VANS RV-4

C-GFEW

PILOT'S OPERATING HANDBOOK

SERNO. 2794

Constructed: 1999

Builder: Mike Toews

Last Revision: 9 January 2003

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1. GFEW DESCRIPTION

1.1 General

This Pilot's Operating Handbook provides appropriate information to achieve maximum utilisation of the aircraft. It is not designed to be a substitute for adequate and competent flying instruction and should not be used for operational purposes unless kept up to date.

Continued airworthiness is the responsibility of the owner. The Pilot in command is responsible for ensuring the aircraft is safe for flight and for operating within the limits detailed in this handbook and as displayed on placards and instrument markings in the Aircraft and in accordance with the current Special Certificate of Airworthiness issued by Transport Canada.

The RV-4 is a two place all metal low wing conventional gear sport airplane.

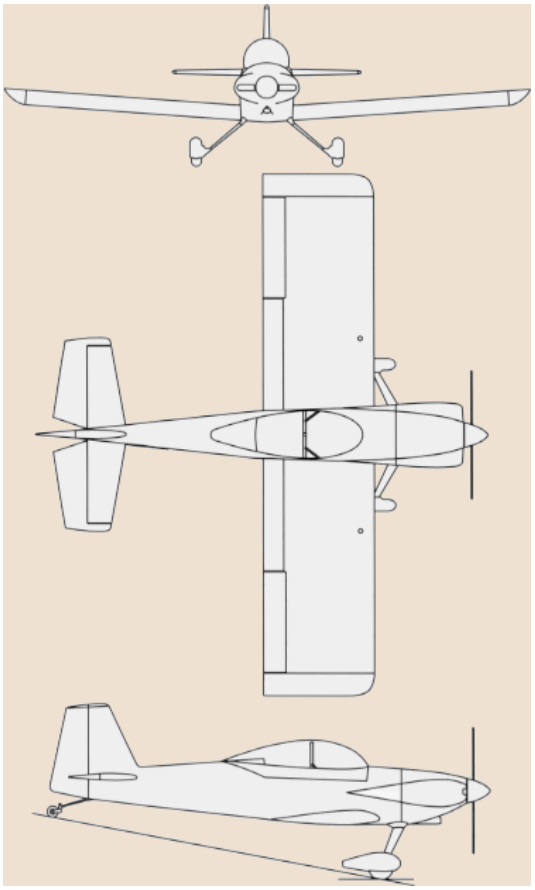


Table 1: Aircraft Specifications

RV-4 SPECIFICATIONS			
Span	23'0"	Wing Loading (lbs/sq.ft)	13.64
Length	20'0"	Power Loading (lbs.hp)	10.0 (150 hp)
Height	5'0"	Engine(hp)	150
Wing Area (sq. ft)	110	Propeller	Wood fixed pitch (70" x 69")
Empty Weight (lbs)	935	Fuel Capacity (US gallons)	32 (192 lb)
Gross Weight (lbs)	1500	Baggage (Structural Limit) (lb)	100

RV-4 Solo Weight (1240 lbs)			
Engine (hp)	150	160	180
Top Speed	201	205	213
Cruise (75%@8000')	189	193	201
Cruise(55%@8000')	171	174	182
Stall Speed	48	48	48
Takeoff Distance(ft)	325	300	260
Landing Distance(ft)	300	300	300
Rate of Climb(fpm)	1850	2050	2540
Ceiling(ft)	21700	24000	28600
Speed Ratio	4.19:1	4.2:1	4.4:1

RV-4 Gross Weight (1500 lbs)			
Engine (hp)	150	160	180
Top Speed	200	204	212
Cruise (75%@8000')	188	192	200
Cruise(55%@8000')	170	173	180
Stall Speed	54	54	54
Takeoff Distance (ft)	475	450	400
Landing Distance(ft)	425	425	425
Rate of Climb(fpm)	1500	1650	1950
Ceiling(ft)	18000	19500	23000
Range(75%@8000') statute miles	650	650	600
Range(55%@8000') statute miles	850	850	790

1.2 Cockpit

The cockpit consists of a simple VFR panel arrangement as shown below.

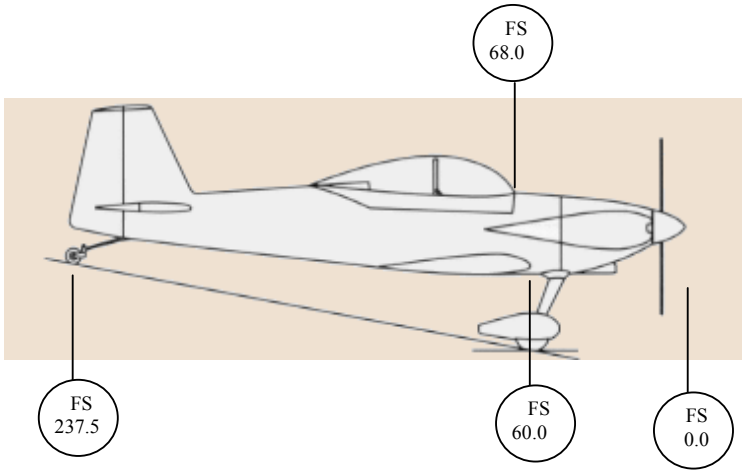
Figure 2 – Cockpit Layout

Item	Description	Item	Description
1	Clock	8	Exhaust Gas Temperature Gauge
2	Vertical Speed Indicator	9	Oil Pressure Indicator
3	Altimeter	10	Oil Temperature Indicator
4	Turn & Bank Coordinator	11	Tachometer
5	Airspeed Indicator	12	Aerobatic Entry Speeds
6	G-meter	13	Switch, Turn Coordinator
7	Ammeter	14	Switch, Auxiliary Fuel Pump

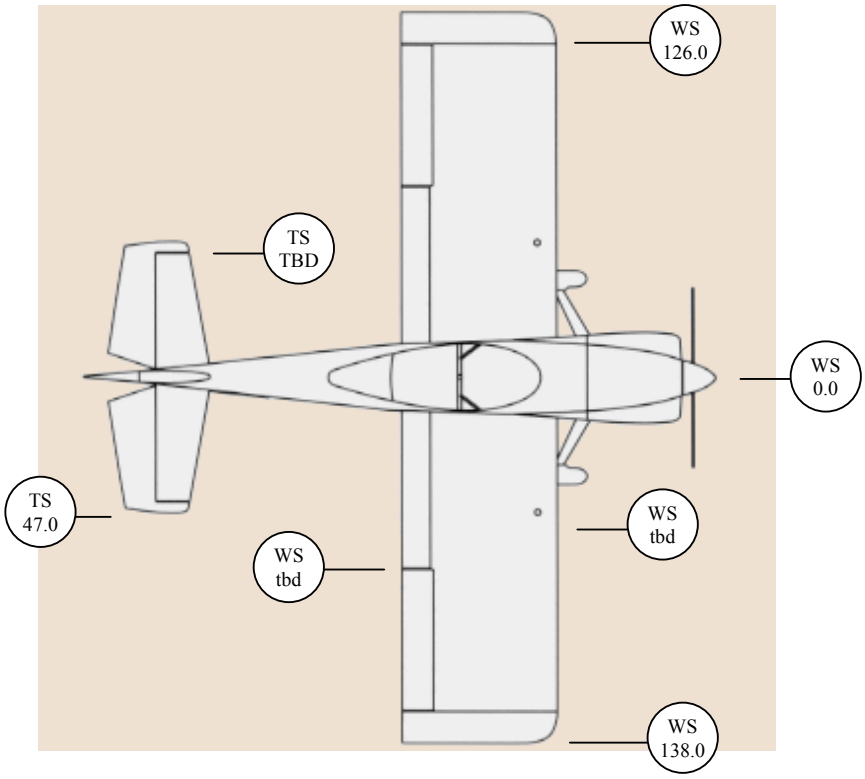
15	Intercom	33	Primer
16	Carbon Monoxide Indicator	34	Push to Talk Button
17	Transponder	35	Aileron Trim (Fwd side of stick)
18	VHF Radio	36	Cockpit Heat Control Lever
19	Carb Heat Control Lever	37	Fresh Air Vent
20	Trim Lever, Elevator	38	Ignition Switch
21	Throttle	39	Master Switch
22	Mixture	40	Compass Correction Card
23	Tension Control, Throttle / Mixture	41	Circuit Breaker, Starter Relay
24	CD Player Attach Strips	42	Circuit Breaker, Master Relay
25	Mic / Headset Jacks	43	Circuit Breaker, Turn Co-ordinator
26	Global Positioning System	44	Circuit Breaker, GPS
27	Fuel Qty Indicator, LHS	45	Circuit Breaker, Intercom
28	Circuit Breaker, Fuel Qty Indicator	46	Circuit Breaker, VHF Radio
29	Circuit Breaker, Fuel Pump	47	Circuit Breaker, Transponder
30	Circuit Breaker, Fuel Qty Indicator	48	Compass (Directly above item 4 when canopy is closed)
31	Fuel Qty Indicator, RHS	49	
32	Fuel Selector (shown on LH tank)	50	

1.3 Station Diagram

1.3.1 Fuselage



1.3.2 Wing/Tail



1.4 Engine

Engine Manufacturer	Lycoming
Model Number	O-320-A2B
Rated Horsepower	150
Rated Speed (rpm)	2700
Displacement (Cubic ins)	320
Compression Ratio	8.50:1
Type	Four cylinder, Direct Drive Horizontally Opposed, Air Cooled

1.5 Propeller

Manufacturer	Colin Walker
Model	70 x 69 (pitch)
Number of blades	2

Diameter	70 ins
Type	Wood, Fixed pitch
Limitation	3000 rpm

1.6 Fuel

Capacity (total)	32 Gal (US) 26.7 Gal (imp) 121 Litres
Usable Fuel (Gal and Litres)	To be established
Fuel Grade, Aviation	100LL (LHS - use for T.O. & Landing)
	82 Octane Mogas (RHS - Cruising)

Warning:

Do **NOT** use mogas fuels containing Alcohol (i.e. fuel from Mohawk). Fuel purchased from Co-Op has been used successfully and is recommended.

Caution:

Mogas is more susceptible to the formation of carb ice than avgas. Use of avgas is recommended when conditions susceptible to carb ice are encountered. If carb ice is suspected, refrain from using Mogas and land at the nearest available airport.

Mogas is also more susceptible to vapour lock. When conditions (ie. High temperatures and altitudes) favouring vapour lock are expected, refrain from using Mogas.

1.7 OIL

Oil Capacity	8 US qts 7.6 Litres	
	Do NOT fill over 6 qts	
	Minimum Safe level - 4 qts	
Specification	Ref Lycoming Manual	
	Viscosity for Ambient Temperature starting:	
	SINGLE	MULTI - GRADE
Above 60 F	SAE 50	SAE 40 or 50
30 F to 90F	SAE 40	SAE 40

0 F to 70 F	SAE 30	SAE 40 or 20W-30
Below 10 F	SAE 20	SAE 20w-30
Oil in Engine	Philips 20/50	

1.8 Abbreviations and Acronyms

CG	Center of Gravity
GS	Ground speed
IAS	Indicated Airspeed
KCAS	Knots, Calibrated air speed
KIAS	Knots, Indicated Airspeed
KTAS	Knots, True Airspeed
LBS	Pounds
MAC	Mean Aerodynamic Chord
MTOW	Maximum Take off weight
MLW	Maximum Landing Weight
MZFW	Max Zero Fuel Weight
OAT	Outside Air Temperature
Va	Manoeuvring speed
Vfe	Maximum Flap Extension Speed.
Vne	Never exceed speed
Vno	Maximum Structural Cruising Speed
Vs	Stalling Speed (clean)
Vso	Stalling Speed (landing configuration)
Vx	Airspeed, Best Angle of Climb
Vy	Airspeed, Best Rate of Climb

1.8.1 Conversion Factors

MULTIPLY	BY	TO OBTAIN
Gallons (Imperial)	1.20	US Gal
	4.55	Litres
US Gal	.833	Gal (imperial)
	3.78	Litres
Litres	.264	US Gal
	.220	Gal (Imperial)
Knots (Kt)	1.15	Statute Miles
	1.85	Km
Pounds (lb)	.454	Kg

DENSITIES

Fuel	7.2 lbs / Imp Gal	1.58 lbs / litre	6.0 lb / US gal
Oil	9.0 lbs / Imp Gal	1.98 lbs / litre	7.5 lb / US gal

2. LIMITATIONS

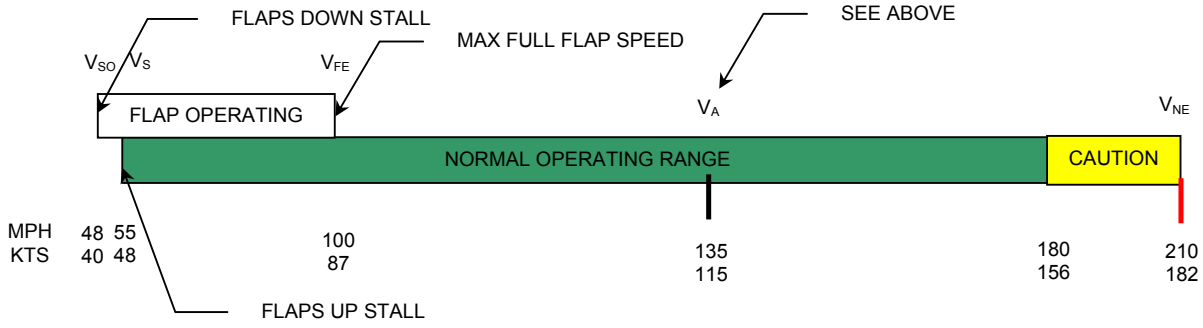
2.1 Airspeed

Table 2: Airspeed Limitations

Designation	Nomenclature	IAS (mph / kts)	Color Band	Comments
V_{NE}	Never exceed	210 / 182	Redline	
V_{NO}	Normal operations, smooth air	180 / 156	Green (from V_S to V_{NO})	
V_A	Do not make full or abrupt control movements above.	135 / 115	Black	Full elevator will produce 6g's at V_A.
V_{FE}	Flap extension speed: 20 deg flap 40 deg (full) flap	 110 / 95 100 / 87	White (flap operating range)	

Caution:

Because of the range between V_{NE} and V_A the RV-4 is more susceptible to pilot induced overstresses than most contemporary aerobatic aeroplanes. Cruise speeds are often well above V_A. THEREFORE, THE PILOT CAN EASILY IMPOSE DESTRUCTIVE LOADS ON THE AIRFRAME at speeds ABOVE THE RELATIVELY LOW MANOEUVRING SPEED. NOTE LIMITATIONS, EXERCISE CAUTION AND FLY ACCORDINGLY.



2.2 Weight

Gross Weight (Normal Category)	1500 lbs
Gross weight (Aerobatic Category)	1375 lbs
Maximum baggage	100 lbs (Subject to W & B)
Maximum Capacity – Crew Position	240 lbs each (Subject to W & B)
SOLO – Front Seat	

2.2.1 Center of Gravity

Design CG range is:

Fwd Limit	15% MAC	8.7" from L.E.= 68.7" aft of datum
Aft Limit	30% MAC	17.4" from L.E.= 77.4" aft of datum (Normal Category)
Aft Limit	27% MAC	15.6” from L.E. = 75.6” aft of datum (Aerobatic Category)

Note: Datum 60" forward of L.E.(leading edge of wing)

2.2.2 Load Factors

The structure has been designed to withstand g loads of:

+6 / -3 at 1375 lbs

The calculated breaking strength (Ultimate Load) of 9G’s is the load the airframe has been designed to withstand for a minimum 3 seconds (assuming no airframe deterioration, corrosion, fatigue, material flaws or construction errors, etc).

Approaching the 9G load or operating above the +6 / -3 g factors at a weights above 1375 lbs could permanently weaken the structure even if failure does not occur.

2.3 Engine

Based on installed engine Lycoming O-320-A2B

Maximum horse power		150
Tachometer	Normal operating range. Green Arc	500/2700 rpm
	Red Line (Max Continuous Power)	2700 rpm
Oil Temperature	Maximum	245 Deg.F
	Desired	160 - 210 Deg.F

Oil Pressure	Min.	25 psi	
	Max (red line)	90 psi	
Cylinder Head Temperature (Not Installed)			
	High performance cruise max.	435 Deg.F	
	Economy cruise max.	400 Deg.F	
	Min for maximum life	150 Deg.F	
	Red line	450 Deg F	

Max cooling target on decent 50 Deg F/min to avoid shock cooling, preferably 25 Deg F/min.

Oil sump capacity	Max	8 US Qts	
	Min	2 US Qts	
Fuel pressure	Min (red line)	0.5 psi	(Fuel Press Gage
	Desired	3 psi	Not Installed)
	Max (red line)	8 psi	
Fuel grade	(Minimum Octane)	80 (Red)	
Propeller	Max RPM	3000 rpm (See Engine Limit)	

2.3.1 Placards

Location	Placard	Remarks
Instrument Panel	SOLO – Front Seat Only	
Passenger Compartment, RHS	This aircraft is amateur built and is operating without a certificate of airworthiness.	
Passenger Compartment, RHS	Maximum Capacity 170 lbs in combination with 30 lbs in aft baggage area.	This placard is placed iaw the RAA inspectors wishes and is completely bogus (in my humble opinion). Fortunately this manual in not under their jurisdiction – The placard should read: Maximum Capacity this compartment 240 lbs. Check Weight and

		Balance.
Baggage Area	Maximum Capacity this Compartment 100 lbs. Check Weight and Balance	

2.4 Types of Approved Operation

C-GFEW is approved for Day VFR operation, and aerobatics (Ref. Section 5.3) only and in accordance with the current Special Certificate of Airworthiness issued by Transport Canada.

Night, VFR over the top and IFR flying is NOT approved.

3. EMERGENCY PROCEDURES

3.1 General

Recommended procedures for dealing with various types of emergency and critical situations are detailed in this section. They are suggested as the best course of action based on the aircraft structure, equipment and systems configuration. They are not a substitute for sound judgement and common sense and are **NOT** intended to replace pilot training. Pilots should familiarise themselves with the procedures and be prepared to take appropriate action should an emergency arise.

3.2 Emergency Procedures

EMERGENCY CHECKLIST

FLY THE AIRPLANE BAIL OUT DECISION ALTITUDE..... **1500 AGL** (2300 ASL STBH)	
ENGINE OUT Airspeed.....82 mph Flaps .....20 deg **Select Field to Land** Master..... ON (OFF to land) Primer .....SECURE Carb Heat..... ON Fuel..... Select Tank (OFF to land) Throttle.....1" fwd Mixture ..... FULL RICH Fuel Pump.....OFF Starter ..... Engage	**FIRE (AIR)** Airspeed .....82 mph Flaps .....20 deg Master ..... OFF **Fuel..... OFF** Cockpit Heat..... OFF Carb Heat..... ON Mixture .....FULL RICH Throttle .....FULL OPEN **Return to airfield or select field to land**
ELECTRICAL Airspeed.....82 mph Flaps .....20 deg Master.....OFF Breaker(s) .....RESET as required Master..... ON if required **Return to airfield or select field to land**	**CANOPY DEPARTS AIRCRAFT** Airspeed .....75 mph Flaps .....UP Cockpit Heat ..... ON **Return to airfield or select field to land**

BROADCAST ON 121.5 MHZ IF TIME PERMITS

FLY THE AIRPLANE

BAIL OUT DECISION ALTITUDE..... **1500 AGL** (2300 ASL STBH)

DITCHING

Wind / Swell Direction.....Check
Heading.....Towards Land / Shipping
Airspeed.....82 mph
Landing .....Along Swell or into Wind
Check Failure.....Attempt Fix
Radio.....121.5 (Mayday)
Engine.....Shutdown
Harnesses.....Tight
Canopy Latch..... Secure
.....Prepare to Break
Headset.....Disconnect
Master.....OFF
Flaps .....DOWN
Touch Down..... Tail Low

DITCH

Canopy.....Open
Seatbelt.....Disconnect
Exit Aircraft.....Inflate Life vest

FIRE (GND)

Engine .. Continue Running / Starting
Fuel Selector..... OFF
Throttle 1000 rpm (Engine **Running**)
.....FULL (Engine Starting)
Mixture ..... ON (Engine **Running**)
..... OFF (Engine Starting)
Fire ..... Extinguish Externally
Master ..... OFF

ENGINE ROUGHNESS

Carb Heat..... ON
Mixture .....Adjust
Fuel Pump.....Cycle
Fuel Tank .....Select Other
Magneto's.....Cycle L / R / Both

Return to airfield

FUEL PRESSURE LOSS

Fuel Pump..... ON
Tank.....Select

Return to airfield

PREPARE FOR SUDDEN ENGINE STOPPAGE

OIL PRESSURE LOSS

Throttle Do not change unless Req'd

Return to airfield or select field to land

PREPARE FOR SUDDEN ENGINE STOPPAGE

HIGH OIL TEMPERATURE

Oil Pressure .....Monitor
CHT.....Monitor
Throttle..... Reduce if possible
Altitude .....Descend if possible

Return to airfield

ALTERNATOR FAILURE

Hi Load Item (ie Ldg Lite)..... ON
Note... Increase in Ammeter Reading
40 Amp CB(Firewall) ..... Reset
Electrical Load..... Reduce

Return to airfield

3.3 Stall and Spin Recovery

The following has been taken from information provided by Vans Aircraft Inc which is based on their own testing of the RV-4 aircraft. Characteristics of different aircraft are different; the information should be taken as a guide only and not as specific to this aircraft.

3.3.1 Stalls

(Notes from testing section of Vans assembly manual for aircraft)

Indicated stalling speed of 38 mph can possibly be 50 mph or more. However the readings are relative and you can believe the gauge will indicate the same speed consistently, if the stall is approached at the same rate every time.

Except for accelerated stalls and secondary stalls, approach each slowly while keeping the nose from turning with the rudder. Allow the speed to bleed off until you feel a slight buffet. Note the airspeed and recover with a smooth forward movement of the stick as power is added. Simply relieving back pressure on the stick when the stall occurs is normally sufficient. Stalls entered from steep bank or climb will require more aggressive recovery control application. Remember, the RV4 has light elevator forces, and over control can easily occur, causing secondary stalls.

3.3.2 Spins & Spin Recovery

(Following notes are From Vans RV-4 test flights)

Spin tests of the prototype RV4 were performed up to the limit load (1375 lbs. Aerobatic gross) and CG (27% aft of leading edge) with satisfactory recoveries being easily affected. With the CG more forward and power at idle, the RV-4 would not remain in a spin for more than about two turns, even with full pro spin control input. With the CG aft it could be held in a spin but would recover as soon as the controls were returned to neutral. Inverted spins were not tested since the prototype RV-4 was not equipped for inverted fight. In general the RV-4 spins nose low and has very positive spin recovery qualities.

Even though the prototype has good spin recovery characteristics, each airplane is unique and should be individually tested. Small variations can have surprisingly large affects on spin and spin recovery characteristics. This is particularly true of any additional surfaces forward of the aircraft CG. For example, spin recovery was better when the landing gear leg fairings were removed. They reduce directional stability.

Vans Aircraft does not consider spins to be a recreational aerobatic manoeuvre, and does not recommend they be casually undertaken in the RV-4.

4. NORMAL PROCEDURES

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

4.1 Operating Speeds

Vy	Best rate of climb speed	1230 lb	110 mph	96 kts
		1500 lb	120 mph	105 kts
Vx	Best angle of climb speed	1230lb	78 mph	68 kts
		1500 lb	82 mph	71 kts
	Best glide angle	1500 lb	82 mph	71 kts
Va	Turbulent air operating speed		135 mph	115 kts
Vso	Stall full flap		48 mph	49 kts
Vs	Stall flaps up		55 mph	52 kts
Vfe	Maximum full flap speed		100 mph	87 kts
	Landing Final approach speed (full 40 deg flap)		80 mph	67 kts
	Demonstrated cross-wind velocity		**To be established**	
	Take off rotate speed		65 mph	56 kts
	Top speed		201 mph	174 Kts
	Cruise 75% @ 8000 ft msl		188 mph	164 Kts
	Cruise 55% @ 8000 ft msl		170 mph	148 Kts
V_{NE}	Never Exceed Speed		210 mph	182 kts

4.2 Entry Speeds – Aerobatic Flight

Entry Speeds	mph	
Split S	100 - 110	
Immelmann	140 - 190	
Loop	140 - 190	
Aileron Roll	120 - 190	
Snap Roll	80 - 110	
Vertical Roll	180 - 190	
Hammerhead	100 - 190	
Spin	slow decel	
½ Cuban	140 - 190	

C-GFEW does NOT have an inverted fuel system. Fuel starvation will occur if negative g manoeuvres are attempted.

4.3 Engine Operation

	RPM	HP	Fuel Cons. US gal/Hr	Max Oil Cons. qts/Hr	Max. CHT
Normal Rated	2700	150	10	0.1	500 Deg.F
Performance Cruise (75%)	2450	120	8.5	0.1	500 Deg.F
Economy Cruise (65%)	2350	104	7	0.1	500 Deg.F

4.3.1 Starting

COLD	**HOT**
Prime..... 3X Throttle.....pump 2X Throttle .....fwd 1 inch Master ..... ON Starter ..... ON (5 Second max) Repeat if not running	Same as cold but **NO PRIME**

4.3.2 Shutdown

If an engine restart is expected prior to the engine cooling (ie. Within ½ hour) turn off mags rather than close mixture. This makes for easier starting and longer battery life. Close the mixture following shutdown.

CAUTION

Do not leave the aircraft unattended in this configuration as magneto problems could lead to an inadvertent running engine / propeller strike / runaway airplane if the propeller is accidentally rotated.

4.4 Check Lists

PREFLIGHT CHECK

EXTERNAL CHECKS	**INTERNAL CHECKS**
All switches. .....OFF	Park Brake ..... (Not installed)
Exterior ....Check for damage	Canopy ..... Latch Mechanism
Flap pushrod ends…...Wear/security	Controls ..... Correct & Free
Empennage fairing.. ..... Secure	CB's ..... In
Control surfaces..... ck. interference	Flaps..... Cycle
Hinges ...……...Freedom/Wear	Trim ..... Cycle
Tanks .....Caps secure & quantity	Fuel ..... Select Tank
Tank drains.. ..... Drain	Fuel Pump .....Off
Fuel vents ..... Clear	Carb heat.....Off
Tires..... 44 psi	Mixture..... Idle Cut Off
Pitot tube..... Clear	Throttle ..... Closed
Windshield ..... Clean	Primer.....Closed and Secure
Prop & Spinner .....Damage/Security	Rudder Pedals.... Cotter Pins Secure
Oil..... 5 qts (min)	
Dipstick ..... Secure	
Cowl..... .Secure	
Air inlets ..... Clear	
Static ports..... Clear	
Flaps .....Extend	
Nav lights ..... Not installed	
Strobe ..... .Not installed	
Stall Warn ..... .Not installed	
Fuel gauges/Quantity.....CHECK	

START	**TAKEOFF**
Passenger ..... Brief	Controls ..... Free and Correct
Chocks .....Removed	Fuel ..... Select Tank
Harness(es) ..... SECURE	Primer ..... SECURE
Altimeter ..... Set	Canopy ..... SECURE
Propeller..... Clear	Eng Run Up ..... 1800 RPM
Flaps ..... UP	Mags..... Check Drop Left/Right
Fuel ..... Select Tank	Carb Heat ..... Check RPM Drop
Prime..... As Required	Trim (Pitch/Roll).....NEUTRAL
Brakes..... HOLD	Flaps .....UP or 20 Deg
Carb Heat.....OFF	Fuel Pump ..... ON
Mixture ..... FULL RICH	
Throttle..... Fwd ½ Inch	
Master ..... ON	
Starter .....ENGAGE	
T/B ..... ON (as required)	
Radio..... SET (as required)	

LANDING	**SHUTDOWN CHECKS**
Fuel ..... Select Tank	Park brake ..... (Not installed)
Primer ..... SECURE	600 - 750 RPM ..... Set
Mixture ..... FULL RICH	Magnetos..... Check
Carb Heat..... ON	Radios ..... Off
Fuel Pump..... ON	Electrics .....Off
Airspeed.....70 - 80 mph	Mixture .....Idle cut off
Flaps ..... As Required	Magneto Switch..... Off
	Master switch..... Off
	Fuel ..... Select Tank
	Flaps..... Down
	COCKPIT..... TIDY

5. PERFORMANCE

5.1 General

Aircraft performance is specific to a particular aeroplane. Experience has shown Vans published test data is close to that of other similar aircraft. Differences in build standards and equipment fitted inevitably mean individual evaluation is required.

In this section some performance characteristics have been obtained from published data and the characteristic for this aircraft have yet to be established. In some cases data is not currently available.

5.2 Airspeed Calibration

Air speed systems, particularly in home build aircraft are usually inaccurate. The system as installed has proven to be reasonable.

CALIBRATION CURVE/TABLE TO BE ESTABLISHED

5.2.1 Take off & Landing

PERFORMANCE GRAPHS TO BE ESTABLISHED

Take off distance	325 / 475 ft
Landing distance	300 / 425 ft

5.3 Aerobatics

C-GFEW is approved for aerobatics in Canada iaw CAR 602.27 & 28 and A.I.P. Para. RAC 1.12. Demonstration and the appropriate log entries of the manoeuvres listed in Section 4.2 have been carried out by a Transport Canada recognized Aerobatic Instructor. **Although fitted with an Christen inverted oil system, GFEW is currently limited to positive g aerobatics due to the float type carburettor.**

The following data relates to USA.

Refer to manoeuvring speed and weight and balance limitations when planning aerobatics. Manoeuvring speed is the highest speed at which full and abrupt control can be applied without exceeding aircraft design strength. This is not the highest permissible aerobatic

entry speed. For any speed above manoeuvring speed, control inputs must be limited .

Due to the wide speed range, entry speeds for some manoeuvres can vary. For vertical manoeuvres (eg. Loops, Immelmann turns and horizontal eights) entry speed has an inverse relationship to G forces required to complete the manoeuvre. An entry speed at lower speeds requires a higher G load than for entry at higher speeds. **Note: Due to relatively light control stick forces and high aerodynamic cleanliness, excessive speed build up can occur very quickly, particularly in a dive. Due to light control forces and aerodynamic cleanliness the RV 4 is a Pilot limited aircraft - it is the pilots responsibility not to over-stress the aircraft.** Following are guidelines only as starting points for aerobatic manoeuvres. Do not attempt any aerobatics without instruction from a qualified aerobatic instructor. Preferably one with experience in RV type aircraft.

6. WEIGHT & BALANCE

6.1 General

To achieve the designed performance and flying characteristics the aircraft must be flown with the weight and centre of gravity (CG) within the approved operating range/envelope. **It is the pilots responsibility to ensure the aircraft is loaded within its operating envelope and will remain there throughout the flight.**

An overloaded aircraft will not take off, climb or cruise as well as one properly loaded. Stall speed is increased.

If the CG is too far aft, longitudinal stability is reduced leading to inadvertent stalls and spins; spin recovery maybe difficult or impossible with the CG aft of approved limits.

With a CG forward of limits higher airspeeds are required to maintain elevator authority during the flare. I.e. higher landing speeds result.

6.2 Moment Arms

	ARM aft of datum
Tail Wheel	237.5 ins
Main Wheel, Right	59.25 ins
Main wheel left	59.00 ins
Fuel	70.00 ins
Pilot	82.5 ins
Passenger	107.0 ins
Fwd Baggage	75.0 ins
Aft Baggage	130.0 ins

7. SYSTEMS and OPERATION

7.1 Airframe

The airframe is aluminium alloy monocoque construction except for steel components comprising: engine mount, landing gear struts, main landing gear mounts, elevator bellcranks and other miscellaneous items. Fibreglass is used for wing tips, elevator tips, vertical stabilizer and rudder tips, wheel skirts and miscellaneous fairings.

The aircraft is conventionally configured with a non laminar flow airfoil. The effect of (small) surface irregularities is relatively minor (compared to a laminar flow airfoil).

7.2 Engine and Propeller

The aircraft is powered by a Lycoming 0-320 A2B four cylinder, direct drive, horizontally opposed, air cooled engine rated at 150 HP at 2700 rpm. The engine is fitted with a 40 amp 14 volt alternator, shielded ignition, fuel pump and automotive type oiled carburettor air filter (K & N) mounted in a ram air box underneath the engine which incorporates the carburettor hot air control system.

The exhaust system is all stainless 4 pipe (straight) with no mufflers. One heat shroud provides cockpit heat as required and is ducted to the center section of the firewall.

The Colin Walker, 70 ins diameter fixed pitch, two blade propeller is made from laminated British Columbia, Canada, Maple.

CAUTION:

Ensure propeller is HORIZONTAL when engine is not running. Non horizontal stopped propeller may collect moisture over time, which may run to the low blade causing an imbalance.

7.3 Landing gear

The conventional configuration landing gear legs are made of aircraft steel (4130), to which a wooden damper has been attached along the aft edge to improve damping.

The tail wheel is a full swivel, solid rubber tire (6” diameter)

The main gear (5:00 x 5-6) are fitted with Cleveland 199-102 wheels and disc brakes

The braking system consists of toe brakes attached to the pilots rudder pedals operating individual Cleveland brake cylinders for each of the main landing wheels. They share a common reservoir installed on the top fwd face of the fire wall.

Both brake pedals should have a similar feel and a firm resistance after ½" of pedal travel (top).

The rear seat pedals may be installed when required or desired. The rear seat pedals do not contain braking provisions.

7.4 Flight Controls

Flight control integrity is essential for safe flight. At installation or after maintenance be confirmed ALL controls are connected, secured and safetied and they **all operate within the specified ranges smoothly and in the correct direction**. Full travel should be confirmed prior to each flight. NO play is permitted in the control hinges; sloppiness may induce flutter. Similarly, trim tabs must be free of play.

Dual flight controls (except rudder and throttle) are provided. A bolt at the base of the passenger (rear seat) 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 pushrods. The rudder is operated through a cable system to the rudder pedals. A mechanical trim lever is located on the pilots LHS and enables operation of the elevator trim tab on the trailing edge of the LH elevator. It should be noted there is no return spring on the rudder cable system.

Flaps are operated mechanically via a control rod located near the pilots seat base - LHS.

Table 3: Control Travel Limits

Surface	Design Travel (Degrees)	Minim Limits (Degrees)
Aileron	30˚ up, 17˚ down	25˚up, 15˚ down
Elevator	30˚ up, 25˚ down	25˚ up, 20˚ down
Rudder	35˚ right, 35˚ left	30˚ right, 30˚ left
Flaps	40˚ down	40˚ down

7.5 Fuel System

Fuel is stored in two 16 us gal. tanks located in the wings leading edge structure. The tanks are attached with screws and nutplates and are easily removed. 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 to check for sediment and water.

The fuel selector valve is located on the lower console just forward of the pilots control stick. In the forward position the system is OFF. Both tanks have a “flop tube” fuel feed for maximum fuel pick up in any flight attitude.

An auxiliary electric fuel pump is fitted in case of failure of the engine driven pump and is also used during take off and landing. The switch is located on center of the pilots instrument panel directly below the turn co-ordinator.

A fuel gascolator is located on the fwd lower fire wall. This is not the lowest point in the fuel system and is intended as a dirt trap only prior to fuel entering the engine driven fuel pump. The unit should be cleaned out and examined at regular intervals and/or service periods.

Fuel quantity gauges are located on the lower console immediately forward of the pilots control stick. Sending units are installed through the aft baffle of each fuel tank and are only accessible after removing the tank from the wing.

7.6 Electrical System

The electrical system includes a 14 volt, 40 amp alternator, a 12 volt battery, 12 volt regulator, and a master relay.

Electrical switches are located on the center of the instrument panel, with circuit breakers on the RHS lower panel (pilots cockpit).

The VHF radio, Transponder and GPS have their own ON/OFF switches in addition to the master switch.

The intercom is connected directly to the main electrical bus and is on when the master switch is on.

Electrical accessories include starter, electric fuel pump, and gauges as listed in the equipment list - section 9.

7.7 Instrument Panel

The instrument panel contains instrumentation and controls as listed in this manual

(Reference Section 9). The instrument panel is fully accessible by removing the forward cover between the firewall and the instrument panel. Limited access is available from below.

7.8 Static Air Pressure System

The system supplies static air pressure to the airspeed indicator, altimeter and vertical speed indicator. The static pressure ports are located on the fuselage sides near FS 170 just below the main longeron. As part of the daily inspection, the static vents should be inspected and confirmed as clean and open.

7.9 Heating and Ventilation

Cockpit heat is provided via a heated muff attached to the one of the RHS exhaust pipes and is fed with fresh air from the right engine inlet ramp and attached ducting. Heated air enters the cockpit through the center of the firewall and is controlled with a ratchet cable control above the outside air vent (directly above pilots RH knee). Pull to open (heat). In the closed position, excess air is dumped into the low pressure area of the engine compartment.

Fresh air from a single NACA duct on the RH side of the fuselage is fed into an adjustable vent just below the RHS of the instrument panel (directly above the pilots RH knee).

7.10 Cockpit and Baggage features

The seat back and bottoms are non-adjustable. Cushions are provided when parachutes are not worn. Additional cushions or pillows are recommended for smaller passengers.

Caution

Ensure additional items do NOT foul with control sticks and flap lever.

A 4 point safety harness is provided in each crew position and should be carefully fitted and adjusted prior to take off. During single crew operations the passenger harness must be securely stowed. Harnesses should be checked regularly for damage and / or wear.

A baggage area with a maximum structural capacity of 100 lbs is located behind the passenger seat. Weight and balance limitations further constrain the capacity. A small glove box is located on the floor under the pilots RH knee. Ensure all items are properly stowed prior to take-off.

7.11 Canopy

The RV4 canopy is a side hinged (LHS) bubble canopy covering both seats.

Operation of the canopy is via a single lever (one inside, one outside) that **must** be in the **full forward** position for both **opening and closing**.

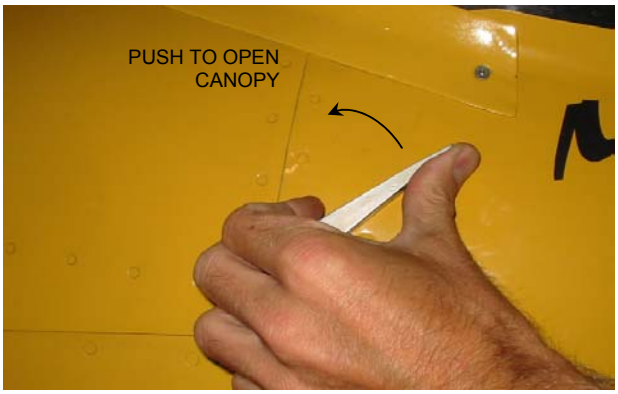


Figure 3 – Canopy Operation

The single lever controls locking pins (RHS) at the forward and aft ends of the canopy. Damage to the airframe will result if the lever is not forward when the canopy is being opened or closed.

8. GROUND HANDLING, SERVICE & MAINTENANCE

8.1 General

This section provides information on handling, service and maintenance of the aircraft.

The owner should stay in close contact with Vans Aircraft inc. so as to obtain the latest information pertinent to the aircraft including improvements or new equipment that may be of interest to the owner. Service Bulletins pertinent to the airplane can be found on Van's Website (www.vansaircraft.com).

The owner should also obtain up to date service bulletins and Airworthiness Directives (ADs) related to installed equipment and particularly the Engine and Propeller and other proprietary items (Wheels, brakes, radio and navigation equipment etc.).

8.2 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 pushing locations to help move the airplane: wing tips, top of vertical stabilizer, rollbar (canopy open).

When taxiing the aircraft ensure the taxi path and propeller blast areas are clear. In the first few feet of taxi apply the brakes to ensure effectiveness. Do not operate the engine at high rpm, taxi with care - **an RV4 can take off at throttle settings no higher than those needed for engine run up and magneto checks**.

When parking ensure aircraft is sufficiently protected from adverse weather and it presents no danger to others (aircraft). Park the aircraft into wind if possible and moor securely.

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.

8.3 Inspection Panels

In addition to the engine cowling, the RV4 includes a number of removable inspection panels. The inspection panels are located as shown in Figure 4.

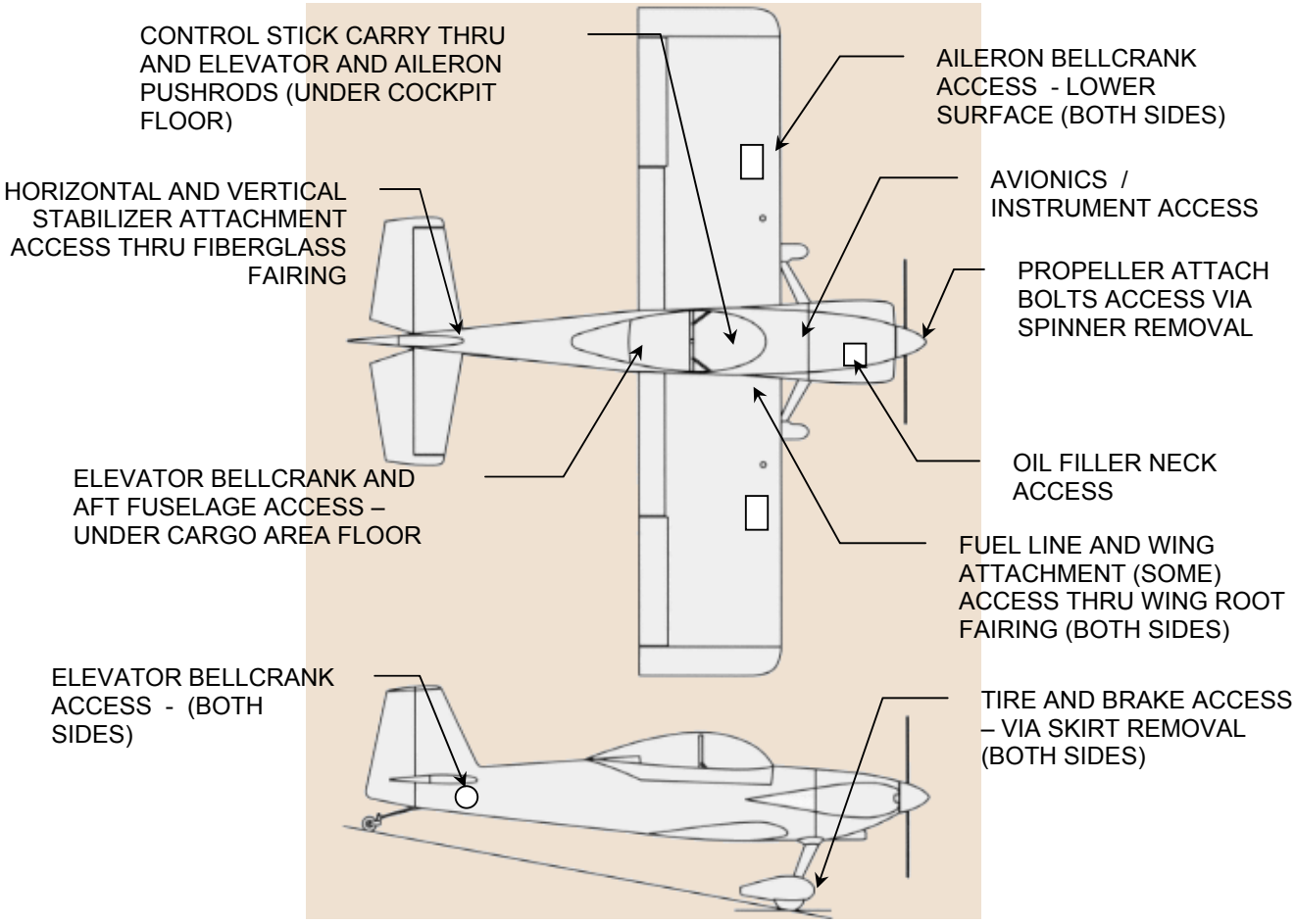


Figure 4 – Inspection Panels

8.4 Cowling Removal

With a few simple tools removal of the cowling can be accomplished in 5 minutes or less as follows:

8.4.1 Tools Required

¼" ratchet with #2 Philips head screw driver or angled screw driver

Philips screw driver

3/8” Wrench

Drill Motor (Cordless preferred)

Pair of pliers (maybe)

Clean Rag

8.4.2 Procedure

Ensure ignition is off. The propeller and spinner may remain attached to the airplane.

WITH PLIERS OR BARE HANDS, REMOVE (PULL AFT) THE HORIZONTAL COWL PINS LOCATED UNDER THE CLIPS ON EITHER SIDE OF THE COCKPIT WALLS AS SHOWN.

USING THE ANGLES SCREW DRIVER OR ¼” RATCHET WITH PHILIPS HEAD SCREW DRIVER, REMOVE THE COWL PINS LOCATED ABOVE EACH ENGINE AIR INLET LIP AS SHOWN

WITH BARE HANDS REACHING TO THE INSIDE TOP AFT EDGE OF THE COWLING (THRU OIL ACCESS DOOR) REMOVE THE TWO CURVED PINS SECURING THE UPPER COWL HALF TO THE FUSELAGE. PULL THE RHS PIN TO THE LEFT AND THE LHS PIN TO THE RIGHT. DO NOT CONTACT RHS MASTER RELAY TML. ITS **HOT!**

GENTLY LIFT THE UPPER COWL HALF OFF THE AIRPLANE AND STOW IN A SECURE LOCATION – PREFERABLY LYING DOWN.


WITH A PHILIPS SCREW DRIVER AND 3/8" WRENCH REMOVE THE VERTICAL HINGE PINS ALONG THE AFT EDGE OF THE LOWER COWL HALF (BOTH SIDES)


GENTLY PUSHING BACK AND DOWN ON THE FRONT OF THE LOWER COWL HALF TO PREVENT SPINNER AND COWL DAMAGE REMOVE THE LOWER COWLING AND STOW IN A SECURE LOCATION.

1. Reverse the procedure to install the cowl with the following precautions/notes

2. Ensure the flexible air seal is smoothly fit around the carburator air inlet and engine cylinder air inlet ramps during the installation of the lower cowl. The air seals of the cylinder air inlet ramps shall be above the aluminum ramps.

3. Insertion of the longitudinal hinge pins (the long ones) joining the two cowl halves requires careful alignment of the hinges on the upper and lower cowls and may require spinning the pins (with a drill motor) while pushing forward to fully engage the pins.

4. Ensure all pins are installed prior to next flight.

8.5 Fuel Tank

8.5.1 Removal (one side)

1. Drain as much fuel out of the tank(s) as possible using the quick drain located in the lower aft inboard corner of the tank. Removal of the quick drain will facilitate quicker draining.

2. Remove the wing to fuselage fiberglass fairing.

3. Disconnect the fuel qty sender electrical line (pull apart).

4. Using a 9/16" "crows foot" open end socket, disconnect the main fuel line from the tank – located near the inboard leading edge of the tank.

5. Disconnect the vent line located near the upper inboard edge of the fuel tank.

6. Remove all #8 screws attaching the tank to the wing.

7. Remove the AN4 bolt connecting the forward inboard corner of the tank to the fuselage.

8. Carefully slide the tank forward and away from the airplane.

9. The fuel sending unit is located through the aft baffle of the tank.

10. The fuel pick up (flop tube) may be accessed through the removable panel on the inboard rib of the tank.

8.5.2 Installation

1. Using care to ensure the skins of the fuel tank slide easily over the wings main spar and the rib immediately outboard of the tank, position the tank in its original location.

2. Reverse the procedure noted above.

3. Ensure the quick drain is installed prior to re-fueling.

8.6 Flight Control Access

8.6.1 Fwd Cockpit

1. Remove the seat cushions if installed (velcroe) and remove the hinge pin securing the pilots seatback to the floor. Removal of the lap belts is optional and will facilitate better access.

2. Unclip and remove the fire extinguisher (RHS of pilots seat).

3. Remove all fasteners securing the floor to the airframe and remove the floor.

8.6.2 Aft Cockpit

1. Remove the seat cushions if installed (velcroe) and remove the hinge pin securing the passenger seatback to the floor.

2. Remove all items from the aft cargo area except the ELT.

3. Disconnect the ELT antenna from the ELT and push the antenna lead through the rubber grommet located in the cargo area bulkhead.

4. Remove all fasteners securing the cargo bulkhead and remove the bulkhead.

8.6.3 Aft Fuselage

1. Remove all fasteners securing the inspection cover to the fuselage located directly beneath the horizontal stabilizer and remove the cover.

2. Remove all fasteners securing the fiberglass fairing surrounding the horizontal and vertical stabilizers and remove the fairing.

8.7 Maintenance and Service

All work should be entered in the appropriate log book indicating:-

Date work was done
Description of work
Number of hours recorded on the aircraft at time of work.
Name and signature of individual doing the work.

There is no specified maintenance / service schedule for the aircraft. The following are suggested maintenance items for the 100 hour or annual check.

Remove engine cowls (See Appendix 5) for general inspection including the following:-

Gascolator	Empty and clean bowl and replace noting any residue.
Oil hoses & filter	Check for leaks and signs of loosening
Oil cooler	General check of installation
Oil	Check level and review top up frequency

Carb. Air inlet	Check filter visually
	Check carburettor heat functionality
Carburettor	General exterior check including control cables.
Magnetos	General exterior inspection
Plug leads	Inspect for condition
Fuel hoses.	Check for leaks and signs of loosening
Fuel pump	Check body joins for leaks
Primer system	Check for integrity
Exhaust system	Check for blown manifold gaskets
	Check heat muffs (Carburettor and Cockpit heat) & ducting
	Check joints for wear/damage
	Check mounting points
	Check general integrity of system
Engine mount	Check for damage
	Check cotter pins (engine &bulkhead)
	Check main-gear structure for wear/damage
	Check Vibration Isolator Condition
Brake fluid	Check level - note change since last check
Compartment wiring	Check all wires for damage and security
Cooling system	Check all baffles for damage/wear/security
	Check flexible sealing strips
	Check blast tubes to Magnetos
Propeller	Check for nicks, scratches or delaminations
Spinner	Check spinner & back-plate for cracks
General	General review / inspection of Engine Compartment and propeller, spinner and its installation
Cowls	Inspect for damage – Check for Hinge / Pin integrity.
	Re-install cowls and attaching pins etc
	Remove main-gear skirts:
Tires	Check pressure - Mains 42 psi (cold)
	Inspect tires for wear, slip on hub, sidewall condition.
Brake system	Inspect brake shoes, replace if appropriate.
	Inspect hydraulic lines, joints and bleed points.
Wheels	Check bearings for play.
	Check split pins and bolts for integrity.
General	Check for wear / damage.
Skirts	Inspect for damage.

Re-install wheel skirts

General airframe and control surface review including, but not limited to:

Control surfaces	Individual inspection of each surface for free movement, satisfactory mounting/hinge condition and actuating system integrity, particular attention should be given to flap actuating rods as the rod end is not wire locked. Remove stabilizer root fairing for inspection of trim cable and empennage structure.
Fiberglas components	General inspection for integrity
Fuel tanks	Inspect for leaks and integrity.

GENERALLY THE AIRCRAFT SHOULD BE MAINTAINED IN ACCORDANCE WITH

Canadian Aviation Regulations (CARs)

LIGHT AIRCRAFT MAINTENANCE SCHEDULE FIXED WING

NOTE:- A detailed 100 hour / Annual maintenance schedule is given in appendix 4. This is based on the above schedule and adjusted for C-GFEW and Textron Lycoming Operator's Manual.

8.8 Service Notices and Special Inspections

Check Vans Aircraft website for updates on a regular basis (www.Vansaircraft.com).

		Status
SB 96-12-1	Rudder Cable Attachment	ONGOING
SB 97-05-1	Rear Seat Reinforcement	Complied with
SB 96-10-1	Filtered Air Box	Complied with
SB 96-10-2	Full Swivel Tail wheel	Complied with
12 June 00	Notice – Fuel Pick Up	Not Applicable

9. EQUIPMENT LISTING

9.1 Engine, accessories & Instruments

Engine: Lycoming O 320 A2B

Serno:

RV-4 C-GFEW SERNO. 2794

Minimum Equipment List				
Description	**FS**	**WT**	**Manufacturer/Supplier**	**Part No.**
Battery	57	23.5	Concorde	25RG
Alternator			Bosch	AL257X
Starter			Bendix	
Tray, ELT			Dorne Margolin	
Antenna, ELT	160	0.1	Dorne Margolin	
A/S Indicator	66			
VSI	66			
Turn Co-ordinator	63	1.25	Electric Gyro Corp (Cessna)	1394T100-7Z (C661003-0506)
Altimeter	66		Bendix	3252011-0101
Compass	68		Wentworth Aircraft	
G Meter	67		Vans Aircraft	BJ10-2
Clock	68			
Tachometer	66			
Filter, Air Intake			K & N	E-3260
EGT Indicator	67		Westach (c/o Kimpex)	2DC2-1S
EGT Probe, LH			Westach	
EGT Probe, RH			Westach	
Oil Press. Ind	67		Stewart Warner	
Oil Temp Ind.	67		Stewart Warner	
Sending Unit, Oil Temp	40		Van's Aircraft	
Adaptor, Oil Temperature Sending Unit,	40		Vans Aircraft	VA-147
Ammeter	67		Stewart Warner	82359
Shunt, Ammeter	48.5		Stewart Warner	813489

Minimum Equipment List				
Description	**FS**	**WT**	**Manufacturer/Supplier**	**Part No.**
Regulator, 12V	49		Local	
Relay, Starter	48		Vans Aircraft	ES 24022
Relay, Master	48		Cole Hersee c/o Vans	ES 24115
Fire Extinguisher	80			
Fuel Qty Gage, LH	60		Stewart Warner	82378
Fuel Qty Gage, RH	60		Stewart Warner	82378
Sending Unit, Fuel Qty, LH	75.5		Stewart Warner	F-385B
Pump, Fuel	55		Facet	40108
Sending Unit, Fuel Qty, RH	75.5		Stewart Warner	F-385C
Gear Leg Fairings	50	.05	Vans Aircraft	
Intercom	68	.1	FlightCom	A403
VHF Radio	66	2.9	Bendix / King	KY97A
Antenna, VHF Radio	75	0.2	Dorne Margolin	
Transponder	66	3.1	Bendix / King	KT76A
Antenna, XPDR	140	0.1	Dorne Margolin	
Inverted Oil System	46	8.9	Christen / Aviatt	801-4

Optional Equipment List				
Description	**FS**	**WT**	**Manufacturer**	**Part No.**
ELT	130		Dorne Margolin	
Wheel Skirt, LH	59	2.0	Vans	
Wheel Skirt, RH	59	2.0	Vans	
Fairing, Gear Leg/Fuse	49	.1	Vans	
Fairing, Gear Leg/Skirt	49	.1	Vans	
Seat Cushion, Pilot	83	.1	Hanks Upholstery	n/a
Seat Cushion, Pax	107	.1	Hanks Upholstery	n/a
GPS	64	.2	Ipaq 3850 / AnywhereMap	Garmin 35
CD Player	64	.3	Sanyo	
Parachute	83	5		
Parachute	107	5		

Supplemental Parts List					
Description	**FS**	**WT**	**Qty**	**Manufacturer**	**Part No.**
Isolator, Engine Vibration, Conical			4	Lord (Available from Aircraft Spruce & Vans)	J6230-1 Lycoming 71032
Belt, Alternator			1	Gates (Available from Birch Auto)	
Exhaust, Engine			1 Set	High Country c/o Vans	EXH4P RV4CON320
Brake Pads (Liners Only)	273	.1 ea	4	Cleveland	066-10600

Consumables List			
Description	**Manufacturer**	**Supplier**	**Part No.**
Kit, (Air) Filter Recharge	K & N	Softies Speed Shop	99-5000
Oil, Engine	Philips	Harv's Air Service	20-50
Fluid, Brake	Any Good Quality	Any	DOT 3

9.2 Suppliers List

Aviall – Battery XXX Winnipeg, Mb. XXX	Perimeter Aviation - Avionics 636 Ferry Rd. Winnipeg, Mb. 786-7031	Van's Aircraft, Inc. - Various 14401 NE Keil Road Aurora, OR 97002 503.678.6545
Goulet Aircraft Supply – General Sanford St. Winnipeg, Mb. XXX	Softies Speed Shop – K & N Filters Wall St. Winnipeg, Mb. R3C XXX	
Harv's Air Service - Oil Hiway 12, S. Steinbach, Mb. 326-	Wentworth Aircraft - Various 2825 13th Ave. S. Minneapolis, MN, 55407 1-800-493-6896	

Tools and Materials

Cleveland Tool & Material 1804 First Street Boon IA 50036 Tel: 001 515 432 6794 Fax 001 515 432 7804	Avery Tools XXX Austin, Texas XXX Tel: XXX Fax:	

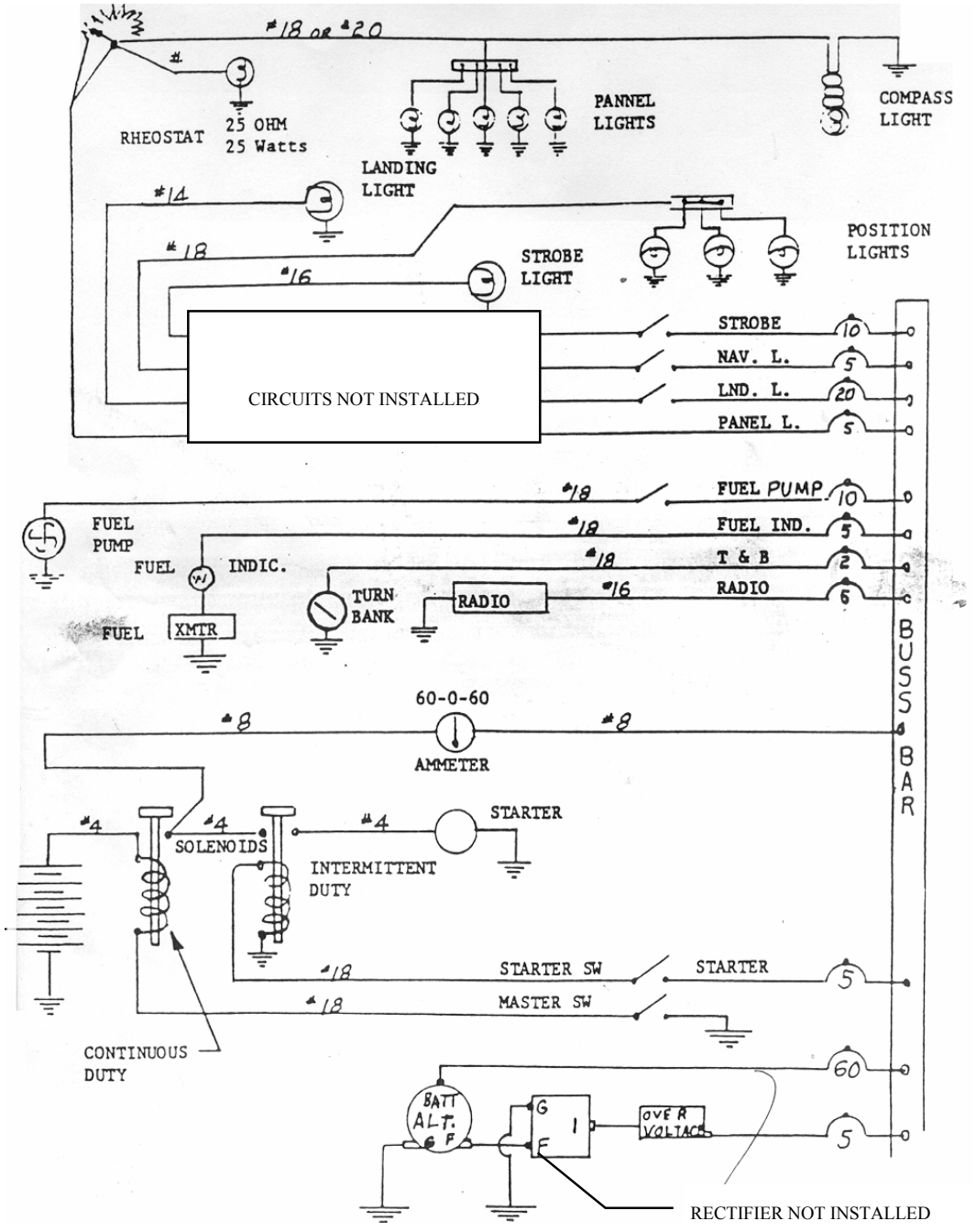
APPENDICES

APPENDIX	CONTENTS
1	Electrical Diagrams
2	Performance curves
3	Weight & Balance
4	Maintenance
5	Task Descriptions

APPENDIX 1

ELECTRICAL DIAGRAMS

Figure 5: Electrical Wiring Diagram



All wiring, lugs and terminals iaw standard aircraft practices as specified in AC43.13

APPENDIX 2

PERFORMANCE CURVES

(TBD)

APPENDIX 3

WEIGHT & BALANCE

WEIGHT & BALANCE DATA

MAKE: *Vans* MODEL: *RV4* SERIAL: *2794*

REGISTRATION *C-GFEW*

Datum= 60 inches forward of wing leading edge. (L.E.)

Design C.G. Range = 15% to 30% of wing chord, or 8.7" to 17.4 inches from L.E., or 68.7 to 77.4 inches aft of Datum.

Wing L.E.= 60 inches aft of datum.

Main wheel, right = *59.25"* aft of datum.

Main wheel, left = *59.00"* aft of datum.

Tail Wheel: *237.5"* aft of datum.

Fuel = 70 in. aft of datum.

Pilot = 82.5 in. aft of datum.

Passenger = 107.0 in aft of datum

Aircraft weighed empty in level flight attitude.

(Includes 6 qts of oil, no fuel)

Baggage = 130.0 in. aft datum.

	Weight(lbs)	Arm(ins)	Moment(lbs.in)
9.2.1.1.1			
9.2.1.1.2 Right Wheel-	423.5	59.25	25092
9.2.1.1.3 Left Wheel-	429.4	59.00	25337
9.2.1.1.4 Tail Wheel-	40	237.5	9500
9.2.1.1.5 TOTAL:	893	67.1	59929

9.2.1.1.6

9.2.1.1.7 *CG= 59929/893 = Empty moment of aircraft 67.1 ins aft of datum*

The airplane must be re-weighed whenever a change exceeding 5% of the last weight and balance is surpassed. I.e. 938 lbs. See Amendment Sheet.

2x

I CERTIFY THE FOLLOWING DATA HAS BEEN PREPARED IAW AC43.13-1A AND TO THE BEST OF MY KNOWLEDGE REPRESENTS THE TRUE EMPTY WT AND C.G. OF THIS A/C.

08 SEPT 99

RV-4 Section 14

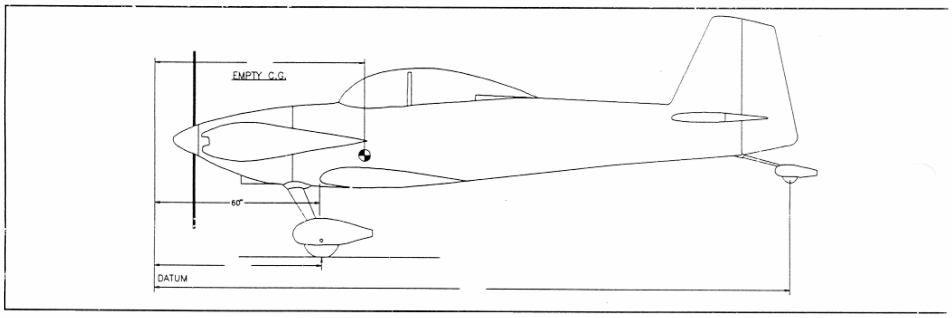
WEIGHT & BALANCE DATA

MAKE VANS MODEL RV-4 SERIAL NO 2794 REGISTRATION C-GFEW

Datum = 60 inches forward of wing leading edge. (L.E.)
Design C.G. Range = 15% to 30% of wing chord, or 8.7" to 17.4 inches from L.E., or 68.7 to 77.4 inches aft of Datum.

Main wheel, right = 59.25 in. aft of datum.
Main wheel, left = 59.00 in. aft of datum.
Tail wheel = 237.5 in. aft of datum.

Fuel = 70 in. aft of datum.
Oil = 40 in aft of datum
Pilot = 82.5 in. aft of datum.
Passenger = 107 in. aft of datum
Baggage = 130 in. aft of datum.



Aircraft Weighed empty in level flight attitude. REF: COCKPIT RAIL (LHS

	Weight	Arm	Moment
Right Wheel -	423.5	59.25	25092
Left Wheel -	429.4	59.00	25337
Tail Wheel -	40	237.5	9500
			59929

C.G. (total moment divided by total weight) =

893 | 67.1

EMPTY ZEE
NO SEAT CUSHIONS
NO WHEEL SKIRTS
ELT NOT INST
OIL 6 qts.

AIRCRAF WEIGHED AT JB3 IN ANGAR

EMPTY (SEE M.E.L.)
ZERO FUEL
OIL 6 qts.

08 SEPT 99

14-7

WEIGHT AND BALANCE AMENDMENT(S)

Added the following:

	Weight (lb)	Station (in)	Moment (in lb)
As Weighed Airplane	893	67.1	59920
Skirts / Fairings	4	59.1	236
ELT and Antenna	2.1	135	284
Paint	20	107	2140
VHF Radio and Antenna	3.1	67	208
Transponder and Antenna	3.2	67	214
Inverted Oil System	8.9	46	409
Full Swivel Tail Wheel	0.7 (diff)	273.1	191
Total	935		63603

Current as of 23 August 2002

CG=__63606 / 935_ = Empty moment of aircraft 68.0 ins aft of datum

The airplane must be re-weighed whenever a change exceeding 5% of the last weight and balance is surpassed. I.e. 938 lbs

Table 4: Sample Weight and Balance Calculations

(Using "as weighed" airplane)

RV-4 C-GFEW SERNO. 2794

	wt	arm	moment
rh	423.5	59.25	25092
lh	429.4	59	25337
tail	40	237.5	9500
	892.9	67.1	59929

SAMPLE 1 GROSS WT, TWO STND PEOPLE, FULL FUEL, BAGGAGE

	wt	**arm**	**moment**		
AIRPLANE	892.9	67.1	59929.3		
PILOT	170	82.5	14025		
PAX	170	107	18190		
OIL	0	40	0		
FUEL	192	70	13440	us gals	32
AFT BAG	75	130	9750		
FWD BAG	0	56.5	0		
	1499.9		115334	Utility Range	68.7 to 77.4
		76.9		Aerobatic Range	68.7 to 75.6

SAMPLE 2 MOST AFT CG, TWO STND PEOPLE, MIN FUEL, BAGGAGE

	wt	arm	moment		
AIRPLANE	892.94	67.11463	59929.34		
PILOT	170	82.5	14025		
PAX	170	107	18190		
OIL	0	40	0		
FUEL	42	70	2940	us gals	7
AFT BAG	68	130	8840		
FWD BAG	0	56.5	0		
	1342.9		103924		
		77.4		Utility Range	68.7 to 77.4
				Aerobatic Range	68.7 to 75.6

SAMPLE 3 MOST FWD CG, STND PILOT, FULL FUEL, BAGGAGE

	wt	**arm**	**moment**
AIRPLANE	892.9	67.1	59929
PILOT	170	82.5	14025
PAX	0	107	0
OIL	0	40	0
FUEL	192	70	13440
AFT BAG	0	130	0
FWD BAG	10	56.5	565
	1264.9		87959
		69.5	

us gals	32
Utility Range	68.7 to 77.4
Aerobatic Range	68.7 to 75.6

SAMPLE 4 MOST FWD CG, TWO STND PEOPLE, FULL FUEL, FWD BAGGAGE ONLY

	wt	**arm**	**moment**
AIRPLANE	892.9	67.1	59929
PILOT	170	82.5	14025
PAX	170	107	18190
OIL	0	40	0
FUEL	192	70	13440
AFT BAG	0	130	0
FWD BAG	10	56.5	565
	1434.9		106149
		74.0	

us gals 32

Utility Range 68.7 to 77.4

Aerobatic Range 68.7 to 75.6

APPENDIX 3

MAINTENANCE

Maintenance and Inspection Schedule

The following maintenance schedule is based on typical RV Series Maintenance Schedule and Textron Lycoming Operators Manual to Revision April 1998

Table 5: Maintenance Schedule

ITEM	RECURRING INSPECTION HOURS						
	DI	5	10	25	50	100[1]	2000
ENGINE				Visually Inspect		Annual	O/H or on COND
ENGINE OIL	LEVEL			CHANGE			
OIL SCREEN				CLEAN			
CARBURETOR				SECURITY			
AIR FILTER						CLEAN [2]	
EXHAUST				CHECK		Remove Heat Muff	
FUEL LINES				CHECK			
GASCOLATOR				CLEAN			
HOSES				CHECK			
STARTER				LUBE			
ALT BELT				CHECK			
BRAKE FLUID				LEVEL / AIR			
TIRES	VISUAL			CHECK PRESSURE		(1)	
BRAKES	VISUAL						
PROPELLER BOLTS					TORQUE	TORQUE [1]	
CONTROLS	VISUAL			VISUAL		(1)	

Notes: (1) Mandatory Inspection

(2) Use K & N Filter Recharge Kit (p/n 99-5000)

.

Maintenance Cycle:

25 Hour check	At 25 Hours or 6 Months whichever is sooner
100 Hour check	Comprising 25, 50 & 100 hour check items at 100 Flying hours
Annual check	25, 50, 100 hr. & annual check items not exceeding 12 months

Permitted variation:

25 & 100 Hour check	10%
Annual	None

FINAL CHECKS (include with all checks)

Carry out an engine ground run.

Check Powerplant, liquid, air and fuel systems for leaks during and following ground run.

Check instruments, systems and services. Radio for electromagnetic interference.

Following ground run, ensure all cowlings and access panels are secure.

Certification:

Ensure Engine, Airframe and Propeller logbooks have been correctly filled in, certified and are up to date. (All flights and work carried out must be entered and signed as required)

Ensure all mandatory placards are installed and legible.

Check all mandatory requirements (modifications, inspections and other directives) have been complied with.

Review maintenance schedule to ensure all maintenance needs are being met to continue safe operation. Account to be taken of maintenance history, operating environment and utilization.

25 Hour or Six Months Maintenance Check

Structural/Zonal

Inspect external surface of fuselage, wings, empennage, cowlings, flaps and control surfaces.

Check and inspect canopy fit, operation and condition including satisfactory operation of latching and locking mechanism.

Check protective treatments, drain holes free from obstruction, access panels secure

Landing Gear

Remove wheel skirts and inspect for damage.

Inspect landing gear legs and fairings for damage and integrity

Check brake system for leaks.

Inspect brake pads and discs for condition and wear

Check brake fluid reservoir (Fill as required)

Check tire condition and pressure (Mains 42 psi). Tail wheel is solid rubber. Lubricate bearing and swivel mechanism.

Re-install wheel skirts

Flying Controls

Check flight controls for smooth, full and correct movement.

Check correct and smooth operation of trim mechanism.

Liquid, Air and Gas Systems

Inspect Pitot / static system, vents and Pitot head. Pitot head correctly aligned

Equipment and Environmental

Check first aid kit complete and within expiry date.

Check seat belts / harnesses for satisfactory condition, locking and release.

Check seat belt / harness mounting points and brackets

Check expiry date of carbon monoxide warning disc

Check fire extinguisher for leakage / discharge.

Lubrication

Lubricate aircraft as appropriate (all rod end bearings, zerks (Tail wheel qty 2) and hinges).

Powerplant Installation

Engine cowls, clean and inspect for damage (cracks, distorted, loose or missing fasteners).

Operational check of engine controls for full and free movement – throttle, mixture, and carburetor heat system including air door and box.

Inspect spark plug cable leads/ ignition harness and ceramics for damage, corrosion and deposits. If fouling spark plugs apparent, rotate bottom plugs into top position.

Check ignition harness for security of mounting clamps and ensure connections are tight at spark plug and magneto connections.

Check cylinders for evidence of excessive heat (burnt paint on cylinder). This condition is indicative of internal damage to the cylinder and cause MUST be determined.

Inspect rocker box covers for evidence of oil leaks. If leak found replace gasket, torque cover screws 50 inch-pounds.

Cooling system – Check cowling and baffles for damage and secure fasteners.

Inspect air intake seals, ducting and clamps.

Inspect vent lines for evidence of fuel or oil seepage

Inspect all wiring connections to the engine and accessories.

IN ADDITION TO THE ABOVE, LYCOMING RECOMMENDs AT 100 HOURS:

Check all wiring connected to the engine or accessories. Any shielded cables that are damaged should be replaced. Replace clamps or loose wires and check terminals for security and cleanliness.

Remove spark plugs; test, clean and re-gap. Replace if necessary.

Magnetos – Check breaker points for pitting and gap. Check for excessive oil in the breaker compartment, if found wipe dry. Breaker point felt to be lubricated. Check magneto to engine timing.

Engine Accessories – Check for secure mounting and tight connections

Cylinders – Check visually for cracked or broken fins.

Engine Mounts – Check mounting bolts and bushings for security and excessive wear. Replace excessively worn bushings.

Air Induction

Inspect air filter, intake and induction system.

Remove and clean air filter. Follow directions supplied with K & N Filter Cleaning kit.

Exhaust system

Check attaching flanges at exhaust ports on cylinder.

Examine exhaust manifolds for general condition.

Engine Lubrication

Drain oil sump.

Remove oil screens and inspect for metal particles. Small amounts of black carbon particles are acceptable (normal). Particles should crush easily when rubbed between fingers. Wash and clean oil screen.

Inspect oil lines and fittings for leaks, security and damage.

Refill engine with oil (see manual section 1.5).

Fuel System

Check primer lines for leaks and security

Drain samples from drain points and check for water, foreign matter and correct color.

Drain carburetor and clean inlet line fuel strainer.

Check tank vents unobstructed.

Inspect fuel system/lines and tank for leaks.

Remove and clean fuel filter bowl (gascolator) and screen.

Pressurize fuel system and checks for leaks after re-assembly.

Propeller

Inspect spinner and back plate, and spinner attachment screws.

Inspect propeller blades for damage.

Electrical System

Check and inspect battery installation for leaks and security. The installed battery is a sealed unit.

Check operation of all electrical circuits.

Inspect Alternator drive belt tension and condition.

Check all controls and switches labeled correctly.

Radio

Inspect antennas, insulators, instruments and displays.

Check placards and markings legible.

Carry out VHF ground function check.

Inspect cables and terminals.

Instrument Systems

Inspect instruments for damage, and legibility of markings and associated placards.

Check instrument readings are consistent with ambient conditions; operation, as far as possible on engine ground run.

Check last compass swing date (and any other instrument calibration dates) to determine if renewal required.

100 Hour (Same as 25 Hour and the following:)

Structural

Remove all inspection panels, rear cargo bulkhead, floor panels and fairings (wing, empennage, landing gear, etc).

Inspect internal structure of fuselage, wing and empennage revealed by removal of above items.

Inspect internal corrosion protection, drain holes (directly below tail wheel spring attach bolt) and paths.

Landing Gear

Inspect structural members and attachment fittings.

Inspect and check all brake hydraulic lines, flexible hoses, connections and master cylinders.

Inspect wheels for alignment.

Support the weight off the wheels and check wheel bearings for play. Check landing gear mounting bolts.

Inspect wheels for cracks, corrosion and broken bolts.

Lubricate main and tail wheel bearings.

Flying Controls

Inspect all control surface hinges, hinge bolts, brackets, push-pull rods, bellcranks, stops, control horns and balance weights. Check associated locking systems.

Check control neutrals and travel.

Inspect rudder control cable, fairleads and cable guides.

Inspect rudder pedals and pedal mechanism.

Check flap operation, mechanism, and actuating system.

Check and inspect aileron and rudder trim for correct operation and security.

Liquid, Air and Fuel Systems

Inspect tanks, filler caps, valves, fuel lines, hoses and drains.

Check gascolator security. Pressurize fuel system (auxiliary fuel pump) and check for leaks

Equipment and Environment

Operational check and inspect cockpit heating/ventilation system.

Check cockpit heating system controls, hoses and ducts.

Check and inspect cockpit heat exchanger for signs of exhaust gas leakage.

Check Fire extinguisher charge and security.

Powerplant Installation

Inspect accessory housings, cylinder assemblies, bulkhead/firewall and sealing, cooling baffles/seals, cowlings, items in engine bay for interference.

Inspect throttle, carburettor heat, mixture and cockpit heat controls for security, travel and operating conditions.

Inspect inverted oil system for obstructions and security.

Inspect crankcase for cracks, leaks and security of seam bolts.

Inspect engine mounts/bushing for deterioration/cracks and loose mounting. (Replace as required)

Check and record in engine log book cylinder compression and leakage.

Clean engine as required.

Ignition System

Inspect Magneto harness leads.

Carry out high-tension leakage and continuity test.

Inspect magneto points for condition and correct clearance.

Inspect Magneto for oil leakage.

Inspect breaker felts for proper cam lubrication.

Check Magneto to engine timing.

Inspect condition of spark plugs (clean and adjust gap as required, adjust in accordance with Lycoming Service instructions). If fouling of plugs is apparent rotate plugs bottom to top.

Exhaust System

Inspect exhaust stacks, connections and gaskets. (Replace gaskets as required).

Inspect cockpit heat exchanger and tubes.

Engine Lubrication

Clean and inspect oil cooler fins.

Inspect Sump, Oil hoses and vent.

Inspect oil sender connections for leaks and security.

Fuel System

Inspect condition of flexible fuel lines and fire-sleeve. Confirm all fire-sleeve is safety wired iaw AC43.13

Check operation of fuel selector valve.

Inspect fuel gauges for damage and operation.

Inspect security of all fuel lines.

Inspect fuel boost pump (engine and auxiliary).

Propeller

Remove spinner, inspect complete propeller and spinner assembly for security and damage or wear.

Inspect propeller mounting bolts and safety. Remove safety wire and re-torque (225 to 250 in lbs).

Safety wire propeller bolts.

Re-install spinner.

Electrical System

Inspect – components, wiring, terminals and connectors.

Check correct type and rating of circuit breakers.

Check lamps and lights (not installed).

Check starter brushes and alternator belt tension/drive.

Inspect condition of alternator and starter (and mounting integrity)

Ensure voltage regulator is operating correctly.

Instrument System

Inspect instruments: panel; mounts; hoses; electrical wiring.

Check Pitot/static system for leaks and general security.

ANNUAL (Same as 100 and 25 Hour and the following:)

Electrical System

Consider battery capacity check and charge especially if colder weather is imminent.

Other Maintenance / Inspection Suggestions

90 days Remove and clean fuel filter bowl and screen.

400 Hours Remove rocker arm covers. Check for freedom of valve rockers when valves are closed. Look for evidence of abnormal wear or broken parts in the area of the valve tips, valve keeper, springs and spring seat. Any damage requires removal (including piston and connecting rod assembly) and inspection for further damage.

500 Hours Inspect distributor block for cracks, burnt areas or corrosion and height of contact springs.

500 Hours Remove and flush oil radiator.

1000 Hours CONSIDER overhaul or replacement of magnetos.

1000 Hours CONSIDER propeller replacement.

1000 Hours CONSIDER replacement of flexible fuel lines.

1000 Hours CONSIDER replacement of flexible oil lines.

1000 Hours CONSIDER overhaul or replacement of fuel pump (engine and auxiliary).

2000 Hours CONSIDER engine overhaul or replacement.

Note: the engine installed on C-GFEW had approximately 1600 hours on it when it was installed. The engine had been top overhauled around the 1300 hour time frame.

Minimum 10 years (earlier if required) reweigh and check weight and balance schedule.

Notes on Mandatory requirements

To operate the aircraft a Special Airworthiness Certificate (SAC) issued by Transport Canada must be in force and valid. The SAC is invalidated when the airworthy condition of the aircraft is changed (damage sustained, improper storage, component failure etc) or work is carried out which constitutes a major modification i.e. adding a second wing.

In addition to the SAC, the following are required:

Valid Pilots License (aeroplane) - Tailwheel proficiencyrequired.

Valid Medical Certificate (Pilot – Cat 3, minimum)

Certificate of Registration

Insurance

Pilot / Owner Maintenance for Certified Airplanes (Reference)

Pilots and owners of Certified aircraft, who are not licensed AMEs may carry out the following routine maintenance procedures without re-authorization by a licensed AME.

1 Replacement of landing gear tires. This includes removal and replacement of wheels, cleaning and servicing of wheel bearings, application of creep marks, removal and refitting of brake units as required for wheel removal and the renewal of brake pads and replenishment of hydraulic brake system fluid level.

2 Replacement of defective safety wiring or split pins excluding those in engine and flight control systems.

3 Replacement of seats or seat parts and repairs to upholstery and decorative furnishing of the cockpit or cockpit interior which does not require dismantling of any structure or operating system related to the structure of the aircraft.

4 Repairs, not requiring welding, to fairings, non-structural cover plates and cowlings.

5 Replacement of safety belts or safety harnesses.

6 Replacement of bulbs, reflectors, glasses, lenses or lights.

7 Replacement of any cowling not requiring removal of the propeller or disconnection of engine or flight controls.

8 Replacement of unserviceable spark plugs. (including removal, cleaning, gaping testing and refitting of all spark plugs).

9 Replacement and maintenance of battery.

10 Replacement of VHF communications equipment not combined with navigation equipment.

11 Manufacture and fitting of required cockpit placards and notices.

12 Lubrication of aircraft (including prior cleaning of hinges).

13 Inspection of engine induction air filter (including cleaning and refitting)

14 Inspection of fuel filters (including removal, cleaning and refitting).

Changing engine oil (including removal, cleaning/replacement, refitting oil filter).

TORQUE SETTINGS

Exhaust Stack (High Country Recommendation)	100/140 in lbs	
Lycoming Recommendation:		
¼ in. fasteners	8 ft lbs	96 in lbs
5/16 in fasteners	17 ft lbs	204 in lbs
Plugs	30/35 ft lbs	
Engine Mount bolts		40 in lbs (1)
Rocker Cover Screws		50 in lbs

General Torque settings for STEEL bolts (fine threads):-

AN3	(3/16 in)	20-25 in lbs
AN4	(1/4 in)	50-60 in lbs
AN5	(5/16 in)	100-140 in lbs
AN6	(3/8 in)	160-190 in lbs

General Torque settings for ALUMINUM ALLOY bolts/screws (coarse threads lower setting):-

3/16 in	5-6 in lbs
¼ in	8-10 in lbs
5/16 in	19 –22 in lbs

Note: (1) The distance between the two large washers holding the rubber vibration isolators (engine mount) is to be 1 27/32" (1.84")

CONSTRUCTION HISTORY

Builder	Mike Toews
Type	Vans
Model	RV-4
Serno.	2794
Reg'n	C-GFEW
Project Started	August 1990
1st Flight	Sept 17, 1999
1st Passenger Flight	November 19, 1999

Plans, kit and construction manual purchased from Vans Aircraft of North Plains, OR. The kit included everything except the following components:

Engine Purchased from Al Piche of Winnipeg, Mb (approx 1995). Al's Cherokee 140/160 was destroyed in a wind storm at Ste. Andrews airport that damaged 15 to 20 aircraft. Engine was nearly complete - firewall fwd.

Carburetor Purchased from Hugh Martin (Airworthiness Engineer, Transport Canada, Winnipeg, Mb.)

Propeller Manufactured by Colin Walker of Surrey, B.C.

Instruments Purchased from various sources including Harv's Air Service (Stbh, Mb.), Wentworth Aircraft (Minneapolis, MN), Vans Aircraft (North Plains, OR), Birch Auto Supply (Stbh, Mb.).

Battery Purchased from Harv's Air Service

Stick Grips Manufactured by local wood carver - Peter Wiebe

Alternator Purchased from Central Refrigeration, Winnipeg, Mb.

Paint RM UNO, 2 Part Urethane, Base Color - Yellow (Match to 2000 Dodge Trucks). Art work by John Henry Friesen Signs

STATEMENT OF CONFORMITY

Builder: Mike Toews

Type: Vans

Model: RV-4

Serno.: 2794

Reg'n: C-GFEW

I CERTIFY, THAT TO THE BEST OF MY KNOWLEDGE THIS AIRCRAFT WAS CONSTRUCTED IAW THE PLANS AND SPECIFICATIONS (MEETS OR EXCEEDS) PROVIDED BY VANS AIRCRAFT AND IAW WITH ACCEPTED AIRCRAFT PRACTICES AS OUTLINED IN ADVISORY CIRCULAR AC43.13-01 AND AIRWORTHINESS MANUAL CH. 549.

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Mike Toews Date