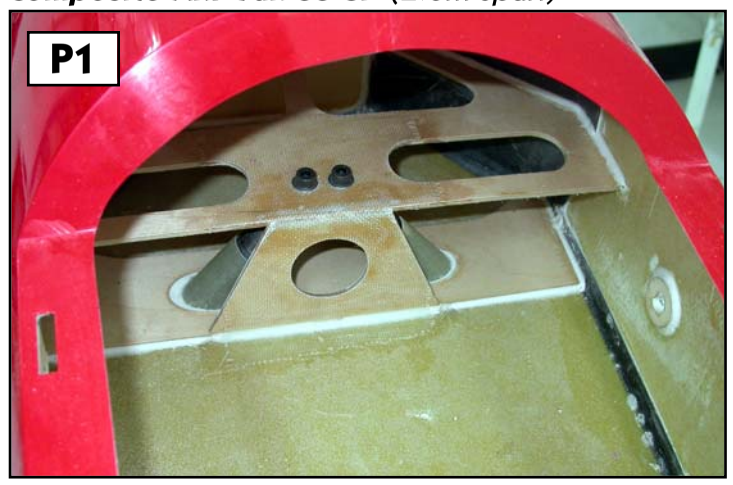
Instruction Manual

Composite-ARF Yak-55 SP, 2.6m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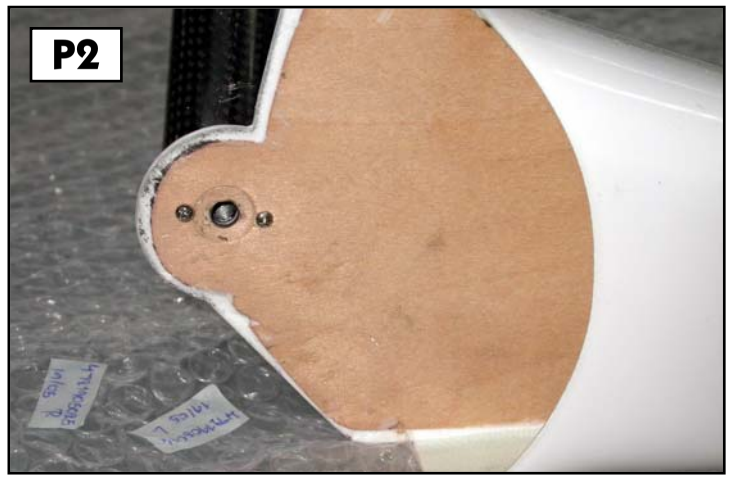
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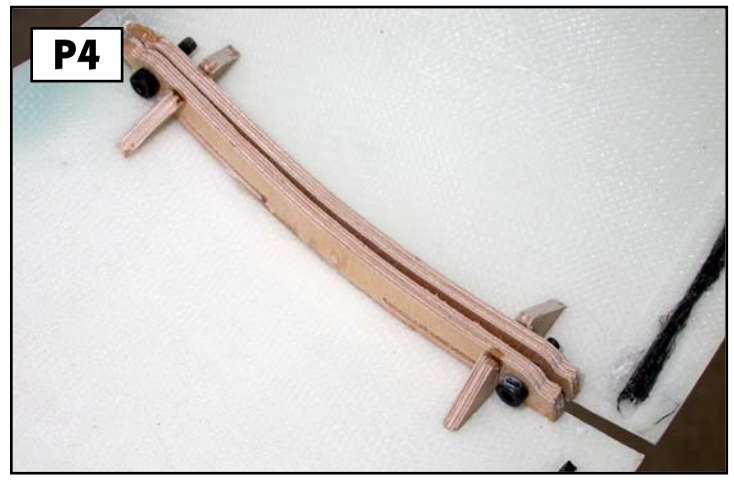
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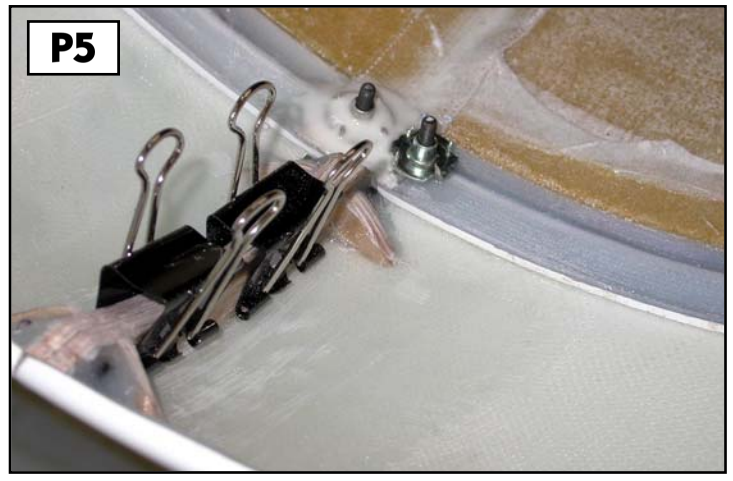
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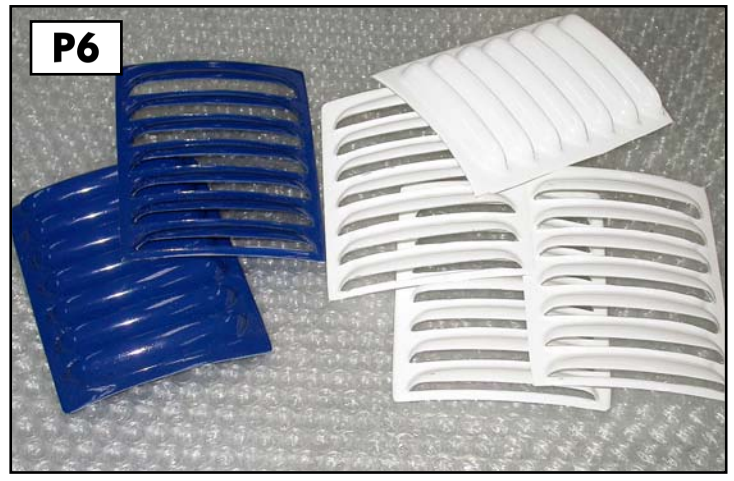
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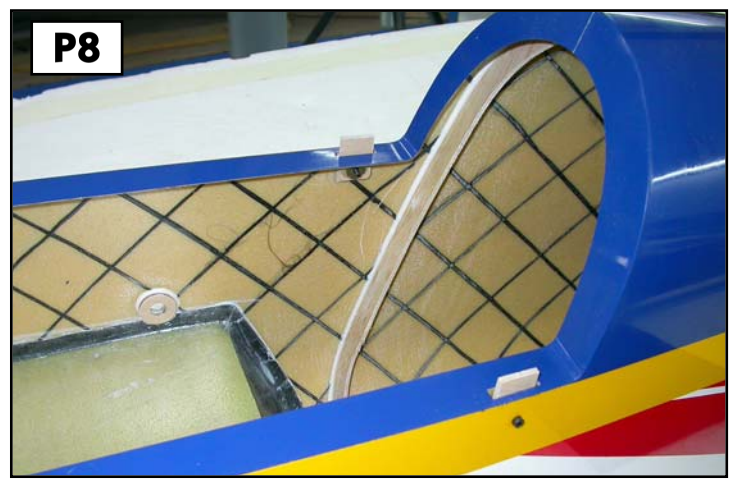
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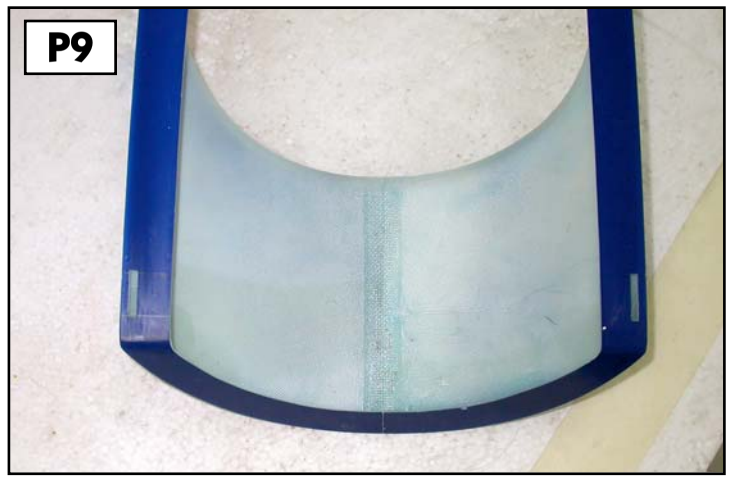
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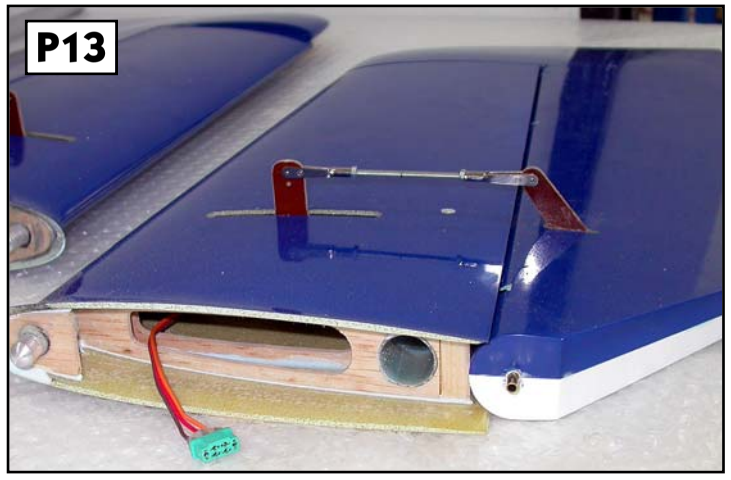
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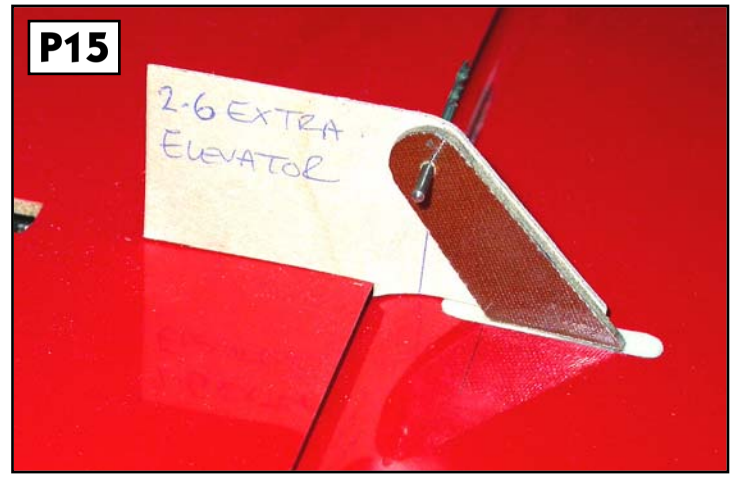
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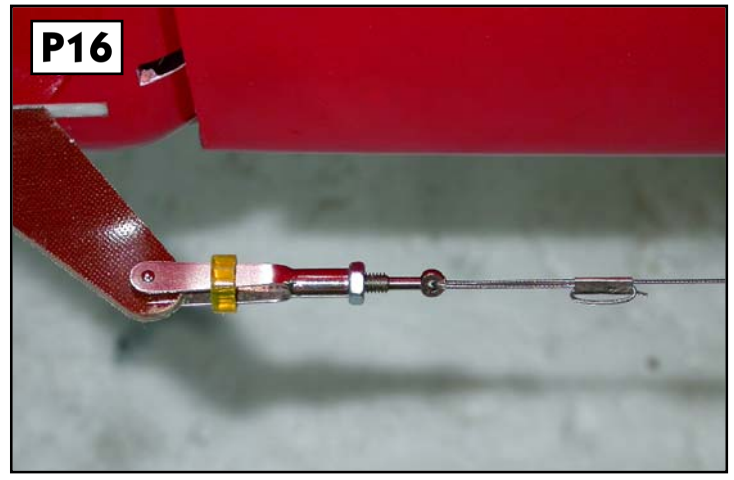
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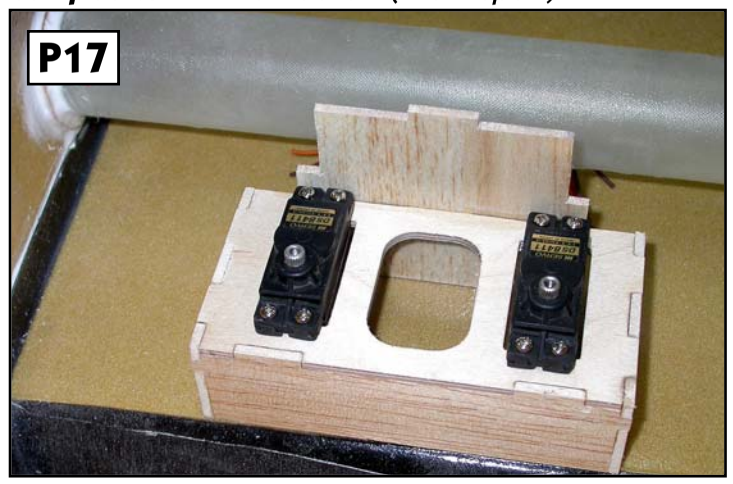
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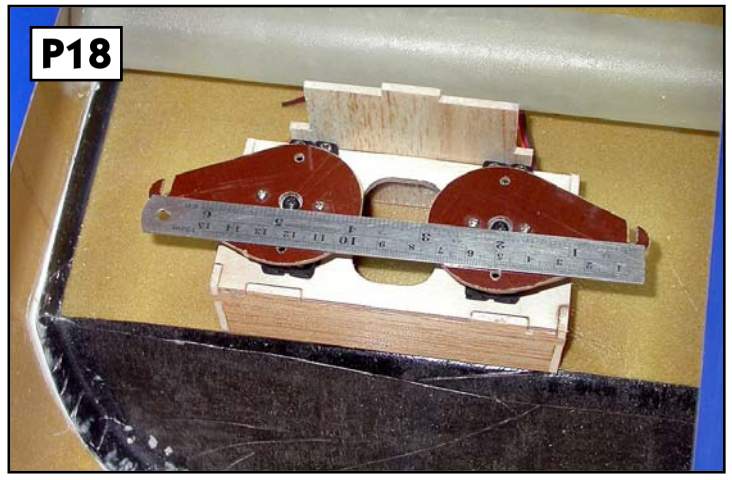
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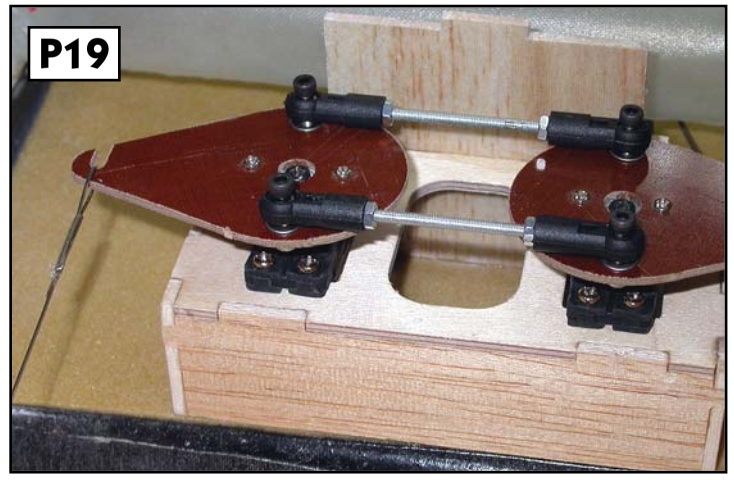
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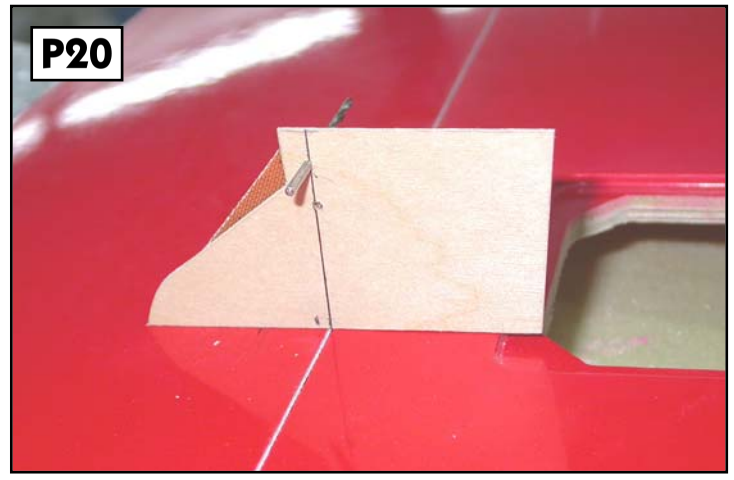
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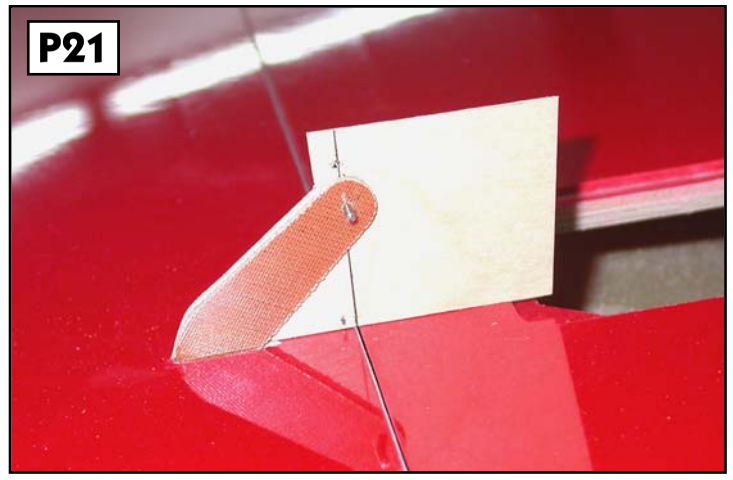
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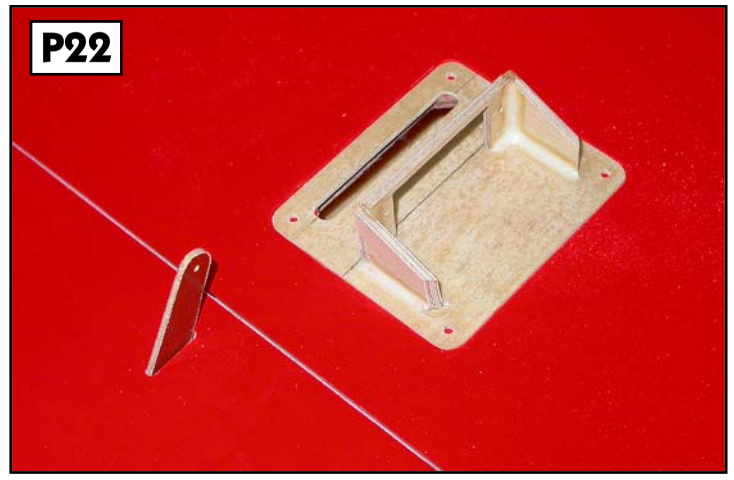
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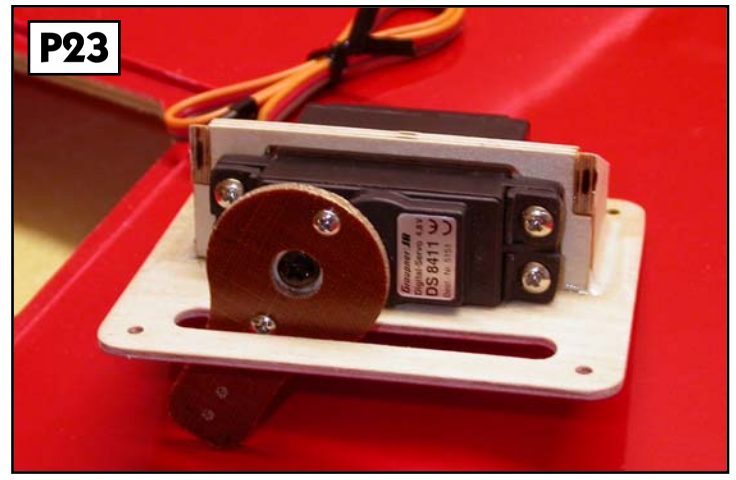
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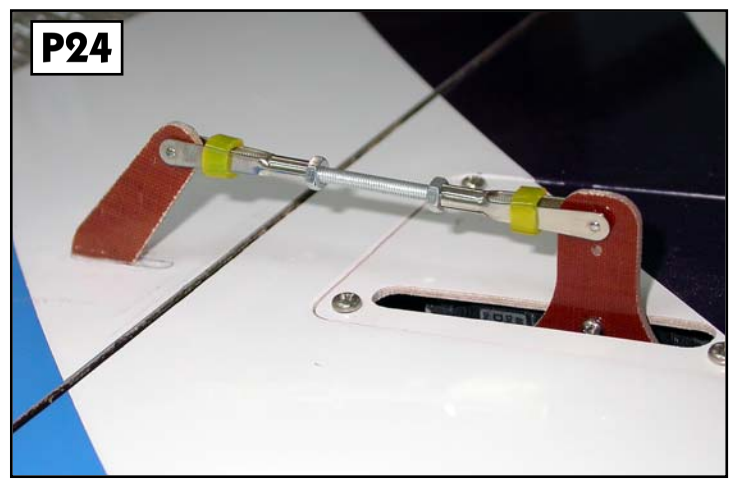
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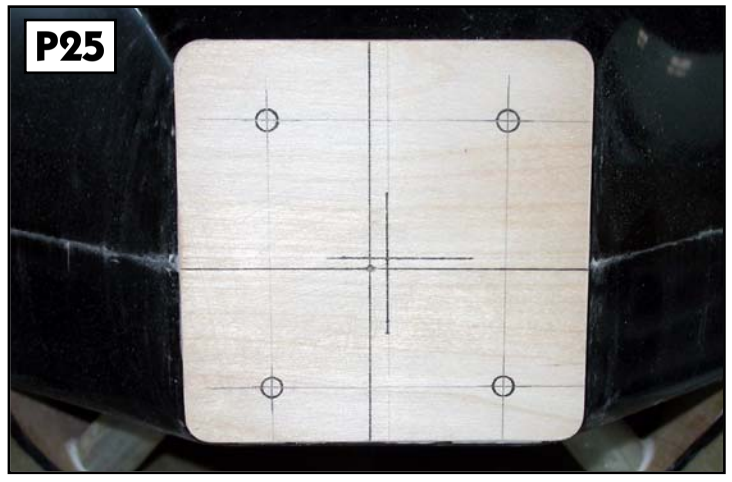
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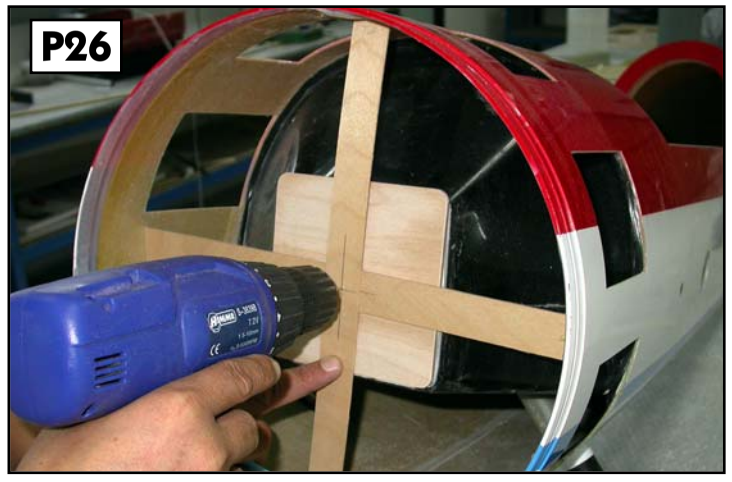
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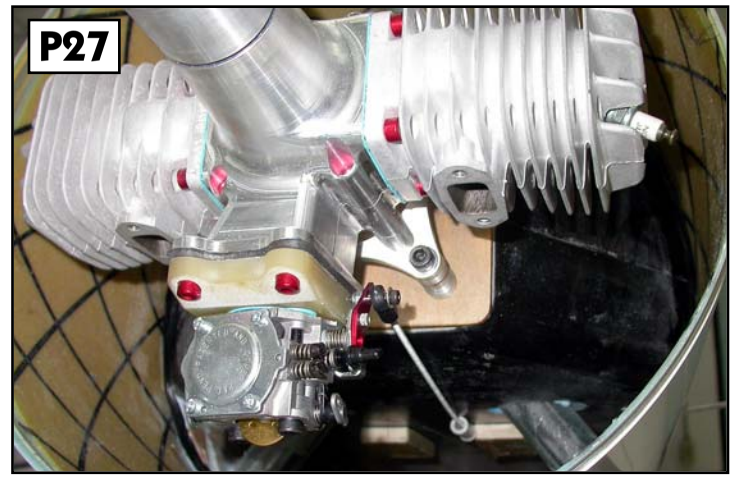
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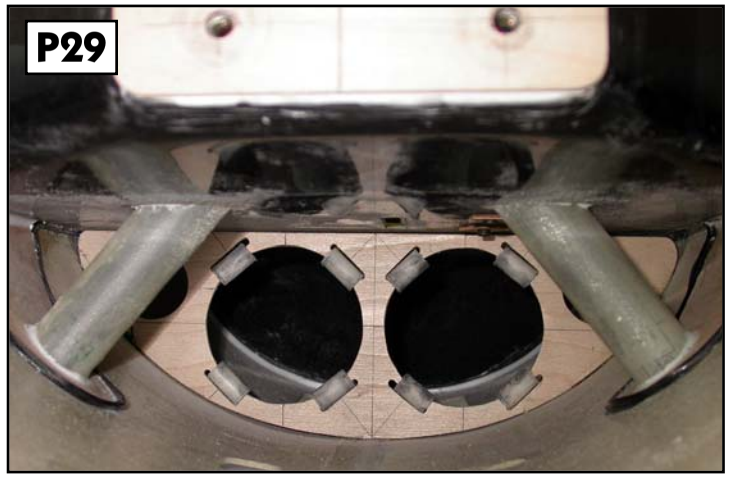
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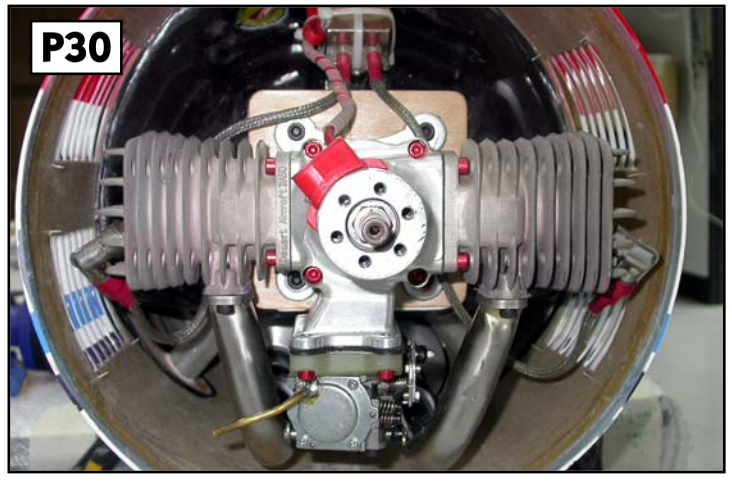
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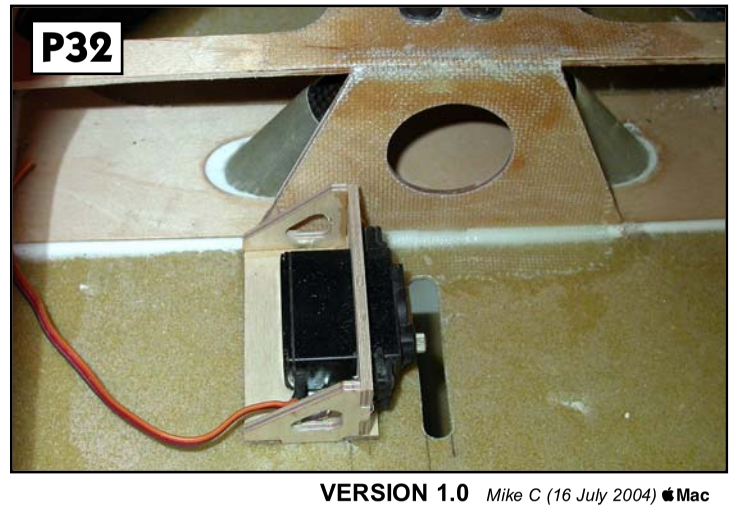
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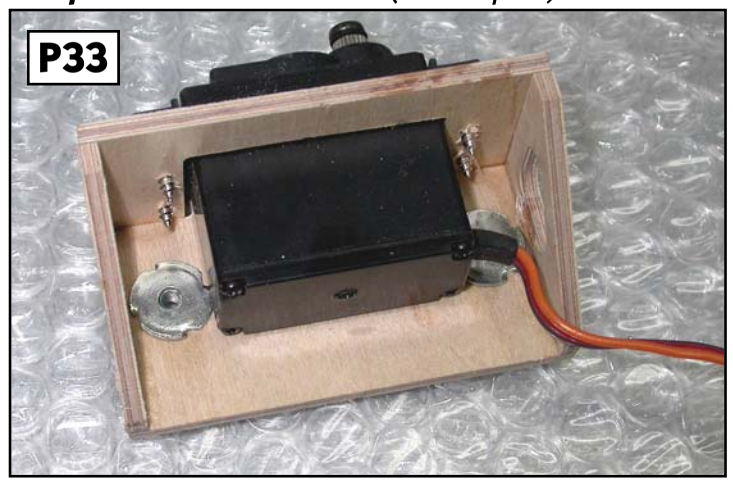
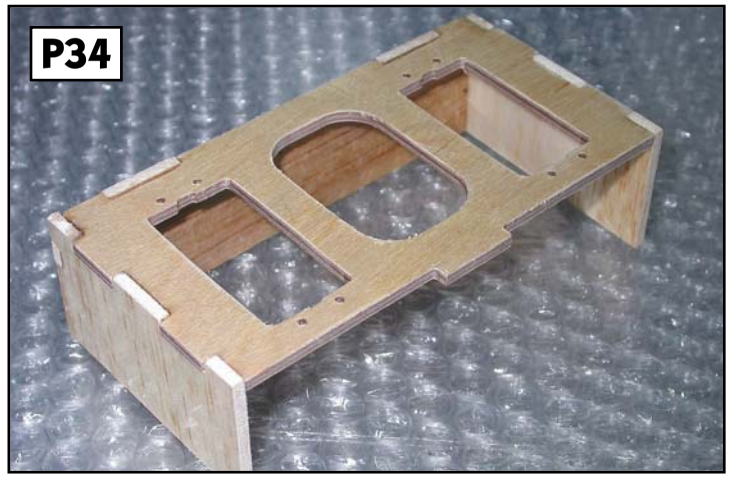
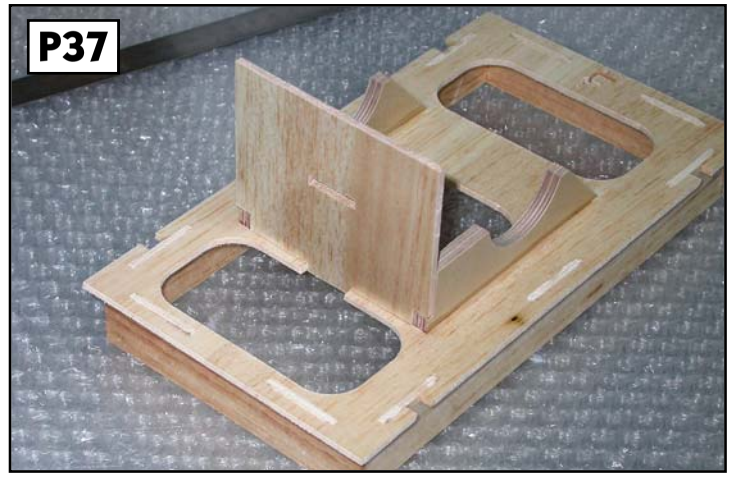
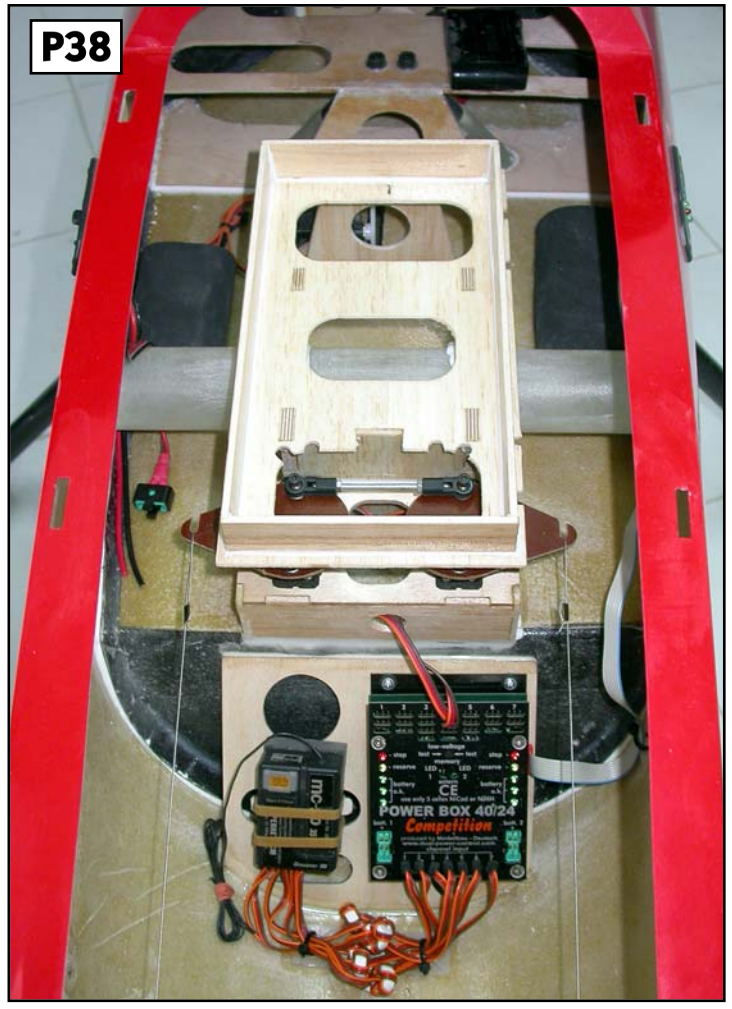
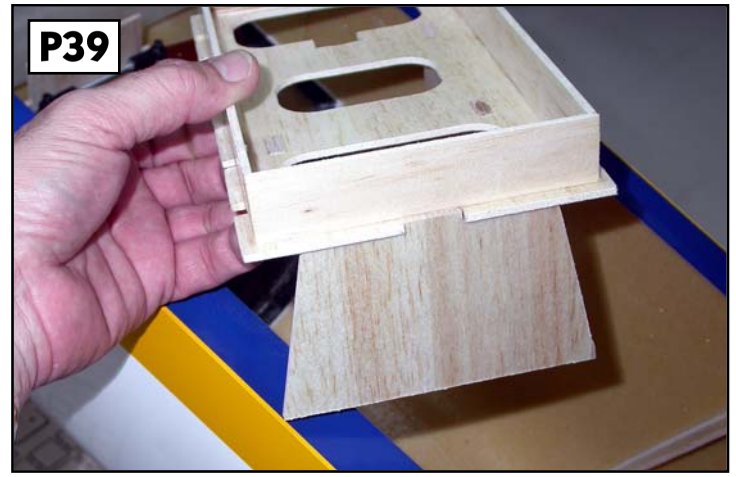
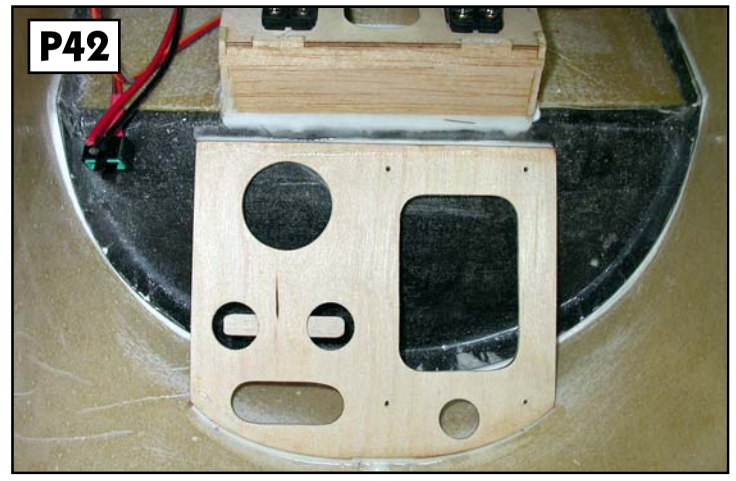




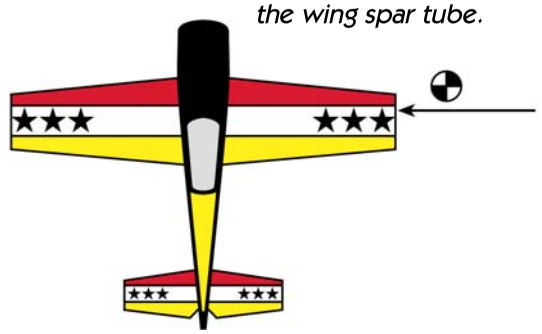








C of G: At the back edge of the wing spar tube.



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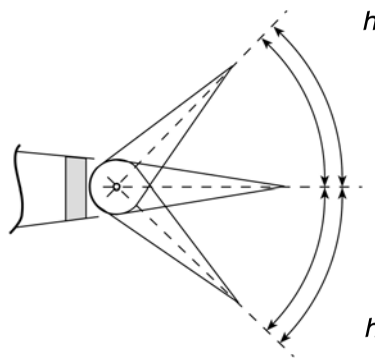
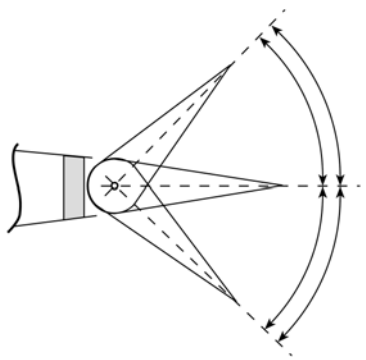
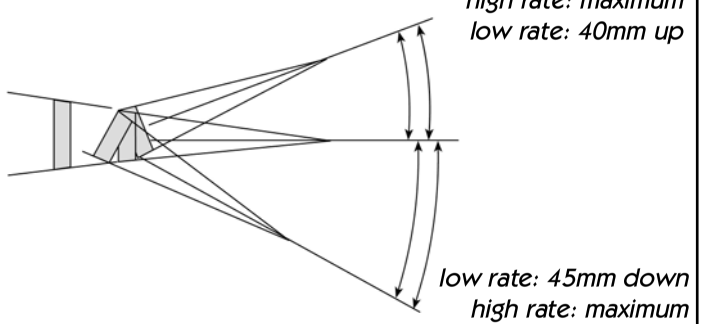


ELEVATOR THROWS



RUDDER THROWS



AILERON THROWS

Instructions for Yak-55 SP IMAC-Airplane

Thank you very much for purchasing our Composite-ARF Yak-55SP all composite aircraft, made with the revolutionary Total Area Vacuum Sandwich (TAVS) technology

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.

The new Composite-ARF 2.6m Yak-55 SP is based on our very successful 3.3m Yak-55SP (seen below in our limited edition 'Honeycomb' design), which is one of the most revered planes in the IMAC and aerobatic scene, and uses the latest moulding technology and techniques to make it easy for you to get this plane in the air quickly, and on a very reasonable budget. We have taken advice from many of the top TOC and IMAC pilots to improve our original design even further, and wish to thank all those experts for their assistance.

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.

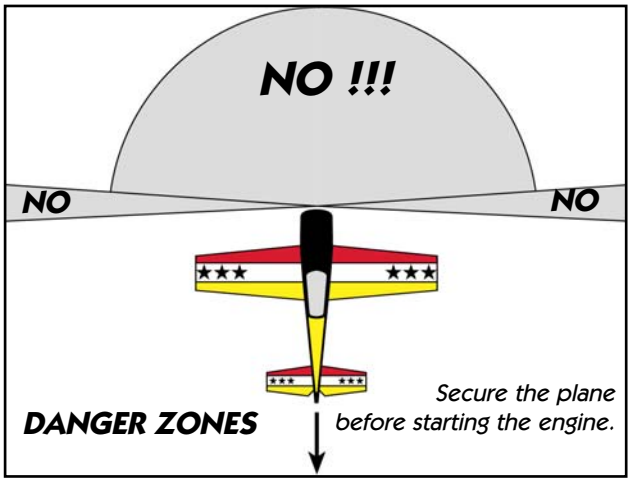
Attention !

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-maneouvres. 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 lightweight 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 and sleeve are 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 tubes for the rudder 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 Yak-55SP.

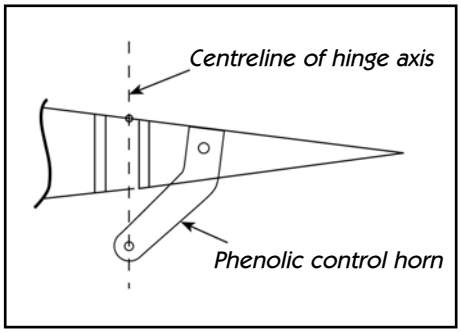
General information about fully-composite aircraft structure and design

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.

Description of Parts

(above) Super-Xtra wings shown with minimal internal structure.

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 no additional structural parts are needed except for main spar, which is a large anodized 40mm Ø Aluminium (6061 alloy) tube with a 1.4mm wall thickness.



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 hinge 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 wouldn't 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. Make sure that the control horns are glued into the ailerons properly. The hole in the phenolic horn for the quick-link needs to be exactly perpendicular to the hinge axis line, and in this manual we show you a simple way to ensure that the horns in all pairs of control surfaces will be identical, making it easy to set up your R/C for accurate flying manoeuvres.

The wings are already set-up with servo covers and hatches for 2 servos per aileron, and we recommend a pair of high-torque servos, like the JR D8411, in each wing. Our servo covers and milled plywood mounts make both installation, and exchange if necessary, very quick and easy and provide a rock solid servo mounting and linkage system.

The wings are attached to the fuselage with the 4 threaded aluminium dowel anti-rotation pins, with 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 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.

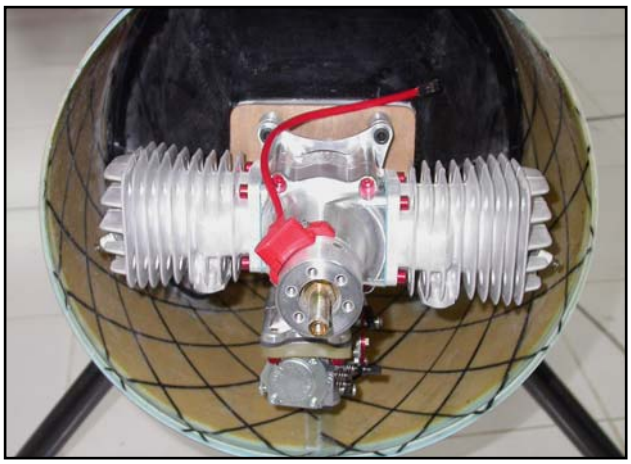
(above) Yak-55SP full-composite wings and 40mm Ø 6061 alloy main spar tube.

The Fuselage:
The fuselage is also made in negative moulds, and it is all constructed using TAVS technology. All the loadbearing internal parts are glued in during manufacture, to ensure accurate location and reduce the assembly time for you. The sleeve in the fuselage that takes the main wing spar tube, the stab spar tubes, and the holes and reinforcement plates for the anti-rotation dowels, are already installed. There is no need to even check the incidences - you can be assured that these are already set in the moulds so that no adjustment is necessary.

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 !

The motordome and firewall are preinstalled, and provide plenty of strength for any engines up to 100cc on the market today. See the Engine Installation section for details of engine and setting thrust angles.

The engine cowling and canopy frame 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 aluminium tubes, fitted through phenolic hinge bearing plates which are installed during manufacture for perfect alignment.

The rudder and elevator design allows for at least 50 degrees throw. All the structural parts are preinstalled. The horizontal stabs are mounted with one 20mm tube and one aluminium anti-rotation pin each. Please remember during assembly of the plane that every gram of weight should be saved in the tail area.

(above) A general view of the Yak-55SP stabilisers.

(below) The lightweight fin-post has the phenolic rudder hinges already installed at the factory ensuring perfect alignment.

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.

A couple of views inside the new factory, showing the a small part of the Finishing area, and the Quality Control/Assembly areas with the 2.6m Yak-55SP, 2.6m Extra 330L, 2.3m Extra and Rookie production lines.

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) An example of one of our big Yak-55's in the honeycomb 'limited' edition' scheme ... all painted in the moulds !

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 jobs is unique.

(below) One of our customers with the 3.3m Yak-55SP practising his tail-in hovering on a very windy day !

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) A general view of the tail-feathers of the new ‘Shulman 2000’ paint scheme on the 2.6m Yak-55 SP.

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… !

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

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 on 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 stronger 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, 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 Yak-55SP 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. 8 required). We highly recommend JR 8411's for the ailerons and elevators, and either 8411 or 8511/8611's for the rudder.
2. Throttle servo (1) Any standard servo will do (eg: JR/Graupner 4041)
3. Aluminium Spinner 125 - 140mm dia (5 - 5.75"). eg: Tru-Turn.
4. Main wheels 125 mm (5"). Dubro wheels are recommended.
5. Engine DA-100. This is the recommended engine for your Yak-55SP. The instructions refer to that engine throughout, but you could use any other 80 - 100cc engine.
6. Mini-Pipe or Tuned-pipe set. (Incls: 2 canisters/pipes, 2 aluminium or stainless-steel headers, 2 Teflon couplers, 4 spring clamps, & mounting hardware. Available from C-ARF)
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. Either one 2800 mAH pack, or 2 x 1800 mAH packs if preferred.
10. Powerbox 40/24 or Professional and dual powerswitches for dual batteries if preferred.
11. Fuel tank (900 - 1000 ml) with gasoline stopper. We use Dubro.
12. Cable ties in various lengths.
13. Propeller. 2-blade Carbon Meijzlik or Menz 28" x10" for DA-100.

Did you read the hints and warnings above and the instructions carefully?

Did you understand everything in this manual completely?

Then, and only then, let's start assembling your Composite-ARF Yak-55 SP.
If not, please read it again before you start the assembly.

Building Instructions

Please note that this Instruction manual shows photos of both the original Red/Blue/Yellow scheme, and also the new-for-2004 'Shulman 2000' paint scheme.

Some of the photos of the original scheme show the prototype fuselage, which had our 'diagon-technique' carbonfibre reinforcing on the inside surface of the fuselage moulding - but this was found to be completely un-necessary. The 'production' Yak 2.6m fuselage is extremely torsionally strong and rigid, and does not need any further reinforcement.

With experience of the prototype we also redesigned some of the internal wood parts for the fuel tank tray and rudder servo mounting plates, etc, to save overall weight, make it quicker and easier to assemble, and also move the weight of these items backwards as the prototype was a bit nose-heavy.

If you have any questions during assembly of the Yak-55SP, or can suggest any information or details that should be included in these instructions, please don't hesitate to email us at:
techsupport@composite-arf.com or ***feedback@composite-arf.com***

We know that even a great product can be made better !

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 and control horns installing anyway.

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. Additionally 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.

Important Note: Preparation of all mating surfaces for gluing all parts and components is extremely important. Scuff both surfaces properly, with 80/120 grit sandpaper or a Permagrit tool, and then clean off the dust with alcohol, or similar. Sanding and then gluing ***without*** cleaning the surfaces gives nearly as poor joints as not sanding at all !

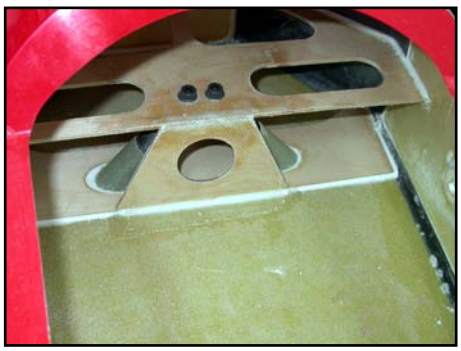
Landing Gear

Finished in 2 hours

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

Composite-ARF developed a new carbon fibre landing gear for the Yak 2.6m. 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!

The legs are fitted through the glassfibre sleeves that are installed at the factory, and bolted to the plywood bulkheads and plates shown here with M6 x 20mm bolts and 13mm Ø washers. Both main legs are identical, and can be used either side.

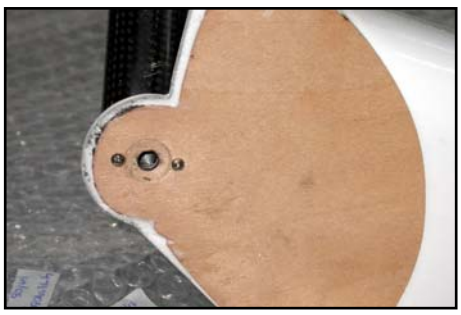


(above) The main landing gear legs are bolted to plywood bulkheads that are factory-installed.
(below) Wheel axles are M6 bolts, which fit into threaded inserts in the moulded carbon legs.

Fit the wheelpants to the legs as follows: Set the fuselage on a level surface with the tailwheel (optional tailwheel assembly available from C-ARF) in place. Fit the wheelpants over the M6 x 70mm axle bolts, and also temporarily fit the wheels, and screw the bolts into the threaded inserts that are moulded into the legs during manufacture.

Adjust the angle of the wheel pants so that the tops of both are parallel with each other, and the bottom edges angle upwards a little, as shown in the photo at the top of page 14. When satisfied with the angle, temporarily tack the wheelpants to the carbon landing gear legs with a small drop of thin CA. Remove the wheels and axle bolts and then secure the wheelpants to the legs with 2 small sheet-metal screws (2.2 x 10mm), into 1.8mm Ø holes drilled into the ends of the carbon legs.

(above and below) The wheel pant is held to the main leg with 2 2.2 x 10mm sheet-metal screws as shown here.



You can use any 5" main wheels of your choice. Kavan wheels are very lightweight, but not very durable on asphalt runways, and Dubro wheels are a little heavier but much more solid, and this is what we use at C-ARF. The head of the axle bolt goes on the *outside* of the wheel. The order of the items on the bolt is: Bolthead, washer, wheel hub, 2 or 3 washers, M6 nut, washer, fibreglass wheelpant, carbon landing gear leg. You may need to adjust the number of washers, or add a 6mm wheel collar behind the wheel to maintain free wheel movement and centre the wheel against the wheelpant, depending on the actual wheels used. A drop of loctite on the M6 axle bolt where it goes into the threaded insert in the leg is good insurance.

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!

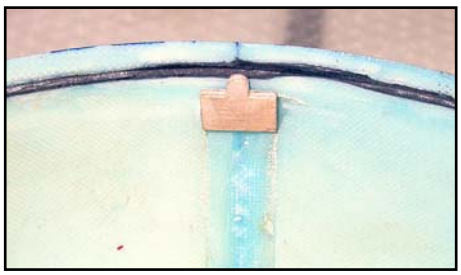
(above) The completed wheel pant and wheel (5" Dubro shown) (below) Optional tailwheel assembly from Composite-ARF. It is simply fixed to the bottom of the fuselage with the clamps supplied, and 4 small screws into the plywood plate that is installed at the factory.

Cowling and Grilles

Finished in 2 hours

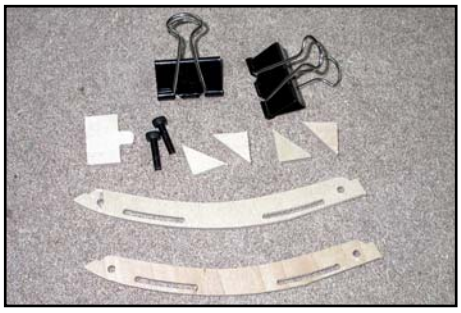
Attaching the 1 piece cowling is quite easy, as it is already cut and trimmed at the factory, and should need almost no adjustment for a perfect fit. With the fuselage set on it's main undercarriage legs, on a level table, trial fit the cowling on the fuselage, checking that the moulded lip on the cowl sits properly into the groove moulded into the front edge of the fuselage. If necessary, sand the inside back edge of the cowl slightly, and the moulded-in groove in the fuselage, to get a perfectly flush fit.

Mark a centreline on the top of the cowl and the fuselage, on small pieces of masking tape. File a small slot in the top centre of the fuselage lip, as shown here, to take the location tab on the milled plywood part that will be glued inside the cowling to locate it. Tape the cowling firmly in place on the fuselage, and glued the milled plywood tab onto the inside of the cowl with 30 minute epoxy and milled fibre. Be careful not to glue the cowling on permanently! This tab makes it easy to locate the cowling, so that the bolts in the bottom line up with the securing M3 blind nuts etc.



(above) Milled plywood tab glued to inside of cowling to locate it (above) A small notch must be filed in the front lip of the fuselage to take the milled plywood tab.

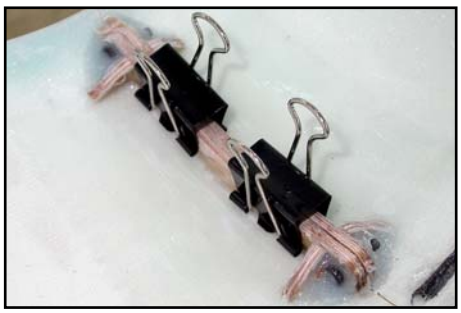
The split joint at the bottom of the cowling is reinforced with the CNC milled plywood parts supplied. Prepare all the mating surfaces carefully with some rough sandpaper and clean off the dust with alcohol. Tack glue the plywood parts in place with CA as shown, and add the small triangular pieces at the front and back to hold them at 90° to the cowling. Wax the threads of two M3 bolts and fit through the holes in one side and CA the bolt heads in place.



(above) Parts for the cowling joint. (below) The milled plywood parts are glued into the cowling, and the two M3 bolts are glued into one side only. Secure the plywood parts with small pieces of glassfibre cloth and epoxy. The spring clamps hold the parts together for flying.

Remove the cowling and secure the plywood parts with some fibreglass cloth and slow epoxy on both sides, making sure that the glue goes into the milled slots in the plywood parts. Also secure the heads of the 2 bolts with some epoxy thickened with microballoons at the same time.

When cured refit the cowling and check for a perfect joint line at the bottom. Then drill two 3 mm Ø holes from the underside through the cowl and fuselage - about 8mm from the back edge of the cowling. Wax two M3 bolts and fit into the holes with two M3 blind nuts on the inside of the fuselage. Secure the blind nuts to the inside of the fuselage with a drop of thick CA, then remove the M3 bolts and secure the blind nuts properly with 30 min epoxy and microballoons. Note that the Blind nuts are fitted inverted, with the spikes pointing upwards !

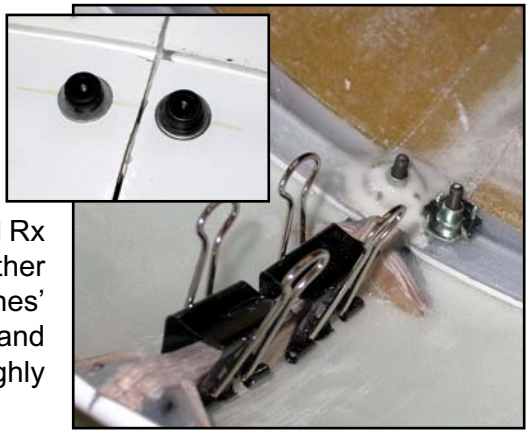


(above) Finally the cowling is retained with two M3 bolts from the underside, into Blind nuts glued onto the inside of the fuselage with epoxy & micro-balloons.

For flying the cowling is held together using the 2 strong steel paper clamps (supplied) as shown in the photo. This system makes it very quick and easy to remove the cowling for motor or exhaust system access if needed, and has been proven with many hundreds of our Yak 55's.

The 6 vacuum-formed grilles (louvres) for the cowling come pre-painted in a single colour and trimmed approx. to size from the factory. However you need to cut out the vertical face behind each angled blade on the louvres - easily done with a very sharp X-Acto knife in a couple of hours. It is important not to forget this as it allows the cooling air to escape from the cowl.

Mask each of the 6 pre-cut openings in the fuselage about 5mm (1/4") outside the cut-out, with tape as shown, and scuff up the exposed surface with coarse sandpaper. Prepare the bottom surface of the grilles in the same way and glue them in place with slow CA.



The last photo below shows the completed cowling and grilles, and you can also see the position of the dual Rx battery switches. The Ignition battery switch is on the other side of the fuselage in a similar position. 'Powerswitches' were used for both Rx batteries and ignition switches, and are available as an optional items from C-ARF., and highly recommended.

(above) tape off about 5mm (1/4") around grilles and sand to ensure a good glue bond.

Canopy Frame and Canopy

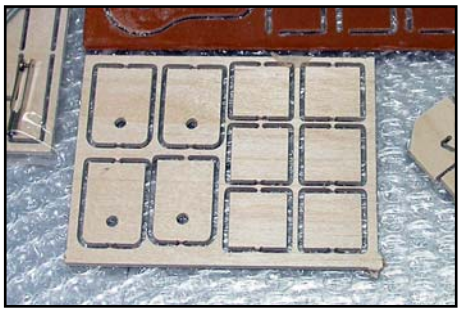
Finished in 3 hours

The canopy frame fits the fuselage already. It is important to finish the mounts step by step as advised below. The parts shown in the photo here are from the prototype, and production versions may look slightly different.

Mill 6 slots (3mm wide x 20mm long) in the canopy frame in the positions shown, with the outside edge of the slots approx. 3 - 4 mm inside the outer edge. Then tape the canopy frame to the fuselage in the correct position, and mark through all 6 slots onto the fuselage with a felt pen. Take off the canopy frame and mill the 4 front and back *only* in the fuselage, making them about 4.5mm wide (1.5mm wider towards the centre of the fuselage).

Then mill the 2 middle slots in the fuselage also, but only 3mm wide, so that the 20mm square plywood parts are a sliding fit in the slots.

Now glue 4 of the 20mm square milled plywood pieces to the inside of the fuselage directly below the front and back 4 slots, making sure that the inner faces are exactly vertical. Because of the shape of the fuselage you will need to thicken the epoxy (30 minute type with some milled fibre and microballoons), especially for the front mounts. Make sure that these are properly glued in place and that the



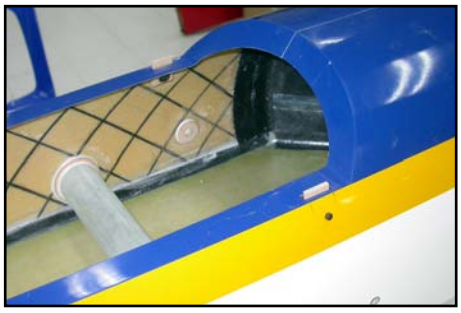
(above) Milled plywood parts for the canopy frame fixing.

(below) One of the finished rear mounting tongues in place.

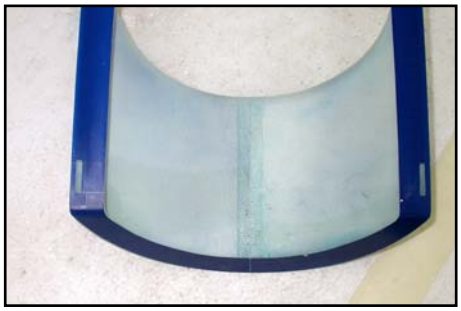
space between the plywood plates and fuselage is completely filled with epoxy.

Drill a 3mm hole through the side of the fuselage in the centre of the 4 front and rear mounting plates only (not the middle 2 plates). Take the 4 plywood rectangles with the milled holes, and glue the four M3 blind nuts in place with 30 minute epoxy. Bolt the 4 plates inside the plywood plates that are glued inside the fuselage with M3 x 12 bolts, so that the top of the plates stick up through the milled slots in the fuselage by 5mm. Cut off excess length if necessary.

Put some clear tape around all 6 slots on the fuselage and frame and wax these areas carefully, without getting wax on the plywood plates. Sand the areas around the 6 slots inside the canopy frame with rough sandpaper. Clamp and tape the canopy frame in place and then glue the 4 plywood parts to the canopy frame with 30 minute epoxy and some milled glassfibre.



(above) The back 2 plywood tongues bolted in place to the fuselage, ready for gluing into the canopy frame
(below) The position of the slots in the canopy frame.

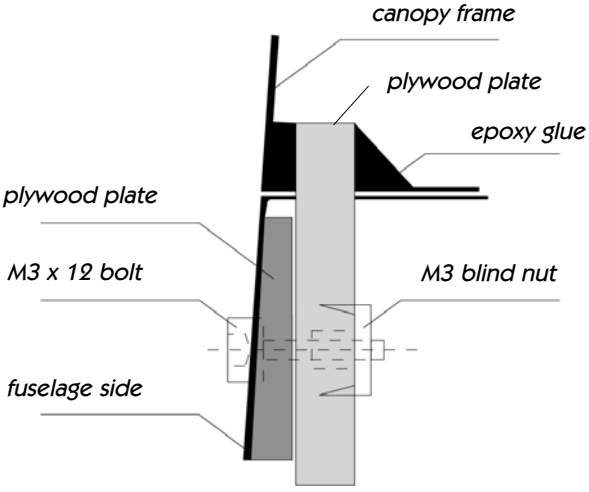


Slide in the 2 centre guides (20 x 20mm plywood squares, no hole) and glue them to the canopy frame with 30 min epoxy and milled-fibre also. These centre guides just make sure the middle of the canopy frame stays aligned properly with the edges of the fuselage. If the joint area was waxed carefully, you can take off the canopy frame in about 1 hour.

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 the clear plastic. Then cut it to exact shape with a 6 mm overlap all around.

Make several hand-holds with 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).



CANOPY FRAME FIXING

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.

Then make visual check from the front and back to make 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 recommend that you also glue the inside edges with the the epoxy mixture to be sure that the canopy cannot come off in flight.

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

Finally the 4 holes for the heads of the M3 bolts that hold the canopy frame in place need to be 'counterbored' into the outside surface of the fuselage, so that the boltheads do not squash the relatively soft foam cored vacuum moulding.

Counterboring means making a larger hole for the bolthead to go in, so it sits flush with the outside surface of the fuselage, and the head sits against a *flat* surface inside the hole - not an angled surface like that made with a normal countersink. The easiest way to do this is with a Dremel and a small mill. Make the counterbored bored holes 6mm Ø and about 5mm deep, so that the bolt head sits against the plywood squares in the fuselage. Even better is to glue metal washers into the holes for the bolts to sit flat against.

Note: This 'counterboring' technique also needs to be used in the bottom surface of both horizontal stabs for the M3 bolts that hold them onto the 20mm aluminium tube.

(above) Clamp the canopy frame securely in position while the epoxy/microballoons mix dries.
(below) Use masking-tape handles to pull the clear canopy tightly against the canopy frame while gluing it in position with a few small drops of thick odourless CA.

(above) Finally secure the canopy to the frame with an epoxy and microballoons mixture inside.
(below) Counterbore the 4 holes for the M3 canopy bolts so that the heads sit against the plywood plates inside the fuselage.

Horizontal Stabs

Finished in 2.5 hours

The stabs are 99% finished at the factory, and only need the servos, horns and linkages installing. Insert the 20mm aluminium tube spar into the fuselage sleeve, and install both stabs to check the fit between the root ribs and the fuselage. You might need to sand the root of the stabs slightly to make a perfect joint, and if the spar tube is too long you can shorten it a little.

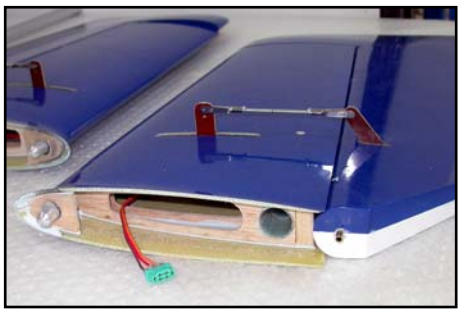
Attach the elevators to each stab using the 4mm Ø aluminium tubes provided. Be careful inserting the tubes, and if they are a bit stiff, then use a little grease on the wire. Don't use too much force, otherwise the phenolic plates inside might break loose. Leave the tubes a bit long during assembly, and cut them to length later. During final assembly, retain the ends of the tubes with a small piece of clear tape at the root and tip ends.

Fit the servos into the root ribs (with servo output shaft at the front) and screw in place using the 2.8mmØ x 14mm screws we supply in the kit, *not* the standard screws that come with the servos. Because of the thin profile you must install the servo arms through the slots in the bottom of the stab, and you will need to make the slots 1mm wider when using the C-ARF phenolic servo arms. You can extend the slots forwards to get the maximum throws if needed.

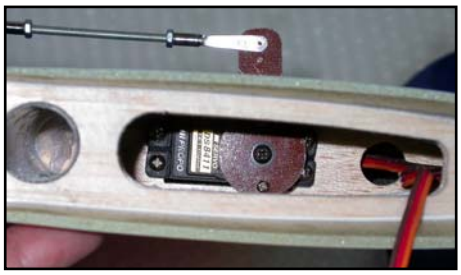
The slots are already milled in the elevators for the elevator horns, but may be adjusted a little if required. It is important that they line up with the output arm on the servo so that there is no twisting moment. Trial fit *one* horn in the milled slot, so that the hole for the clevise is between 22 - 24mm from the bottom surface of the elevator, and exactly perpendicular to the hinge axis (the centre of the aluminium hinge tube). Adjust slots as needed. Put a layer of 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.

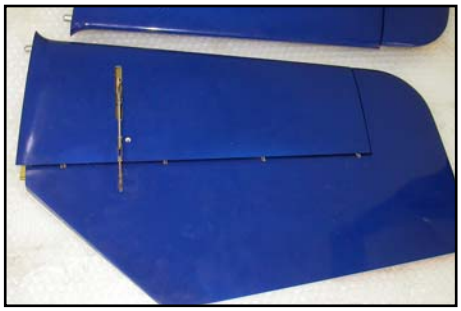
Mark the part of the horn that will be glued inside the elevator, and then remove it and scuff up both sides with coarse (60 grit) sandpaper or a Permagrit tool. Glue the horn in place with slow epoxy (minimum 30 min. cure) mixed with milled fibreglass, or a filled thixotropic epoxy (eg: Loctite/Hysol 9462 or BVM Aeropoxy). Check that horn is at 90° to the surface of the elevator, and in line with servo output phenolic arm, and wipe excess glue off before cure.

When the 1st control horn is fixed, make the horn alignment template from thin scrap plywood (see photo) and accu-



(above) Completed stabs showing linkage, sleeve for aluminium spar tube and front anti-rotation pin.
(above) JR8411 servo fitted into stab with phenolic C-ARF horn.

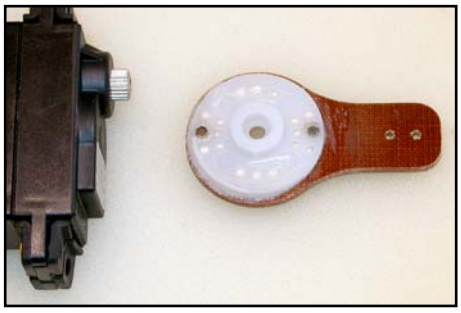




(below) Note the position of the counterbored hole for the stab retaining bolt, secured with clear tape before flying.
(below) Elevator horn alignment template made from scrap plywood. Line is hinge axis. Use for both elevators to ensure same throws. (2.6m Extra shown)

rately mark the position of the quick-link hole in the horn. Drill 1.5mm diameter and glue in a short piece of 1.5mm Ø wire with a drop of thin CA.

Fit the control horn to the other elevator in the same manner, adjusting the milled slot as needed to make sure that it lines up with the servo output arm, and using the template to make sure that the hole in the arm for the clevise is in exactly the same position as the 1st horn. This method makes sure that both surfaces have identical control movements, and a similar method is also used for the aileron horns.



(above) Shows C-ARF servo arm glued and screwed onto standard 25mm diameter servo output arm. (below) M3 blind nut glued into the 20mm Ø elevator spar tube with epoxy and milled fibre.

Servo choice: The elevators can travel more than 50 degrees, and it is up to you whether you want to use this throw or not. The throw defines the kind of servo. If you are going to use the maximum throw for 3D manoeuvres, we definitely recommend digital servos like JR8411. It is not just that the torque of a standard servo is not enough - it is the play in the gears which could cause problems centering, and high speed flutter might be the result.

When using the powerful digital servos and larger throws we highly recommend that you use our Composite-ARF phenolic servo arms, designed for this kind of aircraft and included in the kit. These must be fixed to the standard (25 mm/1" Ø) plastic output arms supplied with the servo with 2 small sheet-metal screws each. Rough up the bottom surface of the C-ARF servo arm and the top surface of the standard servo arm. With servos installed, centre the standard servo arms (using your R/C) at 90° to the btm. surface of the stabs.

Then glue the phenolic C-ARF arms in place with a couple of drops of thick CA, making sure they are centred on the servo arm bolt in the shaft and also at 90° to the stab surface. Finally remove them from the servo and secure the phenolic arms to the standard plastic arms with at least 2 of the very small (2.2mm Ø x10) sheet metal screws provided in the kit. Make up the linkages from the 80mm long M3 threaded rods, with 2 quicklinks and 2 x M3 locknuts for each stab. Don't forget to 'Loctite' the quick-link and lock-nut on one end of each linkage. Do ***NOT*** use ball-links on the servo arms or the control-surface horns, because they will twist the servo arm/horn and cause flutter. This is a solid experience and you should consider it a ***FACT***.

The last job is to fit the M3 stab retaining bolts. Inside the stabs and you will see the small square 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. Thread the hole with an M3 tap and secure it with an M3 x 16 bolt. To be really safe, you can glue an M3 blind nut inside the stab spar tube, with some 30 minute epoxy/microballoons. 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.

Note: Try to always leave the stab tube fixed into 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.

Rudder

Finished in 2 hours

Trial fit the the double-sided phenolic control horn in the slot that is already milled in the base of the rudder, and mark the part that will be glued in. Remove it, mask the exposed parts and scuff the centre part on both sides with coarse sandpaper. Glue in place with slow (*minimum* 30 minute!) epoxy and milled fibre, making sure that it is perfectly centred in the rudder. Fit the rudder to the vertical stabiliser with a 4mm brass hinge tube, in the same way as the elevators. Check for smooth movement.

The 2 rudder servos are fitted to a mounting plate in the fuselage that is not installed yet - but we included the instructions for installing them here so you can find them later!

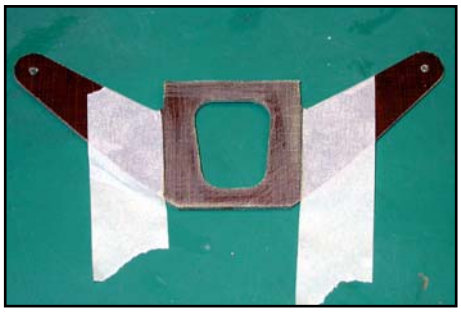
Once the Rudder servo mounting plate has been installed, at a later stage, you can install the servos as follows: Fit the 2 servos into the tray, with the output shafts towards the back of the fuselage, and screw in place using the 2.8mm Ø x 14mm long sheet-metal screws supplied with the kit, *not* the standard screws that are supplied with the servos (they are too small). The milled plywood plate is strong and stiff enough, and you do not need any extra strengthening.

Rough sand the top surface of 2 standard 25mm (1") diameter plastic output arms (or the larger 35mm/1.5" Ø types) with 60 grit, or a Permagrit, and the bottom surface of the 2 phenolic rudder servo arms to ensure good glue adhesion. Then fit the plastic output discs to the servos and connect the servos to your R/C to centre both servos.

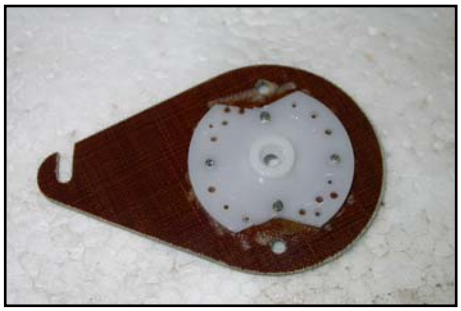
Note: If you use the larger (35mm Ø) plastic servo output discs you will need to notch them to clear the nuts that secure the ball-links, as shown in the photo here.

With the R/C still switched 'ON' place the C-ARF rudder servo horns on top of the servo output discs, with both 'hooks' facing forwards, and align them exactly using a steel ruler as shown in the photo above. Make sure that the back of the hook slots and the output disc securing screws are all aligned perfectly. Then glue the C-ARF phenolic arms on top of the plastic output discs with a few drops of thick CA or slow epoxy and milled fibre. When the glue has cured, remove and secure the phenolic arms to each output disc with 4 of the small (2.2mm Ø) sheet-metal screws supplied.

Fit 4 ball-links to the phenolic horns as shown, through the holes that are milled during manufacture, using M3 x 16 mm bolts and washer under the bolt heads, and an M3 nut



(above) Pass rudder cable thru' crimping tubes 2 times for safety, and prevent the quick-links from opening by putting small pieces of tubing over them.



(above) Rudder horn roughed up with coarse sandpaper. Glue in with slow epoxy and milled fibre.
(below) JR8411 Rudder servos installed in the milled plywood plate, using the 2.8mm Ø sheet metal screws supplied.

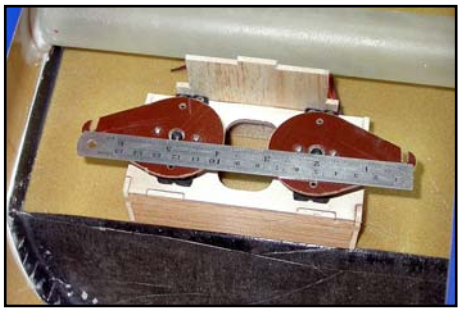
under the plate. Add a drop of Loctite to the nut before tightening to make sure it is secure. Join the 4 ball-links with 2 lengths of M3 x 60mm threaded rod, not forgetting the M3 locknuts. Adjust the lengths carefully so that there is no buzzing or humming from the servos at neutral or full throw.

When the servos are installed you can mark the positions for the slots needed in the fuselage for the cables to exit, using a long steel ruler and marking the position on masking tape. The back end of the slots is 550mm from the back of the fin post, and they should be about 50mm long and 3mm high. Cut out the slots with a very sharp knife, and adjust with a small file. Start by making the slots smaller than this, and trial fit the closed-loop cables to check the position for your particular rudder set-up.

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 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). 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 Yak from perfect tracking.

Servo choice: The rudder is a huge surface on the Yak-55 SP and, just like the elevators, the choice of servo is up to you. We recommend that you use a pair of high quality digital JR8411 servos, which are quite sufficient for pattern flying and all normal manoeuvres.

However if you want the ultimate power and precision, especially for radical 3D/Freestyle manoeuvres, we highly recommend the new JR 8511/8611 servos - which are very nearly the same size and weight, and almost exactly the same price !



(above) With the servos connected to your R/C to centre the servos, align the horns carefully as shown before gluing the phenolic horns to the plastic servo horns. Finally secure with at least 2 small sheet-metal screws (supplied in the kit).

(above) Cut the slots for the rudder cables to exit, approx. 50mm long x 3mm high. The back edge of the slots is about 550mm from the back of the fuselage/Fin post.

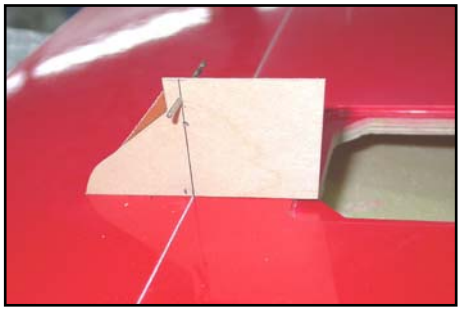
Wings

Finished in 3 hours

Like the stabs, the wings are 95% finished at the factory, and have already been installed on your fuselage to check the alignment. Slide the wings onto the wing tube and check for a perfect fit. You can sand the edges of the wing roots a little if needed. If the wings don't go on completely, and fit snugly against the fuselage, it may be that the supplied anodised 40mm diameter wing spar tube may be a few mm too long. If so, shorten it as needed. Fit the 4 plastic wing retaining nuts onto the M6 threaded wing dowels.

(above) The wings have 2 moulded-in pockets for the aileron servo hatch covers in each panel.

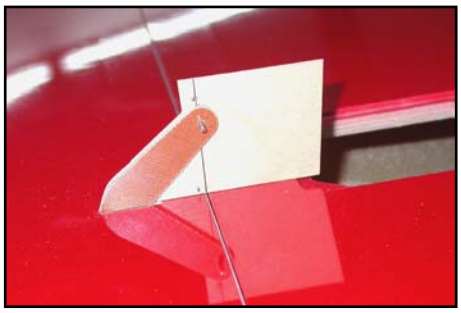
Each wing has 2 servos for each aileron, and the servo hatches are already pre-moulded in the wing for you, and supplied with matching servo covers and milled plywood servo mounts. The 4 slots are already milled in the ailerons for the phenolic control horns, which should be prepared and glued in using exactly the same method as described in the Stabiliser section. Please use slow epoxy (at least 30 minute) and a little milled fibre for this.



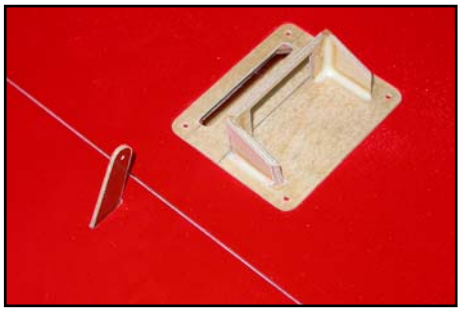
(above) The aileron horn template used to position the inner horns for gluing in place. The line is perpendicular to the hinge axis.
(below) Same template, with an extra hole drilled exactly 7mm higher, for installing outer horns.

Important Note: The distance from the quick-link holes in the phenolic horns to the hinge axis line (*top* surface of the wing) must be the same for the inner and outer horns. However, because the wing/aileron is 7mm (1/4"") thinner at the position of the outer horns, these outer horns must stick out of the aileron 7mm *more* than the inner horns.

NB: *Those of you with good eyes will notice that the photos used to explain the aileron horn templates actually show the wing of our 2.6m Extra 330L, not the Yak, but the method is exactly the same!*



Make a horn alignment template from thin scrap plywood, as shown, to check that the distances from the quick-link hole to the hinge axis are exactly the same. Because of the difference between the inner and outer horns, the easiest way to do this is to make the template for the inner horns and glue them both in place first, and then drill another hole in the template 7mm higher for the outer horns, exactly on the line drawn on the template, perpendicular to the hinge axis. The hole for the quick-link in the inner horns should be about 21mm from bottom surface of wing.



(above) Adjust position of servo mounts so that C-ARF servo output arms align with aileron horns.

Sand the inside surface of the servo hatch covers, and the milled plywood parts that make up the servo mounts to make sure you have a good gluing surface. This is very important ! We recommend that you mark the 4 hatch covers now so that they are always fitted in the correct positions (eg: Starboard/Right inner/outer etc).

Assemble the servo mounts from the 3 CNC milled plywood

parts supplied for each servo, using CA. Fix the servos into the mounts with the 2.8mm Ø screws provided in the kit, and place them on the hatch covers to check the alignment so that the servo arms are in the centre of the slots milled in the hatch covers, and also align with the aileron horn slots. Don't forget to allow for the extra thickness of the C-ARF servo horns that will be fixed onto the standard plastic servo arms. You will need to make the slots in the servo hatch covers a little wider, by 1mm or so.

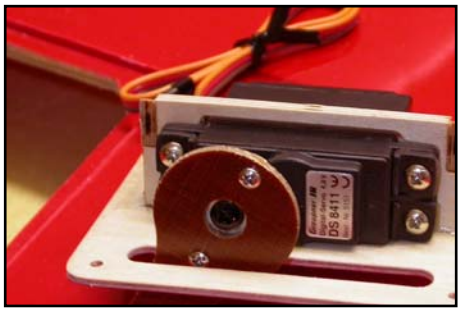
Glue the servo mounts to the hatch covers with CA, and then remove the servos, and reinforce the glue joints between the servo mount and the servo cover plate with slow (min. 30 minute) epoxy and milled fibre, with a nice glue fillet all around (see photo). This is an important joint!

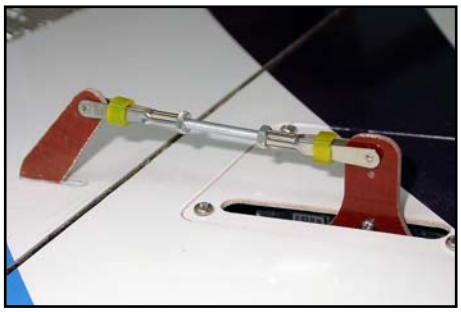
Rough sand the top surface of the 4 standard 25mm Ø plastic servo arms, and one side of 4 C-ARF servo horns to prepare for gluing. Then refit all 4 servos to the completed hatch covers and install in the wing. Connect all servos to your R/C and centre them. With the servos centred, insert the C-ARF servo horns through the slots in the hatch covers and glue them to the plastic servo arms with one or two drops of thick CA, making sure that they are all at 90° to the btm. surface of the wing using a small 90° set-square. When the CA has cured, remove them and glue and screw onto the plastic servo arms properly using the small sheet-metal screws provided, in the same way as the elevator and rudder servo horns. The servo covers are fixed to the underside of the wing with 4 small sheet-metal screws provided. This kind of servo mount allows changing of a servo within a few minutes, if needed.

Finally make up the linkages from the M3 x 70mm threaded rods supplied, with 2 quicklinks and 2 x M3 locknuts for each linkage. Don't forget to 'Loctite' the quick-link and lock-nut on one end of each linkage. Please use the quick-links and hardware supplied - do ***NOT*** use ball-links if you use these C-ARF servo arms, because they will twist the servo arm and cause flutter. This is a solid experience and you should consider it a ***FACT***.

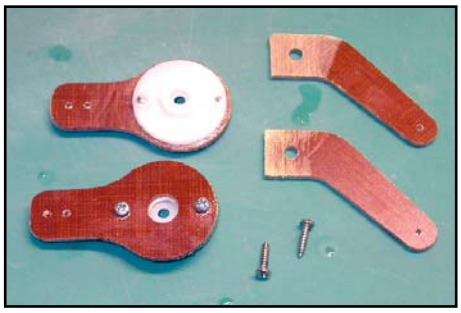
Servo choice: We recommend using 2 high quality servos (eg: JR/Graupner 8411) per aileron as the surfaces are very large. The ailerons have enough torsional flexibility to prevent servo damage if each pair is not perfectly matched.

Attention: To prevent severe wing damage during any possible aileron flutter, we highly recommend that you box the 4 servo cutouts between the bottom and top wing surfaces with scrap 6mm (1/4") balsa, along both sides, glued with epoxy, to stiffen the bottom wing skin. (see photo on right)





(above) The completed aileron linkage. Note locknuts and safety-tubes (made from Tygon) used on both ends of the linkage.



(above) View of the C-ARF servo horns, shown fitted to standard 25mm Ø servo arms, and also a pair of the standard C-ARF phenolic control surface horns. Note gluing surfaces roughened up with coarse sandpaper to ensure good bond.
(below) Boxing of aileron hatch cutouts with 6mm scrap balsa sheet on both sides.

Engine and Exhaust Installation

Finished in 4 -5 hours

We strongly recommend that you complete the motor and exhaust installation *before* the fuel tank base and rudder servo plate are permanently installed.

In the prototype we used a a Desert Aircraft DA-100 and a pair of tuned-pipes (MTW part # KS1060), which is a highly recommended combination with lots of power and lightweight. In the new 'Shulman 2000' scheme plane, also shown here in some photos, we fitted a pair of mini-pipes (MTW part # DT75K), instead of the tuned-pipes, and this is also a fabulous set-up with more than adequate performance for any manoeuvres you might want to fly.

Headers for both set-ups are available, and the aluminium types can be easily bent by hand, so that they clear the main undercarriage legs. Of course many other engines in the 80 - 100 cc range are suitable for this plane as well.

The moulded motor dome is reinforced inside with plenty of carbonfibre and does not require any additional strengthening. If using a DA-100 and 2-bladed carbon propeller the sidethrust required for our Yak-55 is very small at only about 1 - 1.5°, with 0.5° - 1° downthrust. The fibreglass motor dome is accurately offset in the moulding process, using a precision jig, and the plywood firewall is glued directly to this in the factory, which already gives you very close to the ideal thrustlines when the motor is mounted in the centre of the motor dome.

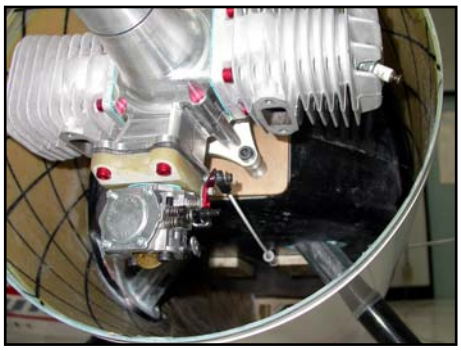
You can check the incidence of the firewall easily by setting the assembled model on a flat table, and setting the wings at 0° (measured with an incidence meter). Then check the incidence of the firewall, which should already have approx. 1° downthrust and 1.5° sidethrust built into it.

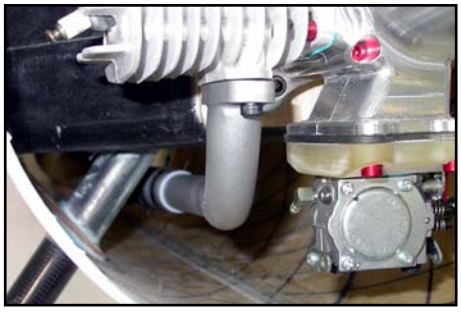
To make sure that the centre of the spinner is in the centre of the cowling, you only need to offset the motor from the centre of the firewall, which is easily done as the fuselage is exactly circular at this position. Cut 2 strips of scrap plywood, about 25mm wide and 335mm long, and adjust lengths so that they both fit inside the fuselage exactly, against the surface of the firewall. Mark the exact middle of each piece and drill a small hole through both. Using them as shown in the photo, you can mark and drill a small hole in the centre of the firewall as your reference point. Then mark a horizontal line through the centre point, across the firewall with a steel ruler, using the moulded lines in the motor dome as a reference.

If using 1° downthrust and 1.5° sidethrust on a DA-100 you

(above) Engine alignment is simple as the firewall is already offset for you in a precision jig at the factory. Here you can see the centre and offset marks on the firewall.
(below) Use 2 equal length strips of plywood to find the exact centre of the firewall.

(below) In this view you can also see the nice direct throttle linkage under the cockpit floor.





need to offset the motor mounts 4.5mm to the left (pilots view) and 3mm up to make sure that the centre of the spinner is central in the cowling. Mark the offsets on the firewall carefully, and then mark the positions of the 4 motor mounting holes using a 90° square. In the case of the DA-100 the mounting bolt holes are 80mm vertical, and 70mm horizontal centres.

(above) A view of the plywood bulkhead for supporting the full-length tuned-pipes (# KS1060).

Drill all 4 holes 7.5mm diameter, and glue the M6 blindnuts to the inside face of the firewall with 30minute epoxy. Bolt the engine and stand-offs in place using the M6 x 30mm bolts and 13mm washers supplied. Depending on which motor and stand-offs you are using, you may need to pack the stand-offs equally away from the firewall a little, with thick washers, to prevent the propeller touching the cowling. Try to maintain a clearance of about 5 - 6mm.

(above) Shows the exits of the pair of # KS1060 tuned-pipes from the bottom of the fuselage. Make the exit holes at least 35mm wide x 120mm long for adequate cooling air to exit the fuselage.
(below) Alternatively you can fit a pair of mini-pipes and headers such as these #DT75K from MTW.

Small adjustments to sidethrust and downthrust after the first flights, if needed, can be made by adding or removing washers between the back of the engine mount and the plywood firewall.

Standard Mufflers: We do not recommend the use of standard mufflers, do the higher noise levels.

Tuned pipes: A tuned-pipe installation is a little more complicated than the use of a standard muffler, 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. Especially if using a DA-100 motor we highly recommend the # KS1060 tuned pipes, because the shape of the fuselage and the separate compartment under the cockpit area makes it easy, safe and reliable with excellent cooling. This set-up gives the engine a nice throttle response, a perfect mid-range, and also increases the top end power noticeably.

The pair of tuned-pipes, with the headers, teflon joiners and clamps are all available from C-ARF as optional parts. The support bulkhead for the tuned-pipes will be included in the kits shipped from mid-2004. Alternatively you can download a full-size template of it from our website, or purchase it from Desert Aircraft (the retailer for KS and MTW products).

The photographs on this page should make the installation clear. They show the special support bulkhead fitted at the back of the exhaust compartment, under the cockpit area, complete with the 8 small silicone tubes that soft-mount the pipe, and protect the milled plywood from the heat.

Mini-pipes: The second example of the 2.6m Yak shown in the lower photos shows the installation of a pair of MTW mini-pipes (part# DT75K), which are also available from C-ARF as an optional part. There is plenty of space for these, although you must be careful to keep at least 6mm clearance between the headers and the fibreglass sleeves for the main landing gear, which

may need a little bending of the headers.

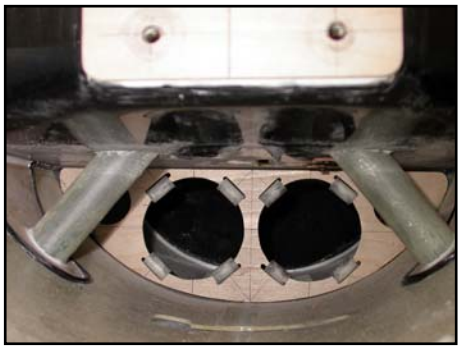
All new kits shipped from mid-2004 will have this CNC milled plywood bulkhead and silicone bumpers included in the kit. Alternatively you can download a full-size template of it from our website.

The bulkhead should be fitted about 110mm (4.25") behind the back of the fibreglass sleeves for the main landing gear, glued in with slow epoxy and milled-fibre, and reinforced with glassfibre tape.

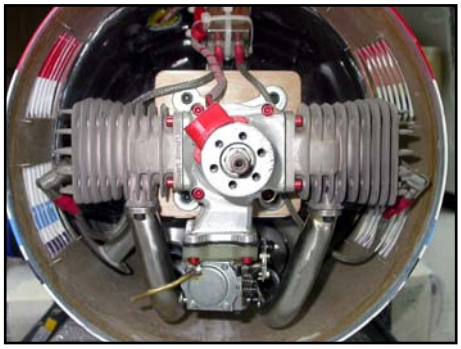
Important Note: If using internal tuned-pipes or mini-pipes, C-ARF recommend that you keep the headers at least 6mm (1/4") away from the fibreglass sleeves for the main undercarriage legs, and 10mm (3/8") away from the moulded cockpit floor to prevent any heat damage.

Cooling Slots: Whichever exhaust system you choose, don't forget 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 about 35mm (1.5") wide and 125mm (5") long, and it is best if you make nice rounded corners to reduce any chance of tearing in the composite skin. For the mini-pipe installation the front of these slots should start about 25mm in front of the back end of the mini-pipes, as shown. When cutting the slots leave about 30mm (1.25") between the slots so that you don't cut through the jointing tape used in manufacture.

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



(above) A view of the plywood bulkhead and silicone supports for the MTW #DT75K mini-pipes.
(below) Completed DA-100 and mini-pipe installation, with the ignition unit on a foam rubber pad, secured onto the motor dome with 3 small cable ties.

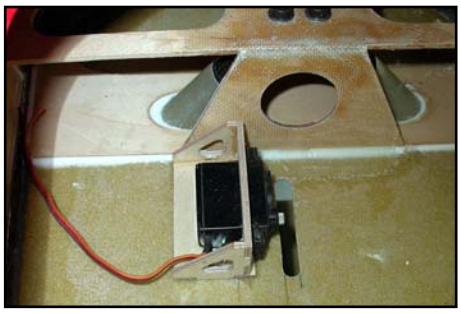


(above) A view of the cooling slots for the MTW mini-pipes, and the cut-outs for the exhaust outlets.
(left) A general view of the completed DA-100 and mini-pipe installation.
(Shulman 2000 scheme)

Fuel Tank Base, Rudder Servo Plate and Throttle servo mount

Finished in 1.5 hours

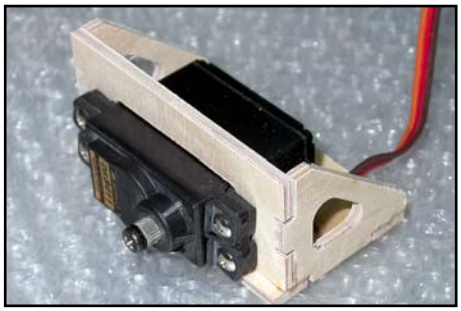
The rudder servo plate, fuel tank base and throttle servo mount are assembled from a combination of CNC milled plywood and composite-balsa parts that have been laminated both sides with glasscloth, and vacuum-bagged, at the factory. This material gives exceptional strength with low weight and is more than adequate for this structure - so please don't modify it in any way.



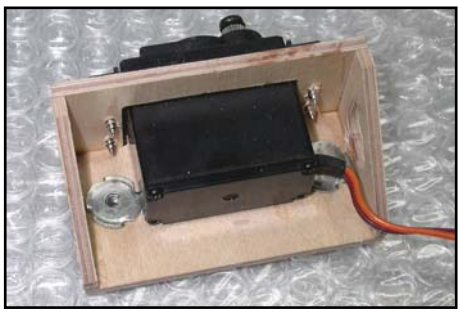
(above) Throttle servo location shown here. The mount is fixed down to the cockpit floor with M3 bolts and blind nuts.

Throttle Servo Mount

Assemble the throttle servo mount from the milled plywood parts, which clip together with interlocking tabs to make this easy. Glue the milled plywood parts together with thin CA, and then reinforce all joints with 30minute epoxy and milled fibre. Trial fit the servo and determine the position to get a nice straight linkage to the carburettor, without touching the main undercarriage legs. Mark the position of the servo arm and cut a slot in the cockpit base for it.



The mount is held in place using 2 x M3 blind nuts, as shown, and two M3 x 12mm bolts and washers from the underside of the cockpit floor. Please glue a small scrap of 3mm plywood under the cockpit floor to reinforce it and prevent the bolt heads pulling through the composite material.

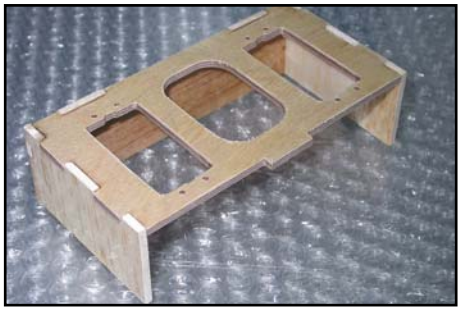


Unless you have a very short screwdriver, you will find it easier to drill a hole through the side of the fuselage (which will be covered by the wing root) to access the bolt or screw holding the servo arm onto the servo shaft. Make up the throttle linkage from the M3 all-thread, stop nut and quick - links that are included in the hardware bag.

Note that 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. The photo on page 25 also shows the throttle linkage in place.

Rudder Servo Mount

The rudder servo mounting plate is also assembled from interlocking milled plywood and composite balsa sheet parts, as shown in the photos below. See also the photos in the Rudder section.



Tack the assembly together with thin CA, and then reinforce all joints with a mixture of 30 minute epoxy and milled fibre. Mark the exact centre of the cockpit floor and trial fit the mount to be sure it is centrally positioned. Do *not* glue it in place until you have completed the fuel tank base and checked that the 2 parts fit together properly and are

aligned centrally on the cockpit floor. Once happy, rough the gluing surfaces up properly with coarse sandpaper, clean with alcohol and glue in place with slow epoxy (min. 30 minute) and milled fibre mixture.

You will find that the back edge of the rudder servo mount is almost flush with the top edge of the angled moulded bulkhead at the back of the cockpit floor. To be really secure, this joint can be reinforced with a length of glassfibre tape and epoxy laminating resin.

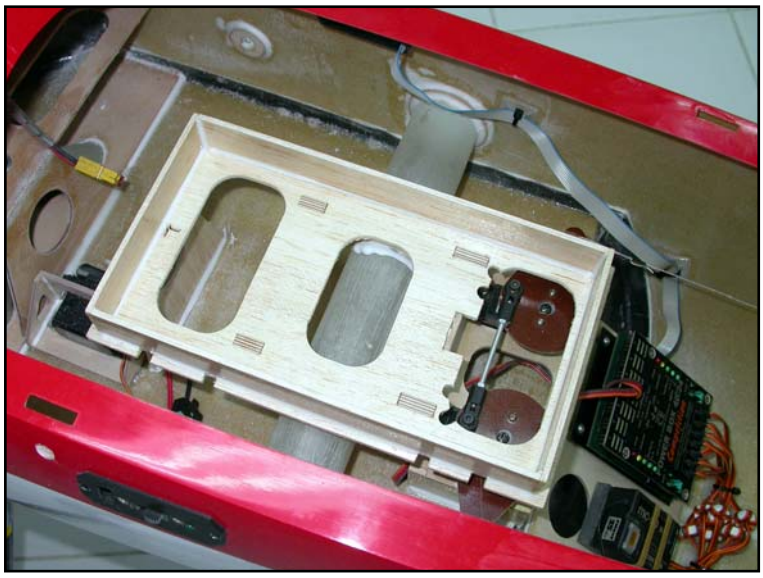
Fuel Tank Base

The Fuel tank base mounting plate is also assembled from interlocking milled plywood and composite balsa sheet parts, as shown in the photos here. The Front edge of the plywood tank base is marked with an "F" milled into the surface for your convenience.

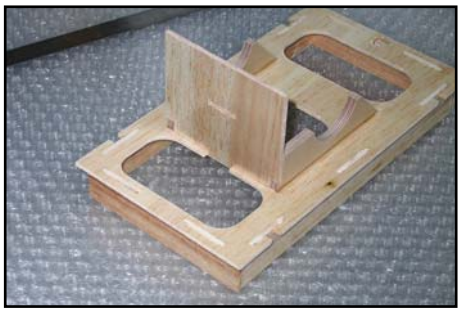
Note that the 4 plywood parts with the radius that will fit over the main wing spar tube sleeve are double thickness. Glue these together with CA before installing in the slots in the tank base. Assemble the parts with thin CA, and then reinforce all joints with the epoxy/milled fibre mixture.

Finally this part is glued onto the fibreglass sleeve for the main spar, after roughening it up properly, with slow epoxy and milled fibre, checking that the slot in the vertical -bulkhead has located on the tab on the front of the rudder mount, which keeps everything central.

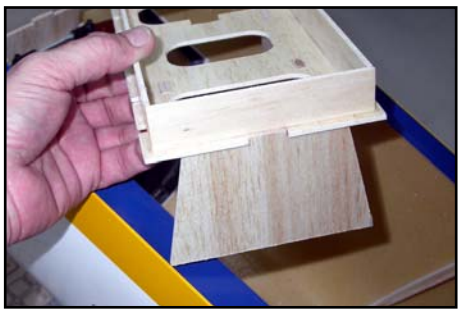
Don't forget to give all the bare edges of the milled balsa and plywood 1 thin coat of epoxy to fuel proof them before finally gluing into the model. A 960cc Dubro tank (part #690) fits the base perfectly, and is secured with 3 long cable-ties as shown.



(below) 3 photos of the tank base



(above) The slot in the vertical balsa sheet (rear bulkhead) locates on the tab on the front edge of the rudder servo mount.
(below) The composite balsa front bulkhead might not look exactly like this in production kits.



(left) General view of the completed rudder servo mounting plate and Fuel Tank base glued in final position on the main spar sleeve.(Shulman 2000 scheme)

R/C & Gear Installation

Finished in 4 - 6 hours

Everyone has their own favourite methods when fitting the R/C and gear, so the installation shown here is a guide, and has worked perfectly in all of our planes flown by C-ARF factory staff, and many of our customers.

You can either install a simple R/C system with a single receiver NiCad and switch, or fit twin NiCads and switches with a single receiver and a high-quality servo powerbus system for the ultimate in safety and security. Particularly if you decide to build the plane with 8 high power digital servos the 2nd option is highly preferable, if only because of the high current draw during 3D style manoeuvres.

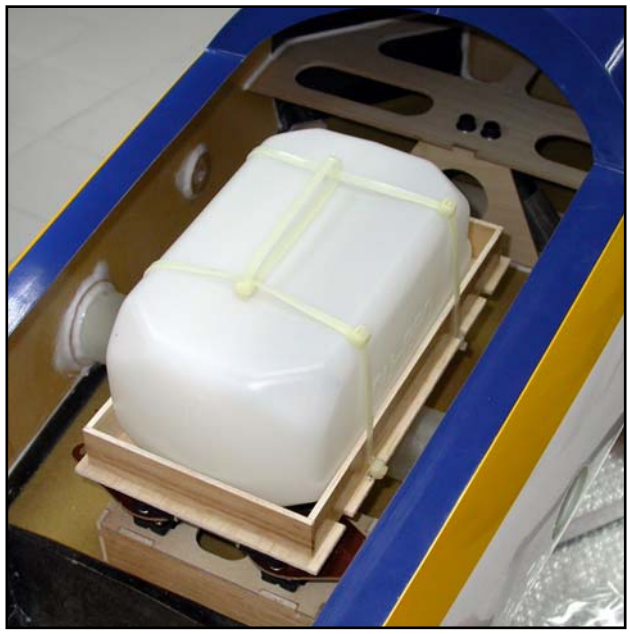
It's your choice, but the dual Nicad and powerbus installation does give extra 'peace of mind', increases the safety factor and protects your investment, and therefore this is what C-ARF recommend. The full 'PowerBox' range is all available from C-ARF as an option. Visit our website for more details.

Fuel proofing: Before doing the final R/C installation, we recommend that you protect all the bare wood parts and edges 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 - 40 grams (1 1/2 oz) of epoxy to fuel proof all the wood in the whole area in the front of the plane.

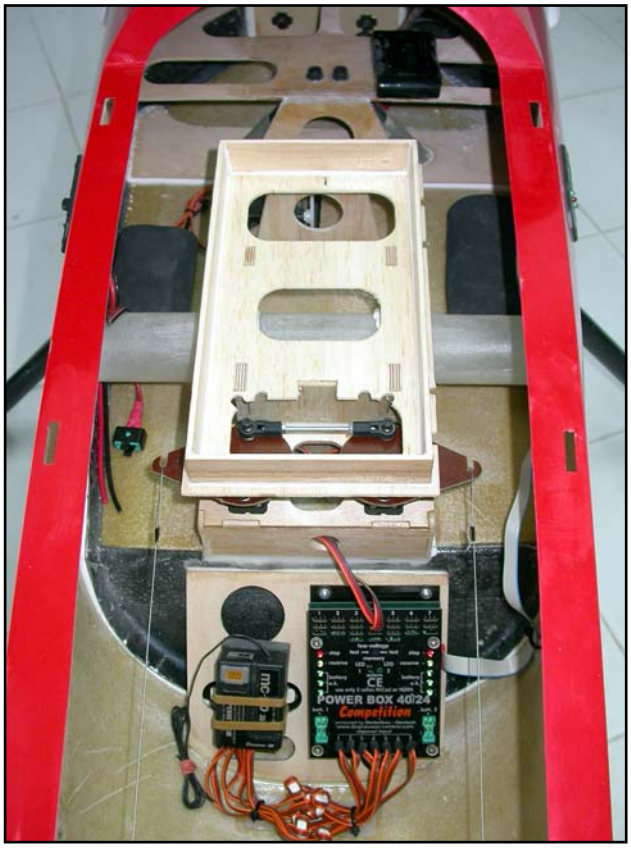
Simple installation

For a simple installation the receiver can be fitted to the milled plywood bulkhead behind and below the rudder servos, which keeps it (and the antenna) as far away from the high current motor ignition system as possible. Protect it from vibration with a thick foam pad. Run the antenna wire along the side of the fuselage and then vertically through the top of the fuselage just behind the cockpit and back towards the vertical stab. Keep it as far as possible from the cables for the elevator servos and the closed-loop rudder wires.

The single Rx NiCad should be a 5-cell pack of at least 2400 mAH and will need to be fitted



(above) This general view shows the Dubro tank (part number #690) in position on the fuel tank base, held in place with 3 cable-ties.
(below) General view showing PowerBox Competition and Rx installed on the plywood plate provided. With a DA-100 the 2 Rx batteries need to be fitted to the fuselage floor just in front of the spar as shown here.



on the upper plywood plate behind the firewall. The ignition battery for the motor can be fitted in the same area, and of course both should be protected with foam sleeves, and fixed securely with cable-ties. Please 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.

NB: Please double-check the manual for your R/C system if the use of 5-cell NiCads is recommended, or not.

Dual NiCad and Powerbox installation

We recommend using two 5-cell 1800 - 2400 mAH NiCad packs when fitting the Powerbox 40/24 or Powerbox Competition systems, as shown.

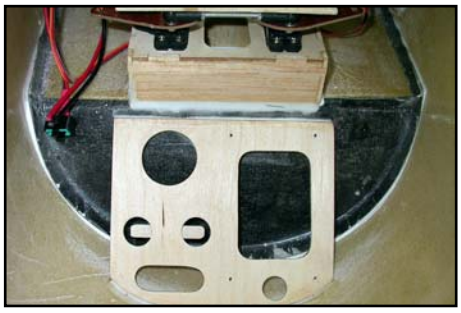
The PowerBox power control unit is designed especially for large models and provides dual battery inputs with hi-amp connectors, multiple outputs for 6 channels/24 servos (no 'Y' leads needed), automatic voltage regulation and stability, built-in servo amplifiers for those long servo cables, as well 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 can be screwed to the milled plywood bulkhead supplied in the kit, which is glued behind the rudder servo mounting plate as shown. The receiver is installed on the same plate, on a foam pad and secured with 2 rubber bands.

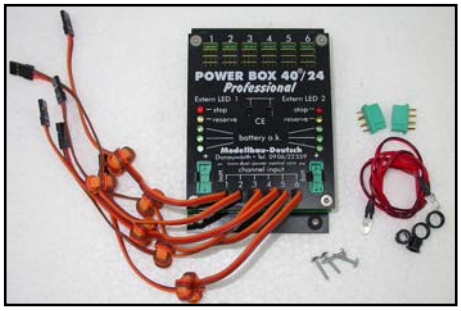
With the R/C installation described here and this motor and tuned-pipe/mini-pipe set-up, you will not need any additional ballast in the nose to obtain the correct 'Centre of Gravity' for pattern flying. For the Shulman 2000 scheme shown in these instructions the 2 Rx batteries (2000 mAH) were secured with cable-ties to plywood plates glued to the cockpit floor immediately in front of/under the wing spar tube.

We also highly recommend the high-quality PowerBox powerswitches for the dual batteries, and we also use one of these in the ignition circuits of all our planes. Remember the high current that 8 digital high power servos can draw during 3D and Freestyle manoeuvres when making your decision on R/C equipment.

If fitting the switches into the outside surface of the fuselage, as shown on page 16, please reinforce the area inside the fuselage 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 left side, and the single Ignition switch on



(above) Rx and Powerbox plate.
(below) The Powerbox 40/24 Professional is highly recommended for control of dual batteries and 8 high power servos in the Yak-55.



(above) Powerswitches are used for both the dual Rx NiCads & the single Ignition Nicad, fitted into the fuselage sides.
(below) Depending on the Fuel tank you choose, you might need to make extra notches for the cable-ties in the edge of the Fuel tank base plate as shown here.

the right side. These powerswitches are available as options from C-ARF, please see our website for current details.

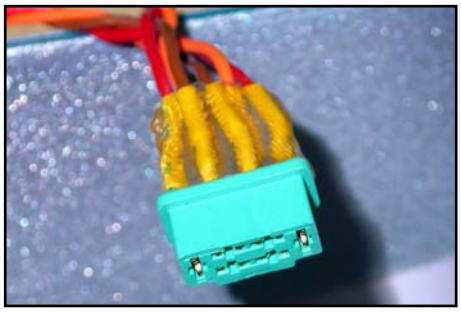
Composite-ARF advise you to keep all the cables between the motor ignition battery, ignition switch, and high voltage ignition unit as far away as possible from the receiver and R/C system.

Servo extension leads etc.
Please make sure that you use good quality 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.

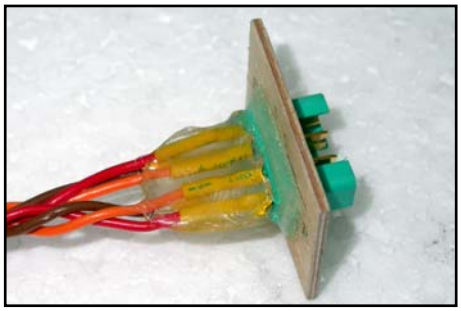
At C-ARF we hard-wire all our servos with twisted cable leads of the exact length required and Multiplex 6-pin connectors (see photos). For the 2 aileron servos you can use 1 pin for each wire, and for the elevators you can gently squeeze pairs of adjacent pins together and use a pair of pins for each cable. 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. 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.

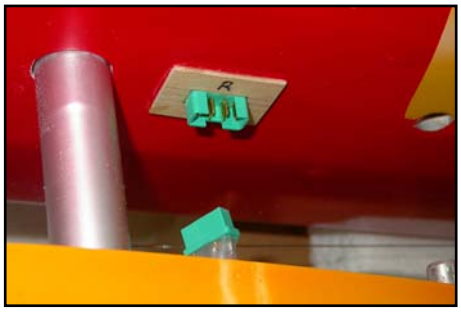
Motor ignition system
The ignition unit is fixed to the top of the motordome, inside the cowling area, on a piece of hard foam, and retained with 3 cable ties. See bottom photo on page 27. At C-ARF we recommend a 4-cell 1200 - 1400 NiCad for ignition power, and we use a Powerswitch for the cut-off. The battery can be installed anywhere to obtain the correct Centre of Gravity, even on top of the motor dome next to the ignition unit if you wish, but a common choice is on the plywood plate next to the main landing gear securing bolts.

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



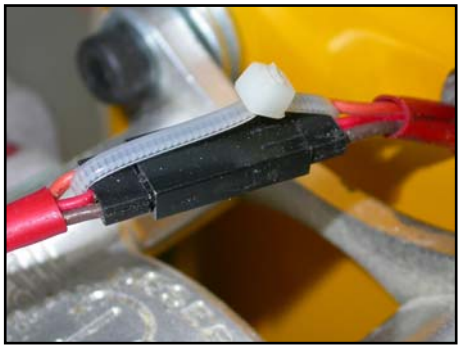
(above and below) 6-pin MPX connectors are used for extension leads, with one half mounted in the fuselage sides.





(above) The MPX connectors are mounted in the sides of the fuselage in plywood plates, making it very quick and easy to assemble, and dis-assemble the model. (2.6m Extra shown here)

(below) A small cable tie makes sure that the ignition connectors cannot come undone in flight!



Fuel tank

The fuel tank is held to the tank base with 3 large cable-ties (see photo on page 30). We used a Dubro #690 tank, but depending on your choice, you might need to make some extra notches in the fuel tank base for the cables ties, as shown in the photo here.

(above) Make sure that the fuel feed tubes cannot come off in flight by using Dubro fuel line barbs, or making your own with a small ring of soft wire soldered on.

Drill a hole in the motor firewall where necessary for the fuel feed tube from the tank to the carburettor, and protect it where it passes through the hole using a rubber grommet or similar. Make sure there are no loose fuel tubes that can come in contact with the hot motor, headers or exhaust system.

Fit the correct stopper to the fuel tank for the fuel type used. (If using Dubro tank the gasoline stopper has a small 'O' moulded in 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 absolutely sure it will come off at precisely the wrong moment and your engine will quit ! Therefore please solder some small rings onto both ends of 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. Dubro Fuel barbs are an excellent alternative, but becoming more difficult to obtain now. 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 - leave open) and one at the top for filling (close for flight).

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 maneouvres. 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 fibre glass 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' manouevres 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 to the fuselage sides with 30min. 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 to make sure they cannot turn?

- Are the swage tubes crimped up nice and tight on the rudder cables?
- For added security 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.

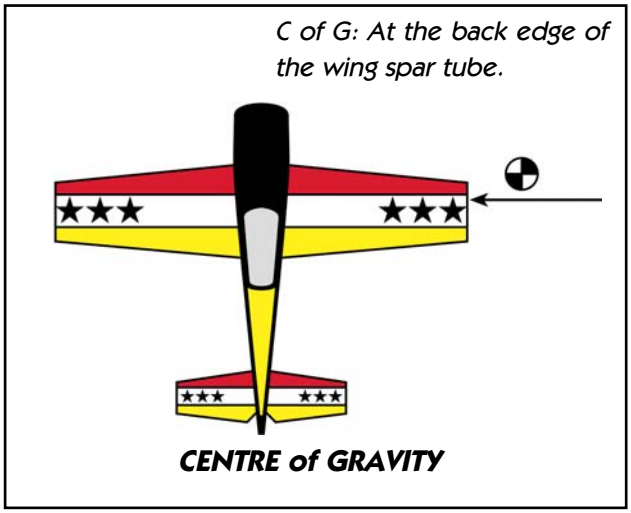
Then you can go on set up all the linkages, control throws and R/C system as described below.

The assembly of the model should be completed in about 23 - 26 hours.

Two more views of the latest 'Shulman 2000' paint scheme on the C-ARF Yak-55SP.

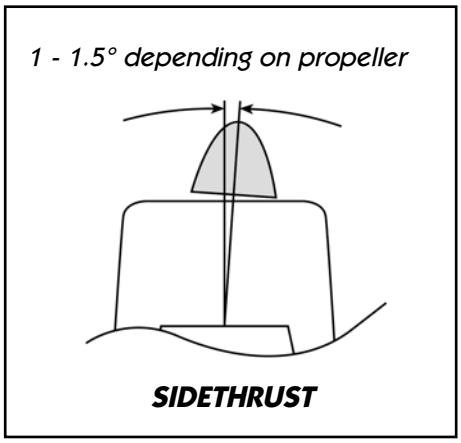
Setting Up Your Aircraft

Centre of Gravity:
The Centre of Gravity should be set on the *back* edge of the wing spar tube, with the plane assembled. The easiest way to check and set this is to insert the wing tube in the completed fuselage *without* the wings attached, and set the balance point on the *centre* of the wing tube, so that plane balances horizontally. When you then fit the finished wings it will move the actual Centre of Gravity back about 10 - 20mm (3/8" - 3/4") to the back edge of the 40mm Ø wing tube which is perfect.



After you are confident you can move it further backwards by up to 10mm behind the back edge of the wing tube, but this is *definitely* a '3D/Freestyle' CG setting and should not be used for the first flights. With this rearward CG you will need to use the high rate control throws shown below.

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.

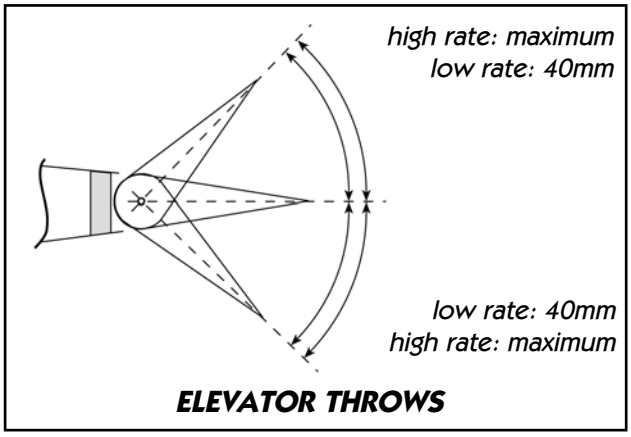


Engine Thrustline:
Already given in the instructions, down thrust should initially be set at 0.5° - 1° degree and right thrust 1 - 1.5° degrees, depending on the prop used. The Composite-ARF Yak-55 SP *really* only needs this small amount of side and downthrust with the DA-100 and recommended propeller.

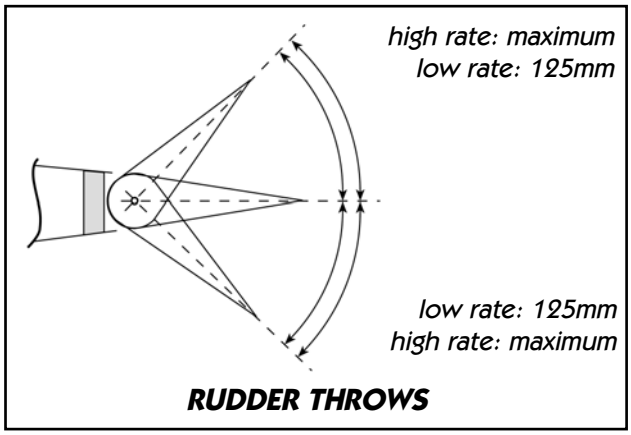
We recommend a 2-blade 28" x10" carbon prop for any 100cc engine. It is a very quiet and powerful solution. They are normally CNC-designed, so the prop is balanced perfectly statically, dynamically and aerodynamically, which keeps the vibration down to a minimum.

Control Throws:
All measurements are 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 , but in this case with 50% exponential. Low rate should be no more than 40mm (1 1/2")



both sides. This is the perfect throw for nice and crisp snaps. If you like you can add about 20% exponential to the low rate setting as well.



RUDDER THROWS

Rudder

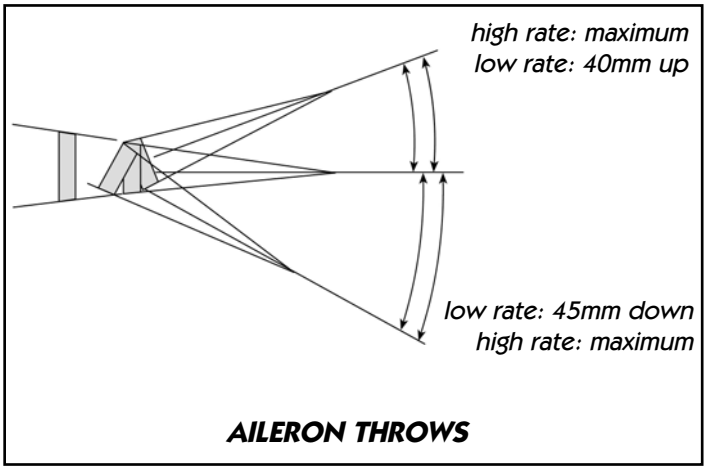
Set the high rate to maximum throw both sides, and at low rate reduced to about 125mm. Add about 25% exponential for smooth tracking corrections. At the same time you should remember that the Yak rudder is very sensitive, and the plane will shake at high speed if the rudder linkage is not really rock 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.


High-Rate throws shown

Ailerons

Set the high rate to maximum throw both sides, and use at least 30% exponential at high rate. For low rate you should decrease the throw to the TOP to 40mm, to the BOTTOM to 45mm. 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. At high rate, for 3D maneouvres, this doesn't affect 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 the maximum high rate throws.


High-Rate throws shown



AILERON THROWS

In General

Your Yak 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. The design is so strong that even flutter will not damage the structure of the plane. But if a servo gear strips, the flutter will not stop until the plane slows down (or 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 short 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 big 3.3m Yak-55SP is known for very good and crisp 'snapping', and we think that the 2.6m version 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 !

You will be pleased to know that your Yak-55SP will ***not*** need any mixing at all for perfect knife-edge tracking. It is 100% neutral when set up as described in this manual. For the finest adjustments as little as 1% maximum might be needed.

Now your Yak-55 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 Yak-55SP. This manual is one of the first of a new standard of Composite-ARF instructions, and we would like to complete all our products with this style in the future. Please let us know whether you like this all new instruction manual, and if you have any ideas to improve it ?

Also let us know, if you think that any hardware is missing or inadequate. 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

Mike C (16 July 2004) Mac

Appendix:

Yak-55 SP, 2.6m Kit
Packing List

Main Items

Art.-Nr.	*Quantity*	*Description English*
	1	Fuselage
	1	Right wing
	1	Left wing
	1	Right stabiliser
	1	Left stabiliser
	1	Right elevator
	1	Left elevator
	1	Rudder
	1	Cowling
	1	Canopy Frame
	1	Right wheel pant
	1	Left wheel pant
	1	Right landing gear, carbon
	1	Left landing gear, carbon
	2	Aluminum tube 3.1 x 4 x 490mm (for elevators)
	1	Brass tube 3.1 x 4 x 500mm (for rudder)
	1	Aluminum Wing tube 50 x 1.4 x 1000mm (wing spar)
	1	Aluminum Stab tube 20 x 1 x 340mm (stab spar tube)
	1	Hardware bag
	1	Milled wood parts bag

General Pack

Art.-Nr.	*Quantity*	*Description English*
	2	Allen screw M3 x 12 mm.
	4	Allen screw M3 x 16 mm (canopy mount)
	2	Washer 3 mm.
	6	Blind nut M3
	32	Sheet metal screw 2.2 x 9.5mm
	2	Allen screw M6 x 20mm
	4	Allen screw M6 x 40mm (engine mount)
	2	Nut M6
	4	Washer 6mm
	4	Blind nut M6
	4	Allen screw M6 x 55mm
	4	Sheet metal screw 2.9 x 13 mm

Wing Pack (2 Sets)
Hardware

Art.-Nr.	*Quantity*	*Description English*
	8	Sheet metal screws 2.9 x 13mm
	2	All Thread M3 x 70mm
	4	Nut M3
	4	Spring steel clevises M3
	3	Plastic nut M6
	4	Sheet metal screw 2.2 x 9.5mm

Stab Pack (2 Sets)
Hardware

Art.-Nr.	*Quantity*	*Description English*
	2	Spring steel clevises M3
	1	All Thread M3 X 80mm
	2	Nut M3
	2	Sheet metal screw 2.2 x 9.5mm

Rudder Pack
Hardware

Art.-Nr.	*Quantity*	*Description English*
	4	Allen Screw M3 x 16mm
	4	Stop nut M3
	4	Washer 3mm
	6	Nut M3
	2	All thread M3 x 60mm
	2	Spring steel clevises M3
	4	Ball link M3
	2	Pull-Pull Cables Ø 0.8mm x 2800mm
	2	Threaded ends for Pull-Pull Cables

Lieferbares Zubehör / Available Accessories:

Tail gear setup with 50mm Ø wheel
Desert Aircraft DA-100 motor
MTW Mini-pipe or Tuned-pipe systems for DA-100 motor
PowerBox 40/24 (Dual Nicad crossover unit)
PowerSwitch 20A (for dual NiCads and ignition)