RV-12
FLIGHT TRAINING SUPPLEMENT

REVISION SUMMARY

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SECTION I

INTRODUCTION

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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-12. The FTS has been prepared with the goal of enabling the new pilot or pilot transitioning from another aircraft to quickly and efficiently learn about features and characteristics specific to the RV-12.

This FTS is provided to supplement 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 in-depth information than is practical to include in the POH.

It is, therefore, 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, or condition, etc. which may result in injury or fatality if not carefully observed or followed.

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

NOTE
An operating procedure, practice, or condition, etc.

Recommended Reading

1. Pilot's Operating Handbook for RV-12

2. Aircraft Maintenance and Inspection Procedures for RV-12

3. User Manuals of components and accessories

Recommended Links

1. General information about Van's Aircraft as well as drawing and manual revisions:
http://www.vansaircraft.com/

2. General information about the Sport Pilot rule and Light Sport Aircraft:
http://sportpilot.org/

3. ACK ELT:
http://ackavionics.com

4. Artex ME406 User's Manual:
http://acrartex.com

5. Dynon Avionics:
http://dynonavionics.com/

6. Flightcom FC-403 User's Manual:
http://flightcom.net/

7. Garmin Avionics:
https://buy.garmin.com/

8. Information about Matco wheels and brakes:
http://matcomfg.com/

9. PS Engineering:
http://ps-engineering.com

10. Rotax Owner Assistance Network:
http://rotax-owner.com/

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 kt (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 lb
- Maximum cruise configuration stall speed of 45 kt CAS
- Maximum speed in level flight with maximum continuous power of 120 kt 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 that 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-12 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-12 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-12 package have been determined in the design stage.

RV-12 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-12's mission profile is rather broad -- it is intended to fill nearly all sport flying needs - 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-12 incorporates wings that are easily removable. Because the cost of hangar space is typically the single biggest 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-12 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-12 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-12 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-12 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 that is further forward than desired. The selection of the very light Rotax 912ULS engine enables the RV-12 to balance well even with two heavy occupants sitting forward of the wing spar.

We feel that an RV-12 in its basic form with fixed-pitch prop, modest instrumentation & avionics, and Rotax 912ULS 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-12, whether major or minor, was the end product of much deliberation.

RV-12 GENERAL DESCRIPTION

AIRFRAME:
The RV-12 is an all metal, two place, low wing, single engine fixed tricicle gear airplane designed to conform to the S-LSA category. The fuselage is made of conventional formed sheet bulheads, stringers and skin. (Semimonocoque)
A major item 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 convetional fin, rudder and a stabilator/anti servo tab.

ENGINE AND PROPELLER
The RV-12 is powered by a Rotax 912 ULS four cylinder, horizontaly opposed, air cooled with liquid cooled cylinder heads, dual carburetors, rated at 100 HP/73.5 kW @ 5800RPM. Power to the dual spark plugs is provided by two independent Electronic Ignition units. The 912 ULS engine is furnished with a starter, a 14 volt generator and an external rectifier-regulator. The propeller is a gear driven Sensenich model 2A0R5R70E, composite two blade, fixed ground adjustable pitch with a 70 inch/177.8 cm. diameter.

FLIGHT CONTROLS
The full span ailerons and flaps are combined into one unit called flaperons. An internal mechanical mixer allows the ailerons, via torque rods, to “droop” performing the function of flaps.
The stabilator and rudder are connected to the controls by pull-pull cables. The trim tab is driven by a DC motor.

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

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SECTION III

PRE-FLIGHT PLANNING

INDEX

GENERAL

This section will give you the basic parameters and considerations for using your RV-12 and guidelines for how to optimally operate the aircraft (in terms of performance and efficiency) considering the requirements of the flight (load to be carried and distance to carry it), the atmospheric conditions (temperature and wind vector at the altitudes available to the aircraft), geographic conditions (mountains, deserts, forests, etc.), and runway elevation and length at both the beginning and end of the flight.

BASICS OF LOADING THE RV-12

The RV-12 design places the pilot and passenger forward of the CG and everything else aft of the CG. Thus the most forward loading condition occurs with the heaviest possible pilot and passenger weights and 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 its CG falls outside the allowable range compromises safety and may result in injury or loss of life as well as damage to the aircraft.

TAKE-OFF & LANDING CONSIDERATIONS

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

This difference in takeoff and landing distances becomes more extreme when operating at gross weights approaching 1320 lb and at higher density altitudes.

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

CLIMB CONSIDERATIONS

Use best angle of climb for obstacle clearance immediately following take-off. If necessary for en-route 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 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 during cross-country flying where the objective is to cover distance while efficiently climbing to cruise altitude without the need to clear terrain.

CRUISE CONSIDERATIONS

Cruising at high altitude makes sense 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), also 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 best to use higher power settings (maximum cruise power) as it will minimize the amount of time that the headwind has to slow progress over the ground.

When flying with a tailwind, it is most efficient to use lower power settings (economy cruise power) as it will maximize the amount of time that the tailwind has to aid progress over the ground.

SECTION IV

PRE-FLIGHT INSPECTION

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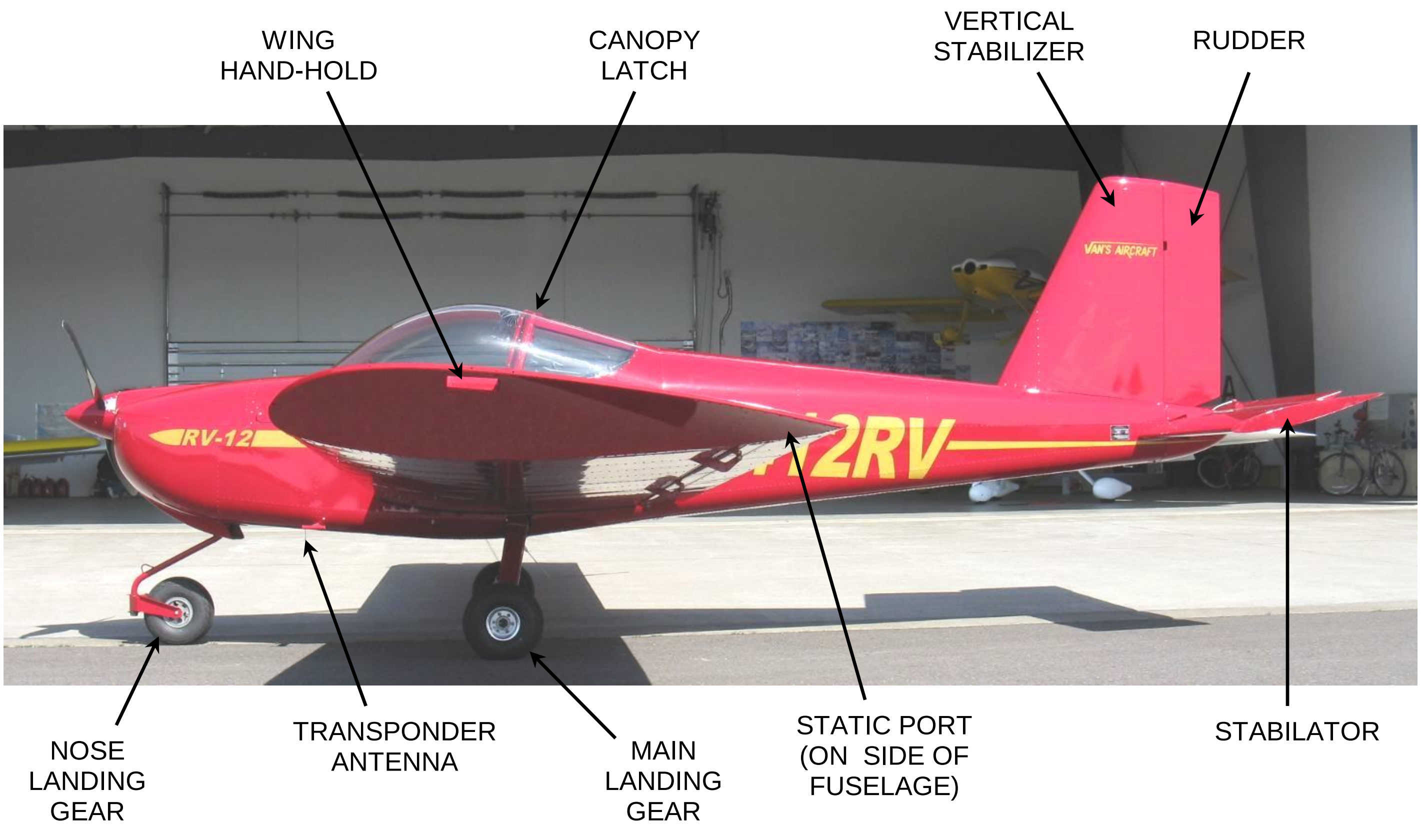
GENERAL



LEFT SIDE VIEW

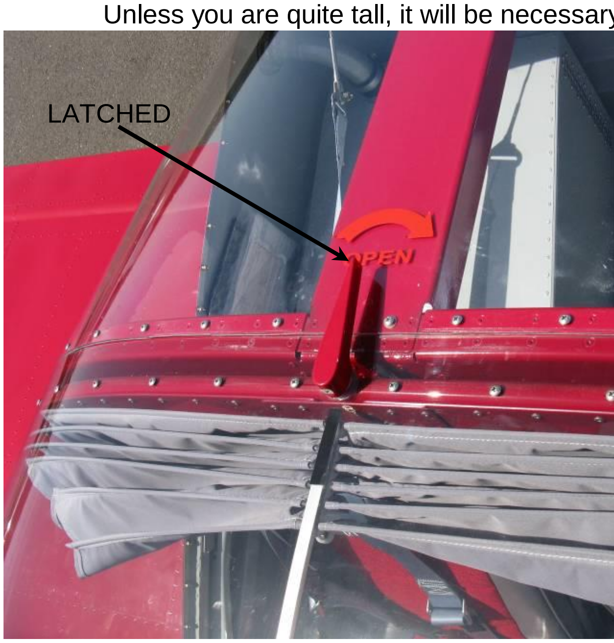
REAR VIEW

RIGHT SIDE VIEW

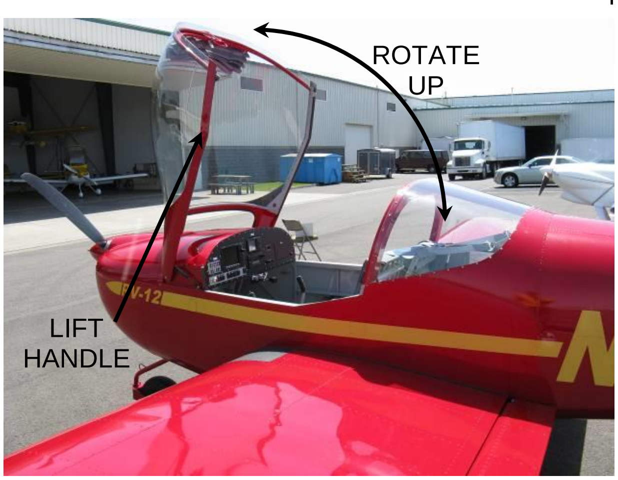
FRONT VIEW

CABIN

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



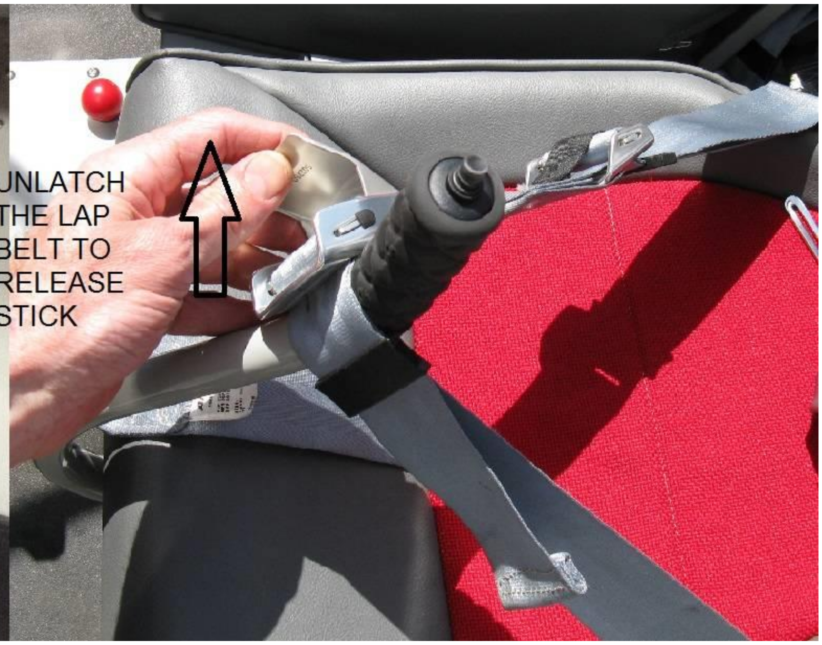
- Canopy – CHECK operation, condition
  Lift handles are located on each side of the canopy frame to be used for raising the canopy



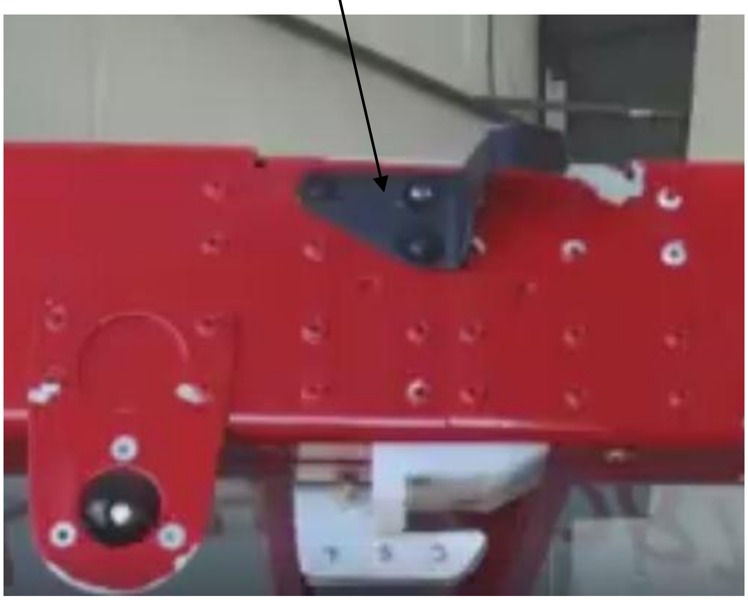
CABIN (continued)

- 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 in the open position must be latched with the F-1231G Canopy Catch.



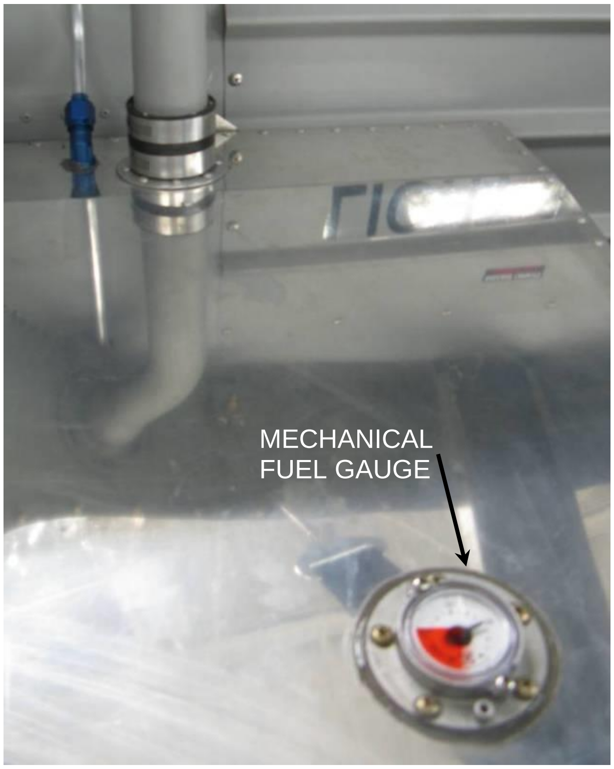
CANOPY CATCH



CANOPY LATCHED POSITION

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

WARNING
Do not take off with less than 4 gallons of fuel as shown in the red "NO TAKE-OFF" arc



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CABIN (continued)

- Master switch – ON

- Stall warning vane – ACTUATE

- Stall warning horn – ON (tone through headset) when vane is actuated when PS Engineering PM-3000-RV FlightCom 903, Garmin SL-40 or Garmin GTR-225 is installed.

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CABIN (continued)

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

- Stall warning vane – ACTUATE

- Stall warning horn – ON (tone through headset) when vane is actuated
- (If Garmin GTR-200 Installed)
  Avionics Switch - OFF

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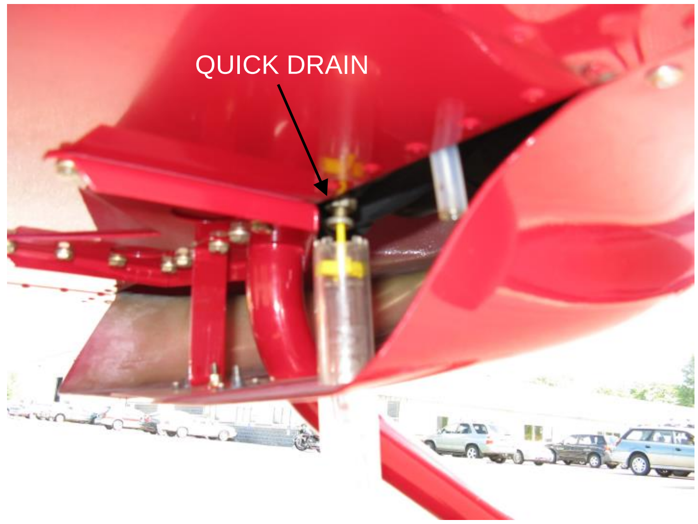
- Fuel Shut-Off Valve – OPEN (Push Down)



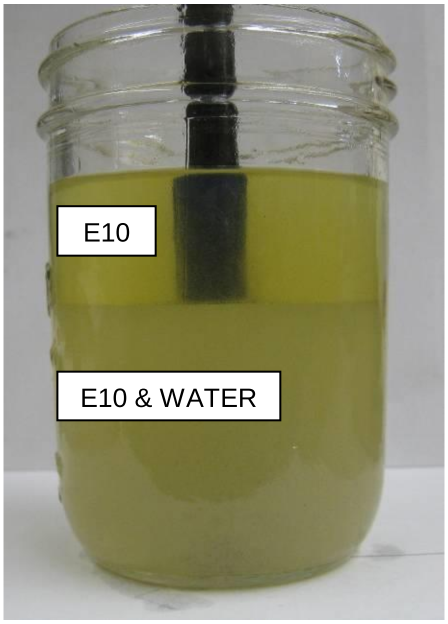
- Fuel Sample – CHECK for water or sediment contamination. For E10 use, see the three photos showing the progressive separation of an ethanol-gas and water mixture, (shown on the next page).
- Complete the rest of the pre-flight inspection with the fuel pump running; about 2 min.

WARNING*
Continue sampling fuel until there are no contaminants detected.

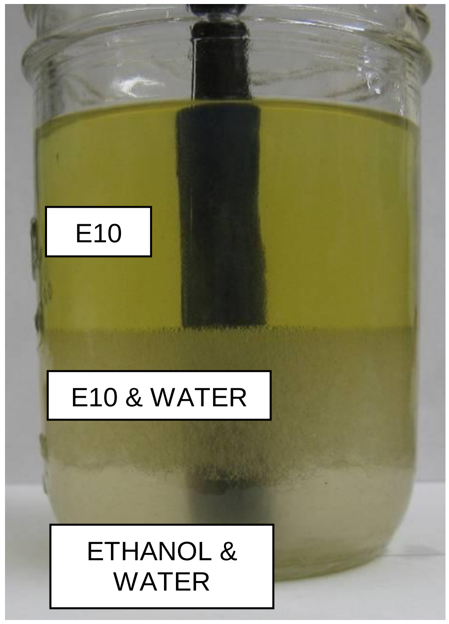
WARNING**
During high ambient temperature conditions, run the fuel pump for 5 mins to flush the fuel lines and minimize the potential for vapor lock.

*****Since the gascolator is not at the absolute bottom of the fuel system, running the fuel pump will 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 in-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.

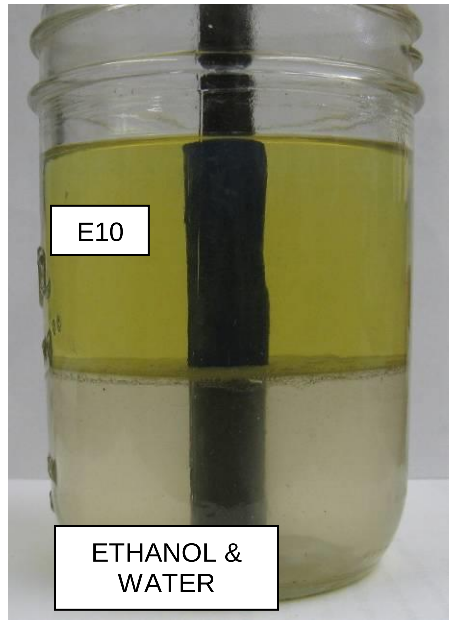
******The recommended fuel pump run time to flush the fuel system is based on the low flow rate through the return line restrictor fitting. Particular attention should be given to the battery voltage when flushing the system, turn off all unnecessary electrical equipment to conserve battery power. If 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.



INITIAL STATE (AFTER MIXING)



MINUTES LATER



FINAL STATE

Refer to the pictures above:

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

Cold Weather Procedures

Post-Flight:

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

Severe Cold:

- Drain the fuel system if the temperature falls below -30ºF [-34ºC].

Long Term Storage

- Fuel Tank – DRAIN
- Fuel Lines – DRAIN
- Gascolator – DRAIN
- Carburetor Bowls – DRAIN
- Option: Fill system with 100LL

CABIN (continued)

- ELT – CHECK OFF
- Baggage – RESTRAINED
- Foreign or Misplaced Objects - CHECK

ACK ELT

ARTEX 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 may possibly 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 be restrained from moving forward into the back of the seatback.

Placing a flat member 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 high up in the baggage area that may come forward.

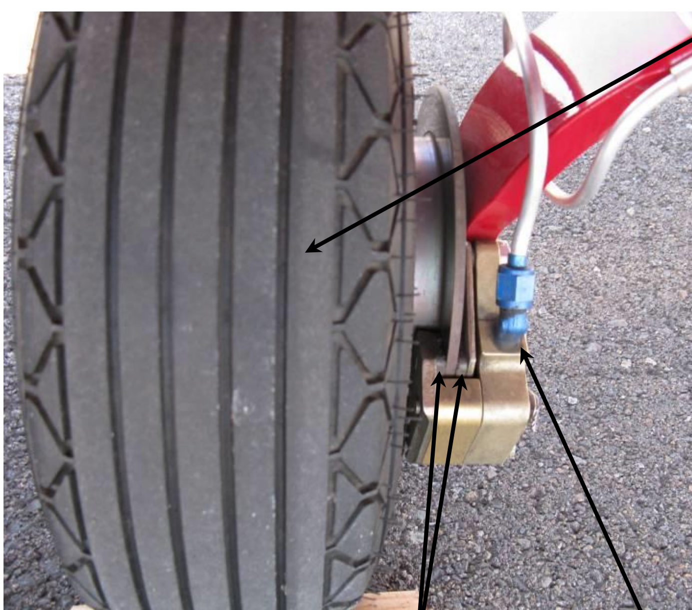
LEFT MAIN LANDING GEAR

- 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 Chocks – REMOVE

NOTE

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

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



BRAKE PADS INTACT

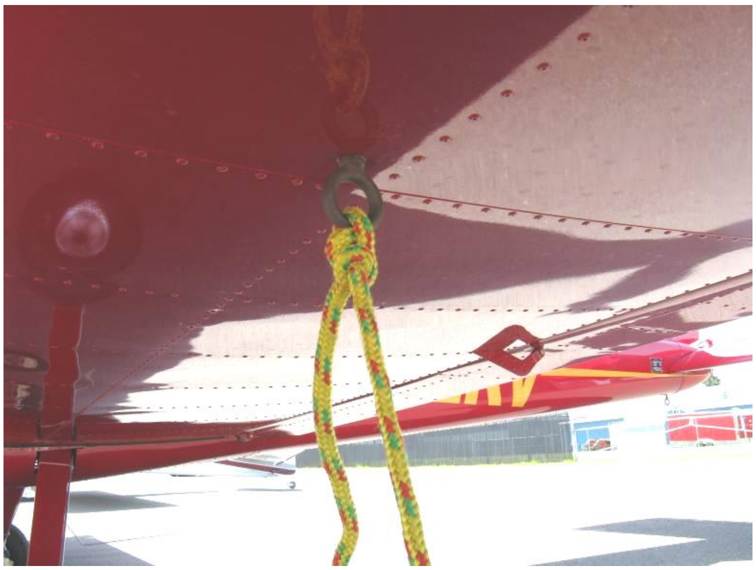
VERIFY NO BRAKE FLUID LEAKAGE

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.

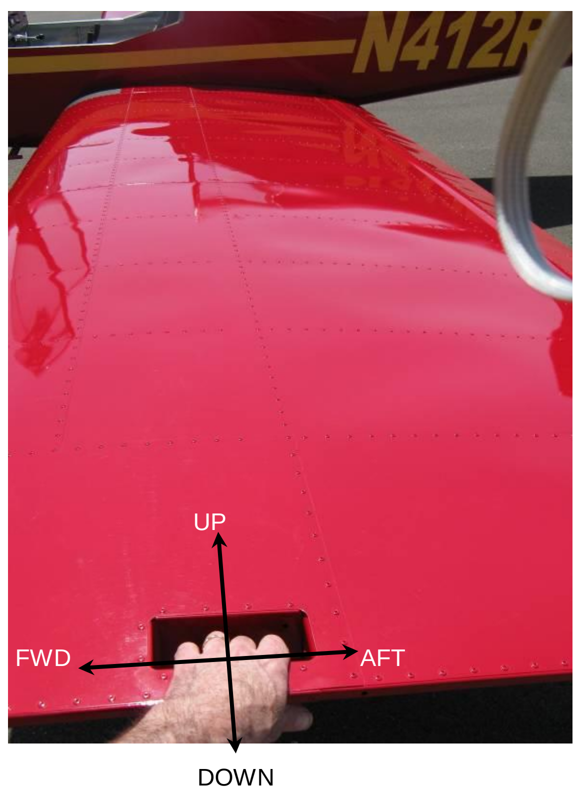
- Tie-Down – UNTIE the tie-down rope/chain, REMOVE eye bolt if desired.



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

- 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.

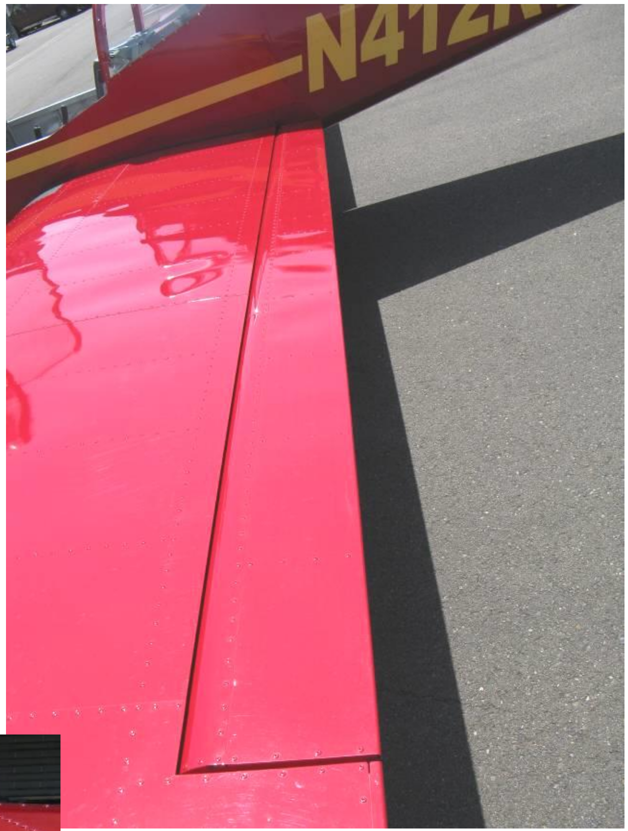
WARNING
Excessive fore and aft play in the left wing will also render the EFIS AOA indications inaccurate.



LEFT WING (continued)

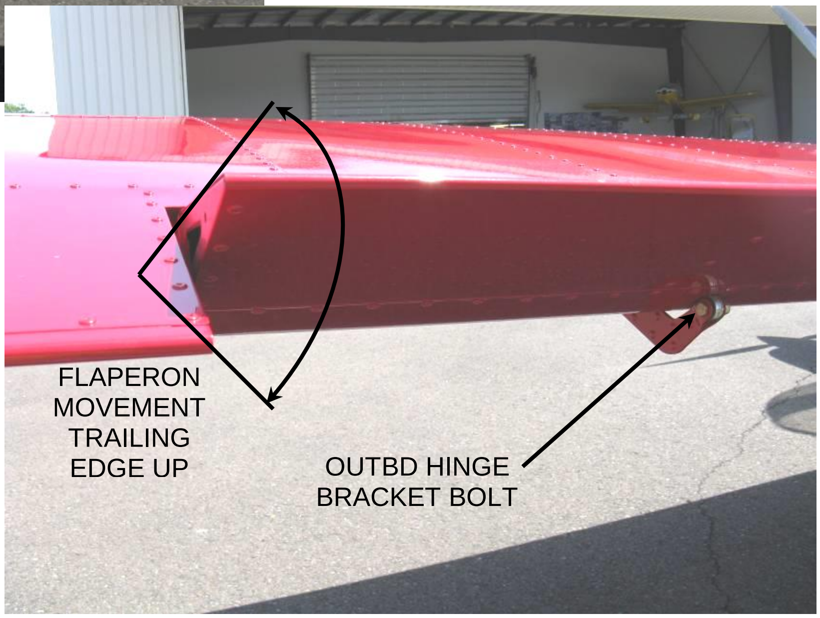
- Flaperon – CONDITION

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



- Flaperon – FREEDOM OF MOVEMENT

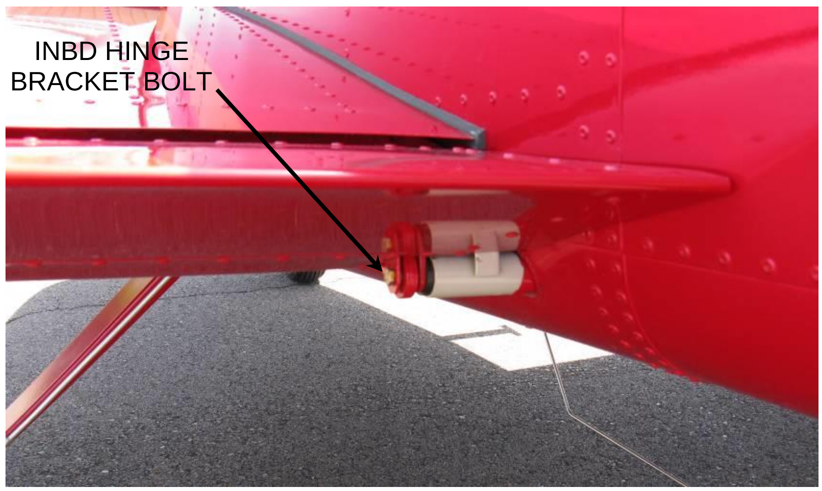
  Move the flaperon through its full range of motion. Verify that it hits a definite stop at both ends of its travel and that there is no binding or limiting friction.



LEFT WING (continued)

- Flaperon - HINGE BRACKET ATTACHMENT

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



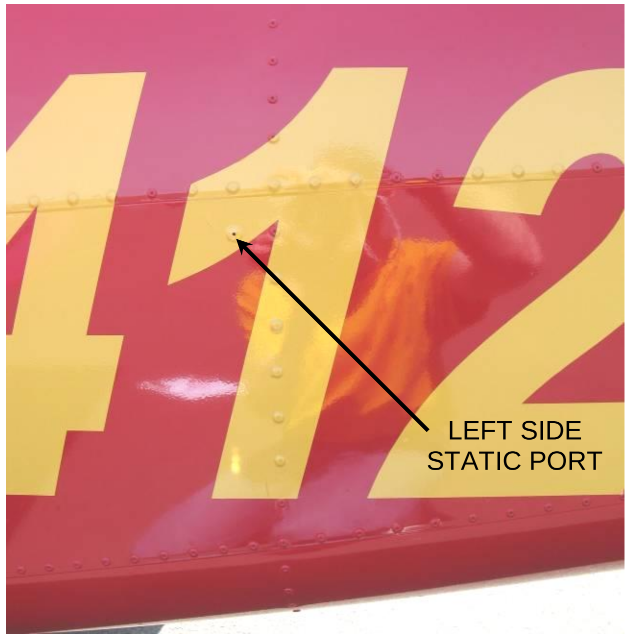
FUSELAGE (LEFT SIDE)

- 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

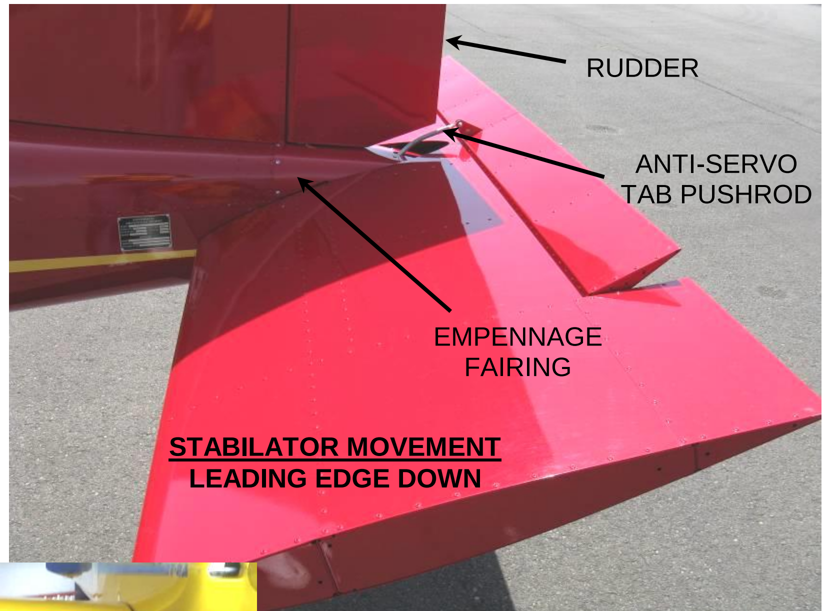
  Look at vertical stabilizer in general, look for dents (Particularly dents in the leading edge), wrinkles, missing or loose rivets, missing or loose screws. Confirm solid attachment to the fuselage.

EMPENNAGE (continued)

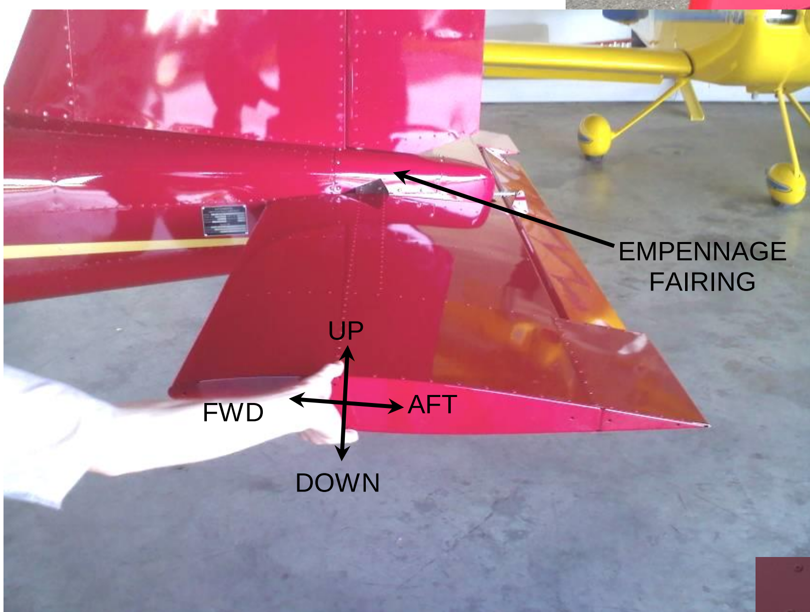
- Stabilator – CHECK condition, freedom of movement

  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.

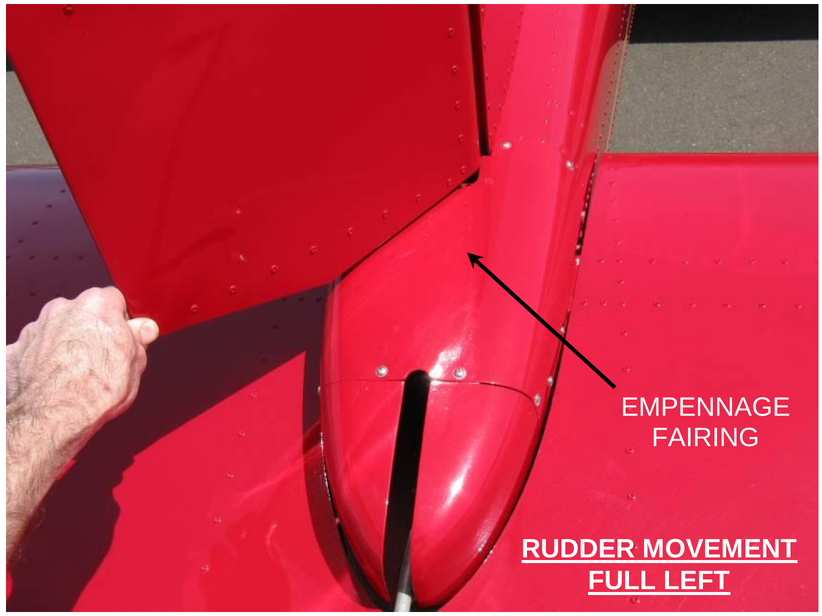
  Verify that the anti-servo tab hinge pins are installed and that the anti-servo tab pushrod attach bolt is installed and that there is no free play in the anti-servo tab rod end bearing. Verify clearance between anti-servo tab pushrod in fully up position and rudder in any position.

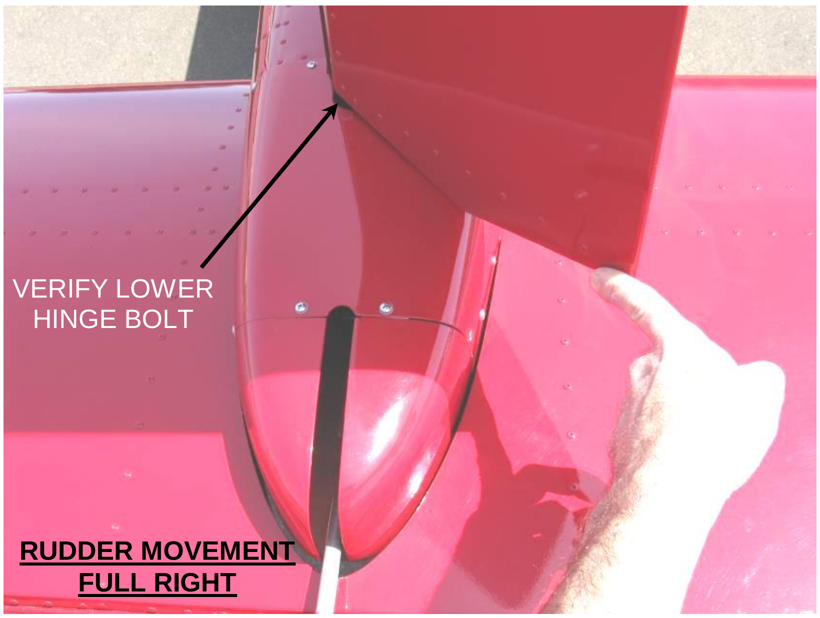
EMPENNAGE (continued)

- 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.

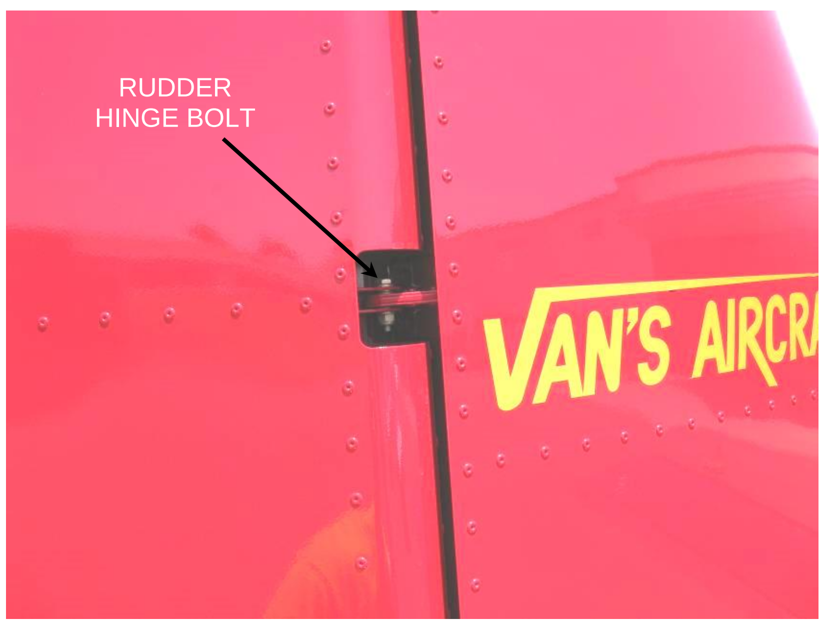
  Verify that the rudder hinge bolts are installed.





- 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

FUSELAGE (RIGHT SIDE)

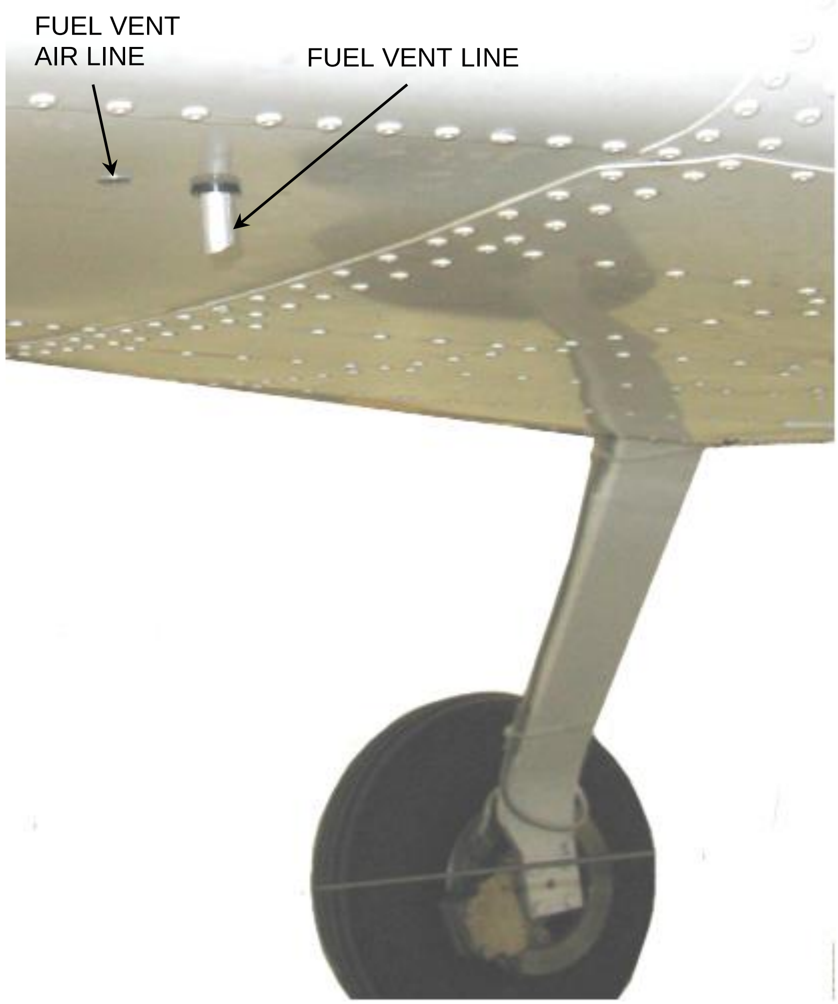
- Static Port – CLEAN & OPEN

- Comm. antenna - CONDITION

  Verify that the comm. antenna is securely attached and has not been damaged. Verify that the skin surrounding the antenna 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

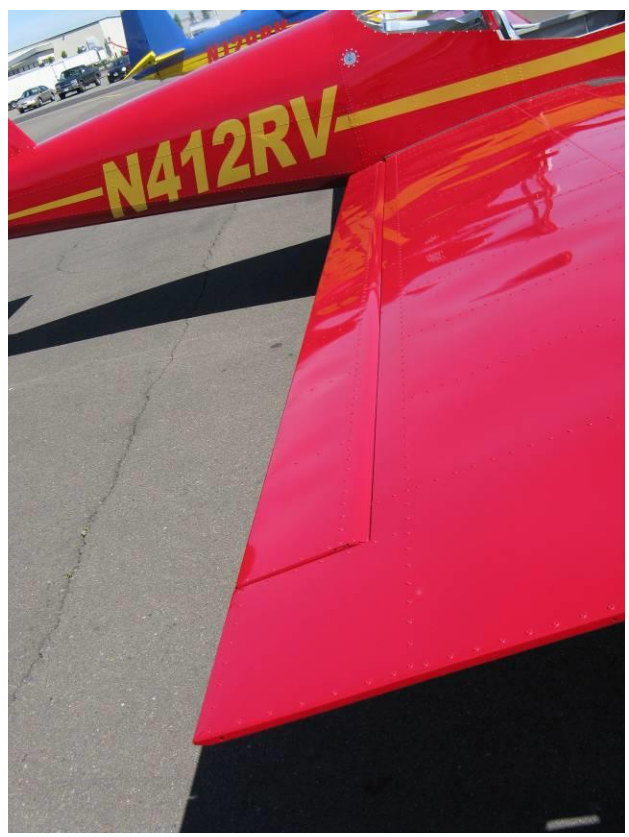
RIGHT WING (Continued)

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.

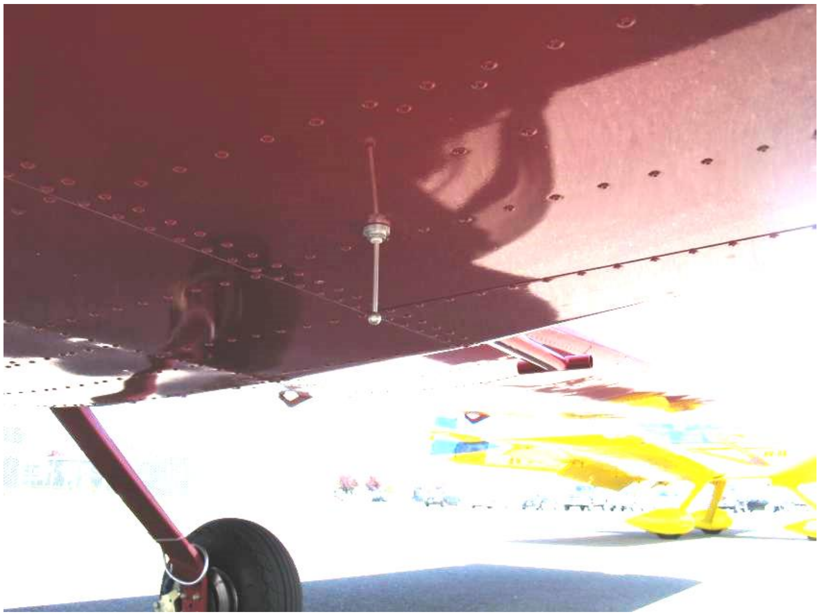
- Tie-Down – UNTIE the tie-down rope/chain, REMOVE eye bolt if desired.

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 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

- Nose Landing Gear –
- CHECK attachment to fuselage

NOSE SECTION (Continued)

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

NOTE

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

- Wheel Chocks - REMOVE

- Cowling – CHECK condition, all screws properly installed
- Right Air Inlet – CHECK unobstructed

- Propeller and Spinner – CHECK condition, security
- Pitot – CLEAN & OPEN

PITOT TUBE

NOSE SECTION (Continued)

- Cooling Air Duct – CHECK unobstructed

- Left Air Inlet – CHECK unobstructed

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

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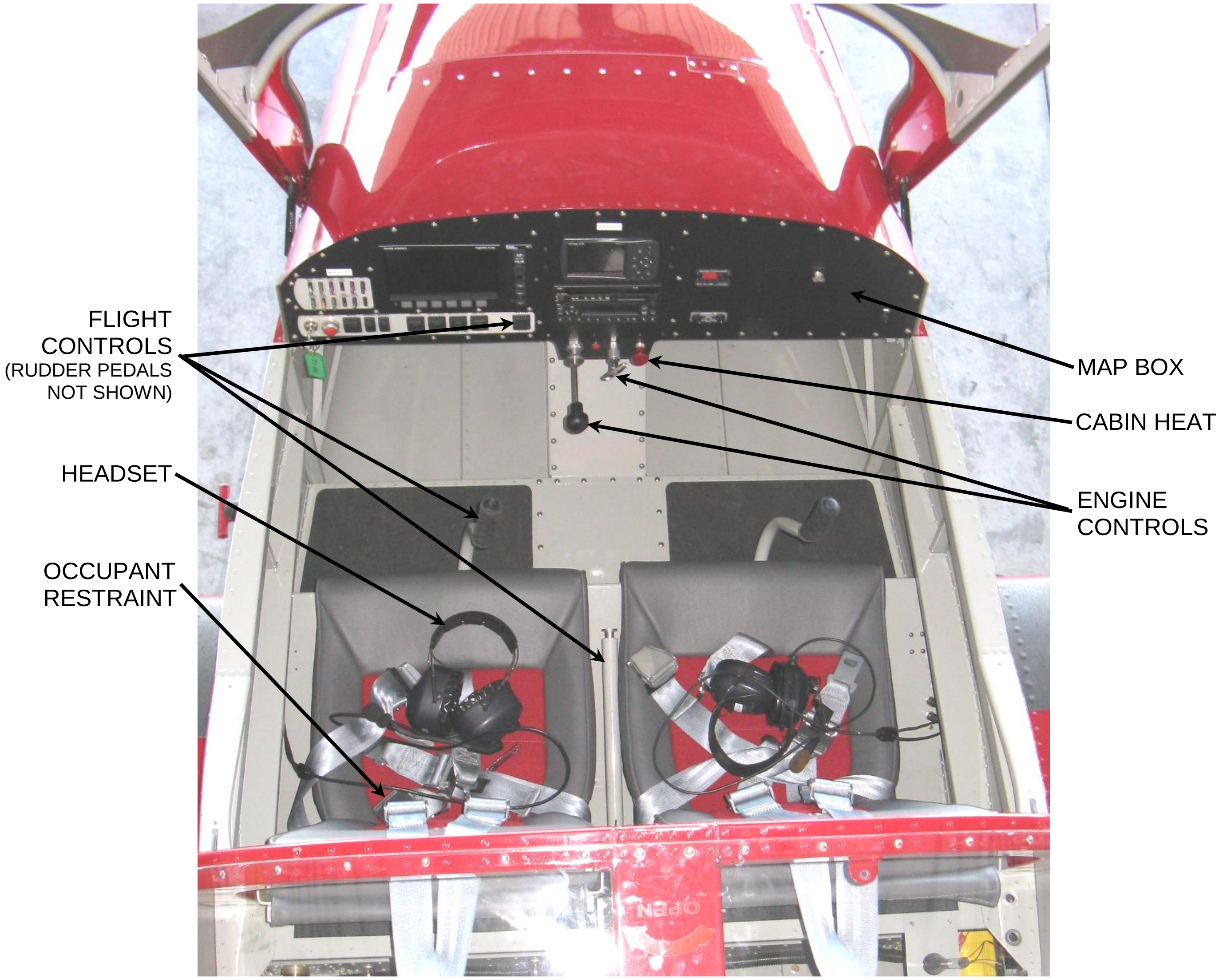
SECTION V
CABIN OVERVIEW

INDEX

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



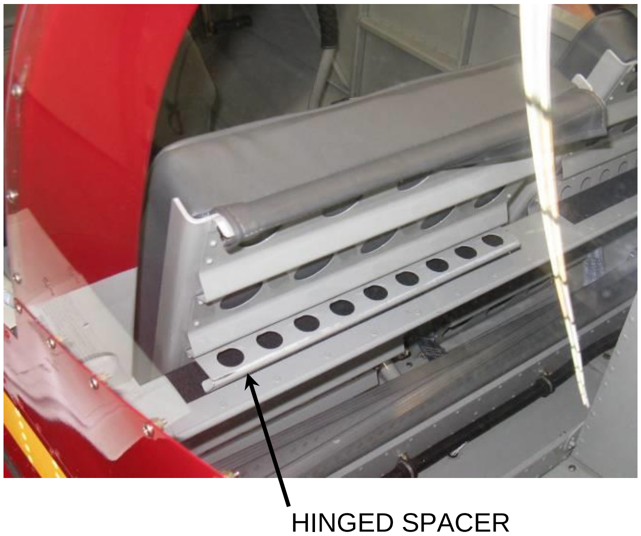
SEAT POSITION ADJUSTMENT

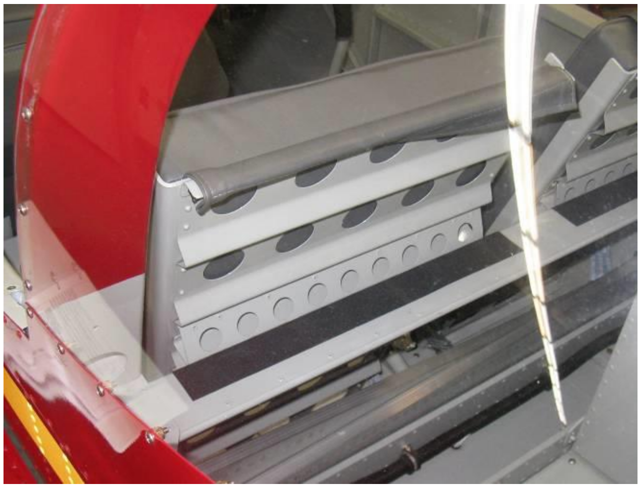
Proper positioning of the seatback is key to establishing the correct relationship of the various controls to the pilot.

The seat must be far enough forward that the pilot can apply full rudder when required. Additionally, the seat must be far enough back to allow full aft control movement. Optional rudder pedal blocks are available for shorter legged pilots who are unable to get full rudder deflection when the seat is as far forward as possible.

The seatback can be attached to the seat pan in one of two positions. Lift-up the seat bottom cushion to access the two hinge halves mounted to the seat pan.

Additionally the seatback recline angle can be adjusted by how the hinged spacer on the aft side of the seatback is positioned. The seatback position and recline angle can be adjusted independently of each other.





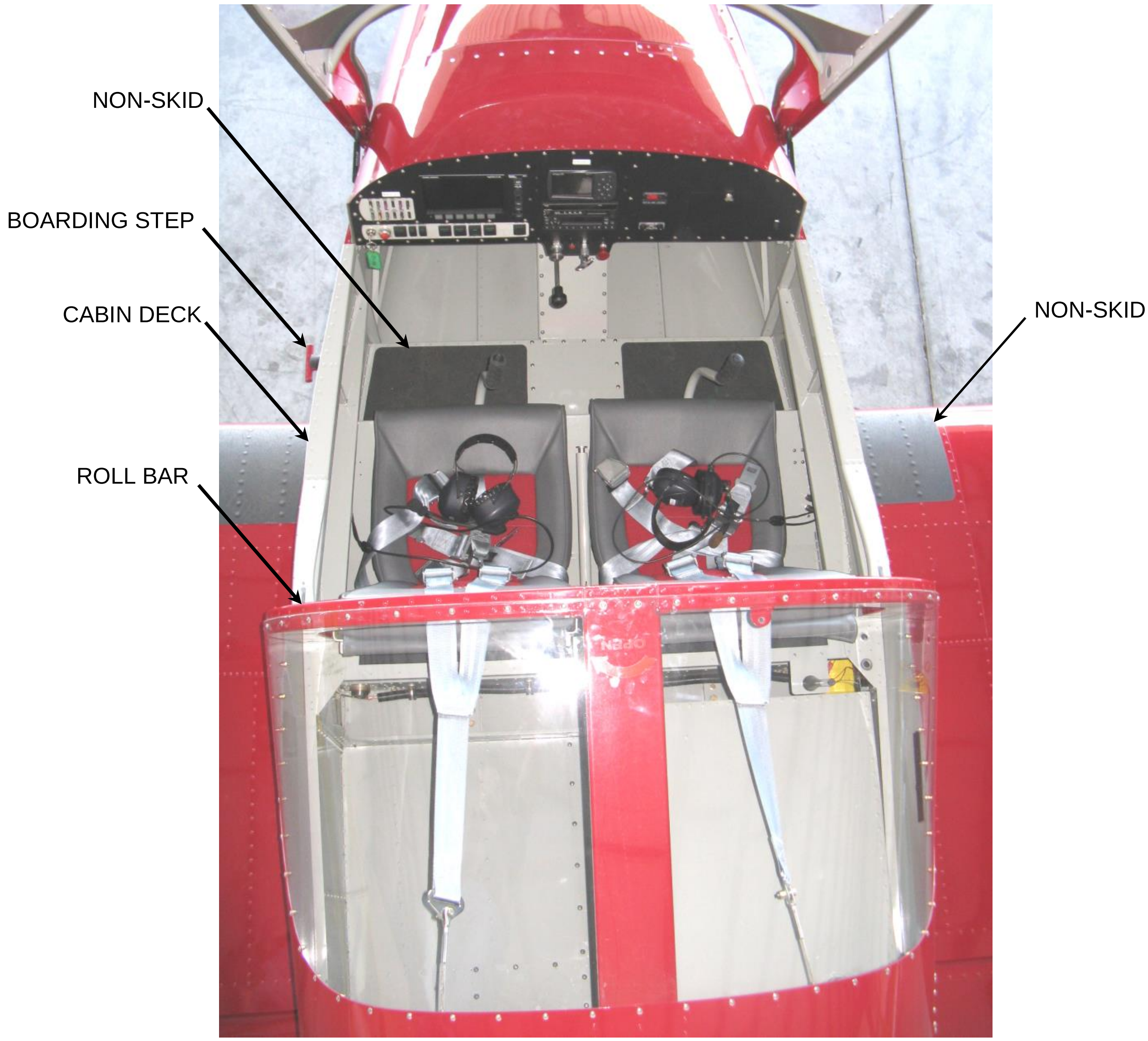
ENTRY & EXIT TECHNIQUE

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: Put bottom on non-skid on 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.

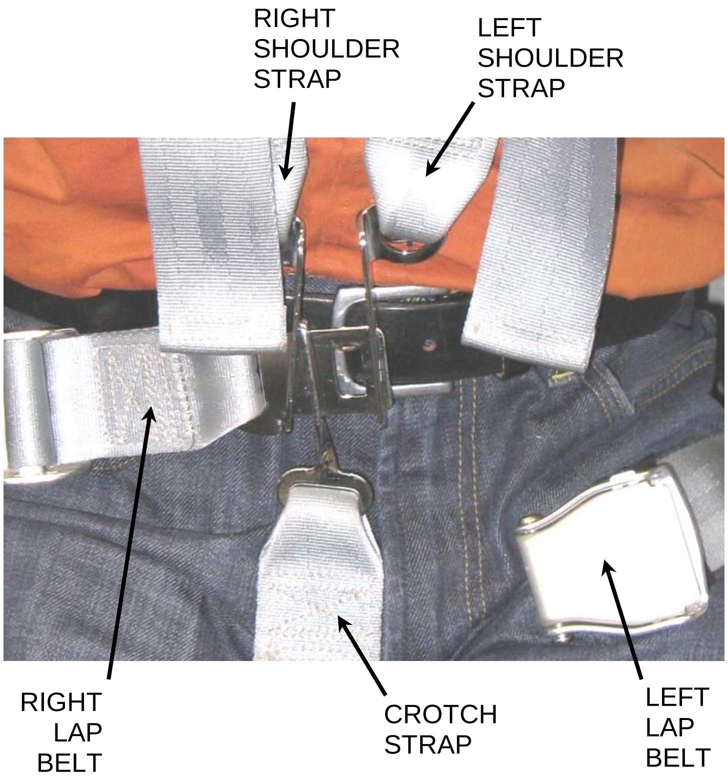
Lower the canopy by pulling aft on the canopy frame. As the canopy rotates down, reach for and grab the canopy latch handle and allow the canopy to finish its rotation down to the closed position. Rotate the canopy handle from being oriented sideways to being oriented fore and aft. The aft ear of the 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 back past the detent before it can be raised up.

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



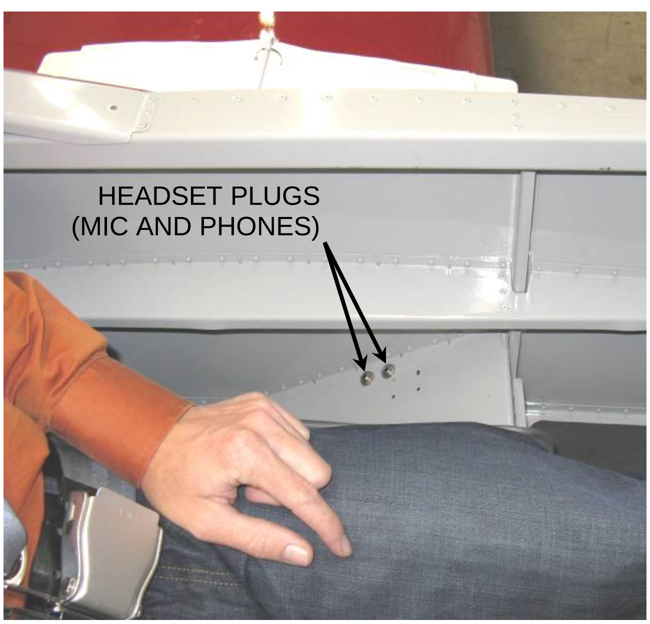
OCCUPANT RESTRAINT

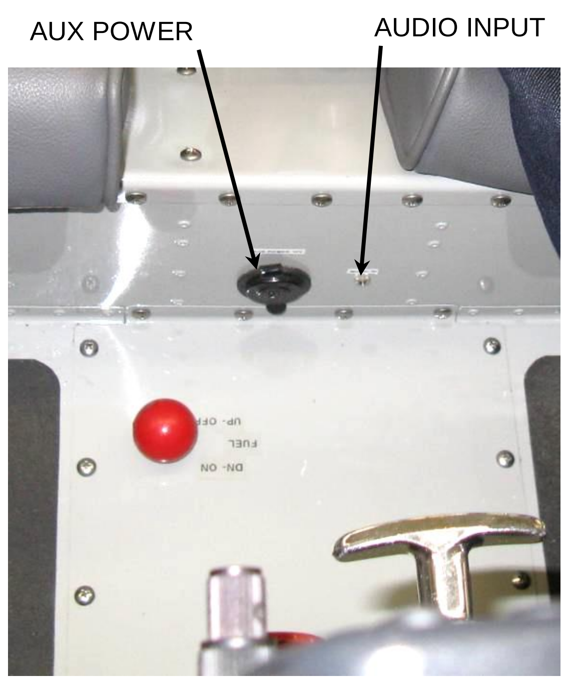
How to get strapped-in properly and adjust lap belt, crotch-strap, shoulder harness.



HEADSET, AUDIO INPUT, & AUX POWER RECEPTACLES

Where to plug-in headsets. Audio input plug location. Aux power jack location.

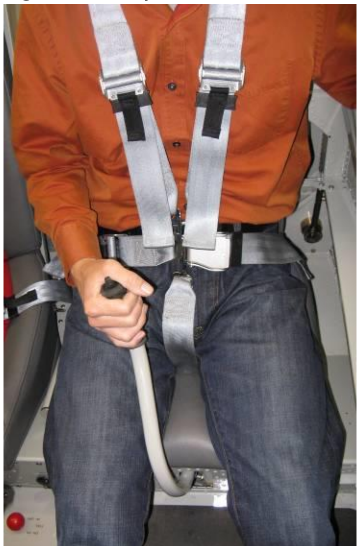




FLIGHT CONTROL SYSTEM

Stick, rudder pedals, brakes, trim. What the surfaces do when the cabin control is moved.

Stick movement controls pitch and roll of the aircraft when in flight. Below each picture explains the position of the trailing edge of the specified control surface.



Left Flaperon: DOWN
Right Flaperon: UP
Stabilator: UP

Left Flaperon: DOWN
Right Flaperon: UP
Stabilator: DOWN

Left Flaperon: UP
Right Flaperon: DOWN
Stabilator: DOWN

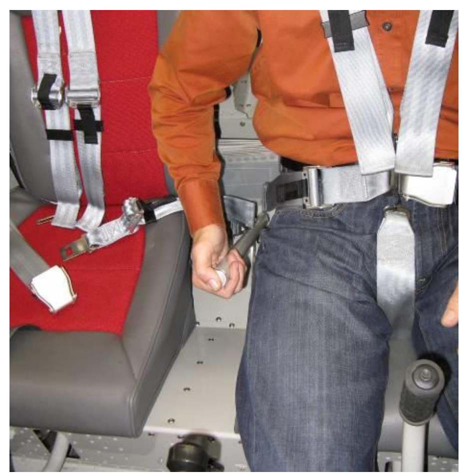
Left Flaperon: DOWN
Right Flaperon: UP
Stabilator: UP

Flap function of the flaperons is controlled using a flap lever. The flap lever has 3 detents. 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.

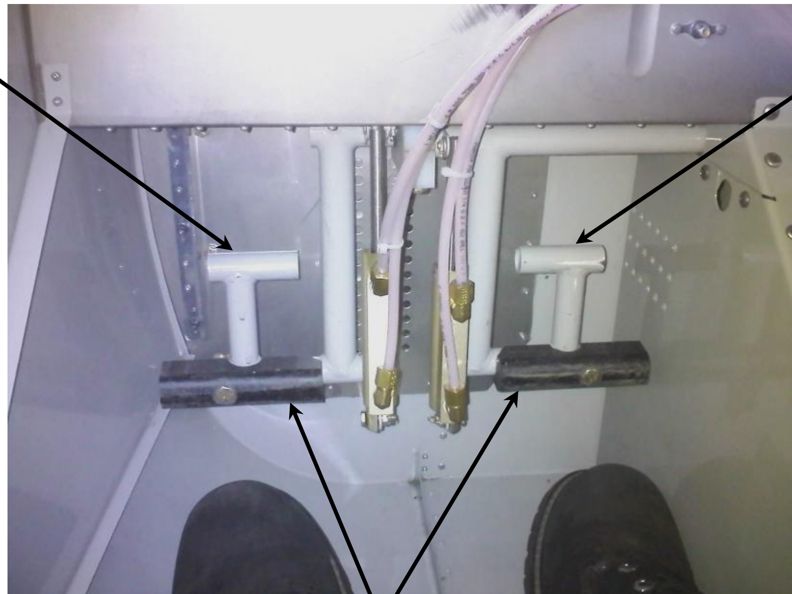
FLAPS UP

FLAPS HALF



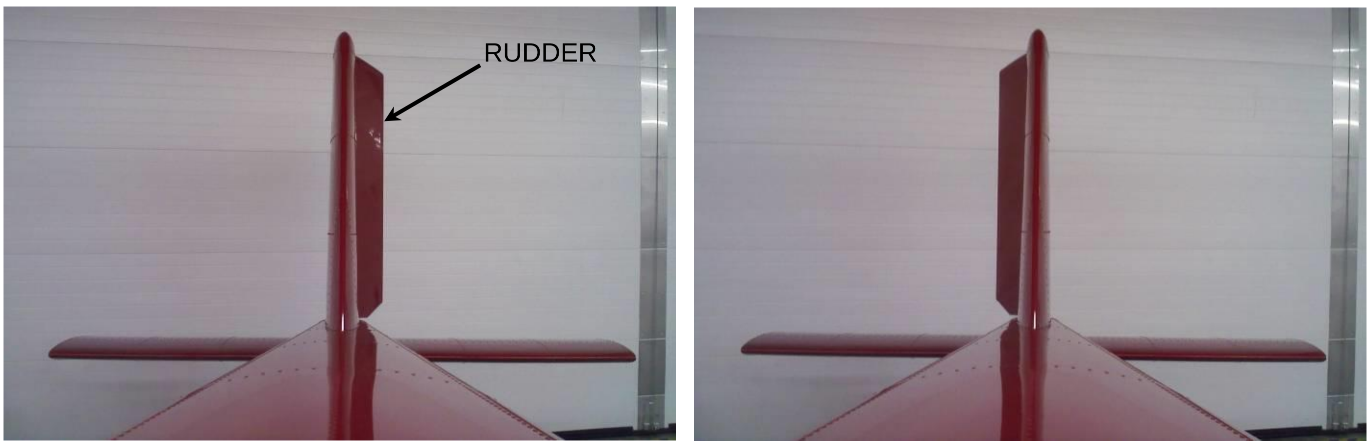
FLAPS DOWN

Rudder pedals control yaw during flight. Brake pedals are integrated with the rudder pedals. The brakes provide stopping and turning control while taxiing.



RUDDER PEDAL EXTENSIONS
Rudder pedals extensions are available from Van’s Aircraft. No tools needed to install.
Part number: RV-12 RUDR.PEDAL EXT.

NOSE TO THE LEFT NOSE TO THE RIGHT



Rudder pedals and related Rudder movement

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Trim is adjusted using a momentary switch on the instrument panel. Accurate adjustment can be made easier by steadying the operating hand on part of the instrument panel during abrupt movements.

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Trim is adjusted using a momentary switch on the instrument panel. Accurate adjustment can be made easier by steadying the operating hand on part of the instrument panel during abrupt movements.

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ENGINE CONTROLS

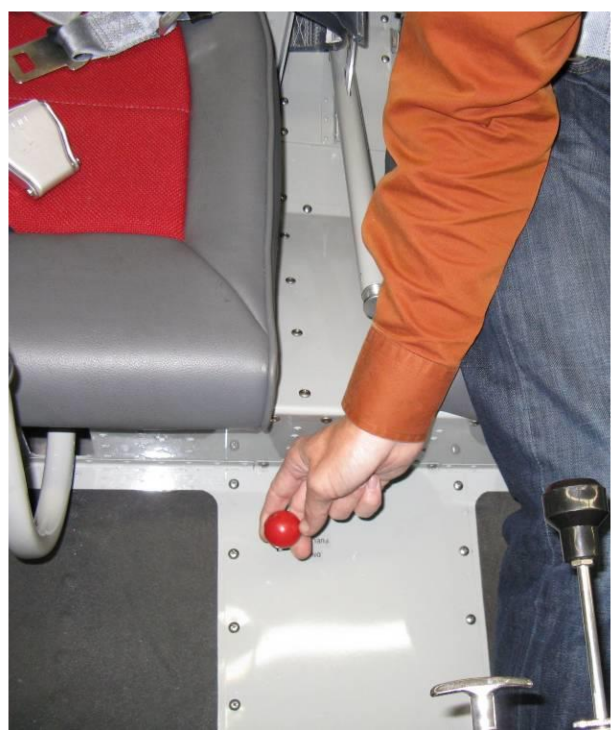
Throttle, choke, fuel shut-off valve

Throttle is used to control the engine RPM. Full throttle position is when the throttle knob is closest to the instrument panel. The throttle control can be set at a specific position by tightening the friction control.

FRICTION CONTROL

Choke is used for cold starting. The choke can be locked in a specific position by rotating the 'T' handle.

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



THROTTLE RETURN SPRINGS

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 very important that the throttle positions of both carbs remain closely matched to prevent uneven power pulses (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 breakage of the 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 end result is that the Rotax throttle requires more operator effort to alter its position than throttles on traditional aircraft engines.

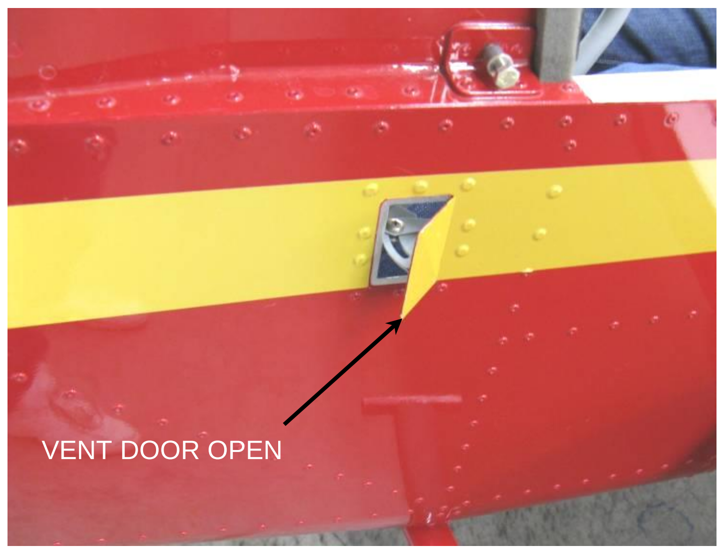
In an effort to achieve lower throttle friction, throttle arm springs have been supplied rated at a lower lbs./in tension per displacement than the stock spring supplied with the Rotax engine. Use of these springs will require a periodic test of the spring functionality as described in the maintenance manual.

FRICTION-VERNIER THROTTLE

Operation of the McFarland Friction-Vernier throttle CT DUAL THROTTLE 12V (MCRV12-TV) is identical to the operation of the standard friction-lock throttle CT DUAL THROTTLE 12 (MCT100D-V) with the exception that small throttle adjustments can also be made by twisting the throttle knob (clockwise-advance, counterclockwise-retard). The McFarland Friction-Vernier throttle operation differs from traditional vernier throttles which incorporate a positive locking mechanism requiring a push-button release action, simply push or pull to override the vernier action.

VENTILATION & HEATER
Vent operation. Heater operation. Optional sunshade.

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.



VENTILATION & HEATER (Continued)
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.

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 if shade is desired. The sunshade is stowed by sliding it aft and holding stationary with the lock screw.

CANOPY CLOSED SAFETY SWITCH

- When the canopy latch is closed a switch is closed behind the roll bar. This is indicated on a SkyView system in the EMS section by a green light.
- If the canopy latch is not latched on a SkyView system the indicator light within the EMS section of the display will turn red.
- For a G3X or SkyView system if the RPM is greater than 3700 RPM with the canopy open an audio warning as well as an onscreen warning will be given. During run-up or during the take-off roll as the RPM is advanced a warning will be given to the pilot.

SECTION VI

INSTRUMENTATION, AVIONICS, & ELECTRICAL SYSTEM

INDEX

GENERAL

This section covers all the items in the instrument panel, switches and fuses, as well as installed instrumentation, avionics (G3X, Skyview, D180, SL40, GTR 200, GTX327, GPS MAP2/3/495/6), intercom and ELT.

CAUTION

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

RV-12 ELECTRICAL SYSTEM THEORY

The 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 and GPS) or are powered-up any time the master switch is on (as is the case for the stall warning system, pitch trim motor, electric fuel pump, and avionics cooling fans). Fuses, most with LED "trip" indicators, are used for protection of the various electrical circuits resulting in lower cost and weight with no adverse effect on safety or functionality. 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 so that, 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, electric fuel pump, and avionics cooling fans operating long enough to allow the flight to be completed.

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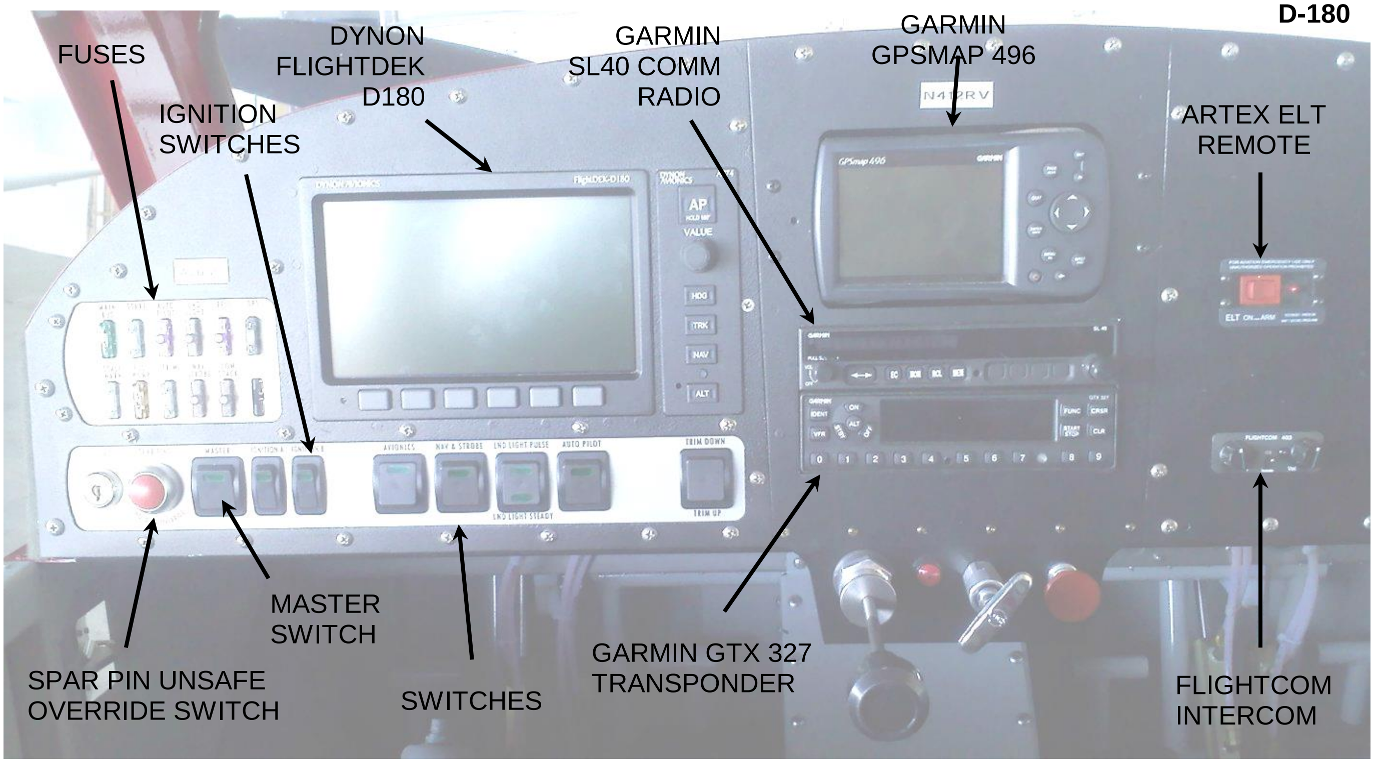
D-180



ELECTRICAL SWITCHES

Except for the keyed starter switch and spar pin unsafe override switch, all switches are internally lit automotive style rocker switches.

Starter switch: This is a keyed momentary contact switch that activates the engine starter so long as the master switch is on and the spar pins are properly installed.

Spar pin unsafe 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 lit, 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, this disable function may be overridden by holding the switch in while activating the starter switch.

WARNING
The spar pin unsafe override switch must never be used when the aircraft is on the ground.

Master switch: This switch connects the battery to the rest of the electrical system via a solenoid. With the master switch on, the EFIS(s), avionics cooling fans, electric fuel pump, stall warning system, and pitch trim system all receive power.

Ignition switches: Each switch controls one of the two electronic ignition modules on the engine.

Avionics switch: This switch controls power to the GPS, communications radio, transponder, intercom and the EFIS (D-180 only),

Nav & strobe switch: This switch controls power to the navigation, strobe and cockpit lights (if installed).

Landing light switch: This switch controls power to the landing light (if installed) and controls whether the light is on continuously (for illumination during night operations) or whether the light pulses on/off/on (for enhanced daytime visibility to other aircraft).

Autopilot switch: This switch controls power to the autopilot (if installed).

Trim switch: This is a momentary contact switch that operates the pitch trim servo motor in either the nose-up direction or nose-down direction.

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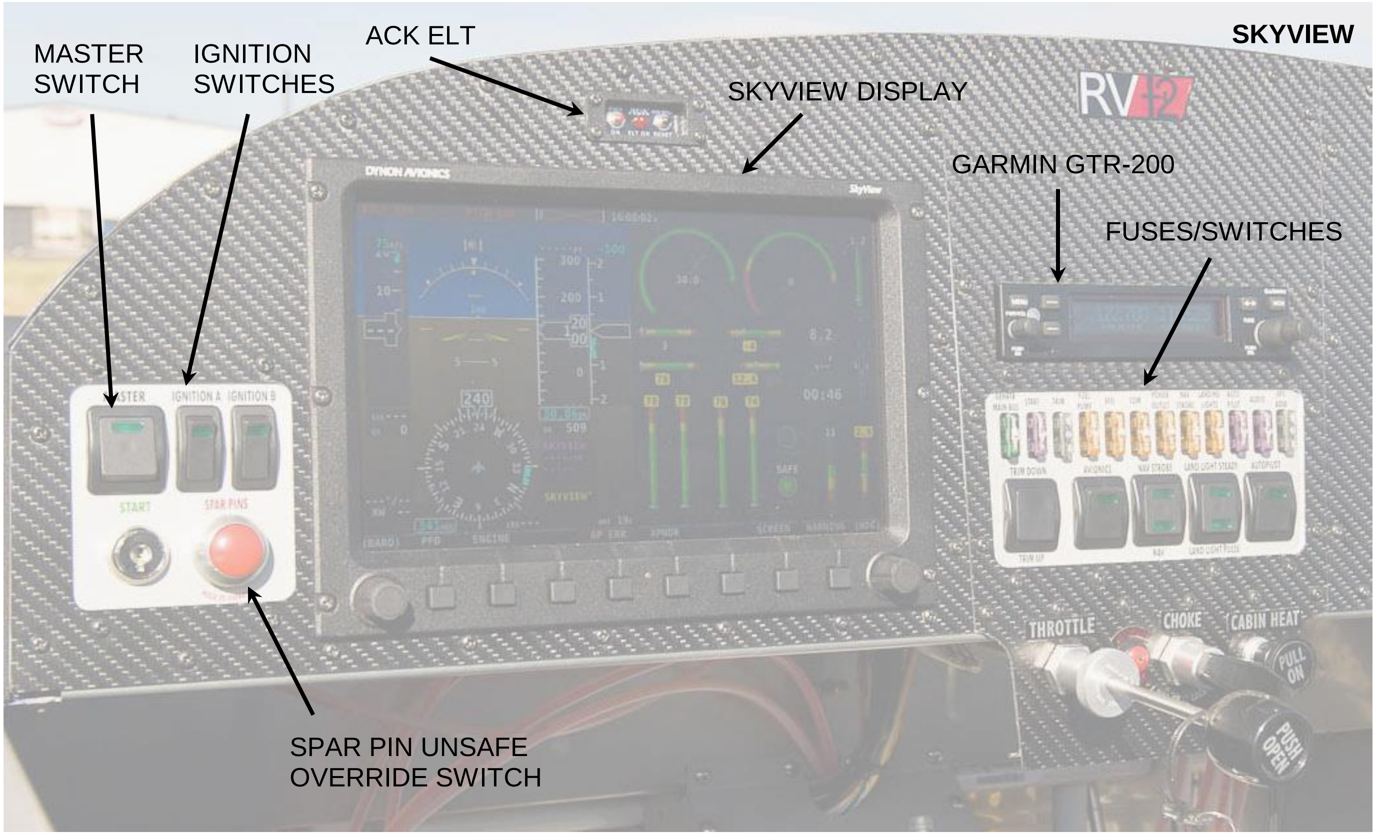

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WARNING
The spar pin unsafe override switch must never be used when the aircraft is on the ground.

Master switch: This switch connects the battery to the rest of the electrical system via a solenoid. With the master switch on, the control module internal cooling fan, EFIS(s), GPS, electric fuel pump and pitch trim system all receive power.

With PS Engineering PM-3000-RV or FlightCom 403 avionics installed, the intercom and stall warning system will also receive power when the master switch is on.

Ignition switches: Each switch controls one of the two electronic ignition modules on the engine.

Avionics switch: This switch controls power to the transponder, SL-40 or GTR-225 radios or the GTR-200 comm radio & intercom.

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

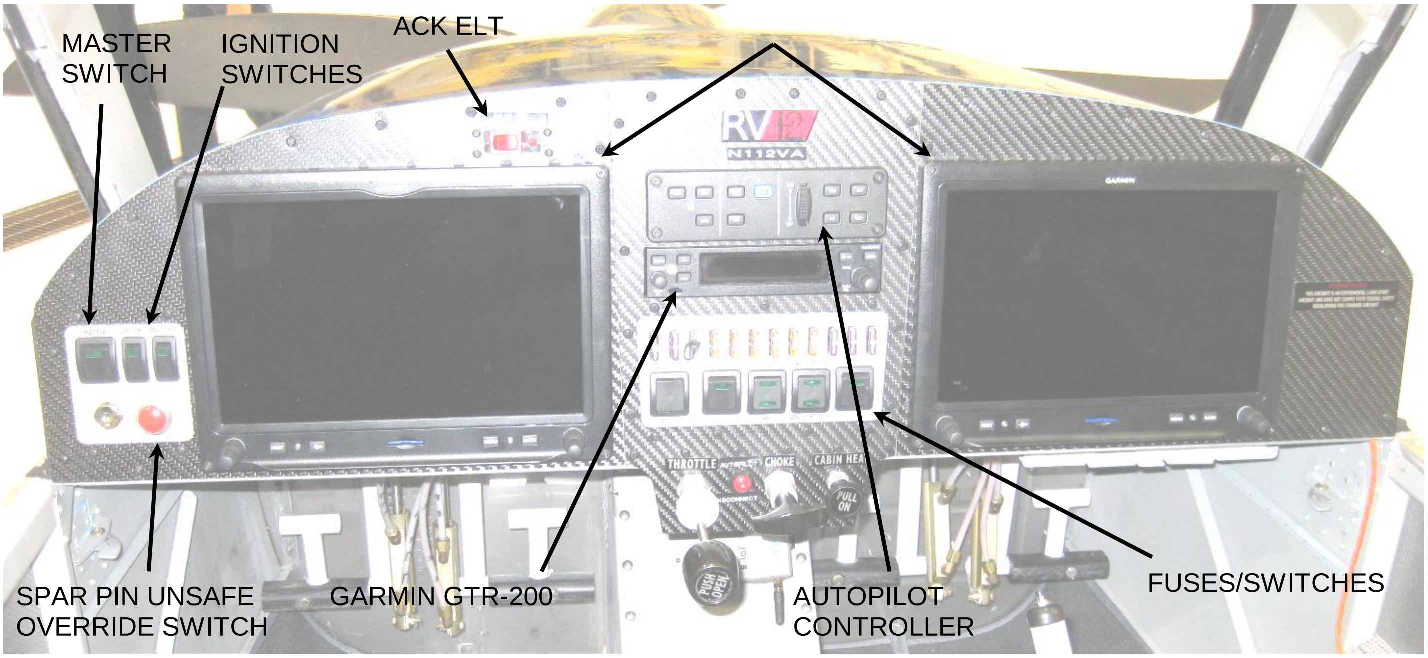
Nav & strobe switch: This switch controls power to the navigation, strobe and cockpit lights (if installed).

Landing light switch: This switch controls power to the landing light (if installed) and controls whether the light is on continuously (for illumination during night operations) or whether the light pulses on/off/on (for enhanced daytime visibility to other aircraft).

Autopilot switch: This switch controls power to the autopilot and SV-AP-PANEL (if installed).

Trim switch: This is a momentary contact switch that operates the pitch trim servo motor in either the nose-up direction or nose-down direction.

G3X



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WARNING
The spar pin unsafe override switch must never be used when the aircraft is on the ground.

Master switch: This switch connects the battery to the rest of the electrical system via a solenoid. With the master switch on, the control module internal cooling fan EFIS(s), electric fuel pump and pitch trim system all receive power.

In addition, the Master switch arms the backup battery. Should the main bus voltage drop, the backup battery will then supply power to the EFIS in order to provide attitude, air data and engine information.

If the PS Engineering PM-3000-RV or FlightCom 403 avionics are installed, the intercom and stall warning system will also receive power when the master switch is on.

Ignition switches: Each switch controls one of the two electronic ignition modules on the engine.

Avionics switch: This switch controls power to the transponder, intercom, comm radio.

NOTE

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

Nav & strobe switch: This switch controls power to the navigation, strobe and cockpit lights (if installed).

Landing light switch: This switch controls power to the landing light (if installed) and controls whether the light is on continuously (for illumination during night operations) or whether the light pulses on/off/on (for enhanced daytime visibility to other aircraft).

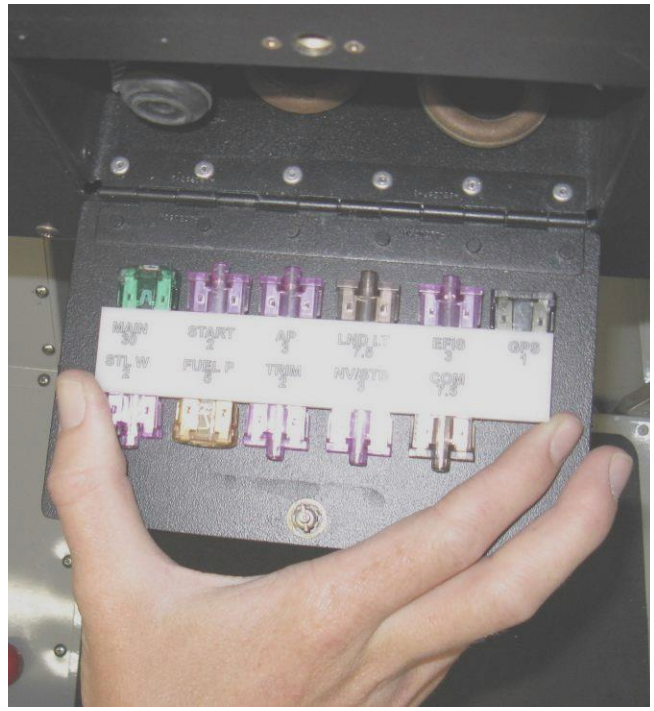
Autopilot switch: This switch controls power to the autopilot servos and controller (if installed).

Trim switch: This is a momentary contact switch that operates the pitch trim servo motor in either the nose-up direction or nose-down direction.

FUSES

The fuse panel is located directly on the instrument panel. Replacement fuses are stowed in a special holder and the holder is Velcro-ed to the inside surface of the map box door or under the instrument panel.

FUSE HOLDER UNDER PANEL



FUSE HOLDER IN MAP BOX

SKYVIEW/G3X FUSE PANEL

D180 FUSE PANEL

DYNON AVIONICS
The user guides can be downloaded - see Section 1 Links for internet location.

GARMIN AVIONICS
The user 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.

ARTEX ELT
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.

SECTION VII

PRE-TAKEOFF GROUND OPERATIONS

INDEX

PRE-START

- EFIS – POWER-UP (D-180 and SkyView only) by holding the left button depressed until the screen flashes then release button.
- Passenger Briefing – PERFORM *
- Seat Belt/Shoulder Harness/Crotch Strap – FASTENED & SNUG
- Canopy – CLOSED and LATCHED
- Fuel Valve – OPEN (push down)
- Throttle – ADJUST FRICTION
- Master – ON
- Ignition – BOTH ON
- Anti collision light - ON

ENGINE START

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

- Fuel Pressure – NORMAL
- Throttle – Cold Start – FULLY CLOSED
  Warm Start – 1/8 in OPEN
- Choke – Cold Start – PULL handle fully out and hold.
  Warm Start – OFF
- Brakes – HOLD
- Propeller – CLEAR
- Ignition Key – ENGAGE
- Throttle / Choke – 2000 RPM
- Oil Pressure – CHECK 12 psi within 10 seconds or immediately shutdown the engine
- Ammeter – CHARGING
- Choke – OFF
- Avionics Switch – ON
- Autopilot Switch – ON

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

* 14 CFR 91.327(e) Each person operating an aircraft issued a special airworthiness certificate in the light-sport category must advise each person carried of the special nature of the aircraft and that the aircraft does not meet the airworthiness requirements for an aircraft issued a standard airworthiness certificate.

SYSTEMS POWER-UP
After engine start and while the engine warms up, the comm. radio and transponder should be set as appropriate, the ATIS/ASOS information obtained, and if needed, navigation waypoints designated.

TAXIING
Taxi operations during high winds require the conventional use of the flight controls. With a head wind or quartering head wind, place the control stick full aft and into the wind. With a tail wind or quartering tail wind, use the opposite procedures. The use of the wheel brakes in conjunction with the rudder will assist the pilot in maintaining directional control. The primary directional control during ground operation is the rudder. Brakes should be used only if and as required to augment the directional control authority provided by the rudder. During taxi, verify flight instruments are displaying correctly and agreeing with known headings.
Be mindful of oil temp/RPM limitations during first taxi of the day. Especially on hot days CHT 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 F-1231G Canopy Catch*.

- Engine Gauges – CHECK
- Brakes – RELEASE
- Taxi rpm – **1800–2500 rpm until oil temp 120° F**
- Flight Instruments – VERIFY proper indications.

BEFORE TAKEOFF RUN UP

- Brakes – HOLD
- Flight Controls – CHECK
- Flight Instruments – CHECK & SET
- Fuel Valve – CHECK OPEN
- Fuel Quantity Indication - CHECK (no take-off with less than 4 gallons fuel)
- Trim – SET for takeoff
- Flaps – SET for takeoff 1st DETENT
- Canopy – CHECK Latched
- Engine Run-Up
  - Minimum Oil Temp 120° F
  - Stabilator – STICK BACK
  - Throttle – 4000 rpm
  - Ignition – Cycle A – B- BOTH ON
    - (Max rpm drop - 300)
    - (Max diff – 115)
  - Engine Instruments – CHECK
    - Normal Indications
  - Ammeter – CHECK
  - Throttle – IDLE
- Fuses - CHECK
- Fuel Pressure – NORMAL
- Seat Belt, Pilot and Passenger – FASTENED & SNUG
- Takeoff Briefing and Abort Plan – REVIEW
- Brakes – RELEASE

NOTE
Higher RPM will heat the oil more rapidly.

Especially on hot days CHT can rise significantly if RPM is low.
High power operation (above 3000 RPM) and engine run-up should be made into the wind and kept to a minimum during high temperature conditions.

SECTION VIII

TAKEOFF

INDEX

TAKE-OFF (Normal)

- Control Stick – Held half way between neutral and full aft
- Throttle – smoothly apply FULL THROTTLE
- Stabilator Control – hold back pressure on control to RAISE NOSE just clear of ground, release as needed.
- Lift –Off – 50 to 55 KIAS
- Climb Vy – 75 KIAS
- Flaps – UP
- TRIM – as required to hold desired airspeed

TAKE-OFF (Obstacle)

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

- FLAPS – 1st DETENT
- BRAKES – hold until application of full power
- Lift –Off – 50 to 55 KIAS
- CLIMB Vx – 60 KIAS until clear of obstacle

TAKE-OFF (Soft Field)

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

- FLAPS – 1st DETENT
- STABILATOR – hold back pressure on control to RAISE NOSE slightly higher than used for a normal takeoff.
- After Lift-Off – momentarily LEVEL FLIGHT to obtain safe margin of airspeed prior to climb (Vx or Vy)

WARNING

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

TAKE-OFF (Crosswind)

During crosswind conditions, use the normal take-off procedures as well as place the control stick into the wind (up wind aileron UP) and raise the nose just clear of the ground as early in the take-off roll as possible with the elevator control to 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 rudder.

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

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SECTION IX

CLIMB

INDEX

CLIMB FOR BEST RATE Vy
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.

- THROTTLE – FULL
  - 5800 rpm Max 5 min
  - 5500 rpm Max Continuous
- AIRSPEED –
  - Best Rate 75 KIAS
    - Flaps – UP
- ENGINE Gauges – CHECK
- TRIM – as required to hold desired airspeed

CLIMB FOR BEST ANGLE Vx
Use best angle of climb for obstacle clearance immediately following take-off. If necessary for en-route 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

- THROTTLE – FULL
  - 5800 rpm Max 5 min
  - 5500 rpm Max Continuous
- AIRSPEED –
  - Best Angle 60 KIAS
    - Flaps – 1st DETENT
- ENGINE Gauges – CHECK
- TRIM – as required to hold desired airspeed

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.

- THROTTLE – FULL
  - 5800 rpm Max 5 min
  - 5500 rpm Max Continuous
- AIRSPEED –
  - Cruise-climb 85 KIAS
    - Flaps – UP
- ENGINE Gauges – CHECK
- TRIM – as required to hold desired airspeed

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

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SECTION X

CRUISE

INDEX

CRUISE

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

ALTITUDE, SPEED & EFFICIENCY

Cruising at high altitude makes sense 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), also 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 best to use higher power settings (maximum cruise power) as it will minimize the amount of time that the headwind has to slow progress over the ground.

When flying with a tailwind, it is most efficient to use lower power settings (economy cruise power) as it will maximize the amount of time that the tailwind has to aid 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 then the pilot should fly at as low an altitude as is safe and open the throttle as much as possible without exceeding engine rpm limitations. 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 because of 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 is necessary then the pilot should fly at as high an altitude as is practical and legal and select a throttle setting so as to yield 87 kt 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 wide open. 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 headwind, the indicated airspeed for max range is 4 kt greater for every 10 kt of headwind. When flying with a tailwind, the indicated airspeed for 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 given amount of time while using as little fuel as is necessary then the pilot should select a throttle setting so as to yield 65 kt 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 when time spent aloft is of greater concern than the number of miles covered.

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SECTION XI

MANUEVERING FLIGHT

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GENERAL

The ideal is that every pilot is able to *accurately* maintain *control* of the aircraft throughout the entire flight considering the variables of aircraft loading (weight and CG location), and weather (wind, temperature, turbulence).

Maneuvering flight must be practiced so that the appropriate control inputs and the response of the aircraft to those inputs may be learned. In addition, the pilot will have been exposed and become accustomed to the sights, sounds, and accelerations of each maneuver. The 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).

Practice of the various maneuvers is fun and satisfying for the pilot and the investment of time pays off because the pilot can see skills improve. Increased pilot awareness shows where more improvement can be made.

SLOW FLIGHT

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

Practice slow flight with different flap settings. Instructors should make a point of control pressure/pitch changes during transition from 0º flap to approach and full flap and then from full to approach to 0º flaps.
The use of EFIS bugs for setting target altitudes and headings is encouraged as it aids the pilot in more precise flying taking advantage of cockpit resources.

Suggested exercise procedure:
Reduce power and allow the aircraft to decelerate to 60 KIAS while maintaining target altitude. Trim as required to minimize 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 of 180 to 360° heading change using not more than 45° bank.

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

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 and re-establish level hands-off flight at 60 KIAS.

STALLS, POWER-OFF

The pilot who is proficient with 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 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. Upon stall break, release control stick back pressure and increase 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 full power, wings level climb at 65 KIAS. Increase nose-up attitude by approximately 15° and maintain that attitude as airspeed decays to the stall.

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

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

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 maintaining directional orientation during a period of rapid heading change. Steep turns also expose the pilot to the additional pitch and power required to overcome the loss of vertical lift associated with a steep turn and the increased G factor.

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 back pressure slightly on the stabilator to maintain the nose close to the previously noted position relative to the horizon.
Continue the turn for a full 360° ending 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 altitude by visual reference to the horizon with only very quick glances at the EFIS to verify 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.

SECTION XII

DESCENT

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NORMAL RATE DESCENT

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 but shorter 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 realist 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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SECTION XIII

LANDING

INDEX

TRAFFIC PATTERN

Enter the landing pattern at 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 on target altitude. Smoothly reduce power to idle maintaining target altitude until airspeed decays to 65 KIAS. Lower flaps to ½ deflection and trim stabilator. Maintain target airspeed by 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 turn to final so as to allow for ground contact at the target touch-down point at minimum airspeed while maintaining engine power at idle.

Descent rate may be increased by slipping the aircraft.

Descent rate may be decreased by addition of engine power.

NORMAL LANDING

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

Once stablished 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, then the transition to landing attitude is being made too quickly.

Once the aircraft is in the landing attitude, maintain altitude by continuing 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 by continuing to hold back pressure on the control while nose wheel is slowly lowered to the runway. 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 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.

OBSTACLE CLEARANCE LANDING
Use of normal landing procedures in addition:

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

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

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

So as to avoid unnecessary nose gear loads, it is especially important that the nose wheel is gently lowered to the runway after the speed has diminished.

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

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

BALKED LANDING
Use once a decision has been made to go around:

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

LANDING WITH AOA (Angle of attack) INDICATOR
The optional Garmin or Dynon AOA indicators can give the pilot improved situational awareness to avoid exceeding the critical AOA and thus reduce the risk of an inadvertent stall during this critical phase of flight.
When calibrated, AOA indicators provide a three color visual display of the AOA with aural tone. This tone will change intensity with the proximity of the Critical AOA. By getting familiar with the aural tone, the pilot will be able to fly the approach to landing at a safe AOA regardless of bank angle. Refer to your EFIS pilots guide for specific details regarding this device.

NOTE
Upon full application of power, expect to hold right rudder to account for p-factor and forward pressure on the stick until re-trimming to maintain desired climb speed.

Upon application of full power, expect pitch up moment during the transition from full flaps and low-power/idle settings to a no flap and full power. Retract flaps in steps to minimize this effect and allow time to adjust elevator trim.

SECTION XIV

SHUT DOWN

INDEX

SHUT DOWN
Upon arriving at the desired stopping point, throttle idle, ELT check light off, turn ignition switches off, then turn off the avionics switch, then turn off any other switches, 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 min.

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.

Post Ignition - Due to hot weather

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

NOTE
To prevent vapor building in the carburetor after shutdown on hot days, the oil door should be left open to let heat out of the cowl. Leaving the canopy in the open position latched with the F-1231G Canopy Catch*, will reduce the risk of vapor-lock.

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

*F-1231G Canopy Catch can be installed using Notification N 16-10-3.

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SECTION XV

EMERGENCY PROCEDURES

INDEX

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 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.

WARNING

Do not turn off the Master switch with the engine running except in an EMERGENCY situation. Running the engine with the Master Switch off may damage the voltage regulator.

NOTE

All airspeeds in this section are indicated knots airspeeds (KIAS) unless stated otherwise.

FIRE

ENGINE FIRE DURING START

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

- Continue cranking engine with starter
- Choke – PUSH OFF
- Throttle – FULL OPEN
- Fuel Shut-Off Valve – PULL UP - OFF
- Inspect aircraft thoroughly for damage and cause prior to restart

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

- Fuel Shut-Off Valve – PULL UP - OFF
- Electrical and Ignition switches – ALL OFF
- Evacuate Aircraft immediately.
- If available, direct a fire extinguisher through the air outlet tunnel at the bottom of the cowl

ENGINE FIRE IN FLIGHT
An engine fire in flight typically is the result of an oil or fuel leak coming in contact with the exhaust manifold.
To extinguish the fire, is necessary to remove the source by shutting down the engine and initiating an emergency descent.

- FUEL Shut-Off Valve – PULL UP - OFF
- IGNITION A & B – BOTH OFF
- CABIN HEAT/VENTS CLOSED
- AIRSPEED Increase glide speed to find an airspeed which will provide an incombustible mixture without exceeding **Vne**.(**Vno** if turbulence exists)
- Consider Side slip to divert smoke from pilot side.
- Follow "Forced Landing Procedures" on page 5
- If time permits MAYDAY 121.5 MHz (or frequency in use)

WARNING
Do not attempt to restart engine.

Before Touchdown
- Master Switch – OFF
- Airspeed – 60 KIAS (55 KIAS minimum)
- Flaps – DOWN after intended point of landing is assured.

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

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

GENERATOR/ELECTRICAL FAILURE (D-180)

WARNING
Electrical fuel pump operation depends upon sufficient battery power. Monitor the fuel pressure provided by the mechanical engine driven pump if the electrical pump has been shut off using the master switch or fuel pump fuse.
Stabilator trim operation depends on battery power.

A generator failure is indicated by a steady discharge on the ammeter and voltage indication less than 12.0 volts.

- Turn OFF all non-essential electrical equipment to conserve battery power. The avionics switch should be switched off and the EFIS and GPS will continue to operate on their internal batteries.

- Land as soon as possible as the battery will furnish electrical power for a limited time only.

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

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

VOLTAGE REGULATOR FAILURE (D-180)
(Silent Hektik Voltage Regulator Installed)

NOTE The regulator has a voltage ramp up schedule and will take 30 mins to reach full output.

If an optional warning light is installed for the D-180 the voltage regulator will give a warning for one of three reasons. All three should be considered.

1) Overvoltage condition
2) No generator output
3) Over Temp Condition

If the generator would fail and cause an overvoltage condition the regulator will shut down automatically and give a warning. If the generator would fail and no longer provide output a warning will be given. Without the engine running when the aircraft is first turned on a warning will be shown because there is no generator output. Note that for both of these warnings the generator will no longer be charging the battery or supplying power to the main bus. As a result the main bus voltage will drop helping the pilot to realize along with the warning that power is no longer being supplied from the generator.

If an over-temp condition occurs the voltage regulator will continue to supply power to the main bus (the bus voltage will remain normal) but a warning will be given. This would most likely occur in elevated temperatures during lengthy ground operations, during a long climb at slow airspeed, or after extended periods of slow flight just above stall speed. These are extreme conditions not seen during most normal operations. If a warning is given in flight reduce the angle of attack and increase airspeed to help the flow of cooling air across the voltage regulator. If a warning is given on the ground increase the engine rpm to force more air through the cooling duct.

GENERATOR/ELECTRICAL FAILURE (SKYVIEW – G3X)

WARNING
Electrical fuel pump operation depends upon sufficient battery power. Monitor the fuel pressure provided by the mechanical engine driven pump if the electrical pump has been shut off using the master switch or fuel pump fuse.
Stabilator trim operation depends on battery power.

SKYVIEW/ G3X 3-6

A generator failure is indicated by a steady discharge on the ammeter and voltage indication less than 12.0 volts.

- Turn OFF all non-essential electrical equipment to conserve battery power.
- Land as soon as possible as the battery and EFIS backup battery will furnish electrical power for a limited time only.

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

- Pull the 30A main bus fuse immediately.
- Turn OFF all non-essential electrical equipment to conserve battery power.
- Land as soon as possible as the battery and EFIS backup battery will furnish electrical power for a limited time only.

VOLTAGE REGULATOR FAILURE (SKYVIEW - G3X)
(Silent Hektik Voltage Regulator Installed)

NOTE The regulator has a voltage ramp up schedule and will take 30 mins to reach full output.

The voltage regulator will give a warning via the EIFS for one of three reasons. All three should be considered.

1) Overvoltage condition
2) No generator output
3) Over Temp Condition

If the generator would fail and cause an overvoltage condition the regulator will shut down automatically and give a warning. If the generator would fail and no longer provide output a warning will be given. Without the engine running when the aircraft is first turned on a warning will be shown because there is no generator output. Note that for both of these warnings the generator will no longer be charging the battery or supplying power to the main bus. As a result the main bus voltage will drop helping the pilot to realize along with the warning that power is no longer being supplied from the generator.

If an over-temp condition occurs the voltage regulator will continue to supply power to the main bus (the bus voltage will remain normal) but a warning will be given. This would most likely occur in elevated temperatures during lengthy ground operations, during a long climb at slow airspeed, or after extended periods of slow flight just above stall speed. These are extreme conditions not seen during most normal operations. If a warning is given in flight reduce the angle of attack and increase airspeed to help the flow of cooling air across the voltage regulator. If a warning is given on the ground increase the engine rpm to force more air through the cooling duct.

ENGINE MALFUNCTION

ENGINE FAILURE ON TAKE-OFF

WARNING
In the event of engine failure after airborne, the control stick must be IMMEDIATELY moved forward to prevent loss of airspeed.

- Airspeed – 60 KIAS (55 KIAS minimum)

If airborne and sufficient runway remains:
- Throttle – CLOSED
- Land using maximum braking after touchdown.

If airborne and insufficient runway remains for landing, attempt an engine restart only if altitude permits:
- Fuel Shut-Off Valve – CHECK ON - DOWN
- Choke – CHECK OPEN - PUSH
- Ignition Switches – BOTH ON
- Fuel Pump - CHECK FUSE (illuminated if blown)

If no restart is possible:
- Select most favorable landing area ahead
- Flaps – FULL DOWN
- Fuel Shut-Off Valve – OFF
- Ignition switches – BOTH OFF

WARNING
Maintain flying speed at all times and do not attempt to turn back toward the runway unless sufficient altitude had been achieved.
- Master switch - OFF
- Touchdown with minimum airspeed particularly if landing on rough terrain.

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

NOTE
The engine starter may be engaged in flight should the propeller stop wind milling.
Propeller will not windmill below 80 KIAS.

PARTIAL POWER LOSS/ROUGH RUNNING
- Follow the engine air restart procedures
- Land as soon as possible using “Precautionary Landing Approach” procedures

ABNORMAL OIL PRESSURE/TEMPERATURE INDICATIONS

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

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

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

High oil pressure is admissible for a short period at cold start. Should high oil pressure occur in flight, reduce power to the minimum necessary; land as soon as practical.

- RPM - reduce to MINIMUM NECESSARY.
- PERFORM precautionary landing as soon as able

NOTE (SkyView Only)
Zero oil pressure will be indicated if main bus power is removed.

EMERGENCY LANDING

PRECAUTIONARY LANDING APPROACH

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

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

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

FORCED LANDING (Power Failure)

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

Extending flaps or slipping the aircraft can lose additional altitude. Diving the aircraft in an attempt to lose altitude when flying into a headwind will only increase the required landing distance. Touchdown with minimum airspeed particularly if landing on rough terrain.

- AIRSPEED Max. gliding distance – **63 KIAS**
  Minimum rate of descent airspeed- **59 KIAS**
- FUEL Shut-Off Valve – PULL OFF
- FLAPS – UP to increase glide range
- RADIO – MAYDAY 121.5 MHz Txpr7700
- Attempt to position the aircraft approximately 1000 feet above ground level (AGL) when on downwind and abeam the intended point of landing.
- IGNITION A & B – BOTH OFF
- On Final Approach
    a) AIRSPEED – 60 KIAS (55 KIAS minimum)
    b) FLAPS – DOWN when intended point of landing assured
- MASTER SWITCH - OFF
- Touchdown with minimum airspeed particularly if landing on rough terrain.

BRAKE FAILURE
At or above approximately 15 kt adequate steering, except in crosswinds, be maintained with aerodynamic rudder control but at low speeds the RV-12 relies on differential braking for steering. On any landing the pilot has two basic goals: to bring the airplane to a stop and to keep it going straight enough to remain on the runway. During the higher speed portion of the roll-out, the aerodynamic rudder control is adequate for steering. Another steering aid might be a crosswind. While cross winds cause an airplane to weathervane and turn into the wind, this turning tendency can be used to advantage. 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 needed. 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 probably be applied to get the aircraft back into the air. This would provide time to consider the options mentioned above. This might mean selecting a more favorable runway or diverting to another airport with more favorable runway options. At the very least, time would be available to plan for and more calmly execute a failed brake landing.

DITCHING
Should it become necessary to make a forced landing over water take into account wind and swell direction.

- INTO WIND landing if high winds are evident
- PARALLEL to SWELLS with calm winds
- AIRSPEED Max. gliding distance – **63 KIAS**
  Minimum rate of descent airspeed- **59 KIAS**
- FUEL Shut-Off Valve — PULL OFF
- RADIO – MAYDAY 121.5 MHz
- Transponder – 7700.
- IGNITION A & B – BOTH OFF
- FLAPS – UP (allows NOSE HIGH attitude)
- CANOPY – UNLATCH (just before touchdown)
- Contact the water with NOSE HIGH attitude
- After coming to complete stop – EXIT AIRCRAFT

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

UNUSUAL FLIGHT CONDITIONS

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

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

An optional Garmin or Dynon AOA indicator can be installed in the RV-12 using an AOA pressure port located on the underside of the 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. After initial calibration and by comparing the pressure from the AOA port with the pressure from the pitot/static system, the EFIS can determine the critical AOA.
AOA indicators provide the pilot a three color visual display of the AOA with aural tone. This tone will change intensity with the proximity of the Critical AOA. Refer to your EFIS pilots guide for specific details.

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

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

- STABILATOR – relax back pressure on control stick.
- THROTTLE – FULL OPEN simultaneously with relaxation of back pressure on stick.
- RUDDER use to maintain lateral control.

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

- THROTTLE – CLOSED
- RUDDER – FULL OPPOSITE direction of rotation
- AILERONS – NEUTRAL POSITION
- STABILATOR – SLIGHTLY FORWARD OF NEUTRAL
- Flaps – UP

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

- RUDDER – NEUTRALIZE
- ATTITUDE – RAISE NOSE SMOOTHLY to level flight attitude

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

RUNAWAY TRIM MOTOR
If the trim motor should begin to run un-commanded in one or the other direction the following actions should be taken:

- Pull the trim fuse as soon as runaway condition is recognized
- Move the Autopilot switch position to OFF (G3X Only)
- Stabilator - HOLD against out of trim condition
- Airspeed - reduce as a way to lessen the amount of stick force required to maintain level flight
- Land as soon as possible

LOSS OF TRIM TAB
Disconnected anti-servo tab:

Should the trim tab become disconnected from its actuation shaft, neither trim or anti-servo function will be available.
Reduce speed to minimize the possibility of trim tab flutter.
Anticipate that control stick pitch forces will become very light, non-existent, or even self-driven.
A firm grip of the control stick is suggested to prevent un-commanded pitch excursions.
Normal control feed-back pressure should not be expected.
Pitch control commands will need to be based solely on visual pitch attitude and Indicated Air Speed references, not on normal control stick pressures. Land as soon as possible.

INFLIGHT OVERSTRESS

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

UNINTENTIONAL FLIGHT INTO ICING

Ice can form on aircraft surfaces at 0ºC (32 degrees Fahrenheit) 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 resolve the icing problem.
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 our 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, then a 180-degree turn will be your 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 tail surfaces with thinner airfoils and can pick up ice faster than the wing.
Do not lower flaps as it changes the airflow over the tail and can induce a stabilator stall. The stall warning horn may cease to function or function falsely because of ice formation on the leading edge of the wing.

- Leave the icing area (by changing altitude, course or both, in order to reach zones with a higher ambient temperature).
- CABIN HEAT ON
- AUTOPILOT OFF
- RPM INCREASE in order to prevent ice build-up on the propeller blades
- FLAPS LEAVE RETRACTED
- **CAUTION Ice build-up increases the stalling speed**
- ATC ADVISE

EMERGENCY DESCENT

If the need for an immediate descent to a lower altitude due to smoke, Pilot/Passenger illness or other unusual situation, perform an Emergency descent mindful of airspeeds and load factors.

- POWER IDLE
- BANK 30° TO 45° maintaining positive load factor.
- AIRSPEED do not exceed **Vne** or 108 KIAS if turbulence exist.
- Do not exceed 82 KIAS if flaps are extended.
- Clear the engine every 1000’ with a short application of power.

LOSS OF FLIGHT INSTRUMENTS (EFIS)

Electronic Flight Information systems are subject to complete or partial failure due to Electrical, AHRS/ADC, or GPS module failures. If a complete electrical failure occurs, the internal back up battery will furnish electrical power for a limited time only.
Stall Warning aural will remain functional with Master & Avionics switch on.

DYNON SKYVIEW REBOOT PROCEDURE
- **Press keys 1 -2 -5** simultaneously

GARMIN G3X REBOOT PROCEDURE
- **Turn Master OFF then ON**

In the event of a complete loss of display information, fly the airplane to the nearest suitable airport using present power settings and normal maneuvers.

- POWER based on lever positions and engine noise
- PITCH slightly below horizon

LOSS OF FLIGHT CONTROLS
STABILATOR CONTROL FAILURE

This procedure assumes landing with a complete stabilator control failure (up & down)
Besides stabilator, there are 3 other forms of pitch control in the RV-12
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 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.
Electric trim can be used to change pitch at the round out and flair
If available, find a suitable airport with a long, wide runway aligned with wind direction and be prepared for the go around.

- POWER – REDUCE
- AIRSPEED – 75 KIAS.
- FLAPS – 1^{st} position.
- AIRSPEED – 60 KIAS.
- Establish a long, shallow final approach to the runway.
- POWER CHANGES TO CONTROL GLIDE PATH.
- When crossing the runway threshold, further reduce power and adjust trim to establish a low sink rate and touch down.
- TOUCH DOWN use power and/or trim to decrease the rate of descent.

NOTE
Flaps in first position allow more nose wheel clearance at touchdown than in full flap position.
If a decision to go around is made, advance the throttle slowly to avoid a sudden pitch up tendency.

LOSS OF AILERON ROLL CONTROL
- Rudder – Yaw changes will have a secondary affect as low rate roll control.
- Autopilot – Depending on where the failure occurred the autopilot may be used to control roll.

Find a suitable airport with a long, wide runway aligned with the wind direction if available**.** To avoid a cross control stall maintain an airspeed 10 KIAS above normal.

LOSS OF FLAP CONTROL

Maintain an airspeed 5 KIAS above normal. Landing distance will be increased.

LOSS OF RUDDER CONTROL

Find a suitable airport with a long, wide runway aligned with the wind direction if available**.** If control has failed in one direction (most common failure) land such that the controlled direction opposes any crosswind component. To avoid a cross control stall maintain an airspeed 10 KIAS above normal. Touchdown at minimum speed. After touchdown shut off engine to minimize idle thrust.

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SECTION XVI

GROUND HANDLING

INDEX

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 page 4-4

FUELING PROCEDURE
Plane stopped, engine and master power OFF
Clamp ground line to exhaust pipe.
Protect rear window from fuel spill.
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
Fuel Sample - CHECK for water sediment.

The recommended fuel is UL 92 basically "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 so long as the proper fuel additive is used (see Rotax service information for more details).

NOTE

See the latest version of the Rotax Operators Manual and SI 912-016 for further information on fuel types and limitations.

CLEANING
Windshield surfaces should be cleaned only with plastic compatible cleaner designed specifically for airplane windshields. 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. Withdraw each of the fuselage pins only enough to release the right wing spar.
2. Remove the right wing and set aside.
3. Remove both of the fuselage pins.
4. Remove the left wing and set aside.

INSTALLATION

Installation procedure is reverse of the removal procedure

Appendix 1: RV-12 Training Syllabus

Training in the RV-12.

The goal of this syllabus is to provide Flight Instructors with an efficient system to train new RV-12 pilots regardless of previous flight experience and proficiency.
The RV-12 presents the pilot with some unfamiliar items not common in other production type airplanes.
The training starts with an evaluation of the pilot's skills, knowledge of the airplane, and insurance requirements. In some cases insurance companies require a Flight Review in the airplane; and some require up to 5 hrs. of dual 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.
The RV-12 Flight Training Supplement and POH should be used as a reference for all maneuvers.

Ground:
Discussion of the RV-12 systems with emphasis on the Rotax 912 and differences with other aircraft engines: Oil system, fuel system, ignition, cooling, propeller, pitot-static, and Angle-Of-Attack (AOA) if installed.
Weight &Balance calculation.
Performance calculation.
Primary and secondary flight controls.
Auto pilot 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 FTS/POH as reference. CFI demonstration of ingress, exit, canopy latch, 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 if taxiing with the canopy semi-open (in windy conditions or around prop/jet blast)

Start & Taxi:
Promote the use of the check list for EFIS boot up, choke and throttle management.
Taxi: emphasis on brakes check, speed control, steering with free castor nose wheel, brake savings philosophy and aft control stick while taxing.
During windy, gusty conditions or near a jet/propeller blast, 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 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 elev. 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 ground).*
    a. Announce: *"Airspeed alive"*
5. Begin climb.
6. Accelerate to 60 kts (Vx) 75 kts (Vy)
7. At safe altitude, retract flaps.

Climb:
Emphasize attention on the outside picture of Vy.
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 they use 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 0º flaps to approach and full flaps and then from full to approach to 0º flaps.

Sequence:

1. Clear the area with two 90º 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 360º 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 90º 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 90º 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 and use the brakes only if needed and after the nose has settled down.

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 70 kts.
4. On base and if landing is assured select full flaps.
5. Trim elevator for 60 kts.
6. Maintain 60 kts until short final and then 55 to 60 kts. (55 + gust factor)
7. Start flair on ground effect and hold nose wheel off the ground.
8. When main wheels settle on the ground, continue to hold back elevator pressure.
9. When nose wheel settles on the runway apply brakes if needed.

Demonstrate slips with different flap settings.

<u>Go around:</u> 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.

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

Demonstrate a power off 180º 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 180º 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 180º turn and/or other IR maneuvers.

<u>Other topics</u>: basic Autopilot and Navigation functions demonstration if aircraft is equipped.

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

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