

Sling 4

DC-KAI-001-X-C-4

SERIAL NO : _____



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KIT ASSEMBLY INSTRUCTION



The Airplane Factory (Pty) Ltd
Kit Assembly Instructions – Sling 4
Introduction

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1 INTRODUCTION

Welcome to the world of the Sling. The Sling 4 is an easy to fly, safe, high quality, well designed aircraft that can be used comfortably and economically for training, around-the-patch flying and long distance commuter type missions.

The Sling 4 was designed right from the start to have outstanding features and characteristics:

- Exceptional, responsive handling, light controls, stable, docile stall, and good lifting ability.
- A large speed range with a fast cruise speed and a really good range.
- A really strong and safe aircraft that requires little maintenance and will last for many thousands of hours – all components used in the Sling 4 are of the highest quality available and wherever possible aviation components are used.
- Complete dual controls for ease of training and dual piloting.
- Large cabin, good visibility, with excellent ergonomics and a large luggage area.
- Fully adjustable front seats and pedals to accommodate all sizes with 3 point harnesses.
- A full selection of analogue and digital instruments available for the owner's personal selection.
- Robust sprung landing gear with powerful hydraulic brakes and direct steering on the front wheel.
- Designed to accommodate a ballistic parachute with strong attachment / balance connection points.
- A well designed engine compartment allowing for good engine performance and space to work.
- All aluminium structure – easy to work with, easy to repair, preferred material for kit builders.
- Apart from the main spars all rivets used are high grade pull rivets for quick, easy construction.

The other thing about the Sling 4 – it's strong. At The Airplane Factory we have a philosophy of making certain our designs are really well thought out with good fatigue and strength safety margins. The parts and assemblies are manufactured to extremely high standards and then properly tested to aircraft standards such as 14 CFR Part 23 (commonly known as FAR23) – depending on the requirements of a particular country's civil aviation authority.

The Sling 4 kit has been designed for ease of construction with all aluminium components perfectly cut and formed and all holes matched exactly, requiring little or no deburring or alignment drilling. The high quality composite components require very little preparation prior to fitting and painting. The empennage and wings are bolted to the fuselage which allows them to be removed for inspection and maintenance work.

The construction manual will always be a work in progress as we find new and quicker ways to assemble the aircraft. We would greatly appreciate builders helping us with detailed advice on improvements and enhancements that we can include in the manual. Should there be a section in the manual that is unclear, we will gladly assist the builder by telephone, e-mail or fax.

Kit builder training courses are offered to potential and new kit builders – keep an eye on our website for dates and locations.

Suggested reading material

There are many books on various aircraft building subjects like sheet metal work, aircraft painting, aircraft instrumentation and wiring. Write to the factory for advice.

Contact us if you have any queries regarding the aircraft, the manual, or the construction of your Sling 4 please don't hesitate to contact us using the details below:

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General enquiries	TEL: +27 (0) 11 948 9898 FAX: +27 (0) 86 632 4493
Sales support	sales@airplanefactory.co.za
Technical Support	technical@airplanefactory.co.za
Kit Packing Support	kits@airplanefactory.co.za

The KAI Feedback Form provides the kit builder with the opportunity to report errors, abnormalities, suggestions, and queries. This form can be found in Appendix A on page 16 of this document.

2 REVISIONS

Record of revisions for this document is shown in the table below:

Revision Number	Date	Purpose	Applicable KAI Section
1.0	30 October 2013	-	-
1.1	27 January 2015	n/a	n/a
2	11 November 2016	Upgrade to better conform with ASTM F2563-10 - Kit assembly instructions for home build aircraft	All
3	10 January 2017	- Add product identification. - Update manuals revisions.	- 4.2 Chemicals - B. Index of kit assembly pages.
4	16 August 2017	Addition of pages applicable to Quick Builders	16 Quick Build

Each section of the construction manual (e.g. Empennage Kit Manual) has an Index and a Record of Revisions table. For a full list of pages that comprise the entire construction manual, refer to the Index of Kit Assembly Pages (Appendix B of this document). This index also contains latest revision for each page. Lastly, for an explanation of document and/or part numbers, and how these reflect the revision, refer to Section 10 of this document.

Release of New Revisions

Along with the hardcopy manual The Airplane Factory makes use of Dropbox to ensure that every kit builder has access to the latest manual at all times, as we continuously upgrade and update the manuals to make it as accurate and user-friendly as possible.

Dropbox is an online storage facility for commercial or personal applications. This means that documents, files, pictures, videos, etc. can be stored online and retrieved by anyone anywhere in the world. It's as easy as uploading and downloading the file/s to and from www.dropbox.com. Emailing attachments are limited to a certain size so uploading the file to Dropbox is an effective way to share files.

Dropbox also offers a program, which if installed on your computer, will check for changes in your online files and automatically sync these with your files on your computer – so you always have the most up to date data.

The Airplane Factory has its own Dropbox account under sales@airplanefactory.co.za. Dropbox will send you an email on behalf of The Airplane Factory notifying you of the shared folder and files. The email will contain a link for you to conveniently click on to open Dropbox and your shared folder. You will be required to login to your own Dropbox account to view the files though.

If you have a Dropbox account, simply sign in with your email address and Dropbox password.

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If you are new to Dropbox, locate the “Sign up” button and click on it. Dropbox is free for private use but Dropbox does require some of your personal info to create an account. Once created, you will log in with your email address and password.

From www.dropbox.com there is a link to download the Dropbox program. Download it, install it, and log in using your email address and password.

The program will automatically and continuously sync your online folders with your local Dropbox folder:

1. Downloading files and folders shared by others
2. Delete files and folders on your local PC if they have been deleted online
3. Uploading files that you place in your local Dropbox folder.

3 INSTRUCTIONS FOR USING THE KAI

It is imperative that the kit builder read this KAI before attempting any work. Each kit is further accompanied with its own KAI with any specific information relevant to that kit. The kit builder must follow the steps set out in the KAI for the best results.

4 SAFETY SUMMARY

This section serves to emphasise the importance of correct safety practises and to list possible hazards.

4.1 Safety Equipment

It is in your best interest to use your own discretion as to when safety equipment should be used so as to minimise risk. Below are a few general points to consider.

- Protective eye wear must be worn at all times when drilling, sanding, painting etc.
- Gloves are to be used when cutting materials, painting, handling of chemicals etc.
- We advise you to make use of overalls and/or Aprons at all times especially when painting or handling various bonding agents to ensure no harm comes to you or your clothing.

4.2 Chemicals

Most of the chemicals used in the assembly of the kit are listed below. Although listed below, care must be taken regarding latest specification of the chemical from the suppliers and Chemicals Data Sheets for any safety and hazard conditions.

Product Name	Product Identification	Applicable Kit Section
Fuel tank Sealant	BLK-C2 3204 B-2	Wings
Sika Cleaner	205	Canopy
Sika Primer	206 GP	Canopy
Sika Primer	209 N	Canopy
Sika Flex	295 UV	Canopy
Sika Tack Go	-	Canopy
Contact adhesive	Super 65	Upholstery
Copperslip grease	-	Engine
Anti-Freeze	Castrol FS	Engine
Engine oil	Grade 10W-40	Engine

5 APPLICABLE STANDARDS AND SPECIFICATIONS

All parts and processes used in the manufacture and assembly of the Sling 4 meet the specific standards required. Kit builders must not deviate from the build standard set forth in the KAI.

14 CFR Part 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

6 TERMINOLOGY

6.1 Definitions:

There are no definitions required as yet

6.2 Acronyms:

CAA – Civil Aviation Authority

KAI – Kit Assembly Instructions

7 REQUIRED KIT BUILDER ABILITIES AND RESPONSIBILITIES

7.1 Skills and Training

The Airplane Factory offers Kit Builder Training Courses to potential and new kit builders – keep an eye on our web site for dates and locations.

7.2 Responsibilities

There are a series of legal requirements associated with the private construction of an aircraft in South Africa. The construction, registration and, ultimately, flying of a Sling is governed chiefly by Part 24 the Civil Aviation Regulations of South Africa (“CARs”) (“Airworthiness Standards: Non-type Certificated Aircraft”), and the Technical Standards (“CATS”) associated with them. As the Sling 4 is a “type-approved” non-type certificated aircraft, the obligations upon the builder, however, are substantially less than is often the case. While the legal requirements are often poorly drafted and difficult to understand, The Airplane Factory has a good understanding of how the requirements are currently applied and has a strong relationship with the CAA (Civil Aviation Authority) and will assist builders wherever necessary.

In summarized form, the most important documentary and procedural requirements with which you will have to comply if you intend to place the aircraft on the South African aircraft register are as follows –

1. You will be required to make application for a build number prior to the start of building (CARs 24.01.2(4)). This application is made on a standard form and must be accompanied by the aircraft “Design Criteria”. The document is essentially a standard form document of which The Airplane Factory will provide a copy if you wish.
2. During the build process you are required, in theory, to maintain “... full recorded details of the process, the materials used, and the dimensions of the parts and components. This is called the build standard of the aircraft.” (CATS 24.01.2.A.3 (4)). Your manual, however, comprises a record of the details, process, materials and dimensions. We accordingly suggest that you maintain a build log, either on computer or by way of written notes, recording on which days, at what times, you perform what work.
3. Unless you are conversant with the technical requirements concerning the construction of the aircraft, you are required to have your aircraft inspected at “... various stages ...” by an approved person (“AP”) (CATS 24.01.2.A.4 (1)). We suggest that you have the aircraft so inspected prior to closing the skin on any major component. (see the next point below)
4. An AP is required to inspect each major component before the skin is closed, so that the underlying structure can be seen (CATS 24.01.2.A.4 (2)). Major components would include the rear fuselage, wings, vertical and horizontal stabilizers, rudder and elevator. These inspections must be recorded in the aircraft airframe logbook. The Airplane Factory will provide an AP if you are in the vicinity of its premises, alternatively, will

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assist you to source one. An airframe logbook should be obtained at commencement of building and each AP inspection and any other relevant material should be recorded in the logbook.

5. Prior to completion of the construction process application for the registration of the aircraft should be made. This is a straightforward process requiring the completion of a standard form.
6. When the aircraft is completely assembled and appropriately placarded, an empty weight and balance test should be implemented to determine the aircraft centre of gravity, according to the provisions of the maintenance manual, and the engine should be test run as provided for elsewhere in this manual. When the aircraft is ready to fly a final inspection by an AP is required (CATS 24.01.2.A.4 (3)). This inspection should also be recorded in the airframe logbook. In addition, CAA (Civil Aviation Authority) requires a second inspection of the control mechanisms by another AP. This should also be recorded in the aircraft logbook. Both AP's should also complete the Part 24 annual inspection checklist.
7. Application should then be made for a "Proving Flight Authority" on the standard form. In order to make application for the Proving Flight Authority application will also have had to have been made for a radio license.
8. Once a Proving Flight Authority has been obtained, proving flights will have to be conducted. It is still necessary to determine the number of hours which CAA (Civil Aviation Authority) will require, but it will certainly not exceed 40 hours. The first proving flight must be conducted by a class 2 test pilot. The Airplane Factory is able to provide such a pilot or will assist you to find one near you.
9. Following completion of the proving flights, application can be made for an Authority to Fly, the document in terms of which the aircraft will be flown thereafter.

8 REQUIRED EQUIPMENT AND ENVIRONMENTAL CONDITIONS

Below is a comprehensive list of tools that you may need. You will probably find that you are able to build the Sling 4 with the bare minimum so only purchase the tools as you need them.

Machinery:

- A compressor – recommended minimum size is a 50 litre tank, 1.8 KW motor and 8 bar pressure.
- A bench grinder – one side used with a smooth grinding wheel to sharpen drill bits etc. and on the other side fit a 3M Scotch Bright light deburring wheel.
- A small drill-press with a small, flat vice for drilling the control rods and other components.
- A small belt sander.

Tools:

Hand tools.

- | | |
|---|------------------------------------|
| • Safety wire twister pliers | • Utility knife |
| • Long nose pliers | • Countersink bit (100 degrees) |
| • Vice grips | • Telescopic magnetic pick-up tool |
| • Side cutters | • Files |
| • Wire strippers | • Hand rivet puller |
| • Aviation snips | • Inspection mirror |
| • Hammer/Mallet (Ball peen, rubber mallet, rawhide) | • Inspection flashlight |
| • Screwdriver set | • Metric Vernier |
| • Wrench/Spanner set (imperial and metric) | • Calculator |
| • Socket set (3/8" drive) | • Magnifying glass |
| • Torque wrench | • Ruler and Tape measure |

Hand tools (continued)

- | | |
|--|---|
| • Hand held drill – preferably a good battery operated drill | • Spray gun and respirator if you intend painting |
| | • Open / ring spanner set - metric |

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- Pneumatic riveter (best is to buy one which automatically extracts the rivet mandrels after pulling)
- Hand operated rivet puller (Stanley 69-799)
- Rivnut puller for M3 to M6 rivnuts and spare M3 mandrel
- Drill bit set with extra bits (sizes are mm dia.): 2.4, 3.1, 3.3, 4.1, 4.9, 6.4, 8.0 and 9.4
- Deburring tools – hand swivelling type and V shaped edge deburring tool
- Hand seamer for bending flanges
- Fluting pliers
- A highly accurate bubble level. Length 1.2m
- Imperial open/ ring spanners – 2 of each: 1/4", 3/8", 7/16", 1/2", 9/16"
- Metric Allen key set
- Electrical connector crimping tool
- Soldering iron – get an adjustable temperature controllable unit with a fine end
- 100 x 3/32" silver coloured Clecos
- 300 x 1/8" Copper coloured Clecos
- 150 x 5/32" Black coloured Clecos
- 20 x 3/16" Copper coloured Clecos
- Cleco pliers – 2 pairs.

Power tools

- Electric Hand Drill Small Electric Grinder
- Electric screw driver*
- Dremel with various grinders and cutters*
- Bench Disk Sander*
- Soldering Iron
- Heat Gun*
- Right Angle Drill and Bits 1/16" - 3/16"
- 12" or 16" drill bits 3/32", 1/8", 3/16"
- Pneumatic pop rivet puller
- Scotch-Brite disk for grinder
- Air compressor
- Shop vac or small vacuum*

Lubricants, adhesives and tapes

- Small Can Lithium Grease
- Clear Silicone
- Contact Cement
- LPS lubricant
- Super Glue
- Lubricating oil
- Drill Lubricant
- Glue Stick
- Masking tape 1/2"
- Double Stick Tape 3M™ Brand #471 Vinyl Tape
- Acetone

Fasteners and clamps

- 25 3/32" cleco fastener (cadmium / silver)
- 200 1/8" cleco fastener (copper)
- 20 5/32" cleco fastener (black)
- 20 3/16" cleco fastener (brass/gold)
- Long-reach wingnut 3/16"
- Several small clamps (G clamps / spring clamps)

Other

- Safety wire
- 4 Assembly tables 2' x 8' x 30" high
- Various sizes wood blocks

9 PREPARING FOR THE BUILD

The workshop space needed to construct a Sling 4 should be not less than a double garage. As the various large components like the wings and empennage are completed, they will need to be carefully moved out of the way and stored, ready for painting and final assembly. Some builders hang these components from the roof to free up more working space. Plan this from the start.

For builders who decide to prime components prior to assembly a well ventilated spray area needs to be set up and cordoned off (plastic sheet will do), as the overspray tends to coat everything in the workshop and more importantly many primers are extremely toxic.

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Good lighting is a vital aspect in ensuring that your workshop is as comfortable, convenient and serves your needs. Make the effort to ensure that your workshop as clean, warm and comfortable as possible – it will greatly enhance your kit building enjoyment.

A workbench of at least 0.7 m x 2 m is needed for the assembly of the empennage, flaps, ailerons, fuel tanks and many of the sub-assemblies. When working with the skins of the various assemblies the top of the workbench needs to be covered with a soft material such as a towel to prevent scratching and denting. In the Airplane Factory the workbenches are covered with a thick smooth vinyl (allows for easy cleaning) under which is a sheet of 10 mm foam.

A second workbench with a smooth jaw vice is necessary.

A toolbox on casters and that can be moved is a useful addition.

Additional tables to set out parts and tools will come in handy.

To construct the wings two tables (or workbenches) of equal height are required.

10 PARTS LIST

Airplane Factory part numbers comprise 11 digits. The 1st to 5th, 9th and 10th digits are alphabet letters. The 6th to 8th and 11th digits are numeric. Hyphens may be used to separate logically distinct fields.

Example: WG - RIB - 001 - R - C - 0

- The 1st and 2nd digit represent the Sub-assembly within the aircraft (here “WG” is for “wing”).
- The 3rd to 5th digits represent the component within the aircraft section in which the part is found (here "RIB" is for "rib").
- The 6th to 8th digits represent the part number within the designated component (here "001" is "part 1", for the inside wing rib).
- The 9th digit represents right ("R"), left ("L"), not applicable ("X") or other relevant consideration (here "R" is for "right").
- The 10th digit represents the aircraft in question (here "C" is for the SLING 4)
- The 11th digit represents the revision in question (here "0" is for revision 0).

Hierarchy

1. Aircraft
2. Assemblies - This is typically what we deliver as a kit component (e.g. Wing, Rudder, Vertical stabiliser, Undercarriage) and is named as ASS-.
3. Sub-assemblies - "Assemblies within an assembly" i.e. an assembly of parts that fall within a larger assembly and is named as WG, RD, RF etc. (e.g. WG-RIB-S01-X-X-0 where the S01 denotes that it is the Rib 1 sub-assembly containing parts, one of which is WG-RIB-001-R-C-0).
4. Parts - As described above.

Each kit will be supplied with a parts list which is also used as a checklist of parts delivered, out of stock at time of delivery, etc.

11 PRE-ASSEMBLY OPERATIONS

11.1 Inspecting Parts Prior To Construction

The aluminium used in the Sling 4 is 6061 T6. One of the advantages of using this aluminium is that it has excellent corrosion resistance properties. That said, if the aircraft is to be used in a particularly corrosive environment then the builder should consider priming each part before assembly. There are various aluminium primers that may be used – the most common being Zinc Chromate.

The first thing to do when opening a kit is a stock check to ensure that there are no parts missing. During the stock checking process the builder must carefully inspect every part for damage. A fully automated CNC punching process is used to cut all the aluminium parts and in the process it is rare but possible that some small marking or denting may occur. Before the parts are packed at the factory each part undergoes a quality control check and small marks and nicks are allowed on most parts. Where little imperfections are visible they can easily be repaired during the painting process. Where absolutely no imperfections are allowed is on the various wing and empennage spars, the fuselage centre carry-through spars, on all structural components and connecting points.

11.2 Parts Preparation and Construction Techniques

To prepare all aluminium parts for construction they must first be deburred and cleaned. The deburring process is simple but does require care and a good eye. The use of a magnifying glass can be a help.

Edge preparation – It is vitally important that the edges of all parts are deburred. In the cutting process a burr is always created on one edge and that must be removed and then both edges must be smoothly rounded off. During the deburring process the builder has to ensure that no nicks are created that could give rise to a stress point. Particular care must be taken on all corners and this is the most likely area for stress cracks to appear. Run a finger over the edges after deburring to ensure the work is properly done.

Hole preparation – The holes have the same burr but the process to deburr them is different. An easy way to deburr and hole is to use a sharp oversize drill bit and turn it between two fingers. Swivel deburring tools also work very well. The thinner the material the more care is needed in the deburring process. With holes all that is needed is to remove the burr and not to make the edges round. The edges on the inside of the hole must retain material so that the bolt or rivet that fits in the hole has the maximum bearing surface.

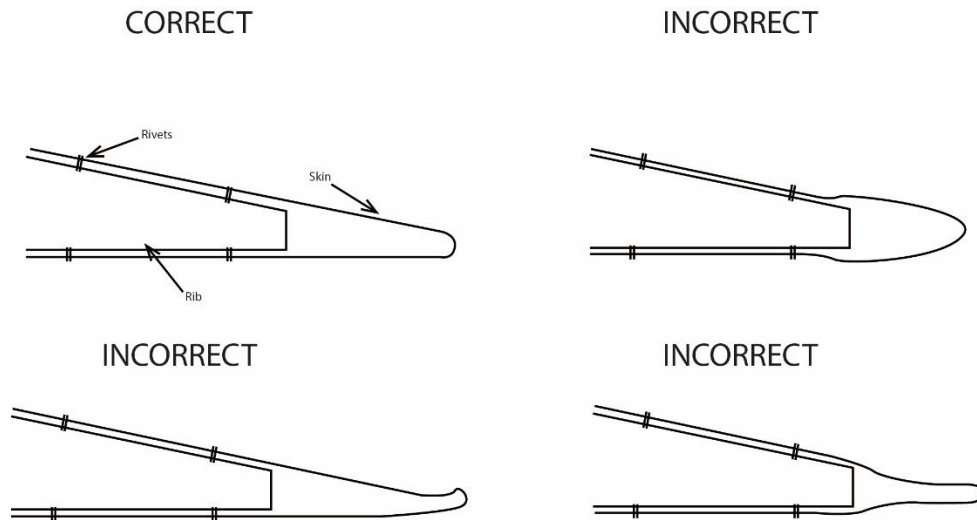
The plastic coating may be removed at any stage but it is there to protect the part from being scratched while being handled and test fitted – therefore it is best to remove the plastic at the last moment just before riveting. To remove the plastic always make sure that there is a pulling motion so that effectively the aluminium is stretched. If the plastic is pulled off whereby the aluminium is effectively being compressed in the process then it is possible to deform or kink the aluminium. The thin skins are particularly susceptible to this kind of deforming while removing the plastic incorrectly.

Marking of parts must only be done with a fine point soft tip permanent marker. Do not scribe or scratch parts.

Aligning ribs and skins: Generally the ribs are of slightly thicker material than the skins. If the flanges of the ribs are not set exactly correctly so that they lie absolutely flat against the skin prior to riveting then what will happen is the skin will be pulled in and pushed out to line up with the slightly off-line rib flanges. Once the frame is riveted together (empennage, fuselage, wing etc.) take a straight edge and lie it on the flanges of the ribs and looking along it bend the flanges of the ribs until they are perfectly aligned. Make sure the ribs are properly in place before doing the alignment as aligning rib flanges of ribs that are not themselves properly lined up could worsen the situation. This rib flange alignment job is time consuming but pays dividends when the skins are riveted in place and remain beautifully flat.

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Finishing tight bend trailing edges: The trailing edges of the rudder, elevator, elevator trim tab, ailerons and flaps have tight bends in the aluminium skins. It is important to ensure that the trailing edges are properly aligned and do not bulge towards the top or bottom. Since the upper and lower skins on each side of the bends are riveted near to the bends to the upper and lower flanges of the ribs in each case, very small changes in the distance from the bend to the first rivet may have a reasonably substantial influence on how straight the skins run off the trailing edge of the rib to the bend. See the diagram below for an illustration of the correct and incorrect form the trailing edge should take.



In order to avoid the incorrect bend it is important to cleco the full length of the upper and lower skins close the trailing edge while the bend is held in a straight position. If the bend is curved and incorrect, release the clecos and straighten the skin into the correct position before inserting any rivets. If necessary, run a drill through the holes to achieve the straight trailing edge required.

Fluting is the process whereby the flange of a rib is dented between the holes so as to straighten the rib to ensure proper fitment. Most ribs requiring fluting will already be fluted at the factory but on occasion additional fluting may be required.

Skin fitment: The skins must always be properly Clecoed in place before any riveting commences. On the Rudder, Elevators, Flaps and Ailerons make sure that the skin trailing edge angle matches the angle of the rear of the ribs – this is when the skin is in a relaxed condition. To achieve this lie the skin on the workbench on the trailing edge with the open end facing upwards – the skin will automatically open up slightly. Place the ribs into the skin and note if the skin has to be pulled open or pushed closed to lie flat against the ribs. To close the angle on the trailing edge of the skin place the skin between 2 planks the length of the skin and gently press until the correct angle is achieved. Do not overdo it. Do not press the skin using your hands, do not do a short length at a time – do the whole length at the same time. The skin is very thin and soft and can dent and deform easily.

Filling and smoothing of rivet heads: Using a scrap piece of aluminium or similar, cut the piece to approximately 90mm long by 25mm wide. Drill a hole of 4.9mm in diameter into the strip as shown below. This will be used as the applicator for body filler. Source another, smaller scrap piece of material as a mixer and scraper.

Using a quality automotive body filler of your choice, mix up only a small amount of filler and work on a portion of rivet heads at a time. Follow the filler manufacturer's instructions on mixing ratios and work according to the drying time of the filler so as not to waste body filler.

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Place the applicator over a rivet head and scrape a small amount of filler into the hole as shown below. Lift the applicator and repeat this step for every external rivet head. Once all the rivet heads are filled, use 220 grit sand paper to remove excess filler and smooth over the rivet heads. Once complete, prime and paint the airframe accordingly.

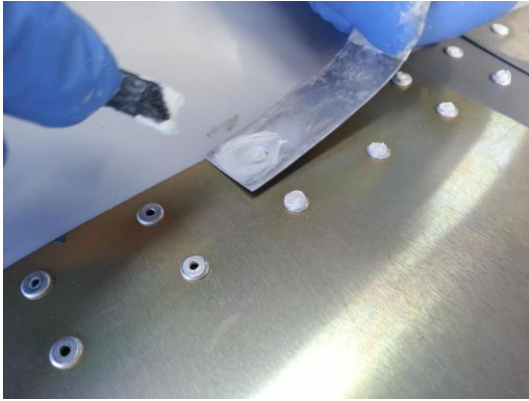


Figure 1

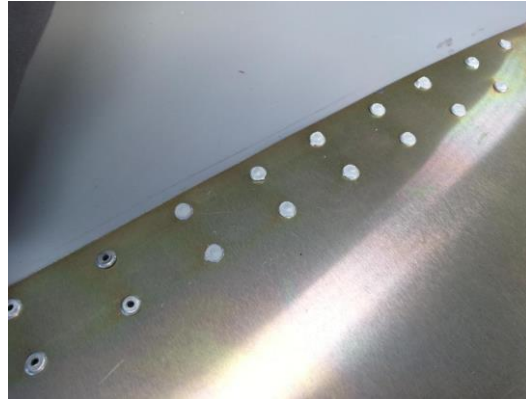


Figure 2



Figure 3

Aligning holes: Almost every hole in the kit will line up perfectly but where there are angles and channels lying inside each other the tolerance on the bending makes it almost impossible to always align the holes perfectly. In this case try to get as many Clecos in as possible to hold the brackets / angles / channels in place and then run a drill through the holes to clean them out. If a hole is slightly elongated the rivet will expand in the hole to take up the extra space. If a hole is drilled or cleaned out then those holes must be deburred and the aluminium chips removed from the assembly to prevent them from getting stuck under the skin and creating an unsightly bump.

Riveting: Firstly make absolutely certain that you are using the correctly sized rivet. There are 4 diameter sized rivets:

Rivet Type	Rivet Diameter	Drill bit hole size (∅)
Countersunk rivet	2.4 mm (3/32")	2.4 mm
Dome head rivet	3.2 mm (1/8")	3.3 mm
Dome head rivet	4.0 mm (5/32")	4.1 mm
Dome head rivet	4.8 mm (3/16")	4.9 mm

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Before riveting make certain that the inner flanges of whatever is being riveted is in place so there is no gap between the riveted components. Check the length of the rivets when riveting thick parts together. The rivet should stick through the part by a length equal to the diameter of the rivet being used. Fit longer rivets where necessary.

Rivnuts: Putting rivnuts into a part requires care and precision. If a rivnut is not inserted and pulled correctly then it will start to turn and eventually pull out completely. First you have to make sure that the rivnut that is to be installed fits tightly into the hole. If the rivnut is a bit loose in the hole then put high strength Loctite (Nutlock) onto the outside of the rivnut before pulling it. On the smaller rivnuts (M3 in particular) it is very easy to break the rivnut tool mandrel (especially the M3) if you use too much force when pulling the rivnut. The trick is to carefully watch as you pull and do it with just enough force so that the rivnut is solidly flared and will not turn loose with time. If you are worried then use high strength Loctite as described above.

Bolts and nuts: Apart from the prop bolts and the 4 main gear attachment bolts, all the hardware used on the Sling 4 is aircraft grade AN hardware. All the bolts and nuts should be torqued to ensure that they are tight but not overtightened. The following chart is set out for use with standard AN locknuts onto aluminium.

Bolt	Bolt diameter	Bolt thread	Torque (Nm)	Torque (ft lbs)
AN3	3/16" (4.8mm)	10-32 UNF	2.0 – 2.7	1.5 – 2.0
AN4	1/4" (6.35mm)	1/4-28 UNF	5.7 – 7.9	4.2 – 5.8
AN5	5/16" (7.95mm)	5/16-24 UNF	11.3 – 15.8	8.3 – 11.6
AN6	3/8" (9.5mm)	3/8-24 UNF	18.0 – 21.4	13.3 – 15.8
AN7	7/16" (11.1 mm)	7/16-20 UNF	50.8 – 56.5	37.5 – 41.7

Use a bolt gauge or bolt chart to check the correct length of the bolt.

With AN bolts it is possible to always have the grip (smooth shank) inside the component so that the thread is never loaded i.e. the thread starts under the washer. Use thick or thin washers so that the nut is properly fastened and never bottoms out on the grip (shank). At least 1.5 complete threads must always protrude from the top of the nut.

The following Thread locking adhesives are used in the KAI:

- 1) Loctite 243 (Blue) – Nut and Bolts lock, medium strength - Loctite 248 and 250 is used as replacements when 243 is not available.
- 2) Loctite 577 (Yellow) – Thread sealant for oil, brake, water and fuel fittings. Seals against loss of liquid.
- 3) Loctite 277 (Red) – Rivnuts. High strength - Loctite 285 is used as replacement when 277 is not available.
- 4) Loctite 648 – High strength is part of the engine kit.
- 5) Loctite 222 – Bolts. Low strength.

Conversion table – American Wire Gauge – mm. - mm ²		
AWG N°	Diameter (mm.)	Area (mm ²)
1	7,350	42,400
2	6,540	33,600
3	5,830	26,700
4	5,190	21,200
5	4,620	16,800
6	4,110	13,300
7	3,670	10,600

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8	3,260	8,350
9	2,910	6,620
10	2,590	5,270
11	2,300	4,150
12	2,050	3,310
13	1,830	2,630
14	1,630	2,080
15	1,450	1,650
16	1,290	1,3100
17	1,150	1,0400
18	1,024	0,8230
19	0,912	0,6530
20	0,812	0,5190
21	0,723	0,4120
22	0,644	0,3250
23	0,573	0,2590
24	0,511	0,2050
25	0,455	0,1630
26	0,405	0,1280
27	0,361	0,1020
28	0,321	0,0804
29	0,286	0,0646
30	0,255	0,0503

Metric conversions	
1 sq. centimetre	100 sq. millimetres
1 sq. metre	10,000 sq. centimetres
1 hectare	10,000 sq. metres
1 sq. km	100 hectares
1 sq. km	1 million sq. metres

Imperial conversions	
1 sq. foot	144 sq. inches
1 sq. yard	1296 sq. inches
1 sq. yard	9 sq. feet
1 acre	4840 sq. yards
1 sq. mile	640 acres

Metric to Imperial conversions	
1 sq. centimetre	0.15500 sq. inches
1 sq. metre	10.763 91sq. feet
1 sq. metre	1.195 99 sq. yards
1 hectare	2.47105 acres
1 hectare	0.00386 sq. miles

Imperial to Metric conversions	
1 sq. inch	6.4516 sq. centimetres
1 sq. foot	929.0304 sq. centimetres
1 sq. foot	0.09290 sq. metres
1 sq. yard	0.83613 sq. metres
1 acre	0.40469 hectares
1 sq. mile	258.99881 hectares

12 ASSEMBLY OPERATION

Each kit should be assembled in the below mentioned order and as set out in the Construction Manual.

- 1) Empennage
- 2) Wings
- 3) Fuselage
- 4) Undercarriage
- 5) Canopy
- 6) Firewall Forward
- 7) Electricals

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8) Finishing

13 FINAL ASSEMBLY INSPECTIONS

Pre-closure inspection to be done according to the CAA (Civil Aviation Authority).

Post-closure inspection to be on the same procedure as above.

14 FLIGHT TEST PROCEDURES

Refer to the standard documents from CAA (Civil Aviation Authority).

15 ADDITIONAL REQUIREMENTS

There are no such requirements.

16 QUICK BUILD

Sling 4 Quick Builds are supplied with the same construction manuals as 'Slow' Builds. This is due to the fact that the quick builder still requires a lot of the information specified in the manuals. The table below indicates what information is applicable to a quick builder in each of the construction manuals.

Manual	Applicable Sections to Quick Builders
Empennage	Entire manual (Supplied as a standard kit)
Wings	Pg. 18a (Fuel tank 2 – Right/Left) – Pg. F2 (Flap assembly)
Fuselage	Pg. E11 (Centre console skins & seat rails) Pg. 15a (Air conditioning duct installation 1) – Pg. E18 (Sling 4 centre fuselage modifications) Pg. H1 (Sling 4 seat buckle strap installation) – Pg. H5 (Sling 4 seatbelt rear installation) Pg. I1 (Introduction and parts list of front seat backrest) – Pg. T6 (Toe brake assembly 6)
Undercarriage	Entire manual (Supplied as a standard kit)
Canopy	Pg. 1 (Preparation for interior lighting wire routing) – Pg. 5 (Sling 4 windscreen installation) Pg. 7 (Door installation) – Pg. 15 (Lock CAM roller fitment)
Firewall Forward	Entire manual (Supplied as a standard kit)
Electrics	Entire manual (Supplied as a standard kit)
Finishing Kit	Entire manual (Supplied as a standard kit)
Fuel System	Entire manual (Supplied as a standard kit)

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B. INDEX OF KIT ASSEMBLY PAGES

Empennage (Rev 2.0)			
Page	Description	Revision	Date
HS1	Horizontal Stabiliser	4	2016/11/17
HS2	Horizontal Stabiliser	3	2016/11/17
HS3	Horizontal Stabiliser	3	2016/11/17
HS4	Horizontal Stabiliser	3	2016/11/17
VS1	Vertical Stabiliser (If Applicable)	2	2016/11/17
VS2	Vertical Stabiliser (If Applicable)	3	2016/11/17
VS3	Vertical Stabiliser (If Applicable)	3	2016/11/17
VS4	Vertical Stabiliser Exploded view	4	2016/11/17
E1	Elevator	5	2016/11/17
E2	Elevator	5	2016/11/17
E3	Elevator	5	2016/11/17
E4	Elevator	2	2016/11/17
E5	Elevator	1	2016/06/29
E6	Elevator Exploded View	3	2016/11/17
RD1	Rudder	2	2016/11/17
RD2	Rudder	3	2016/11/17
RD3	Rudder Exploded View	2	2016/11/17

Wings (Rev 1.8)			
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PG1	Wing Bellcrank Assembly	1	2016/11/17
PG2	Wing Rib 12 Sub - Assembly - Right	2	2016/11/17
PG3	Wing Rib 4 - Right	3	2016/11/17
PG4	Wing Rib 5 & 6 Sub - Assembly - Right	3	2016/11/17
PG5	Wing Rib 8 - Right	3	2016/11/17
PG6	Wing Rib 9 Sub-Assembly - Right	2	2016/11/17
PG7	Wing Rear Spar Pg 1 of 2	6	2016/11/17
PG8	Wing Rear Spar Pg 2 of 2	1	2016/07/19
PG9	Setup Of Wing Twist Jig	4	2016/11/17
PG10	Installation Of Pitot Tube	2	2016/11/17
PG11	Installation Of Pitot And Static Tube	1	2016/11/10
-	Routing Of Pitot Tube	1	2016/04/15
-	Routing Of Pitot Tube	1	2016/04/15
-	Routing Of Pitot Tube	1	2016/04/15
PG12	Strobe Installation - Left Wing	1	2016/07/19
PG13	Test Fitting Of Skins	4	2016/11/17
PG14A	Strobe Installation - Left Wing	3	2016/11/17
PG14B	Landing/Taxi Light Wiring Diagram	0	2016/11/24
PG15	Wing Fuel Tank Jig	0	2015/06/08

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PG16	Fuel Tank Jig 1	JIG	JIG
PG17	Fuel Tank Jig 2	JIG	JIG
PG18	Wing Fuel Tank Jig Setup	2	2016/11/17
PG18a	Fuel Tank 2 - Right/Left	0	2016/11/11
PG18b	Fuel Tank Levels	0	2016/11/11
-	Fuel Tank Pressure Check,With a Detail View	0	2016/11/11
-	Fuel Tank Assembly And Installation	0	2016/11/11
-	Long Ranch Fuel Tank	0	2016/11/11
PG19	Wing Preperation Of Fuel Sender Float Arm	1	2015/06/08
PG20	Wing Fuel Tank Rib 1	4	2016/11/11
PG21	Wing Fuel Tank Rib 1 Fuel Sender Detail	2	2016/07/19
PG22	Wing Fuel Tank Rib 5	4	2016/11/09
PG23	Wing Bundy Tube Bending Detail	2	2016/11/09
PG24	Fuel Cap Flange Assemble	4	2016/11/17
PG25	Fuel Tank Assembly Extras	4	2016/11/17
PG26	Fitment of Fuel Tank	0	2015/06/08
PG27	Wing Tip - Right	2	2016/11/17
PG28	End Rib & Wing Tip	3	2016/11/17
A1	Aileron Ribs	2	2016/11/17
A2	Aileron Assembly	3	2016/11/17
F1	Flap Ribs	2	2016/11/17
F2	Flap - Assembly	4	2016/11/17

Fuselage (Rev 0.15)			
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A2	Rib 8 Assembly	2	2016/11/17
A3	Rib 7 Assembly	3	2016/11/17
A4	Rib 6 Assembly	2	2016/11/17
A5	Rear Rib Assembly	2	2016/11/17
B1	Rib to Jig Overview	0	2014/02/19
B2	Rib 5 Assembly	3	2016/11/17
B3	Rib 4 Assembly	4	2016/11/17
B4	Rib 3 Assembly	2	2016/11/17
B5	Rib 2 Assembly	3	2016/11/17
B6	Sling 4 Parachute Box Assembly	2	2016/11/11
-	Installation Photo's Of The Parachute Box	0	2016/11/24
-	How The Parachute Must Be Set In The Parachute Box	0	2016/11/11
C1	Longeron 8 Assembly	3	2016/11/17
C2	Rear Floor Assembly	3	2016/11/17
D1	Fitment of Lower Longerons	3	2016/11/17
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D4	Luggage Floor Assembly	3	2016/11/17
D5	Luggage Compartment Close Off Skin	2	2016/11/17
D6	Luggage Door Frame Assembly	3	2016/11/17
D7	Sling 4 Rear Fuselage Modified	2	2016/11/17
D8	Sling 4 Rear Fuselage Modified	2	2016/11/17
D9	Sling 4 Parachute System Modified	2	2016/11/17
D10	Luggage Door Installation	3	2016/11/17
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E2	Autopilot Brackets & Tube Guides	4	2016/11/17
E3	Main Spar & Undercarriage Channel	3	2016/11/17
E4	Reinforcing Plate Positioning	0,1	2014/07/21
E5	Rear Bottom Assembly	4	2016/11/17
E6	Forward Floor Sub - Structure	3	2016/11/17
E7	Control Torque Tube Installation	2	2016/11/17
E8	Centre Console & Rudder Pedal Base	3	2016/11/17
E9	Torque Tube Bearing Covers	3	2016/11/17
E10	Rudder Pedal Installation	3	2016/11/17
E11	Centre Consol Skins & Seat Rails	2	2016/11/17
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E13	Firewall & Final Assembly (Pg 1 of 2)	3	2016/11/17
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E16	Sling 4 Centre Fuselage Modified	1	2016/11/17
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E18	Sling 4 Centre Fuselage Modified	1	2016/11/17
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H4	Sling 4 Rear Seatbelt Installation	1	2016/11/08

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-	Door Seal Rubber	0	2016/12/12
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-	The Cabin Heat Installation Layout	0	2016/11/25
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-	The Antenna Mount Bracket Has Been Redesigned And Strengthened.	0	2016/11/24
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