

# **Highlander**

**Model JA20 Tail Wheel**

## **Pilot's Operating Handbook**

**Airplane registration number**

**N-\_\_\_\_\_**

**Airplane Serial No: \_\_\_\_\_**

**ADVISE JUST AIRCRAFT (864-718-0320) IMMEDIATELY OF ANY SAFETY OF  
FLIGHT ISSUE OR SIGNIFICANT SERVICE DIFFICULTY.**

## **Record of Manual Revisions**

<u>Amendment No.</u>	<u>Date incorporated</u>	<u>Signed</u>

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# **Introduction**

## **Manufacturer**

Aircraft Kits and Spares are available from:

**JUST AIRCRAFT, LLC**

All data is kept at 170 Duck Pond rd. Walhalla, SC 29691 Contact Gary Schmitt @ (828)421-1310 for information pertaining to certification documentation.

This Aircraft was designed in accordance to ASTM standards F2245; and F2295 also with CFR FAR 43.

## **General information**

**Ancestry.** The Highlander was developed to meet the niche in the aviation market for a light aircraft that looked and handled like a conventional aircraft, but which conformed to the lower weight and license requirements of light aircraft and was easily towable and stowable. In addition to this, it has side-by-side seating and full dual controls. It was also designed for back country conditions.

**Construction.** The aircraft fuselage is a powder coated tubular steel construction, covered with heat-shrunk polyester fabric and finished with a proprietary coating system. The wings consist of parallel tubular spars with wooden ribs bonded to them, aluminium trailing edges and fibreglass tips. The wings also support both flaps and ailerons. All surfaces are covered in a modern heat-shrink fabric and finished as per the fuselage. The tail surfaces are also made of tubular steel construction, and are wire and tubing braced. The surfaces are finished as per the rest of the aircraft. The windscreen, windows and doors are made from thin transparent polycarbonate sheets.

### **Flying Controls.**

Pitch control is through a conventional elevator controlled by dual control sticks in the cockpit. The linkage between them consists of a series of levers and push rods.

Pitch trimming is through a trim tab fitted to the left side of the elevator. This is controlled using a mechanical trim system operated by a cable system.

Roll control is through conventional ailerons, controlled by dual control sticks in the cockpit. The sticks are linked to the ailerons by a series of levers, cables and pulleys.

Yaw control is through a conventional rudder, controlled by set of pedals in front of the pilot or co-pilots seat. Connection is by a series of levers, and cables. The rudder self centers aerodynamically

The aircraft is equipped with hydraulic disc brakes operated by toe brake pedals connected to master cylinders.

The tail wheel is steerable and connected to the rudder mechanism in the same sense (push right, yaw right, turn right). Low speed steering is achieved by differential braking.

Flaps are fitted to the aircraft and are operated by a central push button lever in the cockpit. Connection to the flaps is via a series of cables and pulleys.

The Gross weight of the aircraft is 1320 lbs.

Top speed (VNE) 130 mph.

Top speed (VNO) 105 mph.

Fuel range (with large tanks) 500 miles with a reserve of 50 miles.

Best angle of climb (V<sub>x</sub>) 53 mph.

Best rate of climb (V<sub>y</sub>) 57 mph.

Stall speed no flaps (V<sub>s</sub>) 36 mph.

Stall speed full flaps (V<sub>so</sub>) 32 mph.

Total fuel capacity (Large Tanks) 26 gal. 25 1/2 useable. (Small Tanks) 18 gal. 17 1/2 useable.

Auto gas is permitted as well as 100ll refer to the engine manual.

For maximum RPM refer to the engine manual.

## **Limitations**

**Units.** When noting limitations, it is important to ensure that the limitations that you are using use the same units and calibrations as the instruments in the cockpit. The limitations below show MPH IAS (indicated Airspeed) but your aircraft may have an instrument in knots, and in any case will read knots CAS (calibrated Airspeed). The difference between IAS and CAS is basically the accuracy of your pitot-static system.

### **Operational Limitations**

The aircraft must only be flown in day VFR conditions.

The aircraft is certified to a “permit to fly” standard. This prohibits aerial work, other than flying instruction of the owner.

For flight the following instruments must be fitted and serviceable: ASI, altimeter, compass, slip-ball, engine instruments as the engine manufacturer requires, or as are necessary to operate the engine within its limits and oil quantity indicator i.e. dipstick.

It is recommended that the aircraft is not flown where a crosswind component above 8 knots (tail wheel is predicted until a pilot is very familiar with the handling of the aircraft).

Do not fly above 10,000ft M.S.L.

### **Flight Limitations**

Airspeed indicator speed range markings.    White    [40 – 70]

Green    [40 – 105]

Yellow    [105 – 130]

Never exceed speed (VNE)            [130 MPH IAS]

Maneuvering Speed (Va)            [ 70 MPH IAS]

Flap limiting speed. (Vfe)            [ 70 MPH IAS]

Maximum Bank angles are 60° either way.

Maximum Pitch attitudes are 30° nose-up, 30° nose-down.

Normal acceleration limits are +4 / -2g.

Stall speed no flaps (Vs) 36 mph.

Stall speed full flaps (Vso) 32 mph.

Maximum Take-off weight is 1320lbs.

Aerobatics and deliberate spinning are prohibited.

Total fuel capacity (Large Tanks) 26 gal. 25 1/2 useable. (Small Tanks) 18 gal. 17 1/2 useable.

Auto gas is permitted as well as 100ll refer to the engine manual.

For maximum RPM refer to the engine manual.

## **Engine Limitations**

See Engine Manual.

# **Emergency Procedures**

## **General Information**

These procedures should be studied until well known; you may not have time to read what to do in case of an emergency.

**Engine Fire During Start** Close throttle and continue cranking engine.

**Engine Failure Before Take-Off** Close throttle, apply brake (if fitted), switch off.

**Engine Failure After Take-Off** Lower nose to establish an approach speed of at least [57 MPH IAS], land straight ahead or near to straight ahead ***DO NOT ATTEMPT TO TURN BACK from below 500ft.***

**Engine Failure in Flight.** Lower nose, maintain best glide speed, select a landing site, and make emergency radio call if time permits. As time permits check for possible reasons for engine failure and attempt re-start (e.g. ignition switches, fuel cock, lack of fuel pressure),

## **Emergency landing without power**

If field is flat land into wind, otherwise uphill. Apply braking only if it is essential to stop within the distance available, and never before all 3 wheels are on the ground.

### **Precautionary landing with power**

Select a landing site, make emergency radio call and land according to terrain and winds.

**Engine Fire in Flight.** Close fuel cock, open throttle fully, make emergency call if time permits, and treat as engine failure in flight. Vacate aircraft as soon as possible after landing.

**Fire in the cockpit.** Close all ventilation, switch off all electrical devices (not the ignition unless there is an engine fire also), land immediately and vacate the aircraft.

### **Loss of Oil Pressure**

Shut engine down and refer to **Emergency landing without power.**

### **High Oil Pressure**

Land at earliest convenience and troubleshoot oil pressure problem.

### **Emergency Decent**

Slow plane down to 70 mph and deploy full flaps, maintain a rate of decent of 70 mph with pitch controls.

### **Alternator Failure**

If the alternator fails you will see indication on your engine instruments. You have a limited time of battery power to keep you flying. Land as soon as possible to troubleshoot problem.

### **Overvoltage**

In an overvoltage situation again you will see this on your engine instruments you may also smell a strong acid smell. Cut circuit breaker off for the alternator. You have a limited time of battery power to keep you flying so land as soon as possible and troubleshoot problem.

### **Inadvertent Spin**

Close the throttle and centralize the rudder pedals and stick. The aircraft will recover rapidly, but may recover into a steep dive from which it is important to recover quickly (so as to avoid exceeding Vne) but not too quickly, otherwise the 4g limit can inadvertently be exceeded.

**Emergency Landing on Water.** Try to land into wind with as high a nose-up attitude as possible. Before impact, pilot and passenger must be prepared to release their harnesses. It



may also be beneficial to release the doors before impact. If wearing lifejackets, do not inflate them until outside the aircraft. Note that it is very hard to judge height above water.

**Emergency Landing in Trees.** Ensure harness (es) tight; try for low bushy trees as far as possible. Try to impact with as steep a nose-up attitude as possible.

**Inadvertent Flight in Hail or heavy rain.** Turn carburettor heat on (if fitted); reduce power to avoid propeller damage, fly out of the weather as soon as possible.

**Inadvertent Flight in Icing Conditions.** Turn carburettor heat on (if fitted), fly out of conditions as soon as possible, land as soon as possible.

### **Loss of primary instruments**

Check to see if breakers are out. Maintain control of plane and land as soon as possible to troubleshoot the problem.

### **Loss of Flight Controls**

Flight controls will self-centre aerodynamically, reduce speed. Make shallow control inputs with remaining controls and land immediately.

## **Normal Procedures**

### **Preflight Check**

**Engine.** Carry out an engine pre-flight inspection following the instructions contained in the Engine Manual.

**Aircraft.** The following is a brief summary of the minimum pre-flight inspection; if you are unsure, it does no harm to increase the number of items on your inspection and you should also check the general condition of the fabric covering throughout the aircraft.

### **Inside the Cockpit**

- Ignition switches OFF

- Parking brake (if fitted) ON
- Condition of throttle controls and throttle cable
- Condition of choke and choke cable
- Condition of carburettor heat lever and cable (if fitted)
- Condition and security of all flight controls and cables. **(This is especially important if you had your wings folded as the control cables may have become twisted on the turnbuckles).**
- Check condition of all instruments
- Check harnesses are properly fitted and not frayed
- Check all baggage is secure.
- Check seats and cushions are secure
- Check sufficient fuel for the planned flight
- Check fuel hoses from the engine, and the fuel filter.
- Check condition of hydraulic brake lines (if fitted)

### **Underside**

- If the aircraft has not flown within 24 hrs or since last fuelled, drain a small amount of fuel from the drain tap and check for water or sediment.
- If fitted verify security of radio aerial
- Condition of fabric.

### **Starting from the port side, inspect:**

- Condition of door, windows, hinges and catches (if fitted)
- Condition of the undercarriage leg, bungee cord, brake cables or hydraulic lines and disc brake (if fitted), actuators and security of wheel and attachments.
- Condition of tire, valve, and correctly inflated.
- Forward spar/ headrack clevis pins and safety clip/ring
- Fastening of the trailing edge spar to the headrack
- The fuel tank outlet connections
- Lift strut attachment to fuselage
- Fuel filler cap in position and secure. Vent clear and facing forward
- The port wing struts and jury struts and fastenings
- Ensure that transportation jury strut bolt has been removed from top of lift strut
- The port wing leading edge
- The port wing wingtip fairing
- The port strobe light (if fitted).

### **Walk around to the port wing trailing edge, inspect:**

- The port aileron and its hinges, fixings and cable attachments
- Move the aileron, confirm there is no free play between it and the other wing aileron
- The port flap and its hinges, fixings and cable attachments
- Look over the upper and lower wing surfaces for any distortion or damage
- The flap return spring operation

- The flap and aileron cable condition (on exit from wing into fuselage)
- Turtledeck condition and security
- Fixing and security of GPS antenna (if fitted).

**Walking back to the tail, check:**

- Tension on the fuselage fabric
- Ensure that transportation jury struts and bolts have been removed from the horizontal stabilizer tabs.
- Condition of stabilizer wire fastenings and cable condition (carefully, a broken strand can be very sharp!)
- Stabilizer attachment fittings
- Elevator and rudder hinges
- Condition and attachment of the elevator trim tab
- Tension and condition of the tail plane fabric
- Condition and security of tail wheel if this configuration in use
- Rudder cables and shackles
- Look forward from behind the tail: any airframe distortion should be visible as an asymmetry.

**Walk to the starboard side and check:**

- Starboard elevator hinges
- Condition of stabilizer wire fastenings and cable condition (carefully, a broken strand can be very sharp!)
- Stabilizer attachment fittings
- Tension and condition of the tail plane fabric
- Elevator linkage and the pushrod.

**Moving forward along the fuselage inspect:**

- Tension on the fuselage fabric
- Look over the upper and lower starboard wing surfaces for any distortion or damage
- The flap return spring operation
- The flap and aileron cable condition (exit from wing into fuselage)

**Moving along rear edge of wing, inspect:**

- The starboard flap and its hinges, fixings and cable attachments
- The starboard aileron and its hinges, fixings and cable attachments
- Move the aileron, confirm there is no free play between it and the other wing aileron
- The starboard strobe light (if fitted)
- The starboard wing wingtip fairing.

**Walk around to the front of the wing, inspect:**

- The starboard wing leading edge
- The starboard wing struts and jury struts and fastenings
- Ensure that transportation jury strut bolt has been removed from top of lift strut
- Check security and fitting of Pitot and Static vents and that they are not obstructed
- Fuel filler cap in position and secure. Vent clear and facing forward

- Condition of the tire, undercarriage leg, bungee rope brake cables or hydraulic lines and disc brake, actuators and security of wheel and attachments
- Condition of tire inflation valve.
- Fastening of the trailing edge spar to the headrack
- The fuel tank outlet connections
- Pitot and static tubing condition and connections
- Forward spar/ headrack clevis pins and rings
- Lift strut attachment to fuselage
- Condition of door, hinges and catches
- Condition and security of exhaust system and attachments
- Condition, cleanliness and security of the windscreen
- Condition and security of cowlings
- Air inlet (naca) scoops secure and unobstructed (if fitted)
- Condition and security of propeller
- Condition and security of spinner

### **Engine Starting Procedures**

(Also Refer to the Engine Manual.)

Aircraft, Crew, Equipment, **Secure**  
**Throttle** full and free, then CLOSED

If engine cold, **choke** ON

**Throttle** CLOSED

**Area** around and behind aircraft clear (Shout “Clear”)

**Ignition** both switches ON.

**Start the engine.** Turn the spring-loaded ignition switch. ( After starting this switch should spring back to “both”

**Taxiing** The aircraft will taxi on whatever course you wish without difficulty using a combination of throttle, brakes and tail wheel steering. In strong winds, keep the stick fully longitudinally with the wind, and laterally into wind (e.g. if the wind is coming from the half past one position, the stick should be at the half past four position). It is easiest to turn using the tail wheel steering (rudder pedals), but this can be supplemented for a very tight turn by using the brake on the side to which you are turning.

**Prior to take-off.** The pilot must ensure that the engine has been run successfully at take-off power prior to take-off (and has in any case run for several minutes) and that the choke is off **Controls** full and free, **Choke** off

**Harnesses** and **Helmets** (if worn), secure

**Instruments** all serviceable, reading correctly. **Ignition** checked for mag drop and selected to both on

**Fuel** on, sufficient for the flight, filter clear of debris, pressure in limits. **Flaps** full and free and set for take-off (normal operation would be 15° i.e. 1 first notch.)

**Trim** set to take-off position

**Wind** speed and direction checked, and suitable for safe take-off on selected runway

**Approach** to the selected runway clear of aircraft.

**Power** checked, and the pilot is satisfied that the aircraft can sustain take-off power. (Engine checks are done at less than full power – see the engine manual, but pilots should check that sufficient power is available at the start of the take-off run.)

**Normal Take-off.** Take-off is conventional for a tail wheel aircraft. As full power is applied, the stick is held fully forward, until the tail rises when the stick is moved aft to the neutral position and checked until sufficient flying speed has been obtained. During the take-off roll the aircraft is kept straight by using the rudder pedals. Rotate at 40 **MPH IAS** and the aircraft should fly-off at around **[46 MPH IAS]**. An initial climb should be established at **[58 MPH IAS]**. It is not advisable to allow the speed to fall below the best climb speed of **[54 MPH IAS]** during the climb-out. In crosswinds, the aircraft will feather into the wind immediately as it is airborne.

### **Short field Take-off**

Set Flaps (15°) During the take-off roll the aircraft is kept straight by using the rudder pedals. Rotate at 40 **MPH IAS** and the aircraft should fly-off at around **[46 MPH IAS]**. An initial climb should be established at **[58 MPH IAS]**. It is not advisable to allow the speed to fall below the best climb speed of **[54 MPH IAS]** during the climb-out. In crosswinds, the aircraft will feather into the wind immediately as it is airborne. Retract flaps once 300ft has safely been achieved.

### **Best Angle of Climb Speed**

(V<sub>x</sub>) is 53 mph.

### **Best Rate of Climb Speed**

(V<sub>y</sub>) is 57 mph.

### **Cruise**

Max cruise speed (V<sub>no</sub>) is 105 mph. If set up correctly, it should be possible to trim the aircraft to within **2 MPH**, by use of the pitch trimmer, with power set as required. Pilots used to open-cockpit ultra-lights are reminded that the doors may reduce the aircraft's directional stability and therefore occasional checks of the slip-ball are worthwhile for efficient flight – for this reason a serviceable slip-ball is a mandatory instrument in the aircraft.

### **Approach Speed**

Normal 60 Mph.

Short field 60 Mph.

**Normal Landing.** After checking that airspeed is within the white arc (flap limiting range) and trimmer neutral, flap for landing should be set initially at 15° (1<sup>st</sup> notch) on base leg with 30° (2<sup>nd</sup> notch) being selected on finals. Be aware that pitch changes will occur with the use of flap and additional power will be required to maintain approach speed, it's not however recommended to trim out the full-flap trim change and the control force should be held on the stick. Generally the aircraft should be landed from an approach speed of about [**60 MPH IAS** although in turbulent conditions, handling can be improved by increasing this by 5-10 MPH and possibly by using less flap than normal. Round out should be initiated at around 8-10 ft. and hold-off 1-2 ft above the runway. The aircraft should be kept straight, using the rudder. Touchdown should be at about the stall speed.

Once experience is gained, pilots may prefer to reduce approach speeds when flying at lower weights.

### **Short Field Landing**

If a short field landing is required then the final stage of flap 40° can be deployed on short-finals. Be aware that pitch changes will occur with the use of flap and additional power will be required to maintain approach speed, it's not however recommended to trim out the full-flap trim change and the control force should be held on the stick. Generally the aircraft should be landed from an approach speed of about [**60 MPH IAS** although in turbulent conditions, handling can be improved by increasing this by 5-10 MPH and possibly by using less flap than normal. Round out should be initiated at around 8-10 ft. and hold-off 1-2 ft above the runway. The aircraft should be kept straight, using the rudder. Touchdown should be at about the stall speed.

**Landing in a Crosswind** Crosswinds of up to 9 MPH may be handled without significant difficulty. The preferred approach is to fly a "crabbed approach" straightening with the rudder in the last few feet and holding the aircraft on the runway centreline using the stick. It is possible that landing into the wind the tail wheels and the main wheels touch the ground simultaneously. The stick should then be brought back as airspeed decreases during the landing roll. In particularly strong or gusty conditions, the pilot may find a 2-wheel landing preferable.

**CAUTION** – It is possible that the crosswind may not be constant. Care must be exercised near the point of landing to keep the aircraft flying along the line of the airstrip immediately before straightening the aircraft for landing.

### **Balked Landing Procedures**

Return throttle to full power. Raise the flaps to one notch, as airspeed increases to 55-60 Mph. slowly raise remaining notch of flaps.

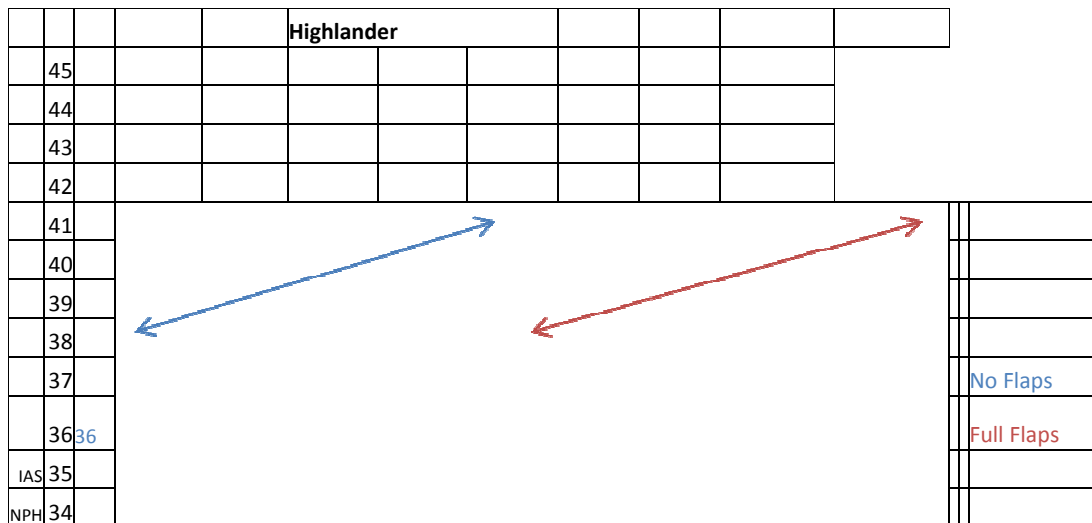
**Turning.** Turning is conventional for this class of aircraft, with a modest amount of rudder coordination required. The maximum permitted bank angle is 60°, which result in quite high back-stick forces, and a corresponding increase in power to maintain a balanced turn. As with any other aircraft, the stall speed will increase with bank angle. However, the nearly full back stick required to stall the aircraft gives a good warning of the impending stall.

**Flight in Turbulence.** The Highlander has a higher wing loading than most light aircraft and hence flies well in turbulence. In turbulence it is best to maintain a reasonably fast cruising speed, which will reduce the effects of gusts and crosswind components; however, do not fly above the maneuvering speed of [70 **MPH** IAS] in turbulence. Below this speed, the worst thing a gust can do to you is stall the wing or one of the control surfaces. Above this speed, it is possible for strong gusts to overstress the aircraft

### **Stalling.**

The graph below shows the aircraft stalling speed at standard conditions (deceleration, wings level, idle power) at various weights. However, note that this is in MPH, and the ASI may under-read considerably at low speeds giving a much lower apparent stalling speed. Stalling speed may increase slightly with forward CG.

### **Graph**



	33											
	32	32										
	31											
	30											
	29											
	28											
	27											
	26											
	25											
		700	800	900	1000	1100	1200	1300	1400			
					Weight, LBS							

**Wings Level, Power Off.** The aircraft can safely be stalled at a deceleration rate of up to 5 MPH/sec. The aircraft exhibits benign, traditional stall characteristics. There is very little aerodynamic warning of the approach to the stall; however, adequate warning is provided by the high pitch attitude and low IAS. The stall is instantly recognizable, by the nose drop and frequently results in full back stick; there is no tendency for the aircraft to drop a wing at the stall. Recovery is immediate upon centralizing the stick and applying power and results in a height loss between stall and recovery, of approximately 100 ft if power is used, and 200 ft to establish a steady glide if power is not used.

**Wings Level, Power On.** With power applied the stall is similar to the idle case; however, stall speeds are reduced by 3 MPH and much higher nose attitudes (approximately 25° nose up pitch) are experienced. Once again there is no tendency for a wing drop.

**In Turning Flight.** Stalling speed in the turn will be increased in the normal manner for any fixed wing airplane. Stall warning is afforded in turning flight by a relatively nose-up attitude, and back-stick. Stall recovery is immediate upon releasing back-pressure on the stick. Height loss in the recovery can also be achieved by applying or increasing power.

**Aerobatics.** Aerobatics are not permitted in this aircraft.

**Departures from Controlled Flight.**

**The Spin.** Deliberate spinning of the Highlander is prohibited. It is however possible, through mishandling of the aircraft, inadvertently to enter a spin, either through stalling the aircraft in a turn or by failing to keep the rudder pedals straight at low speeds. Should this happen, the spin will be seen by a steep nose-down attitude and the aircraft will be rotating rapidly. To recover from this, close the throttle and centralize the rudder pedals and stick. The aircraft will recover rapidly, but may recover into a steep dive from which it is important to recover quickly (so as to avoid exceeding Vne) but not too quickly, otherwise the 4g limit can inadvertently be exceeded.



If flaps were selected during the spin and recovery, then it is likely that in the recovery the flap limiting speed will be exceeded. If this has happened, then land, if possible flapless, as soon as possible and have the entire flap structure and mechanism examined by an A&P or I.A. inspector or other suitably qualified person before any further flight.

**Other Departures.** Other departures from controlled flight are likely either to be due to damage to the aircraft, or hazardous flying conditions. In either case, land as soon as possible and examine the aircraft, particularly the flying controls, for any damage.

## **Performance.**

The best climb speed is [**57 MPH IAS**]. While in general, at speeds different from that performance will be worse, when selecting a climb speed, always remember that should anything go wrong, more speed gives you more time to sort your problems out. Although climb performance may change between aircraft and with conditions, the best climb speed should not change significantly.

The best glide speed is [**53 MPH IAS**], at which a glide ratio of **7.5:1** may be expected.

Because light aircraft are very strongly affected by weight, engine condition, propeller matching, wind and air temperature, it is very hard to give any reliable information concerning the cruise performance of the Highlander. The captain is encouraged to plan very conservatively until sufficient experience is gained of the fuel consumption and cruising speeds at the conditions in which s/he normally flies the aircraft.

The following additional safety factors should be applied to the distance to clear a 50' obstacle. If unsure, always use these factors to ensure you have sufficient take-off distance available.

10% increase in weight	Multiply take-off distance by 1.2
Per 1000 ft runway height above Sea Level	Multiply take-off distance by 1.1
Per 18 F increase in temperature above 60°F	Multiply take-off distance by 1.1
Wet grass	Multiply take-off distance by 1.1
Dry Tarmac or concrete	Divide take-off distance by 1.1
Per 2% uphill slope	Multiply take-off distance by 1.1
Per 5 knot tailwind component	Multiply take-off distance by 1.2

Soft ground or snow	Multiply take-off distance by 1.25
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Using the figures above, the following additional safety factors should be applied to the distance to clear a 15 yard obstacle on the approach. If unsure, always use these factors to ensure you have sufficient runway for a safe landing.

10% increase in weight	Multiply landing distance by 1.1
Per 1000 ft runway height above Sea Level	Multiply landing distance by 1.05
Per 18°F increase in temperature above 60°F	Multiply landing distance by 1.05
Wet grass	Multiply landing distance by 1.1
Dry Tarmac or concrete	<b>Divide</b> landing distance by 1.1
Per 2% downhill slope	Multiply landing distance by 1.1
Per 5 knot tailwind component	Multiply landing distance by 1.2
Soft ground or snow	Multiply landing distance by 1.25

Cruise speeds depend on flight conditions, prop pitch, and engine rpms and vary with weight and equipment carried. They can range from 70 mph to 105 mph. from 4500 rpm to 5500 rpm with fuel burn from 4.5 gph to 8 gph.

## **Weight and Balance and Equipment List.**

So long as it is kept within the placarded operating limits, and no unapproved modifications have been made since construction (including the alteration of ballast if any was fitted for initial approval), the aircraft can be flown with any permitted fuel, pilot and passenger weights without falling outside of its permitted CG limits. However, pilots should be aware that stick forces and displacements will become lighter with aft CG (typically a lightweight pilot, full fuel and a passenger) and heavier with forward CG (typically low fuel, and light

weight pilot). Flying outside of the permitted CG limits at either extreme is potentially dangerous.

Normally next to the fuel fillers the aircraft will be fitted with a placard or placards showing the maximum fuel load that can be carried for any given total cockpit (pilot + passenger + baggage) load. It is important to obey these limitations, otherwise performance values will be incorrect and, far more importantly, it is possible to overstress and damage the aircraft.

The Highlander CG datum is at the leading edge of the wing. Measurements are in inches and lbs.

Weight and Balance must be done with the head rack level (i.e. in flying attitude)

C of G range is from 9" to 15.5" AoD

ITEM NAME	WEIGHT in Lbs.	ARM (distance from datum) in inches	ITEM WEIGHT x ARM
Left main wheel		-8.75"	
Right main wheel		-8.75"	
Tail wheel		160.75"	
Fuel		15"	
Pilot		12-18"	
Passenger		12-18"	
Luggage		55"	
TOTALS		----- ----- =	
CENTRE OF GRAVITY (total arms / total weight)			

The Highlander will have been weighed when first built, and must be re-weighed at intervals. (Typically every 5 years or when it is modified or repaired).

## Description of Airplane and Systems

### General

The Highlander can have its wings folded to enable transportation on a trailer and/or storage in a smaller space, and to this end it is important that the procedures for this operation are followed precisely.

### **Folding the wings**

- Undo the screws (or camloc type fasteners if fitted) holding the turtledeck in place and remove the turtledeck completely.
- Remove the safety clip from the forward spar-securing pin.
- Holding onto the wing strut (to stop the wing swinging uncontrollably) push out the securing pin; the wing can then be folded back. Be aware that the tension will have been removed from the aileron cables, so they will drop as you move the wing back. A tip is to use a piece of pipe lagging foam on the trailing edge: if placed across the aileron and wing tip this will keep the aileron level and will also act as a cushion between the wing and fin. The wing is held in position by attaching the transport jury struts between the tabs on the horizontal stabilizer on the fuselage and the lift strut attach point on the wing.
- Repeat the same procedure for the other wing. Secure the wing as above and ensure that all nuts on the transport jury strut are tight.
- If you intend to trailer the aircraft, be aware that the propeller needs to be secured otherwise wind action could turn the prop and it may hit parts of the trailer. Aircraft should be secured by both the main gear and nose/tail wheel when being transported on a trailer.

<p><b>WARNING.</b> While it is safe to transport the aircraft on a trailer with the wings folded, under no circumstances tie the aircraft down by the landing gear. Suitable tie-down points are the wheels and undercarriage attachment points. Tying the aircraft down by any other part can cause damage which may not be apparent during inspection but can cause failures during flight.</p>
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### **Unfolding the wings.**

- Undo the transport jury strut nuts and remove the bolt from the lift strut, swing wing forward (use the lift strut) and carefully feed the spar end onto the head rack attachment point. Pull on the wing to align the pinhole, insert the pin and then the safety clip. Repeat the procedure for the other wing. Ensure that the transport jury struts are completely removed from the Fit the turtle deck into position and secure with the five screws; camloc type fasteners if substituted must be secured.
- Fit the turtle deck into position and secure with the five screws; camloc type fasteners if substituted must be secured

- Ensure that any packaging/transportation material is removed from the aircraft.

## **Airframe**

The aircraft fuselage is a powder coated tubular steel construction, covered with heat-shrunk polyester fabric and finished with a proprietary coating system.

## **Flight Controls**

Pitch control is through a conventional elevator controlled by dual control sticks in the cockpit. The linkage between them consists of a series of levers and push rods.

Pitch trimming is through a trim tab fitted to the left side of the elevator. This is controlled using a mechanical trim system operated by a cable system.

Roll control is through conventional ailerons, controlled by dual control sticks in the cockpit. The sticks are linked to the ailerons by a series of levers, cables and pulleys.

Yaw control is through a conventional rudder, controlled by set of pedals in front of the pilot or co-pilots seat. Connection is by a series of levers, and cables. The rudder self centers aerodynamically

The aircraft is equipped with hydraulic disc brakes operated by toe brake pedals connected to master cylinders.

The tail wheel is steerable and connected to the rudder mechanism in the same sense (push right, yaw right, turn right). Low speed steering is achieved by differential braking.

Flaps are fitted to the aircraft and are operated by a central push button lever in the cockpit. Connection to the flaps is via a series of cables and pulleys.

## **Instrument Panel**

Instruments that must / may be fitted.

ASI	Altimeter	RPM	EGT
Required (scale to at-least 1.05 V <sub>NE</sub> once calibrated)	Required	Required	Required (2-stroke engines only)

Compass	Coolant temp	CHT	Fuel Pressure	VSI	Slip ball	
Required	At least one required			Optional	Optional	Required

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(Some engine manuals *may* require additional instruments to those shown above.)

### **Engine**

The engine used is a Rotax 912 uls. 100 hp.

### **Propeller**

The propeller used is a Kiev 3 blade.

## **Handling and Servicing**

### **Introduction**

Your aircraft surfaces are covered in a modern heat-shrink fabric and finished as per the fuselage. The tail surfaces are also made of tubular steel construction, and are wire and tubing braced. The surfaces are finished as per the rest of the aircraft. This fabric is tough and durable but care must be taken so as not to puncture it. The windscreen, windows and doors are made from thin transparent polycarbonate sheets.

There is a handle on the rear of the fuselage for ground handling operations. Pushing and pulling by this handle is the recommended way of moving the plane around on the ground.

Your Highlander was designed to be easily towable. Load the plane onto a trailer and secure the wings back locking them into position with transportation jury struts and tie the airframe

down to the trailer. Its recommended to support the fuselage at the rear so the tail wheel is not touching. Secure the prop from turning.

Your Highlander has tie down rings incorporated into the wings on each lift strut attach point. Use conventional tie downs on these rings and tie the tail around the tail wheel spring.

Below are the service intervals to be followed for the airframe. (For engine maintenance see the Engine Manual).

It is also permitted for the pilot to make small aileron adjustments at the aileron wire turnbuckles if the aircraft has a natural turn.

Auto gas is permitted and recommended also 100ll.

See engine manual for oil grades and specifications.

Cleaning of your highlander will prolong the service life of the fabric. Use a weak solution of mild detergent in water. Take care not to get water into electrical devices, venturis, pitot heads or static ports. Ensure that the aircraft is then dried thoroughly.

## **Record of Maintenance**

The Highlander must possess two separate logbooks one for the airframe and one for the engine.

Check A (daily) **need not** be recorded in the aircraft logbooks unless a defect is found.

Check B (25 hrs / 3 months), and Check C (50hrs / 6 months) and the annual inspection **must always** be recorded in the appropriate logbooks. A list of all parts replaced must always be given and the invoices or certificates of conformity for these parts must be retained, along with all other aircraft maintenance records, until at least two years after destruction or permanent withdrawal from use of the aircraft.

## **Preparing the Aircraft for Inspection**

Carry out a visual inspection before cleaning the aircraft. Any fretting damage may be visible from powdery deposits around a bolt hole. Leaks or fatigue cracks may sometimes be detected by visible deposits in surface dust or dirt.

The aircraft may then be cleaned if required using a weak solution of mild detergent in water. Take care not to get water into electrical devices, venturis, pitot heads or static ports. Ensure that the aircraft is then dried thoroughly.

If the aircraft has been stored outside, all frost, snow or excessive dew or rain must also be carefully removed.

Inspection must be carried out in a clean environment, with good light.

## **When to Carry out Maintenance**

- |                |   |
|----------------|---|
| <b>Check A</b> | <ul style="list-style-type: none"><li>• Before the first flight of the day.</li><li>• Before any further flight if the aircraft has been left unattended on an airfield for any period of time.</li></ul>   |
| <b>Check B</b> | <ul style="list-style-type: none"><li>• At 25hr or 3 month intervals, except when a Check C or annual inspection is carried out instead.</li><li>• If necessary, Check B interval may be extended by up to 2½hrs or 9 days, but the next check time must still be taken from the due date of the previous inspection.</li></ul> |
| <b>Check C</b> | <ul style="list-style-type: none"><li>• At 50hr or 6 month intervals, except when a Check C or annual inspection is carried out instead.</li><li>• If necessary, Check B interval may be extended by up to 5hrs or 18</li></ul>   |



days, but the next check time must still be taken from the due date of the previous inspection.

### **Annual**

- Once per year, timed to co-incide with the annual permit renewal, or at 150 hr intervals (extendable by up to 15 hrs if required).
- This may not be extended in time, however if the aircraft is “rested” for some time, the intervals for all other checks may be reset by carrying out an annual inspection.

### **Note: Airframe and Engine Hours**

Inevitably, airframe and engine hours rarely, if ever, match up. While it is permissible to separate airframe and engine maintenance intervals, this becomes very complicated. It is recommended that whichever has the highest hours (usually the engine) is used as the basis for inspection and maintenance intervals.

### **Check A - the Daily Inspection (DI)**

#### **Paperwork**

- Check permit to fly is valid
- Confirm no B, C or Annual checks are due.
- Check that all defects entered into the logbooks are acceptable, or have been rectified.

## **Aircraft**

### **Checks B, C and Annual**

	Check B (25hrs / 3 months)	Check C (50 hrs / 6 months)	Annual (Or 150 hrs)
<b>Fuselage</b>			
Check all pressure instruments for cracks, leaks and stiction			✓
Check all airframe members for cracks, dents, corrosion or deformation		✓	✓
Check all fasteners for security, condition or fretting		✓	✓
Check all rig / derig connections, rings & clips	✓	✓	✓
Check all bracing cables for tension, corrosion or kinks.	✓	✓	✓
Check doors for security and cracks		✓	✓
Check seats for fraying, cracks, security		✓	✓

Check harnesses and belts		✓	✓
Check flying control runs for condition and lubrication	✓	✓	✓
Check operation of all controls	✓	✓	✓
<b>Undercarriage</b>			
Check structure for damage or deformation	✓	✓	✓
Check tire pressures (15psi)	✓	✓	✓
Check freedom & play in bearings		✓	✓
Check brakes for wear or damage		✓	✓
Lubricate all joints and bearings		✓	✓
Check steering mechanisms for wear and lubrication.		✓	✓
Unlace cover and check condition and security of elastics.	✓	✓	✓
<b>Toe brakes</b>			
Check operation, adjust and lubricate cables.		✓	✓
<b>Propeller</b>			
Inspect blades for nicks and splits	✓	✓	✓
Inspect hub for security and condition		✓	✓
Check for vibration on run-up	✓	✓	✓
Inspect leading edge protection (if fitted) for security	✓	✓	✓
Check blade pitch (if ground adjustable)			✓
<b>Fuel System</b>			
Inspect tank(s) for cracks, leaks, abrasion	✓	✓	✓
Drain or flush tank			✓
Inspect tank mount for security or chafing		✓	✓
Inspect all fuel pipes and hose for cracks or perishing. Always replace if unsure.			✓
Inspect system for leaks		✓	✓
Inspect and clean or replace fuel filter. (Check <u>every hour</u> 1 <sup>st</sup> 40 hours of run-in)			✓
Disconnect hose at pulse pump and confirm fuel flows from tanks.		✓	✓
Check operation of fuel tap.		✓	✓
<b>Electrical</b>			
Check electrolyte level of unsealed batteries.	✓		✓
Check security of battery mounting, leaks, connection security.		✓	✓
Check all wiring for condition and security.		✓	✓
Check condition of all switches			✓
<b>Wing</b>			
Check rib or batten profiles match pattern.		✓	✓
Check all members for cracks, dents, deformation, corrosion or fretting.		✓	✓
Check all cables and thimbles for tension, corrosion, fraying, kinking or fretting.	✓	✓	✓
Check all fasteners for security (nylon-insert self locking nuts are to be replaced with new items if removed for inspection).	✓	✓	✓
Check critical structural fasteners for corrosion and deformation.		✓	✓

Check condition and abrasion of stitching and gluing of fabric.			✓
Check main spar joint for wear or deformation.	✓	✓	✓
Inspect all rig & derig points for condition and operation.	✓	✓	✓
<b>Ailerons</b>			
Check for full and free movement.	✓	✓	✓
Check for any excessive freeplay between ailerons, and between aileron and control column.		✓	✓
Check control deflections.			✓
Inspect all hinges, brackets, push-pull rods, bellcranks, control horns, cables, pulleys		✓	✓
Check control cables and stops have correct tension and friction.			✓
<b>Rudder</b>			
Check for full and free movement.	✓	✓	✓
Check connections to tail wheel steering		✓	✓
Check for any excessive freeplay between rudder and pedals.		✓	✓
Check control deflections.			✓
Inspect all hinges, brackets, push-pull rods, bellcranks, control horns, cables, pulleys		✓	✓
Check control cables and stops have correct tension and friction.			✓
<b>Elevator</b>			
Check for full and free movement.	✓	✓	✓
Check for any excessive freeplay between ailerons, and between aileron and control column.		✓	✓
Check control deflections match.			✓
Inspect all hinges, brackets, push-pull rods, bellcranks, control horns, cables, pulleys		✓	✓
Check condition and operation of pitch trimmer.		✓	✓
Check all control cables and stops have correct tension and friction.			✓
<b>Doors</b>			
Check condition of doors, bracing, hinges, and latches.		✓	✓
<b>Rear Fuselage</b>			
Inspect all rear fuselage and tailboom structure through access points.			✓

## Supplements

### Maintenance and Repair

#### Fuel System

- Check venting system on the fuel cap and determine it is not clogged.

- Inspect all fuel lines for cracking, dryrot, and leaks and replace where necessary.
- Be sure the curtiss drain valve is clear and not leaking.
- Replace the fuel filter with a “non-papered” fuel filter with wire mesh.

## **Repairs**

### **General**

Repairs should either be carried out as described below, or to a scheme approved by the **A&P or I.A.**. After making any repairs, you should always obtain a “second inspection” from a qualified pilot or (preferably) **A&P or I.A.** inspector, who should sign in the logbook that they have inspected the repair and consider it safe. Where this is not possible, at the next permit renewal draw the repair to the attention of your inspector who should oversign your own entry.

**Repairs to bolted tubular structure, springs, pulleys, cables, bolts, nuts, etc.** Any damage to such parts must not be repaired and the aircraft must not be flown once the damage has been identified. Identical replacement parts must be fitted before any further flight, and their installation inspected and signed-off in the logbook by a **A&P or I.A.** inspector. The invoice (legally referred to as the Certificate of Conformity) for the parts fitted must be kept with the aircraft logbook. If it is not possible to obtain replacement parts, consult the **A&P or I.A.** Technical Office for advice.

**Repairs to the Engine** These should be carried out in accordance with the maintenance manual for the engine fitted.

**Repairs to Instruments** Light aircraft instruments may be repaired or replaced.

**Repairs to Fuel Hose** Any fuel hose that found to be cracked or damaged must not be repaired. Replace it with at least automotive quality (preferably aircraft or fire-retardant boat use) re-enforced rubber fuel hose. It is not advised that transparent fuel hose is used, and PVC hose must not be used with fuel under any circumstances. Take care not to over-tighten cable ties used to secure hose, since this can cause a flow restriction.

**Damaged Wiring** Replace with fireproof or fire resistant wiring of the same or higher current rating, secured in the original manner.

**Repairs to Batteries** A damaged battery must be replaced and all surrounding structure thoroughly inspected for acid damage.

**Repairs to Tires** An inner tube puncture may be repaired. If there is damage to the tires that shows the inner canvas, replace the tire in question.

**Damage to a Fuel Tank.** The fuel tank should be drained and removed from the aircraft. It is unlikely that the tank will be repairable.

**Damage to the Fabric** Do not attempt to fly if there is damage to the wing or fuselage covering fabric. Repairs should be carried out in accordance with FAA Airworthiness Circular AC43.13-1B chapter 2 section 4, taking care to ensure that the same materials are used as at original build, or - if the aircraft has subsequently been re-covered - the last re-covering.

**Damage to The Welded Steel Frame** If there is damage, either corrosion or bends to parts of the welded steel frame, do not attempt to straighten any damage, and do not attempt to overpaint or repair corrosion. Any repair must be approved by the **A&P or I.A.** and is likely to require cutting out the damaged section, welding in a replacement, painting the repair, and then externally sleeving the repair. Guidance notes on such repairs are to be found in FAA Airworthiness Circular AC 43.13-1B chapter 4, section 5

## **Vital Statistics**

Weight values for this Escapade/Highlander are at Annex A and a description of the aircraft limitations are at Section 2. The following describes the basic dimensions of the aircraft:

	<b><u>Highlander</u></b>
Length	19ft
Length wings folded	20ft 8in
Width wings folded	7ft 11.5in
Height tail wheel version	6ft 2in
Span	31.6ft
Mean chord	45in
Wing area	120.75ft <sup>2</sup>
Undercarriage track width	6ft 4in
Fuel capacity	18 gals/26
Tire Pressure (Main wheels)	15 psi
Tire Pressure (tail wheel)	15 psi
Tire Gear Width	76in

MINOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT  
ISSUE

[illegible][illegible]

## ANNEX B

MAJOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT  
ISSUE

[illegible]

ANNEX C

INSTRUCTIONS AND MANUALS FOR OTHER DEVICES FITTED TO THIS  
AIRCRAFT

No.	Description	Issue or date	Approval Mod No, or original equipment
F1			
F2			
F3			
F4			
F5			
F6			
F7			
F8			
F9			
F10			
F11			
F12			
F13			
F14			
F15			
F16			
F17			