

Revision: 1

Date: 10/28/09

RV-12
PILOT OPERATING
HANDBOOK



Date: 10/28/09

Revision: 1

PRE-START

- Passenger Briefing – PERFORMED
- Canopy – CLOSED and LATCHED
- Fuel Valve – OPEN (PUSH DOWN)
- Throttle – ADJUST FRICTION
- Master – ON
- Ignition – BOTH ON
- Avionics – ON

STARTING ENGINE

- Fuel Pressure – NORMAL
- Throttle – Cold Start – FULLY CLOSED
Warm Start – 1/8 inch OPEN
- Choke – Cold Start – PULL tee handle fully out
(approx 1 inch) and rotate 90°
clockwise to lock
Warm Start – OFF
- Brakes – HOLD
- Propeller – CLEAR
- Start Key – ENGAGE
- Choke – OFF
*Cold weather starts,
lock choke half out
(approx 1/2 inch)
until engine warms up*
- Throttle – 2500 rpm max
- Oil Pressure – CHECK 12 psi within 10 seconds or
immediately shutdown the engine
- Ammeter – CHARGING

Revision: 1

Date: 10/28/09

PRE-TAXI

- Engine Gauges – CHECK
- Brakes – RELEASE
- Taxi rpm – 1400–2500 rpm until oil temp 120°F (50 ° C)

BEFORE TAKEOFF

- Brakes – HOLD
- Flight Controls – CHECK
- Flight Instruments – CHECK & SET
- Fuel Valve – CHECK OPEN
- Fuel Quantity Indication - CHECK
(no take-off with less than 4 gallons fuel)
- Trim – SET for takeoff
- Flaps – SET for takeoff 1st DETENT
- Canopy – CHECK Latched
- Engine Run-Up
 - Elevator – STICK BACK
 - Throttle – 4000 rpm
 - Ignition – Cycle A – B- BOTH ON
(max rpm drop - 300)
(max diff – 120)
 - Engine Instruments – CHECK
Normal Indications
Minimum Oil Temp 120°
 - Ammeter – CHECK
 - Throttle – IDLE
- Fuses - CHECK
- Fuel Pressure – CHECK 2.2 psi minimum
- Seat Belt, Pilot and Passenger – FASTENED
- Brakes – RELEASE

Date: 10/28/09

Revision: 1

TAKEOFF (NORMAL)

- Throttle – smoothly FULL OPEN
- Engine Instruments – CHECK
- Stabilator Control – RAISE NOSE to takeoff attitude
- Rotate – LIFT OFF 50-55 kts CAS
- Climb – 75 kts CAS
- Flaps – UP
- Trim – AS REQUIRED to hold desired airspeed

CLIMB

- Throttle – FULL
5500 rpm Max Continuous
- Airspeed –
Best Rate 75 kts CAS
Flaps – UP
Best Angle 60 kts CAS
Flaps – 1st DETENT
Cruise-climb 85 kts CAS
Flaps – UP
- Trim – AS REQUIRED to hold desired airspeed

CRUISE

- Flaps – CHECK UP
- Throttle – AS DESIRED 5500 rpm Max Continuous,
5800 rpm Max 5 min
- Trim – AS REQUIRED
- Engine Gauges – CHECK

Revision: 1

Date: 10/28/09

DESCENT

- Flight Instruments - ADJUST altimeter setting
- Throttle – REDUCE
- Airspeed – AS DESIRED
- Flaps – UP if above 82 kts CAS

LANDING

- Seat Belt –
Pilot and Passenger – FASTENED & SNUG
- Brakes - CHECK FIRM then release
- Ignition Switch – BOTH ON
- Throttle – AS DESIRED to control rate of descent
- Trim - AS REQUIRED
- Approach Speed – 55-60 kts
- Flaps – AS REQUIRED below 82 kts
- Touch Down - MAIN WHEELS FIRST
- After Touch Down –
Stabilator Control – FULL AFT
Brake as Required

SHUT DOWN

- Throttle – CLOSED
- ELT – CHECK LIGHT OFF & CHECK signal on 121.5 MHZ
- Ignition – BOTH OFF
- Avionics – OFF
- Master – OFF
- Tie Down – CHOCK two wheels min

- Post Ignition - due to hot weather
Ignition – BOTH ON
Choke – ON
Ignition - 3 seconds BOTH OFF

Date: 10/28/09

Revision: 1

REVISION SUMMARY

SECTION	REVISION	DATE
COVER PAGE & ABBREVIATED CHECKLIST	1	10/28/09
I	0	07/06/09
II	1	10/28/09
III	0	07/06/09
IV	1	10/28/09
V	0	07/06/09
VI	0	07/06/09
VII	0	07/06/09
VIII	1	10/28/09
IX	0	07/06/09
X	0	07/06/09
FRONT COVER	1	10/28/09
REAR COVER	1	10/28/09

Revision: 1

Date: 10/28/09

TABLE OF CONTENTS

COVER PAGE & ABBREVIATED CHECKLIST	i-v
REVISION SUMMARY	vi
TABLE OF CONTENTS	vii
SECT I GENERAL INFORMATION	1-1
SECT II AIRCRAFT & SYSTEMS DESCRIPTION	2-1
SECT III OPERATING LIMITATIONS	3-1
SECT IV WEIGHT AND BALANCE	4-1
SECT V PERFORMANCE	5-1
SECT VI EMERGENCY PROCEDURES	6-1
SECT VII NORMAL PROCEDURES	7-1
SECT VIII AIRCRAFT GRND HANDLING & SERVICING	8-1
SECT IX REQUIRED PLACARDS & MARKINGS	9-1
SECT X SUPPLEMENTARY INFORMATION	10-1

Date: 10/28/09

Revision: 1

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Revision: 0

Date: 07/06/09

SECTION I

GENERAL INFORMATION

INDEX

GENERAL INFORMATION 1-1

GENERAL INFORMATION

This manual has been prepared to inform the pilot of the features and systems incorporated in the RV-12. Recommended operating procedures and performance data are provided so that maximum utilization can be obtained with the utmost of safety, economy, and serviceability. A companion manual, the RV-12 Flight Training Supplement, mirrors the content of this manual but presents operating procedures at a greater level of detail than can effectively be presented in this manual.

It is strongly recommended that the pilot be familiar with the aircraft, the RV-12 FTS, and this manual prior to flight.

The words "WARNING", "CAUTION", and "NOTE" are used throughout the manual with the following definitions:

WARNING

An operating procedure, practice, or condition, etc. which may result in injury or fatality if not carefully observed or followed.

CAUTION

An operating procedure, practice, or condition, etc. which if not strictly observed may damage the aircraft or equipment.

NOTE

An operating procedure, practice, or condition, etc.

Date: 07/06/09

Revision: 0

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1-2

RV-12

Revision: 1

Date: 10/28/09

SECTION II

AIRCRAFT & SYSTEMS DESCRIPTION

INDEX

GENERAL	2-1
POWERPLANT SUMMARY	2-2
OPERATING WEIGHTS & LOADING	2-2
AIRCRAFT SPECIFICATIONS	2-3
AIRCRAFT THREE VIEW	2-5
ELECTRICAL SYSTEM	2-6
FUEL SYSTEM	2-8

Date: 10/28/09

Revision: 1

POWERPLANT SUMMARY

Engine Description

Make Rotax 912 ULS
Displacement 1352 ccm
Ignition Ducati Double CDI
Carburetors Bing altitude compensating
Rated Horsepower 100 Hp @ 5800 RPM

Propeller

Make Sensenich
Model 2AOR5R70E

Fuel

Capacity 19.8 US Gallons
Type 100 LL Aviation Fuel
or
(91 AKI) Premium
Unleaded Automotive
See Aircraft Ground Handling and Servicing

Oil

See Aircraft Ground Handling and Servicing

OPERATING WEIGHTS & LOADING

Category	Max Weight	Center of Gravity Range
Light Sport	1320 lb	80.49" to 85.39" (18.4 to 27% Chord)

NOTE

All measurements are aft of the datum line which is 70 inches forward of the wing leading edge.

Baggage 50 lb maximum

Revision: 1

Date: 10/28/09

RV-12 AIRCRAFT SPECIFICATIONS

Exterior Dimensions

Span 26 ft 9 in
Length 20 ft 7 in
Height 8 ft 4 in
Wing Area 127 ft²

Weights

Empty Weight 725 lb (typical)
Gross Weight 1320 lb

Loadings

Wing Loading 10.4 lb/ft²
Power Loading 13.2 lb/hp

PERFORMANCE (1050 lb)

Speed

Top Speed 119 kts
Cruise 5500rpm 7500 ft 117 kts
Cruise 5000rpm 7500 ft 105 kts
Stall - flaps up 41 kts

Ground Performance

Take-off Distance 600 ft
Landing Distance 475 ft

Climb/Ceiling

Rate of Climb 1135 ft/min
Ceiling (estimated) 15,000 ft

Date: 10/28/09

Revision: 1

PERFORMANCE (Gross Weight)

Speed

Top Speed 117 kts
Cruise 5500rpm 7500 ft 114 kts
Cruise 5000rpm 7500 ft 101 kts
Stall - flaps up 45 kts

Ground Performance

Take-off Distance 700 ft
Landing Distance 525 ft

Climb/Ceiling

Rate of Climb 900 ft/min
Ceiling (estimated) 13,800 ft

Range 5500rpm 7500 ft 482 nm
Range 5000rpm 7500 ft 534 nm

Revision: 1

Date: 10/28/09

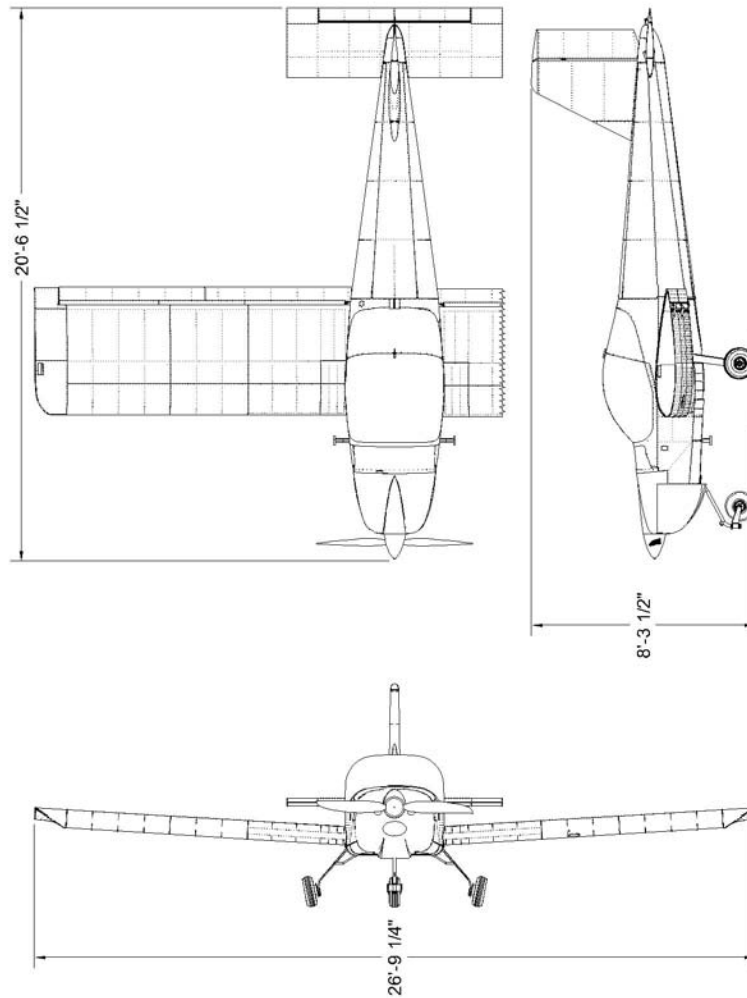


FIGURE 2-1 RV-12 THREE VIEW

RV-12

2-5

Revision: 1

Date: 10/28/09

CAUTION

PLACE MASTER SWITCH IN "OFF" POSITION BEFORE
REPLACING ANY FUSE

NOTE

REPLACEMENT FUSES RATED 3 AMP OR GREATER MUST
BE OF THE TYPE THAT ILLUMINATE WHEN BLOWN

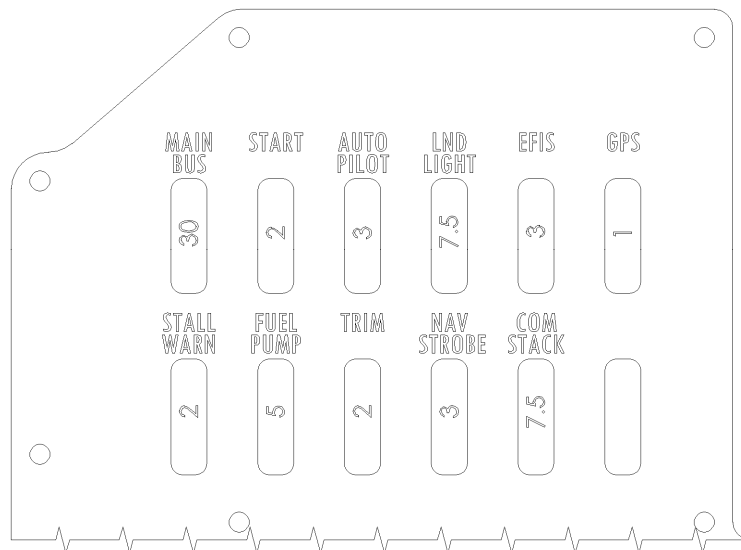


FIGURE 2-3 FUSE PANEL DIAGRAM

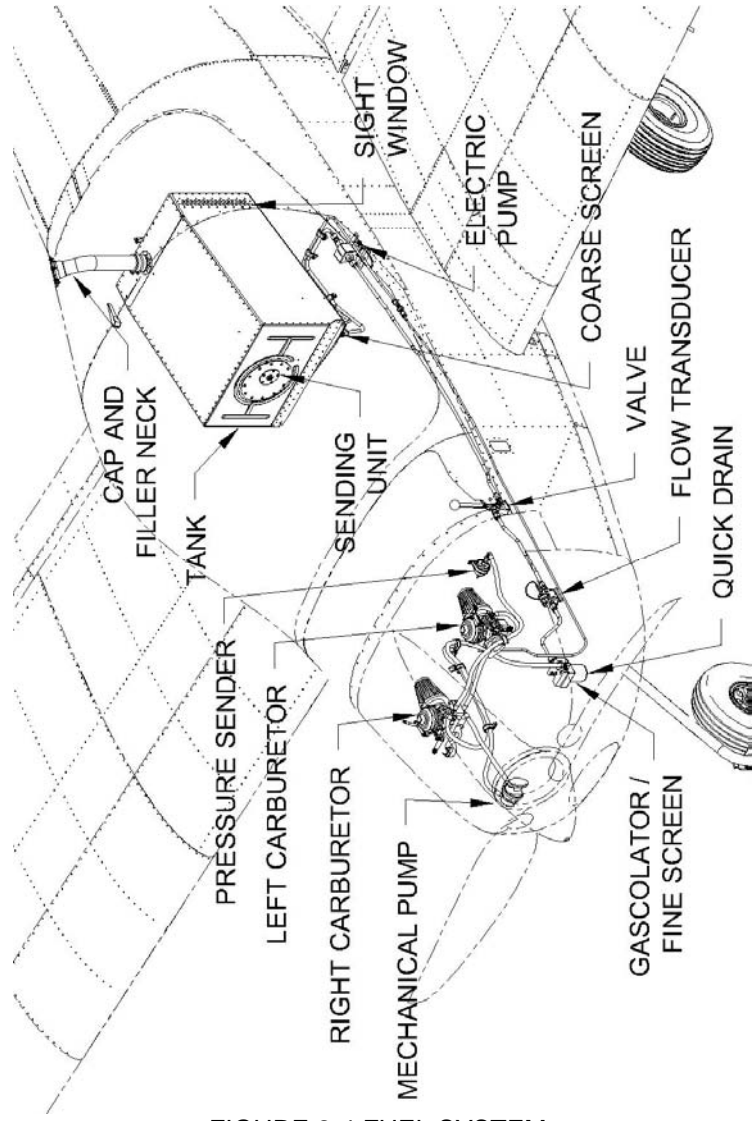


FIGURE 2-4 FUEL SYSTEM

Revision: 0

Date: 07/06/09

SECTION III

OPERATING LIMITATIONS

INDEX

GENERAL	3-1
AIRSPEED LIMITATIONS	3-3
CEILING	3-4
FLIGHT LOAD FACTORS	3-4
PROHIBITED MANEUVERS	3-4
POWERPLANT LIMITATIONS	3-5

GENERAL

This section lists all power plant and airframe operating limitations. These limitations are also indicated in the aircraft in the form of placards, instrument color markings, and audio warnings. The aircraft placards, instrument color markings, and audio warnings are to be the authority if an inconsistency exists with this manual.

WARNING

All operating limitations must be strictly adhered to for reasons of safety and serviceability.

Date: 07/06/09

Revision: 0

FLIGHT OPERATIONS

The RV-12 is designed for operation in the Light Sport Category.

Daytime flight in VFR conditions only is approved providing that the aircraft is operating as specified under Part 91 of the Federal Air Regulations (F.A.R.'s).

WARNING

Night flight is prohibited
(unless equipped with optional lighting).

WARNING

Flight in IFR conditions is prohibited.

WARNING

Flight into known icing conditions is prohibited.

Revision: 0

Date: 07/06/09

AIRSPPEED LIMITATIONS

AIRSPPEED DESIGNATION	CAS (kts)
Stall Flaps Down (@ gross weight 1320 lb) (V_{SO})	41
Stall (@ gross weight 1320 lb) (V_S)	45
Flap Operating Range ($V_{SO} - V_{FE}$)	41-82
Normal Operating Range (green arc)	45-108
Maneuvering (V_A – blue line)	90
Maximum Structural Cruise (V_{NO})	108
Caution Range (yellow arc)	108-136
Never Exceed (V_{NE} – red line)	136

Maximum Direct Crosswind Component 11kt
Maximum Wind Limitation 30kt

NOTE

CAS	Calibrated airspeed is indicated airspeed (IAS) corrected for installation and instrument error.
IAS	Indicated airspeed assumes zero instrument error only.
V_{NE}	Maximum safe airspeed, not to be exceeded at any time.
V_{NO}	Not to be exceeded except in smooth air only and then with caution.
V_{FE}	Not to be exceeded with flaps extended.
V_A	No full or abrupt control movements allowed above this airspeed.

Date: 07/06/09

Revision: 0

CEILING

Service Ceiling Estimated 12,000 ft

FLIGHT LOAD FACTORS

Category	Limit Load Factor
Light Sport Category	+4.0g/-2.0g

PROHIBITED MANEUVERS

AEROBATICS PROHIBITED!
Intentional spinning prohibited

Revision: 0

Date: 07/06/09

POWERPLANT LIMITATIONS

Tachometer

Normal Range (green arc)	1400 to 5500 RPM
Caution Range (yellow arc)	5500 to 5800 RPM
Maximum (red line)	5800 RPM

Cylinder Head Temperature

Normal in Cruise (green arc)	150° to 230° F
Caution Range (yellow arc)	230° to 248° F
Maximum (red line)	248° F

Oil Temperature

Minimum	122° F
Normal in Cruise	190° to 230° F
Caution Range (yellow arc)	230° F to 248° F
Maximum (red line)	248° F

Oil Pressure

Minimum at Cruise	29 psi
Maximum at Cruise	73 psi
Maximum – Cold (red line)	100 psi
Minimum at Idle (red line)	12 psi

Fuel Pressure

Normal Range	2.2 to 5.8 psi
Maximum (red line)	5.8 psi
Minimum (red line)	2.2 psi

Date: 07/06/09

Revision: 0

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SECTION IV**WEIGHT & BALANCE****INDEX**

GENERAL	4-1
INSTALLED EQUIPMENT LIST	4-2
SAMPLE LOADING PROBLEM	4-3
LOADING GRAPH	4-4
FLIGHT ENVELOPE	4-5

GENERAL

It is the pilot's responsibility to ensure that the aircraft is loaded properly and within the weight and balance limitations. All flight performance, procedures and characteristics are based on this prerequisite.

The actual licensed empty weight and CG of a specific aircraft can be found on the Weight and Balance Form and the Operating Limitations Card, both of which are a permanent part of the aircraft's file. All additional changes to the aircraft's empty weight and CG after the time of manufacture must also be attached to or indicated on both forms. From this information and the following instructions, the pilot can easily determine the useful load and proper loading distribution for the aircraft.

Date: 10/28/09

Revision: 1

INSTALLED EQUIPMENT LIST

ITEM	WEIGHT lb	LOCATION in	MOMENT in-lb
DYNON D-180		56.62	
GARMIN GTX 327		55.3	
GTX 327 TRAY		53.71	
GARMIN GTX 328		53.86	
GTX 328 TRAY		53.88	
GARMIN SL-40		53.76	
SL-40 TRAY		47.69	
GARMIN X95/6		58.08	
FLIGHTCOM FC 403		56.48	
ARTEX ME-406		96.18	
DYNON EDC-10A		147.73	
ODYSSEY PC-680		43.56	
TOTAL		-----	

Revision: 1

Date: 10/28/09

SAMPLE LOADING PROBLEM

ITEM	ARM (IN.) (LIMITS 80.49- 85.39)	SAMPLE AIRPLANE	
		WEIGHT (LB)	MOMENT (IN-LB)
EMPTY WEIGHT WITH OIL & COOLANT	81.93	738	60468
PILOT	78.85	190	14982
PASSENGER	78.85	190	14982
BAGGAGE	110.81	50	5541
FUEL (6 LB/GAL)	110.28	119	13101
TAKEOFF WEIGHT & MOMENT	84.76	1287	109073

Date: 10/28/09

Revision: 1

YOUR AIRPLANE

ITEM	ARM (IN.) (LIMITS 80.49- 85.39)		
		WEIGHT (LB)	MOMENT (IN-LB)
EMPTY WEIGHT WITH OIL & COOLANT			
PILOT	78.85		
PASSENGER	78.85		
BAGGAGE	110.81		
FUEL (6 LB/GAL)	110.28		
TAKEOFF WEIGHT & MOMENT			

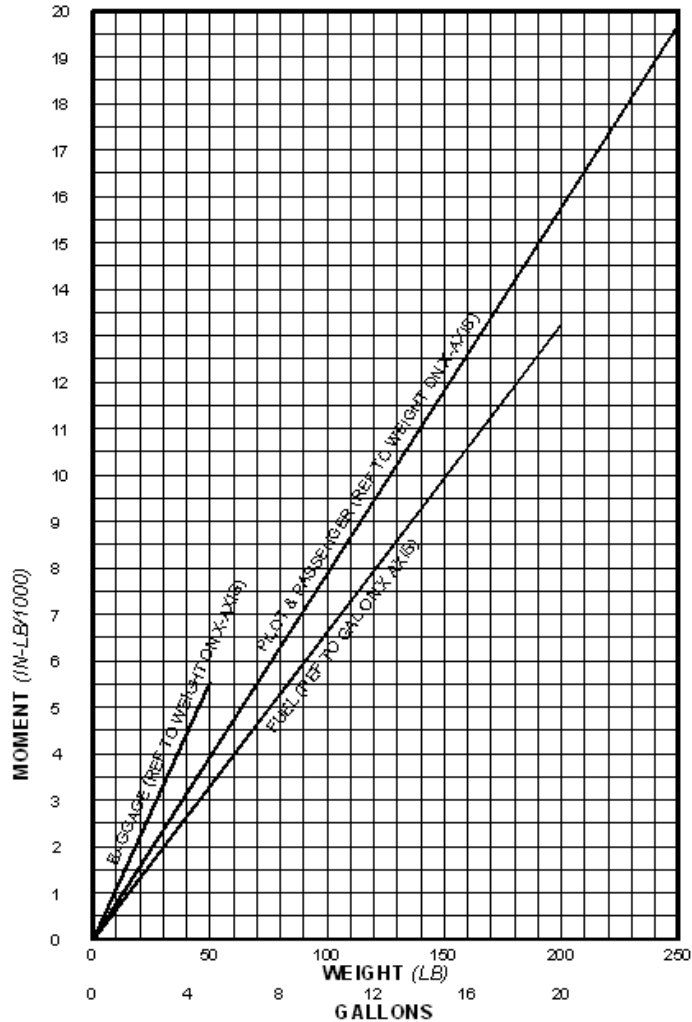


FIGURE 4-1 LOADING GRAPH

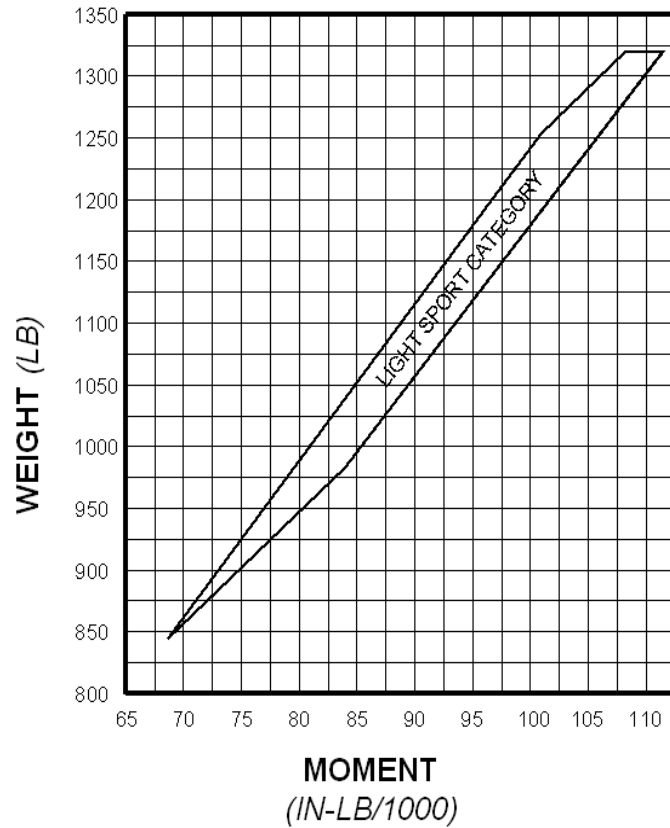


FIGURE 4-2 FLGHT ENVELOPE

Revision: 0

Date: 07/06/09

SECTION V

FLIGHT PERFORMANCE

INDEX

GENERAL	5-1
AIRSPEED CALIBRATION	5-2
STALL SPEEDS	5-2
TAKE-OFF & CLIMB PERFORMANCE	5-3
LANDING PERFORMANCE	5-5
CRUISE PERFORMANCE & FUEL BURN	5-6

GENERAL

This data is to inform the pilot what can be expected from the aircraft in the way of performance and to assist in preflight planning.

The data has been compiled from both estimated calculations and actual flight test using average piloting techniques, with an aircraft and engine in good operating conditions. All information is corrected for standard atmospheric conditions.

Date: 07/06/09

Revision: 0

AIRSPEED CALIBRATION TABLE

CALIBRATED AIRSPEED	INDICATED AIRSPEED	
	D-180	
45	45	
50	50	
55	54	
60	58	
65	65	
70	69	
75	75	
80	78	
85	84	
90	89	
100	100	
110	110	
120	120	
130	130	
140	140	
150	150	

STALL SPEEDS

FLAP POSITION	GROSS WEIGHT	
	1050	1320
UP	41	45
½	39	43
FULL	37	41

Revision: 0

Date: 07/06/09

**TAKE-OFF & CLIMB PERFORMANCE
1320 lb GROSS WEIGHT**

PRESS ALTITUDE	TEMP (°F)	TAKE-OFF DISTANC		MAX RATE OF CLIMB
		GROUND ROLL	50 FT OBSTCL	
SEA LEVEL	0	589	1091	1156
	20	641	1188	1069
	40	696	1291	985
	60	750	1397	906
	80	812	1519	831
	100	873	1647	758
2000	0	681	1263	1007
	20	742	1380	921
	40	805	1505	839
	60	871	1642	761
	80	939	1790	687
	100	1010	1954	616
4000	0	790	1474	858
	20	860	1619	774
	40	933	1777	693
	60	1010	1952	617
	80	1089	2150	544
	100	1171	2379	474
6000	0	917	1742	710
	20	999	1927	627
	40	1084	2138	548
	60	1173	2384	473
	80	1265	2680	401
	100	1360	3060	333
8000	0	1068	2097	562
	20	1163	2355	481
	40	1262	2671	403
	60	1365	3082	330
	80	1472	3678	259
	100	1583	4720	192

RV-12

5-3

Date: 07/06/09

Revision: 0

**TAKE-OFF & CLIMB PERFORMANCE
1050 lb GROSS WEIGHT**

PRESS ALTITUDE	TEMP (°F)	TAKE-OFF DISTANCE		MAX RATE OF CLIMB
		GROUND ROLL	50 FT OBSTCL	
SEA LEVEL	0	471	951	1455
	20	513	1034	1345
	40	557	1122	1241
	60	600	1212	1141
	80	650	1314	1046
	100	699	1421	956
2000	0	545	1098	1268
	20	594	1197	1160
	40	644	1303	1057
	60	697	1416	959
	80	751	1539	865
	100	808	1673	776
4000	0	632	1277	1081
	20	688	1397	975
	40	747	1528	874
	60	808	1672	777
	80	871	1830	686
	100	937	2008	598
6000	0	734	1499	895
	20	799	1651	790
	40	867	1821	691
	60	938	2012	596
	80	1012	2233	506
	100	1088	2497	420
8000	0	854	1787	709
	20	930	1990	606
	40	1010	2226	509
	60	1092	2511	416
	80	1178	2877	327
	100	1267	3387	243

5-4

RV-12

Revision: 0

Date: 07/06/09

LANDING PERFORMANCE – ZERO WIND

DENSITY ALTITUDE	APPROACH SPEED (CAS)	LANDING DISTANCE	
		GROUND ROLL	50 FT OBSTCL
0	55	525	1550
2500	55	565	1615
5000	55	610	1695
7500	55	660	1770

NOTES:

- 1) Decrease the distances shown by 10% for each 5 kts of headwind.
- 2) The data given is with flaps fully extended

Date: 07/06/09

Revision: 0

CRUISE PERFORMANCE & FUEL BURN

DENSITY ALTITUDE	RPM	TAS	FUEL BURN	MPG	ENDURANCE	RANGE
2500	5500	116	5.7	20.2	3:24	394
	5000	103	4.4	23.4	4:25	456
5000	5500	114	5.0	22.7	3:53	443
	5000	101	4.0	25.3	4:53	493
7500	5500	114	4.6	25.0	4:14	482
	5000	101	3.7	27.4	5:17	534
10000	5500	113	4.2	26.9	4:38	524
	5000	100	3.4	29.6	5:45	576

NOTES:

- 1) No fuel allowance is made for take-off, climb, descent, or reserve.

SECTION VI**EMERGENCY PROCEDURES****INDEX**

GENERAL	6-1
FIRE	6-3
ENGINE FIRE DURING START	6-3
ENGINE FIRE IN FLIGHT	6-3
ELECTRICAL FIRE	6-3
GENERATOR/ELECTRICAL FAILURE	6-5
ENGINE MALFUNCTION	6-6
ENGINE FAILURE ON TAKE-OFF	6-6
ENGINE AIR RESTART	6-7
PARTIAL POWER LOSS/ROUGH RUNNING	6-7
ABNORMAL OIL PRESSURE/TEMPERATURE	
INDICATIONS	6-7
LANDING EMERGENCIES	6-9
PRECAUTIONARY LANDING APPROACH	6-10
FORCED LANDING (COMPLETE	
POWER FAILURE)	6-10
DITCHING	6-11
UNUSUAL FLIGHT CONDITIONS	6-12
SEVERE TURBULENCE	6-12
STALLS	6-12
SPINS	6-13
RUNAWAY TRIM MOTOR	6-13
INFLIGHT OVERSTRESS	6-14

GENERAL

This section covers the recommended procedures to follow during emergency and adverse flight conditions. As it is not possible to define every type of emergency that may occur, it is the pilot's responsibility to use sound judgement based on

Date: 07/06/09

Revision: 0

personal experience and knowledge of the aircraft to determine the best course of action.

It is considered mandatory that the pilot be familiar with this entire manual, in particular, the "Emergency Procedures" section prior to flight.

NOTE

All airspeeds in this section are calibrated airspeeds (CAS) unless stated otherwise.

Revision: 0

Date: 07/06/09

FIRE

ENGINE FIRE DURING START

If the fire is believed to be confined to the intake or exhaust system (result of flooding engine):

- Continue cranking engine with starter
- Choke – PUSH OPEN
- Throttle – FULL OPEN
- Inspect aircraft thoroughly for damage and cause prior to restart

If fire persists or is not limited to intake or exhaust system:

- Fuel Shut-Off Valve – OFF
- Electrical and Ignition switches – ALL OFF
- Exit Aircraft
- Direct fire extinguisher through the air outlet tunnel at the bottom of the cowl

ENGINE FIRE IN FLIGHT

- Fuel Shut-Off Valve – OFF
- Ignition switches – BOTH OFF
- Effect an expedited descent and land immediately using “Forced Landing Procedures”

WARNING

Do not attempt to restart engine.

Date: 07/06/09

Revision: 0

ELECTRICAL FIRE

An electrical fire is usually indicated by an odor of hot or burning insulation.

- Electrical Switches – ALL OFF (leave master and ignition switches ON)
- Air Vent – OPEN if necessary for smoke removal and ventilation
- Use hand fire extinguisher if available
- Land immediately (or as soon as practical if location for safe landing is not available)

Revision: 0

Date: 07/06/09

GENERATOR/ELECTRICAL FAILURE

WARNING

Engine operation depends upon there being battery power sufficient to run the ignition system and fuel pump.

A generator failure is indicated by a steady discharge on the ammeter and voltage indication less than 13.2 volts.

- Turn OFF all non-essential electrical equipment to conserve battery power. The avionics switch should be switched off and the EFIS and GPS will continue to operate on their internal batteries.
- Land as soon as possible as the battery will furnish electrical power for a limited time only.

A voltage in excess of 15 volts indicates a runaway generator.

- Pull the 30A main bus fuse immediately.
- Turn OFF all non-essential electrical equipment to conserve battery power. The avionics switch should be switched off and the EFIS and GPS will continue to operate on their internal batteries.
- Land as soon as possible as the battery will furnish electrical power for a limited time only.

Date: 07/06/09

Revision: 0

ENGINE MALFUNCTION

ENGINE FAILURE ON TAKE-OFF

WARNING

In the event of engine failure, the control stick must be IMMEDIATELY and AGGRESSIVELY moved forward to prevent loss of airspeed.

- Airspeed – 60 kts (55 kts minimum)

If sufficient runway remains:

- Throttle – CLOSED
- Land using maximum braking after touchdown.

If airborne and sufficient runway remains for landing, attempt an engine restart if altitude permits:

- Fuel Shut-Off Valve – CHECK ON
- Choke – CHECK OPEN
- Ignition Switches – BOTH ON
- Fuel Pump - CHECK FUSE (illuminated if blown)

If no restart is possible:

- Select most favorable landing area ahead
- Flaps – FULL DOWN

WARNING

Maintain flying speed at all times and do not attempt to turn back toward the runway unless sufficient altitude has been achieved.

Revision: 0

Date: 07/06/09

ENGINE AIR RESTART

- Maintain Airspeed – 60 kts (55 kts minimum)
- Ignition Switches – BOTH ON
- Fuel Pump – CHECK FUSE (illuminated if blown)
- Fuel Shut-Off Valve – CHECK ON
- Choke – CHECK OPEN
- If restart not possible, change throttle and/or choke settings in attempt to restart
- Follow “Forced Landing Procedure” if unable to restart

NOTE

The engine starter may be engaged in flight should the propeller stop windmilling.
Propeller will not windmill below 80 kt IAS.

PARTIAL POWER LOSS/ROUGH RUNNING

- Follow the engine air restart procedures
- Land as soon as possible using “Precautionary Landing Approach” procedures

ABNORMAL OIL PRESSURE/TEMPERATURE INDICATIONS

Oil pressure and temperature problems are usually related with one affecting the other. Before any drastic action is taken, cross check other engine instruments and control settings in an attempt to determine the source of the problem.

High oil temperature is generally a result of loss of oil or overheating (note CHT). If the situation remains unchecked, oil pressure usually drops resulting in possible engine damage. Power should be reduced while maintaining cruise airspeed; land as soon as practical.

Date: 07/06/09

Revision: 0

Little or no oil pressure is usually caused by a failed pressure relief valve, pump, loss of oil, high oil temperature or a defective gauge. A landing should be made as soon as practical using minimum RPM changes. Plan a "Precautionary Landing Approach" as complete engine failure is possible at any time.

NOTE

Zero oil pressure will be indicated if main bus power is removed.

Revision: 0

Date: 07/06/09

LANDING EMERGENCIES

PRECAUTIONARY LANDING APPROACH

A precautionary landing approach should be used whenever power is still available but a complete power failure is considered imminent. Maintain a higher and closer pattern than normal in attempt to remain in gliding distance of the intended touchdown point. Use the normal landing procedures in addition:

- Airspeed – 60 kts recommended (55 kts minimum)
- Throttle – CLOSED when in gliding distance of runway
- Flaps – LOWER AS NEEDED to increase approach descent angle

NOTE

Slipping the aircraft by cross controlling the rudder and ailerons will increase the rate of descent both with or without flaps. If a crosswind exists, place the lower wing into the wind.

Date: 07/06/09

Revision: 0

FORCED LANDING (Complete Power Failure)

If the engine cannot be restarted in flight, trim the aircraft to the recommended glide speed. Remain within gliding distance of the intended point of landing. Maintain a higher and closer pattern than normal making allowance for wind.

Extending flaps or slipping the aircraft can lose additional altitude. Diving the aircraft in an attempt to lose altitude when flying into a headwind will only increase the required landing distance.

- Maximum gliding distance airspeed – 85 kts
Minimum rate of descent airspeed- 60 kts
- Fuel Shut-Off Valve – OFF
- Flaps – UP to maximize glide range
- Radio – MAYDAY 121.5 MHz (or frequency in use)
- Attempt to position the aircraft approximately 1000 feet above ground level (AGL) when on downwind and abeam the intended point of landing.
- Ignition switches – OFF
- On Final Approach
 - a) Airspeed – 60 kts (55 kts minimum)
 - b) Flaps – DOWN after intended point of landing assured
- Touchdown with minimum airspeed particularly if landing on rough terrain.

Revision: 0

Date: 07/06/09

DITCHING

Should it become necessary to make a forced landing over water, follow the "Forced Landing Procedures" in addition to the following:

- Canopy – UNLATCH
- Land into wind if high winds are evident or parallel to swells with calm winds
- Flaps – UP (allows higher nose attitude at touchdown)
- Contact the water with nose high attitude
- After coming to complete stop – EXIT AIRCRAFT

NOTE

Aircraft cannot be depended upon to provide flotation after contacting the water.

Date: 07/06/09

Revision: 0

UNUSUAL FLIGHT CONDITIONS

SEVERE TURBULENCE

To prevent overstressing the aircraft do not exceed 108 kts in rough air. To minimize personal discomfort, decrease the CAS below 90 kts. Maintain a level flight attitude rather than flying by reference to the EFIS as the pitot-static indications may become very erratic.

STALLS

The RV-12 stall characteristics are conventional. Additionally, the RV-12 is equipped with a vane-type stall warning buzzer that activates approximately 7 kt above stall speed.

Aileron control response in a fully stalled condition is marginal. Large aileron deflections will aggravate a near stalled condition and their use is not recommended to maintain lateral control. The rudder is very effective and should be used for maintaining lateral control in a stalled condition with the ailerons placed in a neutral position.

To recover from a stall, proceed as follows:

- Nose attitude – LOWER with relaxation of back pressure on control stick
- Throttle – FULL OPEN simultaneously with relaxation of back pressure on stick
- Use rudder to maintain lateral control

Revision: 0

Date: 07/06/09

SPINS

If a spin is inadvertently entered, immediate recovery should be initiated. The recovery procedure is as follows:

- Throttle – CLOSED
- Rudder – FULL DEFLECTION opposite direction of rotation
- Stabilator – SLIGHTLY FORWARD OF NEUTRAL
- Ailerons – NEUTRAL POSITION

When rotation stops (1/2 – 1 turn after recovery initiated)

- Rudder – NEUTRALIZE
- Nose Attitude – RAISE smoothly to level flight attitude

WARNING

During the spin recovery, the airspeed will build very rapidly with a nose low attitude. Do not use full or abrupt stabilator control movements.

RUNAWAY TRIM MOTOR

If the trim motor should begin to run uncommanded in one or the other direction the following actions should be taken:

- Pull the 2A trim fuse as soon as runaway condition is recognized
- Stabilator - HOLD against out of trim condition
- Airspeed may be reduced as a way to lessen the amount of stick force required to maintain level flight
- Land as soon as possible

Date: 07/06/09

Revision: 0

INFLIGHT OVERSTRESS

Should an overstress occur due to exceeding the airspeed or load factor limits, aggressive maneuvering should be terminated immediately. Fly at a reduced airspeed (65 – 75 kts) to a suitable landing point. DO NOT under any circumstances make large control movements or subject the aircraft to additional G loadings above that required for straight and level flight. After landing, the aircraft should be inspected by a mechanic or repairman prior to the next flight.

SECTION VII**NORMAL OPERATING PROCEDURES****INDEX**

GENERAL	7-1
PREFLIGHT INSPECTION	7-1
ENGINE STARTING	7-3
TAXIING	7-3
BEFORE TAKE-OFF	7-4
TAKE-OFF (Normal)	7-4
TAKE-OFF (Obstacle)	7-5
TAKE-OFF (Soft Field)	7-5
CLIMB	7-5
CRUISE	7-6
DESCENT	7-6
LANDING (Normal)	7-6
LANDING (Obstacle)	7-7
LANDING (Balked)	7-7
SHUTDOWN	7-8

GENERAL

This section covers all recommended normal operating procedures using a checklist format whenever possible with additional information if further explanation is required.

NOTE

All recommended airspeeds in this section are CALIBRATED AIRSPEEDS (CAS) with the aircraft loaded to the maximum gross weight of 1320 lb.

Date: 07/06/09

Revision: 0

PREFLIGHT INSPECTION

Cabin

- Canopy – OPEN
- Fuel tank – CHECK FUEL LEVEL in transparent tank window (no take-off with less than 4 gallons fuel)
- Master switch – ON
- Stall warning vane – ACTUATE
- Stall warning horn – ON when vane is actuated
- Master switch – OFF

Left Main Landing Gear

- Tire – CONDITION, proper inflation 25psi
- Brake – CHECK condition, leakage
- Axle Nut – CHECK cotter pin installation
- Wheel Chocks – REMOVE

Left Wing

- Wing – CONDITION
- Tie-Down – REMOVE eyelet
- Aileron – CHECK condition, freedom of movement

Fuselage (Left Side)

- Controls – CONNECTED
- Static Port – CLEAN & OPEN

Empennage

- Vertical Stabilizer – CHECK condition
- Stabilator – CHECK condition, freedom of movement
- Anti-Servo Tab – CHECK condition, proper attachment
- Rudder – CHECK condition, proper attachment, freedom of movement
- Tie-Down – UNTIE RESTRAINT from eyelet

Revision: 0

Date: 07/06/09

Fuselage (Right Side)

- Static Port – CLEAN & OPEN
- Comm Antenna - CONDITION
- Fuel Cap – SECURE & VENT OPEN
- Controls - CONNECTED

Right Wing

- Aileron – CHECK condition, freedom of movement
- Wing – CONDITION
- Tie-Down – REMOVE eyelet

Right Main Landing Gear

- Tire – CONDITION, proper inflation 25psi
- Brake – CHECK condition, leakage
- Axle Nut – CHECK cotter pin installation
- Wheel Chocks – REMOVE

Nose Section

- Transponder Antenna – CHECK condition & security
- Muffler – CHECK condition, security of attachment
- Master Switch – ON
- Gascolator – DRAIN fuel sample, CHECK for leakage
- Fuel Sample – CHECK for water or sediment contamination
- Master Switch – OFF
- Nose Landing Gear – CHECK attachment to fuselage
- Tire – CONDITION, proper inflation 25psi
- Wheel Chocks - REMOVE
- Cowling – CHECK condition, all screws properly installed
- Right Air Inlet – CHECK unobstructed
- Propeller and Spinner – CHECK condition, security
- Pitot – CLEAN & OPEN
- Left Air Inlet – CHECK unobstructed
- Oil & Coolant Air Duct – CHECK unobstructed
- Cowl Door - OPEN

Date: 07/06/09

Revision: 0

- Coolant – LEVEL CHECK
- Engine Oil – CHECK quantity, color, and clarity

WARNING

Before performing the engine oil check procedure, make sure the master and both ignition switches are at the OFF position.

Remove oil tank cover. Turn propeller by hand in direction of propeller rotation several times to pump oil from engine into oil tank.

- Cowl Door - CLOSED

Cabin

- Canopy – CHECK operation, condition
- Flight Control Locks – REMOVE
- ELT – CHECK OFF
- Baggage – RESTRAINED
- Foreign or Misplaced Objects - CHECK

PRE-START

- Passenger Briefing – PERFORMED
- Seat Belt/Shoulder Harness/Crotch Strap – FASTENED & SNUG
- Canopy – CLOSED and LATCHED
- Fuel Valve – OPEN (push down)
- Throttle – ADJUST FRICTION
- Master – ON
- Ignition – BOTH ON
- Avionics Switch - ON

Revision: 0

Date: 07/06/09

ENGINE START

CAUTION

Do not start engine with outside air temperature below -13° F (-25° C) or above 120° F (50° C).

- Fuel Pressure – NORMAL
- Throttle – Cold Start – IDLE
Warm Start –
1/8 in OPEN
- Choke – Cold Start –
PULL detent switch ON
Warm Start – OFF
- Brakes – ON
- Propeller – CLEAR
- Ignition Key – START
- Choke – OFF
*Cold weather starts,
hold choke on until
engine warms up*
- Throttle – 2500 rpm max
- Oil Pressure – CHECK 12 psi within 10 seconds or
immediately shutdown the engine
- Ammeter – CHARGING

CAUTION

Limit the use of the starter to 10 seconds duration maximum with a two minute cooling off period between each starter engagement.

Date: 07/06/09

Revision: 0

TAXIING

Taxi operations during high winds requires the conventional use of the flight controls. With a head wind or quartering head wind, place the control stick full aft and into the wind. With a tail wind or quartering tail wind, use the opposite procedures. The use of the wheel brakes in conjunction with the rudder will assist the pilot in maintaining directional control.

- Engine Gauges – CHECK
- Brakes – RELEASE
- Taxi rpm – 1400–2500 rpm until oil temp 122°F

BEFORE TAKEOFF

- Brakes – SET
- Flight Controls – CHECK
- Flight Instruments – CHECK & SET
- Fuel Valve – CHECK OPEN
- Fuel Quantity Indication - CHECK (no take-off with less than 4 gallons fuel)
- Trim – SET for takeoff
- Flaps – SET for takeoff 1st DETENT
- Canopy – CHECK Latched
- Engine Run-Up
 - Stabilator – STICK BACK
 - Throttle – 4000 rpm
 - Ignition – Cycle A – B- BOTH ON
 - (max rpm drop - 300)
 - (max diff – 120)
 - Engine Instruments – CHECK
 - Normal Indications
 - Minimum Oil Temp 120°F
 - Ammeter – CHECK
 - Throttle – IDLE
- Fuses - CHECK

Revision: 0

Date: 07/06/09

- Fuel Pressure – CHECK 2.2 psi minimum
- Seat Belt, Pilot and Passenger – FASTENED
- Brakes – RELEASE

High power operation (above 3000 RPM) and engine run-up should be made into the wind and kept to a minimum especially during high temperature conditions.

TAKE-OFF (Normal)

- Throttle – smoothly FULL 5800 rpm Max
- Engine Instruments – CHECK
- Stabilator Control –
 RAISE NOSE to takeoff attitude
- Rotate – LIFT OFF 50-55 kts CAS
- Climb – 75 kts CAS
- Flaps – UP
- Trim – AS REQUIRED to hold desired airspeed

During crosswind conditions, place the control stick into the wind (up wind aileron UP) and raise the nose to a lower than normal attitude with the elevator control to prevent drifting or premature lift-off.

TAKE-OFF (Obstacle)

During an obstacle take-off, use the normal take-off procedures with the following exceptions:

- Flaps – 1st DETENT
- Lift –Off – 50 to 55 kts CAS
- Climb – 60 kts (best angle of climb) until clear of obstacle

Date: 07/06/09

Revision: 0

TAKE-OFF (Soft Field)

For soft field take-off, use the normal take-off procedures with the following exceptions:

- Flaps – 1st DETENT
- Stabilator Control – RAISE NOSE to Take-Off Attitude
- Lift-Off – as EARLY as possible
- After Lift-Off – LEVEL FLIGHT to obtain safe margin of airspeed prior to climb
- Climb Airspeed –
 - Best Angle 60 kts CAS
 - Flaps – 1st DETENT until clear of obstacle, then
 - Best Rate 75 kts CAS
 - Flaps – UP

WARNING

The aircraft will lift-off at very low CAS but continued climb-out below 60 kts immediately after take-off is not recommended.

CLIMB

- Throttle – FULL
 - 5800 rpm Max 5 min
 - 5500 rpm Max Continuous
- Airspeed –
 - Best Rate 75 kts CAS
 - Flaps – UP
 - Best Angle 60 kts CAS
 - Flaps – 1st DETENT
 - Cruise-climb 85 kts CAS
 - Flaps – UP
- Trim – AS REQUIRED to hold desired airspeed

Revision: 0

Date: 07/06/09

CRUISE

- Level-off – TRIM
- Airspeed – ACCELERATE to desired cruise airspeed
- Flaps – CHECK UP
- Throttle – SET RPM to cruise power (5500 rpm Max)
- Trim – AS REQUIRED
- Engine Gauges – CHECK

DESCENT

- Throttle – REDUCE as desired
- Flight Instruments - ADJUST
- Throttle – REDUCE
- Airspeed – AS DESIRED
- Flaps – UP (above 82 kts CAS),
AS DESIRED (below 82 kts CAS)

The descent should be made with enough power to maintain cylinder head and oil temperatures in green arc. If possible, avoid windmilling the engine with the propeller by reducing airspeed or increasing power.

Date: 07/06/09

Revision: 0

LANDING

- Seat Belt – Pilot and Passenger – FASTENED
- Brakes - FIRM
- Ignition Switch – BOTH ON
- Throttle – AS DESIRED to control rate of descent
- Trim - AS REQUIRED
- Flaps – AS DESIRED (below 82 kts CAS)
- Approach Speed – 55-60 kts
- Throttle – AS DESIRED to control rate of descent
- Touch Down - MAIN WHEELS FIRST
- After Touch Down –
 - Stabilator Control – FULL AFT
 - Brake as Required

The best technique for use on soft or rough fields is to fly the landing approach at minimum speed carrying power into the landing flare and using an extreme nose high landing attitude so as to touch down with minimum airspeed.

During gusty wind conditions, fly the landing approach at approximately 5 kts above normal and touch down with the nose slightly lower than for a normal landing.

Crosswind approaches can best be accomplished by using the wing down top rudder method touching first on the down wing side main wheel, followed by the other main wheel, and finally lowering the nose wheel all the while keeping the stick into the wind.

Revision: 0

Date: 07/06/09

LANDING (Obstacle)

Use of normal landing procedures in addition:

- Flaps – FULL DOWN
- Approach Airspeed – 55 kts
- Throttle – AS DESIRED to control rate of descent
- Slip aircraft as necessary to increase rate of descent

WARNING

A relatively high rate of descent is possible in this configuration when at full gross weight and the throttle closed. If airspeed is allowed to decrease below 55 kts, level off can only be assured with an application of power.

LANDING (Balked)

Use of normal landing procedures in addition at the time of going around:

- Throttle – FULL OPEN
- Flaps – 1st DETENT
- Airspeed –
 - Best Angle 60 kts CAS
 - Flaps – 1st DETENT until clear of obstacle, then
 - Best Rate 75 kts CAS
 - Flaps – UP

Date: 07/06/09

Revision: 0

SHUT DOWN

- Throttle – IDLE
- ELT – CHECK LIGHT OFF & CHECK signal on 121.5 MHZ
- Ignition – BOTH OFF
- Avionics – OFF
- Master – OFF
- Tie Down – CHOCK two wheels min

Post Ignition - due to hot weather

- Ignition – BOTH ON
- Choke – ON
- Ignition - 3 seconds BOTH OFF

NOTE

If high winds are anticipated, the aircraft should be hangared. If the aircraft must be left out, park into the wind and use additional tie-down ropes for security. Place the flaps in the full up position and secure the control stick full aft with the lap belt.

Revision: 1

Date: 10/28/09

SECTION VIII

AIRCRAFT GROUND HANDLING & SERVICING

INDEX

TORQUES	8-2
FUEL	8-2
OIL	8-3
COOLANT	8-4
SPARK PLUGS	8-4
TIRES & TUBES	8-4
WING REMOVAL/INSTALLATION	8-5

TORQUE

TABLE 8-1 ROTAX 912ULS

	ft-lb	in-lb	N-m
Oil Tank Drain Screw	18	220	25
Oil Filter	Hand Tighten		
Magnetic Plug	18	220	25
Water Pump Drain Screw	8	90	10
Carburetor Socket Screws	11	135	15
Spark Plugs 12mm/16mm	15	180	20

Date: 10/28/09

Revision: 1

FUEL

Octane Rating

92 AKI (premium)

Too low an octane rating will cause pre-ignition and detonation, which can damage the piston ring grooves, skirt and crown. Fuel evaporates and quickly loses its octane rating by osmosis when it lies in a fuel tank or plastic jug. A premium fuel could see its octane rating drop to unusable levels after as little as three weeks. A lower octane rating would have an even shorter usable life.

Aviation Fuels

Only use 100LL AVGAS and a proper engine oil. The oil will need to be changed more frequently, see the Rotax service manual.

Fueling Procedure

Plane stopped, engine and master power OFF
Ground clamp to exhaust pipe.
Remove filler cap, located right side fuselage aft of rear window.
Insert fuel nozzle, and add fuel. (Max. 19.8 gallons)
Remove fuel nozzle.
Replace fuel cap.
Remove ground clamp.
Wipe away spillage, if any.
Visually check fuel level.

Revision: 1

Date: 10/28/09

OIL

Specifications

High quality 4-stroke motorcycle oil with gear additives and a "SF" or "SG" API classification.

Type

If running unleaded fuel use full-synthetic or semi-synthetic oils.
If running 100LL AVGAS more than 30% of the time use mineral or semi-synthetic oils.

Viscosity

Use the Figure 7-1 to determine the viscosity.

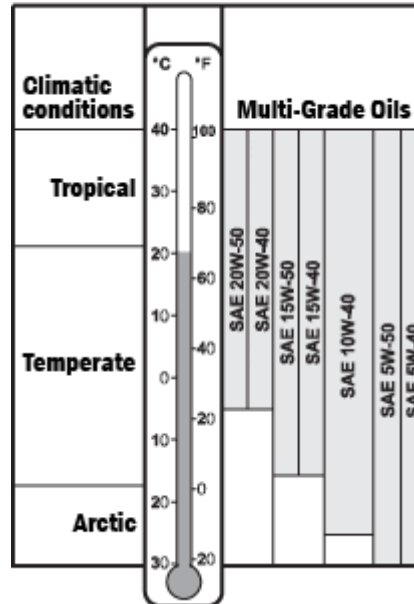


FIGURE 8-1 VISCOSITY

Oil Types To Avoid

- Oils with friction modifier additives "anti-friction", will cause the slipper clutch to slip
- Oils for "conventional" aircraft engines
- Oils for designed for diesel engines with insufficient high temp properties and additives

Oil Filter

Rotax part number 825 701

Date: 10/28/09

Revision: 1

COOLANT

Type

50% long life antifreeze concentrate without sulfates and phosphates, with anticorrosion additives designed for aluminum mixed with 50% distilled or de-mineralized water.

SPARK PLUGS

Type	Socket	Electrode Gap
NGK DCPR8E	16mm	.7-.8 mm/.028-.032

in

EXHAUST

Lubricate ball joints regularly with anti-seize lubricant (Loctite Anti-seize) to prevent gripping and seizing of the joints.

TIRES & TUBES

All three tires are 5.00 x 5 size and either 4 ply load rating or 6 ply load rating tires are acceptable.

Inflation Pressure:

Nose Tire: 20 psi (optimum)/28 psi (maximum)
Main Tires: 25 psi (optimum)/28 psi (maximum)

Revision: 1

Date: 10/28/09

WING REMOVAL/INSTALLATION

Removal and installation of the wings requires two people, one to hold the wing at the tip end and the second person to hold the stub end of the wing. The person handling the tip end of the wing must hold the flaperon approximately in trail as it will tend to flip around and possibly become damaged when disengaged from the fuselage.

REMOVAL

1. Withdraw each of the fuselage pins only enough to release the right wing spar.
2. Remove the right wing assembly and set aside.
3. Remove both of the fuselage pins.
4. Remove the left wing and set aside.

INSTALLATION

Installation procedure is reverse of the removal procedure

Date: 10/28/09

Revision: 1

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8-6

RV-12

Revision: 0

Date: 07/06/09

SECTION IX

REQUIRED PLACARDS & MARKINGS

INDEX

AIRSPPEED/POWERPLANT	
INDICATOR MARKINGS	9-1
OPERATING LIMITATIONS	9-1
PASSENGER WARNING	9-1
MISCELLANEOUS	9-2

AIRSPPEED/POWERPLANT INDICATOR MARKINGS

Limitations are displayed electronically. See Operating Limitations Section 3.

OPERATING LIMITATIONS

Limitations are displayed electronically. See Operating Limitations Section 3.

PASSENGER WARNING

THIS AIRCRAFT IS AN EXPERIMENTAL LIGHT-SPORT AIRCRAFT AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT

Date: 07/06/09

Revision: 0

MISCELLANEOUS

N number on outside of aircraft, 2 places

Stainless steel data plate on outside of aircraft

N number on instrument panel

EXPERIMENTAL placard on baggage bulkhead

Instrument panel switches and fuses are all labeled

Canopy latch placard (on outside of rear window)

Fuel type and capacity placard (near fuel cap)

THROTTLE above throttle knob, PUSH OPEN on knob end

CABIN HEAT above cabin heat knob, PULL ON on knob end

PULL ON & ROTATE TO LOCK below choke control

Fuel valve on/off placard adjacent to fuel valve

Baggage capacity maximum 50 lb on baggage bulkhead

No Push placards (2 places) on anti-servo tab

Minimum Fuel for Take-Off placard on inboard side of fuel tank

Autopilot disconnect adjacent to switch

12 Volt Power Outlet 5A max adjacent to power outlet

Music Input adjacent to receptacle

ELT label adjacent to instrument panel switch

Spare fuse holder (on map box door) fuse positions labeled

9-2

RV-12

Revision: 1

Date: 10/28/09

SECTION X

SUPPLEMENTARY INFORMATION

INDEX

FAMILIARIZATION FLIGHT PROCEDURES 10-1

TAKE-OFF & CLIMB

Normal take-off followed by climb at 75 kt IAS to selected target altitude (suggest 3,000 to 4,000 ft AGL)

Strive to maintain target airspeed during climb.

While climbing, perform left and right turns of approximately 90° heading change using not more than 30° bank.

Strive to keep slip/skid ball centered while rolling into and out of turns.

CRUISE

Upon reaching target altitude, level-off and allow the aircraft to accelerate to cruise speed. Trim as required to minimize pilot workload. Reduce power if/as required to keep engine speed below 5500 RPM.

Strive to maintain target altitude while the aircraft accelerates.

Once established in level, hands-off flight perform left and right turns of 180 to 360° heading change using not more than 45° bank.

Strive to keep slip/skid ball centered while rolling into and out of turns. Strive to maintain target altitude throughout.

Date: 10/28/09

Revision: 1

For added challenge, increase maximum bank angle to 60° and/or begin and end turns with the nose pointed at pre-selected points on the horizon.

Strive to keep slip/skid ball centered while rolling into and out of turns. Strive to maintain target altitude throughout. Strive to begin and end turns with the nose exactly on point.

SLOW FLIGHT

Reduce power and allow the aircraft to decelerate to 60 kt IAS while maintaining target altitude. Trim as required to minimize pilot workload. Adjust power if/as required to achieve target airspeed while maintaining altitude.

Strive to maintain target altitude. Strive to keep slip/skid ball centered during power changes.

Once established in level, hands-off flight perform left and right turns of 180 to 360° heading change using not more than 45° bank.

Strive to keep slip/skid ball centered while rolling into and out of turns. Strive to maintain target airspeed and altitude throughout.

For added challenge, increase maximum bank angle to 60° and/or begin and end turns with the nose pointed at pre-selected points on the horizon.

Strive to keep slip/skid ball centered while rolling into and out of turns. Strive to maintain target altitude throughout. Strive to begin and end turns with the nose exactly on point.

Lower flaps to ½ deflection and repeat exercises listed above using target airspeed of 57 kt IAS.

Revision: 1

Date: 10/28/09

Lower flaps to full deflection and repeat exercises listed above using target airspeed of 55 kt IAS.

Raise flaps and re-establish level hands-off flight at 60 kt IAS.

STALLS, POWER-OFF

Reduce power to idle and maintain wings level flight while increasing nose-up attitude to maintain target altitude until aircraft stalls.

Stall will be noted by the nose pitching-down abruptly and rolling right or left up to 15°.

While approaching the stall, maintain wings-level using rudder only and keeping the ailerons neutral. Upon stall, release stick back pressure and increase power to 18 inches manifold pressure. Allow the aircraft to accelerate to 60 kt IAS and re-establish wings level climbing flight.

*Strive to maintain wings level using only rudder.
Strive to maintain target altitude as airspeed decays to the stall. Strive to quickly and smoothly reduce stick back pressure, increase power, and accelerate to 60 kt IAS after the stall.*

Establish 30° bank turn to the right and repeat above exercise.

Establish 30° bank turn to the left and repeat above exercise.

Lower flaps to ½ deflection and repeat exercises listed above.

Lower flaps to full deflection and repeat exercises listed above.

Date: 10/28/09

Revision: 1

STALLS, POWER-ON

Establish full power, wings level climb at 65 kt IAS. Increase nose-up attitude by approximately 15° and maintain that attitude as airspeed decays to the stall.

Stall will be noted by the nose pitching-down abruptly and rolling right or left up to 15°.

While approaching the stall, maintain wings-level using rudder only and keeping the ailerons neutral. Upon stall, release stick back pressure and re-establish wings level climbing flight at target airspeed.

Strive to maintain constant pitch attitude as airspeed decays to the stall. Strive to maintain wings level using only rudder. Strive to quickly and smoothly reduce stick back pressure, accelerating to target climb airspeed after the stall.

Establish 30° bank turn to the right and repeat above exercise.

Establish 30° bank turn to the left and repeat above exercise.

Lower flaps to ½ deflection and repeat exercises listed above.

CRUISE & DESCENT

Re-establish cruise flight and choose heading to landing pattern entry point.

When at appropriate point, reduce power to establish 500 ft/min descent while maintaining a particular airspeed between 100 and 110 kt IAS. Initiation of descent should be selected so as to arrive over the landing pattern entry point at proper traffic pattern altitude and target airspeed.

Revision: 1

Date: 10/28/09

Strive to maintain airspeed while varying descent rate as little as possible. Strive to make pitch and power adjustments as small and as smooth as possible.

APPROACH & LANDING

Enter the landing pattern at target airspeed and altitude. Maintain traffic pattern altitude and adjust power so as to arrive on downwind opposite the target touch-down point at 80 kt IAS and at target altitude. Smoothly reduce power to idle maintaining target altitude until airspeed decays to 65 kt IAS. Lower flaps to ½ deflection and allow airspeed to decay to 55 kt IAS. Maintain target airspeed by allowing altitude to decay.

Choose point for base turn so as to allow for arrival at the target touch-down point while maintaining engine power at idle. Vary descent rate by lowering flaps to full deflection.

Choose point for turn to final so as to allow for ground contact at the target touch-down point at minimum airspeed while maintaining engine power at idle.

Descent rate may be increased by slipping the aircraft.

Descent rate may be decreased by addition of engine power.

Strive to maintain target airspeed until initiating the landing flare. Strive to touch-down at target touch-down point at minimum airspeed without the need to add power or slip the aircraft. Strive to touch-down on runway centerline. Strive to touch-down as smoothly as possible.

Maintain nose-high attitude after touch-down as long as possible after touch-down.

Date: 10/28/09

Revision: 1

Apply brakes if/as required to stop before the end of the runway or make the next runway turn-off.

Raise flaps and taxi back to parking.

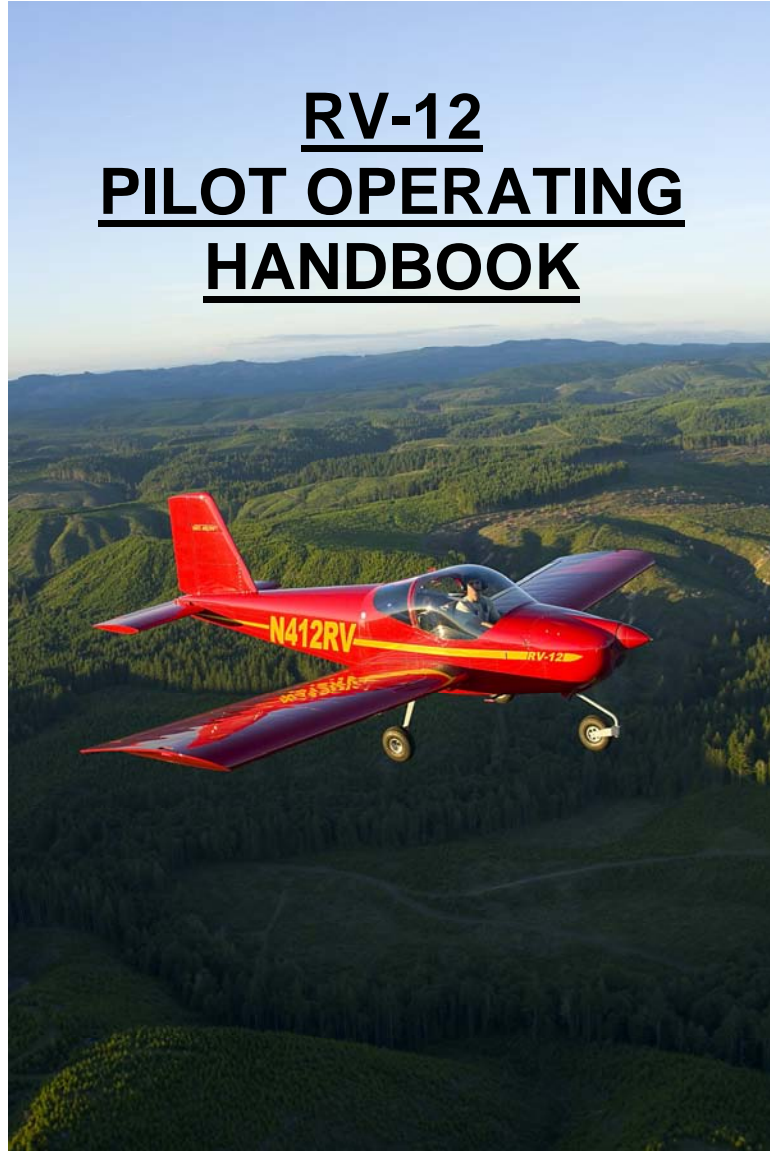
Strive to use the brakes as little as possible while maintaining control using rudder and throttle. Strive to taxi as straight as possible staying as close to the taxiway centerline as possible.

Shut-down the engine and aircraft electrical systems, secure the cockpit, and exit the aircraft.

Revision: 1

Date: 10/28/09

RV-12 PILOT OPERATING HANDBOOK



RV-12

FRONT COVER

Date: 10/28/09

Revision: 1

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FRONT COVER

RV-12

Revision: 1

Date: 10/28/09



RV-12

REAR COVER

Date: 10/28/09

Revision: 1

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REAR COVER

RV-12