



**VAN'S AIRCRAFT**  
TOTAL PERFORMANCE

**RV-12iS**

**FLIGHT TRAINING SUPPLEMENT**



## REVISION SUMMARY

Whenever revisions are issued, they must be inserted in the appropriate place in the manual. A black vertical line along the outside margin of the page will identify revised text and illustrations. Changes in spelling, punctuation and formatting will not be marked.

To verify the latest revision of the POH compare the rev level found on the cover page with the latest revision posted on the RV-12 Service Information page of the Van's Aircraft web site.

| Rev | Section    | Change   | Date     |
|-----|------------|--|----------|
| 0   | All        | Initial Release  | 05/03/18 |
| 1   | Multiple   | Publication  | 10/22/18 |
| 2   | All        | Added Rev level and date to all pages  | 11/15/18 |
|     | Many       | Stylistic and editorial changes  |          |
|     | Section X  | Updated range and cruise information to match data given in the POH  |          |
| 3   | 3.2        | Page 3-2 3500 RPM was 3000 RPM   | 11/08/19 |
|     | Section II | Page 2-2 added optional 3-blade propeller information  |          |
|     | Section VI | Page 6-7 added description of optional carbon monoxide detector  |          |
| 4   | Section VI | <p>Page 6-6 removed regulator manufacturer from text.</p> <p>Page 6-5 replaced GTN 650 with GTN 650Xi</p> <p>Page 6-7 replaced GMC 307 with GMC 507</p> <p>Page 6-8 replaced GTN 650 with GTN 650Xi and GMC 307 with GMC 507</p> | 05/07/20 |

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Purpose of this Manual

This Flight Training Supplement (FTS) was carefully prepared by the test pilots, flight instructors, and engineers of Van's Aircraft - the manufacturer of the RV-12iS. The FTS has been prepared with the goal of enabling the new pilot or a pilot transitioning from another aircraft to quickly and efficiently learn about features and characteristics specific to the RV-12iS.

This FTS supplements the information provided in the Pilots Operating Handbook (POH) but does not replace it. Some sections of the POH are mirrored in this manual but this manual provides expanded, more detailed and more-in-depth information than is practical to include in the POH. It is the intent of this document that applicable section of the FTS and POH be read and understood together.

Therefore, it is strongly recommended that the pilot be familiar with this Flight Training Supplement, the Pilots Operating Handbook, and the aircraft prior to flight.

Definitions

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

**WARNING**

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

**CAUTION**

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

**NOTE**

**An operating procedure, practice, condition, etc.**

Recommended Reading

1. Pilot's Operating Handbook for RV-12iS
2. Aircraft Maintenance and Inspection Procedures for RV-12iS
3. User Manuals of any installed components and accessories

Recommended Links

1. General information about Van's Aircraft as well as drawing and manual revisions:  
<https://www.vansaircraft.com/>
2. General information about the Sport Pilot rule and Light Sport Aircraft:  
<https://www.eaa.org/en/aaa/aviation-communities-and-interests/light-sport-aircraft>
3. ACK ELT:  
<http://ackavionics.com>
4. Dynon Avionics:  
<https://dynonavionics.com/>
5. Garmin Avionics:  
<https://buy.garmin.com/>
6. Information about Matco wheels and brakes:  
<http://matcomfg.com/>
7. Rotax Owner Assistance Network:  
<https://rotax-owner.com/en/>
8. FAA Aviation Handbooks and Manuals:  
[https://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/](https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/)

## SECTION II

### AIRCRAFT DESCRIPTION

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#### **LIGHT SPORT AIRCRAFT OVERVIEW**

##### **A NEW AVIATION HORIZON:**

In 2004, the FAA created sport pilot/light-sport aircraft (SP/LSA) regulations. The most significant change in FAA regulations in 50 years, it allows easier and lower-cost access for those wishing to participate in the joy of flight. With adoption of SP/LSA, flying has become less expensive and easier than ever before. You can become a sport pilot with as little as 20 hours of flight instruction. You can fly a one- or two-seat aircraft capable of speeds up to 120 kts (138 mph). And in most cases, you can pass the medical requirements just by showing your driver's license.

##### **BASIC PARAMETERS OF LSA:**

The FAA has defined light-sport aircraft as simple-to-operate, easy-to-fly aircraft that, since initial certification, has continued to meet the following performance definition:

- Maximum gross weight of 1,320 lbs
- Maximum cruise configuration stall speed of 45 kts CAS
- Maximum speed in level flight with maximum continuous power of 120 kts CAS
- One or two person occupancy (pilot and one passenger)
- Fixed or ground adjustable propeller
- Fixed landing gear
- Single reciprocating engine
- Unpressurized cabin

Light Sport Aircraft may seem familiar to us by their appearance, but they are in fact quite different from the traditional aircraft we are used to. First, LSAs weigh significantly less than many aircraft. With a typical empty weight of 750 lb and a take-off weight of not more than 1320 lb, they are indeed light aircraft. The light weight, coupled with a generous wing area means they have a low wing loading thus making them more susceptible to wind currents than larger, high wing loading aircraft. A good pilot needs, therefore, to remain vigilant from the time the aircraft first moves under its own power until after the landing is complete and the aircraft is brought to a full stop. Pilots who may have experience with traditional aircraft but are new to LSAs need to approach LSAs with an open mind: Open to the fact that a Light Sport Aircraft is different than a traditional aircraft, and open to the reality that pilots can, over time, develop flying habits that are flat-out wrong or at least inappropriate to an aircraft with the weight, power loading and wing loading of an LSA.

#### **RV-12iS DESIGN PHILOSOPHY**

##### **INTRODUCTION:**

Let's take a look at the design philosophy and goals that are the basis for this airplane. The goal was to achieve the maximum overall performance, flying enjoyment, ease of construction, building and flying economy, ease of maintenance, and pleasing appearance possible for a two-place airplane. Understanding how this was achieved might help you better appreciate many features of the RV-12iS as you encounter them while flying.

The formula for achieving maximum overall performance is amazingly simple: Maximize thrust, minimize drag; maximize lift, minimize weight. The implementation of this formula is a bit more complex, however. Thrust, for a given HP engine, has been maximized through use of a good propeller, streamlining of the engine cowl, and directing the engine outlet rearward. Drag is minimized by keeping the aircraft frontal area to a minimum and shaping all airframe components to reduce aerodynamic drag. Lift is maximized through use of a wing with adequate area and good airfoil. Weight is minimized by careful structural design, by using the best airframe materials, and by installation of only essential instrumentation and equipment. Most of the literally hundreds of features which comprise the overall RV-12iS package have been determined in the design stage.

**RV-12iS DESIGN FEATURES:**

The RV's "traditional" configuration - tractor engine, monoplane, stabilizer in the rear - is an exercise in logic and not simply a concession to convention. There are many good reasons why light planes have been built this way for decades, other than the often heard arguments of "entrenched design mentality" from those seeking "technological breakthroughs.". The bottom line is that this configuration has proven to offer the best compromise resulting in the best all-around airplane.

Designers often use the term "Mission Profile," which simply refers to the function an airplane is designed to perform. The RV-12iS mission profile is rather broad – it is intended to fill nearly all sport flying needs. The profile includes excellent flying qualities, maximum speed allowed under LSA rules, low stall speed, good visibility, simple assembly for the home-builder, and economical to own and operate. Meeting all these needs required a design "balancing act." Favoring one need often adversely affects others. An example would be emphasizing cross country cruise performance by installing extra radios, instruments and upholstery. The weight added would adversely affect all other performance parameters. This is not a "maybe," it is a certainty.

Given that low cost of ownership is a selling point for any Light Sport Aircraft and is a prime design goal of all RV designs, the RV-12iS incorporates wings that are easily removable. Because the cost of hangar space is typically the single largest aircraft ownership expense, removable wings mean that storage costs can be reduced (by sharing of 'on-airport' hangar space) or eliminated (by storage 'off-airport' at home). This design feature drove other features such as placement of fuel tank in the fuselage, selection of full-span drooping ailerons (flaperons) which automatically hook-up upon wing installation, and location of the pitot tube in the spinner. Because the RV-12iS would possibly be trailered to and from the airport, the wings-removed width had to be sufficiently narrow to allow it to be legally trailered. This limited the span of the horizontal tail surface to 8 ft. The limited tail span requires that the RV-12iS use a long fuselage placing the tail surfaces well aft for good control authority.

Seating arrangements vary between the RV designs, depending on the primary mission envisioned. Side-by-side seating was chosen for the RV-12iS because this arrangement is generally preferred for its primary mission: Sport Flying. Specific advantages of the side-by-side configuration include equal visibility for both occupants, more-easily achieved dual control capability, lots of instrument panel space, minimized CG travel for various loading conditions and a full cowling with room for engine accessories and plumbing. The RV-12iS design places the occupants further forward than the other side-by-side RV designs. This seating position allows for excellent visibility even in the downward direction because the wing leading edge is far aft relative to the occupants' eyes. The potential down-side of this 'cab-forward' arrangement is a CG further forward than desired. The selection of the light Rotax 912 iS Sport engine enables the RV-12iS to balance well, even with two heavy occupants sitting forward of the wing spar.

We feel that an RV-12iS in its basic form - with fixed-pitch prop, modest instrumentation and avionics, and Rotax 912 iS Sport engine - represents the best compromise.

Obviously, we could go on and on, covering every design decision, compromise, or concession. However, it should be apparent by now that every feature of the RV-12iS, whether major or minor, was the end product of much deliberation.

**RV-12iS GENERAL DESCRIPTION****AIRFRAME:**

The RV-12iS is an all metal, two place, low wing, single engine fixed tricycle gear airplane designed to conform to the LSA category. The fuselage is made of conventional formed sheet bulheads, stringers and skin (semimonocoque). A major component of the fuselage is the center section bulkhead that supports the load of each wing spar and main landing gear. The removeable constant-chord wing is built around a main spar that inserts into the center section bulkhead.

The empennage consists of a conventional fin, rudder and a stabilator/anti-servo tab.

**ENGINE AND PROPELLER:**

The RV-12iS is powered by a Rotax 912 iS Sport four-stroke, four-cylinder, horizontally-opposed, air-cooled with liquid-cooled cylinder heads, electronic fuel injection, rated at 100 HP/73.5 kW @ 5800RPM. Power to the dual spark plugs is provided by two independent electronic ignition units. The 912 iS engine is furnished with a starter, two 14-volt generators and external rectifier-regulators. The propeller is a fixed ground adjustable pitch, 70 inch/177.8 cm diameter, composite, Sensenich model 2A0R5R70E two blade or optional Sensenich 3Y0R5 C70MY three blade.



**FLIGHT CONTROLS:**

The full span ailerons and flaps are combined into a single control unit, called flaperons. An internal mechanical mixer allows the flaperons, via torque rods, to “droop” and simultaneously perform the function of ailerons and flaps. The flap action on the RV-12iS is electrically operated. The stabilator and rudder are connected to the controls by pull cables. The stabilator trim tab is driven by a DC motor.

**FLIGHT INSTRUMENTS:**

The RV-12iS instrument panel employs an electronic flight instrument system (EFIS) display unit(s). All flight, navigation and engine parameter data are displayed on one screen, with an optional second screen available.

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**GENERAL**

This section will give you the basic parameters and considerations for using your RV-12iS. Each phase of flight should be considered during pre-flight planning. Read through the information in the sections within the remainder of the FTS to help prepare for each phase of the upcoming flight.

**BASICS OF LOADING THE RV-12iS**

The RV-12iS design places the pilot and passenger forward of the CG and baggage/other payload aft of the CG. Thus, the most-forward loading condition occurs with the heaviest possible pilot and passenger weights combined with minimum fuel and no baggage. Conversely, the most-aft loading condition occurs when there is a very light pilot, no passenger, full fuel and maximum baggage.

The forward CG limit is established by the strength of the nose landing gear, by the amount of pitch trim authority required to trim the aircraft to 1.3 times stall speed with power off and flaps fully deployed, and by the pitch control authority required to rotate the aircraft to a landing attitude in ground effect, with power off and flaps fully deployed.

The aft CG limit is established by minimum pitch and yaw stability requirements.

**WARNING**

**Loading the aircraft such that the CG falls outside the allowable range compromises safety and may result in injury or loss of life as well as damage to the aircraft.**

**COLD WEATHER OPERATION**

The minimum operating temperature of the aircraft is -20°F (-30°C) and is limited by the EFIS.

**SEVERE COLD:**

- Drain the fuel system if the temperature falls below -30°F [-34°C].

**WARMING OIL/BLOCKOFFS:**

Engine RPM is limited until the oil reaches the minimum operating temperature. On cold days it will take longer to raise the temperature to the minimum temperature. Installing cooler blockoffs as described below will aid in heating the oil. To raise the temperature more rapidly, run the engine at the highest rpm allowed. Even though more air will be pushed through the coolers by the propeller at higher rpm, this cooling effect will be more than offset by the extra heat generated by the engine at higher rpm.

You may install oil cooler and radiator blockoffs as required to allow the oil to reach minimum operating temperatures. When installing blockoffs make sure to placard the panel as a reminder that blockoffs are installed. This will help ensure the operator is aware of the installation and in turn prevent inadvertent overheating concerns when flights are made from cold to warm weather conditions with the blockoffs mistakenly left in place.

**FUEL SYSTEM CONSIDERATIONS:**

It is imperative that the aircraft fuel system be properly checked at the fuel strainer valve and verified to be free of contaminants and water:

- Prior to flight as part of a pre-flight walkaround check.
- After the aircraft has been parked on the ground in conditions that are conducive to water entering the fuel system or with a partially full tank where condensation may form on the empty sides of the tank.
- After flight through precipitation in which water may have entered the fuel system through the fuel cap vent or worn seal or operations in humid conditions.
- After fueling the aircraft. For further information see the FTS section on fueling the aircraft.

Water remaining in the system in cold conditions may freeze in the fuel system lines and cause a blockage. A partially blocked fuel line should be noted by a corresponding drop in the fuel flow rate (fuel flow rate only available on Rotax 912 iS engines).

### **HOT WEATHER OPERATION**

Satisfactory engine cooling and cooling of critical electrical components such as the 912ULS voltage regulator has been demonstrated for this aircraft at an outside air temperature of 100°F (38°F). This is not to be considered an operating limitation. Extra caution should be used when operating near or above this demonstrated temperature. Beyond the normal reductions in aircraft performance there are three main areas of focus when operating at elevated temperatures, coolant temperature while operating at low rpm on the ground, oil temperature during climb and elevated temperatures in the engine compartment beneath the cowling after shutdown.

Operating on the ground at idle rpm, little air is passed through the radiator and oil cooler. When temperatures are elevated a minimum 2000 rpm should be used instead of idle (which on the Rotax 912 iS may be as low as 1440 rpm). If the coolant temperature begins to rise engine rpm should be increased to 3500 rpm and above. This will push air from the propeller through the radiator and return the coolant temperature to a stable value within the operating limitations of the engine. Coolant temperature will rise more quickly with the wind coming from behind the aircraft or directly from the right side.

During climb oil temperature will begin to rise. The oil cooler has been designed for optimal flow and heat dissipation for the aircraft in a  $V_Y$  climb. When climbing at airspeeds below  $V_Y$  oil temps may reach elevated levels. If this happens lower the nose and choose a higher climb airspeed that will stabilize the oil temperature within operational limits.

There is a possibility of developing vapor lock when aircraft are parked in hot weather conditions. A Rotax 912ULS aircraft will be more susceptible to vapor lock than a Rotax 912iS equipped aircraft. This condition is worsened after shutdown resulting in heat building up in the cowling compartment from the hot engine and oil tank. Under these conditions elevated temperatures may turn fuel into vapor. For this reason, when operating in hot weather conditions leave the oil door open after shutdown as a means of letting the heat escape. Also, leaving the canopy closed will elevate temperatures inside the cockpit on a hot day. If possible the canopy should be latched in the mid open position using the Support Plate Canopy Latch. If it is not possible to leave the aircraft in this condition, extra care should be taken to open the cockpit, ventilate the cabin, cool objects that may have been in direct sunlight and run the fuel pump(s) to purge the fuel system of vapor (for more information see the POH Section 4, Normal Procedures).

### **AIRCRAFT FUELING**

See also POH Section 8.3 - FUEL

The fuel tank is designed to be sufficiently vented to allow fueling at fairly rapid rates. Some hoses may be able to deliver fuel at a high enough rate that the baffling inside the tank in combination with the vent size is insufficient. Use caution when using high rate of delivery hoses to avoid "burping" fuel out of the tank and possibly onto the person filling the tank. As the tank is filled use the mechanical gauge on top of the tank to stay aware of when the tank is nearly full. Even when the mechanical gauge shows full (due to tank geometry) the tank can still hold more fuel. Slow the fueling rate and while looking down the filler neck at the fuel level, slowly fill the tank into the base of the filler neck even with the seal between the tank and the filler neck to achieve the full 20.2 US gallon capacity.

After fueling the aircraft it is important (as instructed in the POH) to remove water and contaminants from the fuel system. Water in the fuel may cause engine failure, poor performance, may freeze in the fuel lines as noted above in cold weather operations etc.

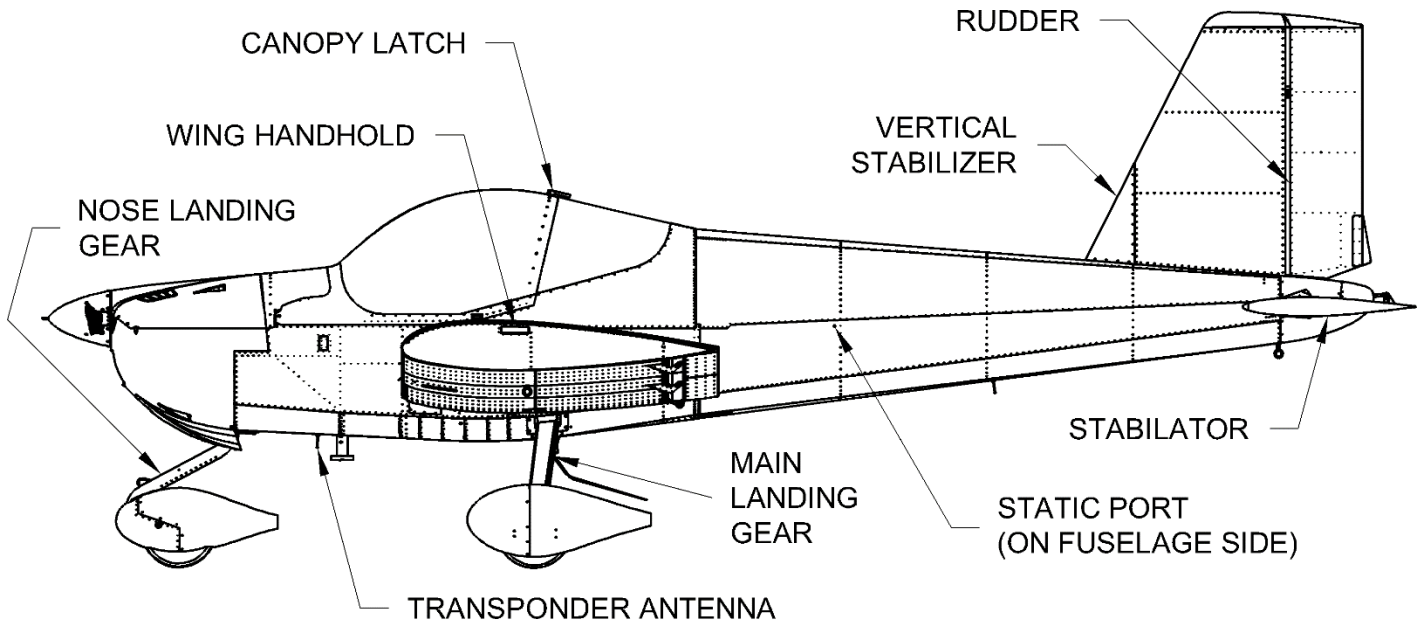
- For Rotax 912 iS powered aircraft, turning on the boost pump will emulsify the water into the fuel making it impossible to remove at a gascolator. Wait until the water and contaminants have settled to the bottom of the drain line coming from the bottom of the fuel tank then drain them from the fuel system via the sump valve fitting.
- For Rotax 912ULS powered aircraft, the fuel pump is located between the tank and the gascolator. First run the fuel pump for 2 mins, then drain the gascolator to remove contaminants and water. Note the water may be mixed with the fuel (as shown in the pre-flight section below).

**SECTION IV**  
**PRE-FLIGHT INSPECTION**

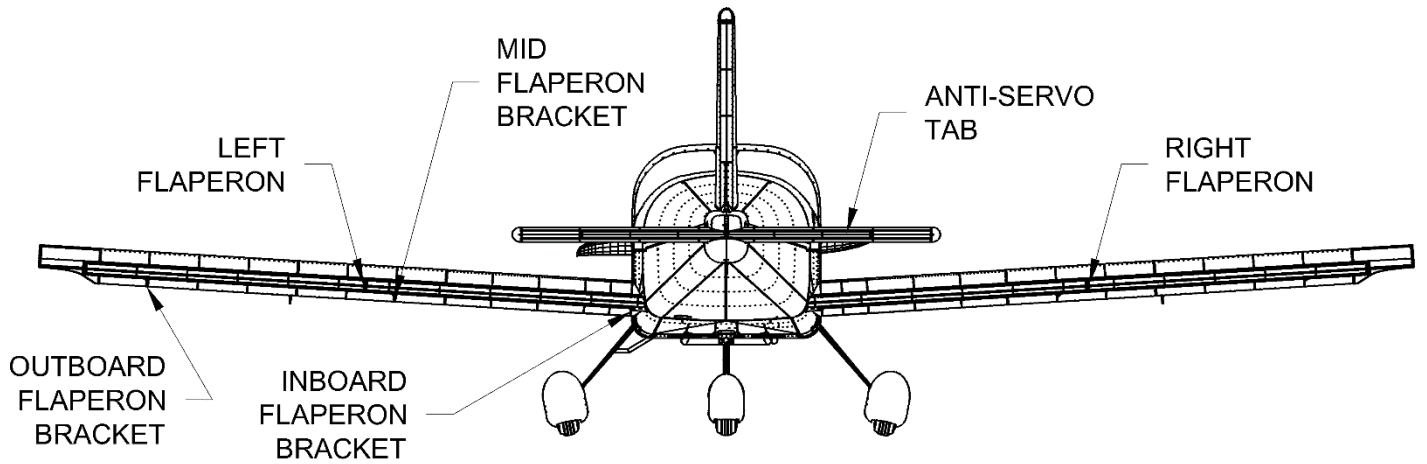
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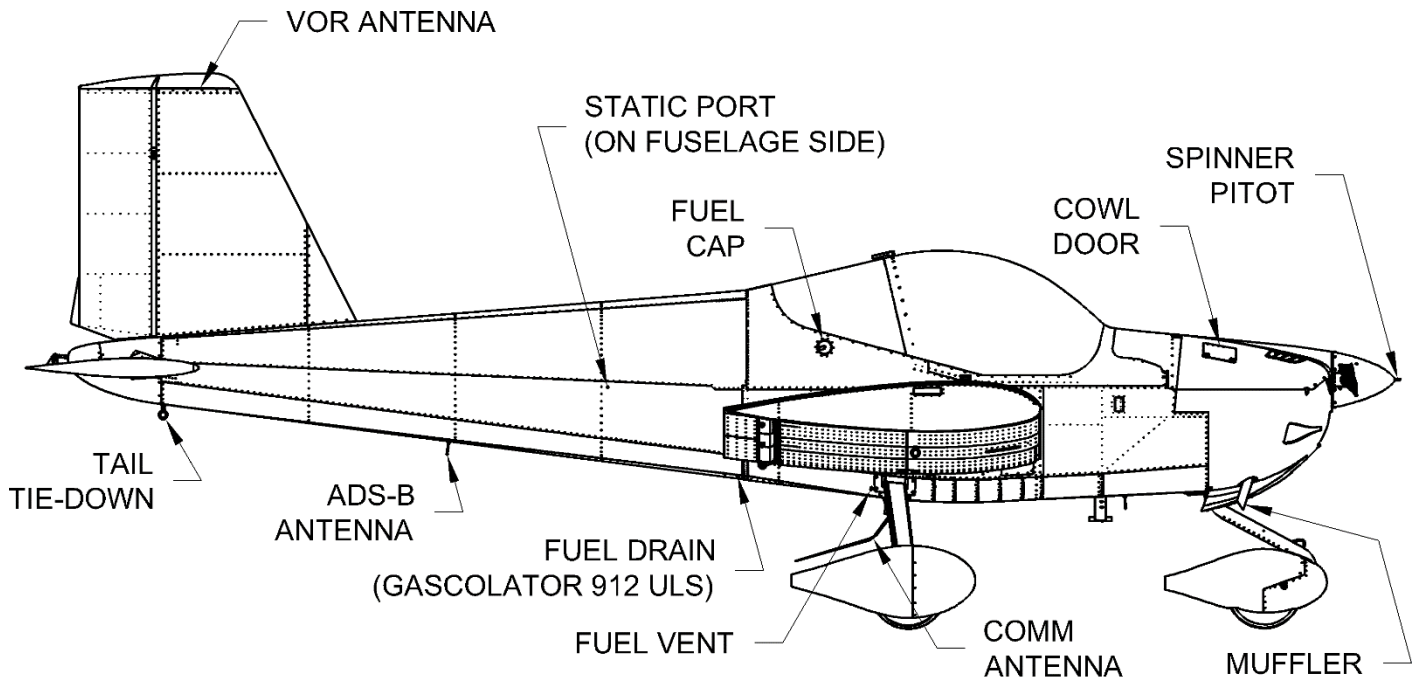
**GENERAL**



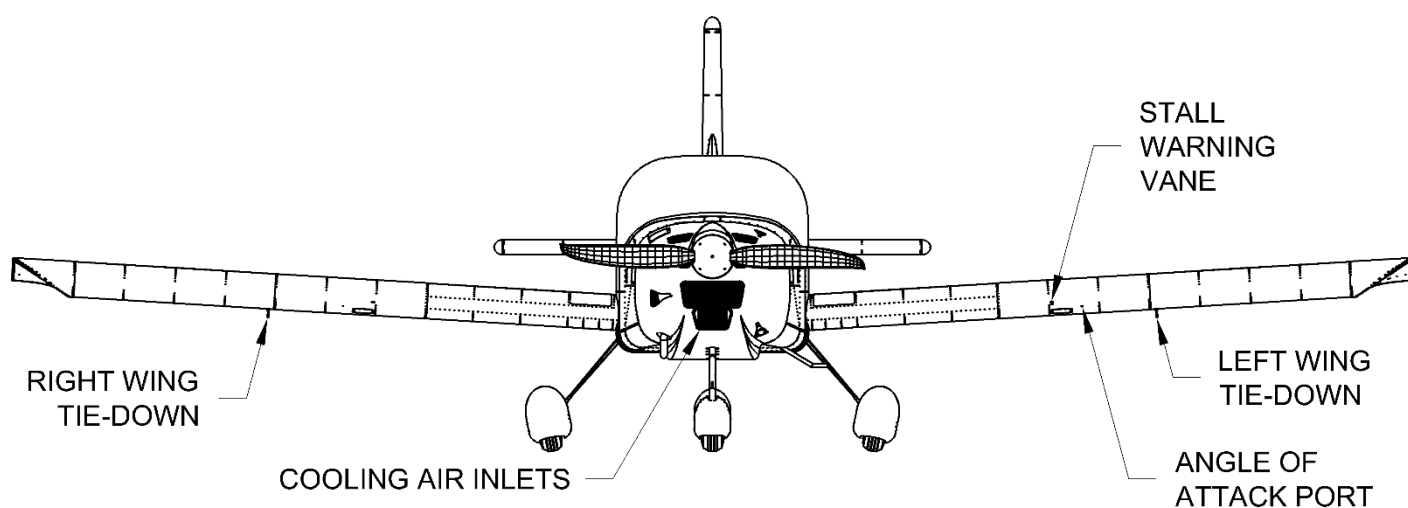
**LEFT SIDE VIEW**



**REAR VIEW**



**RIGHT SIDE VIEW**



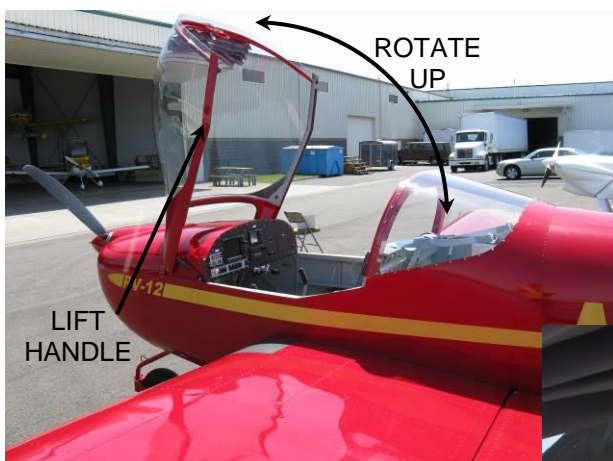
**FRONT VIEW**

**CABIN**

- Canopy – OPEN  
Unless you are quite tall, it may be necessary to stand on the step or wing to unlatch the canopy.



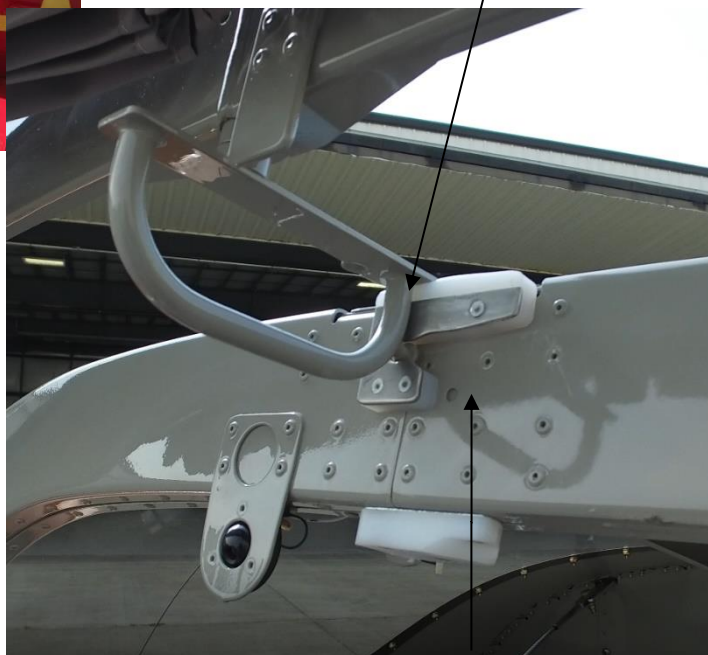
- Canopy – CHECK operation, condition  
Lift handles are located on each side of the canopy frame to be used for raising the canopy



CANOPY LATCHED POSITION

**CAUTION:**

Take care unlocking the controls in gusty conditions.  
In gusty conditions, a canopy left in the open position must be latched with the Support Plate Canopy Latch.





**CABIN (continued)**

- Flight Control Locks – REMOVE  
Collapse Rudder Lock then stow in baggage area.

**CAUTION: Take care unlocking the controls in gusty conditions.**

**In gusty conditions, the canopy left in the open position must be latched with the Support Plate Canopy Latch.**



- Fuel tank – CHECK FUEL LEVEL using the mechanical fuel gauge in the top of the tank



MECHANICAL  
FUEL GAUGE

**WARNING**

Sample the fuel to remove contaminants (mainly water) before the fuel pumps are turned on. The high flow rate of the fuel pump(s) (especially for the 912 iS) will emulsify the water into the fuel making removal impossible.

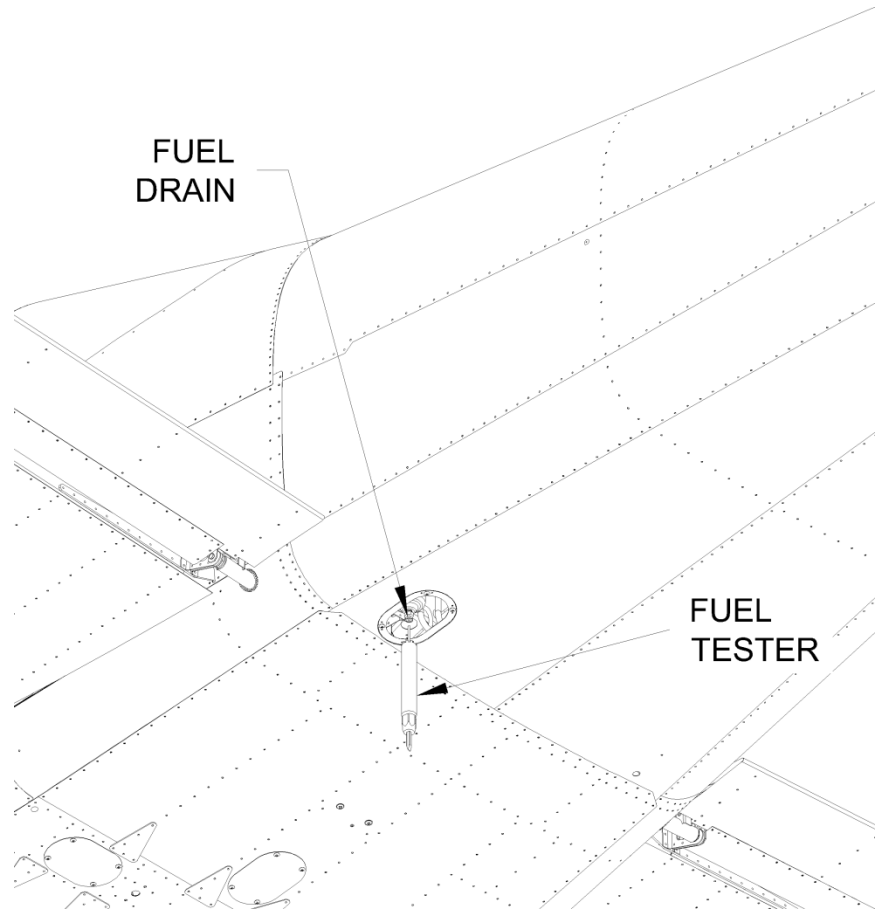
- Fuel Sample – CHECK for water or sediment contamination. For E10 use, see the three photos showing the progressive separation of an ethanol-gas and water mixture, (shown on the next page).

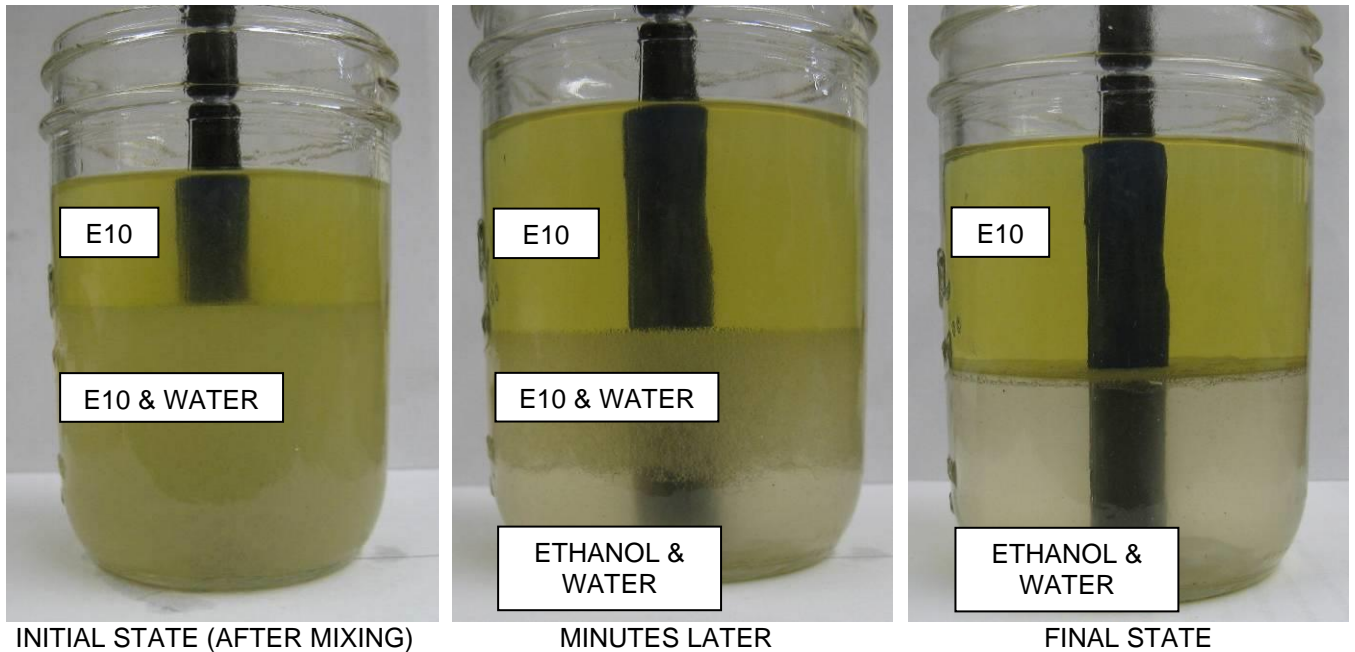
**WARNING**

Continue sampling fuel until there are no contaminants detected.

**WARNING**

During high ambient temperature conditions, run the fuel pump for 5 mins to flush the fuel lines and minimize the potential for vapor lock.





Refer to the pictures above:

- E10 (fuel) - transparent yellow
- E10 & Water - cloudy and yellowish
- Ethanol & Water - transparent and colorless

#### ROTAX 912ULS SECOND FUEL SAMPLE

- For Rotax 912ULS equipped aircraft complete the rest of the pre-flight inspection with the fuel pump running; about 2 minute, and then resample the fuel.

Since the 912ULS gascolator is not at the absolute bottom of the fuel system, running the fuel pump will help move any water trapped in other areas of the system into the gascolator bowl. If a sample yields a large amount of water, the procedure should be repeated with at least 2 min intervals between attempts with the fuel pump on, until all water or debris are removed from the system. The restrictor fitting on the return line limits the flow rate and the pause between samples allows time for fuel within the system to move into the gascolator.

The recommended fuel pump run time to flush the fuel system is based on the low flow rate through the return line restrictor fitting. Particular attention should be given to the battery voltage when flushing the system; turn off all unnecessary electrical equipment to conserve battery power. If the battery voltage is low, proceed to engine start and then let the engine run for at least 5 mins at 2000 rpm to flush the fuel system





**CABIN (continued)**

- Master switch – ON
- (If Garmin GTR-200 Installed  
Check Radio – ON)
- Avionics – ON

MASTER SWITCH



AVIONICS SWITCH



**CABIN (continued)**

- Stall warning vane – ACTUATE
- Stall warning horn – ON (tone through headset) when vane is actuated.
- Fuel Shut-Off Valve – OPEN (Push Down)
- Lights / Strobes – CHECK then OFF
- Avionics – OFF
- Master Switch – OFF
- ELT – OFF
  - Baggage – RESTRAINED
- Foreign or Misplaced Objects - CHECK

**ACK ELT****WARNING**

**Any items not stowed (such as glasses cases, water bottles, notebooks, pens/pencils) can fall into places in the cabin where they are inaccessible in flight.**

**Additionally, these items could become lodged behind rudder pedals or fall into the area under the seat pans where they may interfere with free and clear motion of the flight controls, thus presenting a safety hazard. Baggage must also be restrained from moving forward into the seat back. Placing a flat sheet of material able to withstand a forward load of 450lb resting on the c-channel and the seat back brace is one possible method of restraining the baggage from forward movement. Baggage should not be loaded so high in the baggage area that it may come forward.**

**LEFT MAIN LANDING GEAR**

- Tire – CONDITION, proper inflation 25 psi
- Brake – CHECK condition, NO leakage
- Axle Nut – CHECK cotter pin installation
- Wheel Bearings – SHAKE top of tire left and right
- Wheel Pant (If Installed) – CONDITION CHECK
- Wheel Chocks – REMOVE

VERIFY NO TIRE CORDS SHOWING; TIRE TREAD IN GOOD SHAPE WITH FEW OR NO BALD SPOTS

**NOTE**

Properly inflated tire has no contact between the outer portion of tread and pavement



BRAKE PADS INTACT

VERIFY NO BRAKE FLUID LEAKAGE



AXLE NUT COTTER PIN



**LEFT WING**

- Wing – **CONDITION AND CONTAMINATION:** Look at wing in general, look for dents, wrinkles, missing or loose rivets (particularly dents in the leading edge) snow, frost.
- Tie-Down – **UNTIE** the tie-down rope/chain, **REMOVE** eye bolt if desired. Ensure eye bolt is secured in the wing if not removed.



- Stall warning vane and optional AOA port – check for obstructions



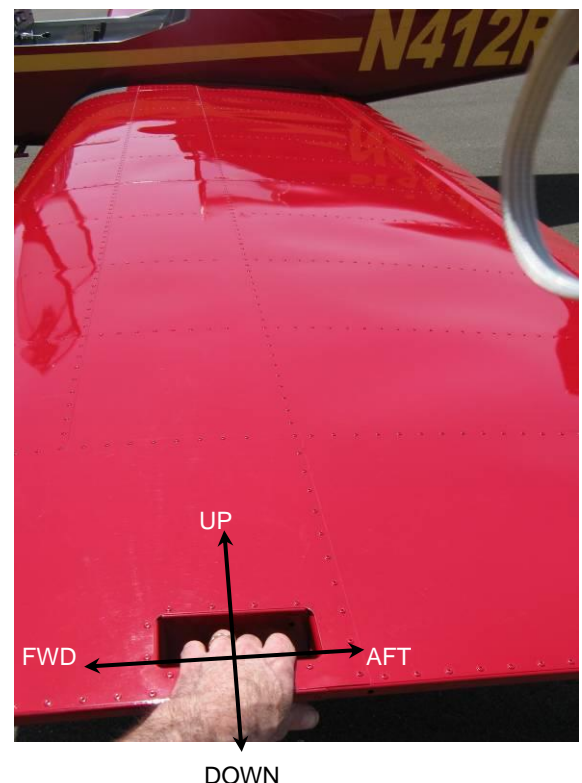
- Wing Hand Hold - **APPLY FORCE** fore/aft & up/down; **CHECK** no free movement.

**WARNING**

**When applying fore and aft force check for play at the rear spar junction. This is usually discovered by hearing a clicking noise.**

**If this is the case, refer to the Maintenance Manual for corrective action.**

**Excessive fore and aft play in the left wing may also render the EFIS AOA indications inaccurate.**



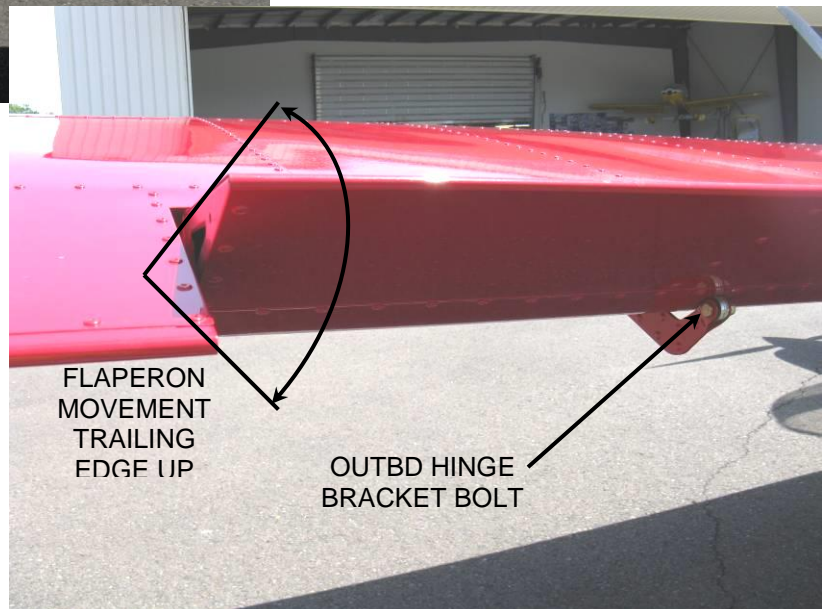
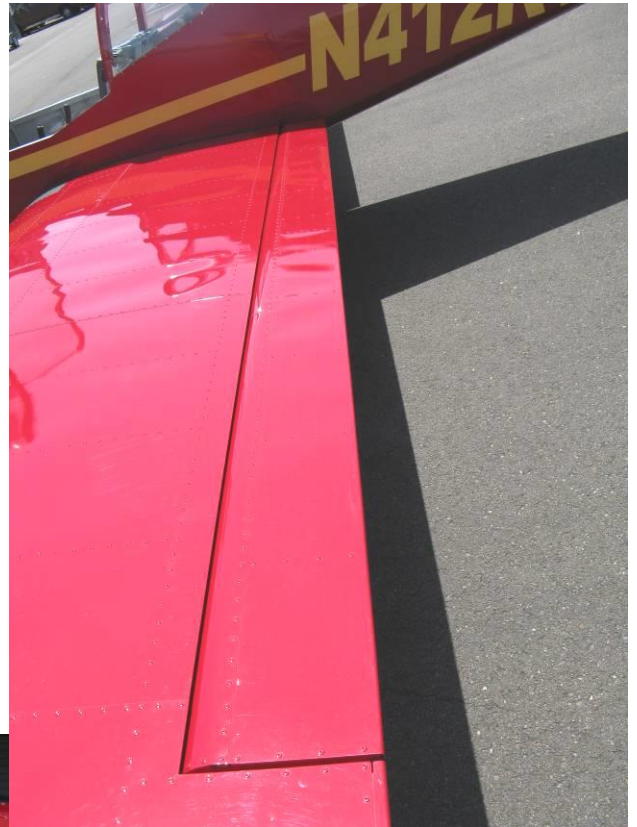
**LEFT WING (continued)**

- Flaperon – CONDITION

Look at flaperon in general, look for dents (particularly dents in the trailing edge), wrinkles, missing or loose rivets

- Flaperon – FREEDOM OF MOVEMENT

Move the flaperon through its full range of motion. Verify that it hits a definite stop at both ends of its travel and that there is no binding or limiting friction.

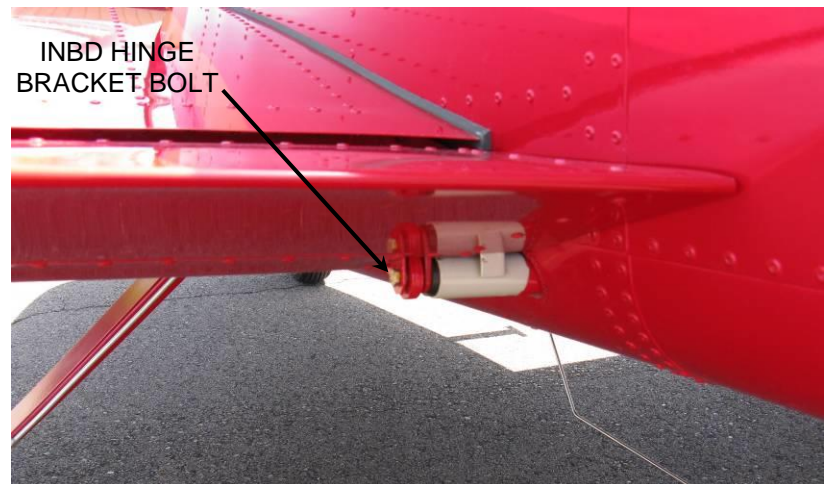




**LEFT WING (continued)**

- Flaperon - HINGE BRACKET ATTACHMENT

Verify that the outboard, mid, and inboard flaperon hinge bracket bolts are installed

**FUSELAGE (LEFT SIDE)**

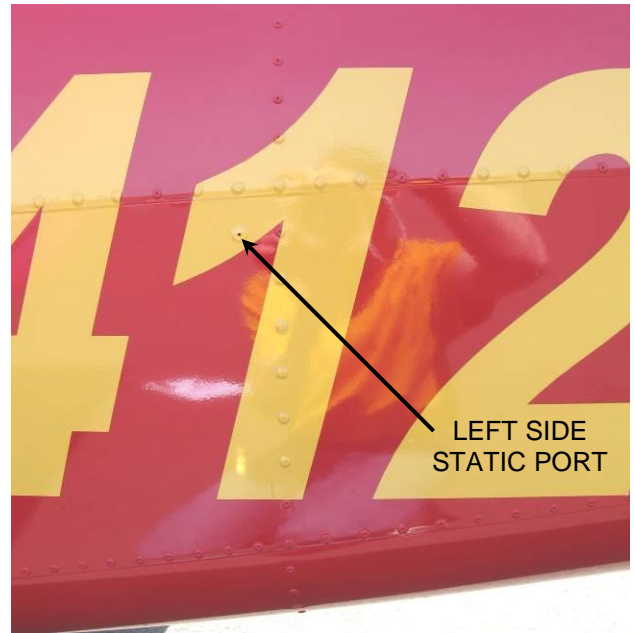
- Controls – CONNECTED

Verify that the tab on the inboard end of the flaperon fully engaged into the slot in the actuator when the wing was installed.



**FUSELAGE (LEFT SIDE) (continued)**

- Static Port – CLEAN & OPEN

**EMPENNAGE**

- Vertical Stabilizer – CHECK condition and security

Look at vertical stabilizer in general, look for dents (Particularly dents in the leading edge), wrinkles, missing or loose rivets, missing or loose screws. Confirm solid attachment to the fuselage.



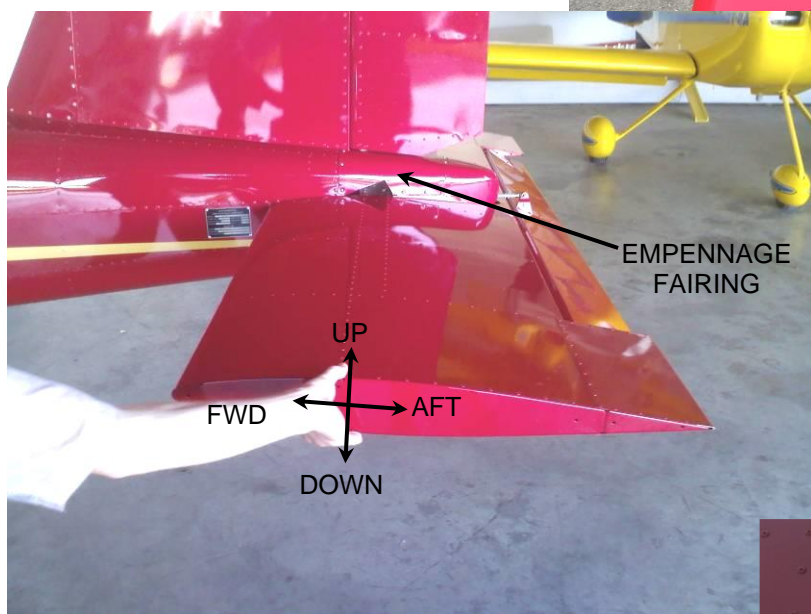
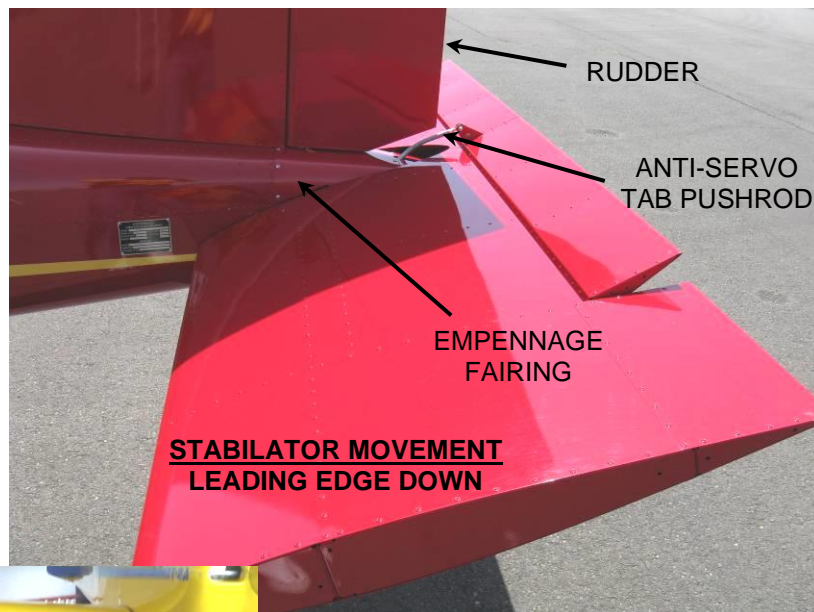
**EMPENNAGE (continued)**

- Stabilator – CHECK condition, freedom of movement

Look at stabilator in general; look for dents (particularly dents in the leading or trailing edges), wrinkles, missing or loose rivets.

Move the stabilator through its full range of motion. Verify that it hits a definite stop at both ends of its travel and that there is no binding or friction.

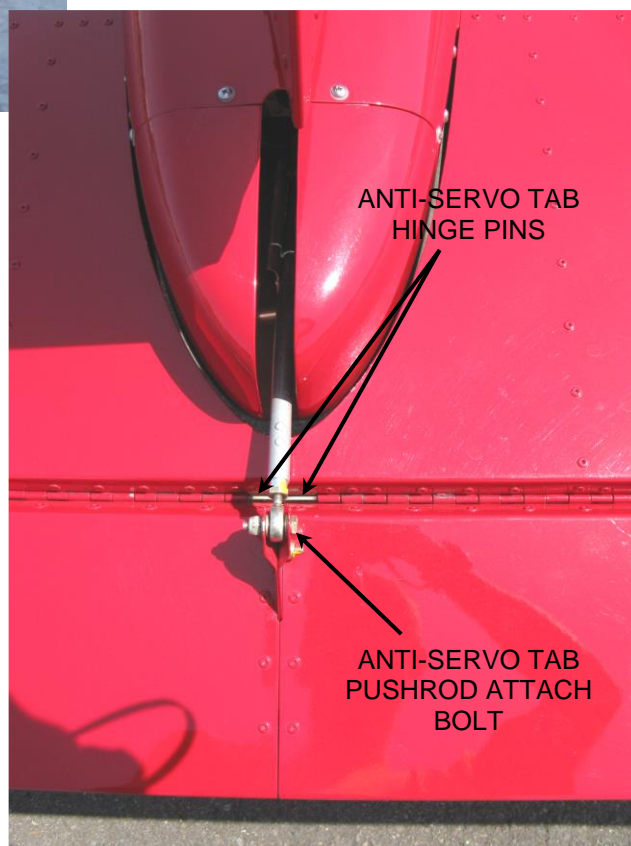
- Empennage Fairing - CHECK all screws installed, no evidence of interference with stabilator, anti-servo tab pushrod, or rudder



- Anti-Servo Tab – CHECK condition, proper attachment

Look at anti-servo tab in general, look for dents (particularly dents in the trailing edge), wrinkles, missing or loose rivets.

Verify that the anti-servo tab hinge pins are installed and that the anti-servo tab pushrod attach bolt is installed and that there is no free play in the anti-servo tab rod end bearing. Verify clearance between anti-servo tab pushrod in fully up position and rudder in any position.



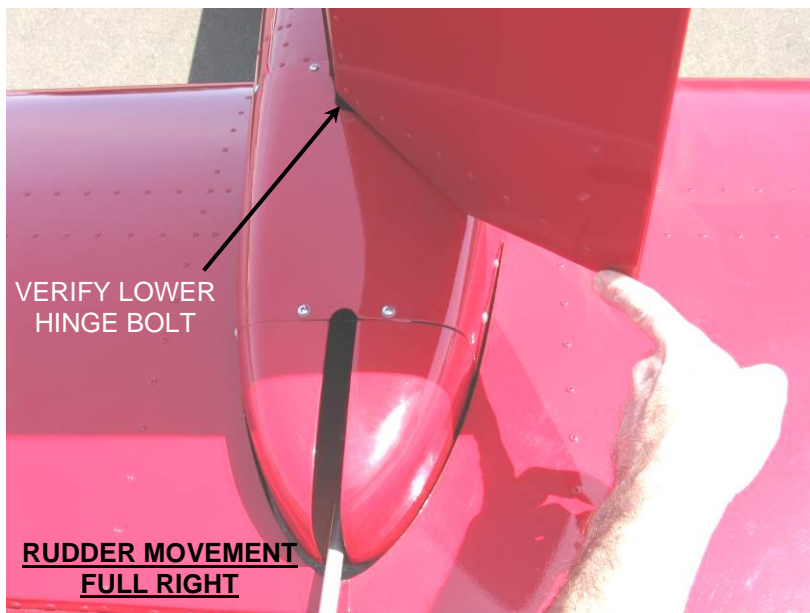
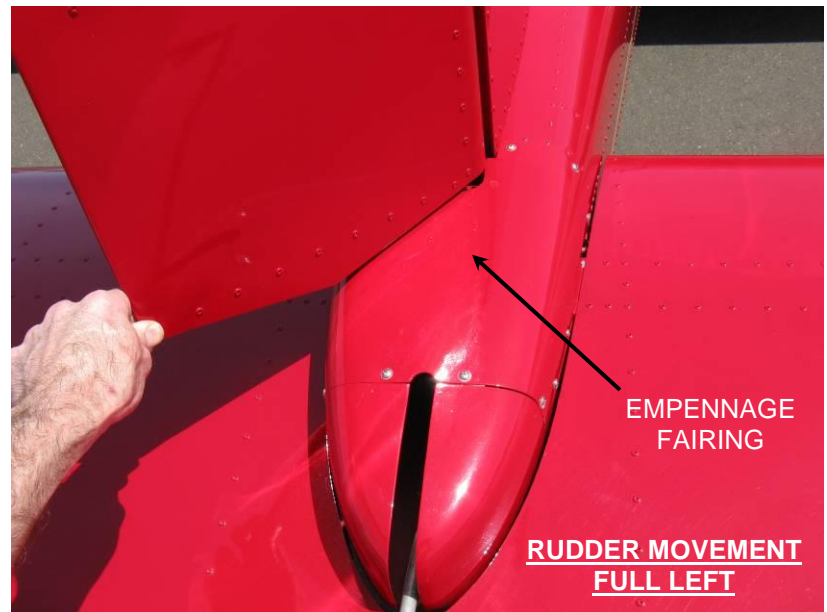


**EMPENNAGE (continued)**

- Rudder – CHECK condition, proper attachment, freedom of movement

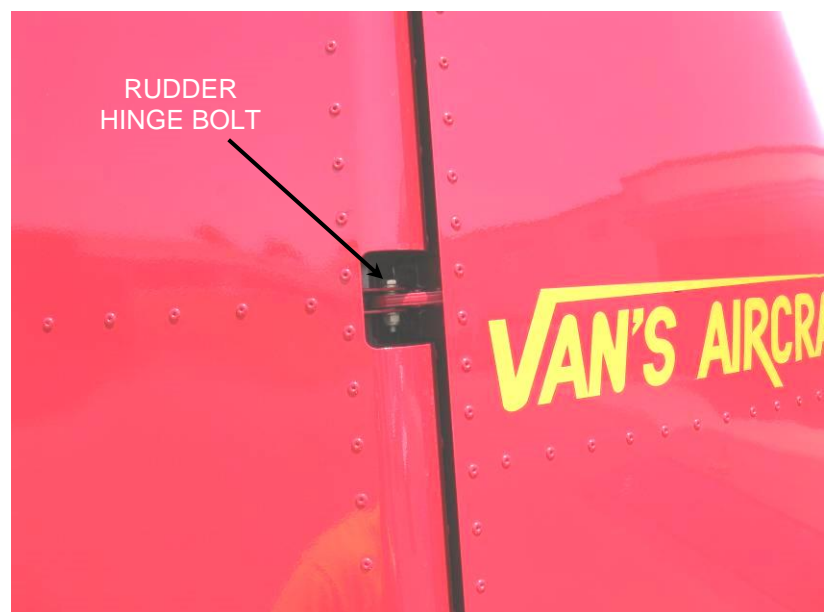
Look at rudder in general; look for dents (particularly dents in the trailing edge), wrinkles, missing or loose rivets.

Verify that the rudder hinge bolts and locknuts are installed.



- Look into the slot for the anti-servo pushrod and check:

Lower Rudder Hinge Bolt  
Elevator Cable Bolts  
Rudder Cable Bolts  
Elevator Trim



**EMPENNAGE (continued)**

- Tie-Down – UNTIE RESTRAINT from eyelet

(Leave eyelet installed to minimize or prevent damage in case of over rotation of the aircraft; verify eyelet installed fully/tight)

**FUSELAGE (RIGHT SIDE)**

- Static Port – CLEAN & OPEN



- ADS-B Antenna – CONDITION (located beneath the tailcone)
- Comm. Antenna - CHECK condition & security

Verify that the ADS-B & comm. antennas are securely attached and have not been damaged. Verify that the skin surrounding the antennas is not bent or wrinkled.

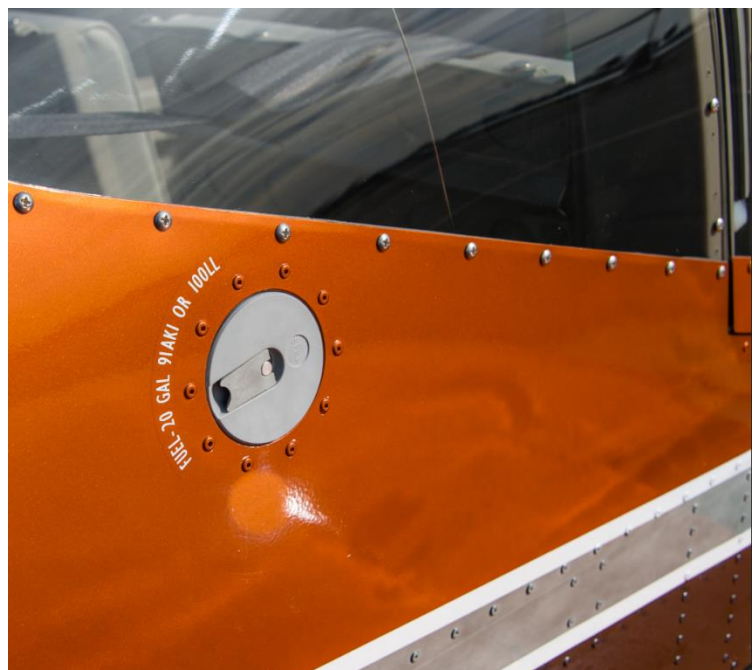


**FUSELAGE (RIGHT SIDE) (continued)**

- Fuel Vent Line- CLEAR
- Fuel Vent Air Line - CLEAR



- Fuel Cap - SECURE WHEN LATCHED





**FUSELAGE (RIGHT SIDE) (continued)**

- Controls - CONNECTED



**RIGHT WING**

- Flaperon - HINGE BRACKET ATTACHMENT

Verify that the outboard, mid, and inboard flaperon hinge bracket bolts are installed



**RIGHT WING (Continued)**

## Flaperon – FREEDOM OF MOVEMENT

Move the flaperon through its full range of motion. Verify that it hits a definite stop at both ends of its travel and that there is no binding or friction.



- Flaperon – CONDITION

Look at flaperon in general, look for dents (particularly dents in the trailing edge), wrinkles, missing or loose rivets.





**RIGHT WING (Continued)**

- Wing – **CONDITION AND CONTAMINATION** Look at wing in general, look for dents, wrinkles, missing or loose rivets (particularly dents in the leading edge) snow, frost.



- Wing Hand Hold – **APPLY FORCE** fore/aft & up/down; **CHECK** no free movement.

**NOTE:**

**When applying fore and aft force check for play at the rear spar junction. This is usually discovered by hearing a clicking noise. If this is the case refer to the Maintenance Manual for corrective action.**



- Tie-Down – **UNTIE** the tie-down rope/chain, **REMOVE** eye bolt if desired. Ensure eye bolt is secured in the wing if not removed.



**RIGHT MAIN LANDING GEAR**

- Tire – CONDITION, proper inflation 25psi
- Brake – CHECK condition, NO leakage
- Axle Nut – CHECK cotter pin installation
- Wheel Bearings – SHAKE top of tire left and right



- Wheel Pant (If Installed) – CONDITION CHECK
- Wheel Chocks – REMOVE

**NOSE SECTION**

- Transponder Antenna – CHECK condition & security



- Muffler – CHECK condition, security of attachment





**NOSE SECTION (Continued)**

- Cowl Door - OPEN
- 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.**

1. Remove oil cap from tank cover.
2. Turn propeller by hand in direction of propeller rotation several times to pump oil from engine into oil tank.
3. A gurgling sound will be heard.
4. Check oil level on stick.
5. Replace the cap from the oil tank.

**ALTERNATIVE Engine Oil – CHECK**

1. Remove oil cap from tank cover.
2. MASTER – ON
3. Ignitions A OFF- B OFF
4. Use the start key to turn the propeller for 10 seconds
5. MASTER OFF
6. Check the oil level
7. Replace the cap from the oil tank



- Cowl Door - CLOSED
- Nose Landing Gear –
- CHECK attachment to fuselage



**NOSE SECTION (Continued)**

- Nose Tire – CONDITION, proper inflation 22psi (23psi maximum)

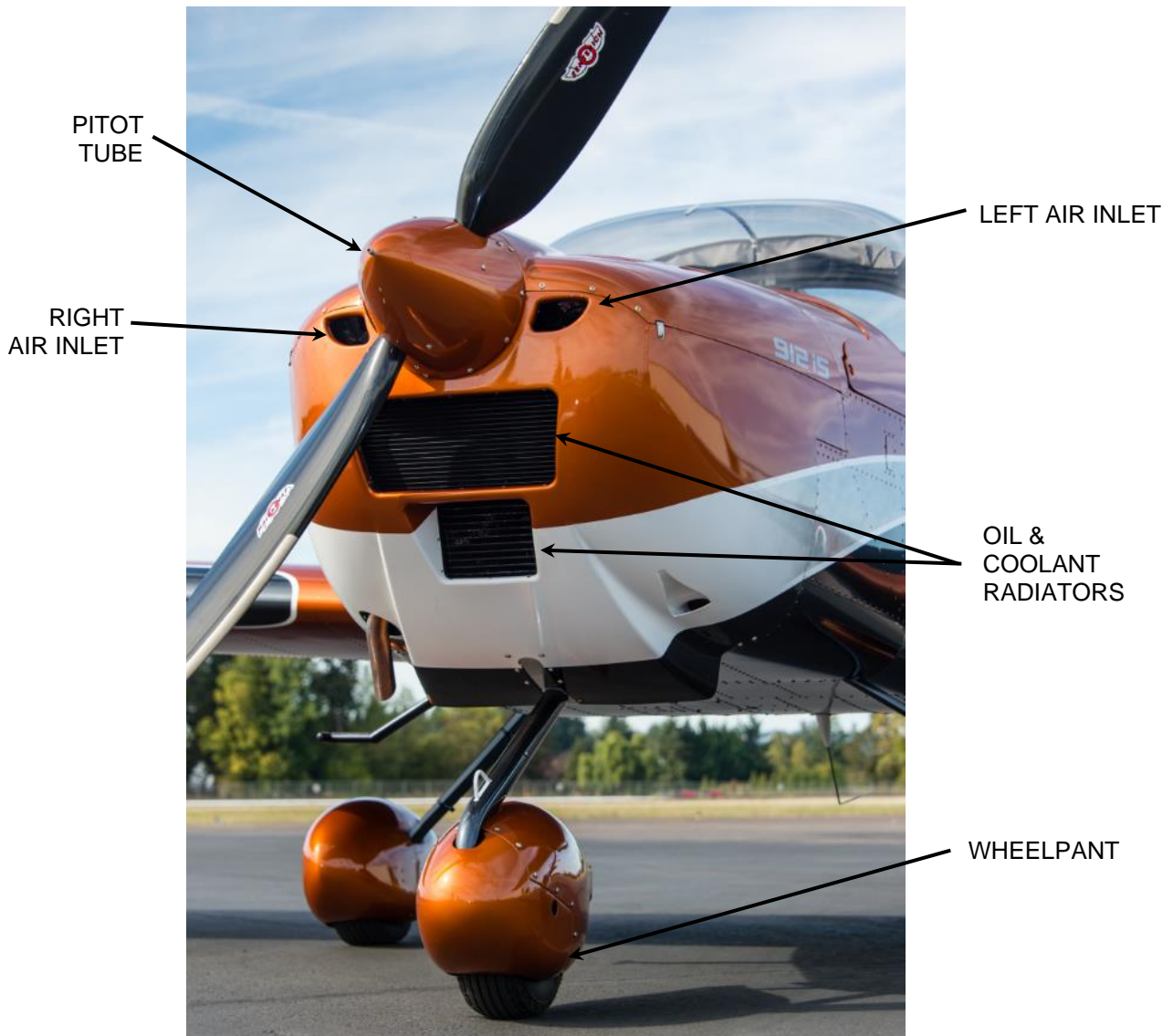
**NOTE**

**Properly inflated tire has no contact between the outer portion of tread and pavement**

- Wheel Pant (If Installed) – CONDITION CHECK
- Wheel Chocks - REMOVE
- Cowling – CHECK condition, all screws properly installed
- Right Air Inlet – CHECK unobstructed
- Propeller and Spinner – CHECK condition, security
- Pitot – CLEAN & OPEN
- Oil & Coolant Radiators – CHECK unobstructed
- Left Air Inlet – CHECK unobstructed

**FINAL WALKAROUND**

- Fuel Sample – CHECK until no more fuel/ water mixture is present.
- CHECK quick drain valve for leakage.



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**SECTION V  
CABIN OVERVIEW**

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**GENERAL**

This section covers the features of the RV-12iS cabin.

See POH Section 7 and RV-12 FTS Section VI for labeled diagrams of the instrument panel, stick grips and center console.

**ENTRY & EXIT TECHNIQUE**

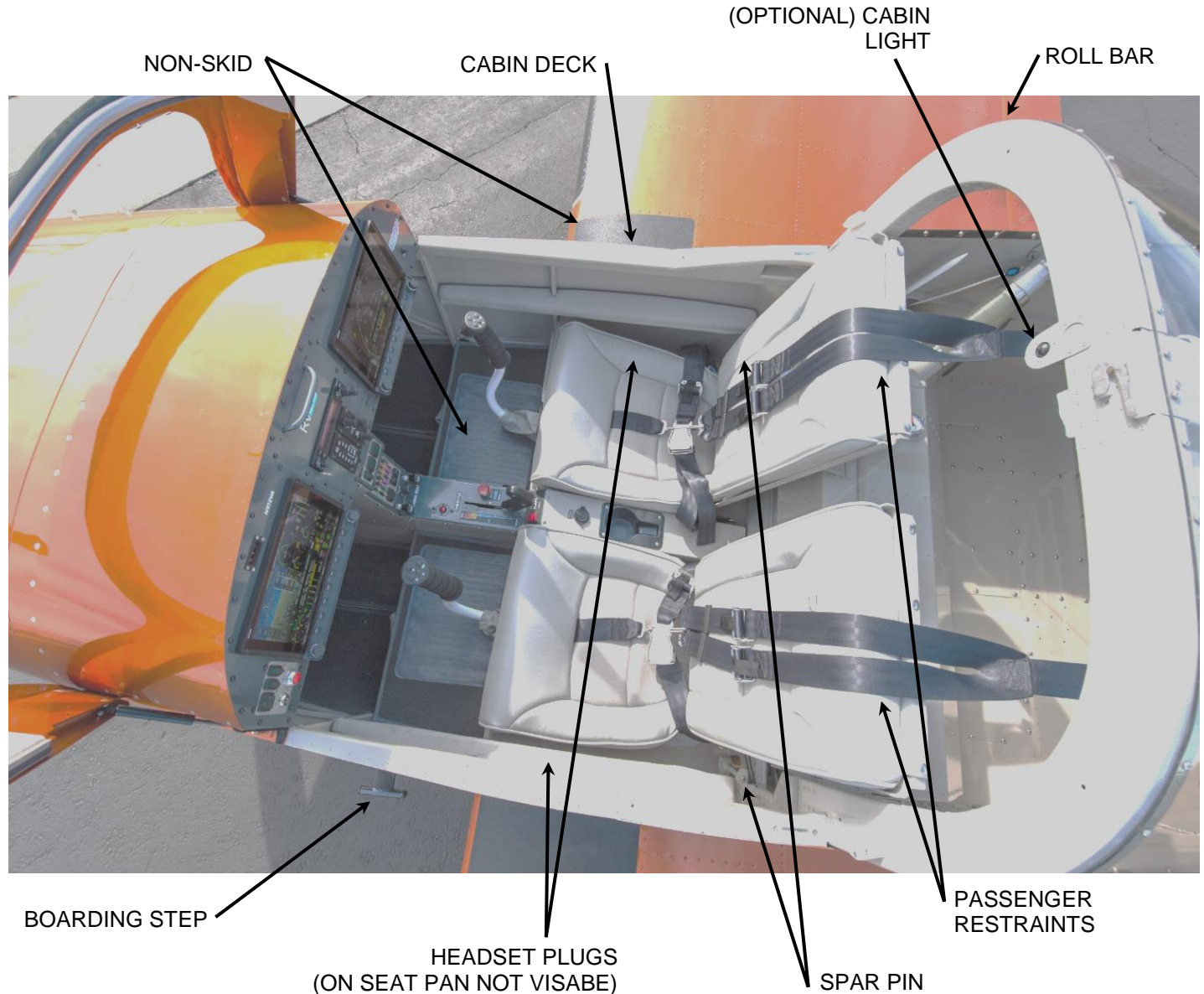
How to get in & out:

Entry method 1: Stand just forward of the wing leading edge facing the cabin. Step up onto the boarding step with your leg that is closest to the front of the aircraft. Place the hand closest to the rear of the aircraft onto the roll bar. Bring your other leg over the cabin deck and place your foot on the non-skid area just forward of the seat. Then move your foot from the step to just forward of the seat and then sit in the seat.

Entry method 2: Sit on the non-skid area of the wing. Swing inboard leg over cabin deck. Place outboard foot on step and push-off with that foot and outboard hand to move from being seated on the wing to being seated on the cabin deck. (Apply hand pressure only over rivet heads on wing to avoid denting the wing skin.) Swing outboard leg into cabin and lower bottom from cabin deck to seat.

Lower the canopy by pulling aft on the canopy frame. As the canopy rotates down, grasp the canopy latch handle and allow the canopy to finish its rotation down to the closed position. Rotate the canopy handle to the latched position (oriented pointing fore and aft). The aft ear of the canopy handle rides on a plastic latch block and clicks or detents into place when latched. Unlatching the canopy requires that the handle be pulled, then rotated past the detent before it can be raised up.

Exiting the aircraft is accomplished by performing the reverse of one of the above entry methods.





**SEAT POSITION ADJUSTMENT**

Proper positioning of the seatback is key to establishing the correct relationship between the various controls and the pilot.

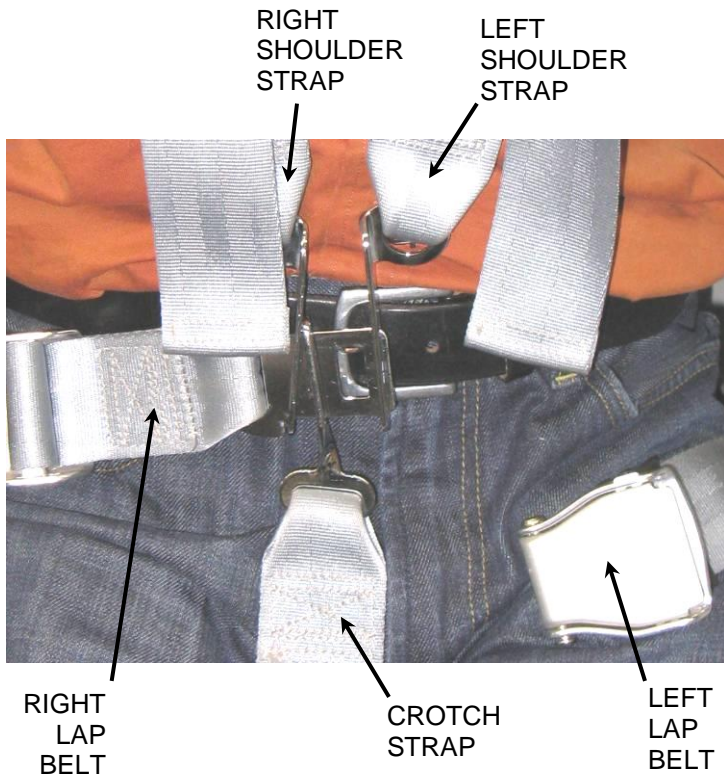
The seat must be far enough forward that the pilot can apply full rudder deflection when required. Additionally, the seat must be far enough back to allow full aft movement of the hand controls. Optional rudder pedal extension blocks are available for shorter legged pilots who are unable to get full rudder deflection when the seat is as far forward as possible. Note that the optional rudder pedal extension blocks are custom fit to individual aircraft, cannot be shared between aircraft, and are not interchangeable.

The seatback can be attached to the seat pan in one of three positions. Rotate the seat back forward, then pull the slide pin to release and reposition the seat using the holes in the seat back pin plate. Additionally, the seat back recline angle can be adjusted by selecting where the hinged seat back brace on the aft side of the seat back is positioned, using the seat back adjustment guides. The seat back position and recline angle can be adjusted independently of each other.



### OCCUPANT RESTRAINT

How to properly fasten and adjust lap belt straps, crotch-strap, shoulder straps.



### HEADSET, AUDIO INPUT

Standard GA headset plugs are located next to the seats, along the outboard side between the seat bottom cushion and the exterior wall of the airplane.





**FLAPS**

The Flap Switch is located in the center console just aft of the throttle control lever.

Aux dual USB power location. A dual USB 5V outlet is located in the center console and provides a maximum of 5A output.

**FLIGHT CONTROL SYSTEM**

Stick, rudder pedals, brakes, trim: How the control surfaces respond when the control stick is moved.

Stick movement controls pitch and roll of the aircraft when in flight. The text note below each picture explains the position of the trailing edge of the specified control surface for each depicted control stick position.



Left Flaperon: DOWN  
Right Flaperon: UP  
Stabilator: UP



Left Flaperon: DOWN  
Right Flaperon: UP  
Stabilator: DOWN



Left Flaperon: UP  
Right Flaperon: DOWN  
Stabilator: DOWN



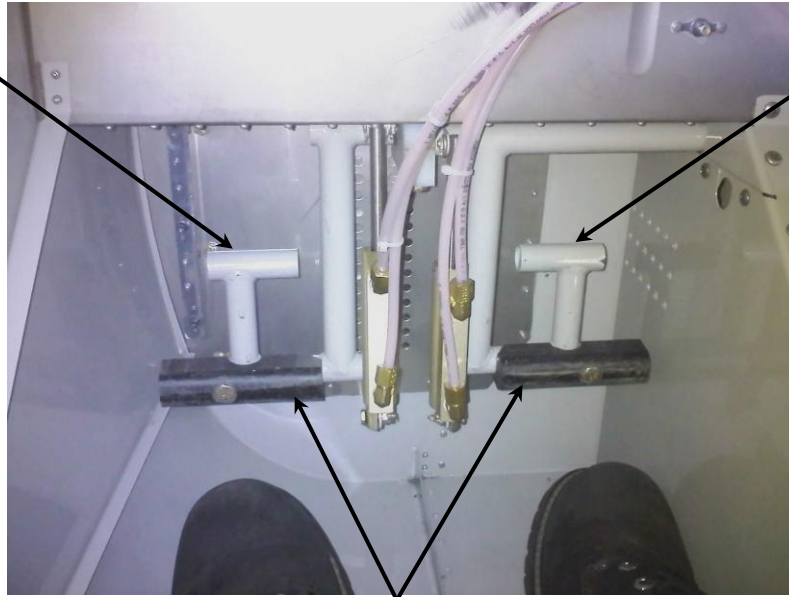
Left Flaperon: DOWN  
Right Flaperon: UP  
Stabilator: UP

**RUDDER PEDALS**

Rudder pedals control yaw during flight. Brake pedals are integrated with the rudder pedals. The brakes provide stopping and turning control while taxiing. Independent left and right brakes on the main gear are used to steer the aircraft at low taxi speeds and may be used to turn the aircraft around a small turning radius.

LEFT  
BRAKE  
PEDAL

RIGHT  
BRAKE  
PEDAL



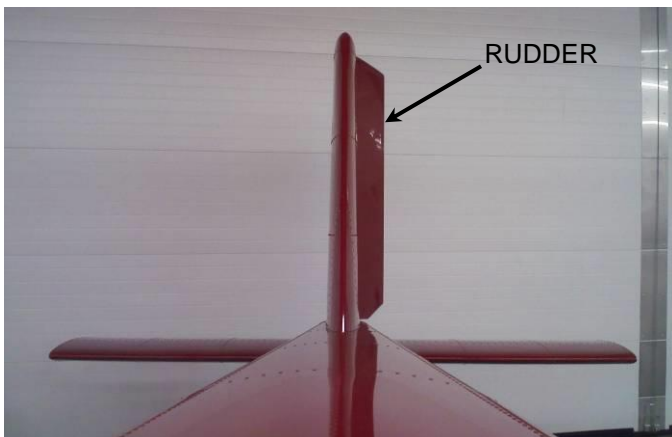
RUDDER CONTROL



NOSE TO THE LEFT



NOSE TO THE RIGHT



RUDDER



**TRIM**

Trim is adjusted using a momentary-contact switches located on the stick grip. See Section VI for further information about trim operation.



PITCH  
DOWN  
TRIM

PITCH  
UP  
TRIM

**ENGINE CONTROLS**

Throttle, Eco Stop, Friction Control, Choke (ULS only), Fuel Shut-Off.

Choke (ULS engine only) is used for cold starting. The choke can be locked in a specific position by rotating the handle.

Fuel shut-off valve is used to permit or prevent fuel from flowing to the engine. It may be pulled up to the 'OFF' position to prevent/stop fuel flow, or pushed down to the 'ON' position for normal operation.

Throttle is used to control the engine RPM. Full-throttle position is achieved when the throttle lever is closest to the instrument panel.

The adjustable friction control knob modifies the friction in throttle control movement. A small amount of friction must be applied to prevent the throttle return spring at the engine throttle body from pulling the throttle to full RPM.

The Rotax 912 iS engine has two different modes: ECO mode and POWER mode. The mode in which the engine is currently operating is indicated on the EFIS.

The engine generates more power while in POWER mode, but fuel consumption increases significantly.

POWER mode is engaged when the throttle position is advanced beyond approximately 97%.

The RV-12iS is equipped with an “eco stop” which allows the throttle position to be advanced up to approximately 97% (i.e. the upper limit of ECO mode). To use the “eco stop”, apply leftward pressure to the throttle handle while advancing the throttle. The throttle’s advance will be stopped by the “eco stop”.

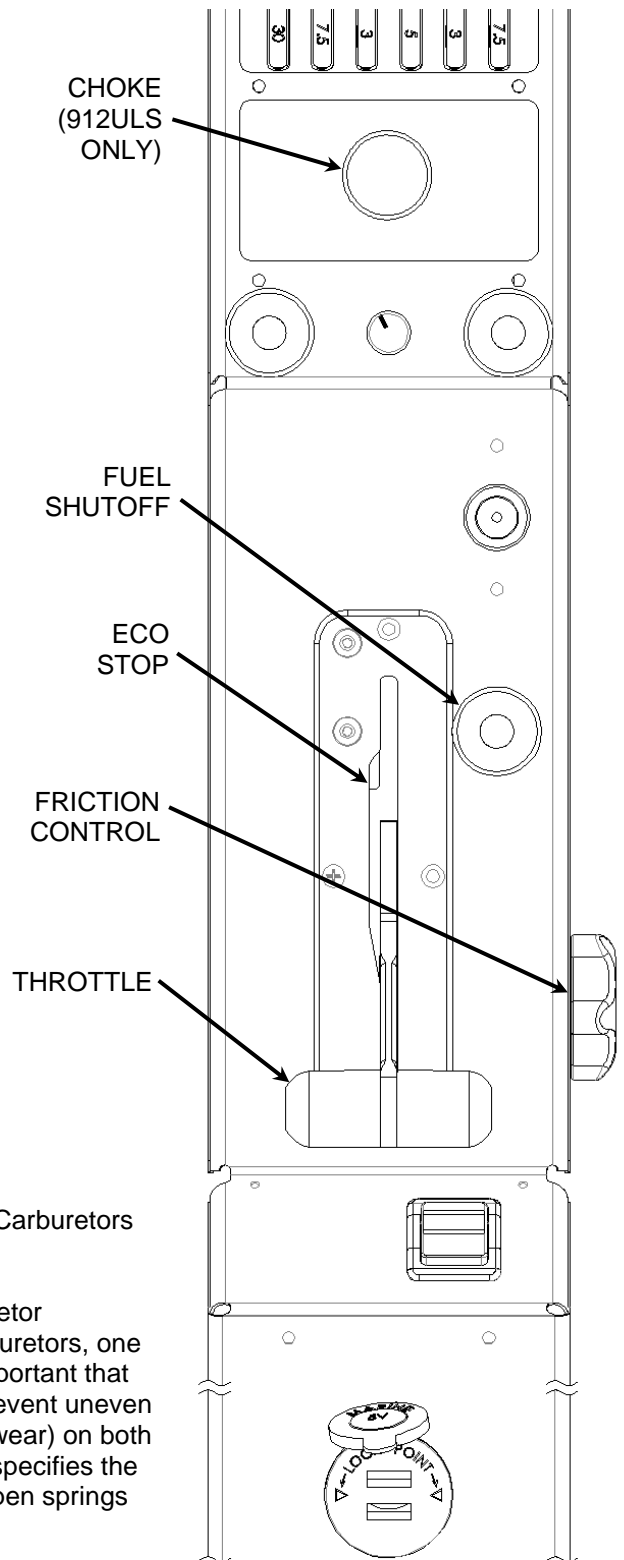
**THROTTLE RETURN SPRINGS – ROTAX 912 ULS ONLY**

The strong coil springs attached to the throttle arms of the Bing Carburetors on Rotax 912 ULS engines serve two purposes:

The primary function of the springs is to assure balanced carburetor operation. The Rotax 912ULS engine is equipped with dual carburetors, one serving the right side cylinders, the other serving the left. It is important that the throttle positions of both carbs remain closely matched to prevent uneven power pulses (which can result in vibration, power loss, engine wear) on both sides of the engine. To assure uniform throttle positions, Rotax specifies the use of semi-rigid throttle cables that rely on the strong throttle-open springs to offset any slack or free play in these cables.

The throttle arm springs also function to “add power” in the unlikely event of a broken throttle cable or throttle mechanism. The constant “Throttle Open” tension on the throttle cables requires a throttle control mechanism with an adjustable friction device to prevent “throttle creep.”

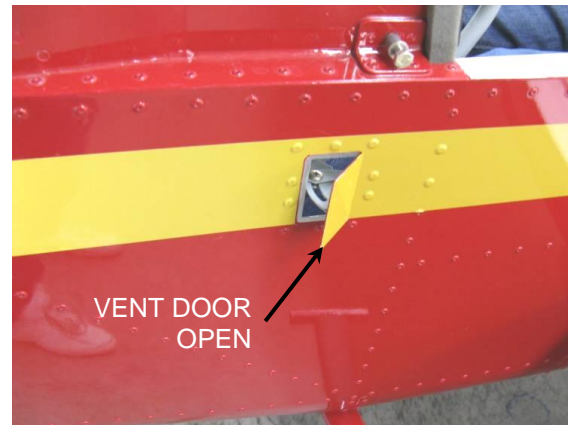
The result is that the Rotax 912 ULS throttle requires more operator effort to alter its position than throttles on many traditional aircraft engines. In an effort to achieve lower throttle friction, throttle arm springs have been supplied rated at a lower lbs./in tension per displacement than the stock spring supplied with the Rotax engine. Use of these springs will require a periodic test of the spring functionality as described in the maintenance manual.





### VENTILATION

Vent doors direct outside air into the cabin. There is one vent door on each side of the fuselage. A tab on the vent door can simply be pushed or pulled to any position depending on the amount of outside air desired.



### CABIN HEAT

Cabin temperature can be increased using the cabin heat control knob. The cabin heat control knob may be pulled to allow heated air into the cabin. The air is heated by passing over the coolant heat exchanger. The heated air continues into the engine compartment, or into the cabin depending on the position of the cabin heat control knob.

CABIN HEAT (PILOT SIDE)

CABIN HEAT (CO-PILOT SIDE)



### SUNSHADE (OPTIONAL)

An optional sunshade is available, which mounts to the inside of the canopy. The sunshade, if installed, may be slid forward on its rail and held stationary with the lock screw when shade is desired. The sunshade is stowed by sliding it aft and holding stationary with the lock screw.

LOCK  
SCREW



RAIL

### CANOPY CLOSED SAFETY SWITCH

When the canopy latch is closed a sensor switch is activated behind the roll bar. This is indicated on a SkyView system in the EMS area by a green indicator "light."

If the canopy latch is not latched on a SkyView system the indicator "light" within the EMS area of the display will turn red.

On a G3X or SkyView system, if the RPM is set to a speed greater than 3700 RPM while the canopy is open, such as during the run-up or take-off roll, an audio warning as well as an on-screen warning will be annunciated.

CANOPY SWITCH





## SECTION VI

## INSTRUMENTATION, AVIONICS, &amp; ELECTRICAL SYSTEM

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| ELECTRICAL SWITCHES              | 6-3  |
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| FUSES                            | 6-9  |
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| ELT                              | 6-10 |

**GENERAL**

This section covers all the items in the instrument panel, switches and fuses, as well as installed instrumentation, avionics (G3X, Skyview, GTR 200) and ELT.

**CAUTION**

**Please pay attention to the operation manuals for each piece of equipment. Preparing by studying the basic operation of this equipment prior to your first transition training flight will be time well spent and helps ensure safe operation. Do not attempt to learn the basics of these systems while flying the aircraft for the first time.**

**As you read this section, please reference the electrical systems schematics found in POH Section 7.**

**RV-12iS ELECTRICAL SYSTEM THEORY**

The RV-12iS electrical system is designed to minimize the workload of the pilot while keeping cost and weight to reasonable minimums.

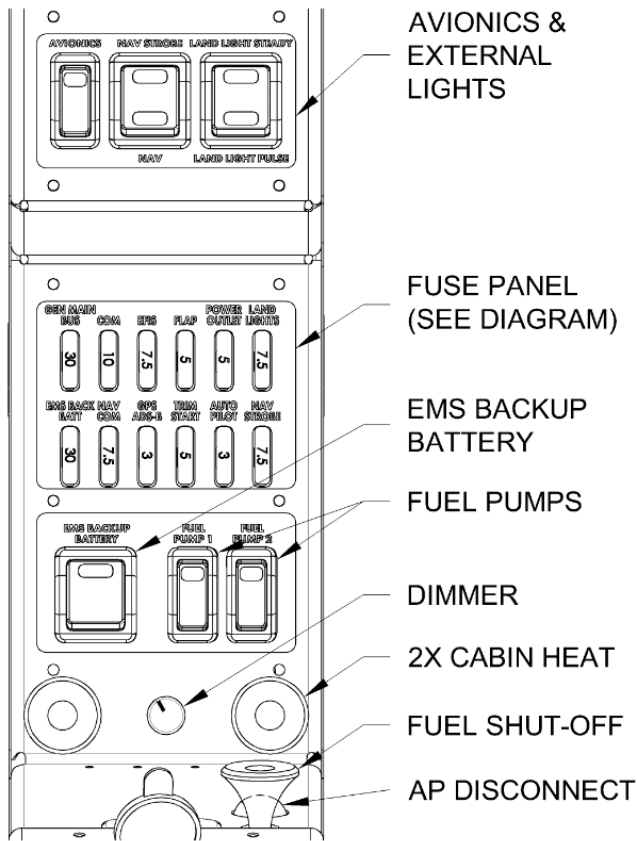
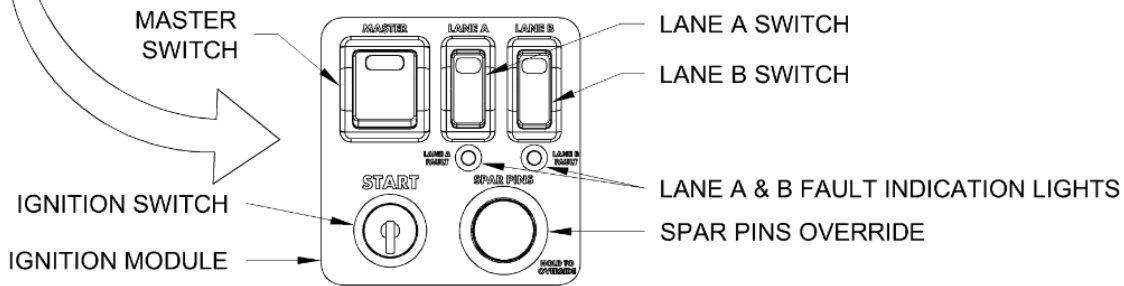
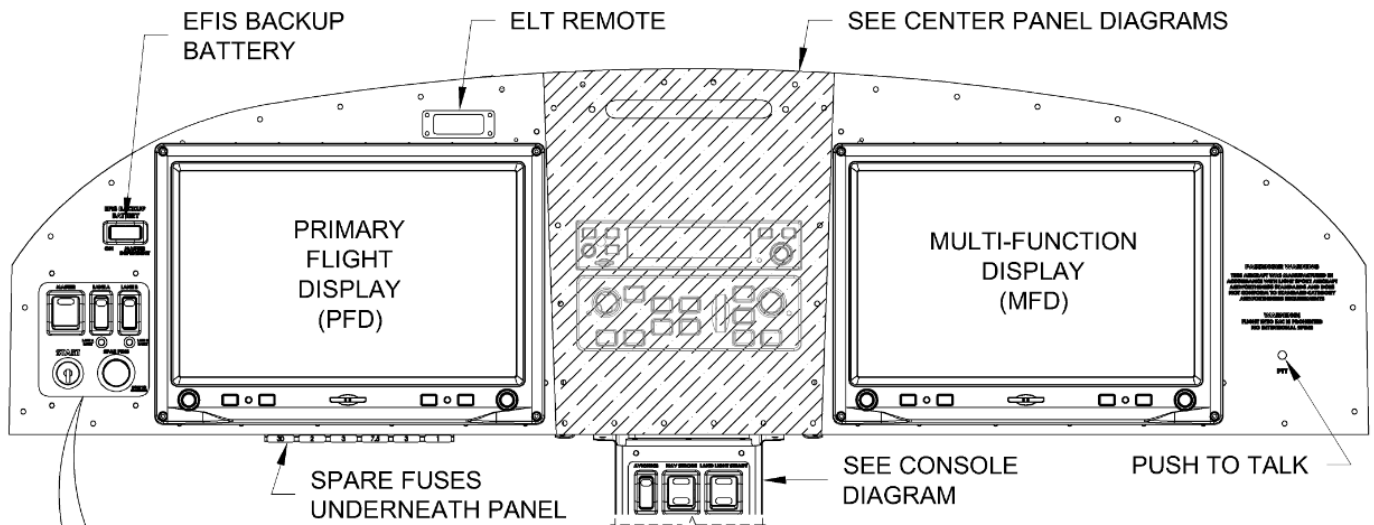
Items essential for basic operation of the aircraft are either provided with their own internal batteries (as is the case for the EFIS) or are powered-on any time the master switch is on (as is the case for the stall warning system, flaps, pitch trim motor and avionics cooling fans).

Fuses are used for protection of the various electrical circuits resulting in lower cost and weight with no adverse effect on safety or functionality. All fuses 3A and above are provided with LED "trip" indicators. Through use of non-resettable fuses, safety is enhanced because the pilot is not able to override the protection of the circuit (as would be the case with a resettable breaker) and his/her attention is fully directed toward flying the aircraft rather than being tempted to "fix" something in flight. Consider that if a fault develops in any circuit, there is nothing constructive that the pilot can do except fly the aircraft to a safe landing before trying to troubleshoot any electrical problem.

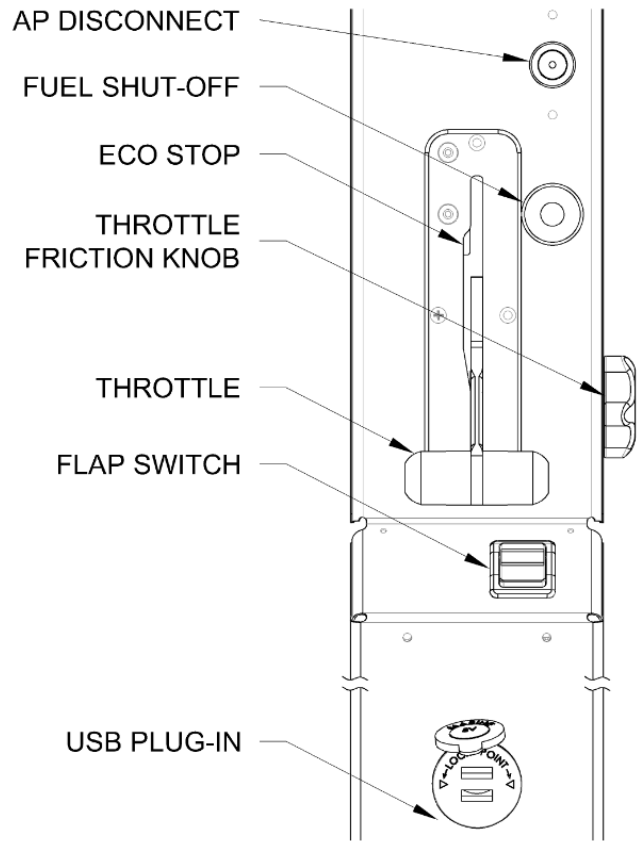
The electrical system design incorporates a separate avionics master switch. With this design, in the event of a generator failure non-essential electrical equipment can be taken off-line while continuing to allow the EFIS(s) and associated accessories to be powered by the main battery and EFIS backup battery.

This design preserves the electrical energy stored in the battery to keep the trim motor, flaps, electric fuel pumps, and avionics cooling fans operating long enough to allow a precautionary landing diversion to be planned and the flight to be completed.

### ELECTRICAL SWITCHES & KNOBS



UPPER CONSOLE



LOWER CONSOLE

**SWITCH LIGHTING:** Except for the keyed starter switch and the Garmin EFIS backup battery switch, all switches are internally lit. If the optional lighting kit is installed, turning on the NAV lights will also light a LED eyeball light located on the roll bar that is used to illuminate the panel area (including the unlighted switches) during night flight.

**IGNITION SWITCH:** This is a keyed momentary-contact switch that activates the engine starter.

Rotax 912 ULS: Power for the Ignition Switch comes from the Main Bus through the Trim/Start fuse. If the spar pins are installed, this switch will activate the engine starter when turned.

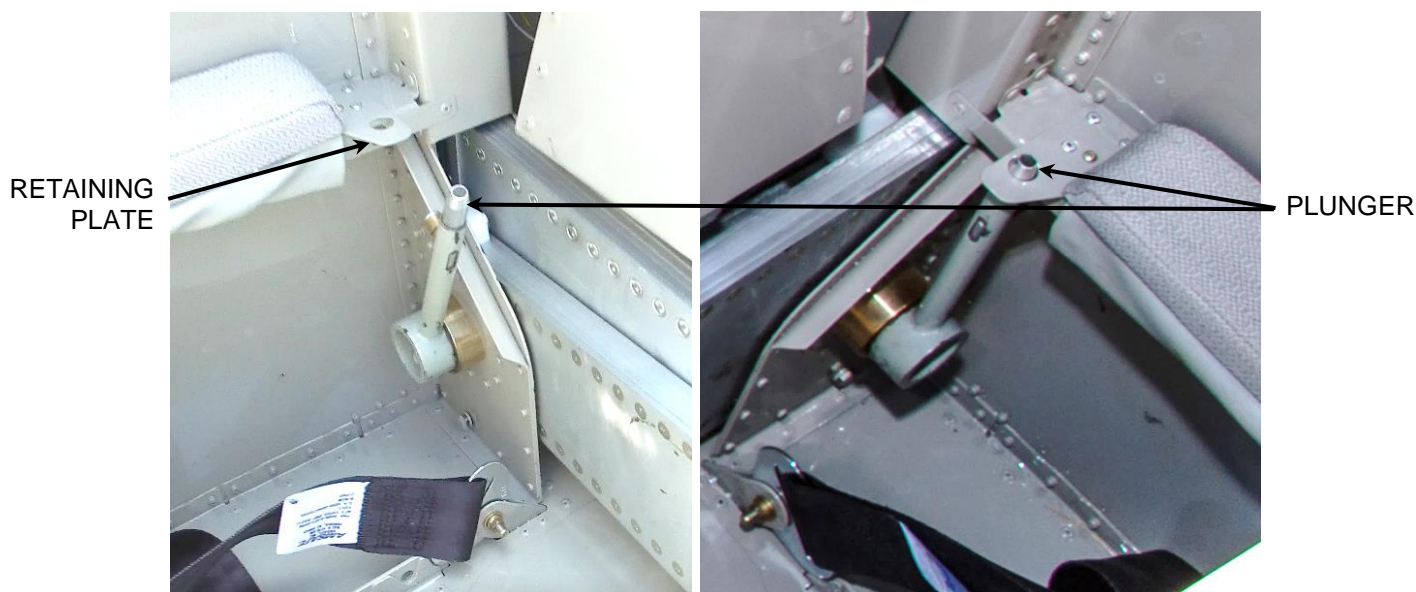
Rotax 912 iS: Power for the Ignition Switch comes through a fuse from Bus A within the 912 iS Fuse Box mounted to the firewall. Bus A is powered on when the Master Switch is turned on (See the further explanation see "Understanding the 912 iS" section below). If the spar pins are installed, this switch will activate the engine starter when turned.

**SPAR PINS OVERRIDE SWITCH:** This is a lighted, momentary-contact switch that serves primarily as an indicator of a potential unsafe spar pin condition. When the indicator is lighted, one or both spar pins are not properly installed. This is detected by a sensor switch located in the armrest, which is activated when the plunger on top of the spar pin switch handle is properly inserted in the hole in the retaining plate on the armrest.

When the Spar Pins Override Switch is lighted (indicating a problem), the starter circuit is disabled. Should the spar pin indication system develop a fault at the same time an in-flight engine re-start is necessary, the starter-disable function may be overridden by pressing and holding the Spar Pin Override Switch while simultaneously activating the starter switch.

#### **WARNING**

**The spar pin override switch must never be used to start the aircraft when it is on the ground. Rectify the cause of the problem before flight.**



**MASTER SWITCH:** This switch connects the battery to the main electrical bus (the power source for the rest of the electrical system) via a solenoid. When the master switch is on the EFIS(s) will automatically start.

**IGNITION SWITCHES:**

Rotax 912ULS: Each switch controls one of the two electronic ignition modules on the engine.

Rotax 912iS: Each switch controls one of the two engine computers (Lane A and Lane B). (Further explanation is provided in the "Understanding the 912 iS" section below).

It should be noted that when each Lane switch is turned, on the corresponding fault light will turn on. This indicates the Lane computer is booting and not yet fully functional, and will turn off after about 3 seconds. During the Before Takeoff Run Up checks (See POH 4.7) note that after checking Lane A the POH instructs that the pilot should wait for the Lane A Fault light to extinguish before checking Lane B. This allows Lane A to reboot before Lane B is taken offline during the checks. You can quickly check Lane B without waiting for the Lane A fault light to go out, but shutting off the Lane B computer with the Lane A computer partially functional will place a fault error code in the electronic maintenance log of the engine. For that reason and to ensure a complete check, ensure the fault light for any Lane is extinguished before shutting off the other Lane switch during run-up tests.

All the critical functions of each Lane computer are duplicated in both computers (in case one computer would fail, the other can assume control of critical functions). Sensors that are only connected to one computer are not duplicated and will not display if a computer should fail or a Lane switch is turned off.

**NOTE**

**LANE A and LANE B have different sensor inputs. During LANE and IGNITION checks, some sensor values are not displayed, depending on the activation state of the LANES.**

Unavailable sensor values if LANE A = OFF and LANE B = ON:

- Coolant temperature
- Exhaust gas temperatures
- Ambient temperature
- Ambient pressure
- Throttle lever position

Unavailable sensor values if LANE B = OFF and LANE A = ON:

- Oil temperature
- Oil pressure

EFIS BACKUP BATTERY SWITCH: Note: This switch is only used on a Garmin system. The Dynon backup battery function is automatically controlled by the EFIS.

This switch has two positions "ON" and "MASTER SWITCH DEPENDENT."

In the "ON" position the backup battery is connected to the dedicated backup battery inputs on the Garmin EFIS and critical modules (LRU's) connected to the EFIS. The "ON" position should only be used to power the EFIS in an emergency if the Master Switch is turned off in flight (for example in case of an electrical fire).

For normal operations the switch should be left in the "MASTER SWITCH DEPENDENT" position. In this switch position the EFIS backup battery will become active when the Master Switch is turned on. If the main bus voltage should fall below the minimum voltage requirements for the EFIS and associated critical LRU's the EFIS backup battery will continue to power the EFIS units.

ELT REMOTE: The ELT remote switch has an "ON" switch that should be activated in an emergency and a test switch that may be used during the first 5 mins of every hour to test the function of the ELT.



AVIONICS SWITCH: This switch controls power to the transponder and the installed COM radio.

**NOTE With Garmin GTR-200 installed, Stall warning tone is only audible with the avionics switch ON.**

When a GTN-650Xi NAV/COM is installed, turning on the Avionics switch turns on both the NAV and COM functions of the GTN-650Xi as well as the transponder.

**DIMMER KNOB:** Turning this knob dims the switch lights, instruments. This knob will also dim the roll-bar-mounted cabin light, if installed and when the NAV lighting switch is in the on position.

**NAV & NAV/STROBE SWITCH:** Turning this switch on in either position will turn on the cockpit mounted roll bar light. Turning the switch to the NAV position turns on the navigation and position lights on the wingtips. This is useful if you wish to turn off the strobes to prevent blinding another person in the area. Placing the switch in the NAV/STROBE position will turn on navigation, position and strobe lighting.

**LANDING LIGHT SWITCH:** This switch controls power to the landing light(s) (if installed) and controls whether the light is on continuously (for illumination during night landing operations) or whether the light(s) pulse on/off/on (for enhanced recognition visibility to other aircraft).

**PTT (PUSH TO TALK) SWITCH:** There is a push to talk switch located on the front of the control grip, plus a single push to talk switch located on the right side of the panel. When the aircraft is used for training the panel-mounted switch allows the instructor to manage radio communications without affecting movement of the control stick.

**AUTOPILOT DISCONNECT SWITCH:** There is an autopilot disconnect switch on the control stick grip and a second switch of the same function on the center console. There is no autopilot power switch in the aircraft. Instead, the autopilot is turned on with the master but is not activated. For Garmin installations, activating the autopilot allows auto-trim to be active. To activate the autopilot and allow autopilot control of the aircraft, use the autopilot switch or appropriate functions on the EFIS screen. Refer to your EFIS system manual for information about how to engage the autopilot (there may be multiple functions depending on how the button is pressed). For Garmin ESP information, please see Section 11.

**FUEL PUMP SWITCHES:** These switches are provided only on Rotax 912iS aircraft. The aircraft should be started with only one fuel pump switch on. Using both fuel pumps during engine start could cause damage to the engine per the manufacturer. Both fuel pumps should be activated after the engine has been started and while in flight.

**WARNING!**

**The Rotax 912 iS is designed to use both fuel pumps in flight. Do not turn off one of the pumps in flight. Both pumps running together provide the fuel pressure necessary for optimal engine performance. In addition, if the single operating pump would fail, the engine would stop leading to possible injury or death.**

**WARNING!**

**The Rotax 912 ULS does not have a fuel pump switch installed. The fuel pump is a continuous-duty design. The only means of controlling the auxiliary electric fuel pump is pulling the Fuel Pump fuse. Turning off the fuel pump in flight may cause vapor lock especially in hot operating conditions. This may lead to possible injury or death. While fuel pump switches may be common on aircraft using other engine types (Lycoming, Continental, etc.) a fuel pump switch should not be used on this aircraft! The fuel pump should not be turned off in flight!**

**EMERGENCY BACKUP BATTERY SWITCH:** Turn this switch on in an emergency if both generators fail to provide electrical power to the computers (Lane A and Lane B) of the Rotax 912 iS engine. The switch provides a direct (non-fused) connection between the main aircraft bus and Bus A/Lane A within the Rotax 912 iS Fuse Box Module.

Leaving this switch on accidentally will not harm the engine, but as stated above this is a non-fused connection. Power normally flows through the 30A Generator Main Bus fuse. A short in the electrical system with the emergency power switch left on could damage the emergency backup battery circuit and possibly lead to a fire. For this reason the emergency backup battery switch should only be used in an emergency.

**START POWER SOLID STATE SWITCH:** This switch is internal to, and automatically controlled by, the RV-12iS electrical system. The Rotax 912 iS installation manual specifies the use of a start power switch which when connected supplies power from the Main Bus to Bus A and Bus B of the engine. This turns on the engine computers (Lane A and Lane B), provides engine sensor data to the EFIS and provides power to start the engine. The RV-12iS automatically detects that the master switch has been turned on and that the engine is not running (Bus A voltage will be below 13.7 volts) and automatically activates the start power switch for the pilot. As soon as the engine begins to run the start switch is automatically shut off. Turning the ignition key switch to the start position will also turn on the start power solid state switch.



**VOLTAGE REGULATOR NORMAL OPERATION:**

The Rotax 912 ULS voltage regulator generates more heat as electrical load is increased. The voltage regulator has internal safety features to prevent damage. For further information read the section on the Rotax 912 ULS voltage regulator in the Emergency Procedure Section of the POH.

The Rotax 912 iS is equipped with two voltage regulators, one for each generator on the engine. These regulators reject any unused electrical power as heat. Allowing the power usage to fall below 7 amps for extended periods of time may damage the regulators, especially on hot days. For this reason, it is recommended to turn on the Avionics Switch, NAV/STROBE Switch and Landing Light Switch once the engine is running. Voltage regulator B provides power to the main bus and is located on top of the fuse box. This regulator is the most susceptible to overheating. The NACA cooling duct in the upper cowl provides cooling air for regulator B for both ground and flight operations.

**FLAP SWITCH:** Deployment of the flaperons is controlled using a flap switch.

Pulling the flap switch aft, toward the pilot deploys the flaps. Pushing the flap switch forward retracts the flaps. The flap switch is latching for the “up” switch position. Simply press the flap switch forward and the flaps will continue to retract, freeing your hand for other critical tasks (especially during a go-around). Remember to re-center the flap switch out of the latched position after the flaps have retracted and pilot workload is reduced. The flap position is indicated on the EFIS screen. The flaps have been designed to provide sufficient roll authority when deployed. The flap feature will generally be used for landing and/or take-off but can be used anytime that the indicated airspeed is below 82 kts.

**WARNING**

**Do not use flaps at an indicated airspeed greater than 82 kts.**

FLAPS UP

FLAPS HALF

FLAPS DOWN

**FUSES**

The fuse panel is located directly on the center console. Replacement fuses are stowed in a special holder underneath the instrument panel on the pilot side of the aircraft. The fuse holder is retained using a hook-and-loop tape fastener.



**AUX POWER OUTLET**

A dual USB 5V outlet is provided with a maximum of 4.8A combined output (2.4A available per USB outlet).

**DYNON AVIONICS**

The user's guides can be downloaded - see Section 1 Links for internet location.

**GARMIN AVIONICS**

The user's guides can be downloaded - see Section 1 Links for internet location.

**FLIGHTCOM INTERCOM**

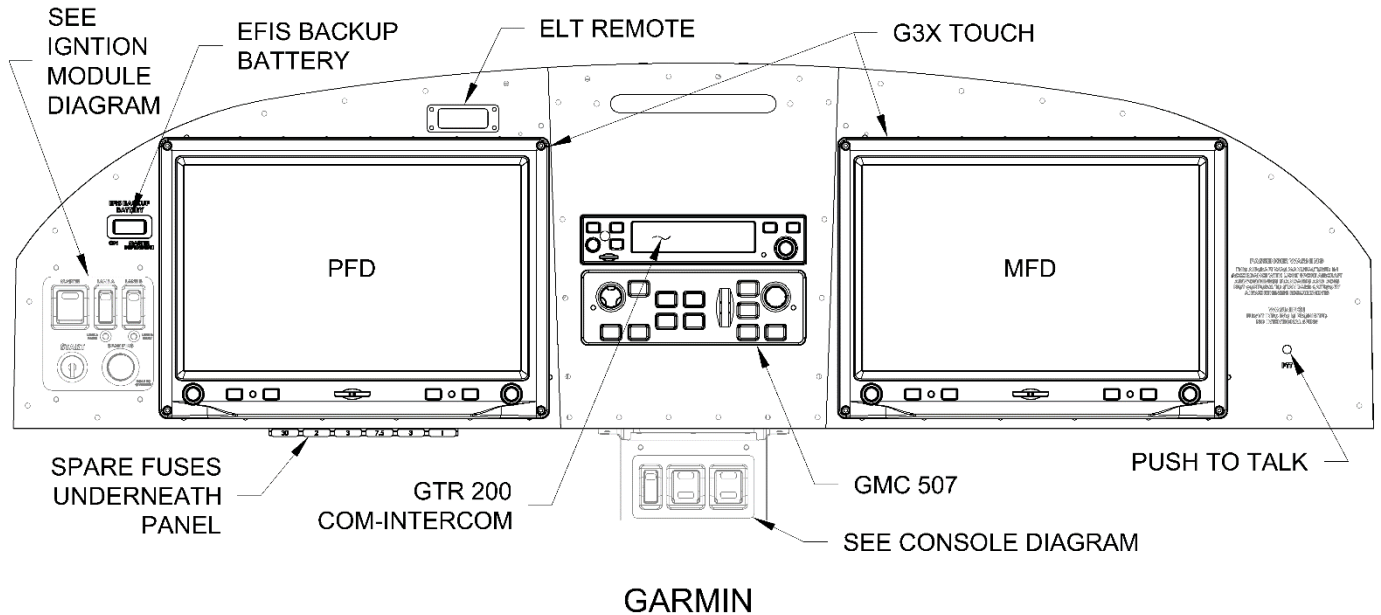
The user's guide can be downloaded - see Section 1 Links for internet location.

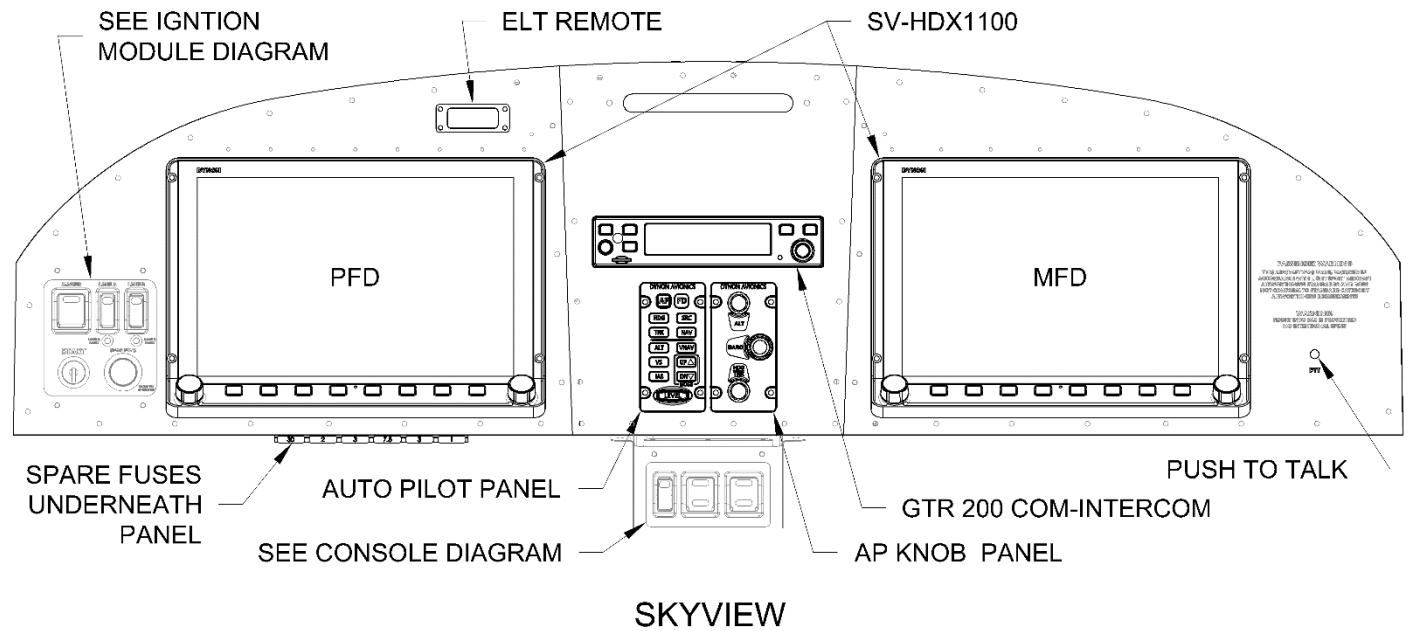
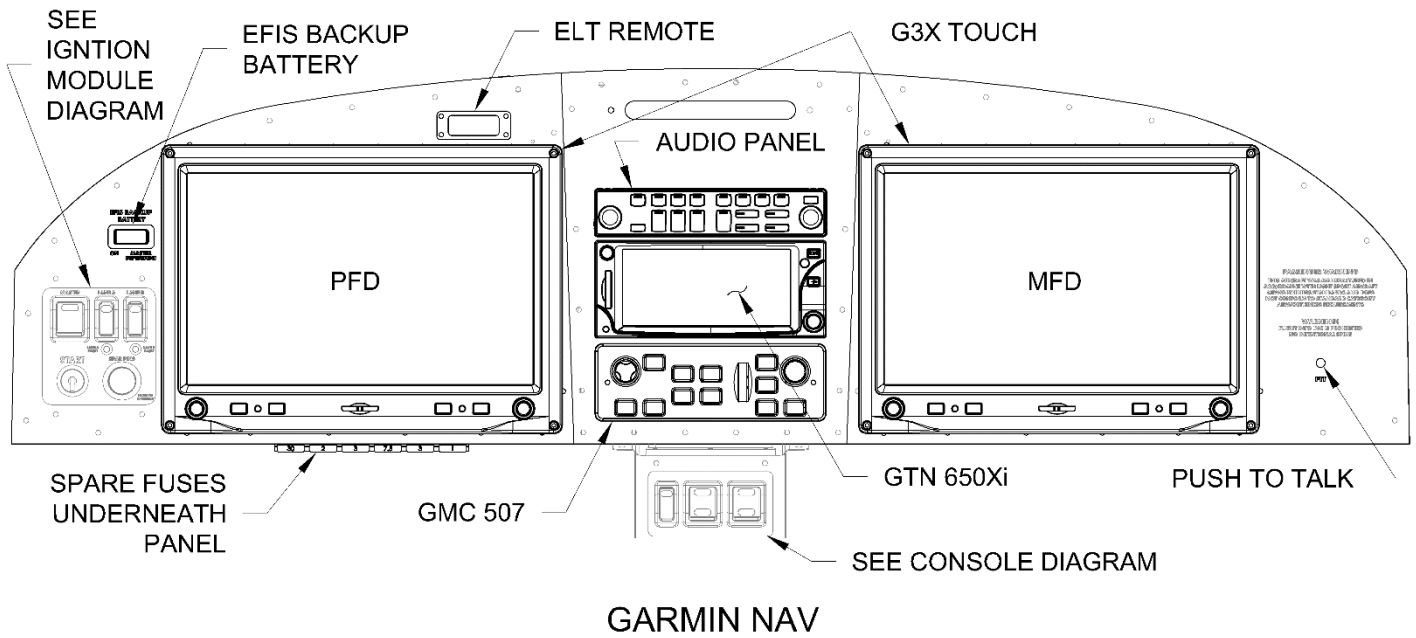
**ACK ELT**

The user's guide can be downloaded - see Section 1 Links for internet location.

**AITHRE CARBON MONOXIDE DETECTOR**

If the optional Aithre carbon monoxide detector is installed, the carbon monoxide level detected in the cockpit will be displayed on the PFD.





**SECTION VII****PRE-TAKEOFF GROUND OPERATIONS****INDEX**

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**PRE-START**

See POH Checklist

**ENGINE START**

See POH Checklist

Note that the POH checklist indicates that after engine start the throttle (912 iS only) needs to be advanced to establish the engine speed above 2,500 RPM for 5 seconds, then returned to idle speed. This is an important step. Understanding why this is required is important in understanding how the 912 iS engine electrical system functions.

If the

From POH section 7.7.2:

*After engine start, the Rotax 912iS generators will supply power to the engine computers but not the main bus. After the engine speed exceeds approximately 2,500 RPM for a few seconds the K1/K2 relay shown in (POH) Figure 7-7 will switch, Generator B will begin supplying power to the main bus and Generator A will supply power to the engine computers. This transition will be noted on the Gen Amp Meter (Shown on the EFIS screen)*

**SYSTEMS POWER-UP**

After engine start and while the engine warms up, the COM radio and transponder should be set as appropriate, the ATIS/ASOS information obtained where applicable, and if needed navigation waypoints should be determined.

**TAXIING**

Taxi operations during high winds require conventional use of the flight controls to compensate for wind effects. With a head wind or quartering head wind, place the control stick full aft and deflect the control stick to “turn/roll into” the wind. With a tailwind or quartering tailwind, use the opposite procedures. Use of the wheel brakes in conjunction with the rudder will assist the pilot in maintaining directional control. The primary directional control during ground operation is the rudder but note that in a tailwind condition rudder authority will be reduced and reliance on brakes will likely be increased. Do not “ride” the brakes while taxiing, as light friction on the brakes can cause them to heat up and become less effective. Brakes should be used only if and where required to augment the directional control authority provided by the rudder.

During taxi, verify the flight instruments display correctly and agree with known headings.

Be mindful of oil temp/RPM limitations during first taxi of the day. Especially on hot days, coolant temperature can rise significantly if RPM is low while stationary.

During taxi operations with the canopy in the open position, the canopy must be latched with the Support Plate Canopy Latch.

See POH Checklist

**BEFORE TAKEOFF RUN UP**

See POH Checklist

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**SECTION VIII****TAKEOFF****INDEX**

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**TAKE-OFF & LANDING CONSIDERATIONS**

The RV-12iS when loaded at or near its maximum weight is limited primarily in its take-off distance. Stated another way, if an RV-12iS can take off from any given runway it can, when properly flown, easily land on that same runway.

This difference in takeoff and landing distances becomes greater when operating at gross weights approaching 1320 lbs and at higher density altitudes.

This difference is less when the aircraft is lightly loaded and when operating at low density altitude.

**TAKE-OFF (Normal)**

See POH Checklist

**TAKE-OFF (Crosswind)**

During crosswind conditions, perform a normal take-off procedure and position the control stick into the wind (upwind aileron UP), and raise the nose with the elevator control so the nosewheel is just clear of the ground as early in the take-off roll as possible. This will help improve rudder authority and prevent drifting or premature lift-off. After lift-off, point the aircraft into the wind, level the wings and hold the slip/skid ball centered using the rudder.

When taking off with a left crosswind and full power, right rudder can be a limiting factor. Advance the throttle more slowly and slightly raise the nose wheel as soon as possible, as rudder authority is greater with the nose wheel off the ground.

**TAKE-OFF (Obstacle)**

See POH Checklist

**TAKE-OFF (Soft Field)**

See POH Checklist

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**CLIMB CONSIDERATIONS**

Use best angle of climb ( $V_x$ ) for obstacle clearance immediately following take-off. When necessary for enroute terrain clearance, it is better to circle while climbing at best rate of climb speed to clear terrain than to try to climb straight ahead at best angle speed.

Use best rate of climb speed ( $V_y$ ) immediately after takeoff (unless using best angle speed to clear obstacles) at least until sufficient altitude has been gained to allow for a return to the airport in the event of an engine failure. Best rate of climb should be used for training flights when covering distance is not a consideration.

Use a cruise climb setting during cross-country flying where the objective is to cover distance while efficiently climbing to cruise altitude, without the need to clear terrain.

**CLIMB FOR BEST RATE –  $V_y$** 

Use best rate of climb speed immediately after takeoff (unless using best angle speed to clear obstacles) at least until sufficient altitude has been gained to allow for a return to the airport in the event of an engine failure. Best rate of climb should be used for training flights when covering distance is not a consideration.

See POH Checklist

**CLIMB FOR BEST ANGLE –  $V_x$** 

Use best angle of climb for obstacle clearance immediately following take-off. If necessary for enroute terrain clearance, it is better to circle while climbing at best rate of climb speed to clear terrain than to try to climb straight ahead at best angle speed

See POH Checklist

**CRUISE CLIMB**

Use a cruise climb during cross-country flying where the objective is to cover distance while efficiently climbing to cruise altitude without the need to clear terrain.

See POH Checklist

**During high temperature days, be mindful of engine oil temperature. If temperature approaches the caution range, lower the nose to decrease climb rate, allowing the airspeed to increase and improve cooling.**

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**CRUISE**

See POH Checklist

**ALTITUDE, SPEED & EFFICIENCY**

Cruising at high altitude provides various benefits, as the aircraft is more efficient when flown high, allows more time for decision making in the event of in-flight emergencies (such as engine failure), and there is generally less turbulence at high altitude than when flying closer to the ground. The only time to vary from this is when unfavorable winds occur or if cloud bases preclude flying higher.

When flying into a headwind, it is often best to use higher power settings (maximum cruise power) as it will minimize the impact of the headwind in terms of slowing progress over the ground.

When flying with a tailwind, it is typically most efficient to use lower power settings (economy cruise power) as this will maximize the impact the tailwind has in aiding progress over the ground.

**CRUISE FOR MAX SPEED**

If the objective of the flight is to get to your destination as quickly as the aircraft is capable of getting you there, the pilot should fly at as low an altitude as can be done safely, and open the throttle as much as possible without exceeding engine RPM limitations. If the ECO throttle stop is set correctly with the 912 iS engine, the aircraft will be just inside the upper limits of the ECO mode operating range at or just below 5500 rpm.

For a Rotax 912ULS equipped aircraft this is a very inefficient way to travel and, if the destination is more than 2.5 hours away, may end-up taking more time due to the need to stop and re-fuel. Cruising at max speed makes sense when flying into severe headwinds because it minimizes the detrimental effect of the headwind.

**CRUISE FOR MAX RANGE**

If the objective of the flight is to get to your destination while using as little fuel as necessary, the pilot should fly at as high an altitude as practical and, for a Rotax 912ULS equipped aircraft, select a throttle setting so as to yield 87 kts indicated airspeed. The optimum situation is to fly high enough so that the aircraft is flying at its most efficient indicated airspeed when the throttle is as open as possible. The altitude required for this to occur is above 12,500 ft, which would require use of supplemental oxygen. Cruising at max-range indicated airspeed should be selected for all flights unless wind conditions or other considerations make cruising at another speed more desirable.

When flying into a headwind, the indicated airspeed to achieve max range is 4 kt greater for every 10 kt of headwind.

When flying with a tailwind, the indicated airspeed to achieve max range is 3 kt lower for every 10 kt of tailwind.

**CRUISE FOR MAX ENDURANCE**

If the objective of the flight is to remain airborne for a longer amount of time while using as little fuel as is necessary, the pilot should select a throttle setting so as to yield 65 kts indicated airspeed regardless of altitude. Cruising at max-endurance indicated airspeed makes sense if the aircraft is being used as an observation platform or for some other mission where time spent aloft is of greater concern than the number of miles covered.



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**GENERAL**

Ideally, every pilot should be able to *accurately* maintain *control* of the aircraft throughout an entire flight considering the variables of aircraft loading (weight and CG location), and weather (wind, temperature, turbulence).

Maneuvering flight must be practiced so the appropriate control inputs and the response of the aircraft to those inputs may be experienced and learned. In addition, the pilot will become exposed and accustomed to the sights, sounds, and accelerations of each maneuver. An additional benefit of frequent practice is that the pilot will remain fresh with motor skills (muscle memory) and memory (fresh recollection of the physical sensations of different maneuvers).

Practicing the various maneuvers is fun and satisfying for the pilot, and the investment of practice time pays off in recognition of improved skills. Increased pilot awareness also enables an individual to recognize where additional improvements can be made.

**SLOW FLIGHT**

Proficiency in executing slow flight maneuvers is foundational because each approach and landing involves precisely controlling the aircraft at minimum speed in close proximity to the ground. Practice and mastering of slow flight will result in better landings and reduces risk.

Practice slow flight with different flap settings. Instructors should make a point of demonstrating and explaining control pressure/pitch changes during transition from 0° flaps to an approach flap setting, then to full flaps setting, and then from full flaps configuration back to approach setting, and finally back to 0° flaps.

The use of EFIS bugs for setting target altitudes and headings as a reference used to measure results is encouraged as it aids the pilot in more precise flying and takes advantage of in-cockpit resources.

Suggested exercise procedure:

Reduce power and allow the aircraft to decelerate to 60 KIAS while maintaining target altitude. Trim pitch as required to minimize required pilot workload between flap settings changes. Adjust power and pitch to achieve target airspeed while maintaining altitude.

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

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

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

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

Raise flaps, maintain altitude and re-establish level hands-off flight at 60 KIAS.

**STALLS AND GARMIN Electronic Stability & Protection (ESP)**

The Garmin G3X system uses an stability and protection system which pushes back on the stick using the autopilot servos as the aircraft nears the edge of a configured stable flight envelope. By default this system is active when the aircraft is started or the EFIS is cycled off and back on. When practicing stalls this system should be disabled. To turn off the ESP function, touch to select the AP annunciator bar at the top of the Flight Instruments area of the EFIS screen. When the Automatic Flight Control System screen appears, touch and select ESP to turn it off.

**STALLS, POWER-OFF**

A pilot who is proficient and practiced in stalls is able to identify and take immediate and appropriate corrective action if/when an inadvertent stall occurs.

Suggested exercise procedure:

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

Stall break will typically be noted by the nose pitching down abruptly and potentially rolling right or left up to 15°. While approaching the stall, maintain wings-level using rudder only, keeping the ailerons neutral. Upon stall break, release control stick back pressure and increase engine power. Allow the aircraft to accelerate to 60 KIAS and re-establish wings-level climbing flight.

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.

**STALLS, POWER-ON**

Practicing power-on stalls offers the same benefits as practicing power-off stalls but exposes the pilot to more extreme attitudes and builds the pilot's proficiency at using rudder to counteract p-factor.

Suggested exercise procedure:

Establish a full power, wings level climb at 65 KIAS. Increase nose-up pitch 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 potentially rolling right or left up to 15°.

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

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.

**TURNS, STEEP TURNS**

Continuous turns of 360° (or more) are good to practice because it familiarizes the pilot with the sight picture of being banked at 45° or more for a period of time long enough to complete a full turn. The sight picture in a side-by-side aircraft is different for a turn to the left versus a turn to the right. Practicing turns also exposes the pilot to the physical sensation of additional acceleration and helps develop skills related to maintaining directional orientation during a period of rapid heading change. Steep turns expose the pilot to the additional pitch and power adjustments required to overcome the loss of vertical lift associated with a steep turn and the increased loading.

Suggested exercise procedure:

Point the nose of the aircraft at a prominent point on the horizon to use for reference. Establish power for cruise flight at maneuvering speed ( $V_a$ ) and trim for level flight.

Note nose position relative to horizon.

Roll into a 45° bank left turn and while banking through 30° increase stabilator control back pressure slightly to maintain the nose close to the previously noted position relative to the horizon.

Maintain the bank angle and altitude, and continue the turn for a full 360°, completing the turn with the nose pointed exactly at the pre-selected reference point.

Strive to maintain constant airspeed throughout the turn and when airspeed increases above  $V_a$ , reduce the amount of bank before attempting to increase pitch.

Maintain attitude by visual reference to the horizon with only very quick glances at the EFIS to verify consistent altitude.

Repeat the above exercise except perform the turn to the right.

Repeat the above exercise except use 55-60° of bank.

Repeat the above exercise except perform the turn to the left.

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**SECTION XII****DESCENT****INDEX**

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**NORMAL RATE DESCENT**

See POH Checklist

For normal operations select a power setting and pitch attitude that will yield a 500 ft/min rate of descent while maintaining airspeed between 100 and 110 KIAS. For cross-country operations, the most efficient way to operate the aircraft is to maintain indicated air speed but with power reduced so as to yield the desired descent rate. It is most efficient to select a slower descent rate over a longer time than to descend at a high rate over a short time. Additionally, a slower rate/longer duration descent will help keep the oil temperature from dropping below the minimum allowed.

When descending for landing, initiation of descent should be selected so as to arrive over the landing pattern entry point at proper traffic pattern altitude and target airspeed. When planning a descent from cruise altitude to the airport traffic pattern, use time to destination to calculate a realistic and comfortable rate (500ft/min).

When available, use the Vertical navigation (VNAV) function of the EFIS to perform a stable descent if terrain, airspace and/or weather permit.

**EXPEDITED DESCENT**

For situations requiring an expedited descent, placing the aircraft into a slip will increase drag and allow for a more rapid descent without exceeding airspeed limits. Another technique for expedited descent is to close the throttle and slow to approximately 80 KIAS and place the aircraft in a 50-60 degree bank descending spiral. The loss of vertical lift allows for a more rapid descent without building-up excess speed. Clear the engine every 1000' with a short application of power.

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**TAKE-OFF & LANDING CONSIDERATIONS**

See TAKE-OFF & LANDING CONSIDERATIONS, **Section 8-1**.

**TRAFFIC PATTERN**

Enter the traffic pattern at the proper traffic pattern altitude. Maintain traffic pattern altitude and adjust power (between 3800 to 4000 RPM) so as to arrive on downwind opposite the target touch-down point at 80 KIAS and target altitude. Smoothly reduce power to idle, maintaining target altitude until airspeed decays to 65 KIAS. Lower flaps to ½ deflection and trim the stabilator. Maintain the target airspeed by trimming and allowing altitude to decay.

If able, choose a point for base turn that will allow arriving at the target touch-down point while maintaining engine power at idle. Vary descent rate by lowering flaps to full deflection. Allow airspeed to decay to 60 KIAS and trim control pressure off.

Choose point for the turn to the final approach leg so as to make 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 at idle while maintaining airspeed.

Descent rate may be decreased by addition of engine power.

**NORMAL LANDING**

See POH Checklist

Once established on final approach, maintain 55 KIAS until the main wheels are approximately 5 feet off the runway. Fully close the throttle if any power had been added. Smoothly raise the nose to a landing attitude without gaining altitude or "ballooning." If the aircraft gains altitude, the transition to landing attitude is being made too quickly.

Once the aircraft is in the landing attitude, continue to smoothly move the stick aft while allowing the aircraft to slowly descend until the main wheels contact the runway.

With main wheels on the runway, maintain nose-high attitude (nose wheel held slightly off runway surface) by continuing to hold back pressure on the control stick while nose wheel slowly lowers to the runway due to reduced airspeed. Hold control stick full aft as speed decays and stabilator effectiveness diminishes.

Apply brakes if/as required to stop before the end of the runway or to make the next runway turn-off. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold stick full aft and apply maximum possible brake pressure without sliding the tires.

**SOFT-FIELD LANDING**

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

To avoid unnecessary nose gear loads, it is especially important that the nose wheel is held off the ground and lowered gently to the runway after speed has diminished.

**GUSTS**

See POH

**CROSSWIND LANDING**

See POH

**OBSTACLE CLEARANCE LANDING**

See POH Checklist

**BALKED LANDING**

See POH Checklist

**LANDING WITH AOA (Angle of Attack) INDICATOR**

The Garmin and Dynon AOA indicators provide the pilot information that can improve situational awareness and help avoid exceeding the critical AOA, thus reducing the risk of an inadvertent stall during this critical phase of flight. In addition, the AoA system can provide indication of available lift and warn of an impending aerodynamic stall in any attitude, speed or configuration.

When calibrated, AOA indicators provide a three-color visual display of the AOA in addition to an aural tone. This tone will change intensity in correlation to proximity of Critical AOA. Refer to your EFIS pilots guide for specific details regarding the specific AoA device installed in your aircraft.

**SECTION XIV****SHUT DOWN****INDEX****SHUT DOWN****14-1****SHUT DOWN**

Upon arriving at the desired stopping point, set the throttle to idle, check to ensure the ELT annunciator light is off, turn both ignition switches off, turn off the avionics switch, then turn off any other switches, and finally turn off the master switch.

- Throttle – IDLE
- ELT – CHECK LIGHT OFF & CHECK signal on 121.5 MHZ
- Ignition – A OFF – Ignition B OFF
- Avionics – OFF
- Master – OFF
- Tie Down – Control locks, CHOCK two wheels minimum

**Cold Weather Procedures**

Post-Flight Rotax 912ULS:

- Fuel Pump - ON
- Fuel Sample - CHECK until no more water or fuel/water mixture is present.
- Fuel Pump - OFF

Post-Flight Rotax 912 iS:

- Let fuel settle to allow water to come out of solution.
- Fuel Sample - CHECK until no more water or fuel/water mixture is present.

**SkyView:** The EFIS and GPS will continue to operate on their internal batteries and will shut down automatically but in order to preserve the internal battery life, it is recommended that the units be shut down immediately after the avionics switch has been turned off.

**NOTE**

**To aid engine cooling after shutdown on hot days, the oil door should be left open to aid heat in escaping from the cowl. Leaving the canopy in the open position latched with the Support Plate Canopy Latch will also help reduce the risk of vapor-lock.**

**NOTE**

**If high winds are anticipated, the aircraft should be hangared. If the aircraft must be left outside, park pointed into the wind and use additional tie-down ropes for security. Place the flaps in the full up position and secure the control stick in the full aft position using the pilot lap belt. Use the tow bar to secure and lock the rudder controls in place as shown in Section IV.**



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## SECTION XV

## EMERGENCY PROCEDURES

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**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 judgment based on pilot training, 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 indicated knots airspeeds (KIAS) unless stated otherwise.**

**ABNORMAL ENGINE INDICATIONS**

See POH

**FIRE****ENGINE FIRE DURING START**

See POH

**ENGINE FIRE IN FLIGHT**

See POH

**ELECTRICAL FIRE**

See POH

**GENERATOR/ELECTRICAL FAILURE**

See POH

**ENGINE MALFUNCTION****ENGINE FAILURE ON TAKE-OFF**

See POH

**ENGINE AIR RESTART**

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See POH

**FORCED LANDING (COMPLETE POWER FAILURE)**

See POH

**DITCHING**

See POH

**UNUSUAL FLIGHT CONDITIONS****SEVERE TURBULENCE**

See POH

**STALLS**

A stall is an aerodynamic event, defined as the interruption of the airflow over an airfoil when it exceeds its critical angle of attack (AOA). The RV-12iS stall characteristics are conventional. Additionally the RV-12iS is equipped with a vane-type stall warning buzzer that activates approximately 7 kts above stall speed.

An AOA indicator system is installed in the RV-12iS. It uses an AOA pressure port located on the underside of the left wing near the leading edge. (Pages 4-3 & 4-12). As the angle of attack increases, the AOA port is exposed to more direct airflow. By comparing the pressure from the AOA port with the pressure from the pitot/static system, the EFIS can calculate the critical AOA. AOA indicators provide the pilot a three-color visual display of the current AOA plus an aural alert tone. This tone changes in intensity as the aircraft approaches Critical AOA. Refer to your EFIS pilot's guide for details specific to your system. Note that an AoA system must be calibrated to the individual aircraft as per tof its original setup to provide accurate AoA information.

For aircraft equipped with a Garmin G3X Touch avionics system, the Electronic Stability & Protection (ESP) function will become active before the stall occurs, gradually pushing back on the control stick with increasing force as the stall condition is reached. This feature should be turned off for stall training.

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

Section XI covers stalls in different configurations as part of the basic transition training. To recover from a stall, always reduce the AOA first.

See POH.

**SPINS**

See POH

**RUNAWAY TRIM MOTOR**

See POH

**LOSS OF TRIM TAB**

See POH

**EMERGENCY DESCENT**

See POH

**LOSS OF FLIGHT INSTRUMENTS (EFIS)**

See POH

**INFLIGHT OVERSTRESS**

See POH

**UNINTENTIONAL FLIGHT INTO ICING**

Ice can form on aircraft surfaces at 0° C (32° F) or colder when liquid water is present. Pilots need to be particularly alert when outside air temperature (OAT) is within 2 degrees Celsius of freezing and moisture is visible in the air. With the exceptions of freezing rain, freezing drizzle and carburetor icing, remaining clear of clouds will prevent icing from occurring.

The ability to plan an escape route in the form of alternative altitudes and/or routes is a key decision factor when the weather forecast for the intended route calls for potential icing. A moderate amount of ice will prevent a small airplane from climbing.

If you can't climb or descend, a 180-degree turn to return to non-icing conditions may be your best and only option.

As soon as ice is noticed on the leading edges and/or windscreen, plan your exit and advise ATC. A loss of airspeed without changes in the power setting can be also a symptom of structural icing.

Remember that the non-visible tail surfaces with thinner airfoils and can pick up ice sooner and faster than the wing.

Do not lower flaps when ice is present, as doing so changes airflow over the tail and can induce a stabilator stall. Also, the stall warning horn may cease to function or function falsely because of ice formation on the leading edge of the wing.

See POH Checklist

**LOSS OF FLIGHT CONTROLS****STABILATOR CONTROL FAILURE**

This procedure assumes landing with a complete stabilator control failure (locked in the up & down movement axis) Besides the stabilator, there are three other forms of pitch control in the RV-12iS: Flaperons, Trim tab and Throttle. Flap extension and retraction commands will result in normal pitch changes, but will be the reverse of conditioned reflexes for normal control stick commanded pitch changes. For this reason, it is not recommended as a preferred pitch controller, in order to avoid the possibility of an erroneous pitch command (and pitch response).

Once trimmed for certain airspeed, retracting flaps will produce a pitch up moment (the nose will rise relative to the previous position).

Electric trim can be used to change pitch at the round out and flare.

If available, find a suitable airport with a long, wide runway aligned with wind direction and be prepared for a go around.

See POH Checklist

**LOSS OF AILERON ROLL CONTROL**

See POH

**LOSS OF ELECTRIC FLAP CONTROL**

See POH

**LOSS OF RUDDER CONTROL**

See POH



**BRAKE FAILURE**

At or above approximately 15 kts, adequate steering (except in crosswinds) can be maintained with aerodynamic rudder control. At lower speeds the RV-12iS relies at least in part on differential braking for ground steering. On any landing the pilot has two basic goals: a) to bring the airplane to a stop and b) to keep it moving straight enough to remain on the runway. During the higher-speed portion of the roll-out, aerodynamic rudder control is adequate for steering.

Another steering aid in the event of a failed brake might be a crosswind. While crosswinds cause an airplane to weathervane and turn into the wind, this turning tendency can be used to your advantage in some cases. Consider the crosswind turning tendency to be the same as a partially-applied brake on that side of the airplane. Thus, if at all possible, plan a landing so that the wind is coming from the side of the failed brake. Use the good brake to counteract the turning tendency of the crosswind. This translates into heavier braking and a quicker stop.

If runway length is a problem, shut the engine off as soon as a go-around is no longer an option. This will minimize the energy dissipation required. Holding rudder pressure opposite the good brake will permit additional force to be applied, particularly at higher speeds. If there is a light wind or no wind, opposite rudder pressure is the only counter force available for the good brake. This means that at low speeds, there is virtually no steering or braking available.

Should the available runway be sufficiently long or wide, it is possible to coast to a stop within the confines of the runway. If runway length is not available, the pilot should steer toward the dead brake side of the runway while rudder steering control is still available. This will keep the maximum runway width available on the good brake side so that a sharp turn can be executed to bring the airplane to a safe stop.

Possibly the worst moment for the pilot to discover a "no-brake" situation would be just as brake is applied following touch-down. Unless there is a long, wide runway ahead, power should be applied to get the aircraft back into the air. This would provide time to consider the options mentioned above. This also might be a good time to consider selecting a more favorable runway or diverting to another airport with more favorable runway options. At the very least, having time to plan for and more calmly execute a failed brake landing is likely a good option to take.

**LOSS OF BLADDER/OTHER BIOLOGICAL CONTROL**

If you survived all this, find a suitable facility and change your underwear.

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**SECTION XVI****GROUND HANDLING****INDEX**

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**TIE-DOWN PROCEDURE**

If possible, the aircraft should be oriented such that the nose is facing into the wind. With the flaps retracted, tie down the wings first with ropes/chains pulling outward and slightly forward from the wing tie-down points. With the wings secured, pull the aircraft backward to remove slack from the ropes/chains on the wings then attach the tie-down rope/chain to the tail tie-down point. If a helper is available, have that person push the tail down and hold it down while the tail is being secured.

**CONTROL LOCKING PROCEDURE**

The flaperons and stabilator controls are secured by fastening the pilot side lap belt around the stick. The rudder is secured by installing the collapsible tow bar/rudder lock. See Section IV.

**FUELING PROCEDURE**

Plane stopped, engine and master power OFF  
 Clamp ground line to exhaust pipe or tie-down ring near the tail  
 Protect rear window from fuel spill/splash  
 Insert fuel nozzle, and add fuel (Max. 19.8 gallons)  
 Replace fuel cap  
 Remove ground clamp  
 Wipe away spillage, if any  
 Fuel Pump - ON 2 min (912 ULS engine only)  
 Fuel Sample - CHECK for water sediment

The recommended fuel is UL 92 "super unleaded" auto fuel. If this fuel is used, there is no need for fuel additives and the engine maintenance intervals are longer (see Rotax service information for more details).

When UL 92 is unavailable, 100LL Avgas may be used but an engine additive (such as Decalin RunUp) to scavenge the lead is recommended and more frequent oil changes are required (see Rotax service information for more details).

**CLEANING**

Windshield surfaces should be cleaned only with plastic-compatible cleaner designed specifically for airplane windshields. Never use glass cleaner or any other ammonia-based cleaner on the aircraft. It is also important to rub the surface gently straight up and down. Using circular wiping motion may create a permanent halo in the windshield. Remove dirt and insects from painted surfaces with water alone and if necessary with a mild detergent or automotive paint cleaner. Oil stains, exhaust stains and grime on the lower fuselage skin can be removed with a cold detergent.

**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. Insert the provided flaperon lock/retaining wedges at the flaperon/wingtip intersection to hold the flaperon in position when removing the wing.
2. Withdraw each of the fuselage pins only enough to release the right wing spar.
3. Remove the right wing and set aside.
4. Remove both of the fuselage pins.
5. Remove the left wing and set aside.

**INSTALLATION**

Installation procedure is reverse of the removal procedure

## Appendix 1: RV-12iS Training Syllabus

### Training in the RV-12iS.

The goal of this syllabus is to provide Flight Instructors with an efficient system to train new RV-12iS pilots regardless of previous flight experience and proficiency.

The RV-12iS presents the pilot with some unfamiliar items not common in other production-type airplanes. Training should start with an evaluation of the pilot's skills, knowledge of the airplane, and insurance requirements. In some cases, insurance companies sometimes require a Flight Review in the airplane; and some require a specified number of dual instruction hours be received in order to insure the pilot.

Ideally each training session should involve 1.2 to 1.5 hrs. flight time plus pre- and post-flight briefings. This RV-12iS Flight Training Supplement and the POH should be used as a reference for all maneuvers and complete understanding of these documents should be emphasized.

#### **Ground:**

Discussion of the RV-12iS systems with emphasis on the Rotax 912 iS engine system, and differences vs. other aircraft engines:

- Oil system, fuel system, ignition, cooling, propeller, pitot-static, and Angle-Of-Attack (AOA)
- Weight & Balance calculation
- Performance calculations
- Primary and secondary flight controls
- Autopilot and EFIS
- Briefing the flight training session: goals and expectations
- Airspeeds: Vs, Vso, Vx, Vy, Vno, Vne, etc.
- Safety briefing: practice area airspace, who is PIC and the flight control exchange routine

#### **Pre-flight:**

Walk around using the FTS/POH as reference. CFI demonstration of ingress, egress, proper use of the canopy latch including the propped-open position, safety belts, spar pins check, fuel/gascolator check, oil check procedure, rudder/control column lock, etc.

Emphasize the vulnerability and care of the canopy system. (Lower the canopy whenever you are not next to the aircraft)

Special care/caution to take if taxiing with the canopy semi-open (in windy conditions or around prop/jet blast) and proper use of the locking canopy latch which allows it to be propped open in a safe/retained manner.

#### **Start & Taxi:**

Promote the use of the check list for EFIS boot up and throttle management.

Taxi: emphasis on brakes check, speed control, steering with free-castering nose wheel, brake use philosophy and application of aft control stick while taxiing.

During windy, gusty conditions or near a jet/propeller blast, and in tailwind situations flight controls should always be positioned to reduce the effect of airflow underneath the control surfaces.

Remind pilot to watch oil temp/RPM limitations during (cold) first taxi of the day.

On hot days, CHT can rise significantly if RPM is set too low.

#### **Run up:**

Using the checklist; emphasize items like canopy latch and low oil temp before and/or high temp after run up. Brief the abort plan and emergency airspeeds before take-off.

#### **Take off:**

Emphasis on takeoff with "soft field" technique rather than rotation speed technique.

Sequence:

1. Flaps 0° or 10°
2. Line up on runway with full aft elevator. Ensure toes are off the brake pedals. Announce: *"Heels on the floor"*
3. Smoothly apply full power – check engine gauges.
4. As airplane accelerates, anticipate left turn tendency with right foot while relaxing back pressure (*Just enough back pressure to keep nose wheel slightly off the ground*).
  - a. Announce: *"Airspeed alive"*

5. Begin climb.
6. Accelerate to 60 kts (V<sub>x</sub>) 75 kts (V<sub>y</sub>)
7. At safe altitude, retract flaps.

**Climb:**

Emphasize attention on the outside picture of V<sub>y</sub>.  
Check engine oil temperatures in warm weather.

**Cruise:**

Help getting used to light control input and maneuverability compared to other G.A. production airplanes. Have the pilot explore power settings for different airspeeds, encourage use of the EFIS bugs for altitudes and headings and to maintain them through the changes in airspeed.

## Sequence:

1. Level off (note nose/horizon relationship)
2. Reduce power to 5000 RPM
3. Trim. Once stabilized note IAS and TAS. \_\_\_\_\_
4. Reduce power to 4000 RPM
5. Adjust pitch to maintain altitude (note nose/horizon relationship)
6. Trim. Once stabilized note IAS and TAS. \_\_\_\_\_
7. Reverse steps.

This exercise teaches the transitioning pilot about control forces and trim. Later on during training, the same exercise can be performed without help from the Flight display (EFIS failure simulation)

**Basic Maneuvers:** For all maneuvers in the practice area, clearing turns are still a good safety practice.

**Slow flight:**

Instructor should make a point of control pressure/pitch changes during transition from 0° flaps to approach and full flaps and then from full to approach to 0° flaps.

## Sequence:

1. Clear the area with two 90° turns.
2. Set Heading and Altitude bugs.
3. Reduce power to 3000 RPM.
4. When below 82 KIAS add 1st notch of flaps.
5. Trim.
6. Add 2nd notch of flaps.
7. Trim
8. Adjust power to maintain altitude.
9. KIAS between 50 and 55.
10. Perform two 360° turns, left & right.
11. Recovery to normal cruise with full power.
12. Flaps to 1st notch.
13. Trim.
14. Flaps up.
15. Trim.

**Stalls power off:**

Practice in different configurations, noting the airspeed of the stall break each time.

1. Clear the area with two 90° turns.
2. Reduce power to idle and maintain wings level flight while increasing nose-up attitude to maintain target altitude until aircraft stalls. Stall break 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. (except stalls from turns)
3. Upon stall, release control stick back pressure and increase power.
4. Allow the aircraft to accelerate to 60 KIAS and re-establish wings level climbing flight.

**Stalls power on:**

Practice in different configurations noting the airspeed of the stall break each time.

1. Clear the area with two 90° turns
2. Reduce power, while maintaining altitude until airspeed is about 55 kts.
3. With wings level, add take off power while increasing nose-up attitude by approximately 15°.



4. Maintain that attitude as airspeed decays to the stall using rudder to control yaw.
5. Upon stall, release control stick back pressure.

**Medium and steep turns:**

Point out small amount of rudder required for coordinated flight and the small amount of elevator back pressure needed to avoid altitude excursions.

**Traffic patterns:** Emphasis on power settings and trim during each flap transition. Starting with descent and traffic pattern power setting (<4000 RPM) for 80 kts in downwind, 65 kts on base and 60 kts on final.

**Approach & Landings:** Special emphasis on trim adjustment after each flap setting change since this is the main cause of over-speed in the pattern leading to un-intentional long landings or worse situations.

Instructor will demonstrate a "hands off approach," weather and traffic permitting and train the pilot to perform the stabilized approach with minimum of control input.

After touch-down, remind the transitioning pilot to allow the airspeed to decay with aerodynamic braking (pitch control) and use the brakes only if needed and after the nose has settled to the runway.

**Sequence:**

1. Slow to 80 kts prior to entering downwind or traffic pattern (3800/4000 RPM)
2. When abeam touchdown point, on extended base, or on extended final: Reduce power to approx. <2500 RPM and select first notch of flaps.
3. Trim elevator for 65 kts.
4. On base and if landing is assured select full flaps.
5. Trim elevator for 60 kts.
6. Once established on final maintain 55 kts until short final and then 50 to 55 kts. (55 + gust factor)
7. Verify feet off brake pedals.
8. Start flare on ground effect and hold nose wheel off the ground.
9. When main wheels settle on the ground, continue to hold back elevator pressure.
10. When nose wheel settles on the runway apply brakes if needed.

Demonstrate slips with different flap settings.

Go-around: Instructors should make a point of the changes in control pressures during transition from full flaps low power/idle setting to a full power /flaps up configuration.

Emergency/abnormal situations: Demonstrate best glide from pattern altitude to landing and loss of flight display in flight emphasizing control by outside references.

Demonstrate a power off 180° best glide speed after a 5 second delay at a pre-determined altitude.

Note altitude loss emphasizing the fact that a turn back to a runway after an engine failure after departure takes more than one 180° turn to land downwind on the same runway.

Once the pilot has demonstrated proficiency, the instructor can opt to practice other emergencies like inadvertent IMC 180° turn and/or other IR maneuvers.

Other topics: Basic Autopilot and Navigation functions demonstration if aircraft is so equipped.

Standards: Pilots should demonstrate a minimum of Private Pilot Standards throughout maneuvers during this training.

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# RV-12iS

## FLIGHT TRAINING SUPPLEMENT



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