Instruction Manual

Composite-ARF SuperXtra 330L, 3.1m

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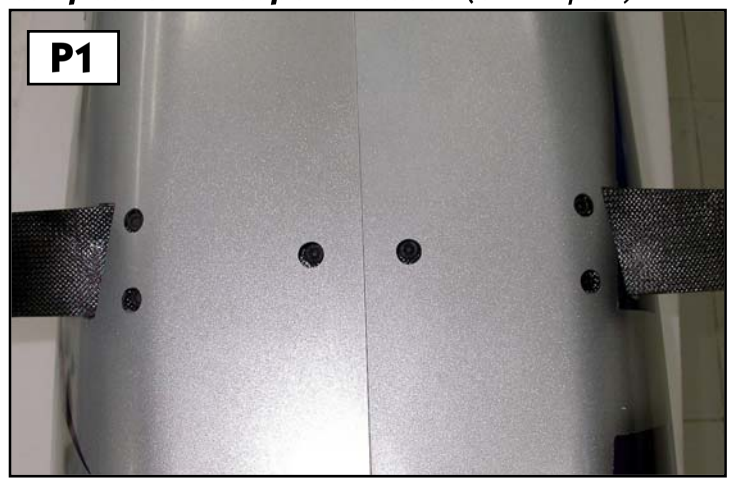

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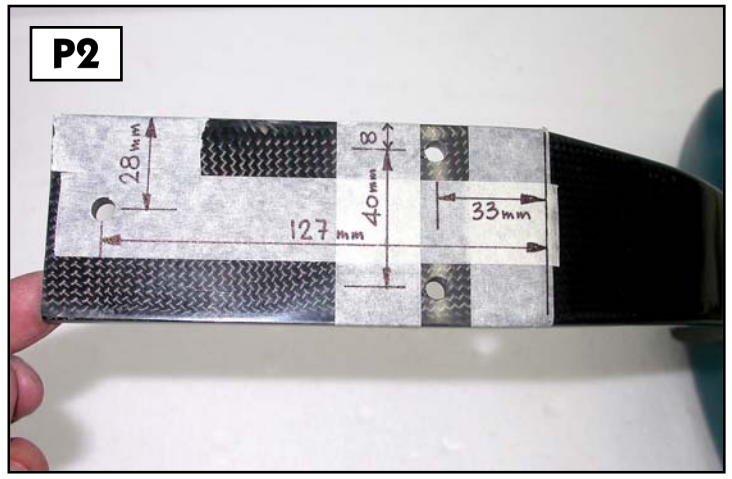

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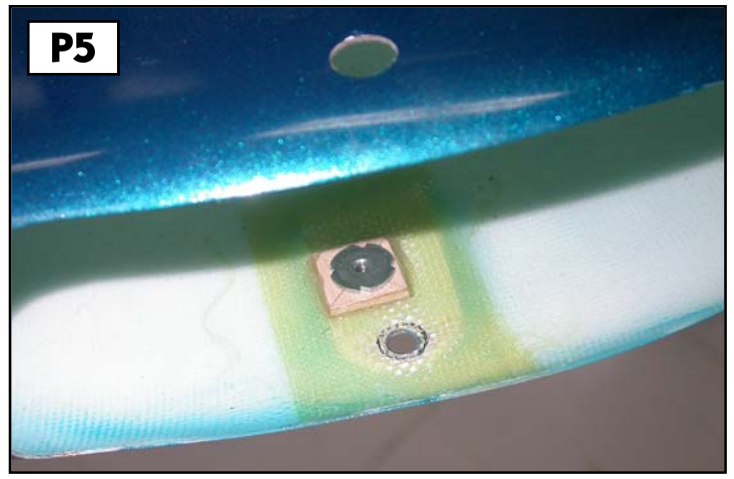

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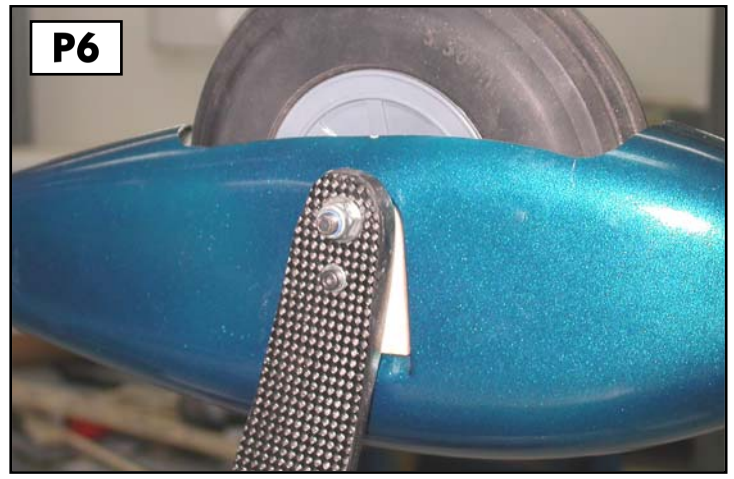

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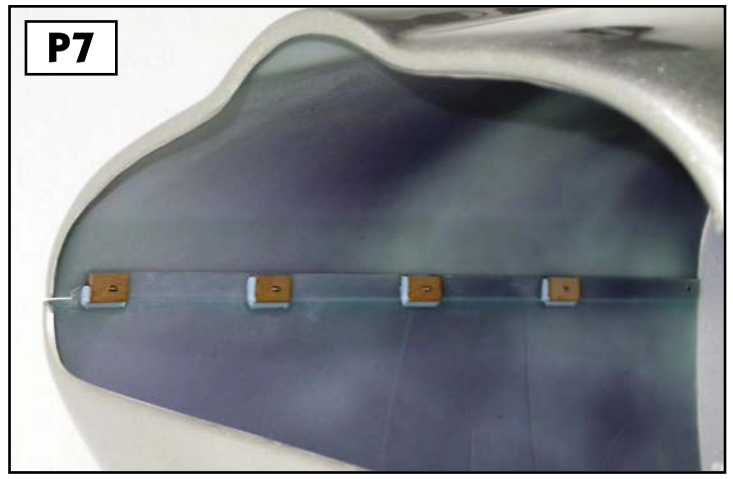

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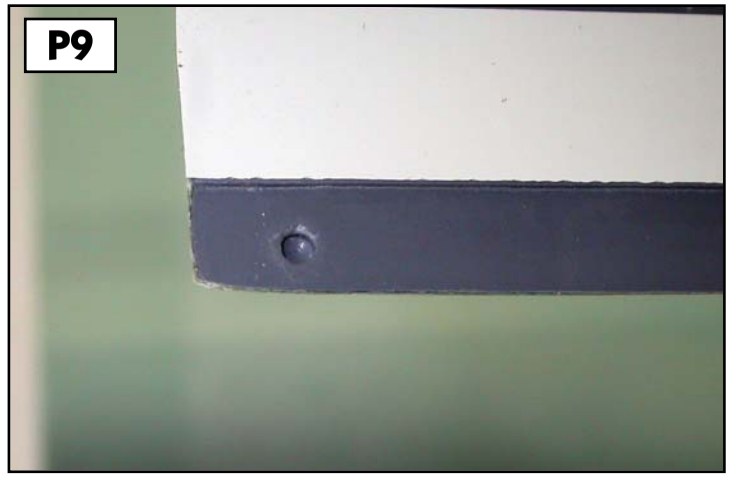

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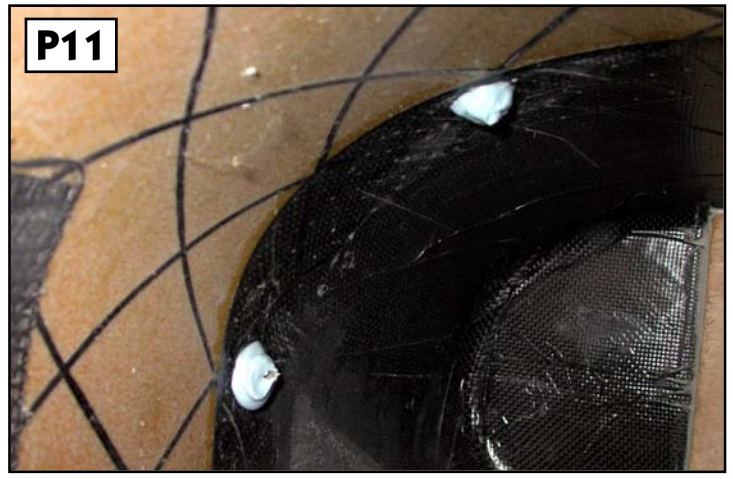

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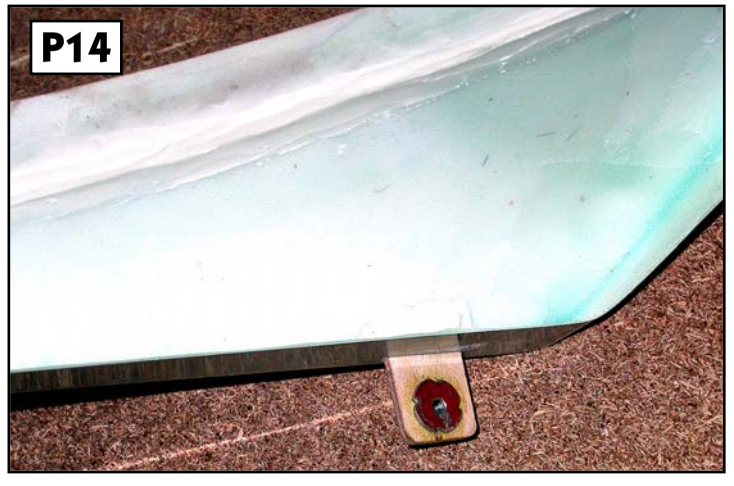

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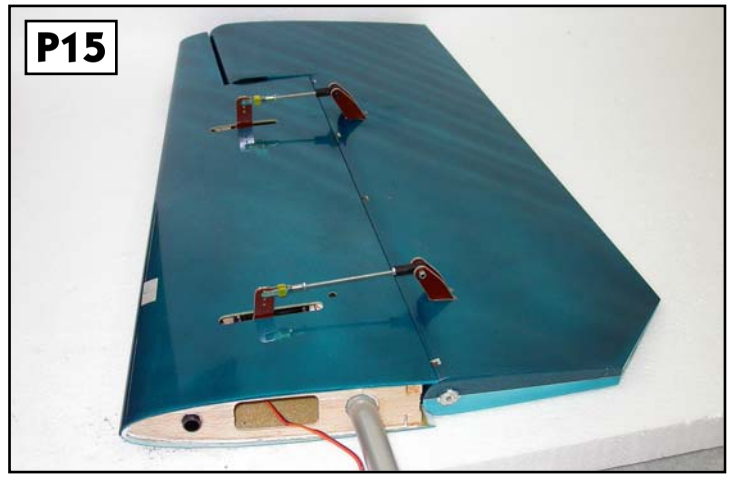

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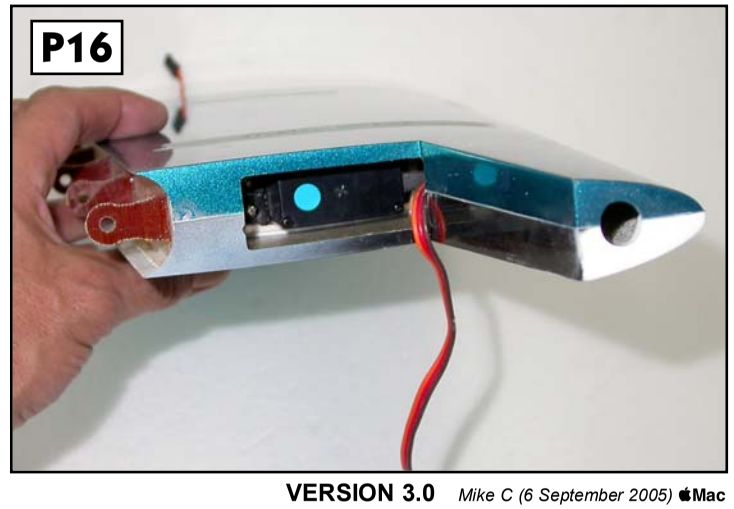

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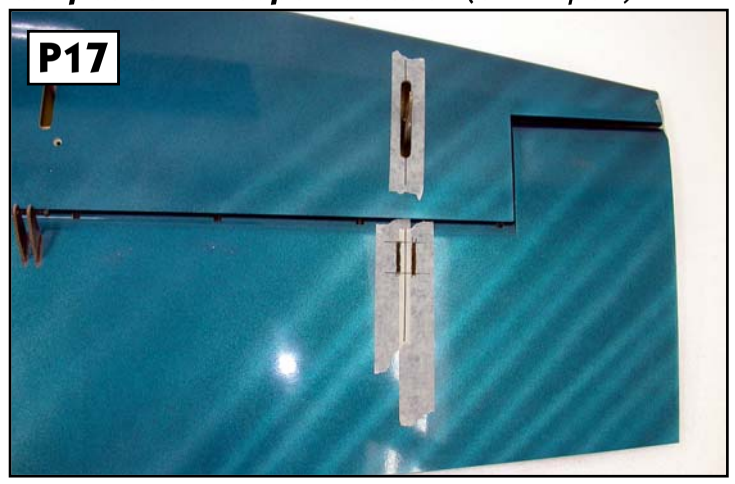

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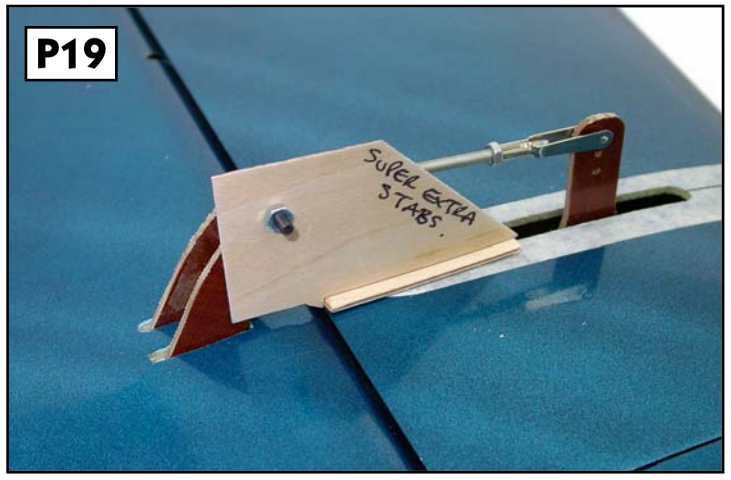

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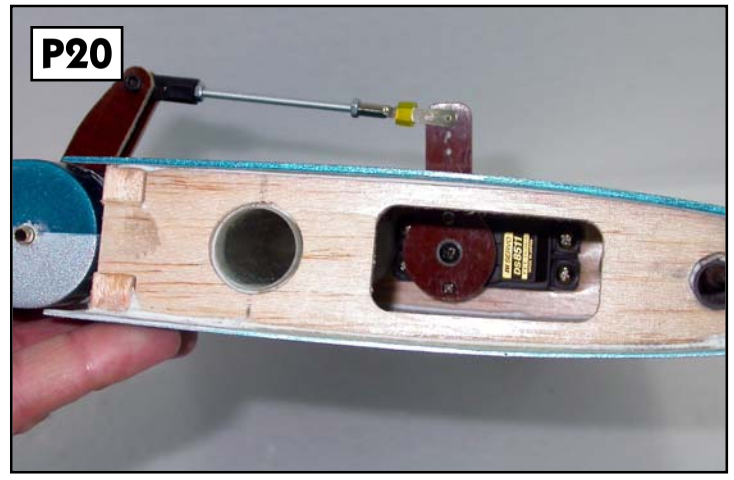

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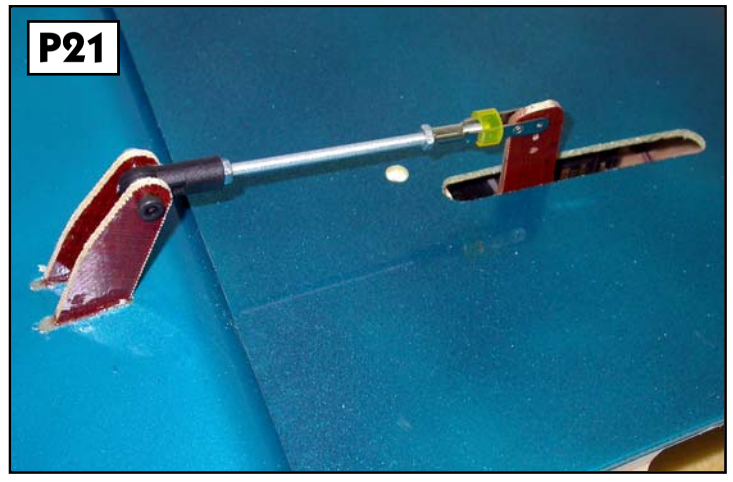

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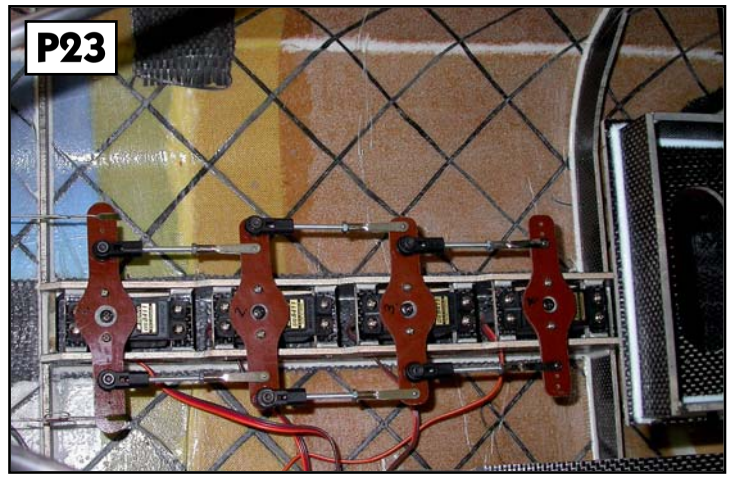

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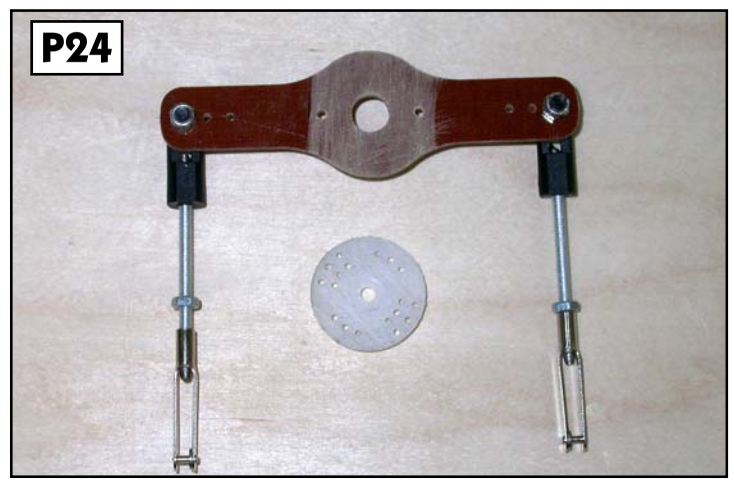

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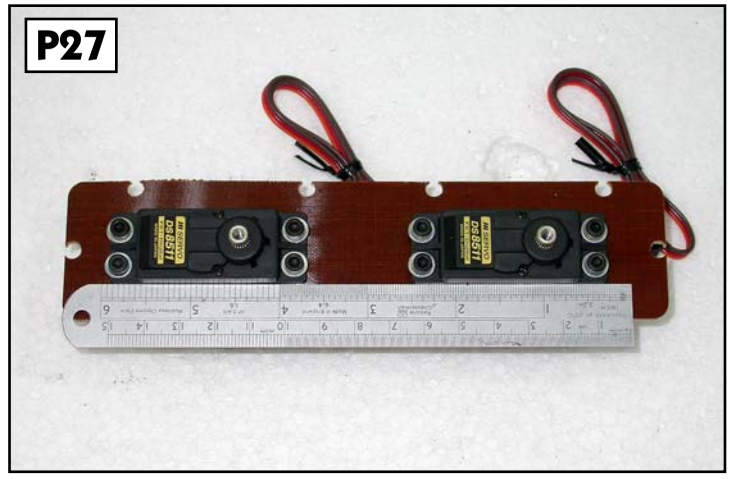

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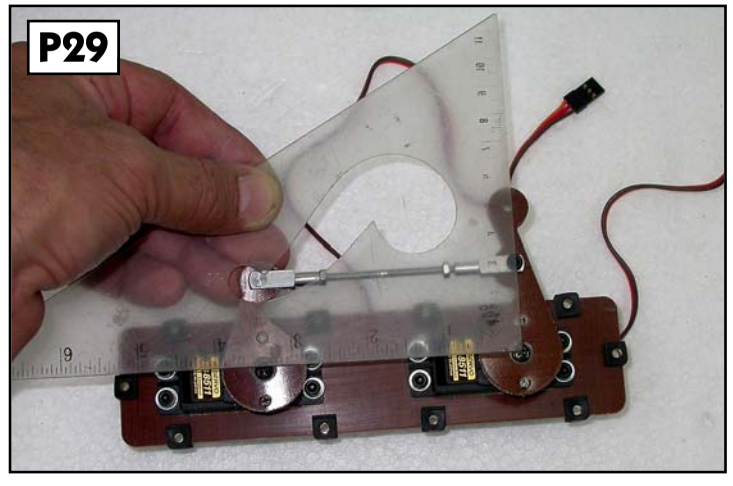

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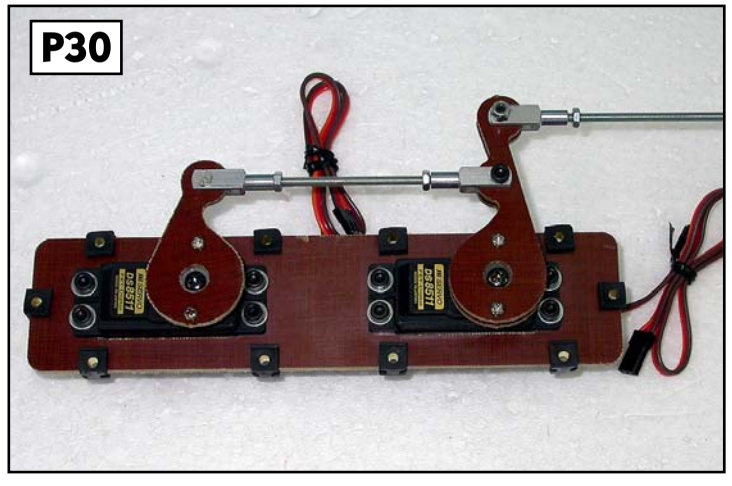

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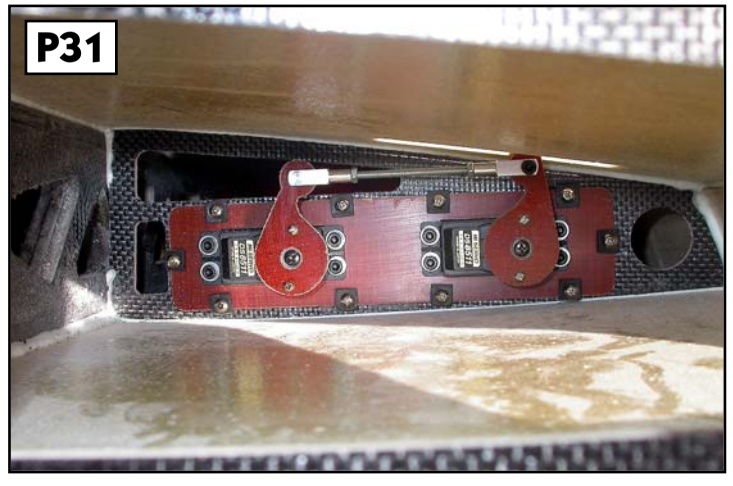

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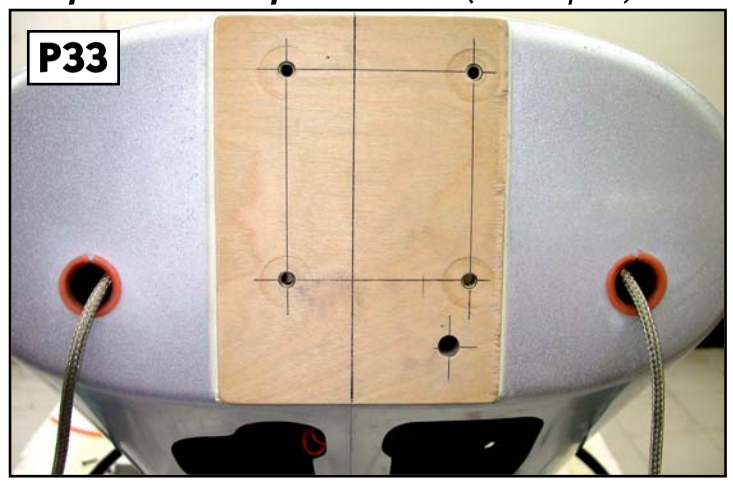
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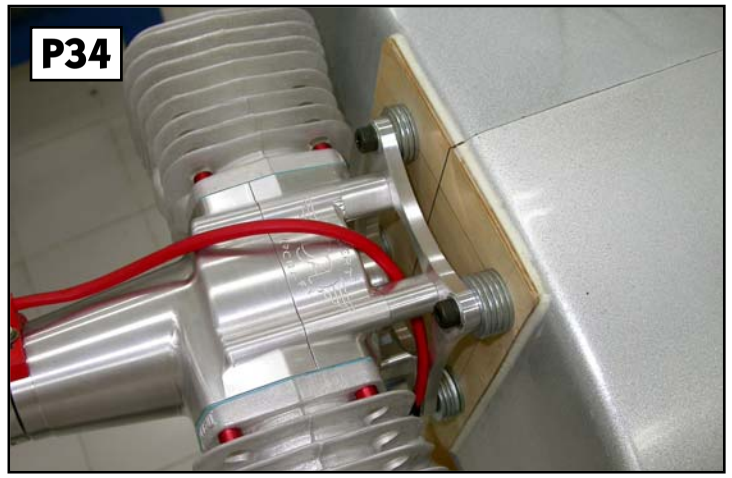
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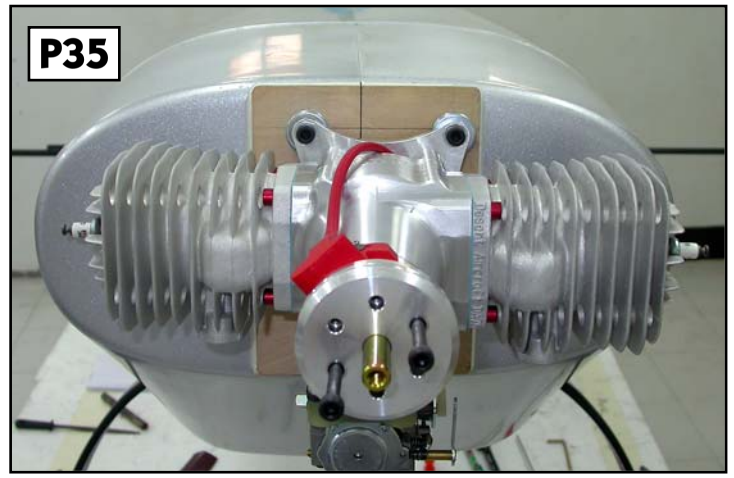
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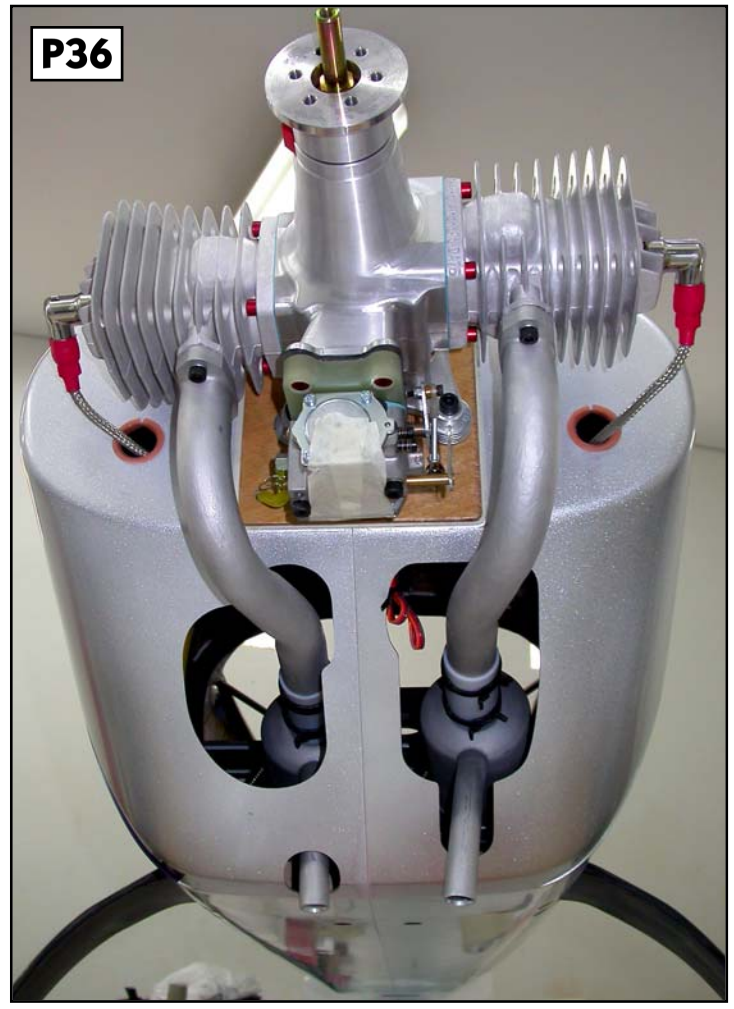
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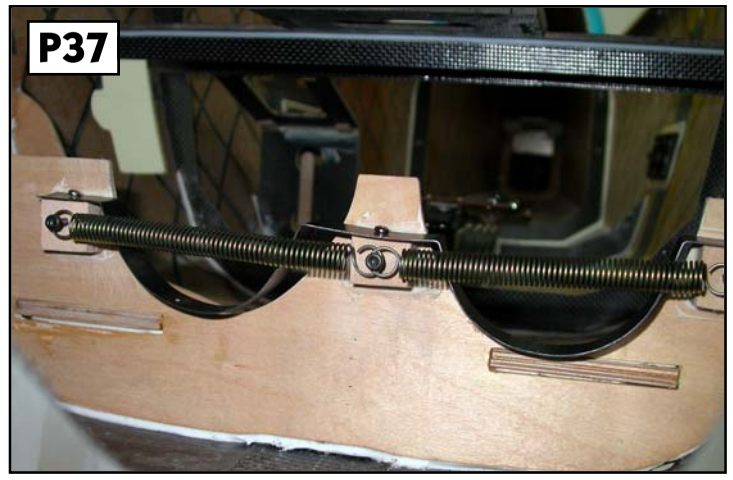
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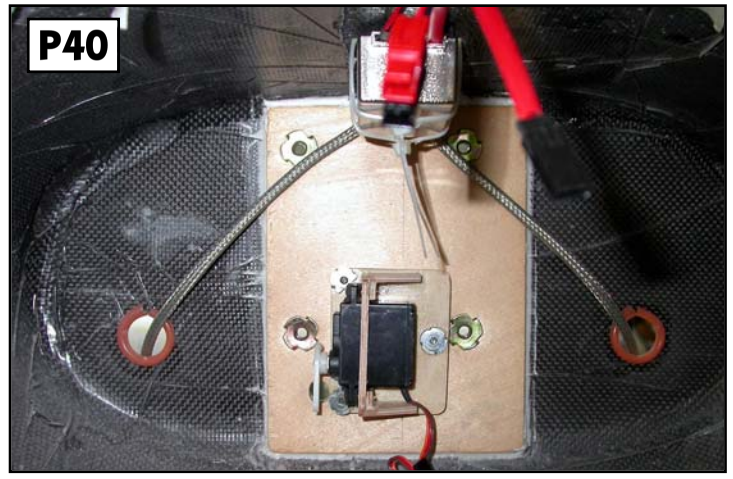
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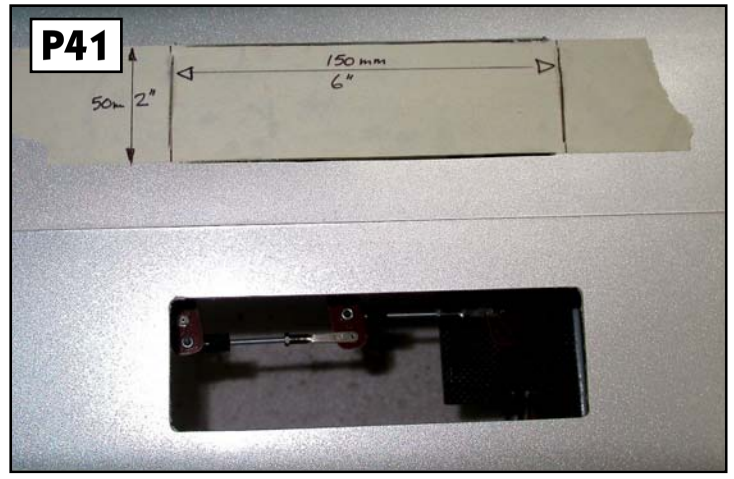
P41
150 mm
6"
50m
2"


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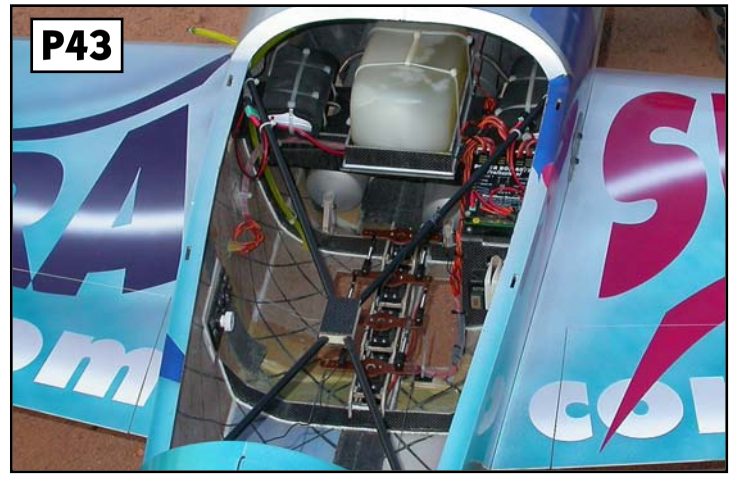
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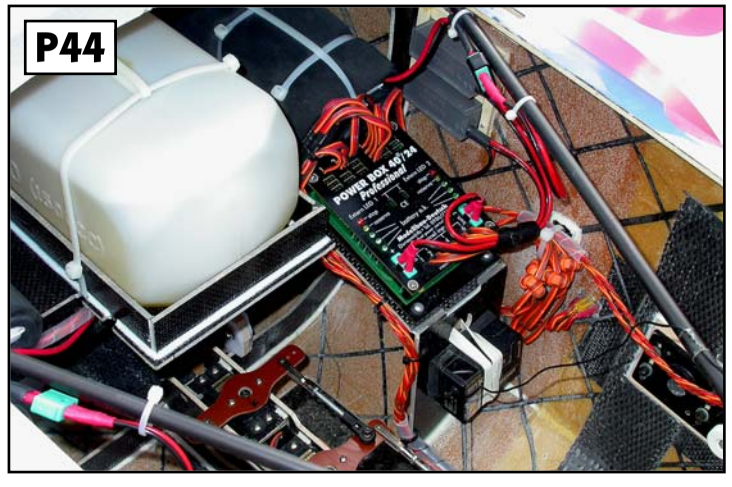
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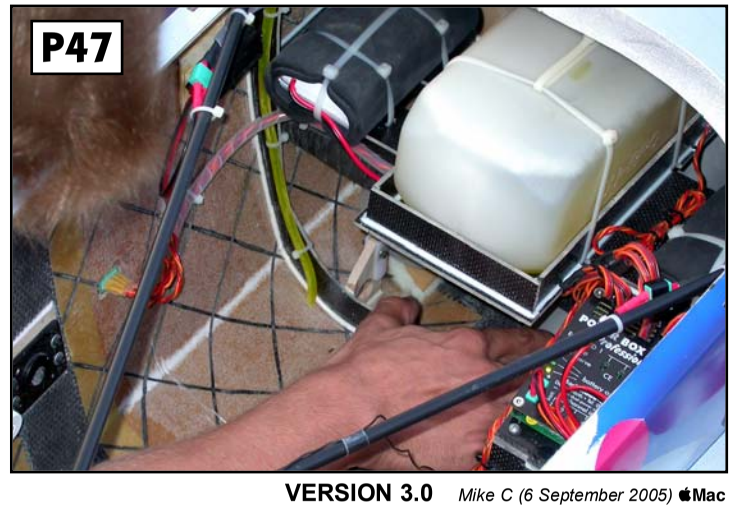
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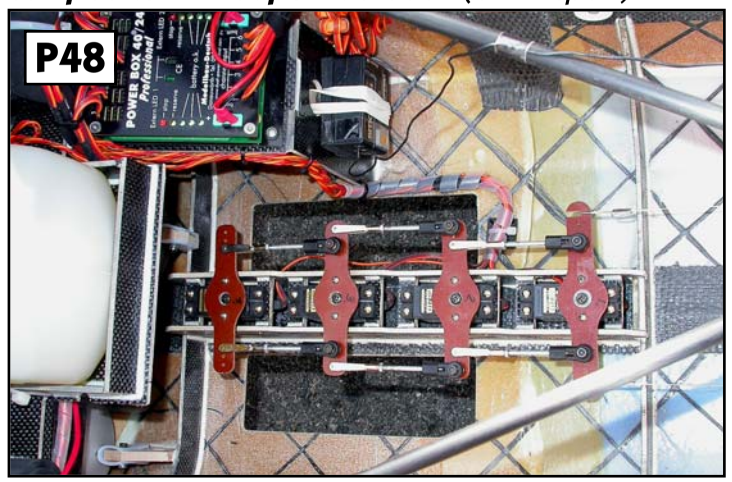
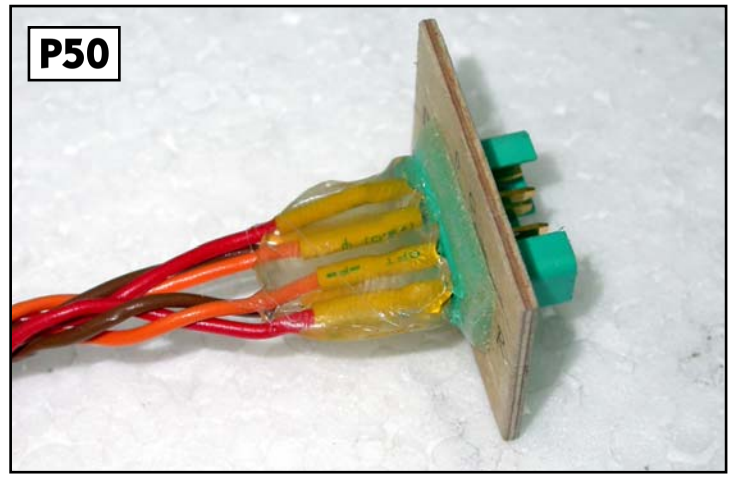
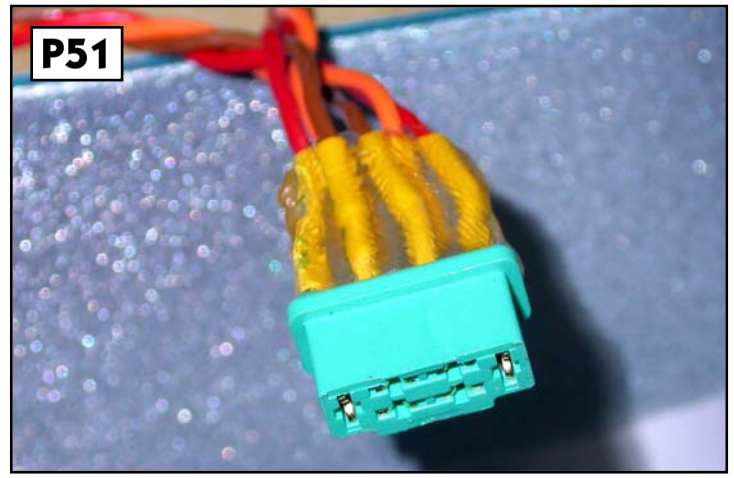
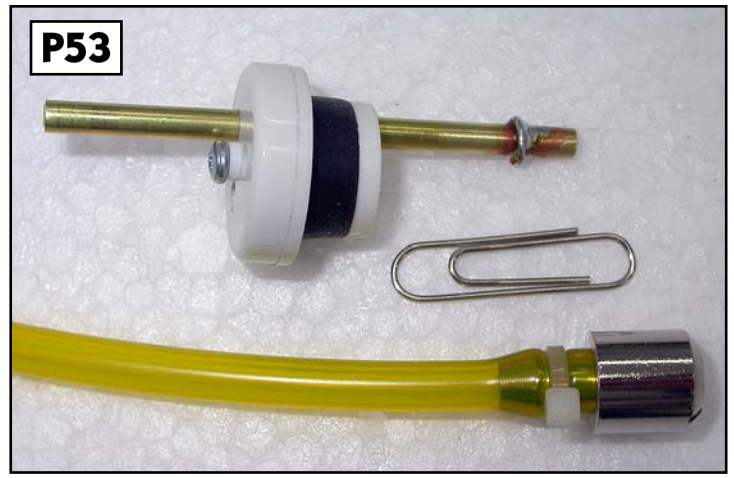
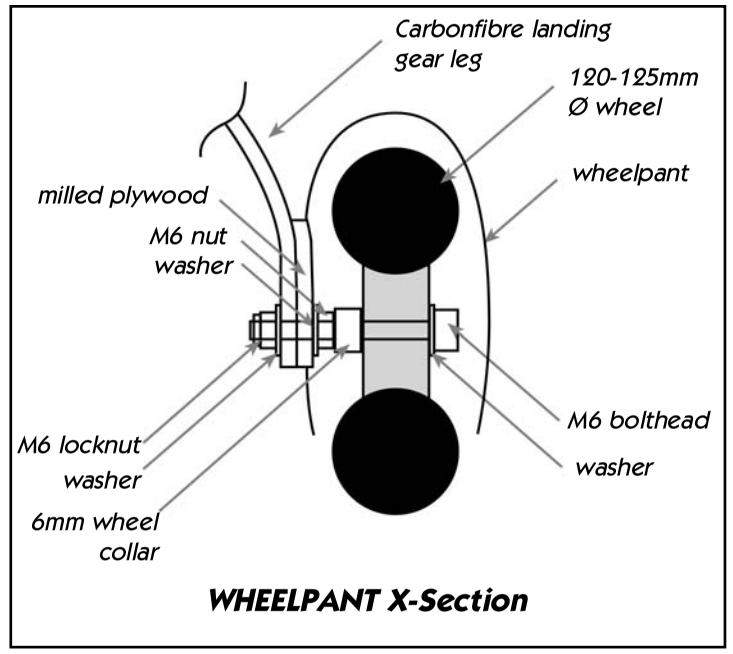


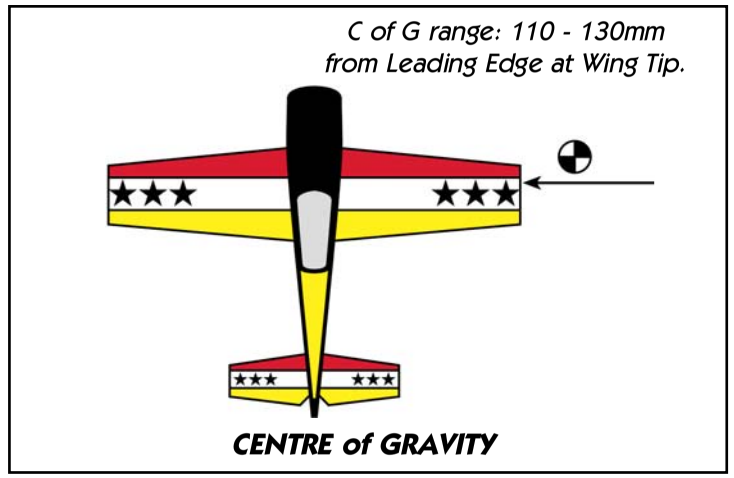


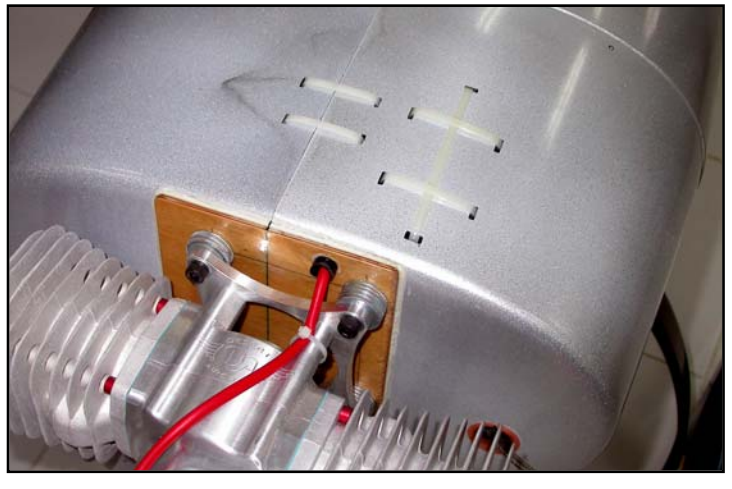


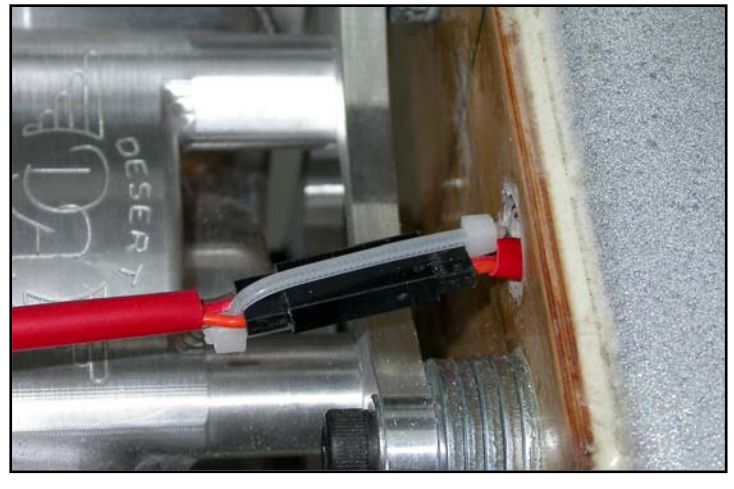


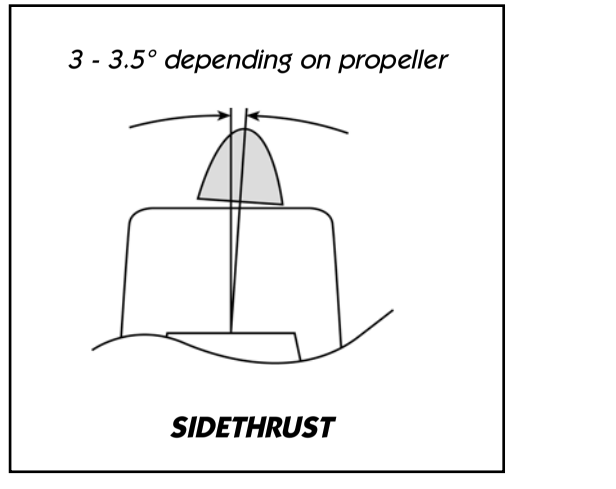


WHEELPANT X-Section









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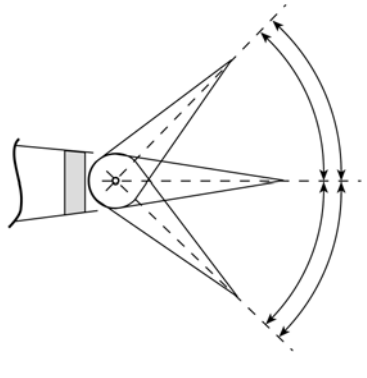

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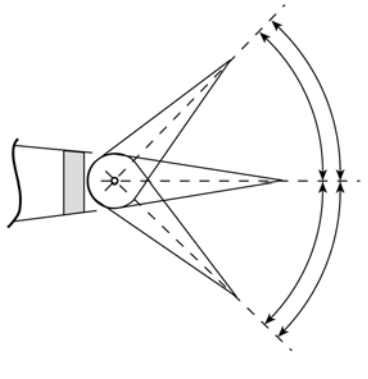

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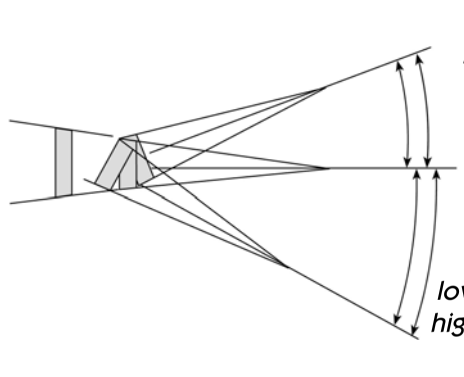


AILERON THROWS

Instructions for Extra 330L IMAC-Airplane

Thank you very much for purchasing our Composite-ARF Extra 330L all composite aircraft, made with the revolutionary Total Area Vacuum Sandwich (TAVS) technology.

This is a fully-updated Instruction manual showing the latest 'Wing-tube' version of the SuperXtra, which replaces the 'carbon blade-spar' version that is not manufactured any more. Some of the photos show the original version, where it is unchanged from the new 'Tube' version - so please don't get confused!

Before you get started building and setting-up your aircraft, please make sure you have read this instruction manual several times, and understood it. If you have any questions, please don't hesitate to contact us. Below are the contact details:

Email:	**feedback@composite-arf.com**
or	**techsupport@composite-arf.com**
Telephone:	**Phone your C-ARF Rep!!! He will be there for you.**
Website:	**http://www.composite-arf.com**

This instruction manual aims to do 3 things:

1) Show you how to build your aircraft accurately and properly.
2) To explain about your fully-composite aircraft, and how to handle and maintain it.
3) How to set up and trim your finished IMAC type aircraft perfectly to give you the most enjoyment from it.

Below are a few of the TOC pilots who helped to design and modify our 3m Extra 330S to the championship-winning standard it is now at. And your 2.6m span Extra 330L is based on the design of that plane and the experience of these experts.

Sebastiano Silvestri

Mike McConville

Ivan Kristensen

Jason Shulman

Composite-ARF would like to thank all of these 4 very experienced pilots for their co-operation and help, which has made this 330 Extra aeroplane as good as it is today.

Of course all four of them are also Rep's for C-ARF, and if you want to ask them any questions you can email them (see our website for links) directly, or email your questions to us at 'feedback@composite-arf.com' and we will forward your comments to them. We are sure that they will answer you right away.

Liability Exclusion and Damages

You have acquired a kit, which can be assembled into a fully working R/C model when fitted out with suitable accessories, as described in the instruction manual with the kit.

However, as manufacturers, we at Composite-ARF are not in a position to influence the way you build and operate your model, and we have no control over the methods you use to install, operate and maintain the radio control system components. For this reason we are obliged to deny all liability for loss, damage or costs which are incurred due to the incompetent or incorrect application and operation of our products, or which are connected with such operation in any way. Unless otherwise prescribed by binding law, the obligation of the Composite-ARF company to pay compensation is excluded, regardless of the legal argument employed.

This applies to personal injury, death, damage to buildings, loss of turnover and business, interruption of business or other direct and indirect consequent damages. In all circumstances our total liability is limited to the amount which you actually paid for this model.

BY OPERATING THIS MODEL YOU ASSUME FULL RESPONSIBILITY FOR YOUR ACTIONS.

It is important to understand that Composite-ARF Co., Ltd, is unable to monitor whether you follow the instructions contained in this instruction manual regarding the construction, operation and maintenance of the aircraft, nor whether you install and use the radio control system correctly. For this reason we at Composite-ARF are unable to guarantee or provide a contractual agreement with any individual or company that the model you have made will function correctly and safely. You, as operator of the model, must rely upon your own expertise and judgement in acquiring and operating this model.

Supplementary Safety Notes

Pre-flight checking:
Before every session check that all the model's working systems function correctly, and be sure to carry out a range check.

The first time you fly any new model aircraft we strongly recommend that you enlist the help of an experienced modeller to help you check the model and offer advice while you are flying. He should be capable of detecting potential weak points and errors.

Be certain to keep to the recommended CG position and control surface travels. If adjustments are required, carry them out before operating the model.

Be aware of any instructions and warnings of other manufacturers, whose product(s) you use to fly this particular aircraft, especially engines and radio equipment.

Please don't ignore our warnings, or those provided by other manufacturers. They refer to things and processes which, if ignored, could result in permanent damage or fatal injury.

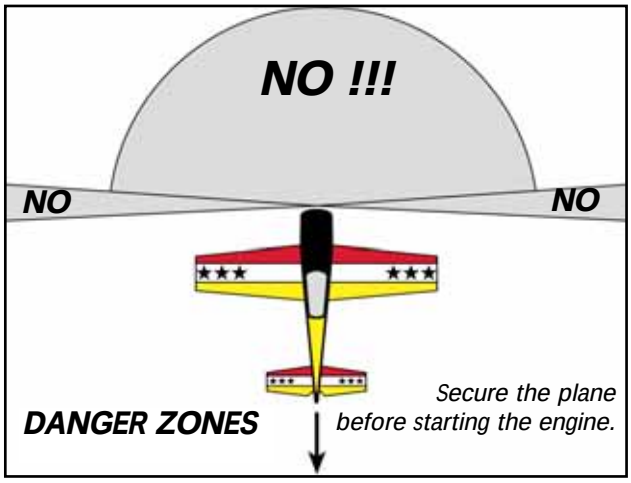
Attention !

This IMAC-Aircraft is a high-end product and can create an enormous risk for both pilot and spectators, if not handled with care, and used according to the instructions. Make sure that you operate your Extra according to the AMA rules, or those laws and regulations governing the model flying in the country of use.

The engine, servos and control surfaces have to be attached properly. Please use only the recommended engines, servos, propellers, and the accessories supplied in the kit.

Make sure that the 'Centre of Gravity' is located in the recommended place. Use the nose heavy end of the CG range for your first flights, before you start moving the CG back to a more critical position for 3D-manoeuvres. If you find that you need to relocate your batteries or even add weight in the aircraft to move the CG to the recommended position, please do so and don't try to save weight or hassle. A tail heavy plane, in a first flight, can be an enormous danger for you and all spectators. Fix any weights, and heavy items like batteries, very securely to the plane.

Make sure that the plane is secured properly when you start up the engine. Have at least 2 helpers hold your plane from the tail end or from behind the wing tips before you start the engine. Make sure that all spectators are behind, or far in front, of the aircraft when running up the engine.



Make sure that you range check your R/C system thoroughly before the first flight. It is absolutely necessary to range check your complete R/C installation first WITHOUT the engine running. Leave the transmitter antenna retracted, and check the distance you can walk before 'fail-safe' occurs. Then start up the engine, run it at about half throttle and repeat this range check with the engine running. Make sure that there is no range reduction before 'fail-safe' occurs. Only then make the 1st flight. If you feel that the range with engine running is less then with the engine off, please contact the radio supplier and the engine manufacturer and DON'T FLY at that time.

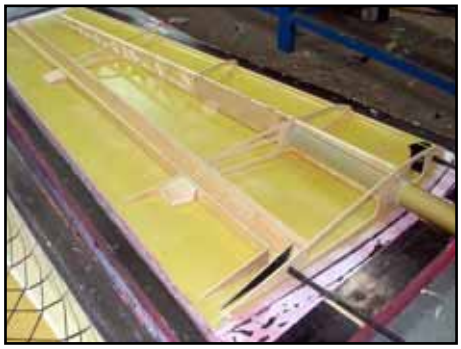
Check for vibrations through the whole throttle range. The engine should run smoothly with no unusual vibration. If you think that there are any excessive vibrations at any engine rpm's, DON'T FLY at this time and check your engine, spinner and propeller for proper balancing. The light-weight sandwich composite parts don't like too much vibration and they can suffer damage. The low mass of all the parts results in a low physical inertia, so that any excess vibrations can affect the servos and linkages.

Make sure that your main spar tube is not damaged. Check that the front and rear anti-rotation pins for the wings and horizontal stabiliser are located correctly in their holes, and are not loose. Check that the 4 plastic wing retaining nuts are tight, that the M3 bolts retaining the horizontal stablisers on to the aluminium tube are installed and tight, and that the hinge wires for the rud-der and elevators cannot come out.

If you carefully checked all the points above and followed our advice exactly, you will have a safe and successful first flight - and many hours of pleasure with your Composite-ARF Extra 330L.

General information about fully-composite aircraft structure and design

All the parts are produced in negative molds, manufactured using vacuum-bagged sandwich construction technology. All parts are painted in the moulds, either single colour or designer colour schemes. A new production method, called TAVS (Total Area Vacuum Sandwich), enables us to present this aircraft with incredible built-in strength, while still being lightweight, and for a price that nobody could even consider some years ago. This production process has huge advantages, but a few disadvantages as well. These facts need to be explained in advance for your better understanding.



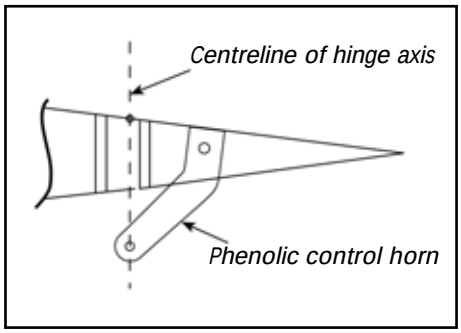
The internal structure of the new SuperXtra wing, before the carbon reinforcement & rovings are added above & below the spar during the joining process.

Description of Parts

The Wings:

Both wing halves are made in negative moulds, and fully vacuum bagged, using only 2 layers of 2 oz. cloth in combination with a very hard 2 mm foam sandwich form a hard and durable outer skin. Because of this TAVS technology very few additional structural parts are needed except for main spars.

The ailerons are hinged already for you. They are laminated in the wing mould and are attached to the main wing with a special nylon hinge-cloth, sandwiched between the outer skin and the foam. This nylon hinge is 100% safe and durable. You will never have to worry about breaking it, or wearing it out. There is no gap at all on the top wing surface, and there is a very narrow slot in the bottom surface, where the aileron slides under the main wing skin during down throw. This hinge setup is the cleanest you can ever obtain, but you have to take some care during assembly for proper installation and servo set up.



First, the hinge line is on the top surface of the wing, not in the centre. This is NOT a disadvantage, if you set in about 10% NEGATIVE aileron differential in your transmitter program. This means that the ‘down’ throw needs to be about 10% more than the up throw.

Why? Because the axis of the hinge is not at the centreline of the aileron, so it moves slightly in and out when it travels, and the aileron gets a little "bigger" in surface area when moving up, and "smaller" when moving down. This is why you have to set the negative differential in your transmitter to compensate for the size changing. 10% is a good starting point, and you will find out the exact setting during the first flights, doing fast vertical rolls and watching the fuselage rolling in a perfect line. You can set it perfectly, this is guaranteed.

The bottom slot needs some explanation, too. The cut line is exactly in the correct position so that the aileron slides under the wing skin smoothly. If the cut was a few mm forward or back, it

would not work properly. So, make sure that the lip is not damaged, and that the aileron slides under this lip perfectly. It will NOT lock at any time, as long as the lip is not damaged. If damage occurs to the lip, you can cut off 2-3 mm, but you should NEVER need to cut off more than this.

The wings are already set-up for 2 servos per aileron, and designed specifically around a pair of JR/Graupner 8511/8611 servos which fit into a CNC-milled phenolic plate. For normal pattern style flying, a pair of JR8411, or equivalent, servos should be sufficient, but we highly recommend that you use the suggested 8511/8611servos.

The wings are attached to the fuselage with the 4 threaded aluminium dowel anti-rotation pins, with big 4 plastic nuts inside the fuselage. If the aluminium dowels come loose in the wing, the wing will slide outwards, away from the fuselage, and the main spar tube will definitely break. So take great care to inspect the glue joints of these anti-rotation dowels in the wing REGULARLY. Excessive vibrations or hard shocks can cause the glue joints to weaken or break. Monitor these joints whenever you set up your plane. Never forget to tighten the nuts inside the fuselage. Your flight will end after 100 ft and you will have to fix a hole in your club's runway. Please DO NOT modify these attachment dowels in any way, their perfect function is proven for many years.

The Fuselage:

The fuselage is also made in negative moulds, and (except for the bottom surface) it is also all constructed using TAVS technology, with the diagon-technique carbon strengthening for improved torsional stability. All the loadbearing internal parts are glued in during manufacture, to ensure accurate location and reduce the assembly time for you. The fibreglass tubes in the wings and fuselage to receive the wing tube spar, the stab spar tubes, and the holes and reinforcement plates for the anti-rotation dowels, are already installed.

The landing gear mount is strong and doesn't need any extra reinforcement. You have an extremely light weight fuselage, and the gear loads need to be led into the structure gently. No glue joint needs to be stronger than the materials that it is attached to, as it would just result in increased weight for no advantage. The landing gear is a fairly flexible design, which works very much like shock absorbers. This plane is not made for crashing, but the landing gear will take some hard landings without problems. Do not change or modify it, as the results would only be negative. We had plenty of time and experience to engineer the strength needed in this area - and we did !

(above) The fuselage is manufactured using the 'Diagon-technique' with carbon tows to give exceptional torsional stiffness combined with extremely low weight.

The motordome and firewall are pre-installed, and provide plenty of strength for any engines up to 150cc on the market today. See the Engine Installation section for details of engine and setting thrust angles.

The engine cowling should be attached using the method shown. It is only a little work and this mounting has been tested and proven for many years.

The Stabilisers:

The stab parts are also vacuum bagged sandwiched. The rudder and elevator control surfaces are hinged with 4mm Ø tubes, fitted through phenolic hinge bearing plates which are installed during manufacture for perfect alignment.

All the structural parts are pre-installed. The horizontal stabs are mounted with one 20mm tube and a carbon rod anti-rotation pin each. The rudder & elevator design allows for at least 50 degrees throw. For the SuperXtra it is necessary to keep the tail area as lightweight as possible, but it is still mandatory that each stab is fitted with two powerful digital servos (JR8411 or 8511/8611) installed in each half.

Please remember during assembly that every gram of weight should be saved in the tail area, without omitting our recommendations about mass-balancing of the elevators.

(below) The SuperXtra is 95% prefabricated, with all the main bulkheads, tuned-pipe supports, carbon bracing etc, installed at the factory. Below is a general view of the cockpit, muffler mounts and R/C gear area - as it is shipped.

Servo Screws:

Fix the *all* the servos into the milled plywood servo mounts using the 2.9 Ø x13mm sheet metal screws provided in the kit, ***not*** the standard screws normally supplied with servos by the servo manufacturer. This is because all the holes in our milled servo mounts are 2mm diameter, due to our CNC manufacturing process, and this is too big for the normal screws.

Take Care:

Composite sandwich parts are extremely strong, but fragile at the same time. Always keep in mind that these contest airplanes are designed for minimum weight and maximum strength in flight. Please take care of it, especially when it is being transported, to make sure that none of the critical parts and linkages are damaged. Always handle your airplane with great care, especially on the ground and during transport, so you will have many hours of pleasure with it.

Some views inside the new factory, showing a small part of the 'Finishing' and the 'Quality Control/Assembly' areas.

The 'Paint Job'

Occasionally customers notice certain problem areas with composite parts.
But the question is: Are these real problems, or are they just a misunderstood sign of high-tech construction, proving the high-end composite technology?

Seams:

ALL composite parts have seams. They are there today, and they will be there forever. You will have to get used to them ... or you'll have to touch up the paint yourself !

But what is a seam? A seam on the fuselage, especially already painted in the mould, proves that this is a vacuum-bagged high-tech part, made in negative moulds. Our seams are fine and straight, no negative impression at all ... but they are there. When possible we include 5mm wide strips of self-adhesive vinyl, painted in exactly the same colour as the plane for you to cover the seams if you want.

(above) The 3.1m SuperXtra, 2.6m Extra 330L and the 2.3m Extra, are also available in the 'JR scheme'.

Paint flaws:

If the aircraft is painted in the moulds, you can save a lot of weight. At least 2 lbs ... and that is definitely worth saving !

A negative paint job is very complicated to make. The painter never sees the result of his job. He cannot see the design growing and developing - he is painting 'blind'. He even cannot see little mistakes and flaws, and even if he COULD, he could not correct them. The maximum time to apply a designer paint scheme in the mould is no more than 20 minutes. It is a big rush against time, because even if it is just few minutes too slow then the masking cannot be removed without pulling off the paint itself ! This is a BIG challenge, but the result is extraordinarily impressive. Even with slight flaws the general appearance of these one-of-a-kind paint

(below) One of our customers with our original 3m Extra 330S practising his tail-in hovering !

jobs is unique.

In a ‘positive’ paint job some effects can never be done. Just think about the shadows, peel backs, highlights, and 3D effects - and all with a perfectly flat and uniform surface for optimum airflow and aerodynamics.

Truly hard to do, but still possible, are the paint jobs which seem to be so simple at first glance: Schemes with straight lines and stripes. Quite easy with positive painting, but it’s very hard masking the lines in the negative moulds, because we cannot assemble the parts before masking. To get the stripes lining up exactly at the rudder, wing and cowling joints is therefore almost impossible. This is why we suggest using thin vinyl trim to make sure that these stripes line up perfectly. Sometimes it is necessary to do that, and it is definitely not a quality problem or a "flaw". It comes back to what is possible, and what is impossible.

(above) The complex paintwork is completed in the moulds by our skilled staff, to produce such stunning schemes as this, all with a perfectly flat surface.

(below) This is the FiberClassics (now ‘Composite-ARF’) force at the TOC 2000, with all models painted in the moulds.

If you want to have a really perfect paint job, then you might decide to have a single colour version and have it painted by yourself or your friend.

But don’t forget: Consider the additional cost, consider the additional weight, consider that even if it is painted ‘positive’ there will be areas you won’t be happy with.

Of course you won’t complain, because you created these flaws yourself… !

Tools and Adhesives

Tools etc:

This is a very quick and easy plane to build, not requiring difficult techniques or special equipment, but even the building of Composite-ARF aircraft requires some suitable tools! You will probably have all these tools in your workshop anyway, but if not, they are available in all good hobby shops, or hardware stores like "Home Depot" or similar.

1. Sharp knife (X-Acto or similar)
2. Allen key set **(metric)** 2.5mm, 3mm, 4mm & 5mm.
3. Sharp scissors
4. Pliers (various types)
5. Wrenches **(metric)**
6. Slotted and Phillips screwdrivers (various sizes)
7. M3 tapping tool **(metric)**
8. Drills of various sizes
9. Small spirit level, or incidence meter.
10. Dremel tool (or Proxxon, or similar) with cutting discs, sanding tools and mills.
11. Sandpaper (various grits), or Permagrit sanding tools (high quality).
12. Carpet, bubble wrap or soft cloth to cover your work bench (most important !)
13. Car wax polish (clear)
14. Paper masking tape
15. Denaturised alcohol, or similar (for cleaning joints before gluing)

Adhesives:

Not all types of glues are suited to working with composite parts. Here is a selection of what we normally use, and what we can truly recommend. Please don't use inferior quality glues - you will end up with an inferior quality plane, that is not so strong or safe.

1. CA-Glue 'Thin' and 'Thick' types. We recommend ZAP, as this is a very high quality.
2. ZAP-O or PlastiZAP, odourless (for gluing in the clear canopy)
3. 5 minute-epoxy (highest quality seems to be Z-Poxy)
4. 30 minute epoxy (stressed joints must be glued with 30 min and NOT 5 min epoxy).
5. Epoxy laminating resin (12 - 24 hr cure) with hardener.
6. Milled glass fibre, for adding to slow epoxy for strong joints.
7. Microballoons, for adding to slow epoxy for lightweight filling.

At Composite-ARF we try our best to offer you a high quality kit, combined with outstanding value-for-money, and as complete as possible. However, if you feel that some additional or different hardware should be included, please feel free to let us know.

Email us: feedback@composite-arf.com. We know that even good things can be made better !

Accessories

Here is a list of the things you may need to get your Composite-ARF Extra 330L in the air. Some of them are mandatory, some of them can be chosen by you. What we list here are highly recommended parts, and have been thoroughly tested.

1. Power servos (min. 12 required). We recommend JR8511/8611's for ailerons, and JR/Graupner 8411 or 8511/8611 for the elevators & rudder. An alternative is Futaba S9351.
2. Throttle servo (1) Any standard servo will do (eg: JR/Graupner 4041)
3. Aluminium Spinner 125 mm dia (5"), eg: Tru-Turn.
4. Main wheels 120 - 125 mm (4.5 - 5"). Kavan Light or Dubro wheels are recommended.
5. Engine DA-150. This is the recommended engine for your SuperXtra. The instructions refer to that engine several times, but you could use any other 150cc engine.
6. Mini-Pipe Muffler Set. (Consists of 2 canisters, 2 aluminium headers, 2 Teflon couplers, 4 spring clamps, and mounting hardware).
7. Standard exhaust muffler. (optional, if noise is not a problem at your field)
8. High quality heavy-duty servo extension cables, with gold connectors. High quality receiver and ignition switches, 'Y' leads, ceramic/ferrite chokes etc.
9. Receiver battery. 2 x 2400 - 2800 mAH 5-cell packs recommended.
10. Ignition switch and battery for motor. 4 cell 1400 - 1800 mAH recommended.
11. Powerbox 40/24 and dual powerswitches for Rx batteries.
12. Fuel tank (1500 ml) with gasoline stopper. We used a Dubro S-50 in this model .
13. Cable ties in various lengths.
14. Propeller. Carbon 32 x 10 or 32 x 12 Meijzlik or Menz.

About the 'New' 3.1m SuperXtra

The 'new' version of our SuperXtra has reverted to the proven 50mm wing tube for several good reasons. It is an overall lighter design, the wings are easier to assemble at the field, and it's easier to transport and ship. Furthermore we have now omitted the wing and stab incidence adjusters - because everyone discovered that there is only ONE best setting for the plane ! Finally we have added the option for a 3rd aileron servo in each wing - for extra 'snap 'response.

The level of prefabrication is still carried to the limit. Canopy frame mounting, control surface horns, servo mounts, etc., are all completed, aligned and checked, or pre-assembled, at the factory ready for your gear installation. Reacting to customer feedback, we have updated the hardware pack, and now do not install the main fuel tank support/main-board and rudder servo tray, to give you the option on position to suit your layout. Of course, these parts are all milled from carbon composite and included in the kit for you to install wherever you want.

Did you read the warnings above, and understand the instructions completely?

Then, and only then, let's start assembling your Composite-ARF Extra 330L.

If not, please read again before you start the assembly...

Building Instructions

General Tips:
We recommend that you follow the order of construction shown in this manual for the fuselage, as it makes access to everything easier and saves time in the end. The wings and stabs can be done at almost any point, and only need servos installing anyway, as we have already installed all the control-surface horns for you at the factory.

The first thing to do is protect the finished paint on the outside of the model from scratches and dents during building - so cover your work table with a piece of soft carpet, cloth or bubble-plastic. The best way to stop small spots of glue getting stuck to the outside of the fuselage is to give the whole model 2 good coats of clear car wax first, *but* of course you must be sure to remove this 100% properly before adding any decals or markings. If you prefer you can cover the majority of the fuselage with the bubble-plastic used to pack your model for shipping, fixed with paper masking tape, which also protects it very well.

When sanding any areas of the inside of the fuselage to prepare the surface for gluing something onto it, do NOT sand right through the layer of glasscloth on the inside foam sandwich !
It is only necessary to rough up the surface, with 60/80 grit or equivalent, and wipe off any dust with alcohol (or similar) before gluing to make a perfect joint.

Before starting construction it is a good idea to check inside the fuselage for any loose glass fibres that could cut your hands, and a quick scuff over any of these with a coarse Scotchbrite pad will remove them.

Note: It is *very important* to prepare the inside of the fuselage properly, by roughing up and cleaning the surface, before gluing *any* parts to it.

Landing Gear

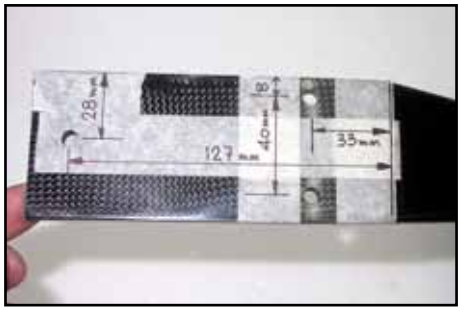
Finished in 2 hours

The 1st job is to fit the landing gear legs and you can leave these in place, as they will protect the bottom of the fuselage during assembly. Wheel pants assembly can be done later, but is shown here.

(above) The main legs are bolted in place through the bottom of the fuselage with 6 x M6 bolts.

Composite-ARF developed a new carbon fibre landing gear for the Extra. It consists of 45 deg laminated carbon fibre cloth and a huge number of carbon tows inside, all made under vacuum and heat-cured. However it is still light weight, and retains enough flexibility to take the shock out of any landings that are less-than-perfect!

To make it easy to replace or maintain the landing gear, the undercarriage fixing bolts are installed from the outside, bottom, of the fuselage, as shown in the photo here.



Mark the centreline on each landing gear, and drill 3 holes with a sharp 6.5mm Ø drill as shown in the photo. The centres of the holes are measured from the bend in the leg that will be flush with the outside of the fuselage.

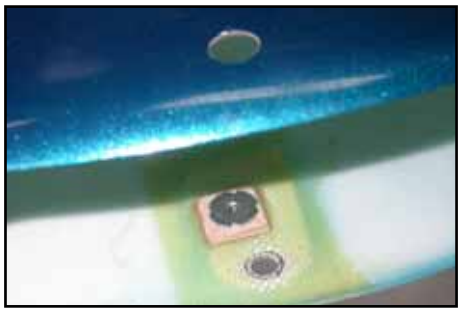
The outer 2 holes are 33mm(1 5/16") from the bend, and the inner hole is 127mm (2 5/16") from the bend. Note that they are not equally position either side of the centreline. The dimensions of 28mm and 8mm are measured from the *front* of the carbon landing gear leg.

Fix the legs into the plane with the M6 x 20 bolts and 13mm Ø washers into the blind nuts that are installed during manufacture. Both main legs are identical, before you have drilled the mounting holes, and can be used either side.

Fit the wheelpants to the legs as follows: Set the fuselage on a level surface with the tailwheel in place. Pack the bottom of the landing gear legs up by about half the diameter of the wheels used (approx. 50mm/ 2"). Rough sand the bottom of the carbon legs where the milled plywood parts will be glued, to ensure a good bond. Fit the 2 plywood pieces to the legs, using an M6 bolt and nut to hold loosely in place. Hold the wheelpants against the milled plywood pieces and adjust the angle of the plywood parts so that they fit into the recesses in the moulded wheelpants, and the bottom of the wheelpants are parallel to the ground and each other. Tack glue the milled plywood parts to the bottom of the legs with a drop of CA. Then glue the plywood parts to the legs properly with slow epoxy and milled fibre.

(above) Milled plywood part glued to carbon landing gear leg.

To keep the wheelpants at exactly the correct angle and flush against the milled plywood part that is glued to the carbon leg, glue a small square (approx. 15mm x 15mm) of scrap 3mm plywood inside the wheel pant 25mm above the axle hole and glue an M3 blind nut to it. Then secure the mainleg to the wheel pant by using an M3 bolt through the leg. Do *not* use a bolt larger than M3, as the larger diameter hole in the leg can weaken it.



(above) Shows scrap 3mm plywood plate and M3 blindnut fitted inside wheelpant.
(below) View of leg showing M3 bolt and M6 axle bolt with locknut.

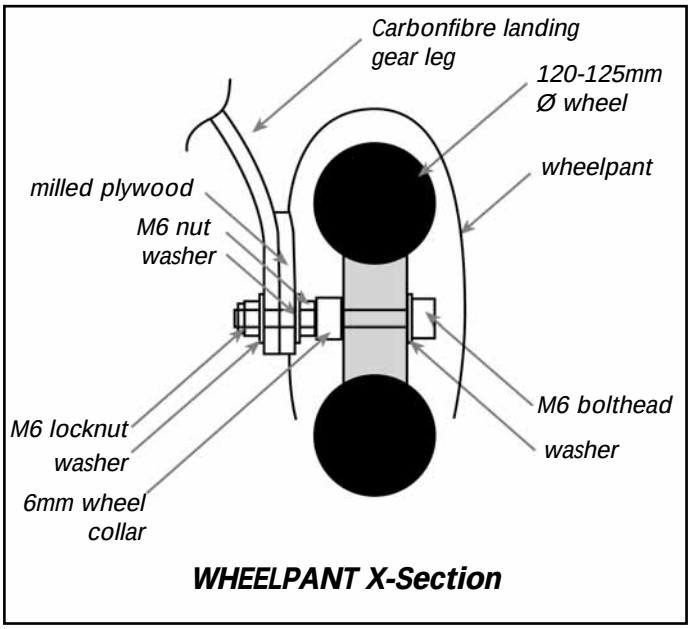
The wheel axles are M6 x 70mm hardened steel bolts, fitted through 6mm holes that you need to drill in the bottom of the landing legs. Use the small dimple moulded into the legs for the exact location. The head of the bolt goes on the *outside* of the wheel, inside the wheel pant. The order of the items on the bolt is: Bolthead, washer, wheel hub, washer, 6mm wheel collar, M6 nut, washer, carbon landing gear leg, and finally another washer and the locking nut.

You may need to adjust the thickness of the wheel collar, or add a couple of extra washers to get the wheel exactly centred in the wheel pant. A drop of loctite on the M6 lock-nut is good insurance.

It is *just* possible to assemble all the spacing washers on the axle and wheel and squeeze it all into the wheelpant carefully, but it is far easier to drill an 9mm (approx.3/8") Ø hole in the outside of the wheelpant (directly opposite the

hole for the axle on the inner face) and insert the axle bolt through this hole.

The order of fitting the wheelcollar, washers and wheel onto the axle, to centre the wheel in the wheelpant, is shown in the diagram here - but of course may vary slightly depending on the size and type of wheel used.



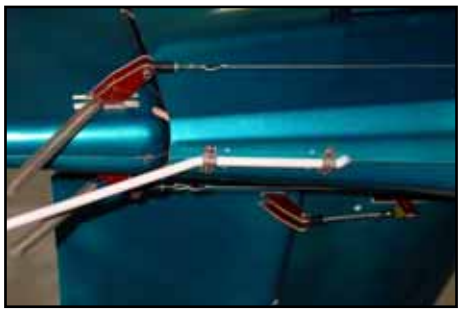
WHEELPANT X-Section

You can use any 4.5” - 5" main wheels. Kavan wheels are very lightweight, but not very durable on asphalt runways, and Dubro wheels are a little heavier but much more solid.

Any standard tailwheel assembly from a good hobby store is suitable for your Extra. The tail wheel setup shown in these photos is an optional part available from C-ARF, and is mounted with 4 sheet metal screws and 2 plastic ‘U’ brackets under the fuselage, screwed into the plywood reinforcement installed in the fuselage at the factory.

You do not need to make the tailwheel steerable, a simple castoring action is fine. However, for asphalt runways you may prefer to connect it to the rudder horn with 2 springs as shown. It’s easy to make these by winding some 0.8mm or 1.0mm Ø piano wire around a 5mm drill bit, turned slowly in a battery-drill, with a small hook in each end to connect to the tailwheel steering arms and the rudder horn.

Remember - keep it lightweight at the tail end!



(above/below) Optional tailwheel assembly from Composite-ARF.

Cowling

Finished in 2 hours

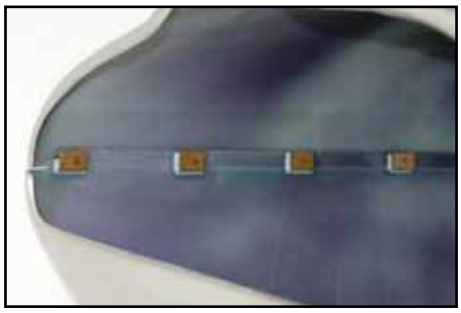
Attaching the 2 piece cowling is quite easy, as it is already cut and trimmed at the factory, and should need almost no adjustment for a perfect fit.

Sand the inside surface of both side (horizontal) flanges to ensure a good gluing surface, and glue the 8 small pieces (size 10 x 20mm) of 3mm milled plywood onto the flanges of the bottom part of the cowling (4 each side), spaced equally from the back to the front (see photos). The front edge of the front piece should be 35mm (1.5") from the front of the cowl to clear the end of the mounting flange. You can tack them in place with thick CA, and then reinforce with 30 minute epoxy and microballoons mix.

Then take the bottom half and drill 3mm holes through the dimple in either side, which match up with the dimple on the fuselage, which also need to be drilled 3mm Ø. Do the same by drilling the 2 holes in the back edges of the top half of the cowling also, in the marks/dimples that are moulded in. Temporarily bolt the bottom and top halves in place on the fuselage with two M3 bolts and blind nuts on the inside (inverted), and check for good fit. Tape the rest of the bottom and top halves firmly in place, ensuring a flush fit with the fuselage, and no gaps. If necessary you can sand the inside back edges of both halves of the cowling to have a perfect flush fit with the fuselage.

Now check the fit of the overlaps of the 2 halves of the cowling, and sand the inside edges a little if needed for a flush fit. When happy, tape together firmly and drill through the joining flanges into the 8 plywood pieces, and secure with 2.2mm ø x 10mm sheetmetal screws provided. The holes for these small screws should be exactly 5mm from the bottom edge of the top half of the cowling. The rearmost 2 screws will need to be shortened after fitting, otherwise they will touch the motor dome. Just cut them off flush with the inside of the plywood pieces.

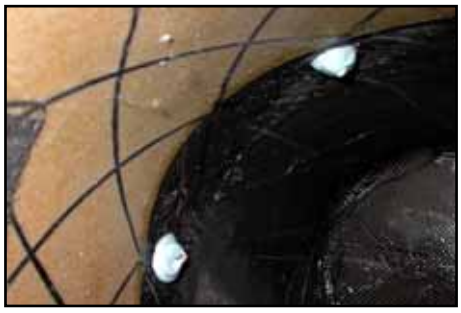
The cowling is retained on the fuselage with 9 bolts M3 x 12mm and blind nuts. Drill one 3mm diameter hole at the top/centreline of the cowl, approx. 10mm from the back edge of the cowling, and insert an M3 x 12mm bolt and then glue an M3 blind nut inside the fuselage with one drop of thick CA glue. Don't forget to rough up the area inside the fuselage with coarse sandpaper first to ensure a good glue bond. Note that the blind nuts are fitted *reversed*, with the spikes pointing inwards! Check alignment again, and then drill and fit the other 6 bolts in the same way, securing the blind nuts to the inside of the fuselage with a single drop of thick CA. Don't forget to wax, or oil, the M3 bolts first, to



(above and below) Drill the moulded-in marks in the fuselage and both cowling halves and retain with M3 bolts to ensure perfect alignment.

make sure that you don't accidentally glue any of the bolts to the cowling or into the blind nuts! Space the bolts about 125mm (5") apart, so that the lowest 2 bolts will be about 35mm from the edges off the square cutout in the bottom of the cowling, which retains it properly.

Finally remove all the bolts and cowling, and glue the 9 blind nuts in place properly using a thick mixture of 30 minute epoxy and micro-balloons, as shown here.



(above) M3 blind nuts, fitted reversed, and fixed with thick epoxy and micro-balloons mixture inside the motor dome.

Cockpit Canopy

Finished in 1 hour

The canopy frame mounting has already been completed at the factory for you. It is held in place with 4 bolts (M4 x 12mm) and and the holes are counter-bored so that the bolt-heads sit flush with the fuselage surface. Fitting the clear canopy into the frame is a little bit tricky, but this is a step by step guide of how to do it successfully:

Sand the inside edges of the canopy frame carefully with rough sandpaper, to ensure a perfect fit of the canopy inside. Lay the canopy on top of the frame, and mark the rough shape with a felt pen or wax crayon. Cut the outer border of the clear canopy with sharp scissors, about 12mm (1/2") too big all around. Unless you are in a very warm room, we recommend that the canopy is slightly warmed up with a hair dryer to prevent cracking - but be careful not to melt or deform it! When the canopy fits inside the frame roughly, mark the final cut line on it. Then cut it to exact shape with a 6 - 8 mm overlap all around.

(above) Counterbore the 4 holes for the canopy frame bolts so that the heads sit against the plywood plates in the fuselage.

Make several hand-holds with wide paper masking tape (see photo) to make holding and positioning the canopy easy. Push the canopy up tightly inside the back of the frame and fix the bottom 2 back corners with one drop of slow CA each (ZAP-O or Plasti-ZAP recommended).

Note: Do NOT use any CA accelerator/kicker - you will immediately 'fog' the clear canopy!

Tape the front of the canopy to the frame temporarily. Mount the canopy frame to the fuselage (use all 4 bolts), and tape the back of the canopy frame tightly to the fuselage. Using the masking tape handles to pull the canopy outwards firmly against the frame, working from the back towards the front, glue the edges of the canopy in place in 2 more places each side, with just a single small drop of CA at each position, all the time checking that the edge of the canopy is tight up against the frame at the front.

(above) The canopy frame is held onto the fuselage with 4 plywood tongues and M3 bolts/blind nuts. Notice canopy finally glued in with epoxy and microballoons mixture.

Then make visual check from the front and back to make sure sure that the canopy is straight. Now that the canopy

is fixed in position and cannot twist or warp anymore, you can carefully glue the rest of the canopy firmly in place. You can either complete the gluing from the outside, allowing the CA glue to wick into the joint between the frame and the clear plastic or, if you prefer, you can carefully remove the canopy frame from the fuselage, and use a 30 minute or 24hr epoxy and micro-balloon mixture for gluing all the edges to the frame on the inside surface. Even if you use the CA glue method, we highly recommend that you also glue the inside edges with the the epoxy mixture to be sure that the canopy cannot come off in flight.

(above) The canopy is glued in place with CA, using masking-tape handles to pull it into place.

If you wish you can tint the inside of the canopy using one of the aerosol spray paints used for painting the inside of poly-carbonate car bodies (eg: the Tamiya or Lexanit ranges). Use many very light coats to get even coverage.

Horizontal Stabs — Finished in 2 - 3 hours

The stabs are 99% finished at the factory, and only need the 4 servos, outer elevator horns and linkages installing. We have already installed the inner control surface horns for you, but it is *mandatory* to fit 2 servos in each stab, to prevent any chance of flutter, and so you need to install the outer control surface horns for the outer servos in each elevator half. Follow the instructions below for fitting the outer horns into the elevators.

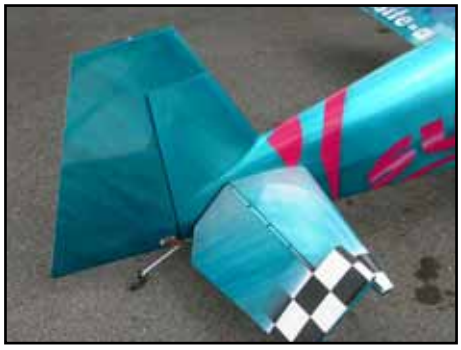
First insert the 20mm aluminium tube spar in the fuselage sleeve, and the 10mm Ø anti-rotation-carbon tube at the front, and install both stabs to check the fit between the root ribs and the fuse-lage. You might have to sand the root of the stabs slightly to make a perfect joint, and if the tube is too long can to shorten it a little.

You have a choice of servos for the elevators, either a pair of the hi-power digital JR8511/8611's in each stab, or a pair of JR8411's, which is also sufficient for each elevator.

Important Note: *C-ARF also strongly advise that you partly static-balance the elevators by glu-ing 25 -30 grams (3/4 - 1 ounce) of lead in the leading edge of the outer mass-balance area in each elevator half, which helps to prevent any chance of flutter that could destroy your Xtra. (see photo on page* 19)

Although the JR8511/8611 servos are about 1 mm longer and wider than the 8411 type, you will find that both sizes will fit in the milled servo cutouts in the rib without problems.

The elevators are hinged to each stab using the 4mm Ø aluminium tubes provided. Make sure there is no burr on the end of the tube, and you can chamfer the end slightly with fine sandpaper to make it easier to get them through the holes in the phenolic hinge plates. Be careful inserting them, and if they are a bit stiff, then use a little grease on the tubes. Don't use too much force, otherwise some of the phenolic plates inside might break loose. Leave the tubes a bit too long during construction, and cut them to exact length when the model is finished. During final assembly,



retain both ends of the tubes with a small piece of clear tape on the root and tip ends of the elevators.
NB: To fit the dual servos in each stab you must fit the outer (tip) servo first, using a long (30cms/12") screwdriver, inserted through the inner servo hole in the root rib to tighten the bolt that holds the servo arm onto the servo shaft.

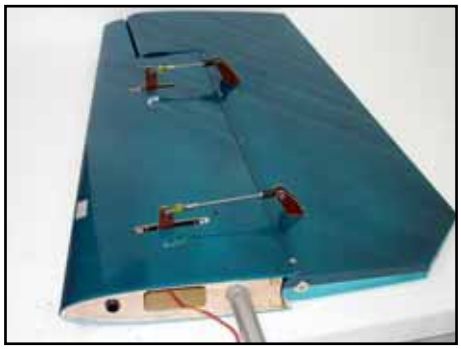
To fit the outer servo, proceed as follows: Mill out a slot in the fibreglass tip of the stab., as shown, to allow the servo to fit in the milled hole in the rib that is already built in during manufacture. Note that the servo is fitted *inverted*, with the servo shaft nearest to the leading edge of the stab. You will need to drill a hole of about 6mm (1/4") in front to get the screwdriver though to tighten the front servo screws. Use the 2.9mm Ø x 13mm screws provided in the kit, *not* the standard screws provided with the servos. You can cover these holes in the tip of the stabiliser moulding with pieces of self-adhesive film afterwards if you wish. You may need to grind 1mm or so off the inner end of the phenolic hinge plate that projects inside the false trailing edge of the stab for enough clearance to install the servo.

Mark and mill out the slot in the bottom of the stab for the servo arm. The slot should be approx. 4mm wide and 55mm long, and the back of the slot should be about 50mm from the trailing edge of the stab. If using JR8411 servos and C-ARF servo arms, then the centre of the slot should be exactly 16mm inside the servo rib, which can be seen in the false trailing edge. In any case, start the slot a bit smaller than this, and enlarge until correct.

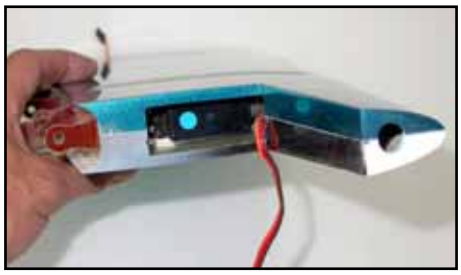
At this point you should fit the elevator to the stab, and make the control surface horn alignment template from a piece of thin scrap plywood as shown here. Make the template to fit the *inner* horns, which are already installed at the factory, and drill a 3mm hole in the plywood that exactly lines up with the 3mm holes in the double horns. Check that it's correct by putting an M3 bolt through the horns and the template. Notice the small 'hook' at the back of the template to set the position from the trailing edge of the stab.

The elevator is 3mm *thinner* at the position of the outer servo than the inner servo and (as it is centre-hinged) so the horns must project out of the elevator 1.5mm *more* for the outer servo than for the inner/root servo. This important to get the same throws from each servo, and prevent them working against each other, and possibly stalling, causing a big current drain on your batteries. Therefore, glue a small scrap of 1.5mm thick ply or balsa to the bottom of the template and use it to set the position of the outer horns while you glue them in place.

Now mark the position of the slots on the elevator for the



(above) Completed stabiliser and linkages showing the mandatory 2 servo set-up, also showing the 20mm Ø stab spar tube and anti-rotation pin.



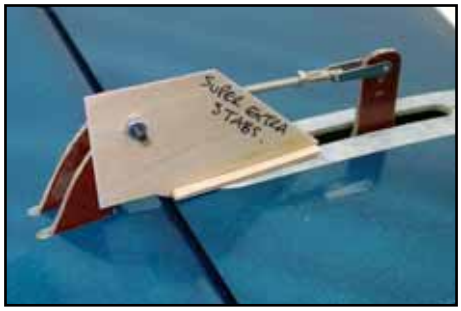
(above) The outer servo is fitted into the stab inverted, against the factory-fitted rib. Note the hole in the tip leading edge for access to the servo securing screws.

(above) Cut the slot for the C-ARF servo output arm.
(below) Horn template for outer horns is made using the inner elevator horns for identical throws.

outer control surface horns. Mill the slots with a dremel until the horns fit properly and can be temporarily joined with one of the ball-links provided and an M3 bolt though the horn alignment template as shown. Put a layer of masking, or clear, tape over the area of the milled slot, wax it carefully, and then cut through the tape with a very sharp knife to allow the horns to be glued into the slots. This stops the glue getting on the surface of the elevator. Scuff up both sides of the phenolic horns with coarse (60 grit) sandpaper or a Permagrit tool to ensure a good glue bond, and glue them in with slow epoxy (minimum 1hr cure) mixed with milled fibreglass, or a filled thixotropic epoxy (eg: Loctite/Hysol 9462 or BVM Aeropoxy). Check that horn is at 90° to the surface of the elevator, and wipe excess glue off before it cures.

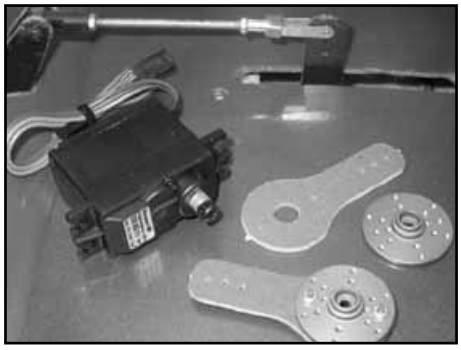
(above) Slots cut in elevator for outer dual control surface horns. (below) Add 1.5mm scrap ply to the bottom of the horn alignment template for correct positioning of outer elevator horns.

Important Note: *The C-ARF phenolic servo arms supplied with the kit have to be attached to the servo output discs, but if using the 8511/8611 servos it is* ***mandatory*** *to use metal (aluminium) servo output discs for this - and* ***not*** *the standard plastic output discs supplied with the servos, as the extreme torque of these digital servos can strip the plastic splines from the inside of the disc - which will result in immediate flutter and destruction of your SuperXtra.*



(above) We strongly recommend that you partly mass-balance the elevators with 25-30grams lead in each as shown here.
(below) You must use aluminium discs on the servos, especially if using the 8511/9611 servos, fixed to the C-ARF phenolic servo arms with at least 2 bolts each.

We also ***highly*** recommend that you also use aluminium output discs when using the JR8411 servos, or other similar hi-torque digital servos. Several reputable after-market accessory companies make suitable aluminium discs, but you must check that the CNC machined splines fit the servo output shaft tightly, with a minimum of play. Fit the discs to the servos and use a little Loctite on the retaining bolt in the centres. Centre all 4 elevator servos using your R/C and attach the phenolic servo arms to the outside of the metal discs temporarily with a couple of drops of CA, making sure that the servo arms are at exactly 90° to the bottom surface of the stabs using a set square. Then remove the arms and discs, drill through both, and secure with at least 2 small bolts, washers and locknuts (M2 or equivalent size).

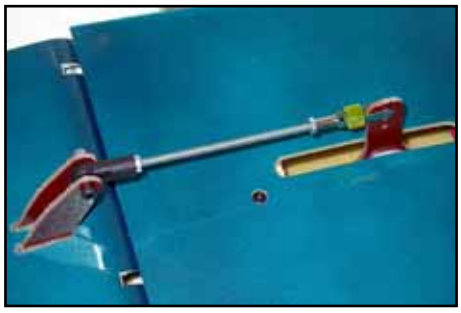


Make up the linkages from the hardware supplied, using M3 threaded rods (90mm for inner servos, 65mm for outer servos), with a quick-link and M3 nut at the servo-end, and a ball-link in between the double horns secured with an M3 bolt and locknut. Add short pieces of Tygon fuel tube, or similar, to make sure the quick-links cannot open in flight ! The last job is to fit the M3 stab retaining bolts and blind nuts. Inside the stabs you will see the small plywood reinforcement plates between the spar sleeve and the bottom surface of the stab. Mark the bottom of both stabs in the centre of this plywood. Install the aluminium tube into 1 stab, and drill a 2.4mm hole right through the stab surface, the plywood plate, sleeve and into the 20mm aluminium

tube. The centre of the hole should be about 34mm from the trailing edge of the stab. Thread the hole with an M3 tap and secure it with an M3 x 16 bolt. To be really secure, you can glue an M3 blind nut inside the stab spar tube, as shown here, with some 30 minute epoxy and micro-balloons. Wax or oil the bolt first!

Fit both stabs to the fuselage, check that they fit tightly to the fuselage at the roots, and then drill the hole in the other stab and spar tube, thread as before, and secure with another bolt. Counterbore the holes in the bottom surface of the stabs for the boltheads so that they fit flush (see canopy frame section).

Note: Try to always leave the stab tube fixed in one stab, and never remove that one bolt, as it is very difficult to find the right position for the stab tube again if it is removed from both stabs!



(above) The completed inner elevator linkage. You can also see the head of the M3 retaining bolt, with the bolt head counterbored flush into the surface of the stab.
(below) M3 blind nut glued inside the stab spar tube with 30 minute epoxy and micro-balloons mix.

Rudder — Finished in 2 hours

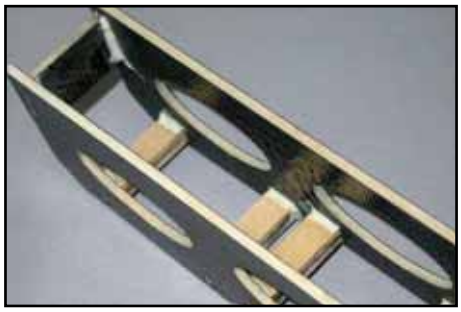
Fit the rudder to the vertical stabiliser with the 4mm Ø brass tube supplied, in the same way as the elevators. Check for smooth movement. The dual phenolic rudder horns are already glued in place at the factory during manufacture.

The rudder is a huge surface on the Extra 330L and the choice of servo is up to you. For pattern flying 4 hi-torque servos (eg: JR4421) would probably be sufficient, but if you plan to fly 3D or radical freestyle we highly recommend using 4 power servos, like the JR8411's shown in this installation, or 8511/8611's. You will be pleased you did!

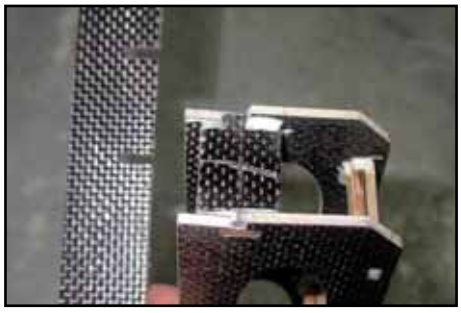
Make up the Rudder tray from the milled carbon-plywood parts supplied. Prepare all joints by sanding, and assemble as shown, using thin CA to secure all the tabs and slots. Cut 8 small pieces of plywood from the strip supplied and epoxy onto the bottom of all the servo rails. Finally reinforce all joints with epoxy and micro-balloons mixture. Drill the 2mm Ø holes for the servo mounting screws before gluing the assembly into the fuselage - it's much easier!

The Rudder tray and Fuel tank base are assembled from the milled carbon parts & plywood strip included, as shown below.

The rudder tray is supported on the 2 carbon-balsa formers supplied, and it's exact position is your choice. However, the back former is usually installed vertically in line with the rear wing dowels, as seen here. Notch both ends of the rudder tray to fit into the slots in the formers (photo right). Prepare the inside surface of the fuselage carefully, and glue the complete assembly in place with epoxy and micro-balloons mixture, with a nice fillet on all joints.



(above) Glue plywood doublers to the bottom of the servo rails.
(below) The completed rudder servo tray is light and very stiff.



(above) Notch the ends to fit into the slots in the formers.
(below) Completed Rudder tray and sub-formers glued in the normal position, with rear former in line with rear wing dowels.

Install the 4 servos into the rudder tray using the 2.9mm Ø x 13mm screws supplied, with the servo output shafts towards the tail of the plane, as shown in the photo.

Rough sand the top surface of 4 standard 25mm (1") diameter plastic output arms with 60 grit, or a Permagrit, and the bottom surface of the 4 phenolic rudder servo arms provided to ensure good glue adhesion. Then fit the plastic output discs to the servos and connect all 4 servos to your R/C system (through the Powerbox) to centre them.

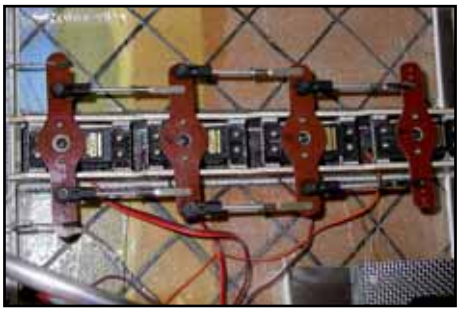
With the R/C still switched 'ON' place the C-ARF rudder servo horn with the 2 hooks in it on the back servo (hooks facing forwards, of course !) and align so that it is at 90° the the rudder servo structure, and glue in place either with a few drops of CA, or with a slow thixotropic epoxy. You can do this using a plastic 90° set-square, and aligning one edge of it with the centre of all the servo arm bolts. The more accurately you do this, the easier it will be to set up the linkages later, but 3° or 4° 'out' will still be OK. Then do the same with the other 3 horns. When the glue has cured, remove all 4 and secure the phenolic arms to each output disc with 4 of the small (2.2mm Ø) sheet-metal screws supplied. It is a very good idea at this point to number the phenolic horns so that you know which one goes on which servo, and which is the front of the horn !

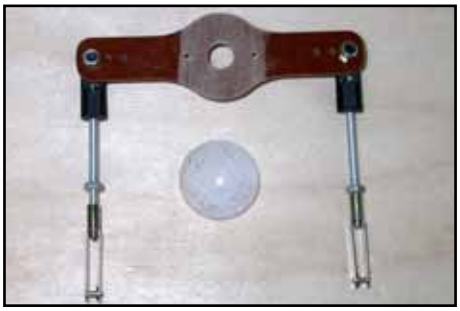
Now connect the horns together with the 45mm long M3 all-thread, ball-links, quick-links, M3 x 16mm bolts and locknuts provided. The easiest way to do this is to firstly connect the back 2 servos together, and adjust them so that there is no servo 'buzzing' at idle or full throw. Then connect the next servo, and do the same adjustment, and finally connect the last servo.

In this way you always know which linkage to adjust when you have 'buzzing', but if you just connect all 4 servos together immediately it can take for-ever to get them right! Note that you will need to re-drill the inner holes (2nd hole from the end) in each phenolic arm 2.9 or 3mm Ø for the M3 bolts. Don't forget to put the M3 nuts on each threaded rod and tighten them up against the quick-links when you have finished the adjustment, and add a drop of Loctite to the locknuts to make sure the ball-links cannot come loose.

The last job is to connect the back servo to the rudder horns with the cables supplied. Cut the 2 slots for the cables to exit the fuselage about 3mm high and 40mm long. the back edge of the slots starts at the front edge of the balsa bulkhead in side the fuselage, and the centre of the slot should be 22mm (7/8") above the bottom chine (corner) of the fuselage. Mark the slots on a piece of masking tape stuck to the fuselage, and cut out with a very sharp knife, and adjust with a small file.

Make the pull-pull wires for the rudder from the hardware supplied, with a loop at the front that goes over the hooks on the output arms, and a quick-link with turnbuckle/threaded end and locknut at the rudder end. For security pass the closed loop cable through the supplied 'crimping tubes' 2 times before squashing flat with pliers (see photo on page 20). Make sure that the wires are tight, and check and adjust after the first few flights as the cables straighten out. Even a small amount of slop will prevent your Extra from perfect tracking.





(above) Shows the pull-pull rudder cables in the slots, the carbon anti-rotation pin, hole for the 20mm°Ø tube spar and the hole prepared for the servo extension cable connector mounting.
(below) Pass rudder cable thru' crimping tubes 2 times for safety.

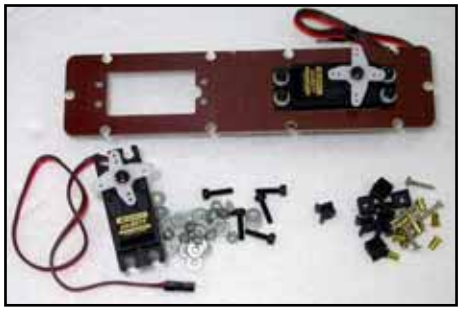
Wings

Finished in 4 - 5 hours

The wings are 95% finished at the factory, and have already been installed on your fuselage to check the alignment. Even the dual phenolic aileron control surface horns have been installed for you. Slide the wings onto the 50mm Ø wing spar tube and check for a perfect fit. You can sand the edges of the wing roots a little if needed. Fit the 4 plastic wing retaining nuts onto the M6 threaded wing dowels. You may need to sand the edges of the spar cutouts in the sides of the fuse a little bit so that the spars don't touch the edges of it.

The standard wing set-up is for 2 servos for each aileron, which are installed in the CNC-milled phenolic plate supplied in the hardware package. This plate is designed to accept a pair of JR8511/8611 servos, which we strongly recommend for this plane, although JR/Graupner 8411's or similar servos will also fit, and should be sufficient if you only plan to fly 'pattern' manoeuvres rather than 3D style.

Note: *As an option you can install a 3rd aileron servo, in the outboard wing rib, for extra 'snap' response. For 3rd servo installation,* *see page 25.*

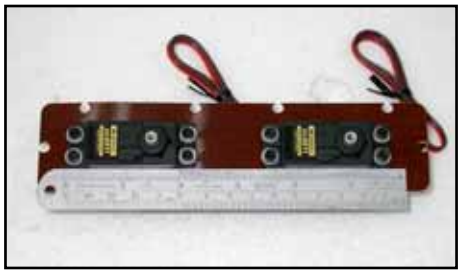


(above) The JR8511/8611 servos and supplied mounting hardware. (below) The 3 phenolic servo arms, prepared before gluing and screwing in position.

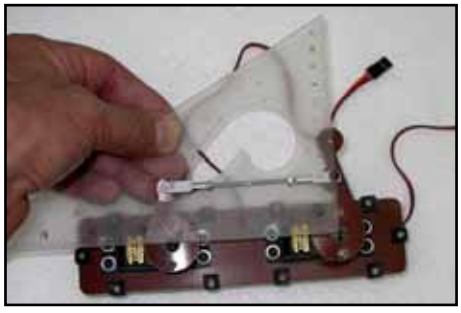
The phenolic servo plates are identical, and there is no 'front' or 'back'. First fit the JR8511/8611 servos into the plate as shown, using the supplied M3 x 12 bolts, small washers and M3 locknuts on the back face, *without* using the rubber grommets supplied with the servos.

Use a steel straight-edge to make sure that both servos are parallel. Then fit the rubber grommets and brass ferrules (supplied with the servos) into the 10 milled slots around the edges of the phenolic plates as shown.

Prepare the 25mm Ø servo arms and C-ARF phenolic servo arms as usual, by rough sanding for a good glue joint. Note that one of the long phenolic arms will need the central hole re-drilling to fit over the centre boss on the *underside* of the standard plastic servo disc (Ø 10mm for JR/Graupner servo arms) as shown in the photo.



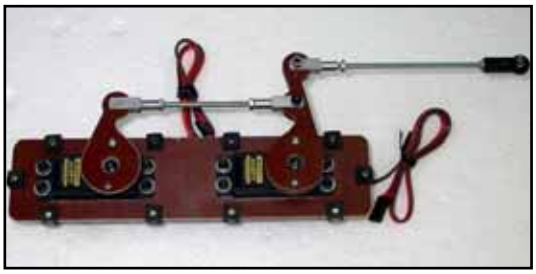
Fit the plastic servo discs to the servos and centre them both using your R/C system. Using a small 90° square as shown, set the shorter single phenolic arm on top of the plastic servo arm on the front servo, and glue in place with a couple of drops of thick CA (or slow filled epoxy), making sure that the output hole for the clevis is at 90° to the centreline of the servos.



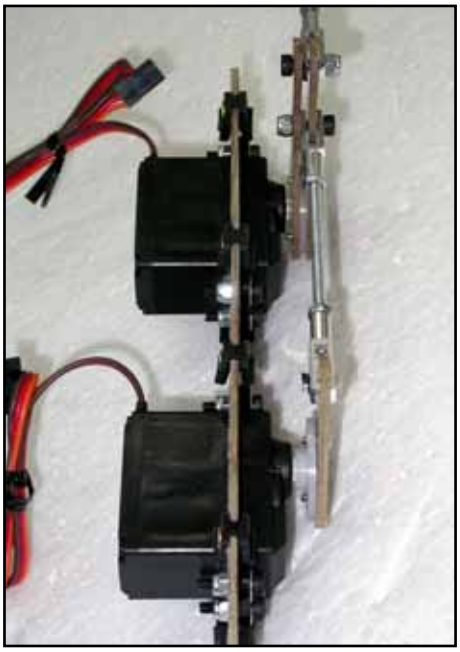
Do the same with the 2 phenolic arms for the back servo, sandwiching the plastic servo output disc between the 2 phenolic arms as shown. Again make sure that the hole for the clevis is at 90° to the centreline of the servos.

(above) Check carefully for neutral alignment of the C-ARF horns on the standard servo discs.

Finally secure the phenolic arms to the servo discs using at least 2 small sheetmetal screws (2.2Ø x 10mm) in each. Make up the linkage between the 2 servos *exactly* as shown in the photo (right), using the 60mm long M3 all-thread, 2 nuts and 2 x M3 clevises. This is important to make sure that there are no 'twisting' moments induced, which could cause aileron flutter.



Note that the back clevis is secured between the 2 arms on the back servo with an M3 x 16mm bolt and locknut, but the nut must *not* be over-tightened or it will prevent smooth movement. The front clevis is secured using the pin and 'C' clip. Carefully adjust the length of the linkage so that there is no 'buzzing' from the servos at neutral or full throw positions.



Then make up the linkage that goes from the end of the back phenolic arm to the aileron horn, using the 90mm long M3 all-thread, one clevis, 2 x M3 nuts and an M3 ball-link on the end. As before the clevis are secured between the 2 phenolic horns with an M3 bolt, and the nut must *not* be over-tightened. We advise one drop of Loctite on the bolt threads so that the locknuts definitely cannot come loose.

Important: Note that both clevises on the rear phenolic servo arm are fitted to the *outside* horn, to keep all the forces in line. This is important to make sure there are no twisting moments, which could cause aileron flutter.

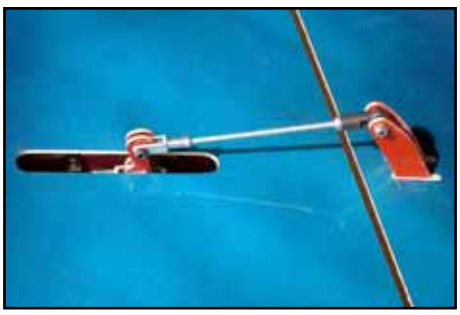
Install the completed aileron plates in the wing, using a long X-head screwdriver and secure with 10 of the 2.8Ø x 14mm sheetmetal screws provided, into the holes that are drilled in the carbon-composite rib for you during manufacture. Be careful not to trap the servo cables between the phenolic servo mounting plate and the rib.

Check that the phenolic servo horn and linkage align with the dual control surface horns in the aileron. With the R/C switched 'On', adjust the length of the linkage to the aileron, and connect the ball-link between the horns with an M3 x 16mm bolt and locknut. You may need to make the slot in the wing a little wider to clear the bolt and locknut on the phenolic servo arm at full throw.

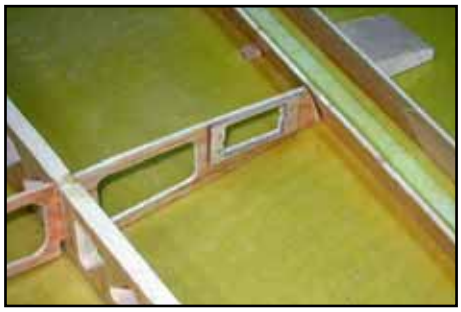
(above) The completed servo tray installed, screwed to the carbon-composite rib with the standard servo screws & rubber grommets. (below) The completed aileron linkage, using all the hardware supplied with the model.

Optional 3rd servo

In the new 'wing-tube' version of the SuperXtra we have added the option for fitting a 3rd aileron servo in the wing, outboard of the standard pair of servos. The outer rib is already has a hole pre-milled for this servo (see photo below). This 3rd servo gives improved response for 'snaps' etc, but it is not absolutely necessary.



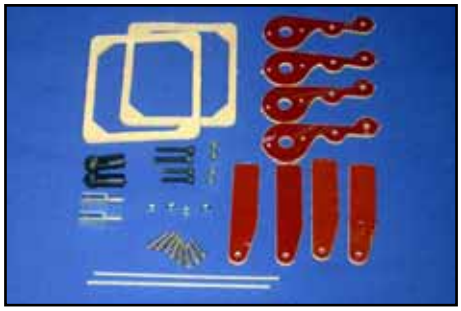
You have 2 choices for servo installation; you can make a very long X-head screwdriver and insert it from the wing root, which is quite tricky but neat - or you can cut a servo hatch in the bottom of the wing surface. If you chose to cut the servo hatch you will need to use the section of wing that you cut out for the cover hatch, and reinforce the underside of the wing skin with the plywood frames supplied in the hardware for the securing screws.



(above) The outer rib in the wings is already milled for the 3rd servo, and has plywood reinforcement on the outer surface as shown.
(below) An example of the linkage for the outer servo the SuperXtra wing, using the phenolic horns & linkage hardware supplied.

The aileron horns are not factory-fitted, but it is an easy job. Duplicate the angle and set-up from the inner aileron horns, but make sure that the 3mm hole in the horns is 9mm further out from the aileron surface, to get the same throws, because the wing is 9mm thinner from the top-hinge axis at this position. Mill the slots in the aileron, sand the portion of the phenolic horns that will be glued inside, in the pre-installed balsa block, and glue them in place with epoxy and micro-balloon mixture - using the same method as explained for the Stabiliser horns.

The pair of the shaped phenolic servo arms must be glued on both sides of a standard plastic servo disc, in exactly the same manner as for the inner servo (see photo page 23). With the servos installed, using the 2.9Ø x 13mm sheet-metal screws provided in the kit, cut a slot in the bottom wing surface for the servo arms, and make up the linkage from the M3 threaded rod, M3 aluminium clevise and ball-link supplied.



(above) The additional hardware included for optional outer servos.

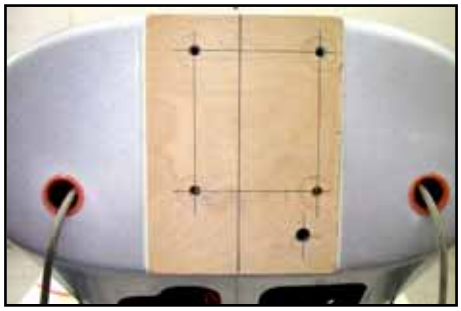
Engine and Exhaust Installation — Finished in 5-6 hours

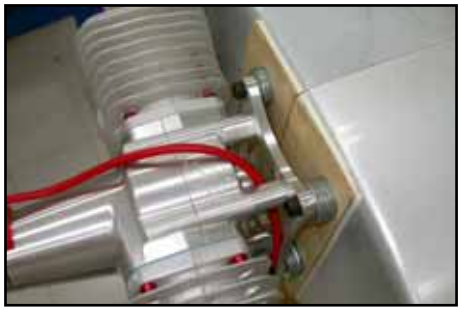
Here we show the installation of a Desert Aircraft DA-150 motor and MTW headers and mini-pipes (available from C-ARF as an option) which is a highly recommended combination with lots of power, yet lightweight. The DA-150 motor fits fully enclosed in the cowling, and no cutouts or holes are needed. Of course many other engines in the 120 -150 cc range are suitable as well. All measurements shown here are according to this set-up, but in the future we hope to add the mounting dimensions for other popular engine and muffler combinations to out website.

The moulded motor dome is reinforced inside with plenty of carbonfibre during manufacture and does not require any additional strengthening, and the plywood reinforcement plate is also already installed for you. The firewall has no downthrust or sidethrust built in to it. When using the DA-150 and a 32 x 10 or 32 x 12 carbon 2-blade propeller, it is usual that this combination

requires about 3 - 3.5° sidethrust, and nominally 0° downthrust. However, due to the mould joining process it is possible that the downthrust can be off by 1/2° or so, but this can be checked easily by setting the wing at 0° incidence and checking the vertical face of the firewall with an incidence meter if you wish.

(above) Vertical centreline and the 1st hole to be drilled shown here. (below) The 4 holes for the motor mounting, and 1 for the linkage from the throttle servo.





To set the positions for the 4 mounting holes for the DA-150 engine), first accurately mark a vertical centreline on the front of the plywood firewall, as shown. Then mark a horizontal line across it 28mm (1 1/8") down from the top of the firewall. The 1st hole (top left hole in pilot's view) is positioned on the horizontal line, 52mm to the left of the vertical centreline. Drill *only* this hole 7.5mm Ø and fit an M6 blind nut inside the firewall and fit the engine in place using only one bolt to check alignment. You will need to pack the engine mount off the firewall by about 11mm, using a stack of large washers so that the spinner backplate has about 4 - 5mm clearance from the front edge of the cowling.

Bolt the cowling in place and put the spinner backplate (125mm/5" Ø) on the motor. Check that the overall height of the motor is correct, and that the top edge of the spinner is approx in the centre of the curved radius on the top edge Drill the 2nd hole, exactly 80mm to the right of the first (pilots eye view). Again mount the motor temporarily, packed off the firewall with a stack of washers about 7.5mm thick, for the sidethrust. Re-fit the cowling and spinner backplate. Ideally the spinner backplate should be in line with the centre of the cowling, and the edge of it should be in the middle of the curved radius on the top edge of the cowling.

If the position is OK, or close enough, then remove the cowling and drill the other top mounting hole, and fit the 2nd blind nut and bolt in place. If you need to increase the moulded in sidethrust a little, use a slightly thinner pack of washers on the 2nd bolt. Again fit the cowling and spinner backplate to check alignment.

If correct, then drill the last 2 holes and bolt the motor in place, adjusting the thickness of the washer packing to leave a minimum 3mm (1/8") gap between the back face of the spinner backplate and the cowling. The centres of the 4 mounting holes of the DA-150 are 80mm horizontally, and 90mm vertically, and with the first 2 holes drilled it is easy to mark the other 2, using a 90° square and offsetting from the 1st two holes.

NB: In the instance that your 1st hole was not in the correct place you can enlarge it a little with a file to correct it, and refit the blind nut, or plug the hole with a piece of hardwood dowel, glued in with slow epoxy and re-drill in the correct position when it is completely cured.

Finally glue the 4 blind nuts to the inside of the firewall and fix in place with a little 30 minute epoxy.

Adjustments to sidethrust after the first flights, if needed, can be made by adding or removing washers between the back of the engine mount and the firewall. In the future we hope to add the mounting hole dimensions for other popular motors to these instructions, or on the website.

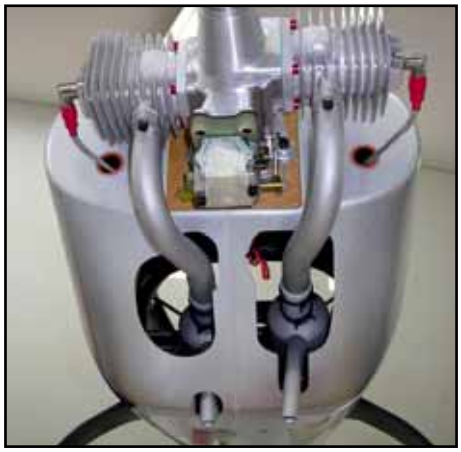
Throttle servo: Make up the throttle servo mount, as shown, from the milled plywood parts supplied, and glue the mount onto the baseplate with 30 minute epoxy and milled-fibre mix. It is your choice where to mount it, but we *do not* recommend that you mount it on the back of the firewall (as shown in a couple of these original photos) because the engine vibrations can 'kill' the servo quickly. A good position is on the side of the fuel tank mount, but the long linkage must be properly supported. The M3 threaded rod, nuts and clevises for the linkage are supplied in the hardware pack.

All DA motors need quite a lot of servo throw to get the full throttle range, so make sure you can fit a long output arm on the servo, and allow for this when cutting the clearance hole in the firewall for the linkage.

Standard Mufflers: If you are using a standard muffler just mount it onto the engine and check if you need to cut clearance holes in the bottom of the cowl for the exhaust outlets.

Mini - Pipes: An internal mini pipe installation is a little more complicated than the use of standard mufflers, but sometimes you don't have any choice, especially if you have noise problems at your club field. In Europe noise is always a problem, so Composite-ARF had to find a quiet and powerful solution, and we recommend the MTW short mini pipes with the headers as shown in this installation. They come complete with teflon joiners and swage clamps and this package can be ordered from Composite-ARF as an option. This set-up gives the engine a nice throttle response, a perfect mid-range, and also increases the top end power slightly.

(above) We highly recommend the MTW mini-pipes, headers and teflon connectors, which C-ARF can supply as an option. Also seen here is the steel strip, bent to the shape of the 2 mufflers.



The Throttle servo mount is assembled from the milled plywood parts, and positioned on the side of the fuel tank plate, or in your chosen position.

The main plywood bulkhead in front of the landing gear already has the 2 semi-circular cut-outs for the twin mini-pipe system, so installation is quite easy. Mount the 2 headers to the motor and use these to find the approx. locations of the cut-outs needed in the bottom of the motor dome. Mill these in the motor dome for the mini-pipes. Keep them small at this time, and enlarge them later for a perfect fit and sufficient cooling. We recommend that you make the holes in the lower firewall at least 12mm (1/2") bigger than the diameter of the mufflers to allow enough cooling air flow. C-ARF advise that you do not cut through the central vertical 50mm (2") wide carbon joining tape between the 2 headers.

The twin mini-pipes seat on a steel strap (supplied with a template for bending), and are held in place with 2 springs. The springs are hooked over three M3 bolts that are screwed into 2.5mm Ø holes drilled in the 3 small plywood blocks that are securely glued to the front of this bulkhead. The photos here should make the construction very clear.

You will find that the mufflers must be angled downwards at the back to make sure that they clear the wing spars when the wings are in the forward (3D) position, and you may need to bend the headers very slightly to achieve this, which is easily done by hand. You might need to enlarge the 2 semi-circular cut-outs in the bulkhead slightly, as we have in the photo above, to get this angle.

(above) View of the muffler mounting from the front, taken through the firewall.
(below) View of the twin muffler mounting from behind.

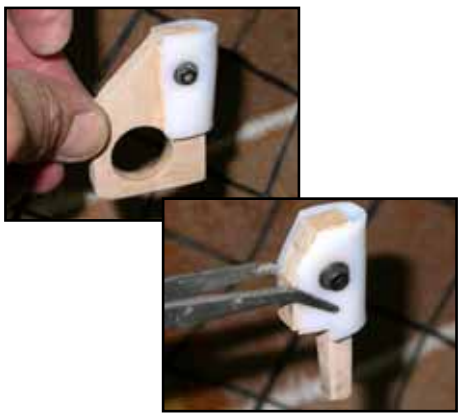
If you don't have any suitable springs to retain the mini-pipes it is very easy to make them. Just clamp a length of 1.0mm piano wire and an old screwdriver (about 5mm Ø shaft) into a battery drill, and hold the other end of the wire in a glove while spinning it on *slow* speed. Bend 2 hooks in the ends to finish the job. Please take care doing this.

To be really sure that the mini-pipes cannot more backwards and touch the spar, we install a couple of 'stops' made from scrap 6mm (1/4") plywood, with a small piece of teflon joiner held onto it with an M3 bolt. Glue these behind the mufflers, against the carbon-composite bulkhead.

(above and below) For additional security, you can fit 'stops' behind both mufflers, so that they cannot move backwards. These are easily made from teflon tube and 6mm plywood blocks as shown.

This simple mini-pipe retaining system has proven very reliable for several years in all our planes, and holds the pipes securely enough, while still being flexible enough to prevent them breaking under normal vibrations. If using internal mini-pipes, C-ARF recommend that you protect the top surface of the moulded carbon-fibre main landing gear legs by covering them with a thin sheet of 1mm plywood, attached with silicone adhesive. No other heat protection is necessary to the fuel tank base, when using the DA-150 and mini-pipes as shown.

The last job to do, an important one, is to cut out the 2 slots in the bottom of the fuselage to let the warm air from the exhaust system escape from the fuselage. These slots should be 50mm (2") wide and 150mm (6") long, and it is best if you make nice rounded corners to reduce any chance of tearing in the composite skin.



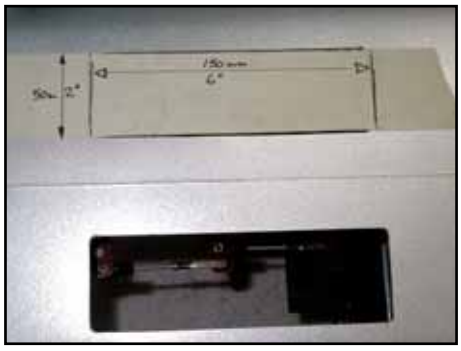
Depending on your motor, you may need to make a simple 3mm thick balsa baffle plate inside the cowling to make sure that enough cooling air is directed around the engine cylinder heads, instead of just going directly out of the opening in the bottom of the cowling. See photo here for an example of the baffle, which improves the cooling considerably. In any case, check that your motor is not overheating

when you make the “engine-running” R/C range checks before flying.

Make up a wire lever so that you can operate the ‘Choke’ for starting thru’ the cut-out in the front of the cowling.

Fuel proofing: We highly recommend that you protect all the bare wood parts inside the front of the plane with one thin coat of 24 hr laminating epoxy, or similar, brushed on. Be careful not to add excess weight here - it only needs about 30 grams (1 oz) of epoxy to fuel proof all the wood in the whole area inside the front of the plane.

Note: Please call your Composite-ARF Rep. or email us at: techsupport@composite-arf.com, if you need any addition-al help with the motor and mini-pipe installation.



(above) Don’t forget to cut the 2 slots, 50 x 150mm, in the bottom of the fuselage to allow the warm air from the mufflers to exit.

(above and below) A simple balsa sheet baffle will improve motor cooling considerably by making sure the air is directed through the cylinder cooling fins.

Don’t forget the all-important engine test-run, with both ‘engine running’, and ‘engine-off’ range checks before the first flights.

Here you see the preparation and range checking before the 1st flight of the original 3.1m SuperXtra 330L built for these instructions, made on our runway at the factory.

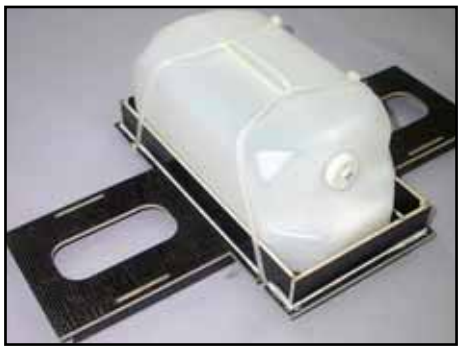
Fuel Tank Base

The Fuel tank base is supplied as several cnc milled parts, all from 3mm carbon-balsa composite material (see photo on page 20). Assembly is self-explanatory as all parts have interlocking tabs and slots. Four parts are glued on the top, to give a bay for the tank to sit in, secured with cable ties in the milled slots, and the 2 longer pieces are glued on the bottom as support rails across the fuselage.

Assemble with thin CA, in the same manner as the Rudder tray, and then secure with a good fillet of epoxy and microballoons as seen here. Please remember to sand all the mating surfaces a little for good glue adhesion.

The Fuel tank tray is a few millimetres too wide, to allow you to sand and position it where you chose. The 'normal' position is directly over the fibreglass sleeve for the wing tube, and in this case you will need to notch the back 2 corners as shown. The carbon balsa support rail underneath the front of the tank base, that spans across the fuselage, will need a scrap balsa block under each end to support if about 5mm above the carbon siderails that are fixed to the fuselage sides. The bottom of the tray and the front surface of the back carbon support rail, are then glued securely to the fibreglass spar sleeve with epoxy and micro-balloons.

(above) Under side view of the assembled tank base
(below) Top view, with tank secured using cable-ties in the milled slots.



(above) Notch back corners of tank base if fitting on top of the spar sleeve as shown. You can just see the balsa block front support.
(left) View of the completed tank base installed in the plane. Space on both sides can be used for smoke tanks, or Nicads etc.

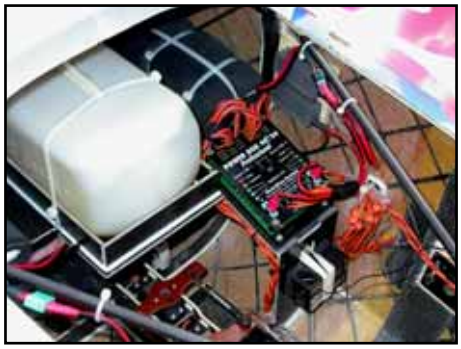
R/C & Gear Installation

Finished in 5 - 7 hours

Everyone has their own favourite methods when fitting the R/C and gear, but the installation shown should be used as a guide, and similar set-ups have worked perfectly in all of our planes flown by C-ARF factory staff, and many of our customers.

Note: *The photos in this section show the gear installation in an original SuperXtra, with the carbon blade spars, but the set-up is almost exactly the same..*

C-ARF highly recommend that you install a dual receiver battery system, with a high-quality servo powerbus unit and dual switches as shown, for the ultimate in safety and security. The full 'PowerBox' range is all available from C-ARF as an option. Visit our website for more details.



(above) Rx nicads are securely fixed either side of the tank base with cable-ties, on rubber pads. (below) Recommended Powerbox and Power-switches are available as options from Composite-ARF.

We recommend 2 Rx batteries of 5-cells, between 1800 - 2400 mAH each, and if you have built the SuperXtra using the DA-150 and the set-up shown in these instructions you should find that one battery each side of the fuel tank, on a foam rubber pad, secured to the carbon-composite tank base with cable-ties, will give the correct Centre of Gravity. *(Please double-check the manual for your R/C system if the use of 5-cell NiCads is recommended, or not)*

Make sure that all the Nicad batteries are fixed very securely in the plane, as the forces on these heavy items during high 'G' manoeuvres is extremely high. When fitting the batteries, make sure that you will still have easy access to the plastic nuts that go on the front wing mounting dowels during assembly of the plane.

Dual NiCad and Powerbox installation

The PowerBox 40/24 power control unit is designed especially for large models and provides dual battery inputs with hi-amp connectors, multiple outputs for 6 channels/24 servos (no 'Y' leads needed), automatic voltage regulation and stability, built-in servo amplifiers for those long servo cables, as well as dual visual LED battery displays. It comes complete with hi-current connectors and is fitted with anti-suppression chokes on all channels.

The Powerbox is screwed to the angled plate, and the receiver is mounted on the vertical bulkhead behind it, as shown, on foam pad, with 2 rubber bands, on a scrap 3mm plywood stick that is glued to the front of the bulkhead This

makes for a very neat installation, with no unnecessary extensions and loose cables in the plane. With the R/C installation described here and this motor/mini-pipe set-up, you should not need any additional ballast in the nose to obtain the correct 'Centre of Gravity' for pattern flying.

Actually the plane shown finished exactly on the nominal Centre of Gravity with this set-up. If using a heavier motor that then DA-150, consideration should be given to the position of the Rx batteries early on, as it may be that they will both need to be installed on the models nominal C of G.

We also highly recommend the high-quality PowerBox powerswitches for the dual batteries, available as an option, and we also use one of these in the ignition circuits of all our planes. Remember the high current that 12 digital high power servos can draw during 3D and Freestyle manoeuvres when deciding on your R/C. equipment.

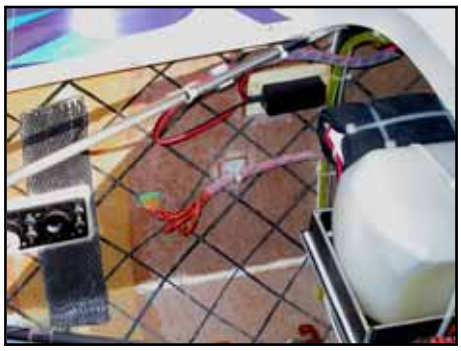
If fitting the switches into the outside surface of the fuselage, as shown, please reinforce the area inside with a small patch of 3mm thick plywood to reduce vibration transmissions to the switches. The switches come with paper templates, making it easy to cut the slots in the fuselage accurately. We fitted the 2 Receiver switches on the right side, and the single Ignition switch on the left side.

Composite-ARF advise you to keep all the cables between the motor ignition battery, ignition switch, and high voltage ignition unit as far away as possible from the receiver and R/C system.

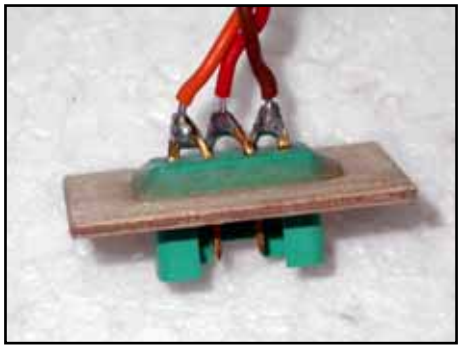
Servo extension leads etc.
Please make sure that you use good quality twisted-cable extension leads, of heavy gauge wire with gold-contact connectors, to all the servos. Certainly we recommend that all servo leads and extensions longer than about 30cms (12") are fitted with ceramic chokes (ferrite rings) to prevent RF noise, at the receiver end - normally within 100mm (4") of the receiver. Of course, if you are using a 'Powerbox' this unit is already fitted with all the ceramic chokes etc, and comes with the required high-quality switches. Also no 'Y' leads are needed, as the powerbox provides 4 inputs for each channel.

At C-ARF we hard-wire all our servos with twisted cable leads of the exact length required and Multiplex 6-pin connectors (see photos), so you can use 1 pin for each wire.or the 2 aileron servos you can use 1 pin for each wire. We glue the female connectors into small plywood plates in the sides of the fuselage for connecting the stabs and ailerons when assembling the plane.

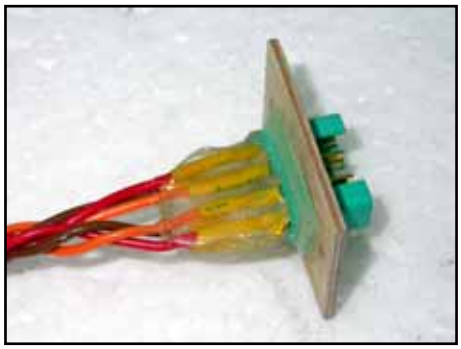
(above) Receiver is held to bulkhead on thick foam pad, with 2 rubber bands around 3mm plywood stick glued behind it. The 2 parts for the Rx & Powerbox mount are supplied loose, for installing in your preferred position.



(above) Plywood reinforcement glued to fuselage for the switch mounting to absorb vibrations.
(below) Hi-amp sockets fitted into thin plywood plates for easy connection of stab extension leads.



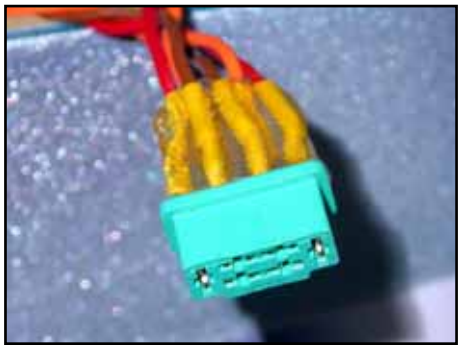
Making up the proper extension cables and connectors is only a little work, if you are proficient with a small soldering-iron, and makes assembly of the model at the airfield very quick and easy! Once all wires are soldered to the gold-plated pins, fit a short length of heat-shrink tube over each one. Finally protect all the connections from vibrations etc with a nice blob of glue from a hot-glue gun. Job done.



6-pin MPX connectors are used for extension leads, with one half mounted in the fuselage sides. Blob of hot-glue over the heat-shrink protects from vibrations and gives nice hand-hold!

Fuel tank

Shown in these photos is the 1500cc fuel tank (Dubro S-50) , which is held to the tank base with 3 large cable-ties (see photo on page 30). Drill a hole in the motor firewall where necessary for the fuel feed tube from the tank, and protect it where it passes through the hole using a rubber grommet or similar. Fix the tubing securely to the underside of the top of the motordome with a couple of cable-ties or equivalent, to make sure that it cannot touch the hot exhaust.



Fit the correct stopper to the fuel tank for the fuel type used. (If using Dubro tank the gasoline stopper has a small 'O' marked on the top of it). We use the excellent 'Tygon' brand of fuel tubing for all our models. It is totally gasoline and kerosene-proof, and does not go hard and crack with age. Secure the feed tube inside the tank to the clunk with a small cable tie. If the tube is even a little loose on the brass tubes though the stopper, you can be sure it will come off at just the wrong moment and your engine will quit ! Therefore please solder small rings onto the brass tubing (easily made from the soft wire of a paperclip wrapped around a small screwdriver) and also secure with a fuel-line clamp or cable-tie (see photo). Don't miss this small detail - it could cost you your plane !

We use the normal 3 tube plumbing system, one from the clunk to feed the motor, one out of the bottom of the plane (vent/overflow) and one at the top for filling (close for flight).

If you want to fit a smoke system the smoke tank can be fitted alongside the fuel tank but you will need to make an extra platform for it. Follow the manufacturers instructions for fitting the smoke system.

Motor ignition system

The ignition unit and battery are fixed to the underside of the motor dome on foam pads, retained with 3 cable ties each, as shown in the photo here. At C-ARF we recommend a 4-cell 1400 - 1800 NiCad for ignition power, and we use a Powerswitch for the cut-off.

Add a very small cable tie, or a 'safety clip', around the cable from the motor pick-up to the ignition unit for extra security (see photo above).

Final check

Now check that you have fixed all components securely. Keep in mind that all the components inside the aircraft are loaded with the same G's as the wing and the wing spar during aerobatic manoeuvres. Check engine, cowling, wing and stab mounts carefully again.

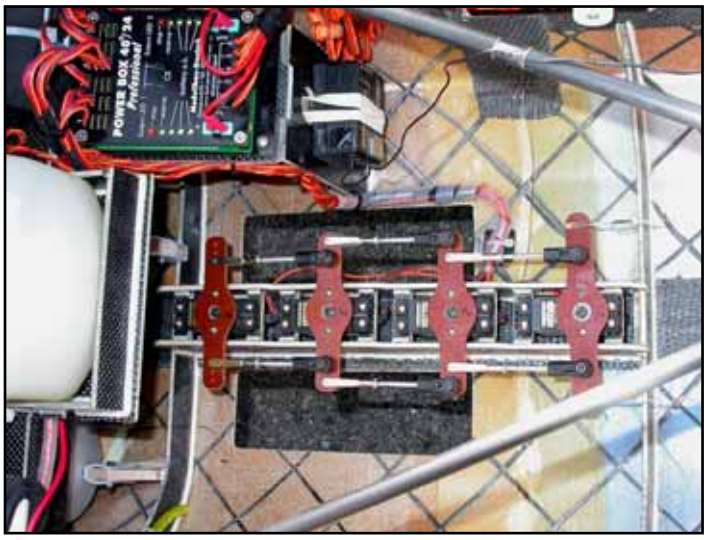
Are all extension leads, cables and fuel tubes securely fixed to the side of the fuselage and cannot come loose when subjected to high 'G' forces during flight. Are all tubes and wires protected from chafing where they pass thru' the holes in fibreglass parts or bulkheads with rubber grommets, or short lengths of split silicone tubing?

Especially if you have installed the internal mini-pipe set-up, you also must make sure that no fuel tubing or wires can come into contact the exhausts. Use the plastic spiral-wrap to tidy up groups of cables and make sure that they cannot move around in the plane under high 'G' manoeuvres by fixing them to the sides with small cable ties. If using the easily-available cable-tie plastic fixing plates, please do not trust the double-sided tape that they usually have on them which can fail under vibrations. Peel it off, rough up the back face with coarse sandpaper and glue them to the fuselage sides with 30minute epoxy.

- Did you fit small Tygon or silicone tube pieces over all the quick-links?
- Did you tighten the M3 locknuts against all the quicklinks and clevises?
- Are the swages crimped up nice and tight on the rudder cables?
- Add one small drop of loctite/thread locking compound on all the bolts that hold the servo arms to the servos, especially important with digital types, as the occasional 'buzzing' you hear is actually high-frequency vibration which, over some time, can cause the servo arm securing bolts to work loose. We have seen this happen several times - so you can treat it as a fact !

Then you can go on set up all the linkages, control throws and R/C system as described below.

The assembly of the model should be completed in about 24 - 26 hours.



Another general view showing the Powerbox and receiver installation. Also visible are the 2 slots in the bottom of the fuselage for warm air to exit from the mini-pipes.

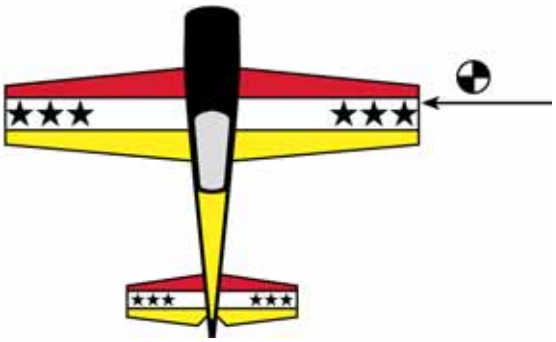
Setting Up Your Aircraft

Centre of Gravity:

For the 1st flights, set the Centre of Gravity between 110 - 125mm (4.4" - 5.0") back from the leading edge at the Wing Tip position. Hold it with a helper at both wing tips in this position and make sure the plane balances horizontally. This is the 'pattern' CG position.

Don't forget to balance the plane laterally, holding the spinner central bolt and a fingertip under the rudder, and if needed add a small weight to the light wing tip to make it track correctly.

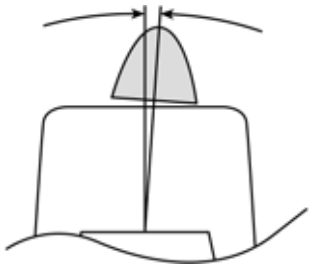
C of G range: 110 - 130mm
from Leading Edge at Wing Tip.



CENTRE of GRAVITY

Engine Thrustline:
Already given in the instructions, down thrust should initially be set at 0° degrees and right thrust 3 - 3.5° degrees, depending on the prop used. We recommend a 32 x10 or 32 x 12 carbon prop for any 150cc engine. It is a very quiet and powerful solution. They are normally CNC-designed, so the prop is balanced perfectly statically, dynamically and aerodynamically, which keeps the vibration down to a minimum.

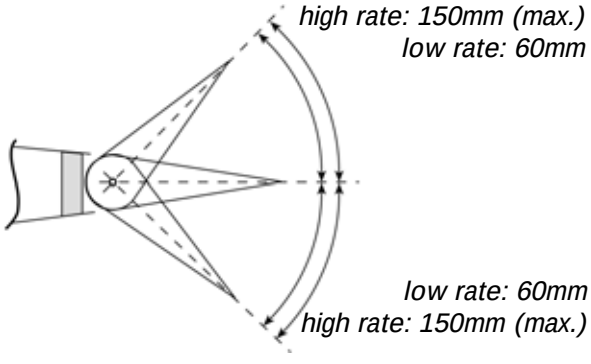
3 - 3.5° depending on propeller



SIDETHRUST

Control Throws:
All measurements are measured at the root/trailing edge position.

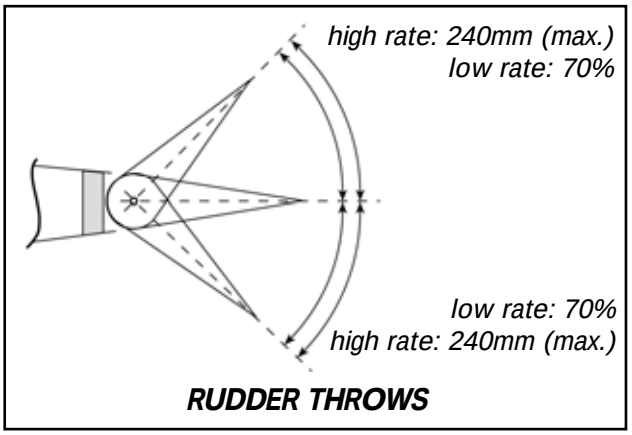
Elevator
All controls should be set with a dual rate switch. On high rate the elevator should really be at maximum, up to 50 degrees both sides (approx. 150mm), but in this case with 50% exponential. Low rate should be no more than 60mm (2 1/2") both sides. This is the perfect throw for nice and crisp snaps. If you like you can add about 25% exponential to the low rate setting as well.



ELEVATOR THROWS

Rudder
Set the high rate to maximum throw (about 240mm) both sides, and at low rate reduced to about 150mm. The Extra needs quite a lot of rudder for nice stall turns, so you should at least add 25% exponential for smooth tracking corrections. At the same time you should remember that the Extra rudder is VERY sensitive, and the plane starts shaking at high speed if the rudder linkage

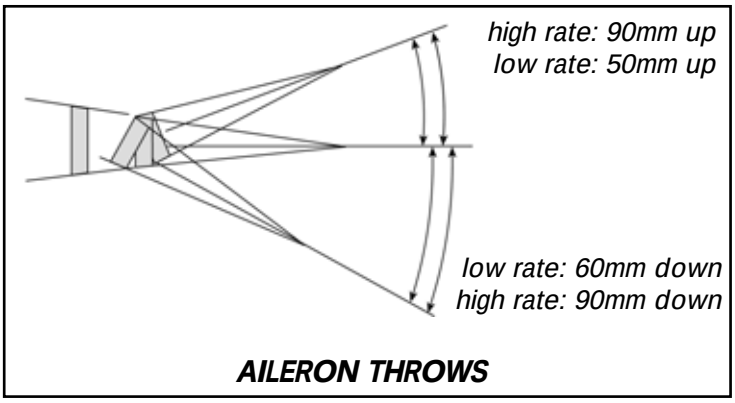
is not really rock solid. So check your linkages and closed-loop cables again and make sure that there is NO slop at all ! On the other hand these characteristics are also the reason for best rudder sensitivity at the slowest 3D-speeds.



RUDDER THROWS

Ailerons

Aileron throw for high rate is 90mm (measured at root) both up and down. Use at least 30% exponential at high rate. For low rate you should decrease the throw to the TOP to 50 mm, and the BOTTOM to 60mm. Yes, you're right - this is a *reversed* differential due to the hinge line being in the top skin instead of on the centre line. You will have to finalise this differential figure during flight, as mentioned earlier in this instruction book. At high rate, for 3D manoeuvres, this doesn't effect the rolling too much, so you can maximize the throws to whatever is mechanically possible, even more up than down if you wish. You may need to lengthen the slots in the servo hatches by 2mm or so at the front to obtain these high rate throws.



AILERON THROWS

In General

Your Extra has very large control surfaces. This makes it very sensitive and reactive. It is always possible that these huge control surfaces can flutter at high speeds if the assembly, servo installation and linkages are not made perfectly, and if a servo gear or output disc/arm strips the flutter will not stop until the plane hits the ground….

So please do yourself a favour, and make sure that you only use the best servos available, and take the utmost care making your linkages. Check every linkage for slop, and rather reduce the maximum throw than risking a high speed flutter due to sloppy servo gear or linkages. To prevent this for sure, we recommend reduced control travels (reduced by using shorter servo arms, not by using electronic settings). Using 2 servos per control surface as described in this manual will never overload or damage high quality servos, even if the maximum travel of each servo is slightly off. The aileron control surfaces have enough torsion flexibility so that damage to the servos should not occur.

The Composite-ARF TOC 3-Metre Version of the Extra 330S is known for very good and crisp 'snapping', and we think that the 3.1m 'SuperXtra' snaps even better. It's like an explosion ... and it still stops immediately that the sticks are released. Be aware of this fact when you try it for the first time. The trick for nice crisp 'snaps' is to stall the plane with a quick hit of 'up' elevator, and then release the elevator to zero, while you give full rudder and aileron together. But of course, you know this needs some practice to make it perfect every time !

Perfect knife edge tracking is achieved by mixing in slight up elevator and opposite aileron to the rudder movement. From our experience as little as 4 - 5% 'up' elevator and 1 or 2% of opposite

aileron are needed.

Now your Extra seems to be ready for the first flight. Always keep in mind, that you have a rock solid, but still sensitive, contest tool in front of you, which, if used as it is designed will give you many hours of pleasant flights. The performance of this aircraft is unlimited, and if maintained regularly and carefully, you will enjoy it's performance for many, many hours. With this aircraft you have the potential to move up to the unlimited "cracks", it's up to you now! You can't blame it on the aircraft anymore….

Have Fun!

Notes:
We hope that you enjoyed building your SuperXtra 330L.

We tried to make this airplane as complete as possible. With good feedback from customers you will help us to continue making good things even better. We appreciate your comments very much.

Email: feedback@composite-arf.com

Thank you!
Your Composite-ARF Team

Successful 1st test-flight made at the factory just before the sun sets!

Appendix:

SuperXtra, 3.1m Kit (version 3.0)

Kit Contents

Quantity	*Description*
1	Fuselage
1	Wing, right
1	Wing, left
1	Stab, right
1	Stab, left
1	Elevator, right
1	Elevator, left
1	Rudder
1	Cowling, top
1	Cowling, bottom
1	Protection bag set, fuselage, wing, stab
1	Canopy frame
1	Wheel pant, right
1	Wheel pant, left
1	Landing gear, carbon, right
1	Landing gear, carbon, left
1	Wing tube aluminum 50mmØ x 1000 mm.
1	Stab Carbon tube 10mmØ x 324 mm.
1	Stab tube aluminium 20mmØ x 320 mm (with threaded holes)
1	Clear canopy
1	Elevator hinge aluminum tube set, 4mm Ø x 570 mm. 2 pcs (in stab)
1	Rudder hinge brass tube 4mm Ø x 630mm (in fin)
1	Milled wood parts bag
1	Hardware bag
1	Instruction Manual (English)

Hardware List

Wing Pack (2 sets)

Quantity	*Description*
1	CNC milled phenolic 2 servo tray (JR)
1	CNC milled phenolic 2 servo tray (Futaba)
4	Servo horn 2 mm phenolic. Long version
1	Servo horn 2 mm phenolic. Short version
2	Aileron Horns, phenolic
14	Sheet metal screws 2.9 x 13 mm
6	Sheet metal screws 2.2 x 10 mm
9	Allen bolts M3 x 12 mm
8	Washer M3.
13	Stop Nut M3
6	Nut M3
2	Allen screws M3 x 16 mm
4	Aluminum Clevise M3 (with 1 pin and E-clip only
2	Ball links M3
3	Plastic nut M6
2	All Thread M3 x 100 mm.
1	All Thread M3 x 65 mm.
1	Plywood servo hatch frame

Stab Pack (2 Sets)

Quantity	*Description*
2	Servo horn 2 mm phenolic. Long
4	Sheet metal screw 2.2 X 10 mm.
2	Spring steel clevis M3
2	Stop nut M3
4	Nut M3
2	All Thread M3 x 75 mm.
2	Allen bolt M3 x 16 mm.
2	Allen bolt M3 x 16 mm.
2	Ball link M3
8	Sheetmetal screws 2.9 Ø x 16mm
2	Control surface horns 2mm phenolic

Rudder Pack

Quantity	*Description*
8	Allen Bolt M3 x 16 mm.
2	Allen bolt M3 x 20mm
10	Stop nut M3
14	Nut M3
16	Sheet metal screw 2.9 X 13 mm.
1	Set of phenolic servo arms for Rudder set-up
10	Sheet metal screw 2.2 x 10mm.
6	Spring steel clevises M3
8	Ball link M3
2	Pull-Pull Cables 0.9mm Ø, 3 metres
6	Crimp tube 2.6 mm I.D.
2	Threaded ends for Pull-Pull Cables
6	All thread M3 x 45 mm.

General Pack

Quantity	*Description*
4	Allen bolt M4 x 16 mm (canopy mount)
9	Allen bolt M3 x 12 mm (cowling)
11	T nut M3 (cowling and wheelpant alignment)
8	Sheet metal screw 2.9 Ø x 10 mm. (cowling)
6	T-nut M6 (engine mount and wheelpants)
2	Allen bolt M6 x 70 mm. (for wheel axle)
6	Allen bolt M6 x 20 mm. (landing gear mount)
4	Allen bolt M6 x 40 mm. (engine mounting)
6	Washer 6 mm (wheelpants)
6	Wheel collars 6 mm I.D. (wheelpants)
2	Stop Nut M6 (wheelpants)
2	Allen bolt M3 x 20mm (wheelpants)
11	Washer M3 (cowling and wheelpants)
2	Nut M6 (wheelpants)
1	Nut M3 (throttle linkage)
1	Clevise steel M3 (throttle linkage)
1	All thread M3 x 100mm (throttle linkage)

Available Accessories

Tail gear setup with 50mm Ø wheel
Desert Aircraft DA-150 motor/mini-pipes
PowerSwitch 20A (for dual NiCads)
PowerBox 40/24 (Dual Nicad crossover unit)