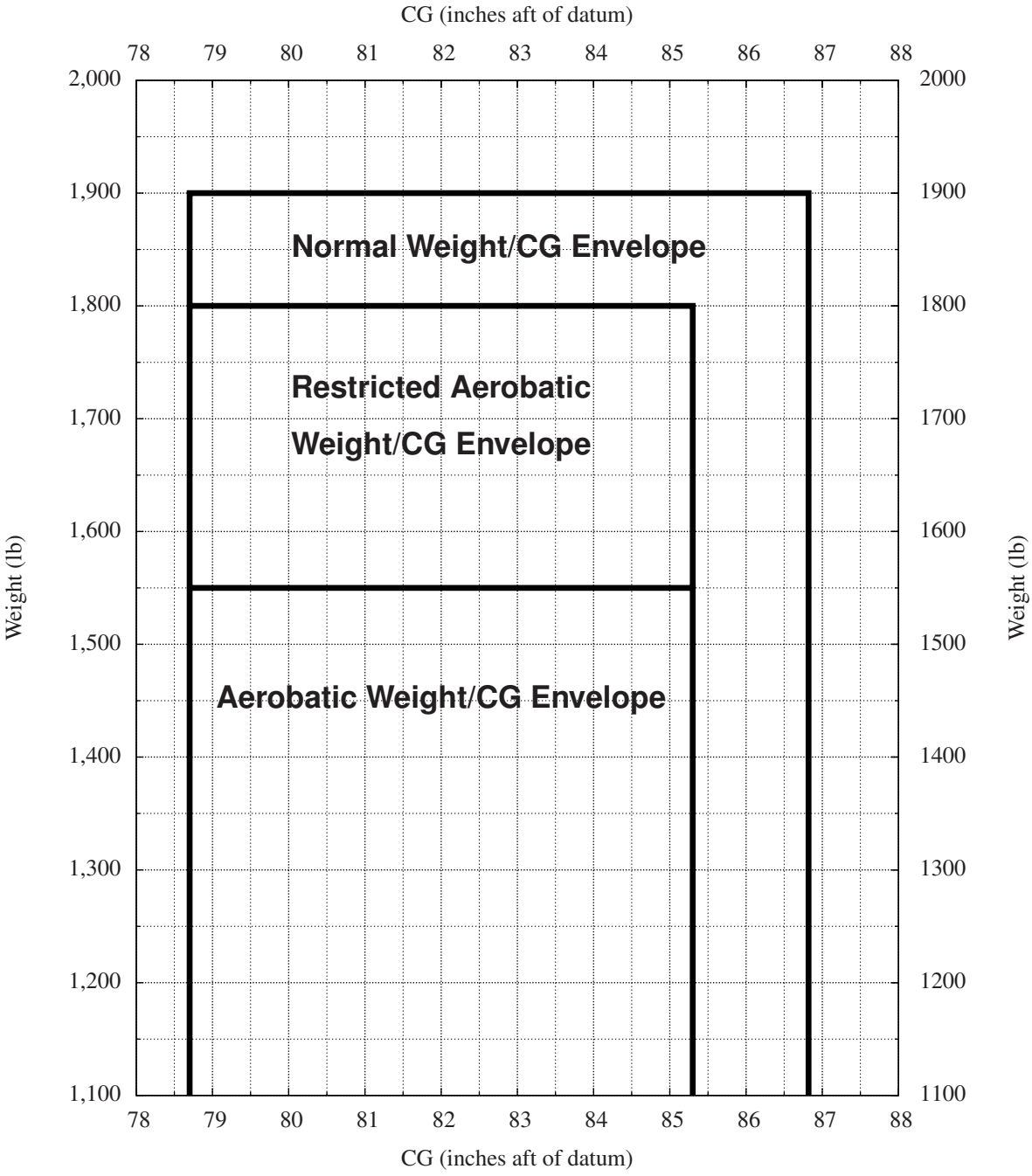


Figure 6.8: CG Limits

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SECTION 7

AIRPLANE & SYSTEMS DESCRIPTIONS

TABLE OF CONTENTS

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AIRFRAME

The airframe is aluminum alloy construction except for steel components comprising: engine mount, landing gear, landing gear mounts, elevator control horns and other miscellaneous items. The tips of the wings and tail surfaces as well as cowling, landing gear fairings, empennage fairings and canopy skirt are fabricated from fibreglass. The aircraft is conventionally configured with a 13.5% thick NACA 23000 series non-laminar-flow aerofoil.

COCKPIT LAYOUT

The flight instruments are in a “Standard-T” arrangement, very slightly right of centre on the main instrument panel. The engine instruments and fuel gauges are to the right side of the flight instruments, and the avionics are located to the left of the flight instruments (Figure 7.1). Switches that are normally only used on the ground are on a switch console on the right cockpit wall below the instrument panel (Figure 7.3). Switches that are normally used in flight are on the sub-panel to the left of the main instrument panel (Figure 7.2).

The throttle, propeller and mixture controls are in a throttle quadrant mounted on the left cockpit wall below the instrument panel. The fuel selector is on a horizontal shelf on the lower, left side of the cockpit ahead of the pilot’s seat.

Engine alternate air and oil cooler door controls are mounted on the side of the left landing gear box structure, below and ahead of the instrument panel. The cockpit heat controls are mounted on the aft wall of the forward baggage compartment, below and ahead of the instrument panel to the right of the pilot’s right calf.

The parking brake control is mounted on the centre of the forward baggage compartment aft bulkhead, below and ahead of the instrument panel.

The front stick grip contains controls for pitch and roll trim, trim and autopilot cut-out, boost pump ON-OFF toggle, radio transmit, and starter engage (Figure 7.4).

The auxiliary power outlet is located on the lower aft face of the right landing gear box structure.

The rear seat has a throttle mounted on the left side wall, and a pitch trim switch just ahead of the throttle. There is a radio transmit push-button near the top of the bulkhead on the right side of the rear cockpit.

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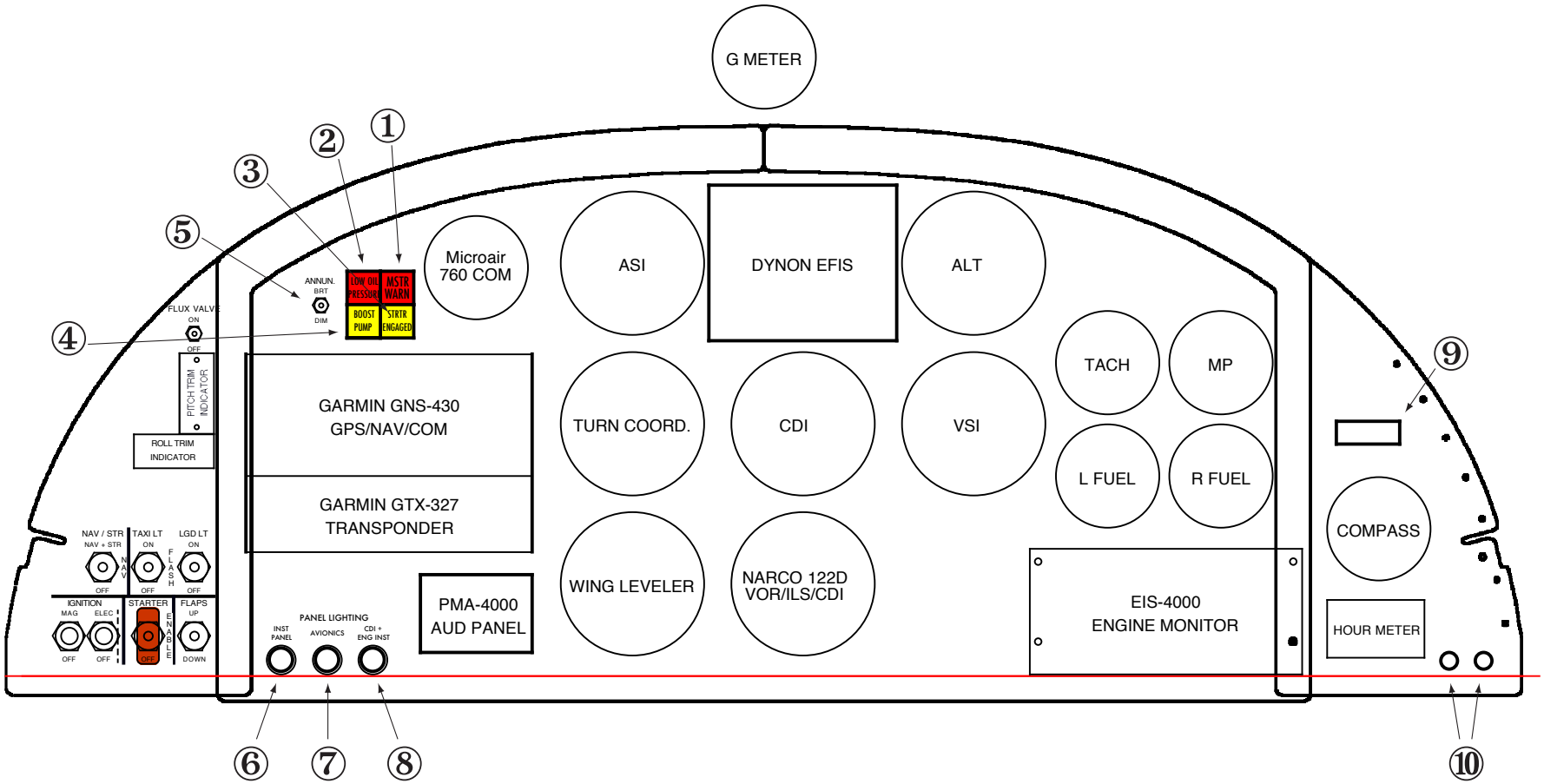
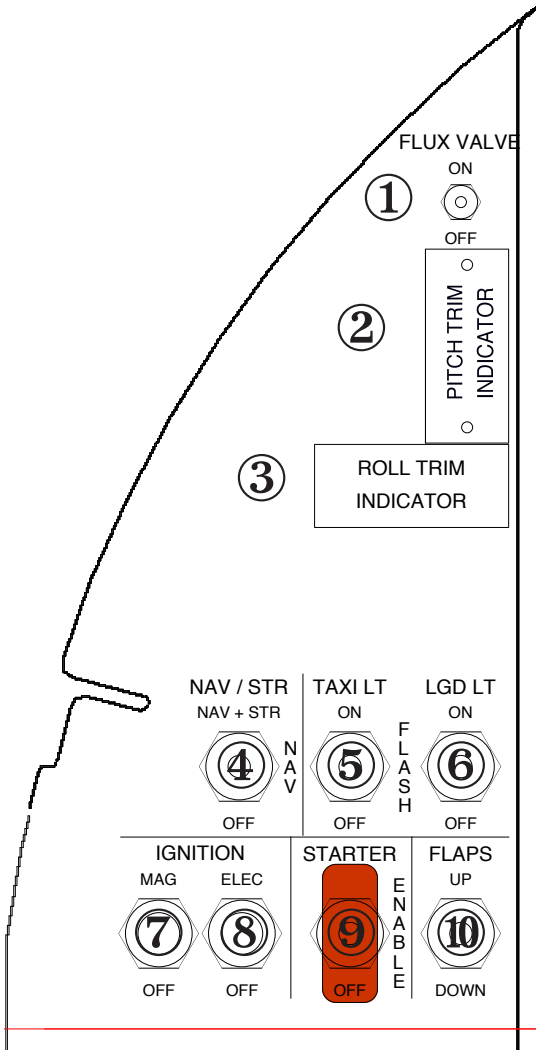


1. **MSTR WARN** — Flashes when the EIS 4000 Engine Monitor detects an exceedence.
2. **LOW OIL PRESSURE** — Lights when the oil pressure is less than 15 psi.
3. **STRTR ENGAGED** — Lights when the starter is engaged.
4. **BOOST PUMP** — Lights when electrical power is supplied to the boost pump.
5. **ANNUN. BRT/DIM** — Controls the annunciator and pitch and roll trim indicator intensity.

   Note: The MSTR WARN annunciator is not dimmable.
6. **INST PANEL** — Dims panel floodlight and Microair 760 COM back-lighting.
7. **AVIONICS** — Dims Garmin GNS 430W and transponder displays.
8. **CDI + ENG INST** — Dims CDI, Narco 122D and Engine instruments.
9. **ELT REMOTE CONTROL**
10. **HEADSET JACKS**

Figure 7.1: Instrument Panel



1. **FLUX VALVE** — Selects the EFIS Flux Valve OFF if required due to electromagnetic interference with COM reception.
2. **PITCH TRIM INDICATOR** — Displays Pitch Trim position. Nose Up trim is to the top of the display, Nose Down trim is to the bottom.
3. **ROLL TRIM INDICATOR** — Displays roll trim position.
4. **NAV/STR** — Controls Navigation and Strobe Lights. Lower position is Navigation and Strobe Lights OFF. Middle position is Navigation Lights ON, and Strobe Lights OFF. Upper position is Navigation Lights and Strobe Lights ON.
5. **TAXI LT** — Controls Taxi Light in left outboard wing.
6. **LDG LT** — Controls Landing Light in right outboard wing.

   The Taxi and Landing Lights flash alternately if both switches are placed in the middle, "FLASH", position.
7. **IGNITION — MAG** — Controls the PMag electronic ignition.
8. **IGNITION — ELEC** — Controls the Light Speed electronic ignition.
9. **STARTER** — Guarded switch enables the Start switch on the front control stick grip, and provides an alternate starter switch. The lower position disables the stick grip starter switch. If the guard is lifted, and the switch placed in the middle position, the stick grip starter switch is enabled. The momentary upper position engages the starter.
10. **FLAPS** — Momentary switch causes the flaps to move up or down while it is held. The flap actuator will free-wheel once the flaps reach full travel up or down.

Figure 7.2: Instrument Panel — Left Side

Right Console — The following switches are on the right console, which is located on the right wall of the cockpit, below the instrument panel:

1. **BATT/ALT** — Battery Master and Main Alternator switch. Left position is both OFF, middle position is Battery Master ON, and Main Alternator OFF, and right position is both ON.
2. **STBY ALT** — Standby Alternator switch.
3. **ESS BUS FEED** — NORM: Essential Bus is fed from Main Bus, via a diode. EMER: Essential Bus is fed directly from Battery.
4. **ENG INST** — EIS 4000 Engine Monitor power switch.
5. **EFIS BU** — Backup source of power for the EFIS, from the Battery Bus.
6. **TURN COORD** — Turn Coordinator power switch, from the Battery Bus.
7. **PITOT HEAT** — Pitot Heat power switch.
8. **DFRST FAN** — Defrost Fan power switch.
9. **TRIM** — Pitch and Roll Trim power. Also selects which pitch trim switches are enabled.
10. **WING LVLR** — Autopilot power switch. Controls power to the Autopilot control head and servo.
11. **ALT** — Main Alternator Field Circuit Breaker. This CB will pop if the Over-voltage Protection System detects an over-voltage, removing power from the alternator field, which shuts down the alternator.
12. **STBY ALT** — Standby Alternator Relay CB. This CB will pop if the Over-voltage Protection System detects an over-voltage caused by the Standby Alternator.
13. **PMAG BU PWR** — PMag Backup Power CB. This CB is located on the inboard face of the side console, below the STBY ALT CB.

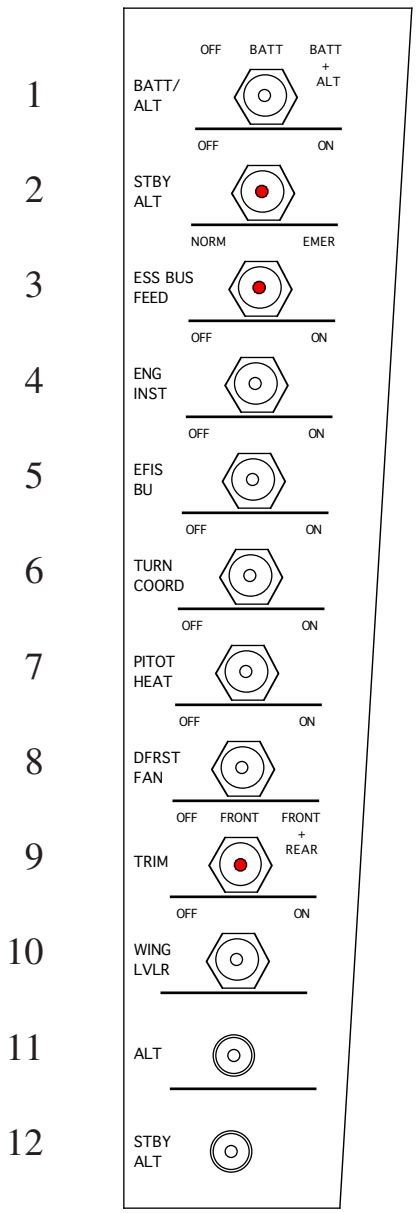


Figure 7.3: Switch Console

STICK GRIP SWITCHES

The front seat has an Infinity Aerospace stick grip with switches that control various aircraft systems.

1. **Trim and Autopilot Disconnect** — Red. The power to the elevator and aileron trim servos is removed when this momentary switch is depressed. The power will be restored when the switch is released. A press and release within 5 seconds will disconnect the autopilot. Holding the switch depressed for longer than 5 seconds will activate the autopilot Pilot Command Steering mode.
2. **Elevator and Aileron Trim** — Controls elevator and roll trim.
3. **Boost Pump** — Blue. The ON or OFF state of the boost pump power is toggled when this switch is pressed and released. The pump ON/OFF status is indicated by the "Boost Pump" light on the instrument panel which illuminates when the boost pump is powered.
4. **Trigger** — Not used. This Push ON, Push OFF switch may eventually be used for smoke system control.
5. **PTT** — Black. Push to Talk.
6. **Starter** — Green. Engages the starter, if the Start Enable switch on the Instrument Panel is in the Enable position.

Figure 7.4: Stick Grip Switches

CANOPY

Canopy Latch — The canopy is latched by a handle and hook at the left front side of the sliding canopy frame. The handle may rotate and the hook may release if the handle is hit in flight, but the air loads push the canopy forward, so there is no risk of it departing the aircraft.

Canopy Jettison — The front canopy bow is attached to the rollers by “Pip” pins that can be pulled by the pilot, thus allowing the front of the canopy to be released from the rails. The canopy jettison procedure is:

1. Canopy “Pip” pins — PULL
2. Canopy Latch — UNLATCH
3. Canopy — PULL AFT and PUSH UP
4. Head — DUCK to prevent getting hit by canopy as it departs the aircraft

WARNING

The canopy may hit the tail as it departs the aircraft, so the canopy should only be jettisoned if it is intended to abandon the aircraft.

ENGINE AND PROPELLER

The aircraft is powered by a Lycoming I0-360-A1B6 four cylinder, direct drive, horizontally opposed engine rated at 200 HP at 2700 rpm. The engine is fitted with a 60 amp 14 volt main alternator, an 8 amp standby alternator, PMag electronic ignition, Light Speed Engineering electronic ignition, fuel pump, fuel injection, and an alternate air induction system.

The PMag has two power sources. It is powered from the Essential Bus during start and at ground idle. It is powered by its own internal alternator if the rpm is above approximately 875 rpm, and will thus provide ignition even after a total electrical failure. The PMag internal alternator may be checked by pulling the PMAG BU PWR CB, which removes the Essential Bus power. The Light Speed Electronic ignition is powered from the Battery Bus, and will provide ignition as long as there is sufficient battery voltage available.

The exhaust system is all stainless steel with a crossover configuration and no mufflers. Two heat muffs provide cabin heat.

The engine drives a 72.05" (183 cm) diameter MT three-blade constant speed propeller. The propeller blade roots have counterweights that force them towards coarse pitch if propeller governor oil pressure is lost. The propeller blades are of composite construction, with a wooden core covered by epoxy fibreglass. The outer portion of the blade leading edges is protected by a stainless steel erosion strip that is bonded in place. The inner portion of the blade leading edge is protected by a self-adhesive strip.

ENGINE MONITOR

The Grand Rapids EIS 4000 Engine Information System (EIS) is located on the lower right side of the main instrument panel, and is powered from the Essential Bus, through the “ENG INST” switch on the right switch panel. The EIS 4000 displays the following engine parametres:

- RPM
- Manifold Pressure (in HG)
- Oil Temperature (°F)
- Oil Pressure (°F)
- Cylinder Head Temperature — all cylinders (°F)
- Exhaust Gas Temperatures — all cylinders (°F)
- Fuel Flow (USG/hr)
- Fuel Remaining (USG)
- Fuel Pressure (lb/in^2)
- Essential Bus Voltage (v)
- Outside Air Temperature (°F) from sensor mounted in NACA scoop under right wing.

Figure 7.5: EIS 4000 Engine Monitor

Alarms

Each parametre that the EIS monitors can have upper and lower limits assigned, and the EIS will annunciate an alarm condition if these limits are breached. The “MSTR WARN” red light will flash (upper left side of instrument panel), and the EIS display will change pages to show the affected parametre flashing above its label. If the parametre returns within the allowable range, the “MSTR WARN” light will extinguish, and the display will automatically return to the previously displayed page. The alarm can be reset by pressing the “Next/Ack” on the EIS. The “MSTR WARN” light will stop flashing, but will remain illuminated as long as any parametre remains outside the allowable range. The display will change to the previously displayed page.

Display Formats

There are 14 different pages of data that may be displayed. Pressing the “Next/Ack” button cycles to the next page. Pressing the “Previous” button cycles to the previous page. Double-pushing the “Display” button changes to the

default page. The two user-configurable pages don't have labels identifying which parametre each block of numbers represents. Pressing and holding the "Display" button from a user-configurable page replaces the digits with the data labels, allowing the data blocks to be identified.

The pages, in sequence, are:

EIS Page Layout	Remarks
3:38 38.2 10.5 Endur Fuel Flow	**Fuel Page** **Top row** — Endurance to dry tanks (H:M), Fuel Quantity (USG) and Fuel Flow (USG/hr). **Bottom row** — Data labels. The fuel quantity is a detotalizer, based on the pilot-entered fuel quantity, less the integrated fuel flow.
2410/23.0 400 200/70 10.5 1335	**User-configurable Page 1 — Default Page** **Top row** — RPM/MP Highest CHT **Bottom row** — Oil Temperature/Oil Pressure, Fuel Flow (USG/hr), Highest EGT Press and hold the "Display" button to replace the digits with data labels. Double-push the "Display" button to switch to this page from any other page.
36.8 10.8 29 -10° 13.6 0.0	**User-configurable Page 2** **Top row** — Fuel Quantity (USG), Fuel Flow (USG/hr) and Fuel Pressure (lb/in^2). **Bottom row** — OAT (°F), Essential Bus Voltage and Main Alternator Load (amps) Press and hold the "Display" button to replace the digits with data labels.
▬▬▬ 2 -50 10.5 1335 2410	**EGT/CHT Bar Graph Page** **Top row** — EGT/CHT Bar Graph — shows the EGT for each cylinder, with the CHT as a missing pixel. Then, the cylinder # of the first cylinder to peak is shown, plus its change from the peak EGT. **Bottom row** — Fuel flow, EGT for first cylinder to peak and RPM.
▔▬ 2 -50 10.5 1335 2410	**EGT Cruise Bar Graph Page** **Top row** — EGT Cruise Bar Graph — shows how the EGT for each cylinder has changed from the saved lean point. Each pixel is 10°F. Bars growing left of centre show decrease in EGT, to the right is an increase in EGT. Then, the cylinder # of the first cylinder to peak is shown, then its EGT vs the peak EGT. **Bottom row** — Fuel flow, EGT for first cylinder to peak and RPM.
1335 1325 E 1330 1325 G	**EGT Page** **Top row** — EGT #2 EGT #1 **Bottom row** — EGT #4 EGT #3 The EGT presentation is oriented as if the viewer was looking down on the engine. I.e. the top row shows the EGTs for the front two cylinders, and the bottom row shows the rear two cylinders.
-12 -25 2 -15 1335 L	**Digital Leaning Page** **Top row** — EGT #2 EGT #1 **Bottom row** — EGT #4 EGT #3 Shows the EGTs for all cylinders that have not peaked. Once an EGT reaches peak, and decreases by 10°F, the EGT is replaced by the amount the temperature has decreased from the peak. The cylinder # for the first cylinder to peak is shown in the top right corner of the display. **Note that the numbering scheme here is not the same as Lycoming's cylinder numbering scheme** — 1 is top left (Cyl #2), 2 is top right (Cyl #1), 3 is bottom left (Cyl #4) and 4 is bottom right (Cyl #3).

Continued on next page

Continued from previous page

EIS Page Layout	Remarks
-12 15 C 10 5 Z	**Cruise Page** **Top row** — EGT #2 EGT #1 **Bottom row** — EGT #4 EGT #3 Shows the amount the EGTs have changed since "SAVE LEAN PT." was selected.
385 400 400 390 395 CHT	**CHT Page** **Top row** — CHT #2 CHT #1 plus highest CHT in top right corner. **Bottom row** — CHT #4 CHT #3 The CHT presentation is oriented as if the viewer was looking down on the engine. I.e. the top row shows the CHT for the front two cylinders, and the bottom row shows the rear two cylinders.
1:22:57 108° 191.5 Hour Unit	**Timer/Temperature Page** **Top row** — Flight Timer — runs when the RPM is above 2000 rpm. Shows the last flight time at power up, and the current flight time after three minutes of flight. Hours:Minutes:Seconds. The internal unit temperature is shown in the top right corner. **Bottom row** — Engine Hours — accumulates when the RPM is above 2000 rpm.
2410 195 82 RPM OilT OilP	**RPM, Oil Temperature and Oil Pressure Page** **Top row** — RPM, Oil Temperature (°F) and Oil Pressure (lb/in^2). **Bottom row** — Data labels.
24.6 0 32.0 MP FP	**Manifold and Fuel Pressure Page** **Top row** — Manifold Pressure (in HG), Aux 2 input (not used) and Fuel Pressure (lb/in^2). **Bottom row** — Data labels.
24 13.4 0.0 OAT Volt Load	**OAT, Voltage and Alternator Load Page** **Top row** — OAT (°F), Essential Bus Voltage and Main Alternator Load (amps). **Bottom row** — Data labels.
13 45 -28 CRate EGTSp Carb	**CHT Rate of Cooling and EGT Span Page** **Top row** — Cylinder Head rate of cooling (°F/mn) and EGT Span between hottest and coolest EGT (°F). **Bottom row** — Data labels. NOTE Ignore the data labelled "Carb". It is not operative.

NOTE

The tachometer signal from the PMag is valid even if the IGNITION – MAG switch is selected OFF. The RPM will read "0" if the PMag has failed.

Setting Alarm Limits

The upper and lower alarm limits, and other user-modifiable data, may be edited via the "Set Limits" function, accessed by pressing and holding the "Next/Ack" and " Previous" buttons. This brings up a long series of pages where individual parametres may be adjusted, using "soft" labels above each of the EIS keys. After the desired parametres are modified, normal operation is resumed by pressing and holding the "Display" button (which will have a soft label of "Next") to quickly scroll through the pages until the final page is reached, or by cycling the EIS power OFF then ON, via the ENG INST switch on the right console.

Normal Operation

After power-up, the EIS will alarm for any parametres that are outside the allowable limits, such as oil pressure, fuel pressure, etc. Acknowledge each alarm in turn by a momentary press of the "Next/Ack" button. The unit will default to the User-Configurable Page 1, which has RPM, MP, highest CHT and EGT, Oil Pressure, Oil Temperature and

Fuel Flow. Pressing and holding the "Display" button will replace the data with the data labels, so each field may be identified. A press of the "Next/Ack" button will bring up User-Configurable Page 2, which has Fuel Quantity, Fuel Flow, Fuel Pressure, OAT, Voltage and Main Alternator Load. There are 14 different pages in all — a double-push of the "Display" button will return to the default page.

Fuel Detotalizer — Upon power-up the fuel detotalizer function will start with the fuel quantity it had at the last power-down. Press and hold the left and right buttons to reach the fuel quantity page. Once on the fuel quantity page, the fuel quantity may be adjusted as indicated by the "Soft" labels. The fuel quantity can be quickly set to 43 USG (full tanks) by simultaneously pushing the buttons indicated by the "Inc" and "Dec" labels.

Digital Leaning Page — The digital leaning page is a special page that is intended to be used when leaning the mixture. This page is identified by the "L" in the lower right corner. Initially it shows the highest EGT for each cylinder, until each cylinder's EGT peaks, in which case it shows the EGT decrease from peak. The first cylinder to peak is identified by the digit in the top right corner of the window. Note that the numbering scheme here is not the same as Lycoming's cylinder numbering scheme — 1 is top left (Cyl #2), 2 is top right (Cyl #1), 3 is bottom left (Cyl #4) and 4 is bottom right (Cyl #3).

The page is used as follows:

1. Select the Digital Lean Page, identified by the "L" in the lower right corner.
2. Select the "Save Lean Point?" window, by a momentary press of the centre and right buttons, and select "RE-SET". This resets the highest EGTs to the current values.
3. Slowly lean the engine. The EGTs should all increase, and the highest EGT for each cylinder will be continually updated.
4. As leaning continues, one cylinder will reach peak EGT. Once the EGT was decreased by 10°F below peak the display will change to now show the number of degrees that the cylinder is less than the peak EGT. The first cylinder to peak is identified by the digit in the top right corner of the window. Note that the numbering scheme here is not the same as Lycoming's cylinder numbering scheme — 1 is top left (Cyl #2), 2 is top right (Cyl #1), 3 is bottom left (Cyl #4) and 4 is bottom right (Cyl #3).
5. Enrichen or lean as desired so all cylinders are at the desired value lower than the peak EGT.

Abnormal Operations

The EIS will flash the "MSTR WARN" red light if any parametre goes outside the upper or lower limits programmed via the "Set Limits" interface. The EIS display will automatically change to a page that displays the parametre of interest, with the value flashing. Press the "Next/Ack" button to acknowledge the warning — the EIS display will return to its previous page. The "MSTR WARN" light will stop flashing, but will remain illuminated until all parametres are within the programmed ranges. If another parametre goes outside the programmed ranges, the "MSTR WARN" light will flash again, and the display will change to show the parametre of interest.

ENGINE CONTROLS

Engine controls consist of throttle, propeller, mixture, alternate air door and oil cooler door controls. The throttle, propeller and mixture controls are in a throttle quadrant mounted on the left side of the front cockpit. The alternate air door position is controlled by a push-pull Bowden cable connected to a knob mounted on the upper, inboard side of the left landing gear box structure, underneath and ahead of the instrument panel. The oil cooler door controls the amount of air that enters the oil cooler, to allow the oil temperature to be varied. The oil cooler door position is controlled by a push-pull Bowden cable connected to a knob mounted on the upper, inboard side of the left landing gear box structure, underneath and ahead of the instrument panel.

LANDING GEAR

The landing gear is of conventional configuration with steel landing gear legs. The tail wheel is full castering — it is normally locked and follows the rudder position, but unlocks to a castering condition if full rudder is applied.

The main gear wheels are fitted with Cleveland 199-102 wheels and disk brakes. The tail wheel is solid rubber.

BRAKES

The braking system consists of toe brakes attached to the rudder pedals operating two Cleveland brake master cylinders. The left and right brake master cylinders share a common fluid reservoir installed on the top left front face of the fire wall. Care must be taken to avoid applying brake pressure when using rudder on the ground.

The parking brake control valve is mounted on the forward baggage compartment aft bulkhead, below and forward of the instrument panel. The valve cannot be seen with the head in the normal flying position, but it can be felt if the hand is placed below the instrument panel, and it can be seen if the head is lowered. The control lever is on the left side of the braking brake valve, and has a spring loaded catch to secure it in the OFF position. The parking brake is OFF if the control lever is rotated vertically upwards, and it is ON if the control lever is rotated vertically downwards.

WARNING

The parking brake valve must be checked prior to landing to ensure that it is held in the OFF position by the spring-loaded catch. If the parking brake valve is in the ON position, any applied brake cannot be released, which may lead to loss of directional control.

WARNING

The brakes have enough brake energy capacity for a single maximum braked rejected take-off or landing from normal approach speed. Multiple hard braking events, or a maximum braked landing from an abnormally high landing speed could overheat the brakes resulting in brake failure.

ADD PHOTO OR DRAWING OF PARKING BRAKE VALVE LOCATION

FLIGHT CONTROLS

Dual controls are fitted. A pin at the base of the passenger control stick allows it to be removed without affecting the operation of the remaining controls. Elevator and ailerons are operated through a system of adjustable push rods. The rudder is operated through a cable system to the rudder pedals.

Pitch trim is by a tab on the right elevator actuated by an electric servo. Roll trim is by a spring bungee system actuated by an electric servo. Pitch and roll trim are selected by a “Coolie Hat” switch on the pilot’s stick grip. Pitch trim can also be selected by a spring loaded switch ahead of the rear seat throttle lever. Trim positions are shown on LCD indicators located on the upper left portion of the instrument panel. Trim system power can be selected to OFF, FRONT or FRONT + REAR by a three position switch on the right console. Trim system power will also be removed while the red TRIM + WING LEVELER cut-out switch on the pilot’s stick is depressed.

Flaps are operated electrically and are controlled by a switch mounted on the left side of the instrument panel.

FUEL SYSTEM

Fuel is stored in two 21.5 US gallon tanks secured to the leading edge structure with screws and plate nuts. Fuel drains are fitted to the lowest point of each tank (and of the fuel system) and should be opened prior to the first flight of the day and after each refuelling to check for sediment and water.

The left tank is fitted with an inverted fuel pickup, which is a weighted length of flexible line, with a fuel pickup at the loose end. This introduces additional failure modes for the left tank — the fuel pickup could get hung up inside the tank, or it could become disconnected at the front end. These failures would increase the amount of unusable fuel in the left tank by several gallons.

WARNING

Never assume that all fuel in the left tank is usable. The left tank must not be selected for takeoff or landing unless there are at least 10 USG of fuel remaining in that tank. If it is planned to use most of the fuel on a flight, the left tank must be used to a low value while adequate fuel still remains in the right fuel tank to safely land the aircraft in case the left fuel tank feed ceases prematurely.

The fuel selector valve is located to the left of the pilot's seat on the lower console. A knob on the valve handle must be lifted to change the selection to or from the OFF position.

A fuel gascolator is located in the left wing root area. This is not the lowest point in the fuel system and is intended as a dirt trap only prior to fuel entering the fuel pumps. The gascolator should be drained prior to the first flight of the day — the fuel selector must be selected to LEFT or RIGHT to allow fuel to flow through the gascolator so it can be drained.

An electric boost pump is fitted in case of failure of the engine-driven fuel pump and is also used during takeoff and landing. The boost pump is controlled by the green ON/OFF toggle push button on the pilot's control stick. The green boost pump lamp on the upper left instrument panel will illuminate when electrical power is supplied to the boost pump.

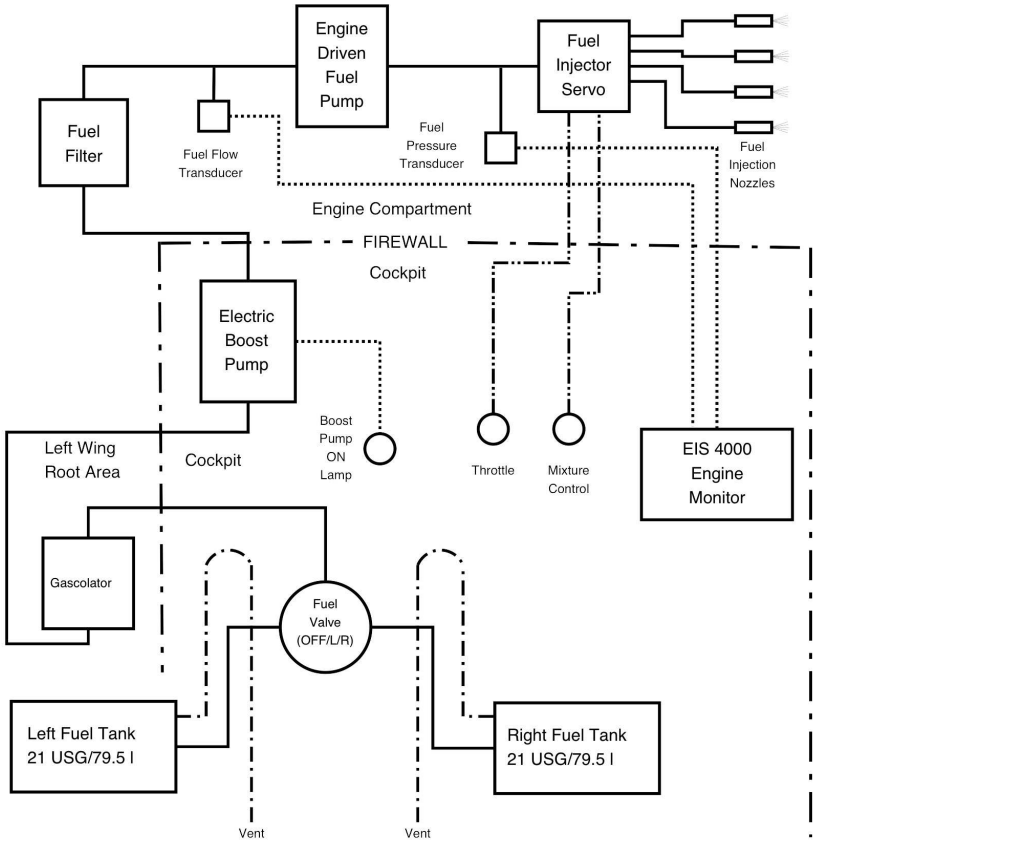
The fuel filter is located on the engine side of the firewall, and is in the system between the boost pump and the engine-driven fuel pump.

A fuel flow transducer is fitted between the engine-driven fuel pump and the fuel injection servo. The fuel flow information is fed to the Grand Rapids EIS 4000, which has a detotalizer function that calculates predicted fuel remaining. The fuel quantity information in the EIS 4000 must be updated whenever fuel is added to or drained from the fuel tanks.

WARNING

The displayed fuel remaining value does not take into account any possible fuel leaks, or erroneous input of starting fuel quantity.

A fuel pressure transducer is mounted between the engine-driven fuel pump and the fuel injection servo. The fuel pressure is monitored and alarmed by the Grand Rapids EIS 4000.



Notes:

1. The Boost Pump is controlled by the blue button on the pilot's control stick. The button acts as a toggle - pressing and releasing the button will select the Boost Pump ON if it was OFF, and OFF if it was ON.

2. The Boost Pump ON Lamp on the left upper instrument panel will illuminate if electrical power is applied to the Boost Pump. It will illuminate even if the Boost Pump has failed.

3. Proper functioning of the Boost Pump is checked on each engine start, or by observing a fuel pressure increase on the EIS 4000 Engine Monitor when the Boost Pump is selected ON.

4. The Gascolator is in the left wing root, between the inboard wing rib and outside of the fuselage. The Gascolator drain is accessible through a hole in the bottom of the left wing root fairing.

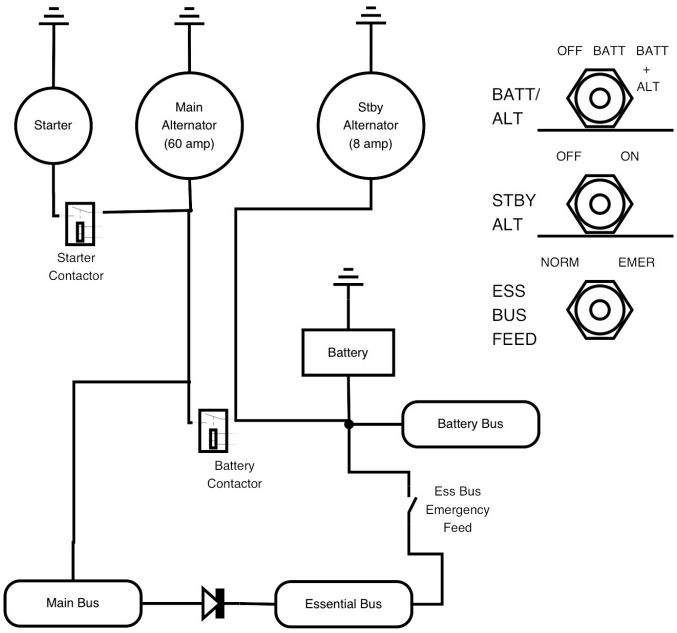
LEGEND

- Fuel Line
- Vent Line
- Mechanical Linkage
- Electrical Connection
- Cockpit Boundary

Figure 7.6: Fuel System

ELECTRICAL SYSTEM

The electrical system includes a 14 volt 60 amp Main Alternator, a 12 volt, 17 amp-hour battery, over voltage protection, an 8 amp Standby Alternator and a Battery Contactor. Power is distributed to Main, Essential and Battery Buses. Normally the Main Bus is powered from the Battery and Main Alternator, and the Essential Bus is powered from the Main Bus via a diode. The Battery Bus is powered all the time, regardless of the state of the Battery Contactor. The Essential Bus has a selectable alternate feed path from the Battery Bus. This alternate feed path is used if the power supplied from the Main Bus has failed, or if the Main Bus is manually shed following Main Alternator failure. An Aux Power outlet located on the lower aft face of the right landing gear box provides 10A of Battery Bus power for handheld devices. It may also be used to charge the battery, providing that the charge current is limited to less than 10A.



Notes:

1. This is a simplified schematic. See separate figures for details of Main and Standby Alternator Control, Over Voltage Protection and Starter control.

2. The BATT/ALT switch has three positions: OFF, BATT & BATT+ALT.

3. The Battery Bus is always supplied with power, even if BATT/ALT is OFF.

4. Essential Bus power is normally supplied from the Main Bus, via a diode. Essential Bus power can be feed directly from the Battery Bus via an emergency feed. This is used if the normal feed fails, or if BATT/ALT is selected OFF to shed load following a Main Alternator failure.

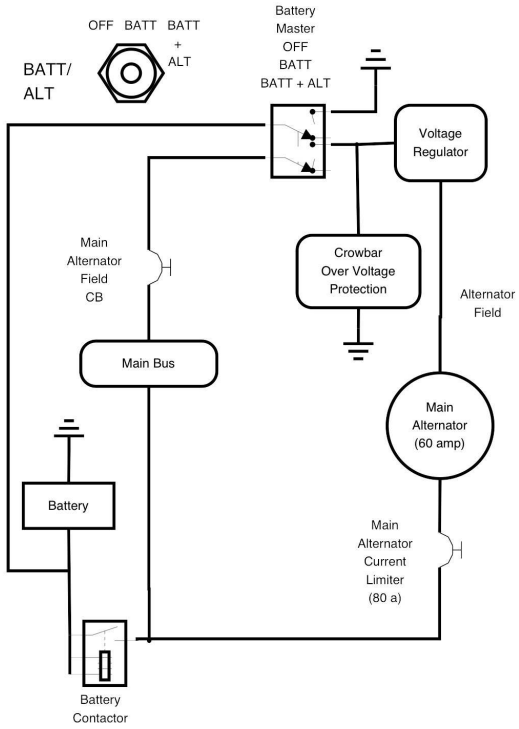
5. The Standby Alternator has sufficient capacity to supply all loads on the Battery and Essential Buses.

Figure 7.7: Electrical System

Electrical System Switches — Electrical system switches are positioned on the right switch console. The master relay and the Main Alternator are controlled by the same three-position switch. The switch positions are OFF, BATT and BATT+ALT. The Standby Alternator can supply power to the Battery Bus, and the Essential Bus even if the BATT/ALT switch is selected to OFF.

Over Voltage Protection — Each alternator has independent over voltage protection. If the alternator output voltage is too high, the over voltage protection system will short the Main Alternator field or the Standby Alternator relay to ground. This will open a CB on the aft end of the right side switch console, and shutdown the affected alternator. The over voltage protection may be reset by pushing the CB back in, but it will pop again if the over voltage condition still exists.

Electrical System Circuit Protection — All circuit protection is by fuses, except for circuit breakers for the Main Alternator Field and the Standby Alternator Relay. The fuses for the Main and Essential busses are mounted on the aft face of the hinged door on the forward baggage compartment aft bulkhead, and are accessible on the ground only. Battery Bus fuses are in a fuse block next to the battery, behind the aft baggage compartment. Fusible links are also used to protect some of the wires.



Notes:

1. The Battery Contactor and the Main Alternator are controlled by the same three-position switch. The system design forces the Battery Contactor to be closed before the Main Alternator can be brought on line.

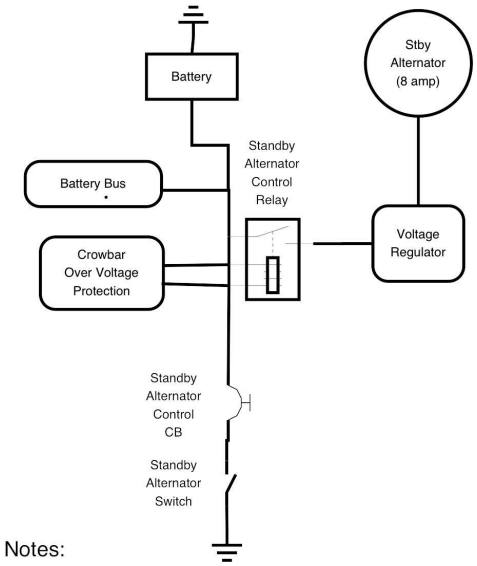
2. If the Main Bus voltage exceeds XX volts, the Crowbar Over Voltage Protection wil short to ground. The Main Alternator Field CB will open, stopping output from the Main Alternator.

3. Over Voltage Protection system operation are indicated by an EIS 4000 alert for low voltage, and ALT CB tripped.

CAUTION

Selecting the BATT/ALT switch from BATT + ALT to BATT or OFF (i.e. selecting the Main Alternator OFF) while the alternator is heavily loaded may cause a voltage spike that could damage the avionics or voltage regulator.

Figure 7.8: Main Alternator Control



Notes:

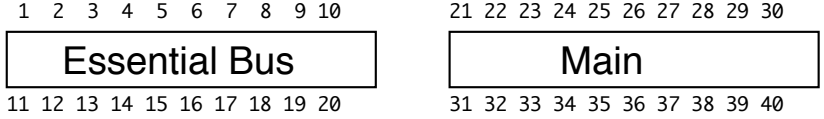
1. If the Battery Bus voltage exceeds XX volts, the Crowbar Over Voltage Protection will short to ground. The Standby Alternator Control CB will open, which will force the Standby Alternator Control Relay to open, stopping output from the Standby Alternator.

Figure 7.9: Standby Alternator Control

Main Bus	Essential Bus	Battery Bus
EFIS Main Power	PMag Electronic Ignition	Light Speed Electronic Ignition
Microair COM	GNS 430W	Turn and Bank
Narco 122D	CDI	EFIS Emergency Power
Audio Panel	Transponder	Aux Power Outlet
CO Monitor	Grand Rapids EIS 4000	
Engine Inst. Lighting	Inst. Panel Lighting	
CDI Lighting	Goose Neck Flood Light	
Landing Light	Pitch Trim	
Taxi Light	Roll Trim	
Position Lights	Fuel Gauges	
Strobe Lights	ELT GPS Decoder	
Oil Press. Warning Light		
Starter		
Flaps		
Boost Pump		
Pitot Heat		
Autopilot		
Hour Meter		
Tachometer		
Manifold Pressure Gauge		
Defog Fan		

Figure 7.10: Items Powered By Each Electrical Bus

Fuse blocks viewed from forward baggage compartment, with access panel open. The top of the access panel when closed is at the bottom of this view.



ESSENTIAL BUS

1	3A		Fuel gauges
2	1A		LED Flood
3	1A	fuse F24	EIS DTS data out
4	3A		GTX 327 Power
5	3A		Gooseneck light
6	10A		GNS 430W COM Power
7	5A		GNS 430W GPS Power
8	3A	fuse F10	Trim Power
9	5A	fuse F30	PMag power
10	3A	fuse F14	EIS 4000 Power
11			
12			
13			
14			
15			
16	1A		ELT GPS Decoder
17			
18	1A		Annuncitor wire 11
19			Stick Grip Trigger
20	10A	fuse F25	Ess Bus Alternate Feed

MAIN BUS

21	3A	fuse ??	Microair 760 Power
22	3A	fuse F22	EFIS Main Power
23	3A	fuse ??	PMA 4000/Lighting (Eng Inst, CDI)
24	5A	fuse F16	Wing Leveler Power
25	3A		Tach, MP
26	10A		Boost Pump Power
27	1A		Boost Pump Relay
28	7.5A		Starter Contactor
29	10A	fuse F5	Strobe Power
30	5A	fuse F11	Flap Power
31	10A		Ess Bus Feed
32	2A		Defrost Fan
33			Narco 122D Power
34	2A	fuse F26	CO1 CO Monitor
35	7.5A		Landing Light
36	7.5A		Taxi Light
37	10A	fuse F6	Nav Light Power
38	15A	fuse F3	Pitot Heat
39			Hobbs Meter and Oil Press
40			Alt Field CB

BATTERY BUS

The following Battery Bus fuses are in a fuse block on the right baggage bay rib, below the battery:

1	3A	fuse F13	Electronic Ignition
2	3A	fuse F23	EFIS Emer Power
3	2A	fuse F7	Turn and Bank
4	10A	fuse F29	Aux power receptacle (cigar lighter)

Figure 7.11: Fuse Locations

COCKPIT LIGHTING

PANEL FLOOD LIGHTS — The main instrument panel lighting is provided by two white LED flood lights, one mounted on the front end of each canopy sill. The flood lights are powered from the Essential Bus, and are controlled by the left-most dimmer knob on the lower left part of the main instrument panel, labelled "INST PANEL".

GOOSE-NECK FLOOD LIGHT — Map lighting and emergency instrument panel lighting is provided by a goose-neck lamp mounted on the right wall of the front cockpit, powered from the Essential Bus. It is controlled by a dimmer knob fitted next to the base of the lamp. The goose-neck may be removed from the socket by pressing the release button next to the base.

760 COM DISPLAY — The display back-lighting for the Microair 760 COM is controlled by the INST PANEL dimmer knob. The display back-lighting is powered even if the 760 COM is unpowered.

GARMIN GNS 430W & GTX 327 — The display and key back-lighting for the Garmin GNS 430W GPS and GTX 327 Transponder are controlled by the middle dimmer knob, labelled "AVIONICS". The display intensity is controlled by an ambient light sensor if the dimmer knob is rotated fully counter clock-wise — this allows the display intensity to increase as required in bright sunlit conditions.

ENGINE INSTRUMENTS & CDI — The analog tachometer, manifold pressure, fuel gauges and CDI are internally lit — these lights are powered from the Main Bus. The light intensity is controlled by the right-most dimmer knob, labelled "CDI + ENG INST".

EXTERNAL LIGHTING

Landing Light — The Landing Light is installed in the right outboard wing. It is powered from the Main Bus and uses a 55 amp halogen automotive bulb. The switch is on the left side of the instrument panel.

Taxi Light — The Taxi Light is installed in the left outboard wing, and is identical to the landing light, except it is aimed at a lower angle. It is powered from the Main Bus, and its switch is on the left side of the instrument panel.

Flash Function — The Landing and Taxi Lights also have a "wig-wag" flash function which flashes the two lights alternately. It is selected by placing both the Landing and Taxi Light switches in the middle, "FLASH" position.

Position Lights - The aircraft is fitted with red, green and white position lights in the left wing tip, right wing tip and rudder bottom respectively. The wing tip position lights are mounted under flush covers in the forward edge of the wing tips. The rudder bottom light is in the centre of a concentric position light/strobe light assembly. The position lights are powered from the Main Bus, and the switch is located on the left side of the instrument panel. The switch has three positions: "OFF", "NAV", and "NAV + STR". The position lights are ON if the switch is in either of the latter two positions.

Strobe Lights — The aircraft is fitted with white strobe lights, with strobe tubes under flush covers on each wing tip and on the aft end of the rudder bottom fairing. The strobe lights are powered from the Main Bus, and the switch is located on the left side of the instrument panel. The switch has three positions: "OFF", "NAV", and "NAV + STR". The strobe lights are ON only if the switch is in the "NAV + STR" positions.

PITOT-STATIC SYSTEM

The pitot system provides pitot pressure to the EFIS and the airspeed indicator. The heated pitot tube is located under the left wing, about two thirds of the way along the span. The pitot heat, powered from the Main Bus, is controlled by the PITOT HEAT switch on the right hand console.

The static system supplies static pressure to the EFIS, airspeed indicator, altimeter, vertical speed indicator and altitude encoder (which provides altitude information to the transponder). The static pressure ports are on the rear sides of the fuselage and are positioned to self drain. An alternate static port is located near the bottom of the right landing gear box in the cockpit. The alternate static port is a locking valve which is spring loaded closed. It can be pushed upwards and turned to lock it in the open position. Airspeed and altitude corrections must be applied if the alternate static port is open.

HEATING AND VENTILATION

Cabin heat is provided via two heat muffs attached to the exhaust system and fed with high pressure air taken from the baffling behind #3 cylinder and ahead of #1 cylinder. The heated air is ducted through the firewall in two locations: ahead of the rudder pedals, and on the rear wall of the front baggage compartment lower extension, near the right landing gear box. The heat is controlled by two push/pull cables just below the right heat outlet. The right heat outlet is from an orientable eyeball vent that may be pointed to blow the hot air past the right side of the pilot towards the passenger.

Ventilation air is supplied from two NACA inlets: one on the front left side of the fuselage for the pilot, and one under the right wing for the passenger. The pilot's ventilation air is fed to an eyeball vent under the left side of the instrument panel. The passenger's ventilation air is fed to an eyeball vent just aft of the front seat back.

A Defog Fan is mounted beneath a grill on the glare shield. It is controlled by a switch on the right console, and blows air from under the instrument panel against the windscreen.

OXYGEN

An Aerox 13 cubic ft, 2015 psi removable oxygen cylinder (D size cylinder) is fitted in the deep well on the right side of the forward baggage compartment. The bottle and mounting bracket may be removed when not required. A pressure gauge, ON-OFF valve and pressure regulator is installed on top of the cylinder. Two oxygen lines are connected to the regulator with quick disconnect fittings. A slide on sleeve protects the pressure regulator and valve.

The oxygen supply hoses are permanently mounted in the aircraft. Quick disconnects on the front end of the hoses allow them to be disconnected from the regulator when the bottle is removed. Quick disconnects on the aft end of the hoses allow the flow meters and cannulas to be removed. Each end of the oxygen supply lines should be capped when disconnected, and the lines should be stowed in the clips provided. The maximum altitude at which the Aerox Oxysaver cannulas may be used is 18,000 ft.

Altitude (ft)	One Person (hr)	Two People (hr)
10,000	26.7	13.3
15,000	14.8	7.4
18,000	10.3	5.1

Figure 7.12: Duration with Full Bottle (2015 psi)

WARNINGS

1. Oil and grease may ignite spontaneously in the presence of high pressure oxygen. Do not handle the O2 system components with dirty hands. Ensure the system components are kept clean.
2. The oxygen cylinder valve cannot be accessed from the cockpit. Ensure the valve is opened and the oxygen lines are connected to the regulator prior to any flight on which oxygen may be required.

DYNON D-10A EFIS

Figure 7.13: Dynon D-10A EFIS

The Dynon D-10A EFIS provides attitude, heading, airspeed, altitude, vertical acceleration and slip ball information on a 4" colour LCD display.

Operator Interface — The six buttons along the bottom of the bezel provide access to various functions. After a button is pushed, labels are displayed above each button. The far-right button will always command a return to the previous menu.

Power — The EFIS is normally powered from the Main Bus. The unit may be turned ON by pressing the far-left button. If Main Bus power is lost, the unit will automatically transition to its internal battery for 30 seconds, then shutdown. A screen message will be displayed, warning of the impending shutdown. This automatic shutdown may be cancelled by pressing the far-left button.

If Main Bus power is lost, but aircraft battery power is still available, the EFIS BU switch on the right console may be selected to provide EFIS power from the Battery Bus.

If any power source is lost, an on-screen voltmeter display will appear, showing the voltage levels of the EFIS main power, emergency power and internal battery.

The unit may be turned OFF by pressing the holding the POWER button, which is the far-left button on the Main Menu.

Attitude — The EFIS uses solid-state accelerometers and rate gyros to determine the attitude. Airspeed data is used to provide acceleration corrections, so the attitude info may be in error during manoeuvring if the pitot or static lines are blocked. The attitude information may become invalid for short periods following extreme manoeuvres (e.g. aerobatics or spins). The colours of the attitude display will be changed from the normal blue/brown to shades of grey if the EFIS detects that the displayed attitude may not be valid.

Heading — The heading is sensed by a remote flux valve mounted in the rear fuselage. The flux valve may be affected by the steel canopy frame when the canopy is open. It is possible that EMI from the flux valve may be heard on the COM. The flux valve may be disabled by selecting the “FLUX VALVE” switch OFF on the upper left side of the instrument panel. If the flux valve is disabled, the unit will use an internal flux valve, but it has very large errors, so the heading info will be essentially meaningless.

Altimeter Setting — The altimeter setting can be viewed or changed via the BARO selection from the Main Menu.

Bugs — Airspeed, altitude and heading bugs may be set via the BUGS selection from the Main Menu.

Dimmer — Screen intensity can be set via the DIM selection on the Main Menu 2 page [Main Menu ⇒ MORE ⇒ DIM].

Optional Display Items — The CLUTTR menu item allows the user to select which items are displayed [Main Menu ⇒ MORE ⇒ SETUP ⇒ CLUTTR]. For example, the airspeed vertical tape and digital readouts may be independently selected, if desired.

The INFO menu controls optional VSI, voltmeter and accelerometer displays [Main Menu ⇒ MORE ⇒ INFO ⇒ LEFT (or RIGHT, as desired)].

Information on the following additional, optional functions may be found in the EFIS Pilot’s User Guide:

- Timer
- Clock
- G-meter
- VSI
- Turn Rate Display
- Checklists (not currently programmed)
- HSI (not currently configured for display)

GARMIN GNS 430W GPS/NAV/COM

Figure 7.14: Garmin GNS 430W

This section will only provide info on basic functions required for VFR flight. See the Garmin GNS 430W Pilot's Guide and Reference for more detailed information, and coverage of IFR related functions. Some aspects of the functionality are configurable via configuration menus (see Pilot's Guide for details).

The GNS 430W System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS receiver, and a Wide Area Augmentation System (WAAS) Global Positioning System (GPS) Navigation computer. The system consists of a GPS antenna, GPS Receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF COMM antenna and a VHF Communications Transceiver.

Provided the Garmin GNS 430W's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

1. VFR/IFR enroute, terminal, and non-precision instrument approach (GPS, VOR, VOR-DME, NDB, NDB-DME, RNAV) operation using WGS-84 (or NAD 83) coordinate reference datum in accordance with AC 20-138. Add WAAS info.
2. The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA GAI-20 ACJ 20X4, provided it is receiving usable navigation information from the GPS receiver.
3. The equipment as installed has been found to comply with the requirements for GPS primary means of navigation in oceanic and remote airspace, when used in conjunction with the 400 Series Trainer Program incorporating the FDE Prediction Program. This does not constitute an operational approval.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

The GNS 430W provides GPS, COM, VOR, LOC and G/S capability with a colour moving map display. The COM is connected to the COM 1 on the audio panel. The CDI may display either GPS, VOR or ILS info.

Power — The GNS 430W is powered from the Essential Bus. The unit is turned ON/OFF by turning the COM PWR/VOL switch at the top left corner. The Self-Test page data must be verified for IFR navigation using the GPS.

COM — The GNS 430W COM is connected to the COM1 selection of the Audio Panel. The COM volume is controlled by the PWR/VOL knob at the top left corner. This knob is pushed to toggle the squelch ON/OFF. Two concentric tuning knobs at the lower left select the standby frequency for the COM and NAV. The frequency tuning function will default to COM, but it may be toggled between the COM and NAV functions by pushing the inner tuning knob (marked "PUSH C/V"). The standby and active frequencies are exchanged by pushing the "C↕" button. Press and hold the "C↕" button to switch to 121.5 mHz.

NAV — The frequencies are tuned as described in the COM section. The NAV audio may be selected via the audio panel. The NAV volume is controlled by the lower of the two VOL knobs (marked "V"). The NAV idents are not fed to the NAV audio by default, but they may be selected by pushing the NAV volume knob.

CDI — the external CDI nav source is selected to either GPS or NAV by the CDI button on the bottom bezel. The current CDI nav source is indicated above the CDI button and by a lit indication on the CDI itself. If GPS is the nav source, the CDI scaling is indicated above the CDI button (see Table 7.15 below).

NOTE
The internal CDI display on the NAV 1 page always shows GPS information.

ANNUNCIATION	MEANING	APPROACH MINIMUMS
DPRT	Departure, indicates the system is using non- precision approach integrity. HAL = 0.3 and CDI full-scale deflection is 0.3 NM.	
ENR	En route, CDI full-scale deflection is 2.0 NM or current CDI scale selection, whichever is smaller.	
TERM	Terminal, CDI full-scale deflection is 1.0 NM or current CDI scale selection, whichever is smaller.	
LNAV	GPS approach active.	LNAV
LNAV+V	GPS approach active + advisory baro vertical guidance.	LNAV
L/VNAV	Lateral Navigation and Baro Vertical Navigation (LNAV/VNAV) approach active.	LNAV/VNAV
LP	LP indicates Localizer Performance active with no vertical guidance.	LP
LPV	Localizer Performance with Vertical guidance (LPV) approach active. A yellow background indicates that the approach is safe to continue but a downgrade to LNAV may occur.	LPV
MAPR	Missed Approach indicates the system is providing missed approach integrity and CDI full-scale deflection ±0.3 NM.	
LOW ALT	For LNAV+V, LNAV/VNAV, or LPV approaches, the LOW ALT annunciation indicates the aircraft's estimated height is significantly lower than the Final Approach Waypoint height.	

Figure 7.15: CDI Scaling Indications

GPS Direct-To — For GPS Direct-To navigation, push the ~~D~~ button. Dial up the identifier using the inner right knob to select characters, and the outer right knob to move to the next character. Press ENT when the identifier is complete. Press ENT again to activate.

Colour Moving Map Display — Press the CLR button to go to the default NAV page (CDI type display plus digital nav data). Rotate the inner right knob one click to the right to get to the moving map display. The range is changed with the Range rocker switch at the top right of the unit.

Nearest Airports — Rotate the right outer knob all the way to the right, to display the NRST pages. Rotate the inner right knob all the way to the left to the Nearest Airports page. The three nearest airports are displayed, with six additional near airports available if the page is scrolled. The page may be scrolled by pushing the right inner knob to enable the cursor, then rotating the right inner knob to move the cursor. Direct-to navigation may be selected to an airport by moving the cursor to the airport identifier, then pressing the ~~D~~ button.

The airport tower or traffic frequency may be moved to the COM standby position by moving the cursor to the desired frequency on the NRST page and pressing the ENT button. Press the "C↕" button to exchange the standby and active COM frequencies.

Antennae — The GPS/WAAS antenna is mounted on the upper fuselage immediately behind the passenger seat. The COM antenna is mounted on the left side of the bottom of the fuselage just behind the wing main spar. The NAV antenna is mounted inside the right wing tip. The signal from the NAV antenna also provides glide slope info.

MICROAIR 760 COM

The Microair 760 COM radio is positioned in a 2 1/8" instrument hole on the upper left side of the instrument panel above the GNS 430W, and is connected to the COM2 position of the Audio Panel.

Figure 7.16: Microair 760 COM

Controls and Indicators

PRIORITY — Top left. A momentary down push selects the frequency in Memory 25, which is 121.5 MHz by default.

ON/OFF/VOL — Inner top knob. Controls power and volume.

SQUELCH — Outer top knob.

Annunciator LED — Top right. Indicates:

Red (steady)	Radio is transmitting
Red (flashing)	Radio has transmitted for longer than 30 seconds.
Green	A signal is received, or the squelch is set so background static is heard.
Off	Radio is not receiving a signal, and the squelch is set so background static is not heard.

MODE — Bottom left. Momentary down pushes on the Mode toggle cycle the 760 COM thru the four modes of frequency selection.

1. **Flip-Flop Mode** — Flip-Flop mode has an active/standby functionality, with the active frequency displayed above the standby one. The standby frequency is changed using the bottom knob. Push the knob momentarily to switch the control between MHz and KHz. The control defaults to MHz after five seconds of inactivity. An underline cursor indicates the field that is currently selected. The active and standby frequencies are exchanged by making a momentary down movement on the ↕ toggle.
2. **Memory Mode** — The top line displays “MEM XX”, where “XX” is the memory number. The lower line displays the frequency in that memory location. The available frequencies are scrolled by rotating the frequency knob (lower knob). A frequency becomes active the moment it is displayed.
3. **Program Mode** — Used to program the frequencies stored in the current memory location. The top line displays “PROG XX”, where “XX” is the memory number. The frequencies in each memory location may be changed. Lower knob changes frequency and memory number (momentary press of knob cycles it between MEM, MHz and KHz). The frequency is stored by a momentary press of the ↕ toggle. The memory location is cleared by pressing and holding the Priority switch
4. **Scan Mode** — Scan mode is selected by pressing and holding the Priority toggle for three seconds. The radio cycles through the memory frequencies, stopping for 10 seconds on each frequency that has a signal. Scan operation is terminated by a momentary press of the ↕ toggle, or the PTT switch.

Other

Power Source — The 760 COM is powered from the Main Bus.

Back-lighting — The display back-lighting intensity is controlled by the INST PANEL dimmer.

Antenna — The 760 COM is connected to an antenna inside the left wing tip.

NARCO 122D VOR/ILS

The Narco 122D is a VOR/ILS receiver with an integral CDI display. It is located at the lower, centre part of the instrument panel, directly below the CDI. The Narco 122D is **not** connected to the audio panel, so it is not possible to listen to navaid idents.

Figure 7.17: Narco 122D

Controls and Indicators

OFF — VOL — PULL IDENT
— Top right. Controls power. The 122D is not connected to the audio panel, so the VOL and PULL IDENT functions are inoperative.

FREQ — Bottom right.
Inner and outer concentric knobs to select the VOR or ILS frequency.

Course
Select — Unlabelled knob at bottom left. Selects the desired course.

Other

Power Source — The Narco 122D is powered from the Main Bus.

Back-lighting — The Narco 122D has no internal backlighting. It is illuminated by the instrument panel flood flights.

Antenna — The Narco 122D receives NAV and G/S signals from the same antenna that feeds the GNS 430W, which is mounted inside the right wing tip.

AUDIO PANEL

The PS Engineering PMA-4000 Audio Panel is located at the bottom of the avionics stack on the left side of the instrument panel.

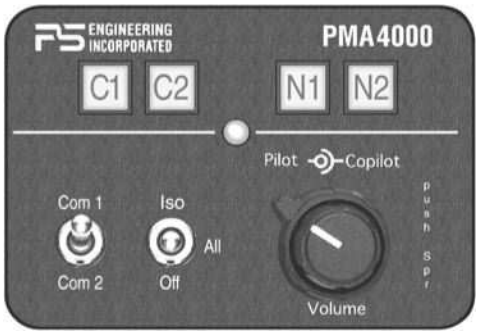


Figure 7.18: PMA-4000 Audio Panel

Controls

Audio Selector Switches
— Top. The four square audio selector switch are labelled as follows:

- "C1" COM 1 — GNS 430W COM
- "C2" COM 2 — Microair 760 COM
- "N1" NAV 1 — GNS 430W NAV audio
- "N2" NAV 2 — not used.

The switches are lit when selected (pressed in). The COM that is selected for transmission is also automatically selected for audio. Both the pilot and passenger may transmit. Only the person who pushes the PTT is heard on the transmission.

Transmit Selector — Bottom left. The COM radio to be used for transmission is selected by the "Com 1/Com 2" toggle switch.

Mode Selector — Bottom centre. The audio panel mode of operation is selected with the "Iso/All/Off" toggle. The modes work as follows:

- **Iso** — Pilot is isolated from the intercom and music audio. The pilot only hears the Com audio (and transmission side tone). The passenger hears only himself on the intercom and the music.

- **All** — Both pilot and passenger hear intercom, radios and music. The music is automatically muted when the intercom is used.
- **Off** — The audio power is not powered. The pilot is automatically directly connected to Com 1 transmission and reception, regardless of the switch selections.

Volume — Bottom right. The pilot's audio volume is controlled by the inner knob, labelled "Pilot". The passenger's volume is controlled by the outer knob, labelled "Copilot". Headset volume controls too?

Squelch — There is no dedicated Squelch control. The audio panel processor continuously adjusts the squelch as required.

PTT — The pilot's PTT is the black switch half-way up the left side of the stick grip. The rear seat PTT is the black button next to the headset jacks on the right cockpit side under the canopy sill.

Hot Mike — Both pilot and passenger intercom are always in a "hot mike" configuration.

GARMIN GTX 327 TRANSPONDER

The Garmin GTX 327 transponder is located below the GNS 430 on the left side of the instrument panel. It is supplied with pressure altitude data by a Trans-Cal SSD120-30N altitude encoder. Some aspects of the functionality are configurable via configuration menus (see Pilot's Guide for details).

Figure 7.19: Garmin GTX-327 Transponder

Controls

ON — Selects Mode A. Transponder replies to interrogations, but does not report altitude.

OFF — Turns off the transponder.

STBY — Puts the transponder in standby mode. The altitude encoder is powered and starts warming up.

ALT — Selects Mode A and Mode C. Transponder responds to interrogations and reports altitude, if the altitude encoder has warmed up. The altitude encoder requires up to two minutes of power to warm up (one minute warm-up time at -20Â°C and two minutes of warm-up time at -55Â°C).

IDENT — Sends an Ident pulse to the ground station for 18 seconds.

VFR — Changes the code to 1200. Pressing VFR a second time returns the code to the previous value.

0–7 — Used to enter a new transponder code. Code selection is started by pressing a digit. The new code will not be activated until the fourth digit is entered. Pressing the CLR key will move the cursor back to the previous digit. Pressing the CRSR key will cancel code entry and return to the previous code.

8–9 — Used in Configuration Mode or to set the timer.

FUNC — Changes the data shown on the right side of the display. Options are Pressure Altitude, Flight Time, Count-Up Timer, Count-Down Timer, Contrast and Display brightness. Note: the availability of Contrast and Brightness selections are controlled by a configuration menu.

CRSR — Used to cancel code entry, and to enable the cursor to input the time for a Count-Down timer.

$\frac{\text{START}}{\text{STOP}}$ — Starts and stops the count-up and count-down timers.

CLR — Resets the count-up and count-down timers and cancels a key press during code entry.

Timers

Count-Up Timer — To operate the Count-Up Timer:

1. Press the “FUNC” key until “COUNT UP” is displayed.
2. If necessary, press “CLR” to reset the timer to zero.
3. Press $\frac{\text{START}}{\text{STOP}}$ to start the timer.
4. Press $\frac{\text{START}}{\text{STOP}}$ again to pause the timer.
5. Press “CLR” to reset the timer to zero.

Count-Down Timer — To operate the Count-Down Timer:

1. Press the “FUNC” key until “COUNT DOWN” is displayed.
2. Press the “CRSR” key and use the “0–9” keys to set the initial time. All digits must be entered, including leading zeros.
3. Press $\frac{\text{START}}{\text{STOP}}$ to start the timer counting down.
4. Press $\frac{\text{START}}{\text{STOP}}$ again to pause the timer.
5. When the timer expires, the words “COUNT DOWN” are replaced with “EXPIRED”, and the timer begins counting up and flashing.
6. Press “CLR” to reset the timer to the initial value.

Other

Power Source — The GTX 327 transponder is powered from the Essential Bus.

Back-lighting — The display back-lighting intensity is controlled by the Avionics dimmer.

Antenna — The GTX 327 transponder antenna antenna is mounted on the right side of the bottom of the fuselage just behind the wing main spar.

AUTOPILOT

The Trio Avionics Pro Pilot autopilot moves the ailerons and/or elevators to control the aircraft. The autopilot can follow the GNS 430W lateral flight plan, including procedure turns and GPS, RNAV or LPV approaches. The autopilot vertical capabilities include altitude hold, vertical speed hold, altitude preselect and LPV vertical path. A two line alphanumeric display provides detailed information to the pilot. The WING LVLR switch on the LH console controls power to the autopilot system. The power to the servos may be temporarily interrupted by pressing and holding the red master disconnect switch on the pilot’s control stick. The autopilot does not control the pitch trim — the aircraft must be reasonably well trimmed in pitch to allow the autopilot to control the aircraft without reaching the force limit provided by the servo slip clutch.

The autopilot control head is on the instrument panel below the turn and slip indicator. The pitch servo is behind the rear baggage compartment, and the roll servo is beneath the horizontal panel just ahead and to the right of the front seat. The autopilot is powered from the Main Bus. Power is controlled by the Wing Leveler switch on the right console and also by the On toggle switch located at the top centre of the control head.

Altimeter Setting — The autopilot does not have a means to directly enter an altimeter setting. Instead, the current altitude is entered whenever the "BARO SET" message is displayed, which allows the system to determine the needed offset to the pressure altitude sensed from the static input.

Controls

1. **Power Switch** — Controls all power to the autopilot control head and servos. This switch is in series with the Wing Leveler switch on the right switch console.
2. **"H NAV"** — Engages or disengages the horizontal (i.e. roll) servo. A three second press and hold engages the autopilot in emergency left course reversal (180° left turn with altitude hold).
3. **"V NAV"** — Engages or disengages the vertical (i.e. pitch) servo. A three second press and hold engages the autopilot in emergency right course reversal (180° right turn with altitude hold).
4. **"H MODE"** — Cycles the horizontal mode between TRK (track), CRS (course) and INT (intercept) modes, if the display is currently showing horizontal mode info. If the autopilot display is currently showing vertical mode information, the first press of the "H MODE" button replaces that with horizontal mode information.
5. **"V MODE"** — Cycles the vertical mode between ALT HOLD (altitude hold), AS/VS (airspeed/vertical speed), ALT SEL (altitude select) and BARO SET (adjust altitude for altimeter setting changes). If the autopilot display is currently showing horizontal mode information, the first press of the "H MODE" buttons replaces that with vertical mode informationl.
6. **Rotary Knob** — Allows pilot input of values by rotation and then pushing to enter. For changes to selected altitude, one click = 100 ft. If the knob is pressed, then turned, one click = 1000 ft. For changes to selected track, one click = 1°.

Figure 7.20: Trio Pro Pilot Autopilot

Indicators

7. **H LED** — Illuminates when the horizontal servo is engaged.
8. **V LED** — Illuminates when the vertical servo is engaged.
9. **GPSS LED** — Blinks when roll steering info from the GNS 430W is available, but not being used because the autopilot is not in TRK mode. Illuminates steady when the autopilot is following roll steering info from the GNS 430W. The autopilot must be in TRK mode to use GPSS.
10. **GPSV LED** — Blinks when vertical steering info from the GNS 430W is available, but not being used because the autopilot is not in TRK mode. Illuminates steady when the autopilot is using vertical steering info from the GNS 430W. GPSV info is only available when the GNS 430W is currently on an instrument approach with vertical guidance (LPV, L/VNAV or LNAV+V).
11. **H MODE LEDs** — TRK, CRS and INT LEDs illuminate steady or flashing to indicate current horizontal mode.
12. **V MODE LEDs** — ALT HLD, AS/VS and ALT SEL LEDs illuminate steady or flashing to indicate current vertical mode.
13. **SLIP BALL** — Indicates lateral acceleration.

14. **H/V FUNCTION ARROW** — Indicates whether the right side of the display and rotary knob are dedicated to H MODE (arrow pointing left) or V MODE functions (arrow pointing right). If the arrow is pointing left, a single press of the V MODE button will switch the arrow to the right. Subsequent presses of the V MODE button will change the vertical mode. Similarly, if the arrow is pointing to the right, a single press of the H MODE button will switch the arrow to the left.

Power

MAIN POWER — The unit is powered from the Main Bus. The toggle switch at the top centre of the control head is in series with the WING LVLR switch on the right console.

Engagement and Disengagement

SERVO ENGAGEMENT — The pitch and roll servos are engaged individually by pressing and releasing the "V NAV" and "H NAV" buttons at the top of the control head. The green "V" and "H" LEDs illuminate when the vertical (i.e. pitch) and horizontal (i.e. roll) servos are engaged. The default horizontal and vertical modes are TRK and ALT HLD.

SERVO DISENGAGEMENT — The autopilot may be disengaged by a quick press and release (press and release within 5 seconds) of the red TRIM/AP disable switch on the front stick grip. The pitch and roll servos may be individually disengaged by pressing and releasing the "V NAV" and "H NAV" buttons respectively.

H NAV Modes

The following horizontal modes are available:

TRK — Track mode uses roll inputs to follow a GPS flight plan or Direct-To. GPS Steering (GPSS) data will be used if available, in which case the roll steering commands are coming from the GNS 430W. TRK is the default power-up mode, if a GPS flight plan or Direct-To is available.

CRS — Course mode uses roll inputs to fly a selected GPS course angle (i.e. a selected track with respect to magnetic north). The selected course is seen on the top left of the display, labeled "CRS". The selected course is adjusted by turning the rotary knob, if the H/V function arrow (middle of the top line) is pointing to the left. The actual track is shown just below, labeled "TRK". CRS is the default power-up mode if GPS data is available but no flight plan or Direct-To has been entered.

NOTE

ATC often requests a specfic heading to be flown. CRS mode allow a specific track to be flown. The CRS can be changed until the EFIS shows the desired heading. The heading will remain constant if the track remains constant, assuming no changes in wind or airspeed.

INT — Intercept mode allows the current GPS leg to be intercepted at a selected interception angle. The default intercept angle is 25 degrees. The angle can be changed with the rotary knob, if the H/V function arrow is pointing to the left. TRK mode will engage automatically as the GPS leg is captured.

V NAV Modes

The following vertical modes are available:

ALT HLD — Altitude Hold mode uses elevator inputs to hold the current altitude. This is the default mode that will be engaged if the V NAV button is pressed with no other modes having been previously selected. This mode may also be automatically engaged after the autopilot commands a level off from a climb or descent to a selected altitude. Small adjustments to the altitude may be made by pressing the "V MODE" button until "ALT ADJ UP/DN" is displayed, then turning the rotary knob. CW rotation increases the altitude by 5 ft/click, and CCW rotation decreases it by 5 ft/click.

VS — Vertical speed mode is used to climb or descend at a selected vertical speed. The

Pilot Command Steering (PCS)

Pilot Command Steering may be commanded by pressing and holding the red Autopilot/Trim Disconnect switch on the control stick for longer than five seconds (if the button is held for less than five seconds, the autopilot servos will disengage).

PCS in Roll — If in TRK mode, PCS will switch the autopilot to CRS mode. The autopilot will continue to fly the GPS track that was being flown when the Autopilot/Trim Disconnect button was released. This is a reasonable surrogate for heading mode (which the autopilot does not have), as the heading will be reasonably constant assuming neither the wind nor the airspeed changes significantly.

If the autopilot is in CRS mode, use of PCS will change the commanded GPS track.

If the autopilot is in INT mode, use of PCS will change the commanded GPS track to be flown until the GPS flight plan leg is intercepted.

PCS in Pitch — The autopilot will reengage in ALT HLD mode with the current altitude as the reference if the vertical speed is less than plus or minus 200 ft/mn when the Autopilot/Trim Disconnect switch is released. The autopilot will reengage in VS mode with the current vertical speed as the reference if the vertical speed is less than plus or minus 200 ft/mn when the Autopilot/Trim Disconnect switch is released.

NOTE

PCS affects both horizontal and vertical modes. There is no way to have PCS only affect one axis. If PCS is used to make a small adjustment to the altitude in ALT HLD, the autopilot will also switch from TRK to CRS mode. TRK mode must be reengaged by pressing the H MODE button until the TRK LED is illuminated.

Safety Features

The autopilot has the following safety features:

1. **Disconnect During Take-off** — If the autopilot is connected during the takeoff roll, it will disconnect when the GPS ground speed increases through 25 kt.
2. **Speed Protection** — The autopilot has minimum and maximum speed protection when in VS mode — if the speed reaches 80 or 190 kt it will capture that speed rather than follow the commanded vertical speed.
3. **Automatic 180° Mode** — An automatic 180° turn + altitude hold can be initiated by pressing and holding either the "H NAV" or "V NAV" buttons for three seconds — pressing "H NAV" will command a left turn, and pressing "V NAV" will command a right turn.
4. **Servo Slip Clutches** — Both servos have slip clutches that will allow the pilot to override the autopilot if sufficient force is applied.
5. **Load Factor Protection** — The pitch servo will disconnect if the load factor exceeds 2g, or is less than 0g — this disconnect logic is in the servo, and is independent of the autopilot logic in the control head.
6. **Disconnect on Power Loss** — The servos should completely release from the flight controls if power is removed from the autopilot.

Preferences Menu

The following autopilot parametres may be changed in flight via the Preferences Menu:

1. **BACKLIGHT and CONTRAST SET** — Sets the brightness and contrast of the LCD display
2. **FL DIST, FL TIME** — Displays re-settable flight distance and flight time
3. **TOT DIS, TOT TIME** — Display non-resettable total distance and total time
4. **SET HNAV GAINS** — Adjusts horizontal H NAV fine tracking gains
5. **SET H SERVO GAIN** — Adjusts H NAV servo response gain

6. **VNAV GAIN SETS** — Adjusts gain for the altitude hold and vertical speed modes
7. **VNAV SERVO DB** — Optimizes the V NAV servo dead-band setting

The preferences are changed as follows:

1. Press and hold the rotary knob for 3 seconds to enter the Preferences Menu.
2. Turn the rotary knob to cycle through the various preference pages.
3. Press the "H MODE" button to activate the cursor and move it to the item to be changed — the cursor is a right facing triangle that sits to the left of the item to be changed.
4. Turn the rotary knob to change the value.
5. Press the "H MODE" button to deactivate the cursor.
6. Press and hold the rotary knob to leave the Preferences Menu.

Messages

The following messages may be displayed on the control head LCD display:

1. **NO GPS** — Displayed when no GPS data is received, or the GPS does not have a valid position. TRK, CRS and INT modes are not available. The autopilot will engage in wing leveler mode, which commands zero yaw rate. The rotary knob can be used to make small changes in the commanded yaw rate.
2. **NO FPLAN** — Displayed when the GPS has a valid position, but no flight plan or Direct-To waypoint has been entered. CRS mode is available, but TRK and INT modes are not available.
3. **TRIM UP REQD** — The autopilot is holding a significant pitch control force. The autopilot vertical servo should be disconnected and the aircraft retrimmed. Anticipate that the aircraft will have a pitch down tendency when the vertical servo is disengaged.
4. **TRIM DN REQD** — The autopilot is holding a significant pitch control force. The autopilot vertical servo should be disconnected and the aircraft retrimmed. Anticipate that the aircraft will have a pitch up tendency when the vertical servo is disengaged.
5. **CLUTCH SLIP** — The autopilot vertical servo clutch is slipping due to excessive control force required. The autopilot is no longer capable of controlling the aircraft in pitch. The autopilot vertical servo should be disconnected and the aircraft retrimmed. Anticipate a significant out of trim condition when the vertical servo is disengaged.
6. **BARO SET** — The alitude indicated on the autopilot control head must be compared to the aircraft altimeter, and the rotary knob turned until the two values agree. Press the rotary knob to input this baro correction into the autopilot. This messages is displayed after power up, and before every climb or descent to a selected altitude.
7. **ALT CAPTURE** — Displayed for five seconds after the autopilot has captured the selected altitude.
8. **VS ERR** — There is a conflict between the sign of the selected vertical speed and the selected altitude — e.g. the selected altitude is lower than the current altitude, but a climb has been selected.
9. **G FORCE LIMIT** — Both servos have disengaged due to a load factor greater than +2g or less than 0g.
10. **I/O ERROR** — Both servos have disengaged due to a communcation failure.

CO MONITOR

The CO Guardian Aero 252F CO Monitor provides visual and aural indications of CO levels that exceed 40 PPM. The CO Monitor is located on the lower left side of the cockpit, ahead of the fuel selector. It is powered from the Main Bus, and has an ON/OFF toggle switch to its right.

Figure 7.21: CO MONITOR

The unit is designed to operate in temperatures of -1°C to 49°C.

Self-Test — The unit performs a self-test upon power application, or when the TEST/RESET button on its face is pressed. A successful self-test provides the following indications in sequence:

- Display shows 0
- Aural alert sounds two beeps
- Green, Yellow and Red LEDs flash in sequence
- Display counts up from 1 to 9 then 0
- Aural alert sounds one beep
- Yellow LED flashes
- Display goes blank
- Green LED remains illuminated, with the Yellow and Red LED OFF

Digital Display — The digital display remains blank for CO concentrations of less than 40 PPM. It flashes two digits in sequence for CO concentrations of between 40 and 99 PPM (e.g. alternating 5 and 0 indicates 50 PPM). CO concentrations of greater than 100 PPM will be displayed as a single, steady digit equal to the hundreds unit (e.g. steady 5 means 500 PPM). The digital display shows the CO level without delay.

Aural Indications — The unit has a built-in speaker. It is not connected to the intercom. CO concentrations of greater than 50 for a specified time delay are annunciated by beeps and flashes of the Yellow LED or Red LED.

Normal Indications — If the CO concentration is less than 40 PPM, the Green light will be illuminated, the display will be blank and there will be no aural alerts. If the CO concentration is between 40 and 50 PPM, the display will alternate between 4 and 0, and the Green light will remain illuminated.

CO Alarm Indications — CO values of 50 PPM or greater are indicated as follows:

CO Conc. (PPM)	Aural Alarm Delay	LED that will be lit
Less than 50	No alarm	Green
50-70	10 minutes	Yellow
70-150	5 minutes	Red
200	3 minutes	Red
300	1 minute	Red
400	No delay	Red

System Failures — System failures are indicated as follows:

- Flashing Green, Red and Yellow LEDs + beep every 30s CO — sensor failure
- Flashing Red LED + beep every 30s — temperature sensor failure
- Flashing Yellow LED + beep every 30s — humidity sensor failure
- Any other combination of flashing LEDs + beep every 30s — micro-controller failure

FIRE EXTINGUISHER

A 2.5 lb halon fire extinguisher is mounted in a bracket on the floor on the left side of the cockpit below the rear seat throttle. The cockpit must be ventilated after using the fire extinguisher.

EMERGENCY LOCATOR TRANSMITTER

The aircraft is fitted with an ACK E-04 406 MHz Emergency Locater Transmitter (ELT). The ELT is mounted in in the aft baggage area, on a tray at the forward right side. The ELT remote control is located on the upper right side of the instrument panel. The ELT may be selected ON by a momentary press of the ON button on the left side of the remote control. The red ON light will flash when the ELT is transmitting. The ELT may be selected OFF by a momentary press of the RESET button. An aural alert will sound every 50 s when the ELT is transmitting.

Figure 7.22: ELT Remote Control

The ELT has a three-position switch. This switch should be in the ARMED position for flight, in which case it is covered with a red plastic cap which retains it in the ARMED position. The ON position is used to force the ELT to transmit after removing it from the aircraft and connecting the telescopic antenna.

Figure 7.23: ELT in Tray

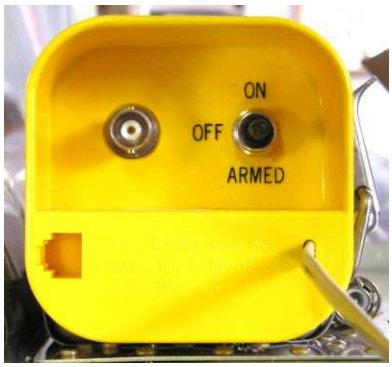


Figure 7.24: ELT Main Control

Following an emergency landing, the ELT may be removed from the aircraft if required. It is secured to the tray by two over-centre locks on band-clamps. The phone line going to the remote transmitter and the antenna coax cable must both be removed. The loose end of the phone line may be clipped into the receptacle on the ELT to make a loop

that can be used as a handle. There is a telescopic antenna clipped to the mounting tray which must be connected to the coax mount on the ELT to allow it to transmit once it is removed from the aircraft.

FIRST AID KIT

A first aid kit in a red zippered pouch is attached to the left side of the rear cockpit side wall.

SECTION 8

AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

This is a place-holder for the Airplane Handling, Service & Maintenance Section. The section will be completed once in-service experience has been gained.

GROUND HANDLING

Ground motion is best accomplished by pushing or pulling on the propeller as near to the spinner as possible. The following are recommended aditional pushing locations to help move the airplane:

- Moving forward — front seat support (canopy open).
- Moving rearwards — wing leading edges and roots of horizontal stabilizer.

A suitable pushbar may be fitted over the two ends of the tailwheel axel.

Take care to not use high power during runup, as the tail will lift even if the control stick is held full aft.

Wing tie down mounting points are located centrally under each wing. Use a 3/8" dia x 16 tpi eyebolt to attach tie down rope to airplane. Secure a third line to the tail wheel spring.

SERVICING

???

CLEANING AND CARE

???

COWLING REMOVAL

See C-GFEW POH for example.

INSPECTION PANELS

In addition to the engine cowling, the aircraft has a number of inspection and access panels:

1. Oil dipstick access door on aft right side of upper cowling.
2. Instrument panel access door on aft wall of forward baggage compartment. Four Torx T10 screws are removed, allowing the access panel to be opened.
3. Three under-wing inspection panels on each wing provide access to fuel tank securing bolts and aileron bellcranks.
4. Rear fuselage inspection plates on each side provide access to the elevator horns.
5. Rear baggage compartment aft wall and hat shelf are removable, providing access to the battery and rear fuselage.
6. Cockpit and rear baggage compartment floors are removable.
7. Wing tips are removable, but note that they must remain close to the wing tips due to the coax connections to an internal antenna in each wing tip, and the power wires for the strobe and navigation lights in each wing tip.

INITIAL INSPECTIONS

The following inspections are required following first flight:

After First Flight

1. Complete firewall forward detailed visual inspection.
2. Check alternator belt tension (7 – 9 ft-lb on pulley when belt slips).
3. Complete airframe visual detailed inspection.

10 Hours

1. Change oil, cut open oil filter and inspect, and inspect suction screen. Look for metal particles, shavings or flakes. Info from Lycoming Service Bulletin No. 480D, July 13, 2000.
2. Retorque landing gear bolts.
3. Complete items from Conditional Inspection, except for oil change, propeller lubrication, ELT.

25 Hours

1. Check alternator belt tension (7 – 9 ft-lb on pulley when belt slips).

35 Hours

1. Change oil, cut open oil filter and inspect, and inspect suction screen. Look for metal particles, shavings or flakes. Info from Lycoming Service Bulletin No. 480D, July 13, 2000.
2. Complete items from Conditional Inspection, except for oil change, propeller lubrication, ELT.

PERIODIC MAINTENANCE

This section includes all items specified in the Lycoming Owner's Manual, MT Operation and Installation manual and Christen 801 Series Inverted Oil System Product Manual. Add items from Slick mag service info. It is supplemented by recommendations from Van's Aircraft, other RV owners, and engineering judgement.

50 Hours or 4 months

The following items should be performed every 50 hours, or four months, whichever comes first:

1. Drain oil sump with oil hot. Send sample for analysis (see Lycoming Service Letter No. 171).
2. Replace oil filter. Cut open & inspect.
3. Inspect & clean suction oil screen.
4. Check & record brake fluid level.
5. Check integrity of:
    a) Fuel & oil hoses,
    b) Ignition system,
    c) PMag wiring at connector & mounting bolts
    d) Exhaust system & attachment hardware,
    e) Cylinders - check for oil leak at rocker box covers, and check for signs of overheating (burned paint),
    f) Baffling/plenum,
    g) Firewall forward wiring,
    h) Engine mount bolts,
    i) Firewall seals, and
    j) Cowling hinge eyes.

6. Inspect & lubricate:
    a) Throttle, mixture & prop linkages,
    b) Alternate air door & control, and
    c) Oil cooler door & control.
    d) Tail wheel (disassemble, inspect locking pin for burrs, lubricate and reassemble)
7. Check alternator belt condition & tension.
8. Check tires for wear, rotate/replace as necessary.
9. On test flight, log engine data.

100 Hours or 12 months

The following items should be performed every 100 hours, or 12 months, whichever comes first:

1. Complete the items from the 50 hour inspection, plus
2. Remove, clean, inspect and regap spark plugs.
3. Inspect & clean gascolator screen.
4. Inspect & clean fuel filter. Check recommended interval.
5. Conduct compression check on all cylinders.
6. Propeller
    a) Remove spinner
    b) Inspect spinner and back plate.
    c) Check propeller mounting bolts and safety wire.
    d) Inspect prop blades for nicks and cracks.
    e) Inspect prop hub for cracks or grease leakage. Add any items from MT manuals.
    f) Check blade track.
        i. Chock the wheels securely.
        ii. Place a fixed reference point beneath the propeller, within 0.25" below the lowest point of the propeller arc. Fasten a sheet of paper to the reference point.
        iii. Rotate the propeller by hand (opposite the direction of normal rotation) until a blade points directly at the paper. Mark the position of the blade tip on the paper.
        iv. Repeat the procedure with the second blade.
        v. Tracking tolerance is 0.125" between the position of the two blades.
    g) Reinstall the spinner.
7. Check alternator belt tension (7 – 9 ft-lb on pulley when belt slips).
8. PMag Electronic Ignition
    a) Check E-Mag website for Service Bulletin compliance.
    b) Check PMag thermal sticker for exceedence.
    c) Check PMag ignition lead resistance is approximately 180Ω per foot. Confirm the resistance is approximately stable while bending, twisting and tugging each end.
    d) Check PMag plug gaps.
    e) Remove PMag and check for smooth rotation and no excessive lateral or axial play in shaft.
    f) Torque wire lead connection screws to 5 in–lb.
    g) Set PMag timing.
9. Light Speed Electronic Ignition
    a) Remove Hall Effect Sensor and open up to check for gear, bearing and seal wear
    b) Set electronic ignition timing
10. Check cylinders visually for cracked or broken fins,
11. Check engine mounting bolts and bushings,
12. Check fuel injector nozzles for looseness, tighten to 60 in-lb torque,
13. Check fuel lines for dye stains at connections, and
14. Re-install spark plugs with new washers.

400 Hours

The following items should be performed every 400 hours:

1. Replace spark plugs, and
2. Remove rocker box covers and check for freedom of valve rockers when valves are closed. Look for evidence of abnormal wear or broken parts in the area of valve tips, valve keeper, springs and spring seats.

500 Hours

The following items should be performed every 500 hours or 36 months:

1. Light Speed Electronic Ignition:
    a) Replace high tension leads (i.e. coil to spark plug wires), and

1500 Hours

The following items should be performed every 1500 hours or 10 years (from CAR 625 Appendix C — not mandatory for amateur-built aircraft). MT's recommended overhaul interval is 1800 hrs or 72 months.

1. Overhaul propeller.

3 Months

The ELT Self Test must be performed every 3 months:

1. Battery Master Switch is OFF.
2. ELT Switch is ARMED.
3. Press Test/Reset Button on ELT Remote Control (right most button).
4. ELT Remote Control Lamp should flash once.
5. A single beep will sound if the ELT passes the self test.
6. Two to Five beeps will sound if there is a problem:
    a) 2 beeps, followed by 2 second delay, followed by 2 beeps: battery low.
    b) 3 beeps, followed by 2 second delay, followed by 3 beeps: low RF power.

12 Months

The following items must be performed every 12 months (the due date is exactly 12 months following the previous inspection):

1. Conduct compass swing of any non-stabilized magnetic compass and install dated compass card (requirement from CAR 625 App. C).
2. Inspect ELT (requirement from CAR 625 App. C).

24 Months

The following items must be performed every 24 months (the due date is exactly 24 months following the previous inspection):

1. Calibrate altimeter and altitude encoder IAW AWM 571 App. B (requirement from CAR 625 App. C).
2. Test transponder IAW AWM 571 App. F (requirement from CAR 625 App. C).

ANNUAL INSPECTION

An annual inspection must be carried out once every 12 months (the due date is the end of the 12th month following the previous inspection). The inspection must include all items listed in CAR 625 Appendix B. The following list expands on the required items. Items marked with (*) are not required as per CAR 625 Appendix B. Completion of these items is not required as per the CARs, but is strongly recommended to improve reliability and safety.

1. AD Review
   - a) Print list of applicable ADs from TC web site. ☐
   - b) Comply with ADs during inspection as required. ☐

2. Aircraft General
   - a) Remove or open all inspection panels, access doors, fairings and cowlings. ☐
   - b) Thoroughly clean the aircraft. ☐
   - c) Inspect panel, door and cowling closing and locking mechanisms for improper installation, function and condition. ☐

3. Fuel System
   - a) Fuel Filter — clean and inspect. ☐
   - b) Gascolator — clean and inspect. ☐
   - c) Fuel Lines — inspect. ☐
   - d) Leaks — check fuel system for leaks. ☐
   - e) Fuel Pressure — Check pressure from electric fuel pump is 25 – 45 psi. Record pressure: _____ ☐
   - f) Fuel Selector Valve — inspect and check operation. ☐
   - g) Fuel Vents — inspect. ☐

4. Engine

WARNING
Ground PMag before working on engine.

   - a) Remove engine cowl. ☐
   - b) Cowling — clean it and inspect for cracks, distortion and loose or missing fasteners. ☐
   - c) Leaks — inspect engine, oil lines, oil cooler and inverted oil system for oil leaks. ☐
   - d) Oil
     - i. Oil temp. sender — inspect for leaks and security. ☐
     - ii. Oil lines and fittings — inspect for leaks, chafing security, dents and cracks. ☐
     - iii. Oil cooler — clean cooling fins and inspect condition. (*) ☐
     - iv. Inverted oil system — inspect for for leaks and security. ☐
     - v. Screens and sump drain plugs — inspect for metal particles and foreign matter. ☐
     - vi. Fill engine with oil per lubrication chart. ☐
   - e) Ignition (*)
     - i. Check condition of spark plugs and adjust gap. ☐
     - ii. Check ignition harness and insulators. ☐
     - iii. Check E-Mag website for Service Bulletin compliance. ☐
     - iv. Check PMag thermal sticker for exceedence. ☐
     - v. Check PMag ignition lead resistance is approximately 180Ω per foot. Confirm the resistance is approximately stable while bending, twisting and tugging each end. ☐
     - vi. Remove PMag and check for smooth rotation and no excessive lateral or axial play in shaft. ☐
     - vii. Torque PMag wire lead connection screws to 5 in–lb. ☐
     - viii. Set PMag timing. ☐
     - ix. Remove Light Speed electronic ignition Hall Effect Sensor and open up to check for gear, bearing and seal wear. ☐
     - x. Set Light Speed electronic ignition timing. ☐
   - f) Thoroughly clean engine and other items ahead of the firewall. ☐
   - g) Studs and nuts — inspect for defects, evidence of improper torque and safety locking. ☐

h) Cylinder compression — conduct compression check on all cylinders. Record readings:

#1:_____
#2:_____
#3:_____
#4:_____

If compression test indicates problems, check internal condition and tolerances. ☐
i) Remove air filter and clean. ☐
j) Check condition of alternate air door and cable. ☐
k) Fuel Injection System
  i. Inspect fuel injection servo. ☐
  ii. Inspect condition of fuel injection lines IAW FAA AD 2011-26-04 & Lycoming MSB 342G. ☐
l) Clean screens in fuel pump. ☐
m) General condition: ☐
  i. Check engine controls throttle, carb heat, mixture, prop and alternate air door. Check condition, proper travel and safety locking. ☐
  ii. Exhaust system — inspect for cracks, defects and improper attachment. ☐
  iii. Inspect heater muffs, heater boxes and SCAT tubes. ☐
  iv. Check breather tube for obstructions and security. ☐
  v. Check crankcase for cracks, leaks, security of bolts. ☐
  vi. Engine mounts — inspect for cracks, looseness of mounting and looseness of engine to mount. ☐
  vii. Flexible vibration dampeners — inspect for poor condition and deterioration. ☐
  viii. Check all engine baffles and plenum parts. ☐
  ix. Check firewall seals. ☐
  x. Check condition and tension of alternator, alternator mount, drive belt and B-lead. ☐
  xi. Check condition of starter, starter mount, starter cable and solenoid. ☐
  xii. Check standby alternator. ☐
  xiii. Check prop governor. ☐
  xiv. Internal corrosion — inspect engines which have not been inhibited and have been out of service in excess of 12 months. ☐
n) Check & record brake fluid level. (*) ☐
o) Lubricate all controls. ☐
p) Reinstall engine cowl. ☐

5. Fuel System

a) Clean and inspect fuel filter. ☐
b) Clean and inspect gascolator. ☐
c) Inspect condition of fuel lines. ☐
d) Check fuel system for leaks. ☐
e) Check pressure from electric fuel pump is 25 – 45 psi. Record pressure ☐
f) Check operation of fuel selector valve. ☐
g) Check fuel vents. ☐

6. Propeller

a) Propeller hub assembly — inspect for cracks, nicks, binding and oil leakage. ☐
b) Bolts and nuts — inspect for improper torque and safety locking. ☐
c) Control mechanisms — inspect for improper operation, insecure mounting and improper range of travel. ☐
d) Composite blades — inspect for:
  i. cracks, bruises, scars, warping, evidence of glue failure and delamination, ☐
  ii. attachment bolt tightness, and ☐
  iii. correct track, excessive rotational and end play. ☐
e) Spinner assembly — inspect for cracks and wear. ☐
f) Variable pitch propellers — check correct operation during ground run. ☐

7. Cockpit

a) Remove seats and cockpit floors. ☐
b) Generally — inspect for dirt and loose equipment that might foul the controls. ☐

c) Inspect cockpit area, forward fuselage and underfloor area for corrosion, cracks, chafed wiring, deterioration, distortion, evidence of failure, defective or insecure attachment fittings, etc. ☐
d) Check for dirt and loose equipment that might foul the controls. ☐
e) Check all wing front spar attachment bolts. ☐
f) Check rear spar carry through structure. ☐
g) Inspect COM 1 and transponder antennae and coax. ☐
h) Landing gear boxes — inspect condition of wiring, etc. Check for FOD. ☐
i) Landing gear attach bolts — Check torque ☐
j) Controls:
  i. Check control columns, systems and connection. ☐
  ii. Lubricate control column bearings as required. ☐
  iii. Check pitch and roll trim operation from front and rear seats. ☐
  iv. Check flap motor, wiring and pushrods. ☐
  v. Lubricate flap pushrod bearings as required. ☐
k) Reinstall cockpit floors and front seat. ☐
l) Windscreen and canopy — inspect for deterioration and breakage. ☐
m) Windscreen and canopy — inspect canopy tracks, rollers and latch. ☐
n) Upholstery — inspect for security and tears. (*) ☐
o) Seats and safety belts — inspect for poor condition, fraying, and any other apparent defects. ☐
p) Rudder pedals, brake cylinders, parking brake valve and brake lines — check condition. ☐
q) Gooseneck and instrument lights — check condition and function of lamps and dimmers. ☐
r) Instrument Panel:
  i. Instruments — inspect for poor condition, mounting, marking and, where practicable, for improper operation. ☐
  ii. Placards —- confirm all placards listed in the POH are in place and are legible. ☐
  iii. Static System — conduct static system leak check. (*) ☐
s) Check condition of heater controls. ☐
t) Check condition of throttle, mixture and propeller speed controls. ☐
u) Check condition of oil cooler door and alternate air controls. ☐
v) Check condition and operation of air vents. ☐
w) Check fire extinguisher. ☐
x) Check wire bundles for chafing, paying particular attention to Infinity stick grip wire bundle at bottom of stick. ☐

8. Aft Fuselage

a) Remove aft baggage floor and aft baggage rear bulkhead. ☐
b) Check under whole aft fuselage, including skins, bulkheads, longerons, stiffeners ,under baggage floor area for corrosion, cracks, chafed wiring, deterioration, distortion, evidence of failure, defective or insecure attachment fittings, etc. ☐
c) Battery — inspect for improper installation and improper charge. Inspect battery hold-down and battery cables. Check battery voltage with no load. ☐
d) Strobe power supply — Check condition and wiring. ☐
e) GPS antenna — check condition of antenna and coax cable. ☐
f) Elevator bellcrank and elevator control tubes — check condition. Lubricate bellcrank and pushrod ends as required. ☐
g) Reinstall aft baggage floor and aft baggage rear bulkhead. ☐

9. ELT

a) Inspect mounting tray and fasteners. ☐
b) Inspect coax cable for abrasion. Disconnect coax connections and inspect jack and plug for corrosion. ☐
c) Inspect cable to remote control for abrasion. Disconnect connections and inspect for corrosion. ☐
d) Inspect GPS data cable for abrasion. Disconnect GPS data cable and inspect jack and plug for corrosion. ☐
e) Check expiration date of ELT, aural alert and remote batteries and replace if they will expire within the next 12 months. ☐
f) Conduct g-switch test from FAA Order 8250.3. From ACK manual, page 13. (*) ☐
  i. Remove ELT from tray. ☐

ii. Select ELT switch to ARMED. ☐
iii. Monitor 121.5, with squelch turned OFF. ☐
iv. During first five minutes of the hour, test g-switch:
A. hold the ELT at your waist with the arrow printed on the battery case facing away from you. ☐
B. move the ELT rapidly away from your waist. ☐
C. when the ELT reaches the full extent of your arm retract it back to your waist as fast as possible. ☐
v. Verify that the ELT tone is heard. ☐
vi. Select ELT switch to OFF within 30 s (406 MHz emergency signal is sent 50 s after g-switch activation). ☐

g) Reinstall ELT ☐
h) Set ELT switch to ARMED ☐
i) Replace red guard over ELT switch ☐
j) Reseal DIN connector with tape ☐
k) Perform ELT Self Test, due every three months ☐

10. Empennage

a) Remove empennage fairing and elevator horn inspection covers. ☐
b) Check horizontal stabilizer attachment. ☐
c) Check vertical fin attachments. ☐
d) Check vertical fin and rudder surfaces. ☐
e) Check rudder horn and attachment. ☐
f) Check rudder bolts for wear. ☐
g) Check rudder strobe and nav light for security. ☐
h) Check horizontal stabilizer and elevators. ☐
i) Inspect horizontal stabilizer front spar IAW SB 14-01-31. ☐
j) Record SB 14-01-31 inspection in logbook. ☐
k) Check elevator trim tab and servo. ☐
l) Check elevator horn. ☐
m) Check elevator bolts for wear. ☐
n) Inspect elevator spar IAW SB 14-02-05. ☐
o) Record SB 14-02-05 inspection in logbook. ☐
p) Lubricate all bearings as needed. ☐
q) Reinstall empennage fairing and elevator horn inspection covers. ☐

11. Wings

a) Remove wing root fairing and under-wing inspection panels. ☐
b) Check fuel tank to fuselage mount. ☐
c) Check wing rear spar attachment bolts. ☐
d) Check surfaces for damage and loose rivets. ☐
e) Check wing walk condition. ☐
f) Check flaps and pushrods. ☐
g) Check fuel tank bolts on front spar. ☐
h) Check aileron bellcrank and control tubes. ☐
i) Lubricate aileron bellcrank and pushrods as required. ☐
j) Check aileron mounts and attachments. ☐
k) Lubricate aileron hinges as required. ☐
l) Check landing and taxi lights and lenses - condition and function. ☐
m) Check nav lights and strobes - condition and function. ☐
n) Check wing tips. ☐
o) Remove wing tips and inspect internal antennae. ☐
p) Reinstall wing root fairing and under-wing inspection panels. ☐

12. Wheels and Brakes

a) Tail wheel assembly.
i. Tail wheel pivot — disassemble. ☐
ii. Tail wheel pivot and locking mechanism — inspect and lubricate. ☐
iii. Tail wheel axle — disassemble. ☐

iv. Tail wheel bearings — inspect and lubricate. ☐
v. Tail wheel axle and tail wheel assembly — reassemble and reinstall on aircraft. ☐

b) Wheel pants and gear leg fairings — remove. ☐
c) Wheels — remove. ☐
d) Wheels — inspect for cracks, corrosion, defects broken bolts and condition of bearings. ☐
e) Wheel bearings — clean, inspect and repack. ☐
f) Tires - inspect for wear, cuts and incorrect inflation; inspect for improper installation and improper operation. Rotate as required. ☐
g) Brake lining — inspect. Minimum acceptable lining thickness is 0.100¨ ☐
h) Brake disc — inspect. Minimum acceptable disc thickness is 0.167¨ ☐
i) Landing gear legs — inspect. ☐
j) Wheels — reinstall. ☐
k) Brake lines — inspect for leaks and condition. ☐
l) Landing gear wear plate at lower fuselage longeron — inspect. ☐
m) Wheel pants, gear leg fairings and intersection fairings — inspect. ☐
n) Tire Pressure — check. Record tire pressures. L:_____, R:_____ ☐
o) Wheel pants and gear leg fairings — reinstall. ☐

13. Operational Inspection

a) Check items that wouldn't normally be checked in flight. Which items?? ☐
b) Pitot Heat — check. ☐

14. Engine Ground Run

a) Idle and maximum rpm — check (for safety reasons, the check of maximum rpm will be done during a takeoff, rather than during a ground run). ☐
b) Ignition drop — check. Record drops. Mag OFF:_____, EI OFF:_____ ☐
c) Oil pressure — check. Record oil pressure at idle: _____ ☐
d) Cylinder and oil temperatures — check. ☐
e) Propeller governor operation – check. ☐
f) Standby Alternator operation – check. ☐

15. Log Book Entries

a) Record annual inspection in Airframe Log Book. ☐
b) Record compliance with FAA AD 2011-26-04 & Lycoming MSB 342F in Engine Log Book. ☐

BATTERY CHARGING

A battery charger lead is attached directly to the battery and extends into the aft baggage compartment.

CAUTION

Pull PMag CB prior to charging battery if the aircraft electrical system is to be powered.

ALTERNATOR BELT TENSION

1. Adjust tension arm so that 11 – 13 ft-lb (new alternator belt), or 7–9 ft-lb (used alternator belt) of torque on the alternator pulley is required to slip the pulley on the alternator belt (from Lycoming SI 1129A Accessory Drive Belt Tension).
2. See Torque Table for tension arm and pivot bolt torque values.

PMAG ELECTRONIC IGNITION

SET IGNITION TIMING

1. Set the engine to 3°ATDC for cylinders 1 and 2.

2. Select PMag OFF, PMag BU Pwr CB IN and ESS BUS FEED switch ON. LED on PMag should be illuminated steady Red.
3. Disconnect MP line at engine end.
4. Blow into MP with a pressure of at least 0.5 psi for a duration of at least one second. Confirm LED is blinking Red. If not, blow again.
5. Blow into MP line a second time. LED will blink Green to confirm timing has been set. If not, blow again.
6. Cycle PMag BU Pwr from ON to OFF to ON to set PMag to normal operation.
7. Move prop around 3°ATDC. LED should be Red prior to 3°ATDC, and Green at 3°ATDC.
8. Select ESS BUS FEED switch OFF.

CHECK IGNITION TIMING

1. Select PMag OFF
2. Select ESS BUS FEED switch ON
3. Set engine to well before TDC for cylinders 1 and 2.
4. Move prop around 3°ATDC. LED should be steady Red prior to 3°ATDC, and steady Green at 3°ATDC.
5. Select ESS BUS FEED switch OFF.

LIGHTSPEED ELECTRONIC IGNITION

SET IGNITION TIMING

1. See the Light Speed Engineering Plasma II Manual for the detailed timing procedure.
2. Set the engine to 5°ATDC for cylinders 1 and 2.
3. Disconnect the two coax at the LightSpeed box.
4. Select the EI Switch to ON.
5. Rotate the hall effect module CCW until the green LED goes ON, then OFF. Torque the hall effect module in place.

CHECK IGNITION TIMING

1. Select the EI Switch to ON.
2. Set engine to well before TDC for cylinders 1 and 2.
3. Rotate prop CW (normal direction of rotation).
4. Green light on hall effect module should illuminate, then extinguish at 5°ATDC for cylinders 1 and 2.

PHASE CHECK

1. disconnect all spark plug wires at the coils.
2. Select EI Switch to ON.
3. Set prop to 5°ATDC for cylinders 1 and 2.
4. Briskly rock prop back and forth — look for a spark at the spark plug lead connections on one of the coils.
5. Connect the spark plug leads for cylinders 1 and 2 to the coil that produced the spark.

SPARK PLUG GAPS

Automotive spark plug, upper plugs, fired by Light Speed electronic ignition - 0.026" – 0.035" gap.

Automotive spark plug, lower plugs, fired by PMag - 0.030" – 0.035" gap.

PROPELLER GOVERNOR

One CW turn of high rpm adjustment screw should decrease max speed by 25 RPM.

RETORQUE MAIN LANDING GEAR BOLTS

1. Torque the 7/16" bolts on the outboard end of each main landing gear leg with the torque wrench on the nut below the aircraft. Hold the bolt heads with a 1/4" drive socket on a ratchet.
2. Torque the 7/16" bolt on the inboard end of each gear leg with the torque wrench on the nut inside the cockpit.
3. Torque the two 5/16" bolts at the inboard end of each gear leg with the torque wrench on the bolt head below the aircraft. Hold the nuts with a 1/2" open end wrench.

RECONFIGURE EIS 4000 ENGINE MONITOR

1. Press and hold the Previous and Display keys.
2. The Set Lean Pt page will be momentarily shown, then the Configuration Set pages will appear.

TORQUE TABLE

Item	Torque Value	Remarks
Main Alternator Mount	110 – 150 in-lb	from Installation Instructions
Main Alternator Tension Arm	110 – 150 in-lb	from Installation Instructions
Main Alternator Pivot Bolt	30 – 40 ft-lb	from Installation Instructions
Spark Plugs	180 in-lb	from PMag and Electronic Ignition Installation Instructions
PMag Spark Plug Adaptors	18 ft-lb	Screw adapters onto sparkplugs, and torque via the spark plug. Do no apply anti-seize. from PMag Installation Instructions
Light Speed Spark Plug Adaptors	25 ft-lb	Do not apply anti-seize. from Electronic Ignition Installation Instructions
Rocker Box Screws	50 in-lb	from Lycoming Overhaul Manual
Exhaust Pipe Nuts	180 – 200 in-lb	Apply anti-seize. from Vetterman Exhaust Installation Instructions
PMag and EI Hall Effect Unit Base Clamps	204 in-lb	from ECI Service Info
Propeller Governor Mounting Nuts	110 – 150 in-lb	from PCU-5000 Installation and Adjustment document
Propeller Governor High RPM Stop Jam Nut	24.8 – 28.3 in-lb	from PCU-5000 Installation and Adjustment document
Oil Screen	135°rotation after contact	from Lycoming SSP-1776-B
Propeller Hub	63 – 66 ft-lb	from MT Operation and Installation manual
Spinner Screws	35 – 44 in-lb	from MT Operation and Installation manual
Brake caliper bolts	75 – 80 in-lb	from Cleveland service info
Wheel half bolts	90 in-lb	Bolts that join the two halves of each wheel. Value from Cleveland service info
Landing gear outboard 7/16" bolts	240 in-lb	from RV-8 Builder's Manual
Landing gear inboard 7/16" bolts	450 – 500 in-lb	from AC43.13-1B
Landing gear inboard 5/16" bolts	100 – 140 in-lb	from AC43.13-1B

Fuse blocks viewed from forward baggage compartment, with access panel open. The top of the access panel when closed is at the bottom of this view.

1 2 3 4 5 6 7 8 9 10
Essential Bus
11 12 13 14 15 16 17 18 19 20

21 22 23 24 25 26 27 28 29 30
Main
31 32 33 34 35 36 37 38 39 40

ESSENTIAL BUS

1	3A		Fuel gauges
2	1A		LED Flood
3	1A	fuse F24	EIS DTS data out
4	3A		GTX 327 Power
5	3A		Gooseneck light
6	10A		GNS 430W COM Power
7	5A		GNS 430W GPS Power
8	3A	fuse F10	Trim Power
9	5A	fuse F30	PMag power
10	3A	fuse F14	EIS 4000 Power
11			
12			
13			
14			
15			
16	1A		ELT GPS Decoder
17			
18	1A		Annuncitor wire 11
19			Stick Grip Trigger
20	10A	fuse F25	Ess Bus Alternate Feed

MAIN BUS

21	3A	fuse ??	Microair 760 Power
22	3A	fuse F22	EFIS Main Power
23	3A	fuse ??	PMA 4000/Lighting (Eng Inst, CDI)
24	5A	fuse F16	Wing Leveler Power
25	3A		Tach, MP
26	10A		Boost Pump Power
27	1A		Boost Pump Relay
28	7.5A		Starter Contactor
29	10A	fuse F5	Strobe Power
30	5A	fuse F11	Flap Power
31	10A		Ess Bus Feed
32	2A		Defrost Fan
33			Narco 122D Power
34	2A	fuse F26	CO1 CO Monitor
35	7.5A		Landing Light
36	7.5A		Taxi Light
37	10A	fuse F6	Nav Light Power
38	15A	fuse F3	Pitot Heat
39			Hobbs Meter and Oil Press
40			Alt Field CB

BATTERY BUS

The following Battery Bus fuses are in a fuse block on the right baggage bay rib, below the battery:

1	3A	fuse F13	Electronic Ignition
2	3A	fuse F23	EFIS Emer Power
3	2A	fuse F7	Turn and Bank
4	10A	fuse F29	Aux power receptacle (cigar lighter)

Figure 8.1: Fuse Blocks

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SECTION 9

EQUIPMENT LIST

TABLE OF CONTENTS

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INTRODUCTION

This is a place-holder for the list of installed equipment. It will be completed with a list of manufacturers, part numbers and serial numbers of the installed equipment and miscellaneous parts.

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ENGINE

Item	Manufacturer	Part No.	Serial No.	Remarks
Engine	Lycoming	IO-360-A1B6	L-25562-51A	Overhauled by Aerosport Power
Propeller	MT	MTV-12-B-C/C183-59B	?	72" diameter. Blade SN ?
Propeller Governor	Aero Technologies	PCU-5000X P-540-036/A-866	08401955	Purchased from American Propeller. Gasket PN MS9144-01
Oil Cooler	Stewart Warner	10599R		or Aero-Classics HE 8001599
Electronic Ignition	E-Mag	P-114		
Electronic Ignition	Light Speed Engineering	Plasma II	31762	
Spark Plugs (Top)	Denso or NGK	W27ESR-U BR9ES	- -	
Spark Plugs (Bottom)	Denso or NGK	W24ESR-U BR8ES	- -	
Air Filter	K&N	33-2060	-	Van's PN E 33-2060
Oil Filter	Champion	CH48110-1	-	
Throttle Cable	Tuthill - Cablecraft	184 VTT-2-60	-	Van's PN CT Q-60
Mixture Cable	Tuthill - Cablecraft	184 VTT-2-52	-	from Van's. Custom length. 52"
Prop Control Cable	Tuthill - Cablecraft	184 VTT-2-48	-	Van's PN CT Q-48
Alternate Air Control Cable	ACS Products	A-740BL0720	-	
Oil Cooler Door Control Cable	ACS Products	A-820BL0360	-	
Heater Box Cable (Front Seat)	ACS Products	A-740BL0720	-	
Heater Box Cable (Rear Seat)	ACS Products	A-740BL0720	-	

ENGINE INSTRUMENTS

Item	Manufacturer	Part No.	Serial No.	Remarks
Engine Monitor	Grand Rapids	EIS 4000	20683-A	SW Vers 44S81F
Tachometer	Van's Aircraft	IE VTACCH3500	-	
Tach Extension Cable	Van's Aircraft	IE VTACH EXT12	-	
Tach Transducer	Van's Aircraft	IE VTACH GEN12	-	
Manifold Pressure Gauge	Van's Aircraft	IE VMP35	-	
Fuel Gauges	Van's Aircraft	IE VFL15	-	Van's Aircraft PN
Fuel Gauge Senders	Van's Aircraft	IE F-385B (L tank) IE F-385C (R tank)	-	
Fuel Pressure Transducer	VDO	360 003	-	from Young's Speed Shop, Ottawa. 80 psi sender, 10 - 180 ohms
Oil Pressure Transducer	VDO	360 004	-	150 psi sender, 10 - 180 ohms
Oil Pressure Switch	Datcon	100451	-	15 psi switch
Hourmeter	Hobbs	85000 Series		ACS P/N 15000

FLIGHT INSTRUMENTS

Item	Manufacturer	Part No.	Serial No.	Remarks
EFIS	Dynon Avionics	100321- Rev 0	004439	Model D10A
ASI	UMA	16-311-241	B0171	
Altimeter	United Instruments	5934PD-3	400700	TSO'd
VSI	Falcon Wultrad	VSI4FM-3	VSIE0206004	Made in China
Turn and Bank	Electric Gyro Corp	1234T100-7TZ	2310-176	
Compass		MC021	052	Made in China
Annunciators	Aerospace Optics Inc.	32245-99-530		Mil Std M22885/90 Vivisun 20/20
Pitot Tube	Aero Instrument Co.	PH 502-12		AN5812-12

ELECTRICAL SYSTEM

Item	Manufacturer	Part No.	Serial No.	Remarks
Battery	Odyssey	PC680	-	
Main Alternator	B&C Speciality Products	L-60	-	Boss mount.
Alternator Belt	Gates	7365 (11A0925)	-	3/8" x 37 1/8"
Standby Alternator	B&C Speciality Products	SD-8	??	
Starter	SkyTec	149-12LS	??	
Battery Contactor	??	??	-	
Starter Contactor	??	??	-	
Essential Bus Diode	??	??	-	
Alternator Field CB	Klixon	7274-11-5	-	MS22073-5 5A CB
Standby Alternator CB	Klixon	7274-11-5	-	MS22073-5 5A CB

AVIONICS

Item	Manufacturer	Part No.	Serial No.	Remarks
GPS	Garmin	011-01060-40	97108744	GNS 430W, mod level 5
Transponder	Garmin	011-00490-00	83710639	GTX 327, mod level 0
Nav 2	Narco	Nav 122D	10499	Warranty #031280300. Narco ship date 10 Mar 05. Dealer code 27025
Com 2	Microair	760	M760-005772	
CDI	Mid Continent Instruments	MD200-306	E22527	
GPS Antenna	Garmin	GA 35	25136	manufactured by AeroAntenna Technology as P/N AT575-93GW-TNCF-000-RG-27-NM
Com 1 Antenna	Comant Industries	CI-122	-	
Com 2 Antenna	Sportcraft	SA-001A-1		Left wing tip
Nav Antenna	Sportcraft	SA-001-1		Right wing tip
Nav Antenna Splitter	Comant Industries	CI 1125	4085047	
ELT	ACK	E-04	001510	Hex ID: 27878 0CF7A FFBFF Aircraft Address: 12609469. 24 bit ICAO Address: C067BD
Altitude Encoder	Trans-Cal	SSD120-30N	18879	
Intercom	PS Engineering	1194 0	BM-01352	PMA4000
Autopilot	Trio Avionics	Pro Pilot	PPR0316VL	SW version OP120710
Autopilot Pitch Servo	Trio Avionics	Gold Standard Servo	S4091	
Autopilot Roll Servo	Navaid Devices	S-2	1444	
CO Monitor	CO Guardian	252	AE6094	
Remote Flux Valve	Dynon	100323- Rev 0	003899	Model EDC-D10A

COCKPIT

Item	Manufacturer	Part No.	Serial No.	Remarks
Defrost Fan	Mode Electronics	59-294-0	-	from Gervais Electronics, Ottawa
Defrost Fan Grill Guard	Mode Electronics	59-319-0	-	from Gervais Electronics, Ottawa

FLIGHT CONTROLS

Item	Manufacturer	Part No.	Serial No.	Remarks
Trim/AFCS disconnect relay	NTE	R14-11D10-12	-	from Active Electronics, Ottawa
Trim/AFCS disconnect relay socket	NTE	R95-111	-	from Gervais Electronics, Ottawa

LIGHTING

Item	Manufacturer	Part No.	Serial No.	Remarks
Landing & Taxi Lights	-	-	-	
Instrument Panel Flood Lights	-	-	-	
Annunciator Lamp Bulb	MRO	56-0022-2	-	T1 Midget flange bulb from MRO, Calgary, 1-800-882-9301Fa1b6

MISC

Item	Manufacturer	Part No.	Serial No.	Remarks
Baggage Door and Canopy Locks	ACS	11-01600		Key # ACS256
Wheel Assembly	Cleveland	40-78B		5" Wheel
Brake Disc	Cleveland	164-01700		
Brake Assembly	Cleveland	30-9		
Brake Lining	Cleveland	066-10600		Part No. is for lining only. Must be riveted to backing plates with 105-00200 rivets.
Fuel Tank Quick Drain Valve	SAF AIR	CAV-110		
Fuel Tank Quick Drain Valve O-Ring		MS29513-006	Replacement O-ring for SAF-AIR CAV-110 drain valve.	