Exodus DeltaJet 500 StingRay
Operators & Maintenance Manual

G–???? -- Serial No.: EA00

Manufacturer

Flylight Airsports Limited - DAI/9967/18
Sywell Aerodrome, Sywell, Northants, NN6 0BT
United Kingdom

This manual is approved for use with Exodus DeltaJet 500 StingRay aircraft constructed by Flylight Airsports and issued with a United Kingdom Type Approved Permit to Fly. It must remain with the aircraft, and not be amended or altered without authority from the manufacturer.

All pilots should read this manual before flying as pilot in command of the aircraft to which it refers.

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TABLE OF AMENDMENTS

Reference	Changes incorporated	Approved. Date
Issue 1	Initial issue	10.05.2022
Issue 1.1	Section 2.14 updated to describe the operation of the new type of Intelligent Battery Status Monitor LED (10 mm Ø) fitted to aircraft from serial number EA019 onwards. Carb Heat section 2.15 added. Specific changes to the Routine Maintenance section 8.8 to reflect in-use findings. Change Wing Strip from 300 hours/4 years to 500 hours/4 years. 'Folding the Wing ' added to section 12.	24.07.2026

Introduction

1.1. The Exodus DeltaJet 500 StingRay is a weight-shift controlled microlight aeroplane, Type Approved in the United Kingdom using British Civil Airworthiness Requirements (BCAR) Section S as a basis for approval to the Air Navigation (Amendment) Order 2021/879 art.10(c) (August 19, 2021) microlight definition up to 600kg.

1.2. This manual is not intended to teach you to fly the aircraft, or to build it. Learning to fly should be accomplished under the supervision of a suitably qualified flying instructor experienced on the type.

1.3. What this manual will do is provide the information that a qualified pilot requires to safely fly this aircraft (although a conversion by an FI familiar with the type is recommended), and to carry out routine maintenance and minor repairs. All modifications to a Type Approved Exodus DeltaJet 500 StingRay must be approved by the manufacturer or the British Microlight Aircraft Association.

1.4. The licence required to fly the Exodus DeltaJet 500 StingRay in the UK is an NPPL (Microlights), with or without operating restrictions. Other Licences may be used if approved by the UK CAA. Pilots used only to 3-axis controls must complete differences training conducted by a microlight FI before flying the aircraft as P1 unsupervised. Existing weight-shift pilots are recommended to have a familiarisation flight with a suitable person to ensure the minimum drama and the maximum enjoyment from the first few P1 flights.

1.5. This aircraft must be operated using two separate logbooks, for the airframe and the engine (or the BMAA combined logbook, reference BMAA/AW/036). All entries must be made in the logbook in ink and within 7 days.

2. *Description of the Aircraft*

2.1. **Ancestry** - The Exodus DeltaJet 500 StingRay is the first aircraft from Exodus Aircraft but shares more than 30 years' history with a long line of trikes built by Apollo in Hungary and wings manufactured by Aeros in Ukraine.

2.2. **Construction** - Construction of the DeltaJet 500 trike unit is predominately from straight aluminium tubes and aluminium or welded steel bracketry. Fairings are polyester glass or carbon fibre composite mouldings. The wing is constructed from pin jointed aluminium tubing. The upper surface of the sail is made from clear NCV (a polyester material) whilst the under surface is Dacron. Double layers of material are used for additional reinforcing in highly stressed areas.

2.3. **Pitch control** - Effected by forward/backward movement of the control frame and follows weight-shift convention, i.e., forward to increase the angle of attack and backwards to reduce it.

2.4. **Pitch trimming** - Effected using an in-flight, electrically operated moveable-hangpoint system, operated by a toggle switch on the port side of the bodyshell.

- Trim speed is increased by pushing the toggle switch forwards, which moves the hangpoint towards the front of the aircraft, and reduced by pushing the toggle switch backwards, which moves the hangpoint towards the back of the wing. As the hangpoint moves the bar position changes and a new trim speed is achieved.
- For takeoff and landing approach, it is recommended to set the hangpoint in roughly the centre of its movement.
- The position of the hangpoint can be gauged by looking up at the hang bracket on the wing keel tube and comparing its position to the forward and rear lines on the keel tube.

2.5. **Roll control** - Effected from lateral movement of the control frame and follows weight-shift convention, i.e., bar right, aircraft rolls to the left.

2.6. **Yaw control** - A separate yaw control is not provided. Like other weight-shift aircraft, yaw is provided from the secondary effect of banking.

2.7. **Braking** - Effected by hydraulic disc brakes fitted to one, two or all three wheels, and actuated by a lever on the left-hand foot pedal. A parking brake is also provided which is selected by depressing the brake pedal, and then lifting a toothed lever to engage with a peg. The parking brake is spring loaded and automatically returns to the off position when the brake pedal is again depressed.

2.8. **Steering** - The nose wheel is steered by the foot pedals. They work in the normal weight-shift aircraft sense – push right go left. Fully adjustable rear seat steering is also an option and operates in the same sense via a rear steering bar and linking rod.

2.9. **Throttle** - The primary throttle control is a foot throttle, actuated by depressing a lever on the Right-hand foot pedal. There is also a separate hand throttle, which is located in a recess on the port side of the bodyshell. The best way to set the hand throttle is to establish the desired RPM with the foot throttle and then pull up the hand throttle lever until resistance is felt. The foot throttle can then be relaxed, and the RPM should be maintained. To reduce power simply push the hand throttle lever downwards.

2.10. **Choke** - The choke lever for the engine is located in a recess on the starboard side of the bodyshell. This works in a pull up for on sense.

2.11. **Fuel Tap** - The fuel tap is located in a recess at the rear of the starboard side of the bodyshell just ahead of the fuel filler cap. The orientation of the fuel Tap is clearly placarded.

2.12. **Baggage storage** – 20kg total baggage can be stowed in a number of places around the aircraft. Loads carried in these areas must be accounted for when calculating the takeoff weight of the aircraft. The storage areas are:

- Front Seat Bags, located in the cockpit under the forward edge of the seat moulding. These panniers are fixed to the aircraft with Velcro straps and a rear webbing strap and can be removed from the aircraft for security if desired. Maximum load for these is 10kg each.
- Front pod Bag, this is an optional removeable bag fitted to the front of the pod ahead of the front side panniers. It is secured via two webbing straps and buckles. Maximum load is again 10kg.
- Although each bag is individually approved to carry a 10kg, **a Maximum load of 20kg** spread between the three bags is allowed.

2.13. **Harnesses** - The Exodus DeltaJet 500 StingRay is fitted with lap straps which utilise conventional 'airline type' buckles. There are also additional inertia reel shoulder harnesses for the pilot and passenger, which attach by threading through the lap straps. It is a legal requirement that the passenger wears one or both of the shoulder harnesses. It is also strongly recommended that the pilot wears one of the shoulder harnesses.

2.14. **Instrument panel LED** – The Exodus DeltaJet 500 StingRay is equipped with an Intelligent Battery Status Monitor, which is a single LED voltmeter specially calibrated for Lithium batteries as fitted to the DeltaJet 500 StingRay. When the Master switch is powered on, it will blink green, yellow, or red to show the battery condition. If the LED does not display any colour, this indicates a voltage of less than 12.75v and it is probably a good idea to charge the battery (remember to only use a Lithium-type battery charger). The voltage thresholds, outputs and interpretation are shown below.

If the LED is anything other than a steady green whilst flying it indicates an abnormality. In particular, an alternating Red/Green indicates 'over-charging' and you should land as soon as possible as damage could be caused to the battery that might result ultimately in fire. Also, any single colour flashing during flight indicates the alternator is not providing sufficient charge to the battery.

Voltage	Output		Engine running	Engine stopped
>15.20 v		Green/Red alternating	Over-charging – generator problem	Not applicable
>13.50 v		Green steady	Normal charging	Normal battery charge
>13.25 v		Yellow 'Flashing'	Under-charging – generator problem	Fair battery charge
>13.10 v		Red 'Flashing'	Under-charging – generator problem	Low battery charge
>12.75 v		Blank – No Display	not charging – battery low	Very low battery charge

If you have difficulty distinguishing between red, yellow and green, any flashing display during flight is a cause for concern.

2.15. **Carburettor icing & 'Carb Heat'** - Carburettor icing is a phenomenon where ice forms inside a carburettor venturi due to the pressure reduction caused by the venturi combined with the cooling effect of fuel atomisation into the induction air. The accumulation of ice can restrict airflow, leading to a loss of engine power, the mixture becoming richer, and possible rough running. It is most common in temperatures between 0°C and 10°C with high relative humidity, but can occur in warm humid conditions, especially at low power settings. In the UK and Northern Europe where high humidity is common, carb icing is a constant threat. Note that humidity is always high close to cloud base.

The DeltaJet 500 is fitted with a pair of carburettor and butterfly heating units supplied with heat from the coolant system. This has minimal effect on performance on colder days, although it is advisable to ensure the coolant temperature is maintained at 80°C or more. It is advisable to warm the engine frequently on long descents.

If the optional electrical 'switchable carb heat' is fitted, this should be selected as 'on' before takeoff whenever icing conditions are possible. However, given the long-term trend towards hotter temperatures in Northern Europe and the increasing use of E10 fuel, we advise that the carb heat can be switched off on days with a high ambient temperature and with humidity low enough to prevent carb icing. This will maximise the power available and help prevent heat soak after flight, which may cause difficulty during a subsequent hot start.

Please reference CAA Safety Sense Leaflet 14 – Piston engine icing, for more information on carb icing conditions. **www.caa.co.uk/media/j5omfigm/ssl-14_piston-engine-icing.pdf.**

3. Limitations

3.1. **Introduction** - This section includes the operating limitations for the Exodus DeltaJet 500 StingRay. Other criteria may also be found in the Type Approval Data Sheet (TADS) BM-94 that is used by the Inspector at Annual Permit renewal to ensure, amongst other things, that the correct limitations are placarded in the cockpit.

3.2. **Units** - When noting limitations, it is important to ensure that the limitations that you are using employ the same units and calibrations as the instruments in the cockpit. The limitations stated in this manual are Indicated Air Speeds (IAS) in MPH, appropriate to the air speed calibration determined as correct for the Type Approved Exodus DeltaJet 500 StingRay. To convert to Calibrated Airspeed (CAS) the calibration data in Section 13 may be used. The difference between IAS and CAS is basically the accuracy of the Pitot-static system.

3.3. **Operational Limitations**

- The Exodus DeltaJet 500 StingRay must only be flown in day VMC conditions.
- The Exodus DeltaJet 500 StingRay is approved to a permit to fly standard. This prohibits commercial operation other than *ab initio* and other flying instruction.
- This aircraft is approved to a UK only standard, which means that permission is required from the host country to fly it overseas. However, various reciprocal agreements exist for flights to other ECAC (European Civil Aviation Conference) member states. The European Microlight Federation (EMF) has useful guidance for flying Microlight Aircraft in Europe – www.emf.nanco.no

3.4. **Minimum instrumentation** – Comprises an ASI, Altimeter, RPM, Compass, Oil Temperature, Oil Pressure, Coolant Temperature, and Fuel Content. Also specified in the Type Approval Data Sheet (TADS) BM-94. The latest issue is available on the BMAA website.

3.5. **Crosswind** - It is recommended that the Exodus DeltaJet 500 StingRay is not flown where a crosswind component above 10 Knots is predicted, or 15 Knots for pilots very experienced on type.

3.6. **Altitude** - Do not fly above 10,000ft standard pressure altitude without the use of personal oxygen. For flight above this altitude a transponder is also required.

3.7. **Flight Limitations**

All speeds Indicated Air Speed (IAS).

	Exodus DeltaJet 500 StingRay
Never exceed speed, V_{NE}	117 mph
Manoeuvring speed, V_A	103 mph
Speed for best rate of climb, V_Y (1,034 ft/min)	65 mph
Speed for best glide angle (8.02:1)	60 mph
Speed for best climb angle, V_X	55 mph
Speed for glide minimum sink (500 ft/min)	48 mph

- Maximum Bank angle is 60° either way.
- Maximum Pitch attitudes are 45° nose-up, 45° nose-down.
- Normal acceleration limits are +4/-0.
- At least 55kg (121 lb/8 stone 9 lb) must be in the front seat for flight, no more than 120kg (264.5 lb/18 stone 12.5 lb) may be carried in each seat.
- Maximum Takeoff weight is 499kg.
- Aerobatics and deliberate spinning are prohibited.

3.8. **Engine Limitations**

- The limitations for the engine are contained in Annex A, they are also placarded in the cockpit.

4. Flying the Exodus DeltaJet 500 StingRay

4.1. **Pre-Flight Inspection (check A) -** Check A, is detailed in the maintenance section.

4.2. **Starting** - The BMAA standard manual pre-start checks [**STAIP**] are recommended. The STAIP checks are:

- **Security –** Check seat belts, helmets and loose items, brakes on, baggage compartments secure.
- **Throttles –** Free movement, set as required (note - check hand throttle lever fully down for off, choke as required.
- **All clear –** All around, facing a safe area, and such that propwash will not cause problems for others.
- **Magnetos –** Mags selected to both on.
- **Prop –** Shout 'Clear Prop', pause, then engage starter.

The actual starting procedures for a particular engine are contained in Annex B to this manual.

Once the engine has started, progressively reduce the choke, check the oil pressure has risen within 5 seconds and set a suitable warm up RPM (approx. 2400-2800).

4.3. **Taxying** - The aircraft will taxy on whatever course you wish without difficulty using a combination of throttle, brake, and nose wheel steering. Remember, relatively lightweight aircraft like the Exodus DeltaJet 500 StingRay can be blown over in strong winds: be careful to always tilt the wing so that the into-wind edge is slightly lower than the rest of the wing. Avoid turning sharply as this generates large amounts of torque and hence wear, transmitted to the pylon, hang point and keel. Always try to help the wing to stay aligned with the trike when turning by bracing the control bar. The turning circle is very tight but, take note, the wing tips stick out and can move around their arc very rapidly!

- **Taxy checks** – taxying is the time to check that:
- the brakes' function,
- the compass moves when the aircraft turns,
- the compass reading reflects the general alignment of the runway(s).

4.4. **Prior to Takeoff** - It is recommended that the BMAA standard pre-takeoff checks [**CHIEFTWAP,** see below] are used, including a check to ensure that the parking brake is off. The pilot must ensure that the engine oil temperature is above 50°C and the engine has been run successfully at takeoff power prior to takeoff.

- **Controls** full and free.
- **Harnesses, Helmets**, and any **Hatches** secure.
- **Instruments** all serviceable, reading correctly.
- **Engine** ignition checked for mag drop, selected to both, **Choke** off.
- **Fuel** on, sufficient for the flight.
- **Trim** set to mid position.
- **Wind** speed and direction checked, and suitable for safe takeoff on selected runway.
- **All Clear**, all around the circuit, final clear and runway unobstructed
- **Power**, check full power is achieved early in the takeoff run.

4.5. **Takeoff** - Smoothly apply power and hold the aircraft straight using the nose wheel steering. Initially, hold the bar in the neutral position in pitch and keep the wings level before moving

the bar forwards to rotate at around 55 IAS. As the aircraft rotates, smoothly allow the bar back, adopt a shallow climb attitude, and allow the airspeed to build to a low-level climb speed of around 65-70 IAS. Once above a height of 200' the airspeed can then be reduced to the best rate of climb at 65 IAS if desired.

4.6. **Short Takeoff** - For a performance takeoff, hold the bar in the neutral position in pitch and keep the wings level. Initially apply full power against the brakes and release the brakes once full power is achieved. Allow the aircraft to accelerate and move the bar positively fully forwards to rotate at around 55 IAS. As the aircraft rotates, smoothly allow the bar back and allow the airspeed to build to 65 IAS – best rate of climb. If obstacle clearance becomes a priority the best angle of climb speed of 55 IAS can be used. However, try not to put yourself in a position where this is necessary as roll control and ability to attain gliding speed promptly following engine failure will be impaired at such a low speed.

4.7. **Soft field Takeoff** - If taking off in calm conditions or from a soft field or a field with long grass, the bar can be moved to the fully forward position at the start of the takeoff run and held there until the aircraft rotates. As the aircraft rotates promptly move the bar back to adopt a shallow climb.

4.8. **Taking off at low cockpit weights** - The Exodus DeltaJet 500 StingRay has a high-performance climb ability. At low cockpit weights very steep angles of climb can be produced at low airspeeds. An engine failure in such a condition if mishandled can result in a stall with significant nose down rotation and subsequent height loss. At takeoff weights below 350Kg, it is recommended to maintain airspeed above 70 IAS whilst climbing at full power.

4.9. **Crosswind Takeoff** - Start the takeoff run with the into-wind wing very slightly low. Hold the aircraft on the ground by holding the bar back slightly from the neutral position to keep the weight on the nose wheel in order to maintain positive directional steering. Allow the airspeed to build to a higher-than-normal value - around 60 IAS - then positively rotate into a shallow climb attitude. Keep the wings level and allow the trike to yaw into the relative wind. At this point, adjust the drift angle if required to maintain runway centreline and proceed as normal. The recommended crosswind component limit is 10Knots or, for pilots very experienced on type, 15 Knots.

4.10. **Landing** – The Aircraft should be trimmed for an approach speed of around 60-65 IAS under most conditions and power set dependant on the type of approach required, glide or powered. If conditions are gusty, or strong wind gradient is suspected, use a higher IAS value. The old adage of adding ½ the wind speed to the approach airspeed is sensible.

- If a performance short field landing is required, use an approach speed of 55 IAS with the trimmer set appropriately. The landing is conventional, maintain the approach speed until approx. 20 feet height, then round out and hold off to make a smooth touchdown. Braking may be used once all wheels are down. Avoid excessive braking on rough surfaces as very large loads can be transmitted into the structure. Also be careful braking on wet grass as it can be very easy to inadvertently lock the wheels and skid, at which time directional control can be compromised. The actual performance figures can be seen on page 15.

4.11. **Landing in a Crosswind** - Crosswind landing limits are largely dictated by the skill of the pilot. Make sure that you have lots of experience with your Exodus DeltaJet 500 StingRay before attempting crosswind landings with components larger than 10 Knots. General technique should be to fly a powered approach, to give more control, maintaining the runway

centreline by setting up a steady drift angle. During the final stages of the approach use a higher-than-normal approach speed to minimise the drift angle. Round out slightly lower than normal and aim for a short hold off, so that the aircraft is landed smoothly back wheels first with the control bar at or only slightly forwards of the neutral position. The contact between the back wheels and the ground will then yaw the trike unit towards the runway centreline at which point the nose wheel can be gently lowered to the ground. Once all wheels are down, the into-wind wing can be lowered slightly, and the bar bought back to neutral to ensure the aircraft stays firmly down.

- To ensure maximum directional control during rollout from a crosswind landing the recommended technique is to move the bar back after landing and apply light to moderate braking. This eliminates any tendency to bounce and ensures good contact pressure between tyre and runway surface. Likewise, this technique to apply aerodynamic loading to increase ground pressure and hence braking efficiency during landing roll is appropriate for short field landing.
- Remember that crosswind landings on grass are slightly easier than on hard surfaces. During crosswind landings a lot of torque is applied through the structure which will result in excessive wear to the hang point and attached structure. Always try to land into wind if possible. If crosswind components are in excesses of 15 Knots then only a small into wind distance will be required for landing – maybe across a large runway could be the better option! Recommended crosswind limit for **experienced pilots** is 15 Knots.

4.12. **Cruise** – The hands-off trim speed range of the Exodus DeltaJet 500 StingRay is approximately 48 to 80mph, depending on cockpit loading. Speeds either side of this range may be held for long periods with light pitch pressures. The fuel consumption and range will vary considerably with airspeed. Recommended cruise is 70-80mph, which will give a good balance of speed and economy. We recommend that you accurately record your fuel burn at typical weights/speeds that you will be cruising at before, you start long cross-country flights, so that you can accurately plan for fuel/range.

4.13. **Mixture control** - If fitted with a mixture control the fuel consumption in the cruise can be reduced by leaning off the mixture. (If a mixture control is fitted, engine EGT gauges are mandatory). Lean the mixture off until the peak EGT is reached, this is then the most economical setting.

NOTE: DO NOT EXCEED MAX EGT LIMITS AS SET IN ENGINE MANUAL. RUNNING THE ENGINE EXCESSIVELY LEAN MAY SHORTEN THE ENGINE LIFE.

4.14. **Turning** - The Exodus DeltaJet 500 StingRay is very well balanced in the turn and is capable of high rates of roll with modest control forces. Fastest roll rates will be achieved at light weights and high airspeed. Conversely when flying at high weights and low speeds manoeuvrability will be reduced. Take care to ensure that your runway will be long enough for takeoff and that no sudden manoeuvring will be required to avoid obstacles early in the climb out when speed may be low.

- Turns at bank angles up to 60 degrees are permitted. At this bank angle to balance the turn forward bar movement will be necessary to generate the required lift for level flight and increased power will be required to overcome drag and maintain the airspeed. In this condition substantial wake turbulence will be produced and it is recommended that for a level turn over 45 degrees of bank that a heading change no greater than 270 degrees is

used, to avoid entry to the wake turbulence and possible excursion outside the permitted flight envelope.

- The Exodus DeltaJet 500 StingRay has close to neutral spiral stability and thus will remain balanced in a turn without significant roll control pressure required. In common with most aircraft, it will not naturally roll wings level from a turn and may exhibit an overbank tendency in a climbing turn, which will be exaggerated at low speed and high-power settings.

4.15. **Flight in Turbulence** - As far as flexwing microlights go the Exodus DeltaJet 500 StingRay handles turbulence very well. However, in common with all microlight aircraft, care must be taken in turbulent conditions, particularly when close to the ground. As previously stated, high airspeed will enhance manoeuvrability in these situations. However, if the conditions become severely turbulent with hard jolts being transmitted through the aircraft, it is recommended that you do not exceed the manoeuvring speed – $V_{A,}$ of 103 MIAS. V_{NE} (117 MIAS) should only be reached in smooth conditions.

- In strong wind conditions avoid flying on the downwind side of large hills or other obstructions. Remember that when landing in strong crosswind conditions that low level turbulence will be produced by obstructions on the upwind side of the runway. Always try to assess areas of possible lift, sink or turbulence from some distance away so that you can be fully prepared for their effects.
- At height the best way to minimise pilot workload and physical fatigue is to fly the aircraft trying to let the control bar float through turbulence. Use your arms as dampers and try not to rigidly fight the movement. Close to the ground where accurate control is required the displacement of the aircraft in turbulence can be reduced by bracing the control bar relative to the structure of the trike unit. This then lends to the wing the pendulum stability of the trike mass. However, the pilot must be ready to make any necessary corrective control inputs.
- Smooth flight in turbulence in a flexwing aircraft is a skill which is learnt with time and experience. Please remember the old adage – 'it is better to be on the ground wishing that you were in the air, than in the air wishing that you were on the ground!'.

4.16. **Slow flight** - If the Exodus DeltaJet 500 StingRay is decelerated at less than 1kn/sec a classical stall will not usually occur. The aircraft will fly with the control bar fully forward on the edge of the stall. Particularly in the glide some pre stall buffet may be felt in the form of pressure 'bumps' pushing rearwards on the control bar. This may also be accompanied by simultaneous rolling tendencies as one wing reaches the stalling angle before the other. In this condition manoeuvrability is severely impaired. Full control is restored immediately upon moving the control bar rearwards and applying power. Correctly co-ordinated height loss for recovery from this minimum speed is negligible.

4.17. **Fully developed stalls** - If the Exodus DeltaJet 500 StingRay is decelerated at a rate greater than 1kn/sec, a fully developed stall will occur at 44 MIAS. This is usually in the form of a smooth nose down rotation to a maximum of around 20 degrees nose-down proportional to the deceleration rate, with negligible to 50' height loss for recovery if correctly co-ordinated. There is not normally a wing drop tendency with power, however a slight wing drop may be experienced in a glide.

4.18. **Climbing flight stalls – Proceed with Caution!**

- Although the aircraft has been tested quite satisfactorily in this regime, at low weights and high-power settings the nose up attitude at the stall break, even with modest deceleration rates can be extreme.
- **In common with all flexwing aircraft inadvertent mishandling at very steep nose high attitudes, initiated by stalling in a climb or by decelerating the aircraft at a high rate (a whip Stall), can initiate a tumble from which there is no known recovery, and which normally results in catastrophic structural failure commonly resulting in death.**
- Pilots should also be aware that as with all aircraft, overloading the aircraft with baggage/heavy occupants will further increase the stalling speeds, as well as the usual drawbacks of reduced performance and structural safety margins.

4.19. **In Turning Flight** - Stalling speeds are increased with bank angle. Flexwing aircraft do not increase stalling speed in proportion to load factor in the same way as conventional aircraft. Expect a stalling speed rise of 60% or more at the maximum permitted bank angle of 60 degrees. Again, a correctly co-ordinated height loss for recovery is negligible to 50'.

4.20. **Rain, ice, and snow** - Flight in rain will increase the stalling speed of the aircraft and exaggerate the slow flight and stalling characteristics. We recommend wiping the fabric of the leading edge with an absorbent cloth if such conditions are observed before flight. During flight, so long as raindrops are present on the windshield of the trike, one must expect a higher stall speed, obtained with the control bar further back than usual. Be particularly careful during the landing approach and raise the recommended speeds by 10% and do not attempt a fully held-off landing.

- Also be particularly careful taking off in rain or with a wet wing. Allow the aircraft to build up more speed than normal before rotating and do so without moving the control bar fully forwards. This will ensure you do not take off and inadvertently enter a stall.
- Any form of wing surface contamination such as ice or snow will result in increased stalling speeds and reduction in overall aircraft performance, sometimes to a drastic extent. **Never takeoff with such contamination present**. If these conditions are encountered during flight, attempt to leave these conditions as quickly as possible. If this is not possible the aircraft should make a precautionary landing as soon as is safe to do so. During this process avoid flight at low speeds and expect poor aircraft performance.

4.21. **Aerobatics** - Aerobatics are strictly not permitted in this aircraft.

4.22. **Departures from Controlled Flight** - Like all flexwing aircraft, the Exodus DeltaJet 500 StingRay has very safe flying characteristics if flown within its prescribed flight envelope. Causes of departure from controlled flight must be avoided and include:

- Deliberate flight outside the flight envelope
- Loss of control after inadvertent cloud entry
- Loss of control in severe meteorological turbulence
- Loss of control in severe wake turbulence
- Most minor excursions outside the flight envelope can be recovered by normal use of the flight controls. The most difficult area to recover from is severe nose up attitudes. As previously mentioned this can result in a sharp and severe nose down rotation rate which can lead to inversion of the aircraft. **Never** deliberately attempt investigation into this regime of flight.

5. Performance

5.1. **Glide performance**

Minimum sinking speed - 48 MIAS – 500fpm	Best glide angle speed - 60 MIAS

The speed for best glide angle will give the greatest still air distance and achieve a gliding angle of around 8.0:1 at MTOW, a gliding distance of around 3 miles from 2000' in still air. Against a headwind this will be considerably reduced, and airspeed will have to be increased to ensure penetration. For example, the best glide angle speed for a 20 Knot headwind rises to 70 IAS.

5.2. **Takeoff performance**

The takeoff distance at max takeoff weight, on short dry grass, in still air, 15degrees C air temp, and at sea level pressure (1013Mb) was found during testing to be 315M including a 1.3 safety factor. As conditions change from these International Standard Atmosphere (ISA) conditions, the following additional factors should be applied.

10% increase in weight	Multiply takeoff distance by 1.2
Per 1000 ft runway height above Sea Level	Multiply takeoff distance by 1.1
Per 10°C increase in temperature above 15°C	Multiply takeoff distance by 1.1
Wet grass	Multiply takeoff distance by 1.1
Dry Tarmac or concrete	Divide takeoff distance by 1.1
Per 2% uphill slope	Multiply takeoff distance by 1.1
Per 5 knot tailwind component	Multiply takeoff distance by 1.2
Soft ground or snow	Multiply takeoff distance by 1.25

5.3. **Landing performance**

Distance from passing 15m in still air to stopping is 219m when using a glide approach at 60 IAS. This assumes only 'moderate' use of the brakes (three-wheel hydraulic disc option). This landing distance can be shortened substantially, in the region of 40m, by applying the brakes more forcefully and pulling the bar fully back to achieve aerodynamic braking effect. This applies whether the aircraft is equipped with the standard nose wheel brake or the optional brakes on all three wheels. As an additional guide, stopping distance from 15m without using the brakes adds another 100m with the engine stopped, and considerably more with the engine idling.

Using the figures above, the following additional safety factors should be applied to the distance to clear a 15-metre obstacle on the approach (taken from CAA GA Safety Sense leaflet 7B). If unsure, always use these factors to ensure you have sufficient runway to avoid using the considerately provided hedge at the far end of the runway.

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 10°C increase in temperature above 15°C	Multiply landing distance by 1.05
Wet grass	Multiply landing distance by 1.1
Dry Tarmac or concrete	Divide 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

6. Emergencies

6.1. **Engine Failure Before Takeoff**. Close throttle, apply brakes, switch off.

6.2. **Engine Failure After Takeoff (EFATO**). Lower nose positively and promptly in order to establish an approach speed of at least 60 MIAS, land straight ahead or near to straight ahead, DO NOT ATTEMPT TO TURN BACK from below 500ft unless in extenuating circumstances.

6.3. **Engine Failure in Flight**. Lower nose to establish the glide attitude. If you have sufficient height a minimum sink speed of 48 IAS can be used initially to conserve altitude whilst finding the wind direction, selecting a landing site, planning the descent. Once you have a plan then adopt the best glide speed of 60 IAS. If time permits make an emergency radio call and check for possible reasons for engine failure (e.g., ignition switches, fuel cock, lack of fuel pressure) and attempt re-start (always remember to cleck the hand throttle is closed). If the selected 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.

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

6.5. **Electrical Fire**. Try to isolate the problem by switching the master switch off, keep the ignition switches on. If this stops the fire then continue to nearest Airfield or carry out a precautionary landing. If the fire persists then switch off the ignition as well and proceed as per an engine failure.

6.6. **Emergency Landing on Water**. Try to land into wind with as high a nose-up attitude as possible. Once emergency radio call has been made unplug headset leads and discard of any other loose items that could impair your exit of the aircraft like map board etc. Before impact, pilot and passenger must be prepared to release their harnesses. If wearing lifejackets, do not inflate them until out of the aircraft. Note that it is very hard to judge height above water.

6.7. **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.

6.8. **Inadvertent Flight in hail or heavy rain**. Reduce power to avoid propeller damage, Bear in mind staling speed will rise so avoid flight at low speeds. Fly out of the weather as soon as possible.

6.9. **Inadvertent Flight in Icing Conditions**. Fly out of conditions as soon as possible. Bear in mind stalling speed will rise proportionally with ice accumulation, so avoid flight at low speeds. Land as soon as possible.

6.10. **Use of Ballistic Parachute (if fitted)**. Tighten harnesses, ignition OFF, pull handle, and make emergency radio call if radio carried. [Note, if a BRS is fitted to this aircraft, it requires specific modification approval and the BRS manual will be annexed to this manual.]

7. Weight and Balance

7.1. The Exodus DeltaJet 500 StingRay will have been weighed when first built including all optional modifications fitted and must be re-weighed at intervals as laid down by the BMAA and CAA current technical procedures.

7.2. Weighing should be carried out by a BMAA inspector or Technical Team member. A copy of the W&CG report must be retained in this manual at Annex C. Also at each weighing, details of the weighing must be entered in the aircraft logbook. Full instructions on how to weigh a microlight aircraft are contained in BMAA technical information leaflet TIL 012, and specifically for the Exodus DeltaJet 500 StingRay in TADS BM-94.

8. Maintenance

8.1. **Introduction**

This manual details recommended maintenance. However, maintenance requirements will depend upon conditions of storage and type of use. Examples of harsh use may include:

- Storage outside
- Use near salt water
- Regular use from unprepared rough fields
- Regular transport by trailer
- Learning to fly

In such cases more regular inspections and component replacement may be required in order to keep the aircraft in an airworthy condition.

8.2. **Who may carry out maintenance and whose responsibility is it?**

- The Exodus DeltaJet 500 StingRay has been conceived and designed to be maintained by a person without specific training in mechanics. However, some mechanical experience is desirable and persons with limited mechanical capability should limit themselves to the simple maintenance actions and engage suitably skilled persons to undertake the more complex tasks. No specific qualifications are legally required for persons carrying out maintenance work on UK Microlight Aircraft.
- The Owner is essentially the 'maintenance manager' and must assume responsibility for ensuring the maintenance actions are carried out as and when required in order that the aircraft may remain in an airworthy condition. As such the owner must be thoroughly familiar with this maintenance manual, and not hesitate to take advice from their local BMAA inspector, professional maintainer, and/or the aircraft manufacturer on any points that are not immediately clear.

8.3. **Recording and certifying maintenance**

- All maintenance actions must be recorded in the aircraft airframe and engine logbook(s). Separate worksheets and invoices for parts/work, should be kept in a file that can be referenced in conjunction with the logbook entries.
- Each logbook entry detailing maintenance should be accompanied by a signature of the person or persons that have carried out the work. Any work that is 'flight critical' must have a second signature (in addition to the person that has carried out the work) to certify that correct reassembly has been carried out. This must be done by a 'qualified person'- the definition of such a person is anyone that the owner deems qualified for the task. Another pilot familiar with the type or similar type, a BMAA or LAA inspector, or a professional maintainer, are examples of persons that could be considered 'qualified' for this task.
- Examples of tasks that are considered 'flight critical' are:
    - Dis/reassembly of control systems or primary structure (outside of normal re/de-rigging).
    - Maintenance by replacement of primary structure.

- Maintenance by replacement of control systems.

8.4. **Sourcing parts**

- Unique airframe parts must be purchased from the manufacturer in the first instance, or another organization approved by the BMAA for manufacturing such parts (usually if the manufacturer has ceased trading). Some parts may be unique to the UK approved model, so this must be verified.
- Non-unique parts may be sourced from other suppliers. However, they should be equivalent in terms of specification and dimension and/or part number. If there is doubt, then there is no doubt – they should not be used.

8.5. **Engine maintenance**

This should be carried out in accordance with the engine manufacturer's specific maintenance schedule for the type and model of engine.

8.6. **Inspections and when to carry them out**

- Pre-flight inspection
- First 10 hours inspection. This inspection should not be extended.
- 50 hours/6-month inspection (whichever comes sooner). This inspection may be extended by 10% (5 hours).
- 100 hours/one-year timed to coincide with the annual permit inspection (whichever comes sooner). This inspection may be extended by 10% (10 hours).

  These hours are airframe hours – which are flight hours. If the aircraft is operated from a rough surface then it is recommended airframe hours are recorded from start of taxying, to finishing taxying at the end of the flight. For convenience owners may choose to base times on engine hours.
- 300 hours/four-year inspection (whichever comes sooner). This inspection may be extended by 10 hours.
- Parachute inspection – maintenance of the parachute system, including the rocket, bridles, and parachute itself, should be carried out in accordance with the parachute manufacturer's specific maintenance schedule.

8.7. **Pre-Flight Inspection**

- 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.

  Trike unit

  - Ignition switches OFF.
  - Master switch ON, check operation of instruments and operation of trimmer. Master OFF.
  - Instruments secure.
  - Hand throttle and choke operation and friction.
  - Loose item check in cockpit fairing.
  - Check nose wheel attachment, security and condition, tyre condition and inflation, brake lines, discs, callipers, and pads.

- Condition of forks, swing arms, and suspension units.
- Lock to lock check of steering and bearings.
- Position and fixing of pedals.
- Throttle and brake pedal operation.
- Security of windscreen.
- Lower fixing of front strut, wire locking in tack.
- Check of forward composite bodywork for integrity and straightness, cracks, etc.
- Condition of seat belts and function of buckles
- Seat cushions position and security.
- Buckles and webbing not twisted.
- Fuel tank and sight gauge, security, integrity, leaks, etc.
- Check of rear composite bodywork for integrity, straightness, cracks, etc.
- Main undercarriage 'beam' security and condition, aircraft not sitting at an angle. Leg fairings, condition, and security.
- Rear wheels, security and condition, tyre condition and inflation, brake lines, discs, callipers, and pads if fitted.
- Wheel spats, condition, and security. Check mounting bolts are tight.
- Engine mounts, security, and condition.
- Engine inspection IAW engine daily inspection sheet.
- Pylon fixation bolts secure and pinned.
- Engine 'bonnet' secured.
- Rear radiator fairing condition and security.
- Oil tank condition and security, check oil level.
- Upper pylon, front strut attachment, hang bolt tight.
- Baggage bags properly secured.

<u>Wing</u>

CAREFULLY CHECK THE ENTIRE LENGTH OF THE LEADING-EDGE POCKET TO ENSURE THAT THE MYLAR INSERT IS LYING FLAT IN THE POCKET. IF ANY SECTION OF THE MYLAR IS FOLDED UNDER, DE-TENSION THE CROSSBAR, REMOVE AS MANY BATTENS AS NECESSARY AND UNFOLD THE MYLAR.

At the nose, with the nose cone removed:

- Check that the nose junction hardware is tight, the front wires catch is secured, the nose battens are engaged in the corresponding holes on the keel tube.

<u>ATTACH THE NOSE CONE</u>.

- Check the condition of the upper and lower surface fabric for rips and signs of damage.

Along the left leading-edge:

- Inspect the leading edge for signs of damage and bends
- Open the main sprog access zipper and look inside, making sure that the crossbar, the main sprog, and the main sprog wire are properly secured.
- Check that the strut is properly secured, safety wire is engaged, and the safety ring is installed.
- Check the sprog hardware, and the sprog cable attachments at both ends of each sprog cable. Close the main sprog access zipper.
- Open the outer sprog access zipper and check the sprog hardware and the sprog cable attachments at both ends of the sprog cable.

CAUTION: REMEMBER TO SLIDE THE NEOPRENE COVER BACK IN PLACE TO COVER THE JOINT. CLOSE THE ACCESS ZIPPER.

At the left wingtip, with the left winglet removed:

- Check that the tip folded batten is correctly installed. Check that the sail mounting strap is installed correctly and secured with Velcro. Re-install the winglet.

Along the trailing-edge, left wing:

- Check that there are no tears in the sail material along the trailing-edge. Check that all battens are properly secured. Check that the inboard and outboard sprogs are properly secured in their position supporting the appropriate transverse battens. Make sure all zippers are closed.

From the rear keel:

- Check that the keel mount webbing and bottom rear wires are safely secured to the keel tube.
- Check the rear wire cables making sure there are no kinks or twisted thimbles.

Under the wing at the control frame apex:

- Check that the crossbar tensioning cables are tight, there are no kinks or twisted thimbles, no signs of wear and make sure that they are secured to the hook on the keel tube.
- Check the control frame apex and the hang block bracket hardware. Check the wing to the trike attachment, the backup loop attachment, the trim mechanism attachment, the rescue system bridle attachment if fitted.
- Check the crossbar centre channels assembly including the pull-back wires/X-bar junction and the centre bolt.
- Visually inspect the crossbar tubes by sighting along the length of the crossbar tubes looking for any evidence of damage.

Right wing:

- As for the left wing, check the trailing-edge, the right wingtip, and the right leading edge.

Under the wing at the control bar:

- Sight along the A Frame uprights making sure that they are straight.

WARNING: DO NOT FLY WITH BENT UPRIGHTS!

- Check that the lift struts are properly secured to the control frame and the safety rings are installed.
- Look under the protective cover and check for proper installation of all nuts and safety rings at the A-Frame corners.

8.8. **Routine Maintenance**

Exodus DeltaJet 500 StingRay

Aircraft serial no/Reg: …… / …… …… …… …..
Airframe hours at check: ……..

	First 10 hours	50 hours 6-month	100 hours one-year	300 hours 4 years	tick
Body					
Check all pressure instruments for cracks, leaks and stiction.	x	x	x	x	
Check all trike tubes for cracks, dents, corrosion, or deformation.		x	x	x	
Check seat frame and front and rear supports for bends.		x	x	x	
Check all fasteners for security, condition, and fretting.	x	x	x	x	
Check operation of flying controls – friction and operation of moveable hangpoint.	x	x	x	x	
Check harnesses for security, condition, and operation of buckles. Check operation of inertia reels.	x	x	x	x	
Check Seat base for cracks (top surface and underneath) and cushions for security and condition.	x	x	x	x	
Check trike, fairings, and cowlings for security and condition.	x	x	x	x	
Check windscreen for security and condition.	x	x	x	x	
Undercarriage					
Check main gear leg for distortion, security to base tube, and condition. Check attachment and condition of axles.		x	x	x	
Check front suspension for distortion, security, free rotation, and condition.		x	x	x	

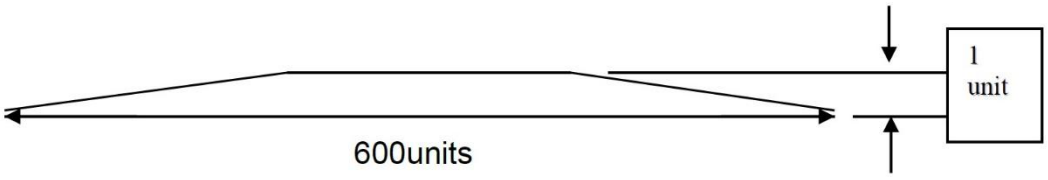
Check wheels for general condition and cracks, security of rims to hub, and rims for distortion.		x	x	x	
Check Tyres for tread, cuts, scores, perishing, correct inflation (25PSI)		x	x	x	
Spin wheels to check bearings.		x	x	x	
Check brake discs and callipers for security, pads for wear levels.		x	x	x	
Check operation of brake system, fluid level, brake lines, and leaks.	x	x	x	x	
Check condition and security of wheel spats and securing bolts.	x	x	x	x	
Propeller					
Inspect blades for nicks and splits	x	x	x	x	
Remove spinner and check hub for security and condition	x	x	x	x	
Check securing bolts torque	x	x	x	x	
Check blade pitch setting			x	x	
Fuel system					
Inspect inside tanks for dirt/contamination by draining a sample with A/C nose raised – clean if required		x	x	x	
Check tank for security and condition		x	x	x	
Check and clean carburettor float bowls	x	x	x	x	
Check fittings for perishing rubber, leaks, etc.		x	x	x	
Inspect all fuel pipes for perishing, abrasion, and security of connections	x	x	x	x	
Fuel filter – check for contamination and change if necessary	x	x	x	x	
Inspect system for leaks	x	x	x	x	
Check operation of fuel tap	x	x	x	x	
Electrical					
Check security of battery mounting, connections, etc.		x	x	x	
Check all wiring for condition and security		x	x	x	
Check condition of all switches		x	x	x	
Wing & Pylon					
Check hangpoint and hangpoint bolt for damage, distortion, condition, and security.		x	x	x	
Inspect the sail for wear, tears, UV damage, loose stitching, etc.		x	x	x	
Check all cables and thimbles for tension, corrosion, fretting, fraying, kinking and replace any that exhibit kinks, wear, damage, or corrosion.		x	x	x	
Inspect all bolts and fasteners for tightness, all safety rings for proper installation and possible damage. Inspect plates and fittings for damage, holes in tubes for elongation.		x	x	x	
Inspect the 'end fittings' of the A-frame uprights and the wing struts for possible corrosion. Apply ACF50 liberally. Change if corrosion found.		x	x	x	

Check the sail washout as described in the SPROG MEASUREMENT section. Inspect the inboard and outboard sprogs and sprog cables for possible damage. Check the rose joint end fittings for straightness – change if bent.		x	x	x	
Lightly spray all zippers on the wing with silicone spray lubricant. Do not use any other type of lubricant. Wipe off any excess silicone so that it does not attract dirt.		x	x	x	
Check all batten ends for splitting – change if found. Check all battens on a flat level floor against the batten diagram provided and correct any that deviate from the pattern by more than 5mm. Lightly silicone spray your battens before you install them in the wing to lubricate the insides of the batten pockets. Do not use any other type of lubricant. Wipe off any excess silicone so that it does not attract dirt.		x	x	x	
Inspect all of the batten pockets and batten pocket stops.			x	x	
Remove nose plates and inspect for wear where they contact the Leading Edge tubes				x	
Engine					
Carry out maintenance actions as per Rotax manuals	x	x	x	x	
Check fuel system – condition of fuel lines, security of connections. Carburettor rubbers for bulges or splits. Air filters – security and condition		x	x	x	
Check oil system – condition of oil lines, security of oil cooler, Oil tank, oil filter, level, and leaks	x	x	x	x	
Check water system/level – condition of hard and flexible water hoses, water radiator, header tank, overflow bottle level & leaks, water carb heat system (if electric solenoid option fitted check for sound of activation on switch ON). Confirm carb heaters get warm when engine is up to temperature.	x	x	x	x	
Check exhaust system – security, springs, check for cracks, dents, blowing.	x	x	x	x	
Check exhaust system – Proximity to cowlings, fluid pipes.	x	x	x	x	
Check electrical system – engine connections, security, and condition. Spark plug connections, CDI unit security.	x	x	x	x	
Check engine mounting structure for condition and security.	x	x	x	x	
Check engine mount rubbers for excessive movement (see specific check advice below)	x	x	x	x	
Check engine mount bolt security	x	x	x	x	
Check engine cowlings for condition, security of mounting fasteners.	x	x	x	x	
General					
Clean all accessible aluminium structure and treat with ACF50 or equivalent		x	x	x	
Symmetry check – stand 5m in front of and behind the aircraft and inspect for general symmetry – pylon vertical, A-frame, wing twist etc.		x	x	x	

Lifed components	
Replace hangpoint bolt at 250 Hours	
Replace control frame upper through bolt at 500 Hours	
Replace front strut upper and lower channels at 1000 Hours	
Replace rear undercarriage mounting bolts at 1000 Hours	
Replace rear undercarriage axle mounting bolts at 1000 Hours	
Replace lift strut upper and lower bolts and pins at 1000 Hours	
Replace wing keel tube at 1500 Hours	
Major Overhaul	
Complete wing strip at 500 Hours/4 Years	
Documentation review	
Latest worksheet and maintenance manual used? at 50hrs	
Any service letters / service bulletins / mandatory permit directives (MPD's) applicable? at 50hrs	
All modifications and repairs approved and documented at 50hrs	
Weight and balance report up to date at 50hrs	
All placards present, correct and serviceable (i.e legible) at 50hrs	
All required instruments serviceable at 50hrs	
All control deflections/functions within limits – values contained in the TADS. at 100hrs	
All ancillary controls are serviceable at 50hrs	
Log book hours up to date and entry completed for this maintenance event. at 50hrs	
Work carried out by: …… Date: …… Signed: …… Comments: …… …… ……	

8.9. **~~3~~500 Hour / 4 years**

- At a maximum interval of every 5~~3~~00 hours/4 years, remove the sail from the aluminium frame and disassemble all frame components. Inspect every part of the wing for any damage or wear. Inspect the tubes for straightness and for signs of corrosion. Straightness



is defined as L/600 (L/400 for leading edge tubes) maximum tolerance.

- The following components should be meticulously inspected for straightness and signs of fatigue crack damage, particularly at holes, notches, and joints. These parts should be

inspected using dye penetrant, radiographic, or high-magnification visual methods. If in any doubt, contact the manufacturer or your inspector.

- Wing
    - Leading edges
    - Leading edge/crossboom attachment holes in the tube
    - Leading edge outer at the sleeve edges
    - Keel Tube
    - Keel Electric ram stop/retainer holes
    - Control frame upright top and bottom fittings
    - Control bar end holes
    - Control bar end knuckles
    - All bolts, pins, and locking assemblies
- Trike
    - Base tube
    - Pylon - top & bottom fittings & bolts
    - Seat frame, check for straightness
    - Seat frame brackets for straightness
    - Front strut, channels & bolts
    - Rear undercarriage bracket - rear corners, check for bending
    - Rear undercarriage axles for straightness and attachment
    - Rear undercarriage symmetry check

WARNING: ANY instance of fatigue cracking must be reported to the Manufacturer.
WARNING: No cracked parts may be returned to service unless there is an approved modification to recover the part.
WARNING: Unserviceable parts to be made unusable, e.g., by cutting up.

8.10. **Lifed components**

- Some components have specific life based on fatigue calculations and assumptions about use and should be changed at the time intervals shown in the table in 8.8.

8.11. **Fabric**

- The Exodus DeltaJet 500 StingRay is equipped with a clear NCV laminate upper surface and a Dacron lower. It should be noted that Dacron degrades more rapidly than NCV when exposed to UV light, and therefore requires more care to ensure a long service life.
- Prolonged outside uncovered storage is not recommended.
- The wing stitching and Dacron undersurface may be tested with the BMAA approved 'Bettsometer'. The stitching will be done annually during its UK Permit to Fly renewal inspection.
- The minimum Bettsometer test value for the wing stitching of the Exodus DeltaJet 500 StingRay is 1,360g. Although not mandatory, we suggest the Dacron undersurface should be tested to 1,000g.

8.12. **Damage to fabric**

- Small tears in the fabric up to 30mm long, or abraded holes up to 15mm diameter, that are more than 50mm from a seam line can be repaired using a self-adhesive patch, if possible to both sides of the fabric – warmed gently with a hairdryer to melt the adhesive.
- Single broken stitches can result in 'running', where a large area loses tension. Securing the broken end with a drop or two of glue will prevent this.

- Any greater damage must be repaired using processes approved by the manufacturer or the BMAA / CAA.

8.13. **Cleaning lubricating and protecting the structure**

- Aluminium and steel airframe components and fasteners can corrode rapidly in certain adverse conditions. These include:
  - Operation in a 'marine' environment (near the coast where salt can be in the air).
  - Dust, dirt, mud, or manure left on the structure for prolonged periods.
  - Dampness for prolonged periods – especially dampness coupled with dirt or dust.
- Always keep the aircraft clean. It pays to clean the aircraft after use before storage. But avoid putting the aircraft away wet in a closed hangar with reduced ventilation.
- Proprietary car 'wash wax' cleaning products are generally suitable for washing. Pay particular attention to rinsing to ensure all traces of detergent are removed.
- Particular care should be exercised cleaning Dacron fabric. We recommend 'Starbrite Sail and Canvas Cleaner'.
- For corrosion protection we recommend 'ACF50' anti-corrosion fluid be liberally applied periodically to the airframe components. This can be applied to a cloth and rubbed on – much like a polishing operation.
- Glass fibre parts can be polished after washing with wax polishes.

8.14. **Engine mount rubbers**

- Engine mount rubbers slowly wear out over time. They should be changed 'On Condition':
- They should be changed if external signs of cracking/perishing are present.
- They should be changed if excessive movement is present. Check this in the following way:

  Remove the engine bonnet.

  Grasp the propeller near the hub.

  Lift up and down, side to side, and diagonally.

  Observe the rubbers and movement relative to the mounting structure. Movement confined to rubber flexing is fine. Clear movement of the whole rubber parts relative to the hole in the mounting structure indicates that the rubber should be replaced.

8.15. **Fuel tanks**

- The fuel tank is aluminium. To inspect the inside, remove the composite seat moulding to uncover the tank and remove the fuel filler tube. The tank can be inspected with a mirror and torch. Any dirt/water or other contamination is easy to see. Using the drain valve will remove most of this, but inevitably some is left in the corners and over the front of the 'saddle' of the tanks.
- A useful technique to clean these areas is to make up a siphon tube using a length of small diameter aluminium tube connected to a length of flexible pipe. This can be directed and used as a very effective 'Hoover' to clean all small remaining particles.

8.16. **Checks following a heavy landing**

Inspecting for damage. After a heavy landing or any other incident that may have caused damage, always ensure that the aircraft receives a thorough inspection before further flight. If in any doubt, contact the manufacturer or your inspector. In addition to a thorough inspection of all parts, carefully check the following points:

- Check the front fork assembly.
- Check the main landing gear for distortion.
- Check all the frame tubes and gusset plates for distortion and all welds for cracks.
- Check the pylon, front strut, and engine mounting frame for distortion and all welds for cracks.

- Main Undercarriage - The main gear leg will bend upwards if overloaded. Usually, a heavy landing will be slightly wing down and one leg will distort more than the other. So initially observe from the rear and check for symmetry, the monopole should be vertical. Also check the angle of the wheel to the vertical. When new the wheel angle unloaded will be slightly 'towed in' at the bottom. A wheel sitting splayed outwards at the bottom indicates the gear leg (or axle) has been bent and is no longer serviceable. The undercarriage attachment plate will also bend upwards at its corners if overloaded.
- Nose landing gear – In the Exodus DeltaJet 500 Stingray, testing has shown the nose gear to be very strong and damage is unlikely and may not be apparent from an external inspection. It is worth lifting the nose wheel clear of the ground and checking for friction in the side-to-side movement of the wheel.
- Wheel rims - If the aircraft is landed heavily it is possible for the tyre to deflect to the point where the wheel rim comes in contact with the ground and dents/distorts. Check this visually and by spinning the wheels. Underinflated tyres will cause this damage following slightly less firm arrivals.
- Perform a full 'annual inspection' on the wing and replace any damaged/distorted parts.
- The above points are the common areas where damage is first witnessed. However, it is possible that other areas may damage first, or may also be damaged. Following any heavy landing a very thorough inspection of all the airframe should be made.

8.17. **Major strip down**

- It is recommended that the Exodus DeltaJet 500 StingRay trike unit receives a major strip down inspection after a substantial period of use/time. In average conditions this is recommended at 1,000hours/10 years. Aircraft stored/used in particularly good conditions may not require this for many years, and those stored/used in poor conditions may require it substantially sooner.
- Essentially then it will be 'on condition', but do not extend this simply for financial reasons. Seek guidance from your local inspector/maintenance professional/ or the manufacturer.
- Such a strip down will involve removal of fabric coverings and trike fairings. This permits full detailed inspection of airframe components and the opportunity to replace all fasteners showing signs of corrosion.
- The simple design and construction of the Exodus DeltaJet 500 StingRay permits such a detailed and comprehensive task to be relatively simply accomplished.

8.18. **General maintenance tips**

8.19. Only use a Nyloc nut once – repeated use will reduce its locking ability. Also, it is recommended that Loctite thread locker is used as standard practice on every fastener using a Nyloc nut. At least one thread must protrude.

8.20. Split pins should not be used more than once.

8.21. Unless otherwise specified airframe bolts should be tightened to remove free play, without causing distortion of the parts/ovalising of tubes.

8.22. Each rear axle is equipped with a tie down which may also be used to support the raised aircraft, such as when checking the wheel bearings or repairing or replacing the tyre. It is strongly advised to apply the parking brake AND chock the other wheels to prevent movement. If the front wheel needs to be raised for inspection or maintenance, the front of the trike can be suspended from a hoist, etc. using a strap attached the bottom of the front strut. Alternatively, the trike can be supported on a plank or similar placed behind the front wheel aperture. To prevent damage to the paint finish and composite bodywork, it is advised to add padding on top of the plank. Special care should be taken when raising the front wheel as the weight of the engine at the rear of the aircraft can lead to overbalancing and expensive damage to the propellor, bodywork and the rear-mounted radiators.

9. Repairs

9.1. General. Repairs should either be carried out as described below, or to a scheme approved by the BMAA, or by the manufacturer. After repairs, you should always obtain a "second inspection" from a qualified pilot or (preferably) BMAA inspector, who should sign in the logbook that they have inspected the repair and consider it safe. Where this is not possible, draw the repair to the attention of your inspector at the next permit renewal who should over sign your own entry. Consult the 'BMAA Guide to Airworthiness Procedures' for full details of procedural requirements.

9.2. Sail Repairs. Sail (flexible surface) repairs must be carried out in accordance with BMAA Technical Information Leaflet TIL 015.

9.3. Repairs to tubular structure, springs, 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 (consult BMAA guide to airworthiness procedures for specific inspection/signoff requirements). 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 BMAA Technical Office for advice.

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

9.5. Repairs to Instruments. Aircraft instruments are not usually repairable and should be replaced.

9.6. Repairs to Fuel Hose. Any fuel hose, which is found to be cracked or damaged, must not be repaired. Only approved fuel hose should be used. 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.

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

9.8. Repairs to Batteries. The Exodus DeltaJet 500 StingRay is fitted with a Lithium-based battery and damage risks an explosion or intense fire. The position of the battery makes damage highly unlikely **BUT** a damaged battery **MUST** be replaced.

9.9. Repairs to Tyres. An inner tube puncture may be repaired. If there is damage to the tyres, which shows the casing cords or inner canvas, replace the tyre in question.

9.10. Damage to the Fuel Tank. The aluminium fuel tank is not usually repairable in-situ. Damage will probably only be repairable through the skills of an experienced welder. After any repair, it will also need to be pressure tested. It is recommended that if the tank is damaged, the manufacturer should be contacted for advice.

10. Vital Statistics

10.1. Weight values for this Exodus DeltaJet 500 StingRay are at Annex D and a description of the aircraft is at Section 2. However, the following describes the basic dimensions of the aircraft:

Length	3.30m (total length, nose to wing tip end)
Span	9.52m
Height	2.75m
Wing area	12.85m²
Nose angle	128 degrees
Aspect ratio	7.05
Undercarriage track width	1.66m
Undercarriage wheelbase	1.75m
Fuel capacity	53 litres
Tyre Pressure	25psi

11. Wing Tuning

11.1. Correctly tuned, the wing is safe, comfortable, and fun to fly. The wing has been test-flown and tuned by Aeros immediately following manufacture, and by Exodus Aircraft before delivery. However, if you have sufficient experience, you may tune the wing yourself, as written below, if necessary. There are a number of adjustments that affect the flight characteristics.

WARNING: **DO NOT PERFORM MORE THAN ONE ADJUSTMENT AT A TIME. IF YOU DO NOT HAVE ENOUGH EXPERIENCE TO TEST FLY THE WING, ASK A MORE EXPERIENCED PILOT TO DO IT FOR YOU. THE TEST FLIGHT SHOULD BE PERFORMED IN SMOOTH AIR AND WITH CAUTION.**

11.2. BATTENS

- The battens will need to be compared and adjusted to match the batten profile template at regular intervals. Small variations in batten camber (±5 mm at the trailing-edge) will not have significant effect on flight. Characteristics.

11.3. BATTEN TENSION

- With some airtime, batten tension may become loose causing the trailing-edge to flutter. If the battens are tensioned too much, the handling will become more difficult. Make sure the battens are tensioned identically on the left and right wing. The top battens on the Exodus Deltajet 500 StingRay are tensioned by cord and elastic.
- To check batten tension, measure the distance from the batten end saddle to the knot when pulling the rope (elastic). This distance should be 1 cm for rope and 3cm for elastic. To change batten tension, it is necessary to undo the knot, change the rope (elastic) length and tie the knot on the rope or swage the elastics again.

11.4. TURN ADJUSTMENT

- The primary tool for turn adjustment is alteration of the wingtips. By rotating a wingtip down, the lift on the end of that wing will increase and this half-wing will rise in flight. Rotate a wingtip up and the lift will be decreased causing that half-wing to drop. It is preferable to rotate the wingtip up first rather than down.

- To rotate the wingtip, remove the self-tapping screw arrowed in the image above and firmly rotate the wingtip until you can see that the screw will go in one of the sets of holes marked +3 and -3 (up or down). Only adjust one wingtip at a time and test fly after each adjustment.
- Fine-tuning of the wing is through adjustment of the under-surface vents, positioned mid-span just behind the leading edge. Both vents are covered up normally by a fabric patch attached by velcro to the inside of the sail. Uncovering the vents will reduce the hands-off trim speed of the wing and increase the pitch forces. Partial or total uncovering of just one of the vents will help to correct a high-speed turn. For example, if the wing has a slight turn to the left only at high speed, partially uncovering the vent of the left (port) wing by approx. 50% is likely to cure this behaviour.

12. Parking, Folding, Rigging, and De-rigging the Wing

12.1. Parking

- Temporary parking of the Exodus DeltaJet 500 StingRay is best done with the aircraft positioned at right angles to the wind and the into-wind wing lowered slightly and secured against the front strut of the trike with a suitable tie. The parking brake should be selected, and the master switch checked to be in the OFF position. In strong wind conditions the aircraft can be positioned into wind and the control bar tied fully back by use of the rear seat belt or similar strap.
- In winds above 5 knots, or when mild thermals are expected, additional security should be used in the form of a ground anchor or large weight placed under the lower wing and attached with a suitable tie to the wing wires or through the wing pocket to the crosstube/leading edge junction.
- For longer term (overnight) or unattended parking outside it is recommended that the wing is lowered onto its A-Frame whilst still connected to the trike and tied down at the strut ends and nose. **See the section on Lowering the Wing below**.
- In addition, the trike is equipped with a tie down point at each rear axle and a strap through the front wheel spokes to 2 ground anchors will hold the front.

12.2. Lowering the wing to the ground (Hobbling)

- Position the aircraft so that it faces into wind – **caution required in strong wind**!
- Set the trimmer to fully slow (rear) position.
- Remove the windscreen / antenna / PTT switch.
- Secure the control bar as far back as possible with the rear seat belt.
- Remove the front strut.
- Bring the control bar forward and up so that the wing keel tube rests on the monopole.
- Get a helper to remove the monopole locking bolt.
- Slowly lower the control bar to the ground or a suitable trolley, being careful to miss the pitot.

12.3. Folding the wing

- Follow the procedure above for lowering the wing.
- Make sure engine is not hot.
- Fit the propeller covers and rotate the propeller so that one blade is vertical.
- Remove the nose cone.
- Remove the undersurface battens.
- Unzip the inner sail pocket on each side of the wing and fold the inner sprogs toward the wing tips**. Failure to do this results in damage to the sprog rose joints.** There is no need to fold the outer sprogs, but you can if you wish.
- Remove the wing tension.
- Remove the top surface battens in the following order 7-6-5-4-3-2. **Never remove batten No 1. Never remove or insert top surface battens with the wing under tension!** You can remove battens 8-11 but it is not necessary.

- With a helper, slowly walk both wings back and towards each other at the same time, rotating the trailing edge upwards as you go.
- The wings **must not be allowed to fold back on their own or bang into each other as damage can occur!**

This is an effective way to secure the aircraft if you are caught out in bad or extreme weather. You should also consider removing battens 8-11 and the internal tip strut at each wing tip. Place straps placed around the wing as required to stop it flapping.

If the front strut has been lowered onto a trolley, the aircraft can now be moved around. This is a great way to store the aircraft if space is limited.

To unfold the wings, simply reverse the above procedures.

12.4. Rigging (images are available in Annex A)

- Lay the wing on the ground, with the bag zipper up. Lay the struts and the winglets next to the wing.
- Undo the bag zipper and take out battens and the control bar.
- Untie Velcro straps. open the control frame apex protection bag.
- Turn the wing on one side and spread the control frame down tubes. Install the control bar according to the markings. Fix the control bar with bolts and nuts so, that fixing nuts are pointing backwards, against the direction of flight.
- Lift the wing upright on the control frame. Try to set the control bar on level ground.
- By lifting up and back of the nose batten cables, push the nose battens fully back into the sail so that the batten tips rest in the holes on top of the keel tube.
- Remove protection bags from the keel, from the control bar apex, from the hang bracket and from the crossbar central unit.
- Remove all Velcro ties and spread the wings approximately 50% from fully open.
- Attach the struts according to the markings. L-|eft, R-right marks must be on the control frame side of the struts on top. Attach the upper part of the strut first, together with the strut safety wire. Tighten the nut and secure with a safety ring. Attach the strut to the control frame bracket. The clevis pin head should be pointing forward. Do not attach the strut safety wire to the base tube for now.
- Attach the bottom front wires and secure the nose catch of the bottom wires on the nose junction channel using the clevis pin and the safety ring.
- Carefully spread the wings all the way, lowering the nose of the wing on the ground. Once the nose of the wing is on the ground the wings spread themselves. You will need an assistant to perform this procedure.
- Position the wing on its control frame, facing into the wind, with the nose on the ground.
- Attach the strut safety wires (left and right) to the base tube. Tighten the nut and secure with a safety ring.
- Pass the rescue bridle through the corresponding hole in the sail and all the way through the rescue bridle palm on the top surface of the wing. Close the bridle palm cover. Pass the rescue system bridle through the keel pocket palms.
- Wheel the trike behind the wing, rolling the front wheel over the control bar. Check that the ignition switch and the key are in off position. Tilt the main pylon of the trike down.

- Connect the trike pylon to the wing hang bracket. Insert the hang bolt, tighten the nut firmly and secure with a safety ring. Attach the backup loop, making U-turn around the keel tube. Connect the rescue system bridle. Lift the nose of the wing to allow for the front wheel to be rolled rearward over the control frame so that the base tube is in front of the cockpit and the rear of the keel tube rests on the pylon. Make sure the protection pad on the main upper pylon is in proper position and protects the pylon against bottom rear wires.
- Remove the wingtip protection bags. Remove battens from the batten bag and check each batten for symmetry against the corresponding batten from the other wing. Align battens at their front tips, and at about the 60% of the chord point. There should be no deviation of more than 3mm (1/8") from one batten to the other along the full length of battens. If you choose not to check your battens for symmetry before each flight, you should, at a minimum, check them once a month. Exodus convention is that the red marked battens go in the left wing and green marked battens go in the right wing. Battens are numbered from the centre outwards, and the longest battens in the Exodus Deltajet 500 StingRay are designated as the "No. l" battens. Install all the cambered upper-surface battens in the sail.

CAUTION: INSERT BATTENS CAREFULLY, SO AS TO MINIMIZE STRESS AND WEAR ON THE SAIL.

- Never insert or remove battens with the cross tube tensioned (except for up to the last three on each side) and never insert or remove battens with heavy wind pressure on the top of the sail or in any condition which causes battens to slide with great resistance in their pockets.
- Remove the auxiliary bungee from the shackle and the hook. Check that the pull back (cross tube tensioning) wires are not twisted. Take the shackle with one hand. At the same time with another hand pull the crossbar backwards - this will considerably help attaching the shackle to the hook, placed on the keel tube. Attach the shackle on the hook.
- Connect two parts of the tip batten so that the sharp (angled) part of them, when connected, is pointed towards the outer part of the wing. Push the tip batten on the hinge with a hand until the tip batten fixates in the kinematic lock. Fix all the battens with the double tensioned ropes and rubber bands.
- Install the under-surface battens.
- The next step is to deploy both the inboard sprogs and the outboard sprogs and secure them in position. Before doing so, working through the sprog access zippers, pre-flight check the following items:
    - internal ribs to confirm that they are fully zipped up
    - the sprog hardware, and the sprog cable attachments at both ends of each sprog cable
    - make sure the sprog is not twisted 1B0°
    - the leading-edge/cross bar junction unit is properly secured and has no damage.
- To deploy and secure each sprog, swing the sprog away from the leading-edge and align it in the centre of the rear end of the sprog access zipper.
- Fully close the sprog access zipper and this will secure the sprog in the proper position underneath the transverse batten and capture it in position.
- Install the strut/control frame protection cover.
- Install winglets and secure them with pins and safety rings.

- When the wing is attached to the trike with the base tube still on the ground install the nosecone, taking care to align it so that it lies flat on top and bottom of the sail.

WARNING DO NOT FLY WITHOUT THE NOSE CONE!

12.5. **De-rigging**

Breakdown of the Exodus Deltajet 500 StingRay is the reverse of its rigging assembly. Please follow these instructions when de-rigging the wing. Please read all the instructions for each operation before beginning. Refer to the section 12.1 Rigging, if necessary.

- Set the trim device to the aft position and then move it '10mm forward.
- Disconnect the socket connector of the trim device from the corresponding connector on the trike.
- Remove the bolt from the front support compression tube.
- Remove the bolt from the main pylon joint.
- Lower the wing until the control bar is on the ground
- Remove the nose cone from the wing.
- Remove winglets.
- Unplug the tip folded battens. Remove the undersurface battens.
- Unzip the sprog access zippers all the way to the leading-edge end of the zippers and put out the inboard and outboard sprogs.
- De-tension the crossbar pullback wires. Attach the auxiliary bungee to the shackle and to the hook.
- Remove the top battens except for the top battens #1. Pack battens into the batten bag.
- Lower the nose of the wing to allow the front wheel to be rolled forward over the control frame.
- Detach the rescue system bridle from the carabiners.
- Detach the backup loop.
- Unbolt the trike from the hang bracket of the wing and lower the nose of the wing on the ground.
- Undo the Velcro of the strut/control frame protection cover and slide the cover towards the middle of the control bar. Detach the strut safety wire from the control bar.
- Install the wingtip protection bags.
- Fold the wings approx. 50 % from fully closed rotating it around the control bar until the wingtips are on the ground.
- Detach the front wires from the nose junction channel
- Detach the struts. Disconnect the bottom first, then disconnect the top together with a strut safety wire. Stow the struts in their bag.
- Install protection bags on the control frame apex, hang bracket, if it stays on the wing (with the hang bracket positioned down) and on the crossbar central unit.

WARNING: FOLDING THE WING WITHOUT PROTECTION BAGS WILL CAUSE THE TUBES DAMAGE.

- Fold the wings completely. Pull the sail out away from the keel until it is even on top and bottom. Roll the sail gently and carefully.

- **NOTE:** Try to roll the sail in such way that the leading-edge portion remains as smooth as possible. Do not attempt to stuff the sail between the Mylar pocket and the leading-edge tube at any point where you feel resistance, and do not attach the Velcro ties tight so as to induce creases in the Mylar or leading-edge sail material.
- Working from the trailing-edge, roll the sail tightly to the leading-edge. Finish rolling the sail in the area of the outer sprogs and install the wing tip cover bags.
- Stow battens in the batten bag in the front part of the wing. Install Velcro ties around the wing.
- Install the wing bag. Lower the wing onto the ground.
- Detach the control bar.

- Fold the control frame tubes, install the control frame bags, and lay the control frame against the keel. Lay cables between down tubes.
- Fit the control bar in the protection bag and stow it between the leading edges in the aft part of the wing. Stow the nosecone under the most forward Velcro.
- Zip up the wing Protection bag.

12.6. Transport

- For short distances on fairly level ground, the Exodus DeltaJet 500 StingRay can be pulled using the front bar against the front strut. If assistance is required, it may be pushed using the propellor hub or the propellor blades close to the hub. **DO NOT PUSH TOWARDS THE ENDS OF THE BLADES.**
- Except for movement within an airfield, the Exodus DeltaJet 500 StingRay is best transported using a dedicated trike trailer after removal of the wing. The monopole may be left in the upright position or lowered to the transport position by substituting the front strut for the provided transport strut. The trike is equipped with a tie down point at each rear axle through which a strap may be fastened. A strap through the front wheel spokes to 2 anchors pulling against the rear anchors will immobilise the trike on its suspension.
- Many trike trailers also have provision for carrying the wing in its folded state. Follow the procedure in Section 12.2 to take off and collapse the wing. Once it is in its wing bag, it can be tied securely to the trailer's wing brackets or placed on a car roof rack. It is strongly recommended that the wing is supported along its entire length whilst on the roof rack. This can be achieved by lashing a ladder to the roof rack and fastening the wing in its wing bag to the ladder.
- **Do not forget to place the protection bags on the vital parts of the wing.**

13. Air Speed Calibration

13.1. **For MPH ASI**

MIAS	MCAS
43	37.7
50	43.7
60	52.3
70	60.8
80	69.4
90	78.0
100	86.6
110	95.2
117	101.2

Calibrated	**V_S**	**40**	**min sink**	**50**	**glide/ approach**	**climb**	70	**80**	**V_A**	**90**	**100**	**V_{NE}**
Mph IAS (indicated)	**44**	**44**	**48**	**57**	**60**	**65**	**81**	**92.5**	**103**	**104**	**115**	**117**

14. Example Placards

(a) Flight Limitations Placard (to be visible to pilot) For MPH ASI:

Exodus DeltaJet 500 StingRay [Engine] [Registration]	
All speeds Indicated Air Speed	
Never Exceed Speed:	117 mph
Manoeuvring Speed:	103 mph
Best climb speed:	65 mph
Best glide speed:	60 mph
Stall speed	44 mph
Bank angle limits:	+/- 60°
Normal Acceleration Limits:	+4/-0g
Empty Weight:	____ kg *
Max Take-Off Weight:	499 kg
Minimum Seat Weight:	55 kg
Maximum Seat Weight:	120 kg in each seat.
Aerobatics and deliberate spinning prohibited.	

* This must match the most recent W&CG report for the aircraft.

(b) Engine Limitations Placard (to be located near to engine instruments)

A placard showing the limitations for all indicated engine parameters is to be mounted close to the engine instruments. Also, main limitations are to be shown as coloured markers (red for danger, amber for caution) on the instrument displays. Refer to Annex B Engine Manual for the correct parameters.

(c) Fuel Limitations Placard (to be located near to filler cap)

FUEL Capacity 55 Litres 4-stroke, add no oil	
Cockpit Weight (kg) Including baggage 180 170 …. …. Or below	Max. Fuel Load (litres) 53 litres
90/95* RON minimum unleaded to BS(EN)228, AVGAS 100LL or UL91	

* Rotax 912UL-01 90 RON, 912ULS-01 95 RON

(d) ASI Markings

The ASI must be marked with the main IAS limiting speeds as follows:

V_S to V_A - green arc , V_A to V_{NE} - yellow arc, V_{NE} - red radial line in accordance with normal aviation practice.

(e) Pitch Trimmer Instructions

Keel tube marked with front and rear limit lines.

(f) Switches

All switches are to be marked with function and sense (up=on, down=off).

(g) Baggage Bags (if fitted)

Max 10kg each or Max combined total of 20kg

(i) Occupant Warnings

Placard stating "Occupant Warning! This aircraft has not been certified to an international requirement" is to be displayed in a conspicuous place.

(j) Parachute (if fitted)

Placards in accordance with BCAR S Sub-Section K Issue 7 or later must be fitted.

ANNEX A – OTHER WING INFORMATION

WING ASSEMBLY AFTER SHIPPING

Before beginning, it may be helpful to read through the section in the main manual on **Rigging the Wing** (page 31) and the later section in this annex on **Removing and Re-installing the Sail** (page 43).

1. Unzip the wing bag. Undo the Velcro straps. Remove battens, the control bar, and the outer leading-edge tubes from the wing bag. Remove all packing material.

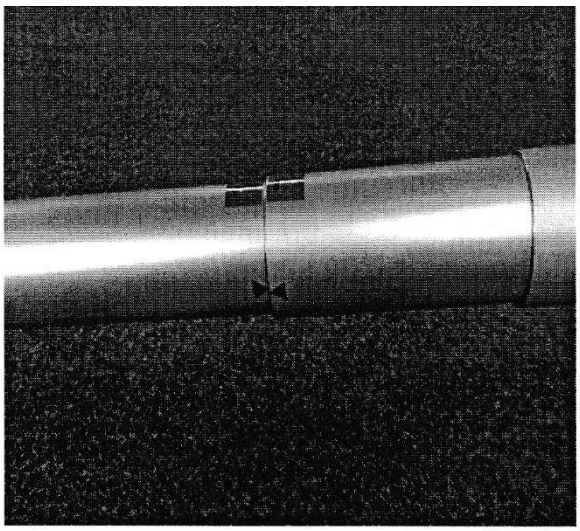


Figure 1

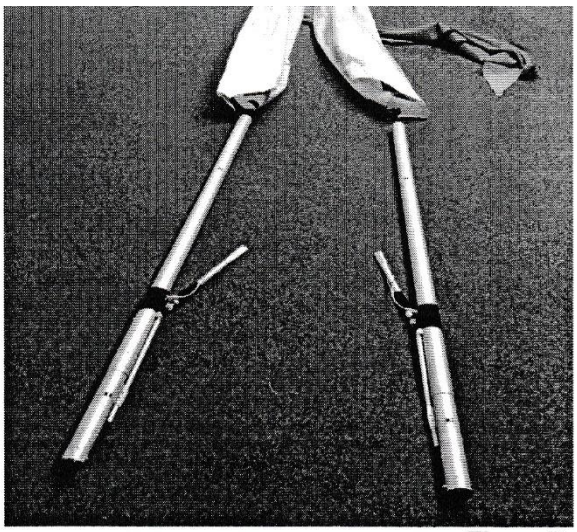


Figure 2

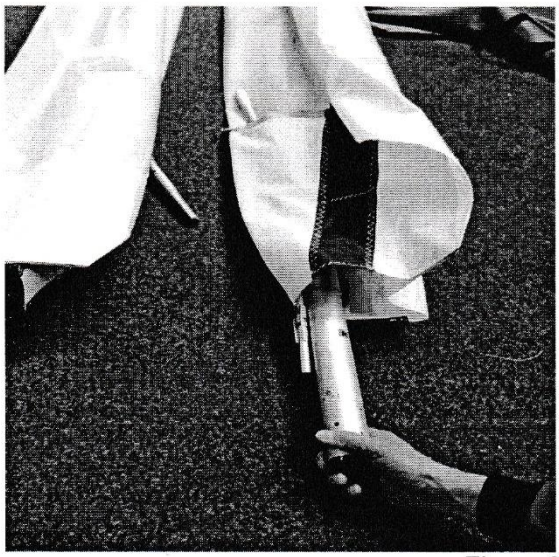


Figure 3

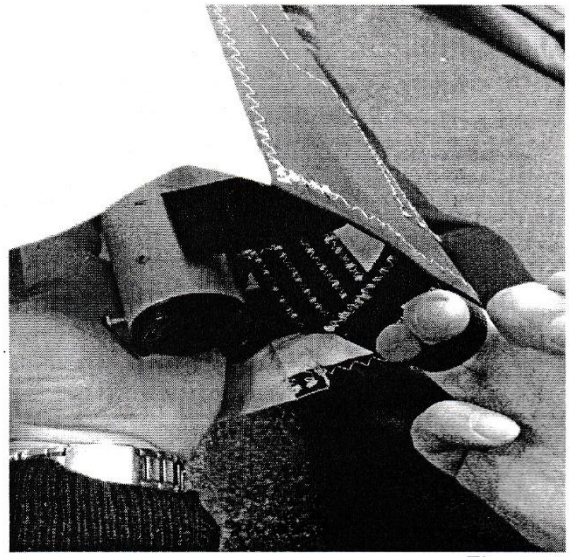


Figure 4

2. Unfold the sail along the leading-edge to its full length. Attach the outer leading-edge tubes to the front leading-edge tubes according to the markings: L-|eft, R-right. The triangular marking on the leading-edge tube #3 and the triangular marking on the leading-edge tube #2 should match together (fig. 1, shown without the sail).

Working on one wing at a time and working with the appropriate leading-edge #3, fold the outer sprog, which is attached to the outer leading-edge tube, forward. Slide the inboard end of the leading-edge tube #3 into the sail.

Align the outer leading-edge properly so that the sprog bracket is on the inside of the leading-edge and slide the outer leading-edge tube forward carefully until it engages completely on the front leading-edge tube, allowing the sprog end to come outside the sail at the access zipper (fig.2 and fig.3).

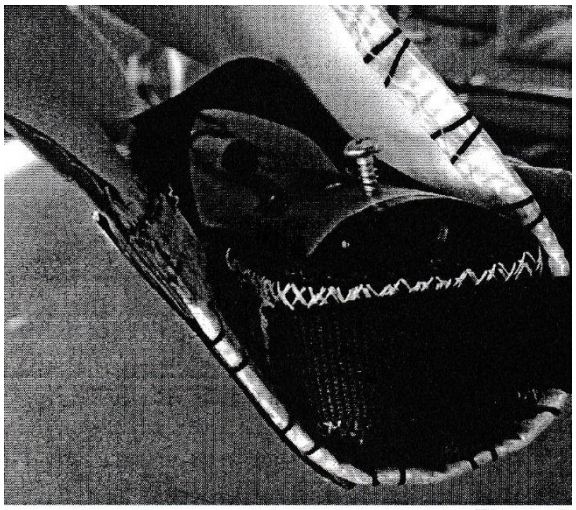


Figure 5

3. Tighten the sail along the leading-edge by putting the sail mount webbing into the slot in the end cap of the outer leading-edge tube. Secure the sail mount webbing to the outer leading-edge with the sail mount webbing Velcro (fig.4 and fig.5).

4. Turn the wing on one side and spread the control frame down tubes. install the control bar according to the markings. Fix the control bar with bolts and nuts so, that fixing nuts are pointing backwards, against the direction of flight (fig.6).

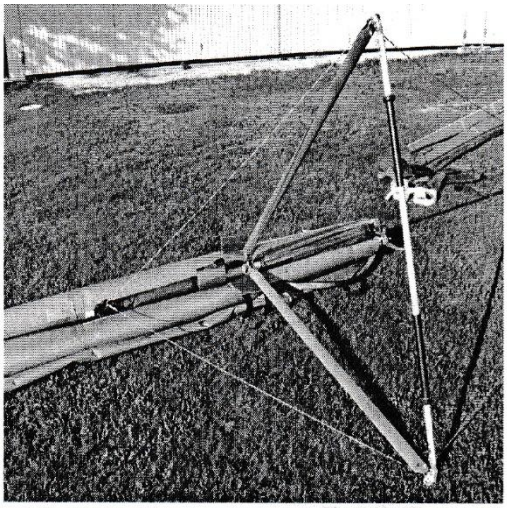


Figure 6

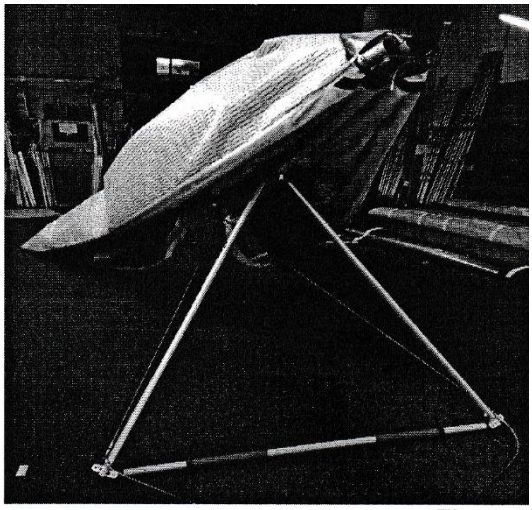


Figure 7

5. Lift the wing upright on the control frame (fig.7)

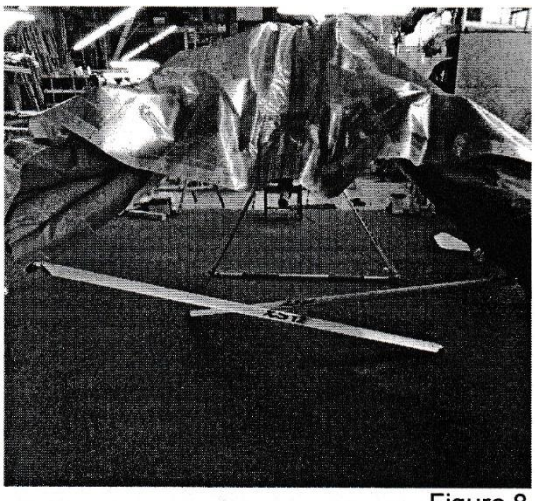


Figure 8

6. Spread the wings approximately 50% from fully open. Attach the struts according to the markings. L-left, R-right marks must be on the control frame side of the struts, on top. Attach the upper part of the strut first, together with the strut safety wire (fig. 8).

Tighten the nut and secure with a safety ring (fig. 9). Attach the strut to the control frame bracket. The clevis pin head should be pointing forward (fig. 10). Do not attach the strut safety wire to the base tube for now.

7. Attach the bottom front wires and secure the nose catch of the bottom wires on the nose junction channel using the clevis pin and the safety ring (fig. 11).

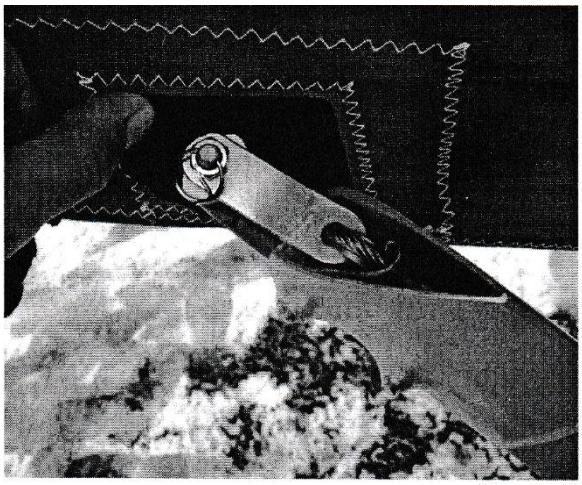


Figure 9

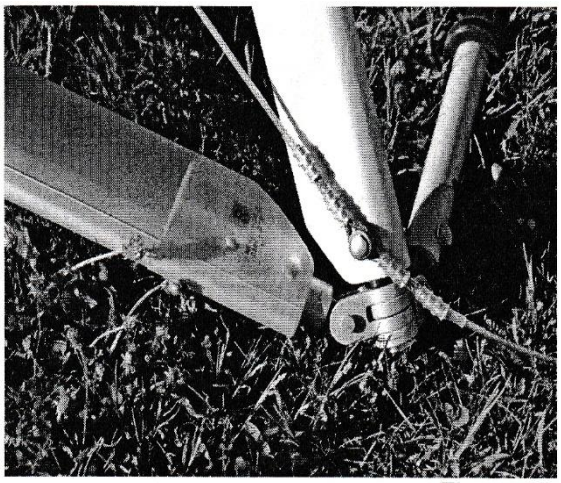


Figure 10

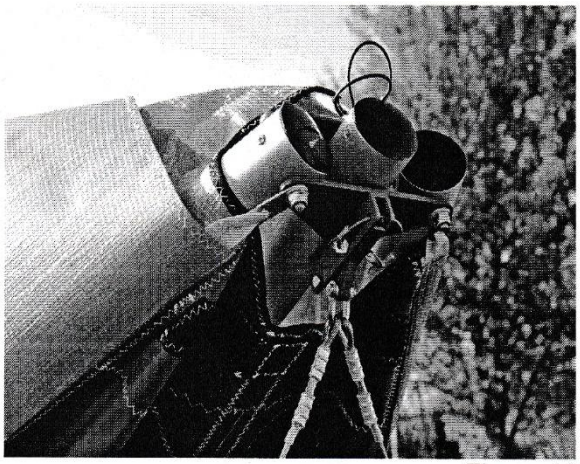


Figure 11

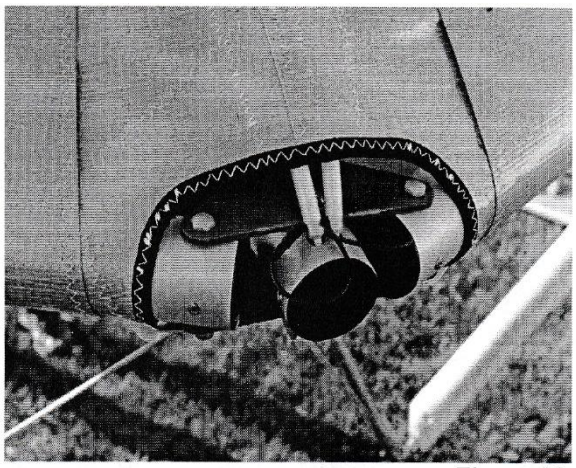


Figure 12

8. By lifting up and back of the nose batten strings, push the nose battens fully back into the sail so that the batten tips rest in the holes on top of the keel tube (fig. 12).

9. Check that the sail mount webbing is in proper position in the slot of the outer leading-edge tube end cap. Open the main sprog access zipper and look inside, making sure that the leading-edge #3 stays in place and the triangular markings on the leading-edge tube #3 and on the leading-edge lube #2 matches together.

10. Carefully spread the wings all the way, lowering the nose of the wing on the ground. Once the nose of the wing is on the ground the wings spread themselves (fig. 13). You will need an assistant to perform this procedure.

11. Pass the rescue system bridle through the corresponding hole in the sail and all the way through the rescue bridle palm on the top surface of the wing. Pass the rescue system bridle through the keel pocket palms.

12. Attach the strut safety wires (left and right) to the base tube. Tighten the nut and secure with a safety ring (fig. 14). Attach the control frame comer protection cover with Velcro.

13. Wheel the trike behind the wing, rolling the front wheel over the control bar. Check that the ignition switch and the key are in off position. Lower the main pylon of the trike.

14. Connect the trike pylon to the hang bracket of the wing. Insert the hang bolt, tighten the nut firmly and secure with a safety ring. Connect the back-up loop, making U-turn around the keel tube. Connect the rescue system bridle.

15. Lift the nose of the wing to allow for the front wheel to be rolled rearward over the control frame so that the base tube is in front of the cockpit and the rear of the keel tube rests on the pylon. Make sure the protection pad on the main upper pylon is in the proper position and protects the pylon against bottom rear wires.

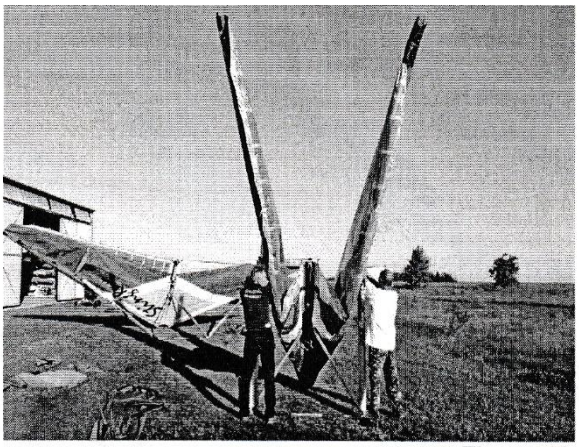


Figure 13

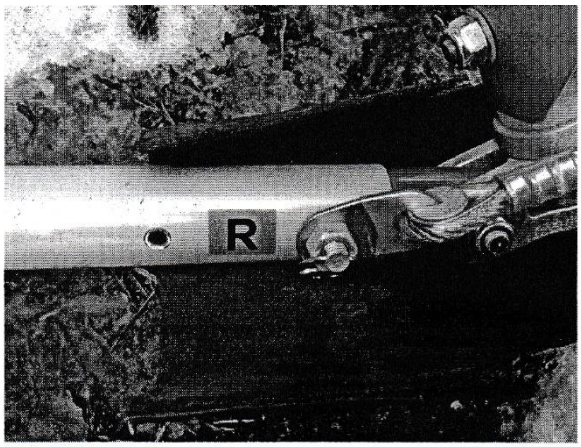


Figure 14

16. Install all cambered battens in the sail.

17. Remove the auxiliary bungee from the shackle and the hook. Check that the pull back (cross tube tensioning) wires are not twisted. Take the shackle with one hand. At the same time with another hand pull the crossbar backwards - this will considerably help attaching the shackle of the pullback wires on the hook, placed on the keel tube. Attach the shackle on the hook.

18. Fix all battens with the double tensioned ropes and rubber bands. Install the tip folded battens. Then insert the undersurface battens.

19. Deploy both the inboard sprogs and the outboard sprogs and secure them in position.

20. Fix the sail mount tangs at the nose part of the sail to the wing bolts. Do not over tighten the mount nuts. When the fixing nut is properly tightened, the sail mount tang rotates freely on the fixing bolt (fig.15).

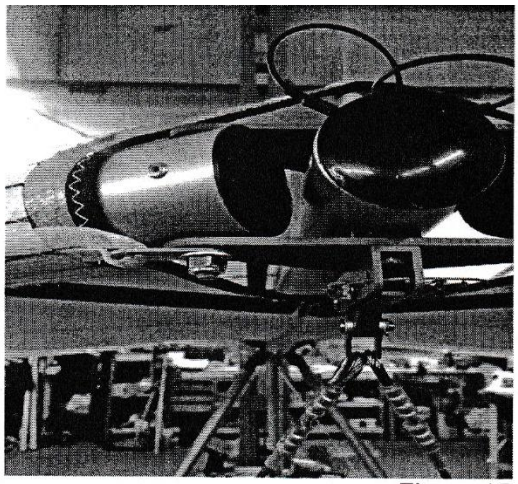


Figure 15

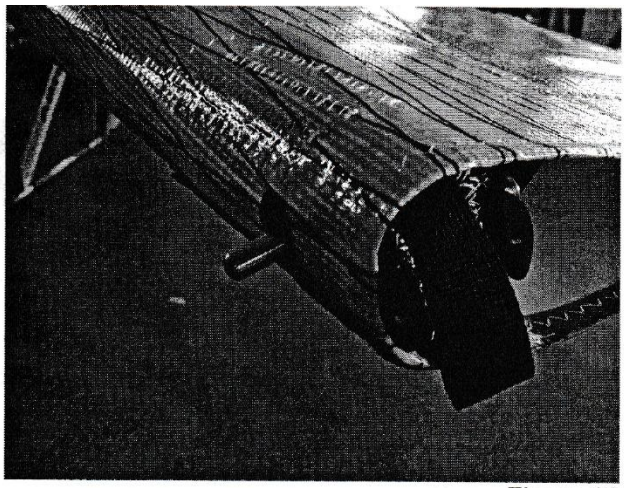


Figure 16

21. Take the winglets and find the winglet fixing rods packed inside. Install the winglets fixing rods to the leading-edges #3 (fig. 16).

22. Install winglets.

23. While the base tube of the trike is still on the ground, install the nose cone.

WING BREAKDOWN FOR SHIPPING

This process will basically be the reverse of reassembling after breakdown for shipping. Before beginning, read through the section above. Refer to the photos in the section above for reference, if necessary.

SPROG MEASUREMENT

The Exodus DeltaJet 500 StingRay uses inboard and outboard sprogs in combination with one transverse batten on each sprog. Each transverse batten spans two top surface battens, so a total of eight top surface battens are supported. The sprog system is the primary component of the system, which provides pitch stability. The function of the system is to support the trailing-edge of the sail at low angles of attack, and thus provide a nose-up pitching moment. The inner and outer sprogs are adjusted at the factory to their proper settings. The sprog angles should be checked regularly. This can be done with any digital electronic angle meter as follows:

1. Fully set up the wing on a reasonably level surface and rest the keel tube on a support with the keel tube horizontal. Attach the keel extension to the keel tube. Using the angle meter, as shown on fig. 55 and fig. 56, check that the keel extension is set to horizontal position. Maintain the keel tube angle during further measurements. Set the angle meter to zero (fig.56).

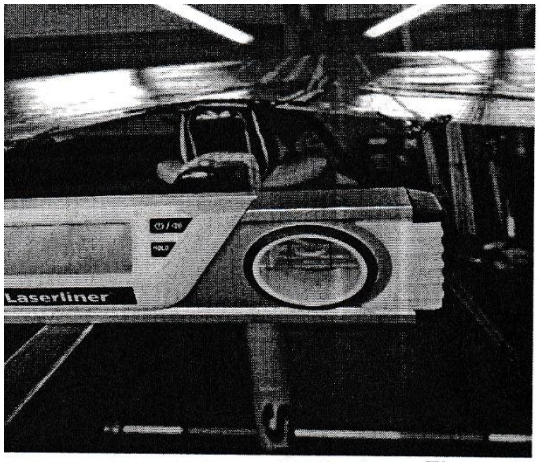


Figure 55

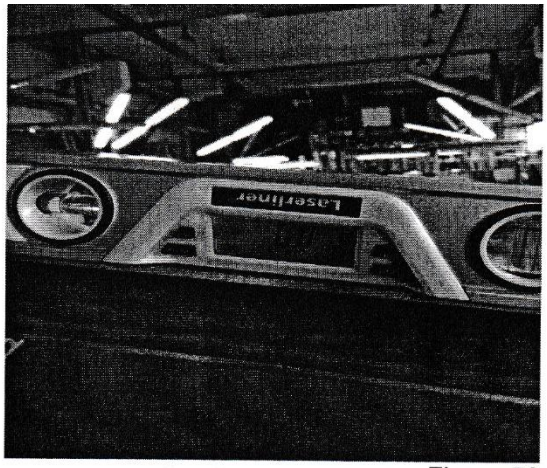


Figure 56

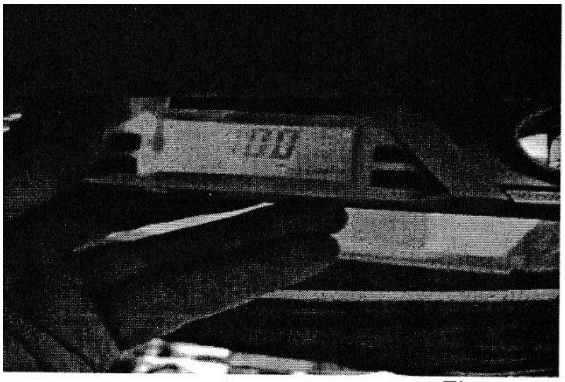


Figure 57

2. Place the worktop of the angle meter under the middle part of the sprog close enough to the sprog wire attachment point so that the entire worktop surface of the angle meter touches the sprog (Fig. 57).

The scale of the angle meter will show the sprog angle.

The **main sprogs** for StingRay should be set to **10** deg.
The **outer sprogs** for StingRay should be set to **14.5** deg.

3. To adjust the sprog angle:

Using the wrench as shown in fig. 58, unlock the sprog threaded adjuster.

Remove the pin from the sprog threaded adjuster at the front of the sprog. To raise the sprog, turn the end of the sprog threaded adjuster counter-clockwise. To lower the sprog, turn the end of the sprog threaded adjuster clockwise.

Refit the pin to the sprog threaded adjuster, install a safety ring, and lock the adjuster with a nut. Press down firmly on the rear end of the sprog to seat the cable before checking the measurement again.

6. Using the wrench as shown in fig. 58, lock the sprog threaded adjuster.

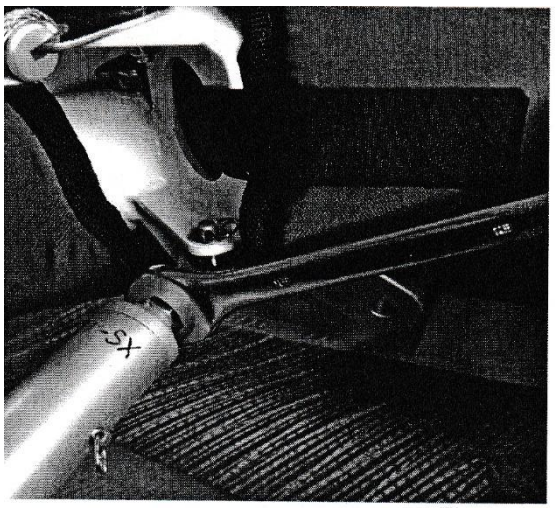


Figure 58

REMOVING THE SAIL FROM THE FRAME AND RE-INSTALLING

Many maintenance and repair procedures will require the removal of the sail from the frame' please follow these instructions when removing and reinstalling the sail. Please read all the instructions for each operation before beginning.

You will need an unobstructed area 2 m by 9 m (6x30 ft). Make sure the surface is clean. If it is abrasive, you should either cover it with protective tarp or be extremely careful not to scrape your sail.

1. Disconnect the trim device rear mount fitting and move the hang bracket with the trim device all the way forward.

2. Remove the winglets. Unplug the tip folded battens. Remove the undersurface battens. Unzip the sprog access zippers all the way to the leading-edge end of the zippers and disengage the inboard and outboard sprogs.

3. Unscrew the sail mount fixing nuts at the nose of the wing (fig. 59). Remove the sail mount tangs from the bolts and replace the fixing nuts.

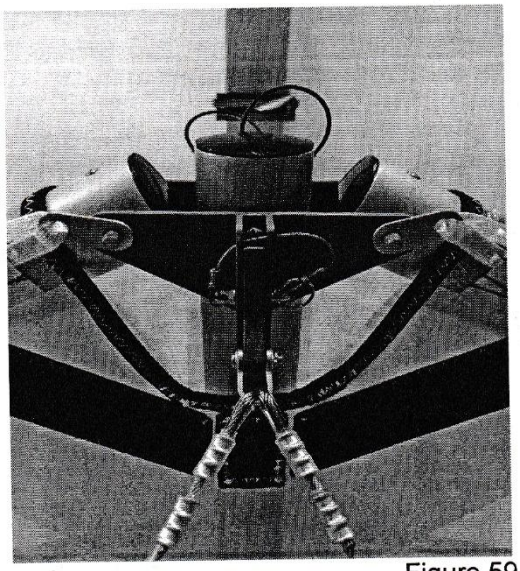


Figure 59

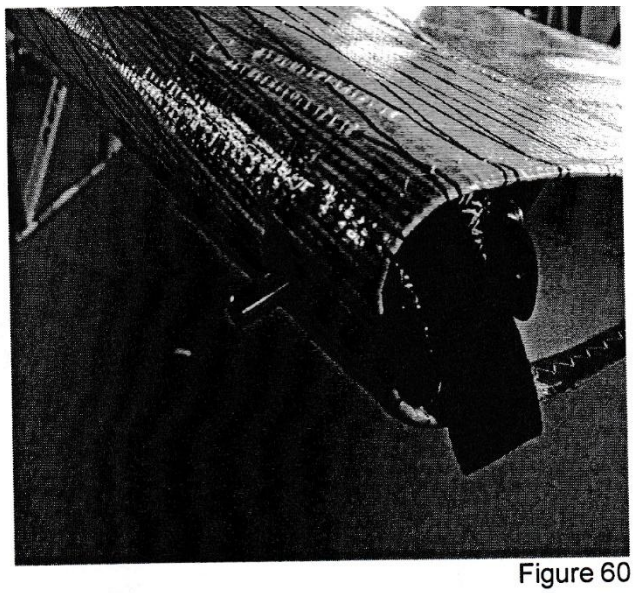


Figure 60

4. Remove the winglet fixing rod (fig. 60). 5. De-tension the crossbar pull-back wires. Attach the auxiliary bungee to the shackle and to the hook.

6. Remove all top battens except for the keel battens' 7. Fold the wings approx. 50 % from fully open (fig. 61). Detach the bottom front wires from the nose junction channel. Detach the struts: disconnect the bottom first (fig.62), then disconnect the top. Stow the struts in their bag.

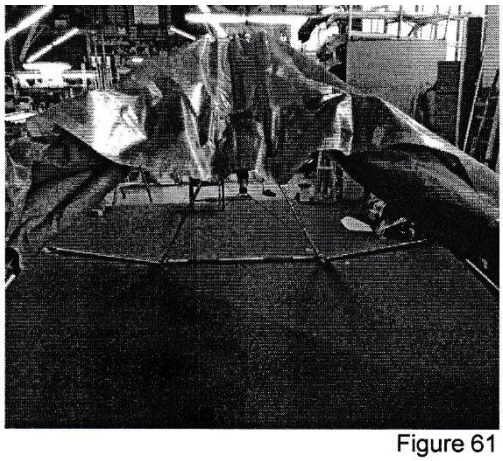


Figure 61

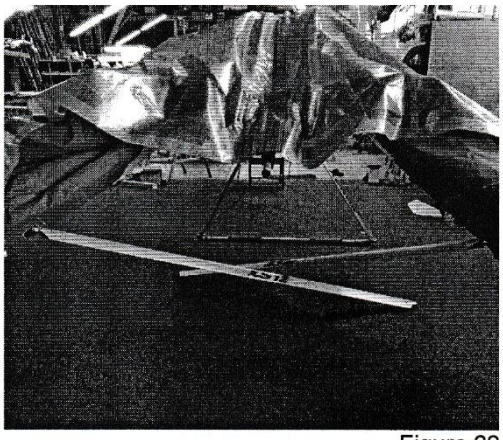


Figure 62

7. Fold wings completely (fig. 63). Lower the wing on the ground or on the support. Remove keel battens from the wing (fig. 64).

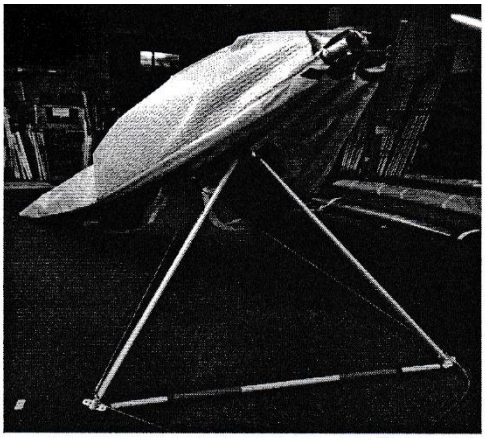


Figure 63

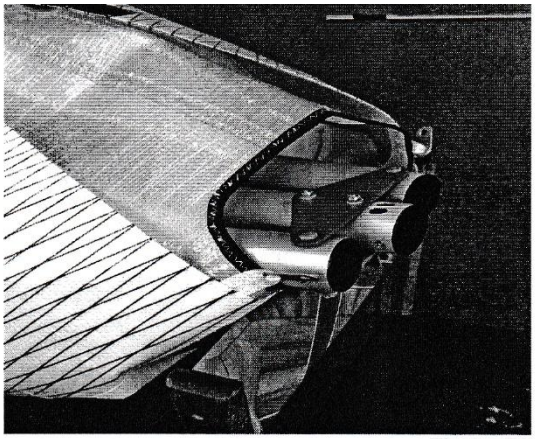


Figure 64

8. Disconnect the rear wires and the keel pocket mount tang from the keel tube (fig. 65). Undo the sail mount webbing Velcro and remove the sail mount webbing from the leading-edge end caps (fig. 66).

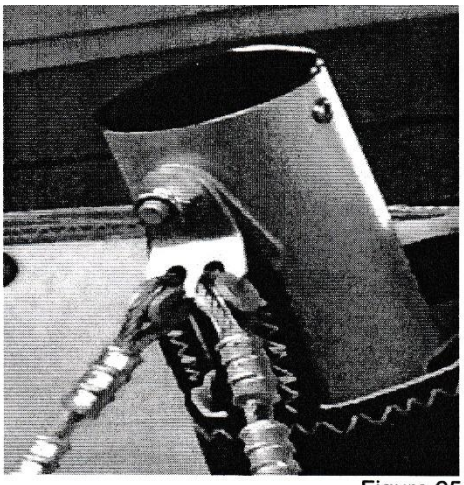


Figure 65

Figure 66

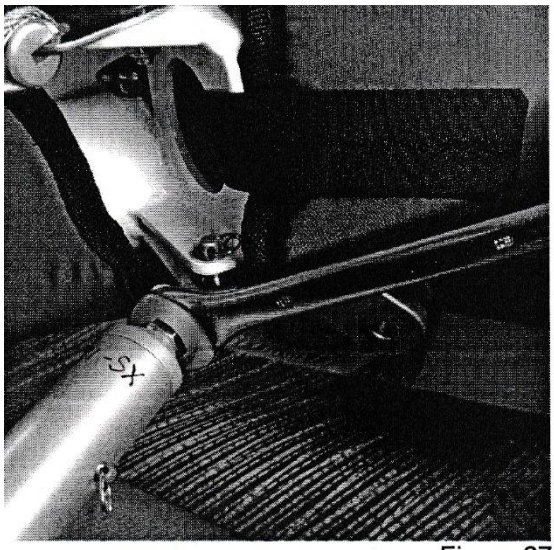


Figure 67

9. Detach the control frame from the keel tube.

10. Secure main sprogs from rotation with a nut outside the main sprog threaded adjusters (fig. 67). Remove main sprogs from the sprog threaded adjusters. Detach the main sprog wires from the main sprogs. Take the sprogs out of the sail.

11. Rotate outer sprogs 180 deg. forward so, that they are pointing towards the nose of the wing. Slide the sail along the keel tube forward (fig. 68). Bring the nose junction of the frame out through the nose opening of the sail (fig. 69). Rotate outer sprogs 180 deg. rearwards so, that they are pointing towards the outer part of the wing.

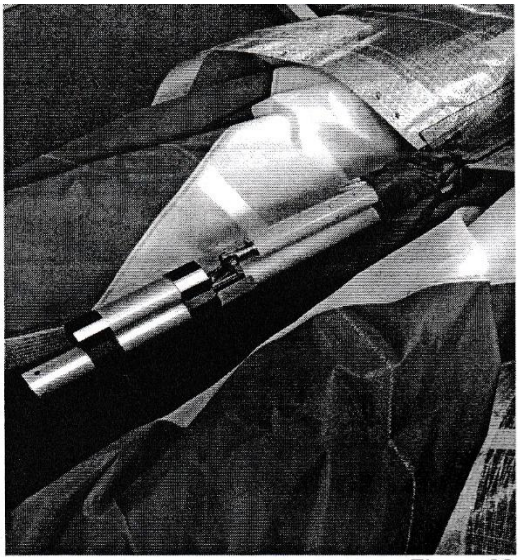


Figure 68

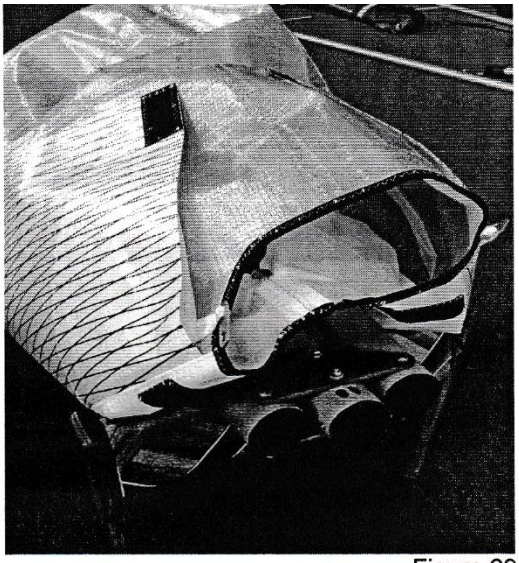


Figure 69

12. Lower the wing from the support on the ground.

13. Slide the sail rearwards and out of the frame completely. If you encounter resistance, stop, and find out what is hanging up.

14. If you need to send the sail for repair, remove the Mylar inserts and the transverse battens. The Mylar insert is to remove from the front end of the Mylar pocket. It helps to secure the opposite end of the sail to something solid, so that you can lay the leading-edge out straight and pull the Mylar straight out of the pocket.

15. Fold and pack up the sail carefully if you plan to ship it out for repair. Be sure to include written instructions of what you want done, your name and a phone number.

RE-INSTALLING THE SAIL ON THE FRAME

Install the Mylar inserts, if they were removed before, in the sail. Make sure you install it right side up; the slit edge is at the front and on the bottom. The easiest way to install the Mylar insert is to push it into the pocket using a long lofting batten attached to the end of the Mylar insert, which is first inserted in the pocket. You will have to stop from time to time to make sure the Mylar insert is properly lying flat in the pocket. Do not push the Mylar insert too far into the pocket (the front edge of the insert should be aflush with the front edge of the insert pocket or the insert should stay approx. 5 mm out). Make sure there are no folds in the Mylar insert, especially at the tips. Make sure the insert wraps in the proper direction to follow the sail around the leading-edge as it enters the pocket.

The procedure of the sail re-installing on the frame is basically reverse of the sail removal. Read and make sure you understand the written above procedure before re-installing the sail on the frame.

ANNEX B – ROUTINE MAINTENANCE WORKSHEET

Exodus DeltaJet 500 StingRay

Aircraft serial no/Reg: …… / …… …… …… …..
Airframe hours at check: ……..

	First 10 hours	50 hours 6-month	100 hours one-year	300 hours 4 years	tick
Body					
Check all pressure instruments for cracks, leaks and stiction	x	x	x	x	
Check all trike tubes for cracks, dents, corrosion, or deformation		x	x	x	
Check seat frame and front and rear supports for bends		x	x	x	
Check all fasteners for security, condition, and fretting	x	x	x	x	
Check operation of flying controls – friction and operation of moveable hangpoint.	x	x	x	x	
Check harnesses for security, condition, and operation of buckles. Check operation of inertia reels.	x	x	x	x	
Check Seat base for cracks (top surface and underneath) and cushions for security and condition.	x	x	x	x	
Check trike, fairings, and cowlings for security and condition.	x	x	x	x	
Check windscreen for security and condition.	x	x	x	x	
Undercarriage					
Check main gear leg for distortion, security to base tube, and condition. Check attachment and condition of axles.		x	x	x	
Check front suspension for distortion, security, free rotation, and condition.		x	x	x	
Check wheels for general condition and cracks, security of rims to hub, and rims for distortion.		x	x	x	
Check Tyres for tread, cuts, scores, perishing, correct inflation (25PSI)		x	x	x	
Spin wheels to check bearings		x	x	x	
Check brake discs and callipers for security, pads for wear levels.		x	x	x	
Check operation of brake system, fluid level, brake lines, and leaks.	x	x	x	x	
Check condition and security of wheel spats and securing bolts	x	x	x	x	
Propeller					
Inspect blades for nicks and splits	x	x	x	x	
Remove spinner and check hub for security and condition	x	x	x	x	
Check securing bolts torque	x	x	x	x	
Check blade pitch setting			x	x	

Fuel system					
Inspect inside tanks for dirt/contamination by draining a sample with A/C nose raised – clean if required		x	x	x	
Check tank for security and condition		x	x	x	
Check and clean carburettor float bowls	x	x	x	x	
Check fittings for perishing rubber, leaks, etc.		x	x	x	
Inspect all fuel pipes for perishing, abrasion, and security of connections	x	x	x	x	
Fuel filter – check for contamination and change if necessary	x	x	x	x	
Inspect system for leaks	x	x	x	x	
Check operation of fuel tap	x	x	x	x	
Electrical					
Check security of battery mounting, connections, etc.		x	x	x	
Check all wiring for condition and security		x	x	x	
Check condition of all switches		x	x	x	
Wing & Pylon					
Check hangpoint and hangpoint bolt for damage, distortion, condition, and security.		x	x	x	
Inspect the sail for wear, tears, UV damage, loose stitching, etc.		x	x	x	
Check all cables and thimbles for tension, corrosion, fretting, fraying, kinking and replace any that exhibit kinks, wear, damage, or corrosion.		x	x	x	
Inspect all bolts and fasteners for tightness, all safety rings for proper installation and possible damage. Inspect plates and fittings for damage, holes in tubes for elongation.		x	x	x	
Inspect the 'End fittings' of both the A-frame uprights and the wing struts for possible corrosion. Apply ACF50 liberally. Change if corrosion found.		x	x	x	
Check the sail washout as described in the SPROG MEASUREMENT section. Inspect the inboard and outboard sprogs and sprog cables for possible damage. Check the rose joint end fittings for straightness – change if bent.		x	x	x	
Lightly spray all zippers on the wing with silicone spray lubricant. Do not use any other type of lubricant. Wipe off any excess silicone so that it does not attract dirt.		x	x	x	
Check all batten ends for splitting – change if found. Check all battens on a flat level floor against the batten diagram provided and correct any that deviate from the pattern by more than 5mm. Lightly silicone spray your battens before you install them in the wing to lubricate the insides of the batten pockets. Do not use any other type of lubricant. Wipe off any excess silicone so that it does not attract dirt.			x	x	
Inspect all of the batten pockets and batten pocket stops.			x	x	
Remove nose plates and inspect for wear where they contact the Leading Edge tubes				x	

Engine					
Carry out maintenance actions as per Rotax manuals	x	x	x	x	
Check fuel system – condition of fuel lines, security of connections. Carburettor rubbers for bulges or splits. Air filters – security and condition		x	x	x	
Check oil system – condition of oil lines, security of oil cooler, Oil tank, oil filter, level, and leaks	x	x	x	x	
Check water system/level – condition of hard and flexible water hoses, water radiator, header tank, overflow bottle level & leaks, water carb heat system (if electric solenoid option fitted check for sound of activation on switch ON). Confirm carb heaters get warm when engine is up to temperature.	x	x	x	x	
Check exhaust system – security, springs, check for cracks, dents, blowing.	x	x	x	x	
Check exhaust system – Proximity to cowlings, fluid pipes.	x	x	x	x	
Check electrical system – engine connections, security, and condition. Spark plug connections, CDI unit security.	x	x	x	x	
Check engine mounting structure for condition and security.	x	x	x	x	
Check engine mount rubbers for excessive movement (see specific check advice below)	x	x	x	x	
Check engine mount bolt security	x	x	x	x	
Check engine cowlings for condition, security of mounting fasteners.	x	x	x	x	
General					
Clean all accessible aluminium structure and treat with ACF50 or equivalent		x	x	x	
Symmetry check – stand 5m in front of and behind the aircraft and inspect for general symmetry – pylon vertical, A-frame, wing twist etc.		x	x	x	
Lifed components					
Replace hangpoint bolt at 250 Hours					
Replace control frame upper through bolt at 500 Hours					
Replace front strut upper and lower channels at 1000 Hours					
Replace rear undercarriage mounting bolts at 1000 Hours					
Replace rear undercarriage axle mounting bolts at 1000 Hours					
Replace lift strut upper and lower bolts and pins at 1000 Hours					
Replace wing keel tube at 1500 Hours					
<u>Major Overhaul</u>					
Complete wing strip at 500 Hours/4 Years					
Documentation review					
Latest worksheet and maintenance manual used? at 50hrs					
Any service letters / service bulletins / mandatory permit directives (MPD's) applicable? at 50hrs					

All modifications and repairs approved and documented at 50hrs	
Weight and balance report up to date at 50hrs	
All placards present, correct and serviceable (i.e legible) at 50hrs	
All required instruments serviceable at 50hrs	
All control deflections/functions within limits – values contained in the TADS. at 100hrs	
All ancillary controls are serviceable at 50hrs	
Log book hours up to date and entry completed for this maintenance event. at 50hrs	
Work carried out by: …… Date: …… Signed: …… Comments: …… …… …… …… …… ……	

ANNEX C – ENGINE MANUAL

The operators and maintenance manual for the engine fitted to this aircraft will be supplied.

ANNEX D - LATEST WEIGHT AND BALANCE REPORT

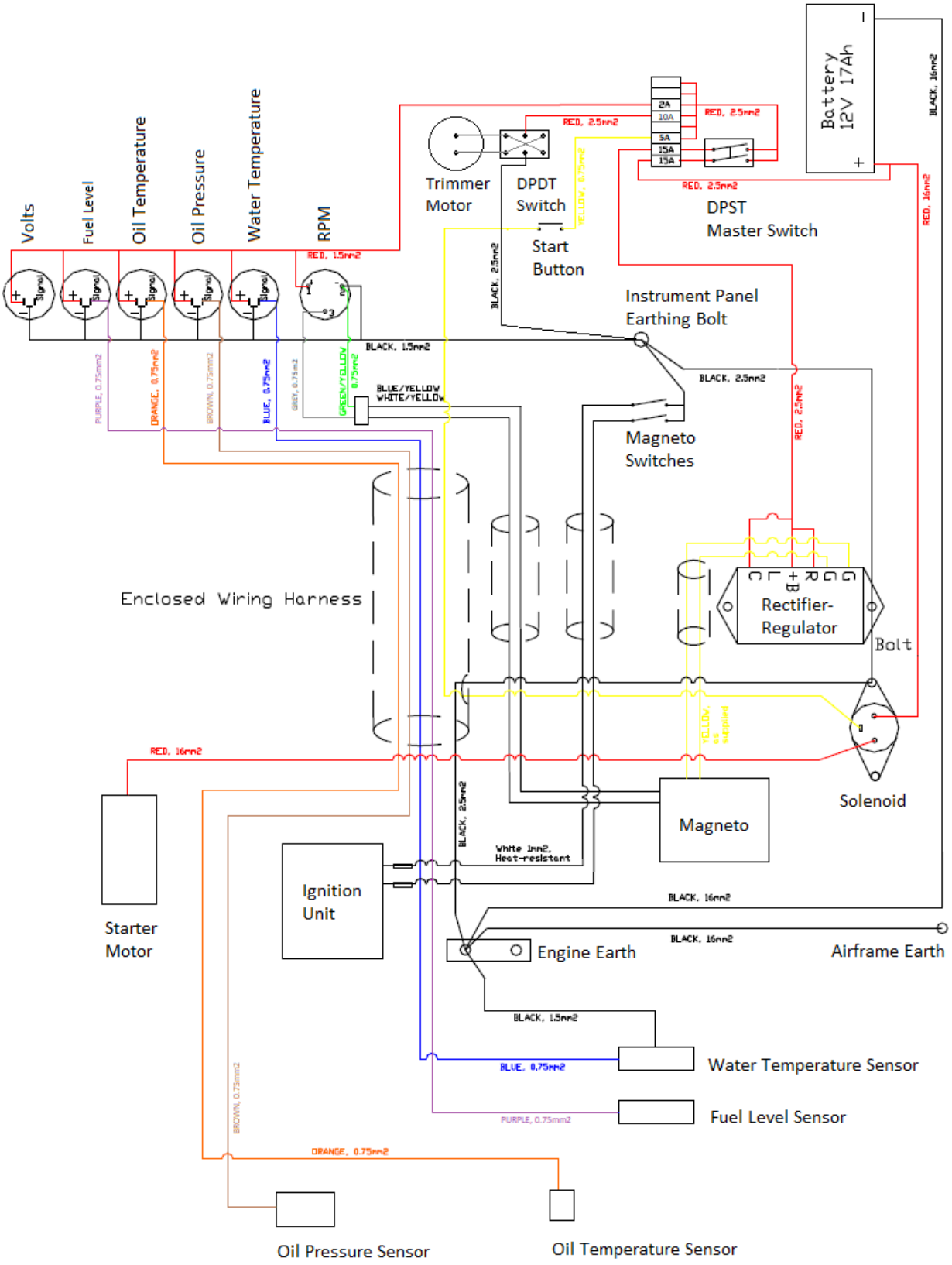
Forms BMAA/AW/028 completed for this aircraft will be supplied.

ANNEX E - MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT ISSUE

Note optional modification reference as recorded in TADS, or note MAAN or AAN number and attach approval document following this page

Modification Reference	Description	Sign and date incorporated

ANNEX F - INSTRUCTIONS AND MANUALS FOR OTHER DEVICES FITTED TO THIS AIRCRAFT

No.	Description	Issue or date	Approval Mod No., or original equipment
1	Trig TT21 Installation and User manuals		Original
2	Trig TY91 Installation and User manuals		Original
3	Trig TN72 manual		Original
4	Kanardia ASI, VSI, ALT and RPM gauges		Original

ANNEX G – WIRING DIAGRAM