XRS
MAINTENANCE MANUAL

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Part # 112962
Drawing # A4-9024

DATA PACKAGE
This manual constitutes one part of the complete data package that accompanies the aircraft. Following is a list of each of the components, which are required.

• **Pilot Operator's Handbook/Aircraft Operating Instructions**	
• **Applicable Base Maintenance Manual**	
• **Applicable Base Illustrated Parts Catalogue**	
• **Wing Maintenance Manual**	+
• **Wing Illustrated Parts Catalogue**	
• **Rotax Owners Manual**	
• **Rotax Maintenance (Compact Disk)**	
• **Radio Manual – If Installed**	
• **BRS Parachute Manual – If Installed**	

AMENDMENT RECORD SHEET

Amendment Date	Issue	Changes Summary	Date Released
Sept 2017	1.0	Additional tuning information.	25/09/2017
January 2019	1.0	Airframe Life limits increased to 1500 hours	30/01/2019

Table 1 Amendment Record Sheets

NOTE

Airborne data packages will be revised from time to time. Owners registered on AirBorne's database will be notified of any changes to data and directed to the AirBorne web site (http://www.airborne.com.au/) for the applicable pages. The amended pages should be printed and the prior page replaced in the folder as soon as possible. The amendment table should at that time be updated with the appropriate details and date. Revised pages will be sent by mail if requested.

INTRODUCTION

This manual contains factory recommended procedures and instructions for ground handling, servicing and maintaining the XRS wing section of this aircraft. The procedures described are to be used in conjunction with those required by the National Airworthiness Authority (NAA) of the country of registration. Any NAA maintenance requirement takes precedence over this manual.

This manual should be used in conjunction with a certified base, and therefore the operator is directed to reference the base maintenance manual for any issues that are related to the base component of the aircraft.

Skills

Only people with an adequate skill level should perform maintenance on this aircraft. A sound understanding of mechanical systems, and good experience with the necessary tools and procedures is required - as the continuing airworthiness of the aircraft relies on the competence of the person performing the maintenance. Assessment and judgement of the condition of each individual component is required, which necessitates a sound understanding of the purpose of each component in the system. All maintenance and repairs must be carried out in accordance with good aeronautical practices.

Skills and authorisations specific to Special Light Sport Aircraft

Maintenance tasks are rated in the categories listed below, according to the applicable category of registration and skill levels required to perform those tasks:

Owner— FAA regulations authorize SLSA aircraft owners who hold at least a sport pilot certificate to perform maintenance as outlined in 14 CFR Part 43. To perform inspections on aircraft condition, functional checks and maintenance in between inspections carried out by LSA Repairman Maintenance certificate holders.

LSA Repairman Maintenance— This certification authorizes a certificate holder to perform line maintenance, repairs and alterations to S-LSA as the task allows. Includes 100 hourly and yearly inspections on S-LSA.

A&P—Mechanic Certificate with Airframe and or Powerplant rating. To perform heavy Maintenance on airframes or powerplant as the rating allows.

Task Specific—Applicable to the following ratings:

LSA Repairman Maintenance with appropriate task specific training or;

A *Mechanic Certificate* with appropriate task specific training.

Authorizes the holder of mechanic certificate or a repairman certificate who has received task specific training, to perform the tasks approved under that training. Allows a repairman certificate holder to perform, heavy maintenance, repairs and alterations on the SLSA.

E.g. The Mechanic Certificate holder may obtain Task Specific training on Rotax engines, to allow overhaul etc.

Skills and authorisations specific to Experimental Special Light Sport Aircraft

LSA Repairman Inspection— To perform line maintenance and inspections to be completed on an E-LSA by a responsible owner, who holds an FAA repairman certificate (light sport aircraft), with an inspection rating or equivalent.

There are no requirements for minimum certification to perform any other task on an experimental aircraft. However, Airborne recommend that only people with an adequate skill level should perform maintenance on this aircraft as described at the start of this section.

Other Categories of Registration

This aircraft is a Light Sport eligible aircraft. This manual is created to be compliant to the standards applicable to Special Light Sport Aircraft.

The category of registration may be quite varied; as such the maintenance requirements of this aircraft are to be applied in conjunction with the requirements of the National Airworthiness Authority (NAA) of the country of registration. Any NAA maintenance requirement takes precedence over this manual.

In the event that the owner is permitted to perform maintenance in their country and category of registration, if there are any doubts regarding the required and appropriate maintenance then the safety of the aircraft may be jeopardised in continuing with self maintenance. In this situation an Airborne Dealer should be contacted for the correct procedures and or servicing.

Tooling

There are no specialised tools needed for the maintenance described in this manual, following is a list of the type of tools that may be required.

NOTE

Loctite will be required in certain locations and should **always** be replaced after disassembly.

- Loctite (243 and 262) for the frame
- Open ended Imperial Spanner set
- Open ended Metric Spanner set
- Torque wrench
- Dry Lubricant – lubricant that doesn't attract dust after application.
- Hex key set
- Bettsometer Instrument
- Various general care items, specified where needed
- Socket Set Imperial and Metric
- 6mm T Allen Wrench
- Allen Key Set Imperial and Metric
- Protractor with built in spirit level (Available from Airborne, part number 108624)
- Digital level
- Protractor with plumb bob

This list may not be comprehensive.

Format

The manual has been prepared using the ATA format, which provides a standard layout of the chapters to be included, and their content. Some of the chapters are not included as they are deemed to be not applicable to this aircraft.

The information in this manual is based on the data that was available at the time of its publication. The latest amendments to this manual will be issued on the Airborne website in PDF format. This should be printed out and added to the manual. Therefore it is important that operators keep a regular check on the website for any amendments that have been made. If any errors or omissions are found in this manual please advise the factory.

Service Difficulty Reporting

Any service difficulties or defects should be reported to Airborne using the form contained in appendix A.

WARNING

THE INFORMATION IN THIS MANUAL NEEDS TO BE FOLLOWED, AND IT IS NOT ACCEPTABLE TO MAKE CHANGES TO THE MATERIALS AND OR PHYSICAL FEATURES OF THIS AIRCRAFT. IN PARTICULAR THE GRADES OF BOLTS THAT HAVE BEEN UTILISED IN THE MANUFACTURE OF THIS AIRCRAFT ARE CRITICAL FOR ITS CONTINUING AIRWORTHINESS. NEVER REPLACE BOLTS WITH ANY OTHER SIZE OR GRADE. GRADE 8 BOLTS ARE NOT INTERCHANGEABLE WITH AIRCRAFT (AN) GRADE BOLTS. THE FATIGUE CHARACTERISTICS OF AIRCRAFT GRADE BOLTS ARE SUPERIOR TO OTHER BOLTS AND ALLOW LONGER SAFE SERVICE LIFE UNDER CYCLIC LOADS LIKE THOSE EXPERIENCED IN AIRCRAFT. THE LENGTH OF THE BOLT IS IMPORTANT. IF A SHORTER BOLT IS USED THE THREAD MAY ENCROACH ON THE LOAD BEARING AREA, WHICH INCREASES THE STRESSES EXPERIENCED BY IT.

MANDATORY SERVICE BULLETINS

AS THE SERVICE HISTORY OF THE AIRFRAME EVOLVES AIRBORNE WILL FROM TIME TO TIME ISSUE AIRBORNE DIRECTIVES, WHICH DETAIL ANY CHANGES TO THE MAINTENANCE MANUALS, PILOT'S OPERATING HANDBOOK, OR ANY OTHER DETAILS THAT AIRBORNE DEEMS NECESSARY FOR OWNERS TO BE NOTIFIED OF.
THE WEB ADDRESS FOR AIRBORNE DIRECTIVES IS:
HTTP://WWW.AIRBORNE.COM.AU/
IT IS THE RESPONSIBILITY OF THE OPERATOR TO KEEP UP TO DATE WITH ANY ROTAX DIRECTIVES THROUGH THE ROTAX WEBSITE.

USE OF METRIC/ IMPERIAL UNITS

This Service Manual uses the metric unit system as the basic system of measurement. Where common usage or available instrumentation refer to the Imperial system, both units are quoted. The following conversion factors are presented as a ready reference to the conversion factors that have been used in this manual.

1 Pound (lb)	=	0.4536 Kilogram (kg)
1 Pound per sq in (psi)	=	6.895 Kilopascal (kPa)
1 Inch (in)	=	25.4 Millimetres (mm)
1 Foot (ft)	=	0.3048 Metre (m)
1 Statute mile	=	1.609 Kilometres (km)
1 Nautical mile (NM)	=	1.852 Kilometres (km)
1 Millibar (mb)	=	1 Hectopascal (hPa)
1 Millibar (mb)	=	0.1 Kilopascal (kPa)
1 Imperial gallon	=	4.546 Litres (l)
1 US gallon	=	3.785 Litres (l)
1 US quart	=	0.946 Litre (l)
1 Cubic foot (ft^3)	=	28.317 Litres (l)
1 Degree Fahrenheit (F)	=	(1.8 X C)+32
1 Inch Pound (in lb)	=	0.113 Newton Metres (Nm)
1 Foot Pound (ft lb)	=	1.356 Newton Metres (Nm)

Table 2 Imperial / Metric Conversions

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Figures

Tables

0. ASSEMBLY AFTER SHIPPING

00.00.00 Wing Assembly After Shipping.

This procedure is to be followed if the wing arrives in a short packed configuration. An approved dealer is responsible for assembly from the short packed configuration. The short packed wing has had the rear leading edges removed to reduce the packed size for transport.
The correct reassembly of the wing is critical for safety and performance of the wing. If there are any doubts about the correct procedure for assembly after shipping contact AirBorne.

00.10.00 Reassembly Guide

Remove wing from box
Ensure that all staples are removed before pulling the wing from the box. Damage to the sail may result if caught on box staples.

Unzip bag
Remove padding from the nose of the wing. Remove all wing straps. Remove padding from control bar and rear leading edges.

Assemble the control frame
Assemble control frame and rotate the wing so that it is lying flat on the ground.

Spread Leading Edges
Spread both leading edges approximately ½ metre. Remove the tip bags, which have been used as protection on the rear of the front leading edges.

Insert Rear Leading Edges

NOTE
Insert rear leading edges in the correct side (left and right hand sides are marked) with the slot positioned horizontally.
As shown on the photo the washout struts (or sprogs) should be routed through the sail zip as the rear leading edge is pushed inwards.

The rear leading edges are located with their slots and held in place by the sail loops.

Figure 1 Insertion of Rear Leading Edges

CAUTION

VELCRO TABS AND SAIL CELLS NEED TO BE POSITIONED AFT OF THE LEADING EDGE. ONCE INSTALLED THE REAR LEADING EDGE SLOT SHOULD BE LOCATED ON THE CHANNEL HORIZONTAL BOLT. IT IS IMPOSSIBLE TO ROTATE THE LEADING EDGE IF CORRECTLY INSTALLED.

Tension Sail

Place one hand on the rear of the leading edge. Pull sail firmly until the loops are located on the end of the leading edge fitting. This holds both the sail and the rear leading edges in place. Ensure the webbing is centrally located with one on each side of the central divider. Repeat for the other leading edge.

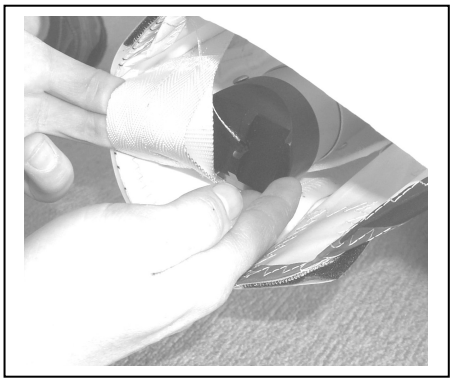
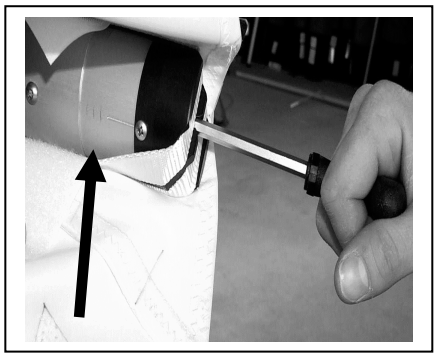


Figure 2 Locating Sail Webbing on Rear Leading Edges

Set Tip Adjusters



Tension the sail using a 6mm Allen key. The tip fitting should be adjusted until the leading edge is positioned on the:

4th mark for XRS Wing

The markings are on the internal tube and should be adjusted until the appropriate mark aligns with the main outer tube.

Secure the hook and loop fastener tabs around the leading edge.

Figure 3 Setting Tip Adjusters

NOTE

If you find difficulty pulling the sail tension on the leading edge the adjustable tips can be wound in (clockwise) The sail nose tangs can be removed to allow the sail to move back. It is, however, extremely important to check that the sail at the nose does not foul on the frame when the wing is being tensioned. Ensure that the nose tangs are replaced and secured.

Assemble

Assemble in accordance with section 4 of the Aircraft Operating Instructions.

Preflight

CAUTION

A THOROUGH AND COMPLETE PREFLIGHT IS ESPECIALLY NECESSARY AFTER REASSEMBLY. THOROUGHLY CHECK ALL NUTS AND BOLTS (REFER TO SECTION 5 FOR TORQUING PROCEDURES BEFORE TIGHTENING ANY NUTS), WIRE ROUTING, SAIL FIT, MYLAR SHAPE AND OVERALL SYMMETRY OF THE WING BEFORE FLIGHT.

Preflight as described in section 4 of the Aircraft Operating Instructions paying particular attention to possible damage to the airframe during transport.

4. AIRWORTHINESS LIMITATIONS

4.00.00 General

This section sets forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure required for type certification.

4.20.00 Airframe Limitations

Component	Life (hours)	Requirement
Heart Bolt (1 off)	100	Mandatory Replacement
Struts	1500	Check For Service Life Announcements. Replace if there are no revisions.
Tubes	1500	Check For Service Life Announcements. Replace if there are no revisions.
Sail	1500	Mandatory Replacement

Table 3 Airframe Limitations

Wing airframes were originally analysed in 2004 using FAA fatigue analysis “Fatigue Evaluation Of Wing and Associated Structure on Small Airplanes FAA Report # AFS-120-73-2”. In order to estimate the time life limits for the major components of the airframe, this is detailed in Airborne report 04-144ds.

The estimates that have been made do not take into account any extreme loads, which will reduce the fatigue life of the airframe. The fatigue life of these components is dependent upon rigid adherence to maintenance schedules.

Subsequent evaluation and analysis of high airtime wings over the past 15 years has allowed justification to increase the time limits of the airframe to 1500 hours. The revision of this manual (Issue 1.1) contains a revised Wing Airframe Maintenance Schedule (Section 5.20.10) which outlines the maintenance requirements for time life of 1500 hours.

5. TIME LIMITS/MAINTENANCE CHECKS

5.00.00 General

The time limits and maintenance schedule provided are in addition to any regulation of the governing body where the aircraft is being flown. The pilot of the aircraft must ensure that the required maintenance is carried out and documented in the correct manner.

Airborne microlights have been designed to permit easy inspection, and operators should have no difficulty in assessing problems or recognising damage if visual checks are carried out correctly.
Maintenance checks may require partial disassembly of the wing. Inspection should include a thorough visual check of the condition of the component and the attachment point in adequate lighting conditions. Cleaning of the component may be required for proper inspection. Significant scratches, cracks, galling, corrosion or any other mechanical wear of the component is reason for replacement. The sail requires special attention to the condition of the fabric, and Bettsometer tests will be required after significant amounts of environmental exposure to things such as UV radiation, chemicals and heat, as well as mechanical wear (and or tears). For instructions on Bettsometer testing see Section 57.30.10 Bettsometer Testing.

The Aircraft Operating Instructions outlines checks required prior to each flight.

Extreme operating conditions may reduce the time limits for components. Unscheduled maintenance is detailed in Section 5.50.00. AirBorne will from time to time amend these maintenance checks as the service history of the aircraft evolves. It is the responsibility of the pilot to ensure compliance with new directives. (Information is available on the website http://www.airborne.com.au/)

5.00.10 Inspection Notes

Installation & Removal
When removing or installing tubing do not bend or force tubes.

Inspection
Inspect tubing for cracks, damage from abrasion, elongated holes or distortion in tube surface. Inspect holes in tubing and corners / radiused areas for cracks during scheduled inspections. Ensure that the areas are clean. A 10X magnifying glass and good lighting will improve this visual inspection for cracks.

WARNING
NEVER ATTEMPT TO REPAIR TUBING. ALWAYS REPLACE WITH A GENUINE NEW PART.

Corrosion
Inspect tubing for corrosion inside and out. Discolouration of the metal may indicate corrosion. Salt is the most common cause of corrosion during coastal operation. Parts affected by salt must be stripped and thoroughly cleaned before reassembly. The cause of the corrosion must be identified and eliminated. If corrosion (pitting or oxidation) is present the component must be removed and replaced with a new part.
Exposed wires may be protected from corrosion by applying a water dispersant such as WD 40, RP7 or Inox using a rag wetted with the water dispersant. Such treatment is only required in corrosive environments. Preventative treatment may be applied as required.

Replacement
Aluminium tube comes in many different sizes and grades. As sections of the airframe are manufactured from tube made specifically to Airborne's specification it is important that only genuine replacement parts as supplied by Airborne WindSports Pty. Ltd are used.

Airframe Bolts
All airframe bolts are either aircraft quality or high tensile bolts. If it necessary to replace any bolts or nuts it is important that the specification of the original bolt are matched when a replacement is selected. This applies not only to the grade of the bolts but to the length as well.

Installation & Removal
- After tightening, all bolts should have thread protruding out of the nyloc.
- All self-locking nuts should not be installed more than 2 times.
- Be sure not to over-torque bolts when installing.
- Check assembly instructions for correct bolt placement.

Inspection
Check bolts for worn shanks, bad threads or corrosion.

Wire Inspection
Inspection of wires should concentrate on any areas where the wires come into physical contact with other components. These areas may cause stress concentration and mechanical wear. Some areas may need to be partially disassembled to fully inspect wires. Kinks created during packing up, transport and storage should also be checked. Any degradation of wires requires replacement.

5.20.00 Scheduled Maintenance Checks

General care should include:
- Washing down the tube with warm water and a light detergent followed by rinsing with fresh water.
- Fabric sponged with warm water and a mild detergent and rinsed with fresh water.

Apart from the consequences of heavy landing, or of exceeding flight limitations, the major factors requiring attention are corrosion, fatigue, wear, UV exposure and heat.
There are no known fatigue problems with Airborne microlights, but excessive loads and vibration can weaken the structure. Regular inspection for hairline cracks in areas under high stress, such as bolt holes and tube junctions is recommended.
Many components can be replaced with ease, for difficult repairs or if the repair process is not fully understood consult your Airborne Dealer or the Airborne factory.
The registration of microlights is only valid provided that all necessary maintenance, modification and service requirements are fulfilled.

These requirements include:
(a) Maintenance of aircraft as per the Maintenance Schedule in this manual.
(b) Modification as detailed in any relevant Service Bulletins.
(c) Modification to approved details, obtained from Airborne WindSports Pty. Ltd.
(d) Repairs necessary to replace minor damage, wear or ageing.
(e) Servicing, replacement and overhaul, inspection and checking in compliance with the Maintenance Schedule.
(f) Any Airworthiness Directory (AD) issued by CASA or the NAA of the country of registration

5.20.01 Maintenance Privileges

This manual lists task to be performed on the maintenance schedule.

The minimum qualification required to perform tasks under USA LSA is prescribed below. The owner / maintainer qualification varies depending on the regulations of the governing body where the aircraft is being flown.

A simple explanation of maintenance privileges permitted according to USA LSA category of registration is described in the table below:

	Experimental LSA				Special LSA			
	Sport Pilot	Owner Sport Pilot	LS – I Sport Pilot	LS - M / A&P / part 145 repair	Sport Pilot	Owner Sport Pilot	LS – I Sport Pilot	LS - M / A&P / part 145 repair
Modifications								
Daily Inspections								
Preventative Maintenance								
Repairs, Major Maintenance.								
100 hour inspection								
Annual Inspection								

Authorized to perform.

May perform only if the Repairman Inspector is the owner of the aircraft.

May perform only if the modification is included in the aircrafts Maintenance Manual or if the repairman is authorized to do so by the manufacturer.

May perform if the Repairman Inspector is the owner of the aircraft and not using the aircraft for compensation (training or towing), or

When using the Experimental aircraft for compensation (Training or towing) until January 31 2010, the inspection must be performed by an LS - M / A&P or part 145 repair facility.

Not authorized to perform.

Table 4 Maintenance Privileges

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Note that owners and pilots are permitted to perform preventative maintenance tasks as prescribed by FAR document: Part 43, Appendix A Sec. A43.1

Limitations Due to Registered Category

S-LSA

Maintenance on a Special LSA, 100 hourly and annual inspections are to be performed by the holder of a LSA Repairman Maintenance certificate or an appropriately rated A&P mechanic.

Note: owners and pilots are permitted to perform preventative maintenance tasks as prescribed by FAR document: Part 43, Appendix A Sec. A43.1

E-LSA

The owner of an aircraft registered as an Experimental LSA has operations limited to private use and has additional maintenance privileges.

During the transition period, commercial operations may be conducted until 31 January 2010. Where the experimental registered aircraft is used for compensation (training or towing) during the transition period the option c) below does not apply to 100 hourly inspections.

The 100 hourly or annual inspections on an E-LSA are to be performed by:

a) the holder of a LSA Repairman Maintenance certificate, or

b) an appropriately rated A&P mechanic, or

c) the owner when the owner is the holder of a LSA Repairman Inspection certificate.

The pilot of the E-LSA aircraft is responsible to see that the maintenance and inspection has been performed on this aircraft as per the maintenance schedules prescribed in this maintenance manual. The maintenance schedule tasks remain applicable, where there is no minimum level of qualification required to perform maintenance on E-LSA, however a minimum skill level continues to apply to tasks. Only people with an adequate skill level should perform maintenance on this aircraft. A sound understanding of mechanical systems, and good experience with the necessary tools and procedures is required - as the continuing airworthiness of the aircraft relies on the competence of the person performing the maintenance. Assessment and judgement of the condition of each individual component is required, which necessitates a sound understanding of the purpose of each component in the system. If there are any doubts regarding the required and appropriate maintenance then the safety of the aircraft may be jeopardised in continuing with self maintenance. In this situation an Airborne Dealer

All maintenance and repairs must be carried out in accordance with good aeronautical practices.

5.20.02 Description of Task Classification

Preventative Maintenance

The preventative maintenance that is permissible to be performed by pilot certificate holders is defined in FAR document Part 43, Appendix A Sec. A43.1.

Line Maintenance

Includes inspections, servicing of fluids. Tasks where specific instructions are described in the manual that do not require specialised training, for replacement, repair of parts and structure or alterations described in the manual. Includes compliance with service directives that prescribe repairmen as the minimum qualification to perform the task.

Heavy Maintenance

Tasks that require a repairman rating with specialised training or Mechanic with A&P rating, such as major engine work, repair of landing gear assemblies. It also includes alterations to structure where instructions are provided in the manual, such as fitment of an undercarriage kit or a tow kit.

5.20.03 Qualification Descriptions

Certification Required to Perform Light Sport Aircraft Maintenance Tasks

[O] **Owner** – Items that can be expected to be completed by a responsible owner who holds a pilot certificate but who has not received any specific authorized training.

[R] **E-LSA Repairman Inspection** – Applicable to E-LSA registration. Repairman Inspection— Items that can be expected to be completed on an ELSA by a responsible owner, who holds an FAA repairman certificate (light sport aircraft), with an inspection rating or equivalent.

[R] **S-LSA Repairman Maintenance** – Applicable to S-LSA registration. Repairman Maintenance— Items that can be expected to be completed on a S-LSA or E-LSA by a responsible individual, who holds a FAA repairman certificate (light sport aircraft), with a maintenance rating or equivalent.

[A&P] **Mechanic Certificate** with **Airframe** and or **Powerplant** Training - A&P – tems that can be expected to be completed by a responsible individual who holds a mechanic certificate with airframe or powerplant ratings, or both, or equivalent.

[RS] **Part 145 Repair Station** – Items that can be expected to be completed by a responsible organization that holds a part 145 repair Station approval.

[TS] **Task Specific** – Items that can be expected to be completed by a responsible individual who holds either a mechanic certificate or a repairman certificate and has received task specific training to perform the task. When specifying the “task specific” level of certification, the specific training is also specified where it is appropriate.

Note that **dealers may be authorized** by the manufacturer to perform a maintenance or modification task for which they are specifically trained. These tasks are not necessarily included in the Maintenance Manual.

This Maintenance manual is created with the focus to maintain Special Light Sport Aircraft (S-LSA). This category of registration allows the aircraft to be used for hire and reward. Maintenance requirements are given in the maintenance schedule tables. Note that the level of qualification is given for each of the tasks.

Notice that this manual prescribes owner maintenance and repairman maintenance. The minimum applicable repairman ratings for each category of registration are as follows:

E-LSA registered - LSA Repairman Inspection certificate **(LS-I)**.

S-LSA registered - LSA Repairman Maintenance certificate **(LS-R)**.

In both cases of E-LSA and S-LSA, a person who holds a mechanic certificate with A&P rating, or a part 145-repair station may perform maintenance and inspections on the LSA.

The 100 hourly or annual inspections on a S-LSA are to be performed by the holder of a LSA Repairman Maintenance certificate, an appropriately rated Mechanic with Airframe and Powerplant (A&P) rating, or a part 145 Repair Station.

The holder of a sport pilot certificate may perform preventive maintenance on an aircraft owned or operated by that pilot and issued a special airworthiness certificate in the light-sport category. Items of preventative maintenance that may be performed by an owner are listed in FAR 43 appendix A, Section A43.1 (c)

5.20.05 Maintenance Task Legend

Your microlight should be maintained in accordance with the following schedules. When registered under LSA, the following schedules are mandatory. The following codes are used in these schedules:

Code

1 Oil lubricate, clean and service.
2 Check as directed.
3 Check for insecurity, cracks, wear legibility and faulty operation.
4 Remove, inspect and replace if necessary.
5 Recommend replacement or overhaul.
6 Mandatory Replacement
7 Refer to Rotax maintenance manual and Rotax maintenance logbook.

Certification required to perform Light Sport Aircraft maintenance tasks

[O] Owner
[R] E-LSA Repairman Inspection (experimental registered aircraft only)
[R] S-LSA Repairman Maintenance
[A&P] Mechanic Certificate Airframe and or Powerplant
[TS] Task Specific

5.20.06 Log Book

When maintenance is performed always fill out the appropriate check sheet supplied in Appendix A at the rear of this maintenance manual. The aircraft logbook should also be filled out when maintenance has been done.

When Service Bulletins have been completed both the maintenance manual and the log book should be filled out. A copy of the Service Bulletin form should be sent to the factory to be stored with the aircraft QA papers.

A separate maintenance manual is supplied with the trike base. The wing maintenance log should be filled out in the wing maintenance manual and aircraft log book.

5.20.10 Wing Airframe Maintenance Schedule

WING MAINTENANCE SCHEDULE Inspection Items	Manual Section Reference	AIRCRAFT OR ITEM HOURS OF OPERATION														
		100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Sail Bettsometer testing	57.30.00		2[R]		2[R]		2[R]		2[R]		2[R]		2[R]		2[R]	2[R]
Wing sail fabric & stitching	57.30.00	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Wing sail attachment points	57.30.00	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Tip assembly and webbing. Correct tension set	00.10.00	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Inspection zips operational	As directed	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Batten fitting latch secure	57.00.00	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]
Check battens on template	57.40.00	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Wires & attachment fittings	As directed	3[R]	3[R]	3[R]	3[R]	4[R]	3[R]	3[R]	3[R]	3[R]	6[R]	3[R]	3[R]	3[R]	3[R]	6[R]
Winglets & attachment fittings	As directed	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]
Reflex bridles, kinks corrosion	As directed	3[R]	3[R]	3[R]	3[R]	4[R]	3[R]	3[R]	3[R]	3[R]	4[R]	3[R]	3[R]	3[R]	3[R]	6[R]
All tubes: Check for straightness, dents and corrosion	As directed	2[R]	2[R]	2[R]	2[R]	4[R]	2[R]	2[R]	4[R]	2[R]	4[R]	2[R]	2[R]	2[R]	2[R]	6[R]
Remove frame, disassemble and check tubes for fatigue cracks radiating from drilled holes	5.50.50					4[R]					4[R]					6[R]
Loose bolts / nuts	20.10.00	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	6[R]
Universal joint / keel roller free moving and in good order	As directed	2[R]	2[R]	2[R]	2[R]	4[R]	2[R]	2[R]	2[R]	2[R]	4[R]	2[R]	2[R]	2[R]	2[R]	6[R]
Heart bolt (See time life 4.20.00)	As directed	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]	6[R]
Trimmer assembly operation	As directed	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]	2[R]
Placards: Trimmer, Kingpost and Data plate	As directed	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]	3[R]

Table 5 Scheduled Maintenance

5.50.00 Unscheduled Maintenance Checks

Unscheduled maintenance is required due to abnormal flight loads such as severe turbulence or heavy landings. If any abnormal loads are encountered during transport or storage then the airframe needs to be checked.
The pilot will be responsible for identification of these extreme operating conditions and identification of the effected components. Where damage is found further checks should be carried out upon areas that may also be affected.
Thorough checks should also be carried out after transportation of the aircraft, and after extended storage periods.

5.50.10 Inspection after heavy landing.

The main attachment point for the wing to the aircraft base should be inspected carefully for any permanent deformation of the U-bracket the main bolt or the keel, as well as all of the other effected components. If the landing resulted in contact with the ground then obviously these parts will require extra attention. The tubing relies on being intact in perfect condition for full strength. If tubing is bent or kinked in any way then it should be replaced prior to flying. This includes its attachment point to bolts. The battens should be checked against the supplied batten profile and the opportunity should also be taken to inspect the batten fittings.

5.50.20 Inspection after heavy turbulence.

The main areas of wing structure that require attention after severe turbulence are the attachment points for structures. These include the front and rear wires, the struts and the main hang point. The sail should also be inspected for any strain or tearing that may have occurred – though this is very unlikely. All of the tubing should be inspected for bending, including the battens against the supplied batten profiles. The opportunity should be taken to inspect the batten fittings at the same time.
If the base bar has made contact with the mast brace at any time during flight then they should both be checked.

5.50.50 Sail removal

The sail should be removed for close inspection of the airframe if the frame is suspected of suffering any damage for example, having bent tubes following a heavy landing, blow over or crash. If the wing suddenly develops a turn after severe turbulence it is possible that some tubes may be bent, therefore close inspection of all the tubes is necessary. It is suggested that the sail should be removed from the frame every 500 hours to check for any signs of fatigue or damage from general wear and tear.

The main points to check are

-Cross bar hinge joint
-Cross bar /leading edge joint (deformation in the bushes)
-Leading edge nose joint (deformation in the bushes)
-Nose plates
-Strut attachment points
-Straightness of the tubes
-Elongation of boltholes
-Damaged wires
-Damage to bolts
-Damage to sail

NOTE

If any part of the aircraft has any signs of damage the part should be replaced prior to re-installing the frame.

Special Requirements and Tips

When installing or removing the sail you will need a large unobstructed area of approximately 12 metres by 3 metres. Make sure the surface is clean and not abrasive. Rough concrete will damage the sail, a grass area will not damage the wing, but will provide many hiding places for bolts, nuts and washers – short carpet is ideal.
It is a good practise to note the order of washers and other fittings prior to disassembly and to have a small container to put the hardware in. The Illustrated Parts Catalogue should be referenced for correct assembly. Taking photos before and during disassembly can also help aid the reassembly process.

NOTE
Wherever possible perform an operation on one side of the wing, and completely reassemble it before continuing with the other side. This method gives an easy reference to the reassembly sequence that is required for correct and safe operation.

De-tension the Tip

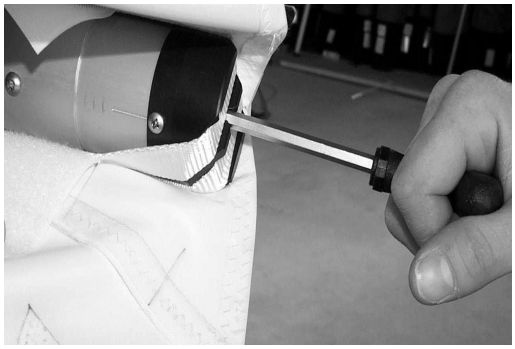


Figure 4 De-tensioning the Tip

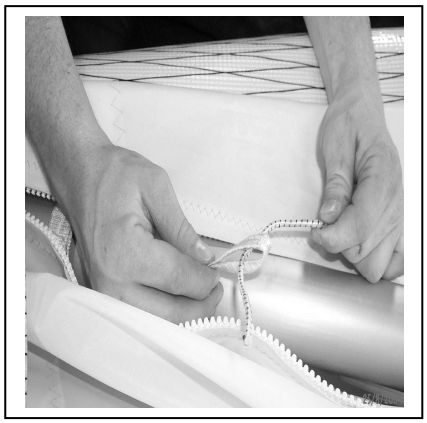
-Undo hook and loop retaining straps at rear leading edge.
-Wind tip-tensioner inward (clockwise) to de-tension the tip webbing.
-Remove sail webbing from rear leading edge.

Remove Rear Leading Edges

-Spread leading edges approximately 1-½ metres apart.
-Remove rear leading edge from airframe.

Figure 5 Removing Rear Leading Edges

Untie Bungie



-Untie bungie from pull back handle. When the wings are folded in the handle is accessed through the undersurface centre zip.

Figure 6 Removing Rear Leading Edges

Remove Zip

-Cut off zip tie at nose junction.
-Remove zip slider from zip and unclip sail safety webbing.

Figure 7 Removing Centre Zipper

Remove Nose Webbing

-Undo sail webbing nut and remove sail webbing. Replace nut finger tight.

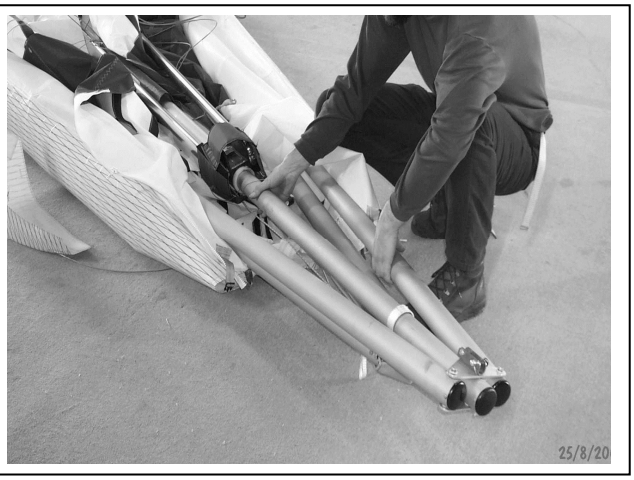
Figure 8 Removing Nose Webbing

Remove Rear Wires

- Remove sail Tang and quick clip

Figure 9 Removing Rear Wires

Remove Airframe from Sail



-Leave control frame attached and carefully slide frame out through the nose of the sail.

Figure 10 Removing Airframe

CAUTION

DO NOT FORCE SAIL. IF IT SNAGS, STOP AND FIND WHAT IT'S CAUGHT ON.

5.50.60 Frame Reinsertion

After the frame has been removed for inspection the frame must be properly reinstalled to maintain a high level of safety. Particular attention must be paid to the correct orientation of bolts and washers.
It is advisable that all nuts that are removed are replaced with new ones, or as a rule Nylok nuts should not be reinstalled more than twice.

WARNING

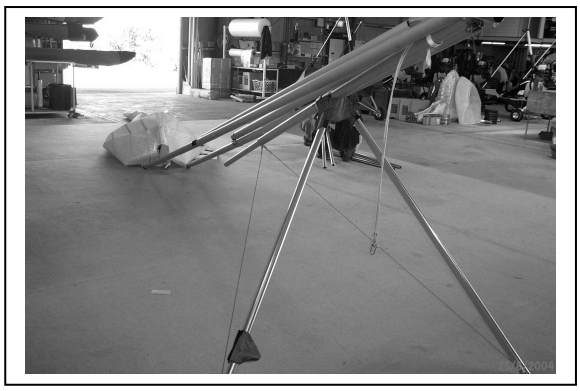
REFER TO SECTION 20 (STANDARD PRACTICES) FOR CORRECT TORQUING PROCEDURES, FAILURE TO READ AND UNDERSTAND THE SPECIFIC TORQUING METHODS THAT ARE NECESSARY FOR THIS THIN WALLED TUBULAR STRUCTURE WILL RENDER THE AIRFRAME UNSAFE TO FLY.

Reinstall Bungie

-Tie pull back handle bungie to pulley temporarily using a bowline knot

Figure 11 Tie Pull Back Bungie To Pulley

Prepare Frame for Sail Reinstallation



-Insert quick clip bolt, attach rear-flying wires and tighten nut finger tight, it needs to be removed again to allow the keel pocket past.
-Insert rear leading edges into **correct right and left hand side** and stand airframe onto its A-frame.
-Lay sail out at the tips inline with the airframe.
-Ensure rears are located correctly.

Figure 12 Frame Preparation for Sail Reinstallation

Reinstall Sail Step 1.

-Slide sail 1 metre up the airframe making sure one leading edge goes in either side of the sail

Figure 13 Sliding Sail Onto Frame Step 1

Reinstall Sail Step 2.

-Hold the leading edge up approximately 1/2 metre off the ground while you slide the sail up, so the leading edges don't hit the cells (internal fabric ribs).
Slide sail up half a side at a time.
-Pull sail on slowly as damage can result if sail is caught on internal ribs.

Figure 14 Sliding Frame Onto Frame Step 2

Insert Keel into Sail

-When sail is approximately halfway up, insert the keel into the keel pocket.
-Slide sail up until the keel pocket hits the quick clip bolt.

Figure 15 Inserting Keel Into Sail

Position Keel Pocket forward of Rear Wires

-Have someone hold the nose of the wing up so the bottom rear flying wires are loose.
-Remove quick clip nut and bottom rear flying wires.
-Slide keel pocket up until the sail tang aligns with the quick clip bolt hole.
-Re-insert quick clip bolt and attach washer, sail tang and rear flying wires, tighten nut.
-Let the nose down.
-Slide the rest of the sail up to the nose.

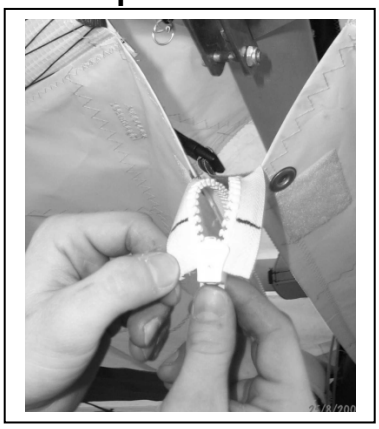
Figure 16 Position Keel Pocket Forward Of Rear Wires

Spread Wings

-Spread each wing apart ¼ of the way alternately on each side until fully open, making sure sail is loose and free at all times.

Figure 17 Spread The Wings Apart

Join Zip



-Connect sail safety strap at nose junction.
-Slide on zip slider, making sure strike marks on the zipper align.
-Fasten zip tie through eyelet holes around the zipper.

Figure 18 Join Centre Zipper

Locate Tip Webbing / Attach Struts

-Locate tip webbing over rear leading edge and secure retaining Velcro.
- Attach Struts.

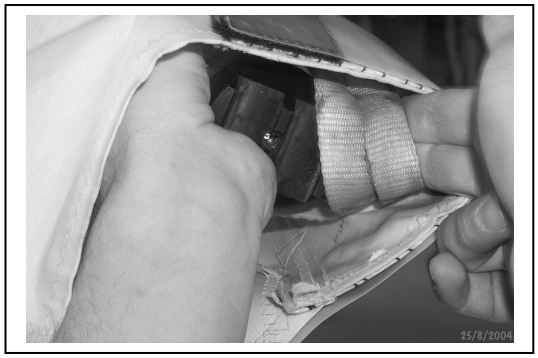


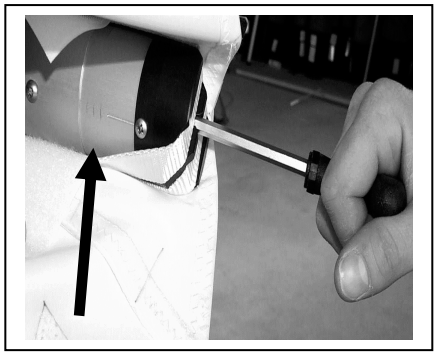
Figure 19 Locate Tip Webbing

Insert Battens

-Insert main sail battens and pull cross bar tension on, Note the pull back handle should be routed through the top sail hole.
-Tie pull back bungie onto pull back handle using a bowline knot.
-Photo shows the pull back handle being tied on.

Figure 20 Insert Battens

Reset Tip Adjusters



Tension the sail using a 6mm Allen key. The tip fitting should be adjusted until the leading edge is positioned on the:

4th mark for XRS Wing

The markings are on the internal tube and should be adjusted until the appropriate mark aligns with the main outer tube

Secure Velcro tabs around the leading edge.

Figure 21 Tension Tips

NOTE
If you find difficulty pulling the sail tension on the leading edge the adjustable tips can be wound in (clockwise). The sail nose tangs can be removed to allow the sail to move back. It is, however, extremely important to check that the sail at the nose does not foul on the frame when the wing is being tensioned. Ensure that the nose tangs are replaced and secured.

Attach Swan Catch

-Attach swan catch.
-Secure and tighten nose webbing tangs.

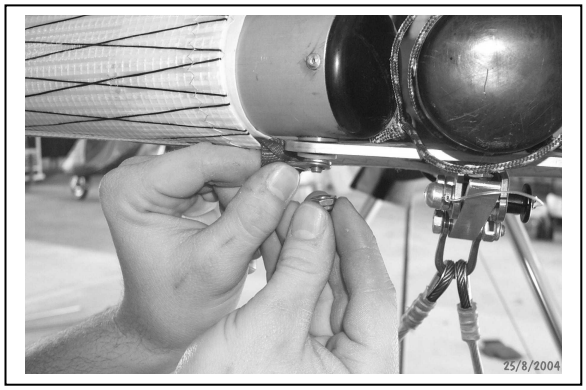


Figure 22 Nose Webbing

Assemble

Assemble in accordance with section 4 of the Aircraft Operating Instructions.

Quality Assurance

After this procedure is completed recheck all nuts, bolts and connections, make sure that there are no parts left over or missing from the assembly.

NOTE
It is good practice to have an independent person check the airframe. AirBorne WindSports always uses a different person for checking the assembly process. Following is the Final assembly QA sheet, which may assist in performing the final inspection process. This QA is used by trained personnel and does not represent all of the instructions that are necessary for a safe aircraft. It is to be used as a reference only.

QA Inspection Form

ASSEMBLY TRACE – WING XRS

GJP-312 pg2

FINAL QA

Line	Check Operation, Security and Finish	Left Side	Right Side
NOSE			
	Nose Assembly		
	Nose Catch		
	Nose webbing secure		
	Nose Battens		
	Nose Cone		
XBAR JUNCTION			
	Cross Bar Hinge		
	Cross Bar Padding		
	Undersurface Zip		
KEEL			
	Keel Roller Position as per page 1(Bolts tight)		
	Placard – Standard Suspension Position Rear hole		
	Serial Number Attached (Record Number)	S: XRS-	
	Down Tubes top assembly		
	D/Tube Stops		
CONTROL FRAME			
	Down Tube Bottom Corners		
	Strut Control Frame Universal		
	Trimmer Placard		
	Trimmer Handle		
	Bottom Front and Rear Wires		
	Base Bar Bolt and Pip Pins		
	Strut LH and RH identification placards		
	Base Bar warning placard		
XBAR L/EDGE JUNCTION			
	Cross Bar / Leading Edge Junction		
	Cross Bar Strut Assembly (Check large s/s washer)		
	Inboard Sprogs – Covers, clevis pins, bolts		
	Inboard Sprog Mylar Cover		
	X/Bar L/Edge Zip		
TIP			
	Outboard Sprogs – Covers, clevis pins, bolts		
	Tip Webbing Located Correctly		
	Tip Velcro secure		
	Tip Tension L/Edge Tension: 3rd Mark N/A; 4th Mark XRS		
	Tip Strut Adjusted		
	Undersurface Bungie Adjusted		
	Winglets attached and aligned		
REAR SAIL			
	Main Sail Battens Adjusted		
	Pull Back Wires, Shackle, Quick Clip		
	Bottom Rear Wires / Keel pocket strap		
VISUAL CHECK (From the nose ensure symmetry)			
	Tip struts		
	Sprogs – Inboard 8 degrees		
	Sprogs – Outboard 10 degrees		

Table 6 Airborne Final QA Inspection Sheet

6. DIMENSIONS AND AREAS

6.00.00 General

This section gives general dimensions for the wing. It should be noted that this is a flex wing aircraft and the dimensions that are given will be different depending on the loads on the wing.

6.10.00 Major Dimensions of the XRS Airframe

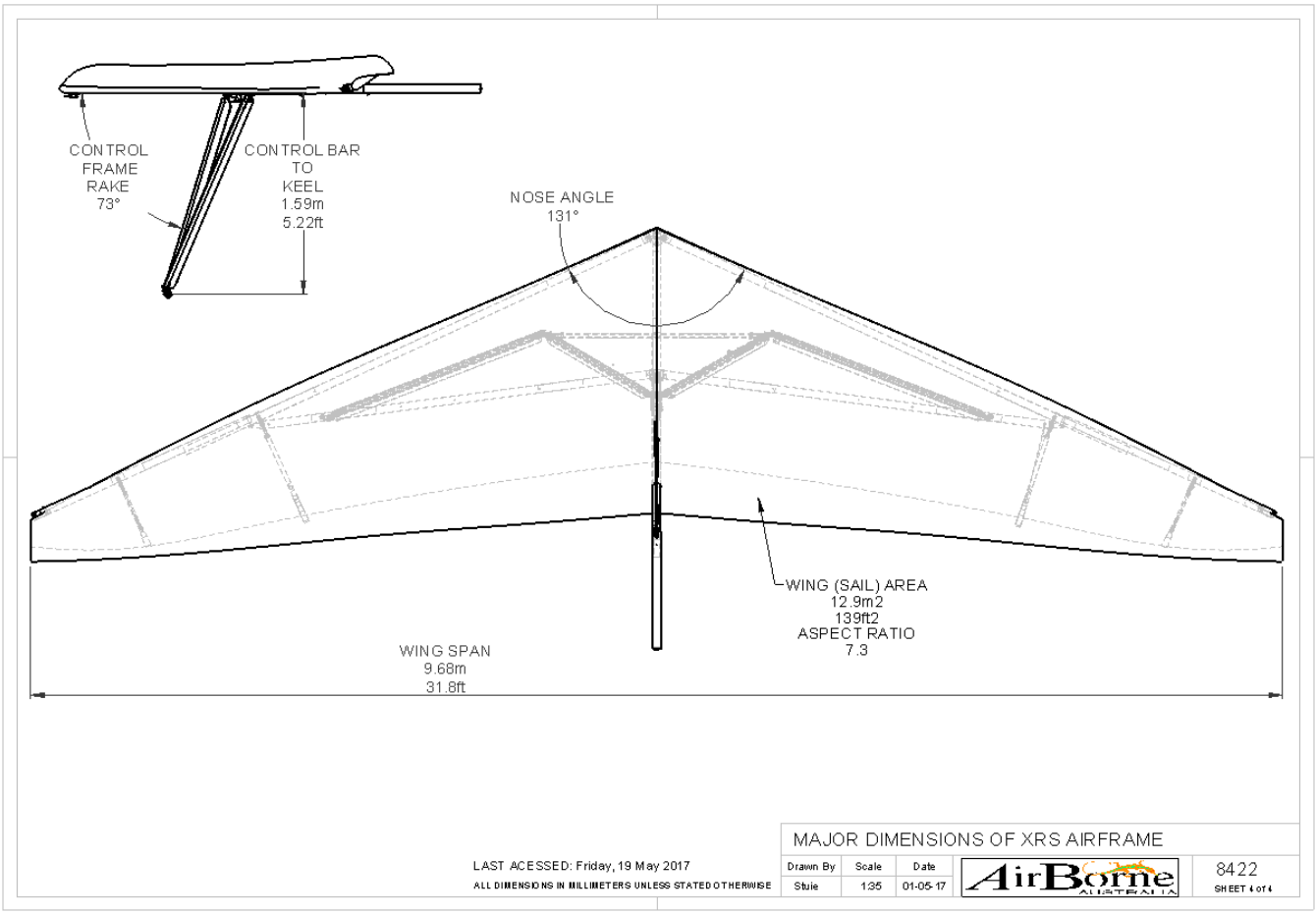


Figure 23 Major Dimensions of Airframe

6.30.00 Significant Dimensions and Areas

General

The Major dimensions of the wing are listed below.

DIMENSIONS		XR-S
Wing Span (inc winglets)	m	9.68
	ft	31.8
Wing Area	sq m	12.9
	sq ft	139
Aspect Ratio		7.3
Wing Weight	kg	57.0
	pound	126
Wing (Packed) Length	m	5.3
	ft	17.4
Wing Length (Short Packed)	m	3.85
	ft	12.6
Control Frame Height From Keel	m	1.59
	ft	5.22
Nose Angle (With Sail Installed)	degrees	131
Inboard strut	degrees	8.0
Outboard strut	degrees	10.0

Table 7 Dimensions

9. GROUND HANDLING

9.00.00 General

The wing should only be moved in the packed up condition or if necessary when attaching to the base.

When moving the wing in the assembled position it is recommended that the wing be lifted with the shoulders whilst standing in the control frame. It is suggested that an assistant is used to support the weight on the rear of the keel tube.

If there is wind or gusts the wing can easily be caught by the wind without proper handling. If there is a significant amount of wind, it is advisable to have assistants to hold the struts. The wing should be moved with the nose facing into the wind.

CAUTION

ENSURE THAT WHEN MOVING THE WING IN WINDY CONDITIONS THAT THE NOSE IS KEPT LOW WHEN FACING INTO THE WING. THE WINDWARD TIP SHOULD ALSO BE KEPT LOWER TO AVOID THE WING RISING.

9.10.00 Ground Transportation

Avoid damage to your wing by using well padded racks. Careless transportation can cause considerable damage to your wing.
We recommend that you support the wing in at least 3 places to spread the load. The wing should be transported with the control frame down (U Bracket on top) to minimise the chance of damage to the cross tubes.
Flat straps should be used for tie downs to avoid damage to leading edge mylar.

Store the wing in a dry room off the ground. Air the wing out regularly to avoid mildew, and never store wet.

10. DERIGGING

10.00.00 General

For derigging and storage see Sections 4 of the Aircraft Operating Instructions or Pilots Operating Handbook as applicable.

11. REQUIRED PLACARDS

11.00.00 General

The placards that are present on this aircraft are a legal requirement showing safety information, emergency information and identification of the aircraft. The placards must be repaired or replaced if they become illegible or damaged in service. Replacement placards may be purchased from an Airborne dealer or direct.

11.10.00 Required Placards

The placards on the aircraft are designed to provide information regarding general aircraft limitations and other details for the safe operation of the aircraft.
The placards that are required for operation of this aircraft are available in Section 2, "Placards", of the Aircraft Operating Instructions or Pilots Operating Handbook as applicable.
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20. STANDARD PRACTICES - AIRFRAME

20.00.00 General

This chapter gives details for each of the bolts that are used on the wing. This is because there are few fittings which require standard torques.

20.10.00 Torquing Procedures

Correct torquing of fasteners is critical. If a bolt or fastener is too loose it may cause unnecessary movement resulting in wear or fatigue damage, while over tightening may cause tensile failure of the bolt, or crushing of components. Specific torques should be determined using an accurate torque wrench. The torque required after the nut is fully on the shaft, but not against the mating surface should be added to the final torque value.

WARNING

THE CORRECT TORQUING OF THE BOLTS FOR THE WING SECTION OF THE AIRFRAME IS ESPECIALLY IMPORTANT FOR THE SAFETY AND LONGEVITY OF THE WING. IN GENERAL STANDARD TORQUING VALUES WILL NOT BE APPLICABLE, BECAUSE OF THE NATURE OF THE THIN WALL ALUMINIUM TUBING THAT HAS BEEN USED TO CONSTRUCT THE MAJORITY OF THE WING STRUCTURE.

NEVER TIGHTEN NUTS SO THAT THE ALUMINIUM TUBING IS DEFORMED FROM ITS CIRCULAR CROSS SECTIONAL SHAPE.

ALWAYS HAVE AT LEAST ONE FULL THREAD SHOWING PAST ANY NYLOK NUT THAT IS USED.

NEVER REPLACE COMPONENTS WITH A SUB STANDARD PART. TO REITERATE, OTHER GRADES OF BOLTS – SUCH AS GRADE 8 DO NOT HAVE THE SAME STRENGTH / FATIGUE CHARACTERISTICS AS AN (AERONAUTICAL GRADE) BOLTS.

Special Torquing Procedures

Special Notes for each of the bolts on the wing are given in the table below.

Definition of "Just Not Loose"

A definition of torque has been made for the assembly of this wing which has been called "Just not loose", a setting which is used to achieve the best combination of strength characteristics of the tubing while not allowing any vibration or relative movement of the bolt in the axial direction. In practice this means that the nut shall be tightened adequately to ensure that each of the components that are held by it are in contact with each other, and then approximately ¼ turn more should be made. The resulting fit should not allow any axial movement of the bolt in its location, but will allow rotation (using fingers) of a held component to be achieved with approximately 20mm of lever arm; (eg. a wire tang).

No.	Area	Instructions
1.	Nose Assembly	Central bolts, "Just Not Loose" Outer bolts to leading edges may be slightly tighter, make sure that the sail tangs are in place with at least one thread showing. This area may be slightly tighter than "Just Not Loose" because there is a bush in the leading edge
2.	Nose Catch	"Just not loose"
3.	Keel Roller / U Bracket	The socket countersunk cap screws which locate in the "Neg Plate" (horizontal aluminium plate with serial number riveted to it) should be tightened to approximately 25 Nm. Red Loctite 262 must be used
4.	Down Tubes Top Assembly	The down tubes are also attached to the U-bracket. The down tubes need to move relative to the U Bracket, therefore it is important that they are able to move after tightening. This may be slightly tighter than "Just Not Loose" Ensure that there is no gap between the neg plate and the U-bracket, there should be approx 2-3 threads showing.
5.	Cross Bar Hinge	The central bolt should be tightened to "Just not loose", the black acetal cross bar protector should still be able to be rotated by hand.
6.	Down Tube Bottom Corners	The base bar fitting bolt, should be slightly tighter than "just not loose", but base bar knuckle should be able to be rotated by hand. Loctite is not required, as there is a locking bolt installed.
7.	Base Bar Bolts	"Just not loose".
8.	Cross Bar Leading Edge Junction	"Just not loose". **NOTE** The vertical bolt will have approximately four threads showing.
9.	Struts	Strut top swivel should be lubricated with a lanolin-based product to prevent corrosion. The bolts and nuts connecting the strut airfoil to the knuckle top and bottom must have Loctite 262 applied. The nut internal and bolts should have a marker line drawn across the end to help see if they become loose.
10.	Pull Back Wires	Tighten bolt till 1-2 threads are showing. **NOTE** The wires that locate on the bolt will float slightly from side to side, there will be two wires in the pull back shackle.
11.	Quick Clip Bolt	"Just not loose"
12.	Trimmer Attachment to Down Tube	Tighten nut until the faces of the saddle and trimmer spool come in contact.
13.	Trimmer Handle	Firm with Loctite 243.

Table 8 Torque settings for the wing

20-20-00 SAFETYING PROCEDURES

All bolts and nuts, except the self-locking type, should be safetied after installation. This prevents them from loosening in flight due to vibration.

Self-Locking Nuts

Self-locking nuts are used throughout the airframe. Self-locking nuts may be reused but not if they can be run on the thread by hand without using tools. After a self-locking nut has been tightened at least one full thread pitch of the male thread must protrude through the nut-locking feature.

Loctite

On any bolt that does not have a Nyloc type locking mechanism, Loctite 243 should be used to prevent premature loosening. On the U-bracket and Struts Loctite 262 (Red High Strength) needs to be used.

20-30-00 CONTROL CABLES AND TERMINALS

There is a single control cable on the wing, used for the trimmer. The trimmer wire is routed through the right hand down tube, through a pulley to halve the ratio, and on to the trimmer reel where the pilot actuates it. The trimmer should be checked regularly for excessive friction and wear. Wear is most likely to occur at the ends of the cables at the attachment points and the areas where the wire is bent.

27. FLIGHT CONTROLS

27.00.00 General

The XRS wings use weight shift control. This means that there is no need for most of the traditional flight control surfaces such as flaps and rudders. The pilot uses the control bar to shift weight relative to the attachment point of the base to the wing, which in turn causes a reaction in the wing and the control response of the aircraft.

27.60.00 Spoiler, Drag Devices and Variable Aerodynamic Fairings

The only flight control on the wing that is not automatic or weight shift controlled is the trim speed control. A pulley device on the right hand down tube gathers wire through a bungie system, and is linked to the keel. Turning the trim handle pulls the keel down at the rear, acting like a counterweight, which has the effect of reducing trim speed. There is a swage on the wire, which allows the pilot to see which position the trimmer is in. The wire for the trimmer assembly should be periodically inspected for wear, and the handle inspected for free operation.

27.70.00 Trimmer Knob Inspection

When inspecting the trimmer assembly, check that the pulley at the bottom of the base bar has not been worn by the position indicating swage on the wire. If the pulley has been worn it will need to be replaced.

57. WINGS

57.00.00 General

The main structure of the wing comprises of aluminium tubing and stainless steel wire. The lifting surface is constructed from Dacron and Mylar polyester fabric. The wing is subject to maintenance checks and preflight procedures that must be carried out prior to flying. Any dents crazing, bends (except for tube bending caused by normal flight and set up loads), corrosion or other distortion of the wing structure renders the wing unsafe to fly. Secondary structures of the aircraft are limited to:

- Keel extension structure
- The trimmer assembly
- The pull back assisting rope and pulley system

CAUTION

IT SHOULD BE NOTED THAT ALL OF THE TUBES THAT ARE USED ARE SPECIFIC GRADES OF ALUMINIUM DESIGNED FOR FLEX, STRENGTH AND FATIGUE CHARACTERISTICS. ALL OF THE TUBES ARE SLEEVED FOR STRENGTH AND WHERE STRESS CONCENTRATIONS EXIST. IF ANY TUBING IS TO BE REPLACED IT SHOULD BE REPLACED WITH AIRBORNE SPARE PARTS ONLY.

57.10.00 Main Frame Description

This section allows the user to understand the main function of each of the components of the wing, which should help the operator, or maintenance personnel to properly inspect the wing.

Keel

The keel of the wing is mainly constructed from 6061 T6 aluminium. Each of the major components of the wing are attached to the keel. Major components from the front to the rear of the keel:

Nose Plates

The nose plates are bolted to the keel and provide attachment points from the leading edges to the keel. They are attached to the keel with bolts. The nose plate bolts also attach the stainless U-channel where the front wires attach to the swan catch.

U Bracket

The U-bracket provides a mounting point for both the control frame and the trike mast, the main attachment point for the base to the wing. The U-bracket is allowed to rotate around the keel, and is held in position longitudinally with acetal bungs, which are bolted to the keel.

Quick Clip

The quick clip is bolted to the keel with the same bolt used to attach the rear wires.

Control Frame

The control frame is constructed mainly from 6061 T6 aluminium. The control frames down tubes work mainly in compression due to the positive loading of the wing, which is reacted through the struts and base bar sections. The base bar works mainly in tension through the strut loads from the crossbars and leading edges.

The control frame is bolted to the keel through the U-bracket. The fittings at the top of the control frame allow relative movement between the U-bracket and the control frame. This is necessary because of the movement between the base and the wing during the weight shift control actions.

Leading Edge

The leading edges are mainly constructed from 6061 T6 Aluminium. The leading edges are mainly loaded in bending and compression and share loading with the cross bars during positive and negative flight loads.

The leading edges are attached to the keel through the two nose plates at the front of the wing, and via a bolt assembly to the cross bars and the struts. The rear leading edges fit inside the leading edge tubes, which locate onto a horizontal bolt in the leading edge assembly. The rear leading edges are a part of the leading edge, but are made in order that they may be removed for ease of shipping.

Cross Bars

The cross bars are mainly constructed from 6061 T6 aluminium. The cross bars serve the purpose of holding the leading edges forwards and spread against the sail, they share the loading with the leading edges during positive and negative flight loads.

The cross bars are attached to each other at the keel using a ball joint that allows relative movement. They are also tethered to the keel via a webbing loop. The cross bars are attached to the leading edges outboard using a bolt assembly.

Battens

The battens are mainly constructed from 7075 T6 aluminium. The battens are located with batten pockets sewn into the sail. The batten fittings at the trailing edge secure the battens into their pockets.

The battens help to maintain the profile of the wing during flight, and are important to the correct and stable operation of the wing. For this reason there is a batten profile that is supplied with each wing for the battens to be checked against.

Battens should always be inserted into the same side of the wing, red is always inserted on the left hand side, green is always inserted on the right hand side. A useful mnemonic is “red is never right”.

WARNING

DO NOT FLY THE WING WITH ANY OTHER BATTEN PROFILE THAN THAT SUPPLIED BY AIRBORNE, AS VARIATION MAY HAVE SERIOUS EFFECTS ON THE FLIGHT PERFORMANCE STALL AND STABILITY CHARACTERISTICS OF THE WING.

BATTENS MUST ALWAYS BE CORRECTLY INSTALLED WITH RED BATTENS IN THE LEFT HAND SIDE AND GREEN IN THE RIGHT HAND SIDE OF THE WING. BATTENS MAY BE DELIBERATELY DIFFERENT FROM SIDE TO SIDE.

Batten end fittings

When inserting batten end fittings prior to closing, batten fittings should sit inserted in the trailing edge. The angle before loading is applied should not exceed 30°.

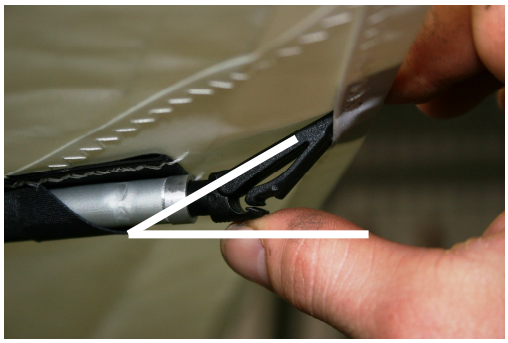


Figure 24 Inserted Batten End Unloaded Angle Check

Latch fittings should be sharp and not rounded. Rounded edges can occur from unloading without depressing the latch. Check the unloaded measurement of latch to body of the outer fitting is not less than 2mm to maintain loaded retaining force.

Figure 25 Batten End Fitting Dimension Check

Hinge Battens Fitting Security Service Bulletin SB-019 describes factors causing unloading and 100 hourly line maintenance. It can be downloaded from the Service Bulletin area of the Airborne Windsports website:
http://www.airborne.com.au/pages/directive.php

WARNING

ALWAYS ENSURE THE BATTEN END FITTINGS ARE CLOSED AND LOADED SECURELY BEFORE TAKE-OFF. BATTEN ENDS BECOMING UNLOADED DURING FLIGHT AT HIGHER AIRSPEEDS MAY HAVE SERIOUS EFFECTS ON THE FLIGHT PERFORMANCE AND STABILITY CHARACTERISTICS OF THE WING.

Struts

The control frame is constructed mainly from 6061 T6 aluminium and are attached to the cross bars and the control frame through fittings that allow them to rotate. The struts work mainly in tension through the loads from the crossbars and leading edges.

Front and Back Wires

The front and back wires are stainless steel braided wires that have swaged fitting at each end for attachment to the nose catch, control frame and keel.

Sprog / Washout Struts

The sprogs are mainly 6061 T6 aluminium tubes that do not operate in normal flight. They attach at the bottom of the leading edges and are connected by stainless steel wire to the top of the leading edges. Sprogs become active at low angles of attack, the rear of the sprog tubes act upwards on transverse battens that serve to keep the trailing edge of the sail raised, providing dive recovery function.

Checking the XRS Stability System

This method is used to check the sprog angle relative to the keel angle of the wing.

Angles may be measured using one of the following tools:

1. Protractor with built in spirit level (these are available from Airborne, part number 108624 PROTRACTOR SPIRIT LEVEL)
2. Digital level
3. Protractor with plumb bob

Inspection steps:

1. Fully assemble the wing ready for flight.
2. On a level piece of ground raise the rear keel to horizontal as 0° is a convenient reference point. Using a stand to support the keel extension.
3. Place the protractor/level on the underside of the keel between the cross bar straps as shown in the following photograph. Do not move the wing from this position.

Figure 26 Setting Reference Keel Angle

4. Check inner sprogs: With the access zips to the inner sprogs closed, place the protractor/level on the underside of the washout struts so that it sits with good contact (pressing through the sail) as shown in the following photograph. Avoid the zip and sew line which will interfere with a correct reading. Measure and record at both inner washout strut locations as described in the table below.

Figure 27 Measuring the inner Washout Strut Angle

5. Check outer sprogs: To check the outer sprogs the zips must be opened in order to be able to place the protractor against the sprog correctly.

Figure 28 Checking the Outer sprog angle

The table below indicates the minimum differential angle for each of the washout struts referenced to the keel at zero degrees. Compare the measurements taken to the certified angles in the applicable table. Make adjustments to raise or lower the struts as required.

As a guide for the magnitude of adjustment:

- the **inboard** struts change approximately **0.5° per revolution** of the threaded strut cone.
- the **outboard** struts change approximately **1° per revolution** of the threaded strut cone.

	Strut	
	Inboard	Outboard
XRS	8.0°	10.0°

Table 9 Washout Strut Angles

Making changes to the angle of a washout strut:

- Swing the strut out from the sail.
- Remove the split ring from the clevis pin.
- Remove the clevis pin.
- To raise the trailing edge, view the washout strut from the rear, rotate the threaded cone anticlockwise until the clevis pin hole reappears, this occurs in 1/2 turn increments.
- To lower the trailing edge, view the washout strut from the rear, rotate the threaded cone clockwise until the clevis pin hole reappears, this occurs in 1/2 turn increments.
- Replace the clevis pin and split pin.
- Replace the strut in the sail and capture it by doing the zipper up.
- Tap the sail from above to jiggle the strut into its flattest position. The strut angle is now ready to be sighted and re-measured.

WARNING

EXPERIENCED PERSONNEL SHOULD ONLY CARRY OUT ADJUSTMENTS TO THE WING STABILITY SYSTEMS. ANY ADJUSTMENTS SHOULD BE RECORDED IN THE MAINTENANCE LOG. CHANGES REQUIRED FOR TUNING ARE SMALL AND INCREMENTAL. MAJOR CHANGES WILL CAUSE THE WING TO PERFORM BADLY, AND MAY BE DANGEROUS.
WHEN MAKING STRUT ADJUSTMENTS, IT IS WISE TO VISUALLY SIGHT THE STRUTS TO CHECK FOR GROSS CHANGES BEFORE TEST FLYING. TO SIGHT THE STRUT SETTINGS, STAND IN FRONT OF THE GLIDER WITH THE KEEL HORIZONTAL & HOLDING THE NOSE WIRES. SLOWLY ROTATE THE NOSE FORWARD AND BACKWARD, NOTICE WHEN THE TRAILING EDGE OF EACH OF THE STRUT LOCATIONS COMES INTO AND OUT OF VIEW.

57.30.00 Sail

The sail comprises the lifting surface of the wing. It is mainly constructed of Dacron polyester fabric undersurface, with the top surface made from Mylar. The sail is constructed from many individual panels, which are sewn together using polyester thread to form the required shape. The sail has attachment points sewn into it to attach to the frame at various points and to hold the battens in place. The Sail also provides zips that facilitate easy preflight inspection of all the members inside the double surface wing.

The sail should be kept out of the sun as much as possible as sunlight will damage the sail, and in time will cause it to fail the required sail strength Bettsometer tests.

Inspection

- Check for tears in the sailcloth or any loose or unravelled seams.
- Check all webbing securing points are not damaged or worn.
- Check all inspection zippers to see if they function smoothly and close completely.

Protection

Ultraviolet radiation from strong sunlight ultimately reduces the strength of Dacron, but this may be reduced to an acceptable level by careful consideration of the wings use and exposure. In its bag the wing is fully protected. Sunlight will eventually cause it to fail the required Bettsometer tests.

KEEP THE SAIL COVERED WHEN NOT IN USE AS CONTINUED EXPOSURE TO ULTRAVIOLET RADIATION DRAMATICALLY REDUCES SAIL LIFE.

The Dacron sailcloth may be cleaned with warm soapy water. Strong detergents must not be used. Thoroughly rinse with plenty of clean water.

NEVER USE CHEMICAL SOLVENTS OR APPLY WATER REPELLENT COMPOUNDS.

57.30.10 Bettsometer Testing

Bettsometer testing is a method of determining the tensile strength of the sail fabric and stitching, which is known to degrade during the life of the sail.

Hour or Time Related Check Limits

Annual Bettsometer test with a 1.2mm diameter needle, with wing sails fitted and tensioned for flight is to be carried out to:
Upper & lower surface: 1360 grams.
Stitches: 1360 grams using a 1mm or 1.2mm diameter hook, pull upwards.

As well as the annual check there are several criteria for testing of sails, which are highly dependent on the conditions that the sail fabric is exposed to. The pilot/operator of the aircraft is responsible for determining the level of exposure that the sail experiences.
Generally the method used for fabric testing is a Bettsometer test (on an annual basis). Annual testing has been found to be adequate for recreational user where the operator takes care to avoid unnecessary exposure to UV.
More frequent testing (200 operating hours or 750 UV hours) is applied where operators exceed these hours prior to the annual test.

NOTE

- If a wing is stored under a roof, but the roof does not have doors on the front – i.e. an open hanger, the wing will still experience UV degradation.
- If a wing is flown, and or left in the open for a day, this will equate to 8-10 hours of UV exposure.

Where aircraft have been exposed to high levels of UV over an extended period (such as being left set-up in the open for 3 months or more - equivalent to 750 UV hours), then testing prior to return to service is recommended.

The instructions that are supplied with the Bettsometer should be followed to ensure proper testing.

NOTE
Some instructions that may be helpful,

- The instructions that come with the Bettsometer recommend that *"any flat section of the sail, clear of obstructions"* is suitable for fabric testing. Single layer sections of the sail would give a more relevant test result than patched or multi-layered sections and obviously those areas most exposed to UV damage (usually the top surface) would be the most useful to test.
- Likewise the stitching exposed on the top surface would show the most UV degradation and will give a better indication of the strength left in the thread than that on the under surface.
- Bettsometers are available from Airborne Windsports.

Figure 29 Bettsometer Instrument

57.30.20

Minor tears or rips in the sail

Minor sail repairs are a Line Maintenance task which Sport Pilots are suitable to perform unless local regulations prohibit owner maintenance for sails. A repair is classified as minor if tears are less than 30mm long, provided that no free edges (such as the wing trailing edge) are broken and that the tear is isolated and not within 50mm of an existing seam line or 100mm of the trailing edge. Also, abraded holes no more than 15mm in diameter. Such damage may be replaced with self adhesive patch material (Often called “sail tape” or “sticky back sail repair tape”) such as used for registration letters. If possible a patch should be applied to both sides of the fabric.
(Reference BMAA TIL No. 015 Issue 1.)
The tape is available from Airborne as a spare part.
Any other significant damage should be discussed with Airborne or a dealer for an assessment of the best repair option.

57.40.00 Tuning

Roll Tuning

Your aircraft was test flown and delivered to you in good flying order.

WARNING

EXPERIENCED PERSONNEL SHOULD ONLY CARRY OUT ADJUSTMENTS TO THE WING, IDENTIFICATION OF A TURN SHOULD ALSO BE CARRIED OUT BY AN EXPERIENCED PERSON. ANY ADJUSTMENTS SHOULD BE RECORDED IN THE MAINTENANCE LOG. CHANGES REQUIRED FOR TUNING ARE SMALL AND INCREMENTAL. MAJOR CHANGES WILL CAUSE THE WING TO PERFORM BADLY, AND MAY BE DANGEROUS.

If you feel that the wing requires adjustment to trim in the roll or the pitch axis you should check that the problem is not caused by something asymmetrical in the frame or the battens. In order of priority check the following:

- Check the battens against the template
- Check that the sail webbing is correctly mounted on the leading edges and tensioned to the correct mark
- Check the keel is straight
- Check that the leading edges are straight and that the rear leading edges are located correctly
- Check front and rear wires are routed correctly

To check your battens use the following procedure:

- Remove the battens from the wing after the wing is de-tensioned as required during the pack up phase. See Aircraft Operating Instructions for pack up procedures
- Lay the template out on a flat surface.
- Note whether the battens have been reflexed. Do not change the reflex initially. The battens may have already been reflexed to correct a turn.
- Start with the keel batten lining the nose of the batten up with the start of the line. The line should be above the batten.
- If the batten does not line up, gently apply pressure using your hand or knee to get a smooth curve.

After checking as noted above a turn can be remedied by adjustments as outlined in the following table.

Roll Tuning Matrix

The following table outlines procedures for tuning a wing to correct a turn.

	Adjustment Method	Remedy Left Turn	Remedy Right turn
VERY MILD TURN	**Batten Tip Ends** Undo batten ends. Rotate batten ends clockwise to reduce tension or rotate batten ends anti-clockwise to increase tension. Note: Tip batten tuning has more effect on turn tuning than the root battens.	The main sail batten tip end tension can be increased 2-3 turns on the left wing. The tension on the right can be decreased the same amount if required.	The main sail batten tip end tension can be increased 2-3 turns on the right wing. The tension on the left can be decreased the same amount if required.
MILD TURN	**Carbon Tip Struts** The carbon tip strut is anchored to the leading edge. An increase in tension will force more washout in to the tip causing the wing to turn to the side with greater tension.	Increase the tension of the right strut by 1-3 turns. The tension on the left strut can be reduced by 1-2 turns.	Increase the tension of the left strut by 1-3 turns. The tension on the right strut can be reduced by 1-2 turns.
MODERATE TURN	**Tip Angle Adjustment** The angle of the tip can be adjusted by rotating the angle of the tip. Adjustment requires removal of the stainless screw, which secures the tip webbing bung. The tip bung is rotated and the screw is re installed in the appropriate hole. Reduction in leading edge tension will simplify procedure. Ensure correct tension is applied after adjustment. See Section 0 Assembly After Shipping for tip adjustment details	Rotate the left tip down (clockwise) 1 hole and re install screw. If more adjustment is required rotate the right tip up (clockwise) 1 hole and re install screw.	Rotate the right tip down (anti clockwise) 1 hole and re install screw. If more adjustment is required rotate the left tip up (anticlockwise) 1 hole and re install screw.
MODERATE TURN	**Undersurface velcro Tab Adjustment (XR series only)** The centre velcro tabs can be shortened up to 20mm which causes reflex in the section. The additional reflex causes increase in lift on that side. Note: *A symmetrical shortening of the velcro tabs will see a reduction in trim speed and a slight increase in pitch pressure.*	On the left side undo chord-wise zip behind the cross bar leading edge junction zip. Adjust position of velcro to shorten standard length by 20 – 30mm.	On the right side undo chord-wise zip behind the cross bar leading edge junction zip. Adjust position of velcro to shorten standard length by 20 – 30mm .

Table 10 Tuning procedure

If after tuning the turn persists consult your authorised dealer or the factory.

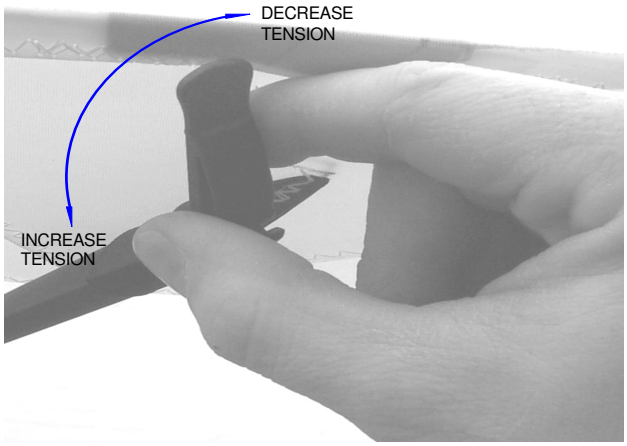
BATTEN TENSION ADJUSTMENT

Over tensioning of battens will cause degradation of handling. A mylar sail tends to shrink as it ages so checking of the batten tension periodically is required.

Fine tuning of battens requires all battens to be loaded. Unload one batten at a time adjust as required and reload prior to next adjustment.

To decrease tension the fitting is rotated clockwise. To increase tension the fitting is rotated anticlockwise. The following tensions relate to standard tensions. Variations of this will allow tuning for very mild turns. See tuning matrix on previous page.

Batten Adjustment



To decrease tension the fitting is rotated clockwise. To increase tension the fitting is rotated anticlockwise

Figure 30 Adjusting Batten Tension

Hinge Battens

The correct tension is applied to the batten when loading with minimal pressure applied an angle of 30º is achieved (see diagram).

Hinge Battens Fitting Security Service Bulletin SB-019 describes factors causing unloading and 100 hourly line maintenance. It can be downloaded from the Service Bulletin area of the Airborne Windsports website:
http://www.airborne.com.au/pages/directive.php

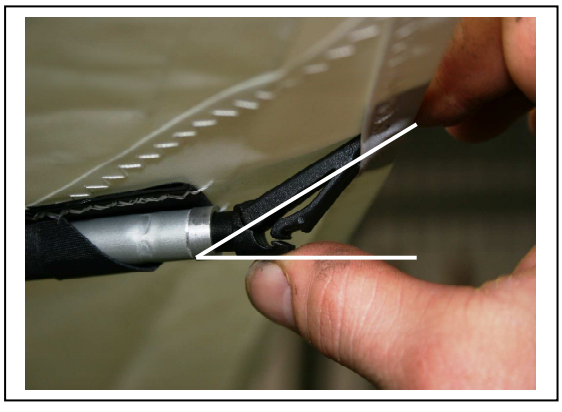
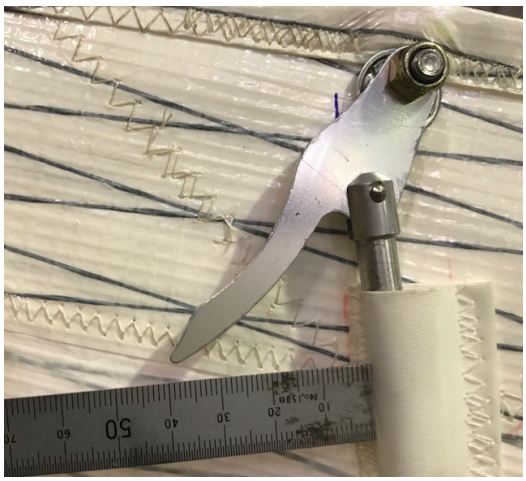


Figure 31 Standard Batten Tension

Lever Battens



Adjust tension so that the lever end is approximately 40mm from the side of the batten tube.

NOTE
Ensure all mainsail batten fittings are loaded before fine adjustment.

Figure 32 Lever Batten Tension

Adjust Carbon Struts

Adjust tension so that the lever end is approximately 45mm from the side of the batten tube.

The carbon tip strut is anchored to the leading edge. An increase in tension will force more washout in to the tip causing the wing to turn to the side with greater tension.

Note 1:
It is important to note that an increase in tension of the tip strut has an opposite effect to tuning than an increase in tension on the main sail battens. Ensure adjustments are made as outlined in the tuning matrix.

Note 2:
Ensure sprogs are loaded before fine adjustment

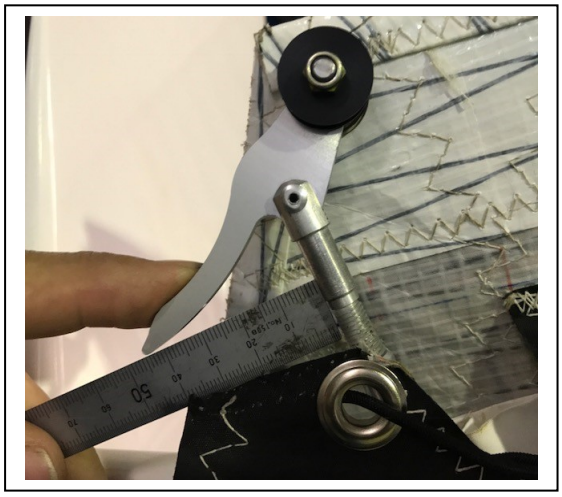
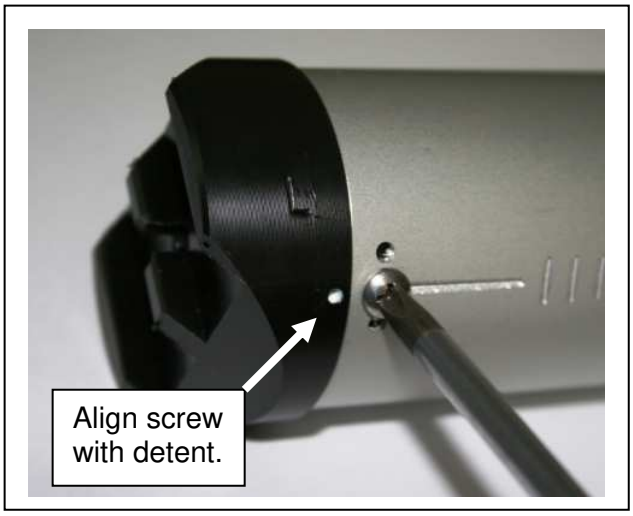


Figure 33 Adjusting Tip Angle (Sail not fitted)

Adjust Tip Angle



The wing can be tuned by rotating the nylon bung up or down.

When the screw is removed the sail tension pulls the bung downward. Have someone hold the sail in position whilst removing the screw. Adjust as required and insert screw.

Figure 34 Adjusting Tip Angle (Sail not fitted)

Symmetry Check - Front

A visual check from the nose of the wing is useful to check the overall symmetry of the wing.

Ensure the U-Bracket is straight, adjust pitch angle so the trailing edge can be seen at the tips.

The view point must be aligned directly along the keel.

Figure 35 Visual Symmetry Check – Front View

If there is a notable difference from side to side either sprogs and/or carbon tip struts are incorrectly adjusted. See the relevant section for adjustment details

The view point must be aligned directly along the keel.

Symmetry Check – Rear

Checking from the rear the undersurface comes into view at the tips. Once again ensure the view is directly along the keel whilst walking back until the undersurface is visible only at the tip. (note XRK shown in photo)

Figure 36 Visual Symmetry Check – Rear View

Pitch Tuning
Trim speed at MTOW and the trimmer in the off position is:

XRS wing **60-65 KIAS,** standard hole position, trimmer off

If the wing is trimming outside the specified trim range a forward or aft movement of the keel roller on the keel tube can be used to trim the wing.
A one-hole adjustment will see a typical change in trim of 5 knots. Moving the roller to the forward position will increase the trim speed whilst moving the roller rearward will decrease the trim speed.

NOTE

- If the suspension point is moved forward the trimmer mast clamp will need to be moved up the mast the same amount. If the suspension point is moved rearward, the trimmer clamp will need to be moved down. That is a single hole adjustment of the keel roller will require a 20mm trimmer mast clamp adjustment.

57.50.00 Attach Fittings

U-bracket
The U-bracket is the main attachment point of the wing to the base structure, as well as to the keel of the wing. It is the major junction for the three main components of the aircraft, the wing (keel attachment), base (mast attachment) and control frame (top knuckle attachment). The U-bracket has two components, a ∩ shaped channel, and a negative block that is attached below the keel to preclude the keel from moving out the bottom of the bracket.

The U-bracket should be checked thoroughly after any unusual loads.

57.60.00 Flight Surfaces
There is a trim speed control device on the wing. The trim control is achieved by a pulley system, which gathers rope through a bungie system, and is linked to the keel. Turning the trim handle pulls the keel down, acting like a counterweight, which has the effect of reducing trim speed.

95. SPECIAL PURPOSE EQUIPMENT

95.10.00 Training Bars
The training bars will be supplied as an option for use by qualified instructors in order to teach people to fly the aircraft, they allow more experienced students to fly the aircraft from the rear if necessary.

The training bars attach to the wings base bar and down tubes, and provide control extensions toward the back of the aircraft for rear occupant usage.

Instructions for fitting and maintenance are included as part of the training bar kit.

APPENDIX A – Condition Inspection Checklist

Wing Maintenance Log. S/N: _____

Date	Hours	Maintenance Section or Service Bulletin	Work Performed	Maintained by

APPENDIX B – Feedback Form

***Operation and Maintenance* Feedback Form**	
AirBorne AUSTRALIA	Please use a copy of this form to provide notification to the manufacturer about issues or anomalies identified during the operation or maintenance of the aircraft or in the content of the manual.
Return to AirBorne WindSports Pty Ltd PO Box 7042 Redhead New South Wales 2290 Australia Fax +61 2 4944 9199 Email trikesupport@airborne.com.au	Please provide your own contact details below
Issue Description	
If you have a proposal to remedy the issue please provide it here: Number of pages submitted including this cover page_____	

End XRS Maintenance Manual