CARF-Models F4U-1D Corsair

Building Instructions

Scale: 1:4.5, Span: 2.8m, Weight: 19-22 kg

The Museum Scale Dream-Warbird from CARF-Models
with Plug-In or Folding Wings, Builders Kit or ARF.

Building Instructions for CARF-Models F4U-1D Corsair

Thank you very much for purchasing our CARF-Models Corsair all composite aircraft, made with our all composite prouction technique. The master plug of this Corsair was designed with a 3D CAD program, and then milled on our 3D capable CNC-router. Skilled craftsmen and experienced modellers have finalized the shapes and contours as well as the details of the plane, before the production mold was made. This high-tech marvel of production tooling is a precise, handcrafted set of molds, which will allow us to supply precision composite parts for many years to come.

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: ordersupport@carf-models.com
Telephone: Phone your CARF Rep!!! He will be there for you.
Website: http://www.carf-models.com

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 CARF-Models 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 CARF-Models 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 CARF-Models 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 CARF-Modelsare 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 flying 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 in this particular aircraft, especially engine and radio equipment.

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

Attention !

This Scale-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 Corsair 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 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 experimenting with moving the CG back. 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 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. If you fly with 2.4 GHz technology, please follow the radio manufacturer's instructions for range checking. Always check range before a flying session!

After starting your engine the first 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. Please follow the engine manufacturer's run-in recommendations and make sure that the engine is ran-in properly before you attempt the first flight.

The light- weight sandwich composite parts don't like too much vibration and they can suffer damage. The low mass of all the parts results in a low physical inertia, so that any excess vibrations can affect the servos and linkages. Check that the M3 bolts retaining the horizontal stablisers on to the aluminium tube are installed and tight, and that the hinge wires for the rudder, elevators and ailerons cannot come out. Make sure that your main and stab tubes are not damaged. If you have the wing fold version, make sure that the wings lock smoothly in the down position and that the wings are attached with the 4 bolts securely. Test cycle the folding sequence several times when the engine is running and make sure that the down lock is always safe.

A special note if the Moki 215 or Moki 250 radial is used: Please make sure that no electric wire can touch any hot component on the engine. All wires should be protected by additional spiral tubing and should be fixed with cable ties on to the firewall. Any rubbing of wires needs to be prevented by using rubber grommets where they are fed through the firerwall. Do not assume that a radial engine runs without vibration. A radial engine with a single sided counter balance on the crank shaft does have very noticable vibrations, which seem "softer" than the vibrations of a single or twin cylinder gas engine, but they are just as abrasive to any rubbing components.

Check the retract system for reliable function. You should be able to cycle the gear at least 3 times, after the gear was retracted for 10 minutes. Please take the time to confirm that the air system is not leaking. Depending on the many different possibilities for air leaks, the air system might seem perfectly sealed when the gear is down, but when the gear is up, a leak might show.

Make sure that all screws and bolts on the landing gear have been tightened and checked. We rely on the QC-procedures of our subcontractor "Sierra Giant Scale" and do NOT check the landing gear equipment before it is sent to you. Please for your own interest check every bolt, and if necessary, secure it with Locktite or similar. Check the safe function of the gear before you install it permanently in the wing.

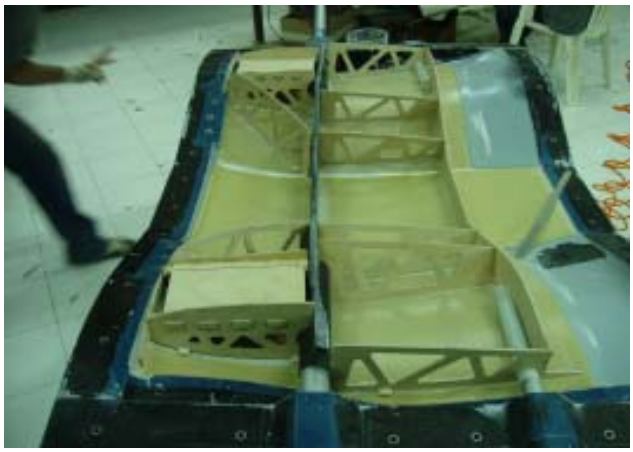
On the hydraulic system for the wing fold, please ONLY use T-Fittings which grab the tube from the outside, such as Festo "Push-In" Tees. An oil spill is not only very time consuming to clean up, it might ultimately be a high risk for the wing fold system to fail in flight.

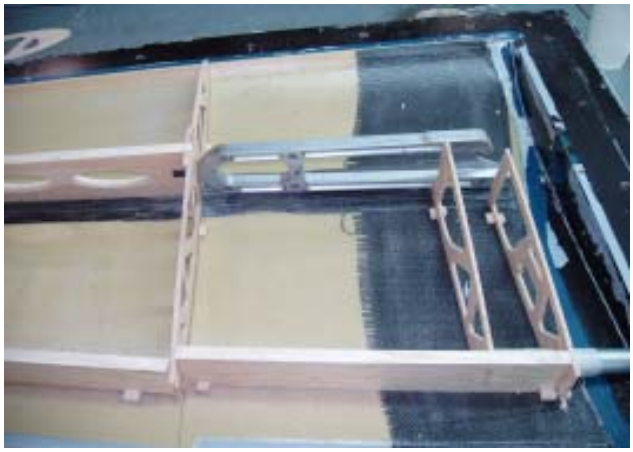
If you carefully checked all the points above and followed our advice exactly, you will have a safe and successful first flight - and many hours of pleasure with your CARF-Models F4U-1D Corsair.

Please check the important values at the end of this manual for control throws and Center of Gravity!

The Fiberglass Parts and their internal structure

A lot of engineering went into the structural integrity of the 3-part wing, especially keeping in mind that a complex wing folding mechanism is to be used. Fuselage and tail planes are a fairly standard design based on the many years of production experience of CARF Models. The hardware is complete and well chosen for the task. Much of it is pre-installed in the ARF version.





Getting Started!

It is highly recommended to assemble your Corsair following the steps in this instruction manual closely. A lot of building steps are interacting and there are not too many choices as to what should be done first, and what last. We recommend to follow this manual closely to avoid time consuming and expensive mistakes.

CARF-Models offers the F4U-1D Corsair in 3 different versions. This manual starts at the very beginning of assembling a folding wing kit version (#792000).

Assembling the plug-in wing version (#791000) doesn't make much difference, to the general building approach, of course will be simplifying the build a lot. The whole chapter about the folding wing hardware installation, and also the hydraulics installation and plumbing, can be skipped.

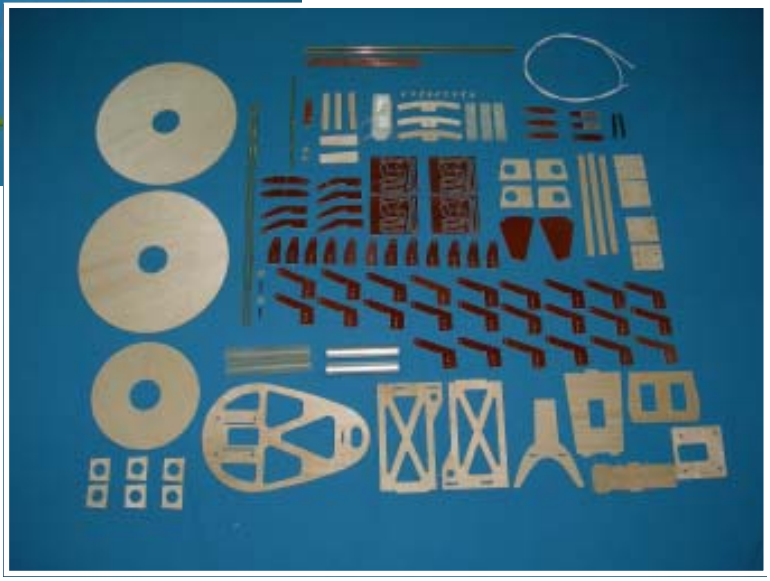
Most of you will be curious about what amount of building the ARF version (#793000) will require from you. The photos below show all the parts, which the factory installs for you before the plane is packed and shipped. If you look at these photos, you will ask, what you still will have to do? Well, it's not much anymore.

ARF Corsair Building Jobs: Installing your engine, your servos, and adjusting your linkages. For transport reasons we do not glue the rudder fin on to the fuselage, but this is a 10 minute job to do. Assemble the 3 torsion linkages and connecting them to the controls and the servos. Installing the landing gear (actually "bolting it in"), glueing in the clear canopy and painting the whole plane in the scheme you picked. That's all. All in all, you might need to read a few tiny parts of landing gear installation, and then the last 10-12 pages about engine and RC installation. And of course, the finish and the preflight info.

All this is already installed in the CARF Corsair ARF.

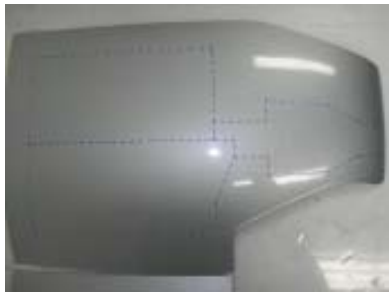
Now, is it worth the extra money to go with the ARF version? ...it depends on you!

If you are a builder, you will enjoy the build every bit as much as if you're more a flyer and go for the ARF version.



1. Main Gear and Gear Door Installation

To start with the gear installation first cut the borders of the gear cutouts along the line and clean the edges. The cut out parts will not be needed anymore, so you can cut slightly smaller and sand to fit. Please note the cutting line Gear doors and permanent mounting covers have to be cut from the laminated carbon fibre part . Fit the 2 permanent covers in tightly, and make sure that around each gear door's edges is a nice and constant gap of approx. 1 mm all around.



Cut the opening for gear doors and permanent covers in the center wing and also cut the gear doors an permanent covers from the carbon parts. See the lines on the photos!

Now use a jig saw blade to remove the center area plywood from the gear mount. When we build the internal structure of the Corsair wing, we have to make sure that the two gear ribs are in the absolutely correct alignment and position, so that the wheel will fit nicely into the wing. And it's tight back there. So we square the mounts by leaving the gear mounting rails and the center wood connected by a few tabs. It is a few minutes work to cut this part out. Be careful not to damage the top wing skin with the jig saw blade. After the center wood is cut out and removed, you're the first person in the world to see the wood structure beneath, so if there is need to re-glue a glue joint, now will be the time to do so. Clean the wood edges with sand paper, where necessary.

Important: After cutting the wood please check all glue joints which appear below. Use epoxy glue and, if needed, some little patches of fiberglass reinforcement.

The Landing Gear Unit with Rotating Strut

Trial fit the landing gear unit now. You will see that you will have to mill a notch in the cooler intake area on the front inside corner, so that the mounting tab of the landing gear can be inserted. Having the gear unit in place, you will have to mark and cut the inner permanent cover in this area, too.

The front outer corner of the gear unit is surely going to touch the top skin of the wing. It's very tight there, and you can mill out the 2mm sandwich foam to gain another 2mm space. You can also grind the gear unit a little bit to round corners, which will give you another one or two mm. Cycle the gear by hand to see if strut and wheel do not bind or hit anywhere. If the mounting rails are not 100% parallel, please use very thin plywood (included in the hardware bag) to slightly pack the mounting areas.

If necessary, you can pack a few layers of 0.8 mm plywood on top of the rails to get the landing gear unit 1-2 mm further up. As soon as the gear cycles smoothly use a pen to mark the holes to be drilled.

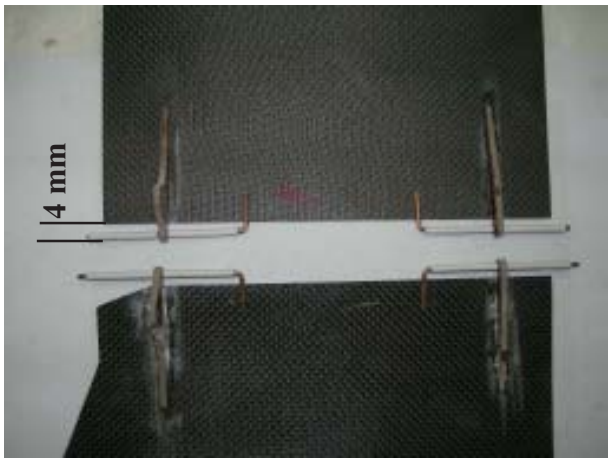
With the gear mounted, determine the best wood tab positions for the little sheet metal screws to hold the permanent gear covers in place. You can use scrap pieces of 3mm plywood to make the tabs and glue them in place with thick CA. Fit the permanent covers with tape and drill 1.5mm holes, which will work perfectly for the supplied 2.2mm sheet metal screws.

Check allignment of gear to be parallel in front and side view.

The front gear door, which covers the strut, will be attached when the landing gear is finally mounted. So please disregard this step for now. The two main doors for the wheel wells are going to be attached next.

Determine the hinge position according to the photos and create a slot in the wheel bay edge approx 5 mm long and 3 mm wide at every hinge point. Sand the inside of the gear doors in the hinge area and tack the hinges in place with a drop of CA. Make sure that the position of the hinges match the slots. Use a 2mm steel pin to align both hinges per door. The hinge pin must be at least 4 mm away from the door edge (see dimension on photo) to enable the door to open fully.

Create two 50 mm long hinge pins from the 2mm steel wire, bend one end 90 deg. Cut 2 plastic tubes per hinge, approx. 20 mm long, and slide them on the hinge pin. Assemble hinge pins and plastic tubes into the hinges. Trial fit the doors with the assembled hinges into the wheel opening. You will realize that the doors (laminated carbon sheet) are thinner than the sandwich material of the wing. To create the correct hinge geometry you must remove the sandwich foam around the white plastic tubes, so that the gear door surface and wing skin are on the same level.

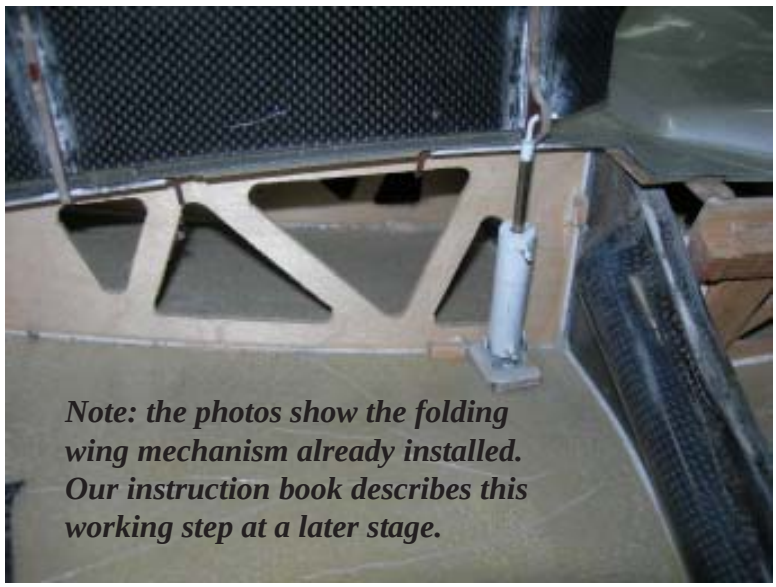


Once all fits nicely, glue the white tubes with a drop of 5 minute epoxy into the wing. Use wide masking tape to hold the gear door in place while the glue is setting. After the glue has set, take off the masking tape and check movement. Glue little recessed tabs from 0.8mm plywood on the rear edge and front edge of the wheel bay cutout for the gear door to rest against when closed. The rear resting lip should not be in the exact center of the cutout, because it could fowl interfere the wheel.

After everything works smoothly, you can apply nice epoxy fillets to every glue joint, as some joints have been only tack-glued during the assembly process.

Now you can install the mounting plates for the gear door cylinders, which are made from 3mm plywood and are glued to the bottom of the wheel bay. The length and the stroke of the Robart Cylinders is perfectly right. There is no room for an additional clevis, but a 90 degree bend of the 2mm pushrod, screwed all the way into the piston rod of the cylinder, works perfectly.

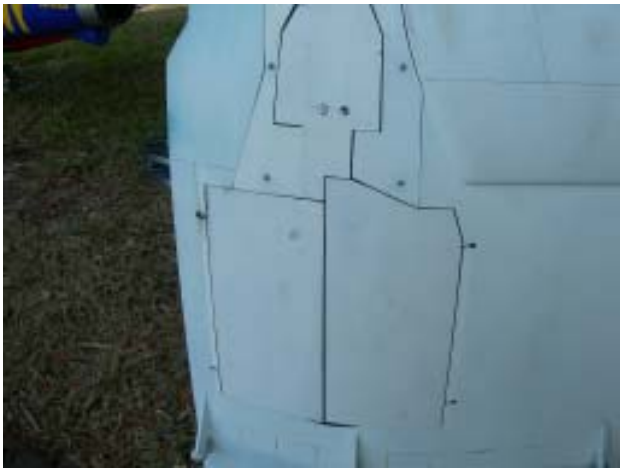
We recommend to screw the mounts for the Robart cylinders directly on to the plywood board and cut the screw tip off. Then take the assembled unit, confirm the correct location and glue in with epoxy. Usually you do not have to remove the mounts anymore, you only have to make sure that you can access the e-clip for the pin at any time, to remove or replace the cylinder, if necessary one day.



Note: the photos show the folding wing mechanism already installed. Our instruction book describes this working step at a later stage.

Set the end positions so that the cylinder still has about 1 mm available travel when the gear door is mechanically closed. This will hold the gear door tight during flight. When the cylinder is fully extended, the angle of the gear doors should be perfectly right, too. We designed the hinges and control horns matching the dimensions and stroke of these cylinders.

The result of your hard work: A giant wheel in a perfectly snug wheel well, covered with tightly fitted gear doors.



2. The wing fold mechanism

We recommend to read this following step several times before you actually start working on the wing fold installation. This is the most complicated (and most critical) building step of your CARF Corsair assembly and you should try to understand every paragraph in full, imagine all possible consequences of the critical work steps. This part of the build should not be rushed, you should allow at least 3-4 building days, to allow glue joints to cure over night before you continue step by step.

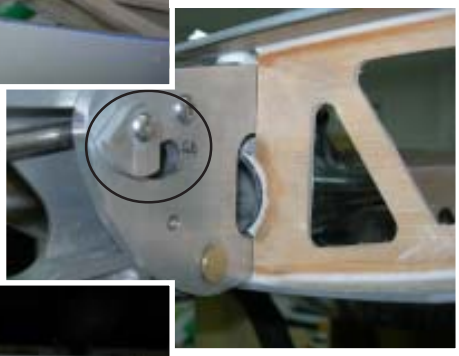
The wing fold mechanism is a CARF Models development, where we put the most emphasis on the simplicity of the system. On purpose we did not want to rely on a locking pin or any other additional mechanical features, which might seem safe at first glance, but create potential of failure when you look closer. So the design of our wing fold uses the same strong mechanical feature as most retract systems do. A hydraulic cylinder is mounted in the outer wing stud, which is permanently mounted to the center wing mounts with an axle. No hydraulic fluid lines need to be disconnected when taking the outer wings off for transportation and storage. The sliding lock pin unlocks the bottom hook of the outer stud when the cylinder expands, and pushes the pin into the opposite end of the slot in the inner mounting claws. Then the force of the cylinder pushes the outer wing upwards. When the wing is almost vertical, the lock pin could slide back to the outer position in the slot, causing the wing to “flop” back and forth in the wind when folded all the way up. To prevent this, a keeper is mounted to the locking pin, which interlocks with a small pin in the center wing fold mount. Incredibly simple, but very effective – and safe.

The Haeusl hydraulic system itself has been used in retract systems for many years, and has proven its reliability world wide. Jet modelers know Haeusl pumps very well, these high precision units are used as fuel pumps by most turbine manufacturers. The hydraulics come with a separate instruction manual, which you please read with great care before you start installing the system into your Corsair.

The first step is to trial fit the assembled wing fold unit to the center wing spar. Every spar has been drilled and sanded to fit the wing fold “claw” before the joining process of the center wing’s mold halves. However, it is quite possible that slight adjustments need to be carried out, such as sanding or grinding mounting surfaces and holes, especially for alignment purposes.

Unbolt the up-lock and remove from the sliding pin for now. The up lock only works properly when the pressurized cylinder operates the movement of the aluminum stud. If the aluminum stud is moved by hand during the installation and the sliding pin is not in the upper end position of the slot, the aluminum up-lock feature can interfere with the pin and get damaged. As soon as the operation is carried out by the cylinder, forcing the sliding pin into the end positon before any rotating movement is initiated, this problem will not occur anymore.

Use 6x M5 bolts and stop nuts to bolt each unit in place. Check the alignment in the down and up folded position as shown on the photos.



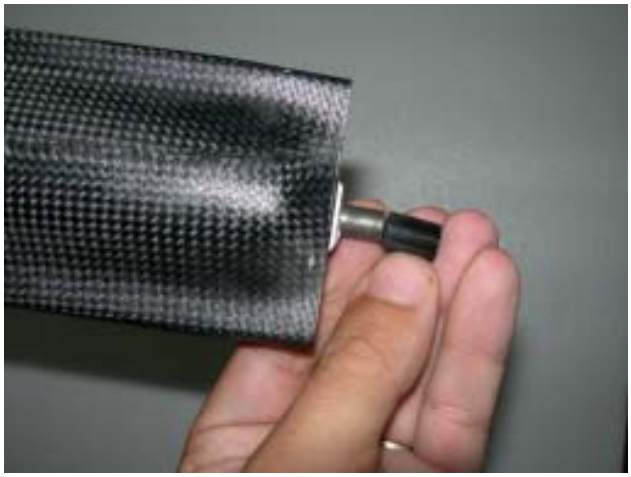
Unbolt this up-lock beforemoving the unitby hand!

If the alignment is slightly off, honestly, there is not very much to do except a lot of grinding, which in return would weaken the spar substantially. Slight misalignments sometimes occur in the up folded position, when the spar twisted slightly during the mold joining procedure. Our recommendation is to accept it, as it does not have any structural or aerodynamical effects in flight, and it is usually not visible at all when the wing is mounted. You should also check the distance between the up folded wing stud and

allignment check from side

distance check from top to center wing edge

the top skin of the center wing. It is very difficult to center the spar perfectly when joining the molds, but slight corrections can be made by grinding the holes in both spar and aluminum claws a little bit. As a rule of thumb a tolerance of 3 mm (1/8") is acceptable.



Then slide the carbon sleeves on the aluminum studs, check that they don't have inacceptable play and that the length would not fowl the movement of the folding wing. The rear edge of the carbon sleeve must match the rear end of the aluminum stud, so that only the 8mm steel pin is visible. The inner edge (towards the root) must have a few mm clearance around the aluminum claws mounted to the center wing. Slide the outer wing over the sleeve and confirm that the root edge would fit reasonably close to the root edge of the center wing. Up to 1 mm can be adjusted when gluing the sleeve into the wing, so this should not worry you right now. As we want to glue the wing fold permanently to the center wing, we want to make sure that no serious mismatch would occur.

When the alignment of the wing folds is acceptable, you should take the claws off the spar, **degrease the claws with alcohol or acetone**, and **wax the bolts thoroughly**. Then apply Aeropoxy (or UHU Endfest) to the surfaces, holes and bolts and permanently install everything finally. Attention: Do NOT tighten the bolts all the way! Leave them ½ turn open, to allow the glue to form a perfectly matching bead between the spar and the aluminum part. After the glue has settled the next day, tighten the bolts finally by applying the torque you're used to apply when tightening e.g. an M5 prop bolt.

Attention: The above is a mandatory, but irreversible working step. You're in trouble now if you did not wax the bolts or didn't trial fit and move the outer wings to the up and down lock positions. The folding studs must move freely, without any resistance, through the whole range of movement. If the stud is not moving freely, the mounting claws are under tension when bolted to the spar. You also must be able to slide the locking pin all the way down in the downlock position with two fingers. If you feel resistance here, you will risk a down lock failure later. Make sure everything operates smoothly and freely! A folding wing is a beautiful scale feature, but it requires technical understanding and careful attention to the mechanical design to operate safely!

The next step is to glue the sleeves into the outer wings. Therefore sand the inner surface of the outer wings and the top and bottom edge of the sleeves with rough sand paper. Trial fit the wing and grind inside the wing if you need to adjust the height for perfect alignment between outer and center wing. You can grind away some of the carbon, up to 1 mm is acceptable. The amount of carbon in the outer wing is way overbuilt and represents a huge safety margin. As soon as the wing can be slid on without force, wrap 3 layers of carbon rovings on a length of 2-3 cm around the sleeve. Then apply laminating resin to the rovings. Use a little bit milled fiber to thicken the resin which is then applied on the joint surfaces. Slide the wings right on, adjust them perfectly to the surface of the center wing and hold them in place with a full width masking tape. Support the wing tip, if necessary, or use a long piece of masking tape to support it towards the center wing. Let the resin set over night.

Next you should create the permanent fixture of the outer wing on the wing fold spar. We recommend to use 2 M4 bolts per wing panel, this gives you redundancy in regards to engine vibrations, which can losen a bolt eventually and you'll be glad to have a second one…

While the outer wing panel is securely taped in the down position to the center wing, drill with dia. 3.3mm through wing, sleeve and aluminum wing fold. Be very careful not to damage the cylinder rod of the wing fold cylinder. You should use a depth gauge (any brass tube over the drill bit will do) or a very short drill bit to prevent drilling too deep.

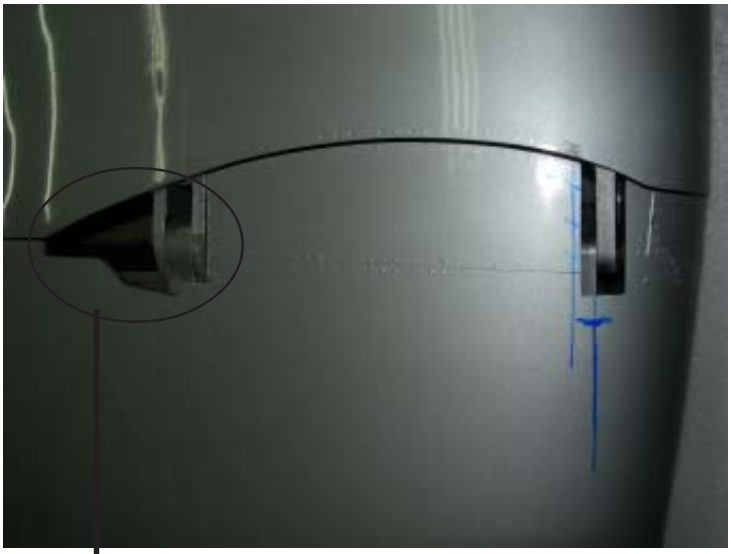
Then use an M4 tap and tap the thread carefully so that you can insert and tighten the M4x8 mm bolts. Countersink the bolt heads so that they sit firmly on the carbon sleeve.

Next day you take the wings off, check the glue joints inside the wing, and apply 2 strings of carbon fibre rovings with laminating resin along each corner of the joint, to create a nice fillet between sleeve and wing skin. Also double check the glue of the two rear ribs with resin and micro ballon. During the waiting time for the resin to cure, you can disassemble the wing fold and determine the position of the front folding hinge. You need to use an extended pin, made from aluminum tubes, carbon tubes or even a long round wood dowel, to carry over the position of the virtual axis of rotation to the front hinge. Trial fit the wood spar in the wing and mark the holes to be drilled to mount the aluminum hinge to that spar. Bolt the aluminum hinge on to the plywood and glue the plywood permanently in place, leaving the extended pin as a jig in place.

A 10 mm steel, aluminum, carbon or wood rod needs to be modified with a 6 mm diameter tip, to allign the front hinge with the wing fold unit, exactly parallel and co-axial!

Mount the opposite aluminum hinge with an M6 bolt and a temporary nut. Tack it to the outer wood support to the aluminum hinge, following the approximate curve of the wing. Slide the outer wing on and trial fit the wood piece in the outer wing panel. This works best when you have the wings folded upright. It gives you room to work. You might have to shape the outer contour of the wood, or remove and re-tack the hinge to the wood to achieve a good result. When the wood basically fits the outer wing, you should pull the wing off and bolt the aluminum hinge permanently to the wood by using the 3.5mm sheet metal screws, just as you did on the center wing hinge.

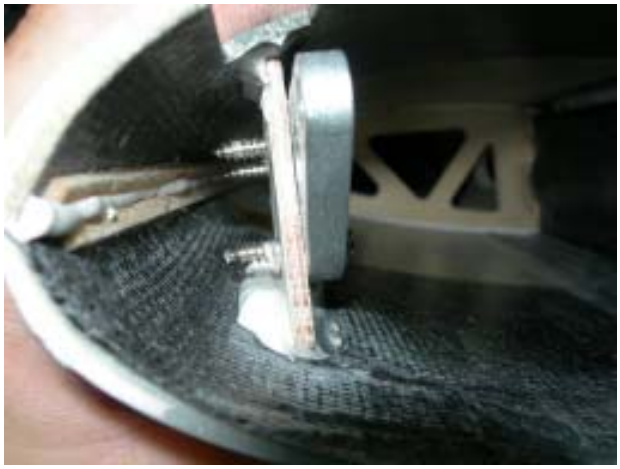
Apply 30 min epoxy with some microballon and/or milled fibre to the wood piece which holds the outer front aluminum hinge. Even if you do not get the joint perfectly in one shot, you can easily create a nice fillet to this short plywood spar later on, after you disassembled the front hinge by removing the M6 bolt and temporary nut and sliding the outer panel off, to hold the aluminum hinge securely in the outer wing.



You might have to adjust the cutout for the main wing spar in the outer wing, so that when folded all the way up, the wing skin does not fowl the folding mech. Use the milled cover as template, but make sure the hole is always at least 2 mm smaller than the cover.

Note: your kit has M4 bolts and T-nuts included instead of the self tappers as in the pics!

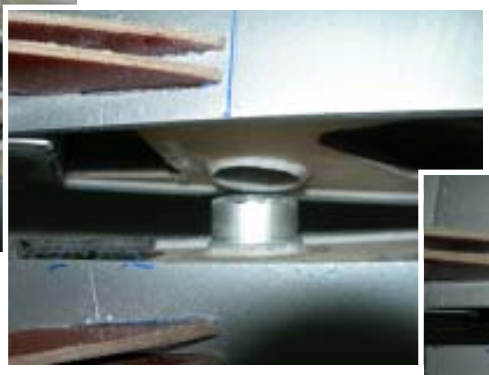
Ready to fill the joints with epoxy/microballon...



Now first move the wing up and down and finally shape the contact edges of the center wing with a narrow sanding block or permagrit file so that the movement is smooth without any binding or locking.

Take the short piece of aluminum tube, taper the edges slightly and slide it into the outer wing rear tube sleeve. Glue the reinforcement ribs into the center and outer wing. Glue a little piece of the sleeve tube into the center wing and glue an approx. 20 mm piece of tube into the outer wing sleeve, so that when the wings fold down, it slides approx. 6 mm (1/4") into the center wing sleeve. We have included some sleeve and some tube for you in the hardware bag.

The shape of this additional wood rib looks a little different to what is included in your kit. But the function is the same.



Congratulations: You have managed to install the wing fold mechanics into your Corsair wing. This was the most complicated task. The remaining building steps should go very straight forward.

Alternatively: Plug In Wings (#791000)

Not much is to be said about the plug in wings… fit the wing tubes and slide the wings on to the center wing. Install the 2 half ribs in the very tip of the airfoil and glue the front wing dowel into one side. This wing dowel is only necessary for precise alignment of the leading edge, it will not have to hold a lot of flying load, as the torsion load is carried by the two wing tubes mainly.

As a reinforcement of the rear wing tube, please glue in the two hard balsa supports with epoxy resin and microballon after cutting out the gear doors, then add another layer of fiberglass from the front to reinforce the rear wing tube mount in the center wing.

Check the glue joints of the ribs in the outer wing panels and if you find any voids or cracks, which we have overlooked, please fill with epoxy and some microballon.

Now glue in the two root rib reinforcements into both outer wing panels and center wing, where the wing fixing bolt will be located. Drill through the root ribs in this area, insert an M6 T-nut from the inside into the outer wing panel and trial fit the M6 wing bolt from the inside of the wheel wells. We recommend to screw one of the white plastic knurled nuts on the wing bolt all the way to the head and glue on with thin CA. This will create a wing bolt which can be tightened by hand, without having to use an allen hex key when assembling the plane at the field. Now glue in scrap balsa pieces to create a surface where the outer wing and the center wing butt together. This will prevent both root ribs to be pulled together and possibly break away from the wing skin when accidentally overtightening the bolt. Now, losing this bolt can have dramatic consequences, even though the wing is mounted with a twin tube system. It still can slide off during flight. Make sure that the bolt is tightened properly and check this before every flight.

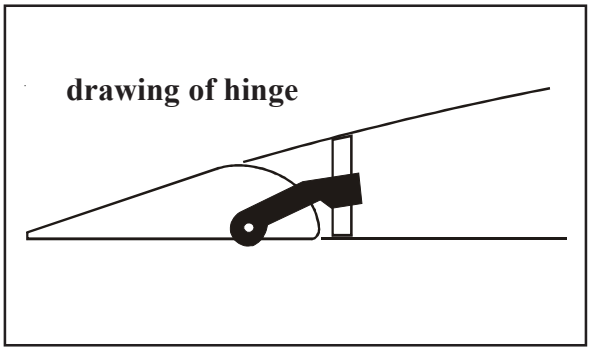
3. Flap and aileron attachment

Except for the very first kits, the flaps and ailerons have all hard points installed, where the control horns, ball links and sliding connecting tabs are mounted.

The most important task is that you align ailerons and flaps when the outer wing panels and the center wing are joined, before you finally glue the flap offset hinges and the aileron hinge posts in.

The ailerons had a set of hinge posts installed in the factory, to make sure that the critical hinge axis is placed correctly, also that the hinge posts can move freely in the cutouts. Mark the hinge post positions to the aileron spar of the outer wing panel and mill 3 slots (3mm wide).

Do not yet glue at this point.



Mill the slots into the flaps, outer wing panels and center wing, according to drawing and photos. Make sure that you carry over the measurements correctly.

It is very helpful to have a long straight piece of aluminum or wood, which can help to align the 4 flaps and ailerons and outer flap to straight trailing edges. Use a waterproof pen and mark the position of flaps and ailerons. You can use some masking tape to protect the surface of the parts. Some pens will not be 100% removable from the silver paint of the parts, after installation is completed.

The edges of the wing surfaces need to be sanded from the inside, so that the flaps can be installed deep enough into the wing. Use a flat permagrit plate or a rough sand paper glued to a piece of thin plywood.

Assemble the flap hinges with the 3mm thick flap-side piece and the 2 2mm thick wing-side pieces with an M4 bolt and stop nut.

Photo of assembled hinge

Dry fit the wing side of the flap offset hinges and the hinge posts of the ailerons all together. Once you are sure that the alignment of the 6 flaps and 2 ailerons is correct, glue the flap-side hinges into the flaps according to drawing and photos. Do take only a reasonable amount of 30 min epoxy, because too much could heat up inside the flap and could distort the fiberglass surface. Let the epoxy cure well. Then dry fit the wing-side of the flap offset hinges and the hinge posts of the ailerons all together. Glue in the hinge posts and front parts of the offset hinges.

You should not use a resin too fast for the job. It can take quite some time to align all surfaces properly. 5 minute epoxy is definitely NOT suited, and 30 minute epoxy can still be too fast. Finish one wing first, and then start with the opposite wing. Do not attempt to glue all 8 surfaces at the same time. Use the straight edge again if you need to make sure that the trailing edge is straight.

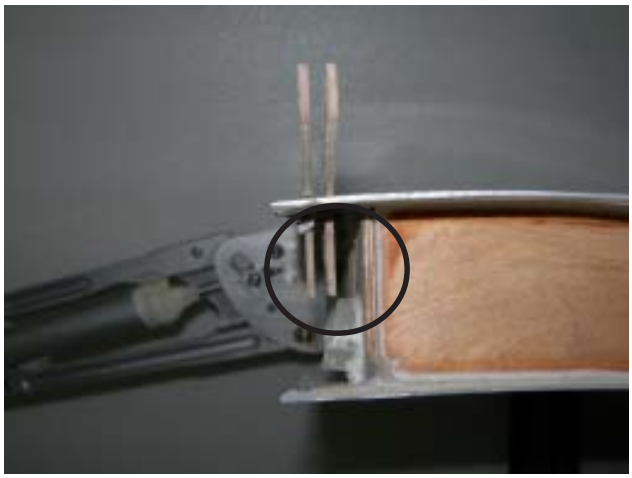
When all is glued and freely moving, take the hinges apart and take all controls off. Use resin filled with microballon to create nice fillets around the flap hinges.

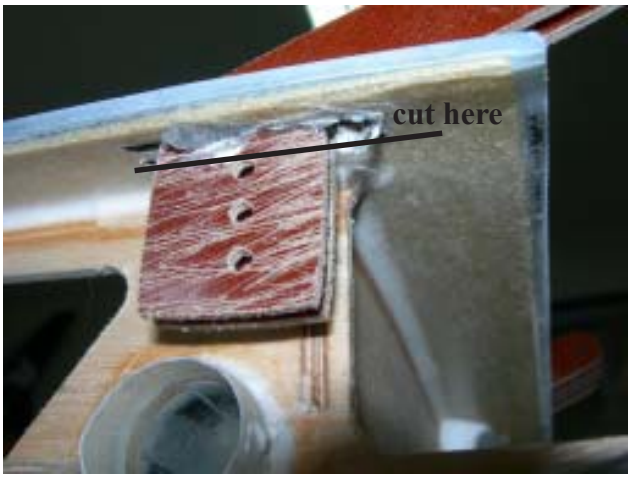
Slide every hinge down into the slot until the shoulder touches the wing surface

Center hinge of center wing top view

Inner and center hinge of center wing

Outer center wing hinge and both outer wing hinges





Note: When you glue the flap hinges to the outer wing, (where the root hinge does not have a wood support in the spar) please remember that the control rod will need clearance below the 20 mm tube. So you might have to cut the outer one of the front hinges short, as shown on the photo, before you finally glue it in.

Now determine the position of the control horns for aileron and flaps. As all controls are completely internal, it is very important to get the position of the horns right. Especially the aileron horn is only 25 mm long, so a play free linkage, a perfect horn and servo installation is mandatory.

Aileron: Mill an opening into the aileron at the root and slot the spar inside the aileron, to accept the horn. You can cut away the front root of the aileron as well, which give you a bit more room to work. Glue the control horn in, as close to the top surface as possible. Use a straight edge to extend the top airfoil contour to the front, to get the horn to the perfect position. Glue in the opposite aileron horn at the same time, and make sure that the position is identical. This will make sure that deflections of both ailerons will be identical as well. Use 30 min epoxy, and make sure that the glue joint is solid and strong!!! Due to the short arm (less than 25mm, 1" to the axis of rotation) there will be a very high force on the horn and the glue joint during flight. **If this joint breaks, the chances of aileron flutter are high, which can lead to loss of control and disintegration in flight.** Lastly, drill/mill a hole into the aileron spar of the wing, so that the control linkage can be installed later.

Aileron horn: Sand surface and glue extremely well! Your plane lives off this joint!

Outer Flap: The control horn, just like on the ailerons, is installed in the very inner edge of the flap. Therefore mill the flat spot open and slot the balsa spar behind it. Measure from the axis of rotation (hinge pin hole) and write down the distance. It should be around 40mm. You must make sure that all 4 flap horns are installed with that very same distance from the axis of rotation, to allow a syncronized movement without having to use 4 separate channels or matchboxes for the flaps. Locate the position of the pushrod. If necessary grind away any excess glue you used to mount and secure the flap offset hinge.

Inner Flap: Drill a 3mm hole into the root of the most inner flap at the same distance from the axis of rotation as the control horn is mounted on the outer flap. This is to mount an M3 ball link to the root of the inner flap. As you can't install a T-Nut from the inside, we opted to use a short piece of threaded rod, glued in with epoxy. Behind the surface is a plywood reinforcement. If you do not find a plywood reinforcement when you drill, just mill out the whole surface in front of the flap spar and insert a piece of scrap plywood. Glue with resin.Here, however, you indeed could use a 3mm T-Nut from the inside, because the inside is accessible. Mount an M3 ball link, either with an M3 bolt, or with an M3 secure nut on to the threaded stud. Drill/mill an elongated hole for the pushrod into the spar.

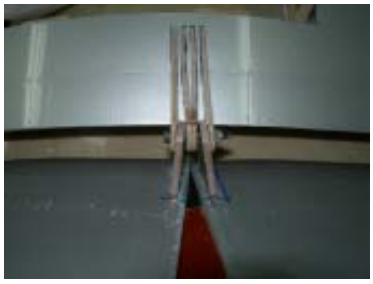

Inner flap: M3 bolt or all thread stud glued in.



Middle flap:
Slider glued into inner flap - middle flap slotted.

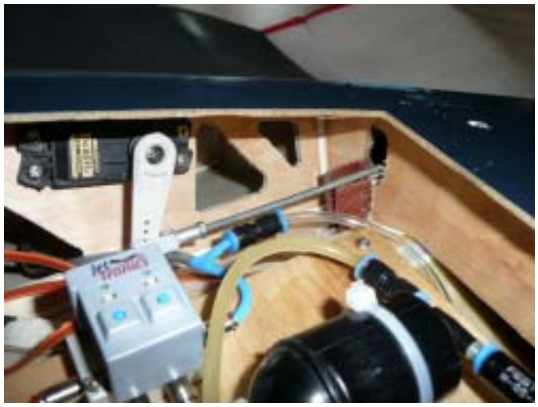
Using 2 channels for the flaps, you would use 2 y-harnesses and combine each inner and outer flap to one channel, and vice versa.

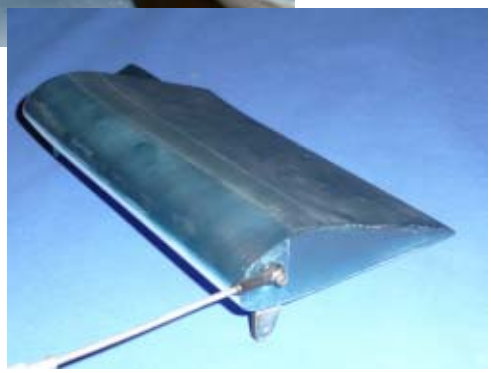
The middle flap moves by a sliding plate interlocking into a slot. Mill a long slot in the butting surfaces and glue the phenolic plate into the inner flap. Please make sure that the angle of that plate follows the curve of the trailing edge somewhat, so that it will not bind inside of the small, curved middle flap. The slot in the middle flap needs to be nice and tight around the plate, so that the middle flap does not "rattle" on the plate. However, it really is enough to slot the fiberglass surface. Any additional reinforcement of that slot is not necessary.


Allow flexing of flap hinges!

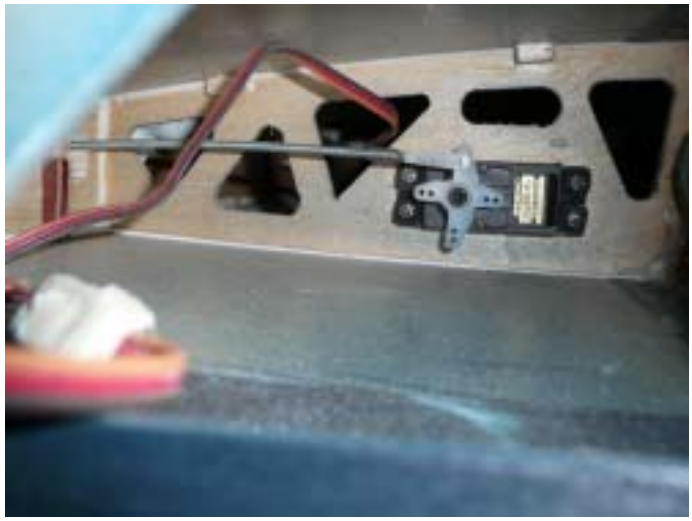
If you want, you can install your servos at this point to make sure that the travel of every control surface is sufficient and that nothing locks or binds. If necessary, you need to adjust the linkage holes drilled in the spar and mill away some fiberglass material around the control horns.





Inner Flap Servo

Outer Flap Servo



Aileron Servo (install with an extended screwdriver)

4. Rear End

3 jobs have to be done at the tail end of the plane. Firstly, the former for the tailwheel need to be installed and the gear door hinged. Secondly, the elevators have to be attached to the stab panels and the elevator torsion linkage has to be installed, and thirdly, the rudder, torsion linkage and fin have to be installed. Lets start with the tailgear formers.

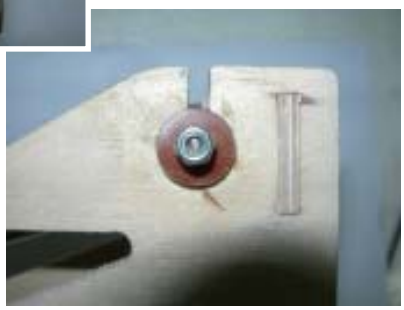
Assembled wooden framework for tailgear

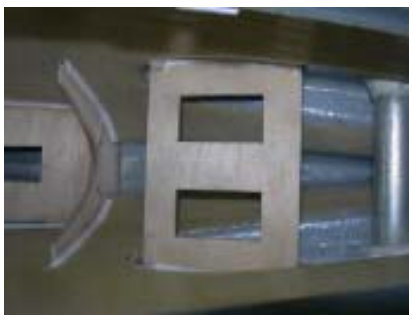
Glue the interlocking wood parts of the tailgear formers together and trial mount the tailgear. It will be quite difficult to mount the tail gear cylinder when the former assembly has already been glued in the fuselage. Therefore it is important that you first understand the installation method with the slot in the wood and the phenolic shims, to be glued to the wood when the installation is finally complete.

Install the complete tailgear and cylinder temporarily into the wooden framework before you finally glue it into the fuselage.

Cut a slot into the fin root rib of the fuselage according to the photos. Dry fit the assembly into the fuselage. When everything sits on its correct place, glue the former assembly into the fuselage using 30 min epoxy. Scuff the glueing surfaces very well and clean from dust with alcohol.

The cylinder mount is removable until the tailgear is finally installed, last the phenolic washer should be glued with CA.



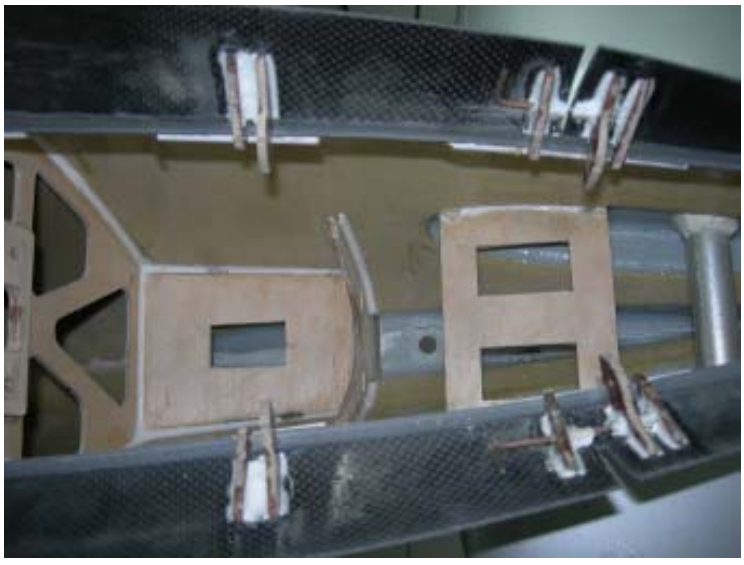


Tail gear doors… They are hinged in the very same way as the main gear doors. They are split in the center, so that they can open even though the hinge line is slightly curved. They also give you the option to install a tail hook, where all 4 doors have to be operational. If you intend not to install a tail hook, you can glue the two rear doors in and only make the two front doors operational. On the following pages we will describe the installation of 4 operational doors.

Tailgear Doors:
First, install the tailgear and make sure that it retracts completely. The tailwheel does not completely retract into the fuselage, so you need to create a cutout for the wheel. Keep this cutout as tight as possible around the wheel, it helps to center the wheel and to support the gear doors in the closed position later on. Then install 2 hinges to every door. See drawing and photos for the correct hinge pin position in relation to the door's edge. Cut the hinge slots into the fuselage and trial fit with a hinge pin and 2 small white plastic tube pieces on each side of each hinge. You should be able to tack all tubes to the fuselage so that the doors move freely. Now connect each front and rear door with a short steel pin and 2 pieces of plastic tube. The steel pin can be glued into one tube, but must slide freely in the other tube. Last but not least, install the "control horn", which also acts as a "close-lock" in the correct position and attach the springs between the tail gear frame and the control horns. You will have to play with gear and doors quite a bit to find the perfect spring tension and the best position for the horns. These horns also create a stop towards the fuselage skin inside the gear well. You can reshape them, if necessary, or attach little plywood spacers to the inside of the fuselage where they rest against.

Finally, disassemble the doors and fill all tack-glue joints with 30 min epoxy or resin and microballon to strengthen them.

Slot the fuselage in th hinge area like on the main gear doors. 3 hinges for front door, 2 hinges for rear door.



Inside view of hinges with plastic tube and steel pin

Close-locks for front and rear door and connection pin between both doors

Glue in the servo mount for the tail gear steering right behind the wing saddle and reinforce with some fiberglass cloth. Install the servo and set up the pull pull cables. We recommend to feed them through two sleeves (white plastic tube) in the tail wheel former (see photo). When the tail gear retracts these cables lengthen. Make sure that they cannot loop around the servo arm and lock up the tail wheel so that it isn't able to lock down. We recommend to use a short piece of Tygon tubing to make the cables stiff in the servo arm area. You can also use springs or rubber bands and pull them sideways to keep them under tension. But be careful that the rubber bands are not too strong. This resistance can also cause the tailgear to not lock down properly. If you want to use a Y-lead for your tailwheel and rudder servo, you must cross over the tailwheel cables to get the same direction of deflection as the rudder.

Position of tail gear steering servo and location for the pull/ pull wires to the tail gear control horn.

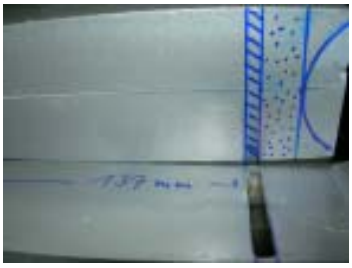
Here you see the springs mounted between the tail gear and the door control horns.

Rudder Fin:
Take the vertical fin and slot its root surface according to the plywood spar penetrating the fuselage's fin fillet. Slide the horizontal stab panels on to confirm the correct angle and glue the fin on to the fuselage. Sand the surfaces with rough sand paper and clean with alcohol before you glue with 30 min epoxy. As soon as the glue has set, mark the position of the top hinge post by installing the rudder temporarily. You can slide in the hinge pin from the bottom side, but make sure that you can grip it with a pair of pliers later to get it out again. Mill the top surface of the fin to accept the top hinge post. There is only one hinge post installed to the rudder, so make sure that this post is mounted properly. Glue in the plywood rib so that the top surface of the 3mm phenolic hinge post is flush with the

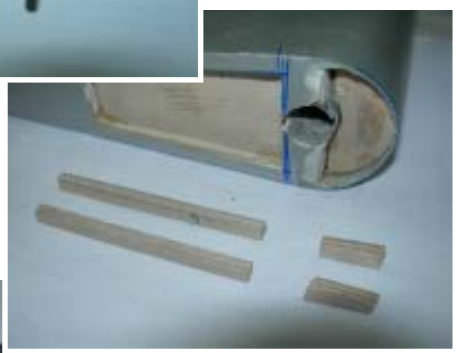
Process of installing the single rudder hinge post. Take great care because this is the only one...

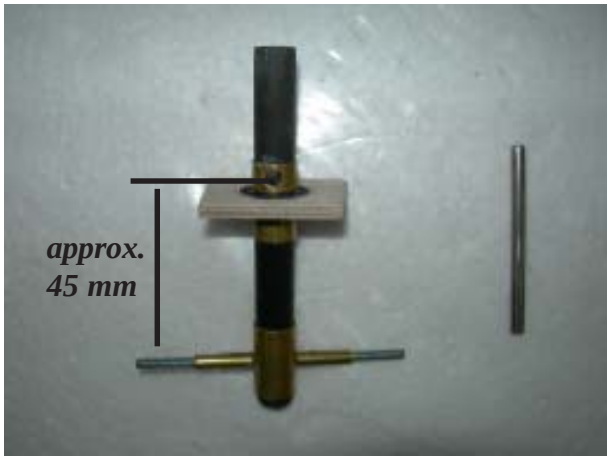
corner of the fin. When the glue has set, drill 2 3mm holes and install the 2 M3 T-Nuts. Counter sink the holes in the phenolic hinge post so that the screw heads are flush with the post's top surface. Install the rudder temporarily to see if movement is sufficient. You can open the slot in the rudder slightly to allow the deflection you desire.

Carry over the hole for the 10 mm torsion linkage from the rudder to the fuselage. You can drill this hole 2 mm larger in diameter, because you will install a ball bearing later, once the position is perfectly determined. Take the rudder off from the fin and glue in the sockets/rails for the torsion linkage. Assemble the torsion linkage from the prepared parts, which you find in your hardware bag, according to drawing and photos. Don't forget to install the ball bearing with its plywood socket to the rod. Dry fit the linkage to the rudders receptacle and mount everything to the fin/fuselage. Then you can glue the plywood bearing socket into the fuselage. The torsion linkage will remain in the fuselage forever, but you still can remove the rudder for maintenance reasons, if you have to. The rudder servo is mounted in the tail gear former assembly. The push push setup of the rudder linkage makes a second support of the torsion linkage obsolete. You will find that the torsion linkage becomes fully defined and solid as soon as both pushrods are installed between torsion rod and servo horn.



Process of gluing the rudder fin to the fuselage and installing the main fin spar.





Use a couple of 0.8mm ply spacers when installing the rudder torsion linkage finally.

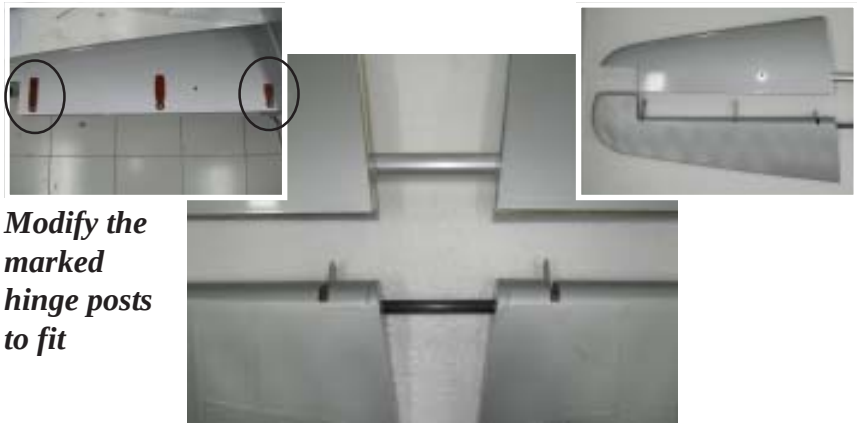
Servo linkages as usual...

Stab/Elevator:
First install the anti rotation pins to the stab. Drill a 6mm hole into the fuselage's stab fairing and the stab rootrib, wax the hole in the fuselage fairing, stick the 6mm carbon anti rotation pin into the fuselage and apply 30 min epoxy on the outer part. Then slide the stabs on the tube and over the anti rotation pin, secure with tape and let the epoxy set. After sufficient time remove the stab, check the glue joint of the anti rotation pin and if necessary, fill the remaining gaps with glue.

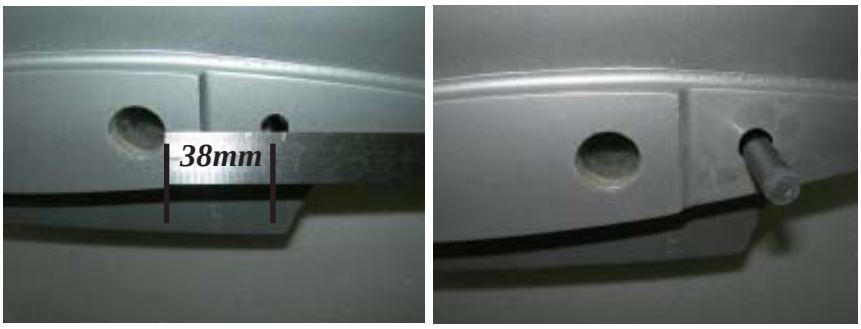
Drill 6mm, and then WAX the hole and the surface around!

Mill the slots for the hinge posts into the stab surface's spar. Shorten the inner hinge post so that it does not interfere with the stab tube. The elevators have to be attached to the

stab surfaces while these are attached to the fuselage. Similar to the rudder, mill a 12 mm hole into the root ribs of the stab fillet. See dimensions on the photos on the right. Dry fit stab with elevators to the fuselage. Use the elevator torsion linkage (assembled according to the drawing/photo) to align the elevators properly. Then glue the hinge posts into the stab spar. Disassemble stabs and elevators and fill the joints with 30 min epoxy, where necessary. Make sure that these hinge posts are glued well into the stab.



Modify the marked hinge posts to fit



Center of torsion linkage is 38 mm behind rear edge of stab tube

Now slide the ball bearings with their plywood sockets on the torsion linkage and glue the plywood sockets into the fuselage. Use 30 min epoxy and sand the surfaces well before applying glue. Mount stab/elevator assembly while you glue the bearing sockets in, and make sure the elevators move freely. After the glue has set, drill 2 holes through the LEFT elevator/ torsion linkage with 2.4 mm diameter. Tap an M3 thread into each hole, counter sink the screw head into the elevator from the bottom side and mount both bolts. NOW drill the holes for the opposite RIGHT elevator, first adjusting both trailing edges exactly to the fillets on the fuselage (you can trust the incidence of this fillet 100%). Next tap these holes M3, countersink the bolt heads and install the bolts to see the result of your work. In case

Use 0.8mm plywood as spacers between the edges of the counter balance surface of the elevator,to make sure nothing locks up. Make sure the root surface is matching the fillet with symmetrical gaps on both sides.

Insert 30 min epoxy through the root ribs to fill the joints of the hinge posts to the rear stab spar. Then place it vertically until the resin has cured. That way it will not run off the joint.

Make sure that the torsion linkage stays in during the whole joining process.

something went wrong with your drilling and your elevators are not 100 parallel, we have included a second piece of carbon rod for a second attempt. Last but not least mark the position of the stab tube and the support rib in the stab and drill a 3 mm hole through stab and tube from the bottom side. Do not drill all the way through. Take the stabs off and glue an M3 T-nut into the tube as a thread for the stab securing bolts. You can trim that T-nut to fit best inside the tube. Wax a long M3 bolt and screw it into the nut during gluing so that the thread stays clean and vertical alignment is maintained.

The result of your work is a beautifully clean rudder and elevator installation, without any visible control horns and linkages. You are nearing the closing stages of your building work, left is the front end of the plane.

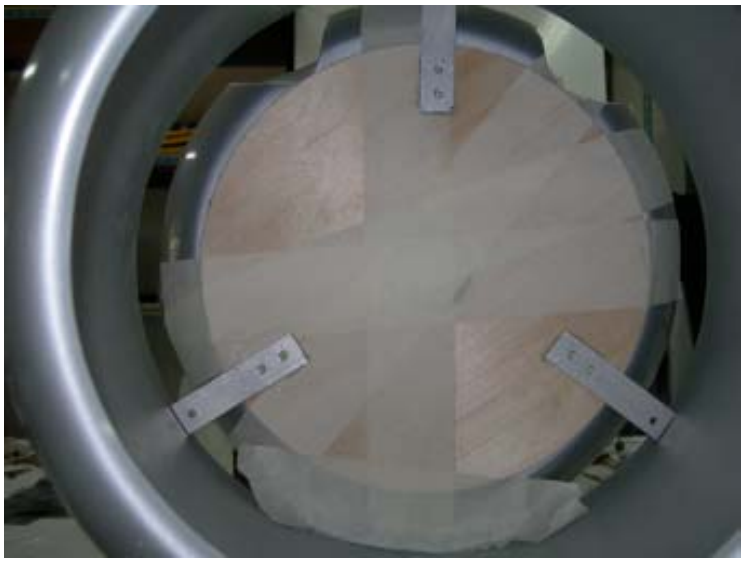
The recommended standard is the single servo version,as shown in the pics here.

Optionally you can use 2 elevator servos, for which you have to split the torsion linkage.

Drill with 3 mm (mark the position carefully and precisely) and then glue in an M3 T-nut

5. The front end.

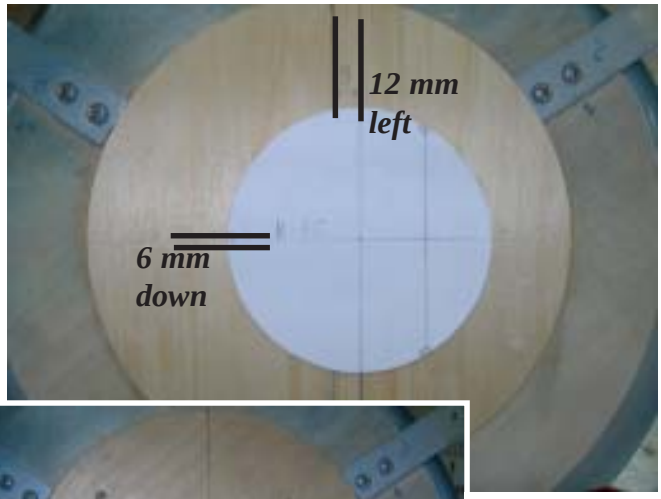

The cowling has 3 fixing points. Each fixing point consists of an aluminum tab, bolted to the fuselage's firewall with 2 M4 bolts, and a plywood tab, glued into the cowling, holding an M4 T-nut, bolted against that aluminum tab. The idea behind this approach is to be able to access the mounting bolts from the rear of the cowl through the cooling air vents. If a radial engine is installed, access to the firewall from the front is very limited due to the cylinders and the ring muffler. Thus fixing the cowl from the rear is very convenient. If you intend to install a twin cylinder gas engine, you can feel free to alter the cowl fixture and simplify the process, however, we recommend to use our suggestion.



First glue on the firewall. One 3mm plywood is glued from the inside to the firewall (use microballon filled epoxy to fill any gap due to the seam band inside) and one 3mm plywood is glued from the outside. This outside plywood former is reinforced with a second one, smaller in diameter, which you need to glue on as well. After the glue has set, tack the 3 aluminum tabs to the firewall with a drop of thin CA glue. Use a balsa stick along the fuselage's outer contour to determine the position of the cowl, matching the position of the milled plywood mount to be glued inside the cowling.


Now tape the cowl to the fuselage. At the top the rear surface butts against the fuselage. At the bottom you need to use some scrap balsa to create a jig, which you can tack in place with a few drops of CA. Make sure that the top contour of the cowling is perfectly in line with the fuselage's contour,

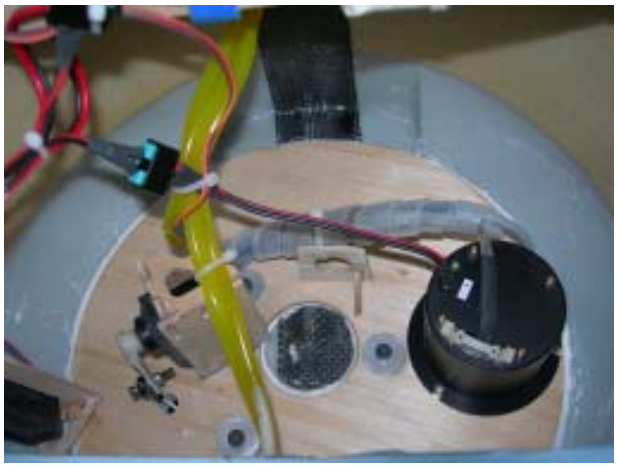

and the rear edge is parallel to the firewall. After the alignment is set and confirmed, tack the milled plywood mounts inside the cowl, so that the holes for the bolt match. Then you can take the cowl off, fill the glue joints of the plywood tabs inside the cowling with epoxy and milled fibre, and we recommend to add a little bit of fiberglass cloth from the front to reinforce the joint. Drill a 4mm hole through the 2 inner holes of each aluminum tab and through the firewall, then break the aluminum tabs off. Enlarge the holes in the firewall to 5.5mm diameter, insert M4 T-nuts from the inside into the firewall and mount the aluminum tabs permanently with 2 M4 bolts. Now glue a T-Nut to each aluminum tab from the front, lining up with the outer hole. Sand the glue surfaces well, degrease with alcohol and glue with a good epoxy, preferably Hysol or UHU Endfest 300. Wax an M4 bolt and turn it into the nut to keep the thread free of glue. Alternatively: Glue a scrap piece of plywood from the front against the plywood tabs in the cowl, enlarge the holes to 5.5mm diameter and install a T-nut the right way around.



Now it's time to mount the engine, in our Instruction Manual we describe the installation of the Moki 250 5 cylinder radial. Please be aware that the engine diameter is not much smaller than the cowl diameter. So, centering the engine is crucial. First determine the center point of the round firewall. The inner hole is a perfect circle, central to the outer contour. Thus it should be easy to create the center point. A right thrust of 2.5 degree is recommended, so the center of the engine thrust line must be moved to the left (viewed from the front against the firewall) by 12 mm. 0.5 deg. upthust will be perfect. this and the sligthly nose down cowl, makes it 6 mm to the bottom.

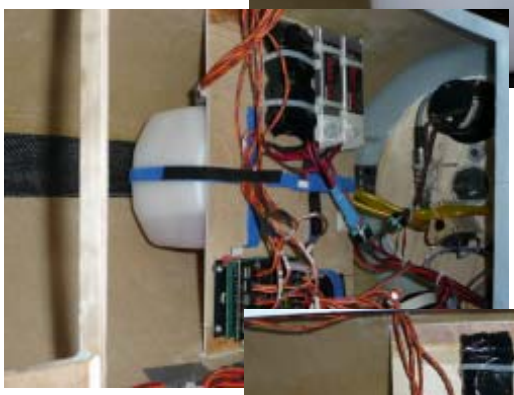
After creating the center point for your thrust line, create a template of the bolt pattern of your engine from cardboard (including the center point) and use this template to drill your holes. It is recommended to drill one single hole first, and then mount the engine with one bolt only. Mount the cowl and confirm that the engine position is correct. Set the right thrust with large spacers. Therefore you can use self tapping screws for the other mounting holes. Its not so easy with the Moki mount, because the mounting holes are in an irregular positon, due to the 5 cylinder locations.You might have to check both the center of prop shaft and distance of each valve rocker to the inside of the cowl. If you find something off, you still can move the mounting pattern of the engine and drill the other holes, then fill the wrongly drilled hole with a wood dowel and re-drill this hole in the corrected spot.

Using M5 T-nuts the correct way from the inside to mount your engine is not sufficient. These will be pulled into the plywood over time and your engine becomes lose. This can result in fatal situations in flight. Please use large aluminum plates or washers and glue the T-nuts reversed on to these plates. They will distribute the load of the bolt better to the firewall's back side.



Now install the throttle servo and the ignition unit inside the fuselage to the back of the firewall. Of course there are plenty of possibilities how and where to install both, but please be aware that you MUST make sure that no wire or connector can rub against the firewall, nor touch the hot cylinders, exhaust headers or ring exhaust. Please take great care in perfecting your installation in this area. A small mistake can result in the engine quitting in flight. We have experienced this ourselves. No cable must go through the firewall without a rubber grommet. If you think that a radial engine has no or very little vibration, you are very wrong. The vibrations of a radial engine are of different nature than the vibrations of a gas twin cylinder engine, but they are significant and should not be ignored. Keep cables and wires as short as possible, fix them inside the fuselage reliably so that they cannot lengthen or be pulled towards the front. Test every wire that it can under NO CIRCUMSTANCES reach a hot engine part. Last but not least, make sure that the ignition unit is mounted as isolated as possible, keep batteries, receiver, servos, switches and power leads as far away as possible.

6. Final wiring and fuel/air/hydraulic plumbing



The fuel tank installation is very straight forward. First finish the internal plumbing of the fuel tank as usual and then install it to the center board with Velcro. Fit the board into the fuselage and glue it to the side walls. Reinforce with fiberglass band.

On the opposite side of this center board you can now install your receiver, Powerbox or DPSI, if you chose to use one. The switches can be installed so that they are accessible through a hatch in the fuselage, charging sockets for receiver and ignition battery as well. We suggest a very practical solution with the photo on the bottom of this page.

Aileron and flap servo extensions can be soldered up using multi pin connectors. Standard extension leads of your radio manufacturer can also be used. For the outer wing servos you will have to permanently install approximately 50 cm (20") long extension wires into the center wing. Make sure that during the wing folding procedure the outer connectors cannot be disconnected accidentally. At the receiver's side you can use another short extension lead so that you don't have to plug the aileron/flap servo leads directly into the receiver at every setup at the flying field. The long extension permanently installed in the center wing can also incorporate a Y-harness to the inner flap servo.

For elevator and rudder servos lead extensions can be hard wired or standard extensions of your radio

manufacturer can be used. Use a Y-harness to connect the tail wheel steering servo to the rudder (remember to cross over the pull/pull cables to synchronise the direction of movement).

Now prepare the wooden board to be mounted into the center wing. Glue the wood rails along the edges to the bottom side of the center wing laminate. Then use 4 sheet metal screws to mount the board to these wooden rails, so that it remains removable for maintenance. Installation of all components is also much easier when it is removed from the center wing.

First mount the air valves for retracts and gear doors. In our solution we have introduced the use of 2 Jet-Tronic valves. Air plumbing is straight forward, main gear and main gear doors can be permanently connected, the cylinder for the tail wheel needs to be T'd in with 2 quick disconnectors. Please make sure that all air lines are installed clean and tidy, so that you can trouble shoot easily if something is not working correctly. Make sure that the color coding is clear, the UP line should be different in color than DOWN line. Also keep in mind that you have similar 3mm Festo tubing to be installed for the wing fold. Pick the colors carefully before you start plumbing.

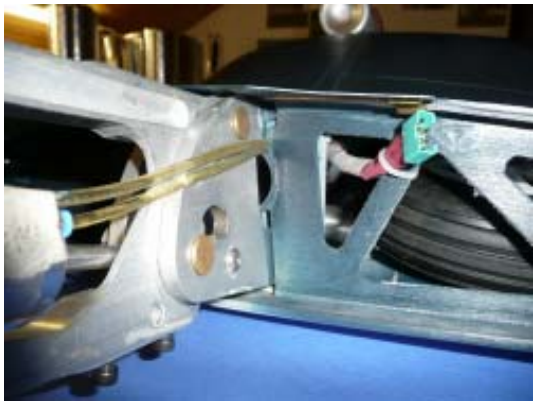
Electronically you can connect the air valves with a Y-harness into one receiver channel. Please put a slow motion function to the gear channel (4 seconds UP and 1 second DOWN). Then program the switch points according to the valve instruction, retract valve close to the DOWN position, gear door valve close to the

UP position. Therefore we suggest the following: Set the travel of the gear channel in your transmitter to 90 % each way. Program the switch points accordingly. Then increase the travel again to 100%. That way the valves will always switch very reliably exactly where and when you want.

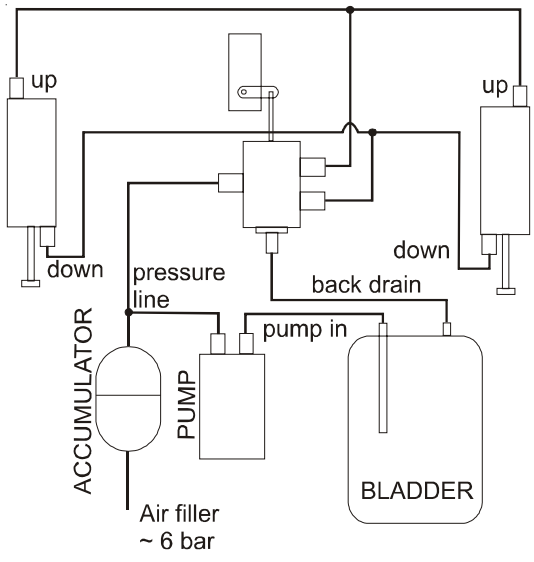
Hydraulic setup for the wing folds is next. First install servo, valve, pump and accumulator as suggested on the photos. It is important that you follow the setup and plumbing instructions of the hydraulic system manufacturer (Haeusl), which in case of system updates always will overrule the instructions given in this manual. That there is no side load on the hydraulic valve's piston, it needs to be installed on a rotating pin. We have included a few milled phenolic parts, which you can use for the valve mount.

Now, permanently install the hydraulic lines from the cylinders to the valve. Start on the pump side and leave the cylinder sides long and open. The right/left UP-lines come together with a T-fitting (use only the black push-in fittings) and push into one connector at the valve block. The DOWN lines with a T-fitting into the other connector at the valve block. The pump outlet is connected to the valve where it is marked with "in". The accumulator is connected parallel to the pump on the pressure side with a T push-in fitting. Both feed and return line can be Tygon. The feed line connects the long pickup tube in the plastic bag with the pump and the return line connects the valve's return outlet with the plastic bag.

We recommend to use Baby Oil as hydraulic medium. This is clean, non-toxic, not harmful to the skin, has no



Schematic drawing of hydraulic plumbing



color, no smell and can be cleaned up after a plumbing mishap easily.

Now take a look at the cylinder side of the hydraulic lines. The cylinders in the wing fold have 3mm Festo Push-in fittings as well. The UP-side exits the cylinder at the back face.

First drill a hole into the root rib behind the top rear claw of the wing fold's center wing mount. That is the best position to feed the hydraulic lines through. Make sure it is big enough so that both lines can slide through without resistance. When the wings move, these lines will have to slide a few cm in and out. Connect the DOWN line straight into the cylinder and strap the UP line to the cylinder with cable ties, so that they will not bind or interfere with the carbon sockets in the outer wing panels. Then loop the UP line inside the aluminum frame to enter the cylinder straight from the rear. Please slide the wings on and off several times and make sure that no tube rubs or is squeezed or pinched inside the socket. Make sure that this is not the case in both UP and DOWN position of the wing, as the cylinder moves up and down inside the socket during the folding cycle quite a bit.

We recommend NOT to fill any hydraulic oil until the plane is painted. An oil spill can really cause a lot of trouble for the paint job later. After the plane is painted and completed, a spill mishap will not affect the strength and integrity of the wing structure. Baby Oil does lift off slowly but surely, and it has no or only very little mechanical impact on the sandwich structure, the glue and the plywood. It will be an unpleasant experience, but not a disaster for the plane.

Still, we will describe the filling and priming procedure at this point. Come back to this chapter later, after the plane is painted:

Disconnect the return line from the plastic bladder. Extend this return line with a 50 cm piece of Tygon tubing into a plastic cup placed beside or behind the center wing. Connect a piece of Tygon tube to the return connector of the plastic bladder and fill it with baby oil. You should keep the original container you purchased the baby oil in connected to the bladder. Or use a large syringe to refill the plastic bladder as the pump operates the cylinders the first time. Make sure that you do not get too much air into the plastic bladder.

We do the priming with the outer wing panels removed! Connect an air compressor and put 3-4 bar of pressure into the accumulator's back side. This keeps the operating pressure low for the first tests. Then connect the pump battery and immediately the pump should start running. Squeeze the bladder to get liquid to the pump right away, so that it doesn't run dry. Depending on the valve and cylinder positions, the wing fold will travel to one end position and the pump will stop when the pressure in the system has reached the same pressure as inside the accumulator. Now turn the servo to move the valve to the other end position, and the wing folds should move slowly to the opposite position. You will find that oil exits the return line, which hopefully still is feeding into the plastic cup placed on the table outside the center wing…

The pump will switch on and off during the operating cycle, trying to keep the operating pressure in the system constant. If movement is too slow, increase the pressure in the accumulator by one or two bar. You should not need more than 4 bar, though, when the outer wing panels are not mounted, to move the cylinders between their end positions. Cycle the wing fold several times. Make sure that you refill the plastic bladder after every cycle. That's why we recommend to keep a

large syringe (or the original container) full of baby oil connected to the bladder permanently. Watch the return line and the plastic cup, as it will fill quickly with every cycle.

When no air bubbles are visible in the return line during the cycles, connect the return line to the bladder. Make sure the bladder is air free. It should be filled with oil approx. 25mm (1") thick.

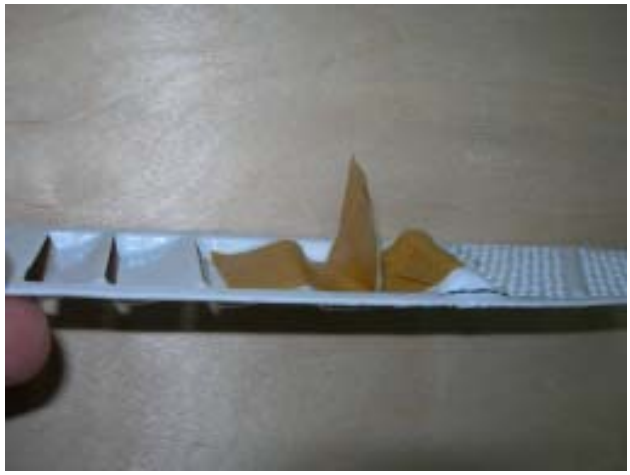
Then cycle the system a few more times, trying to logically imagine possible air pockets in the cylinders, moving and turning the complete center wing to try to get the air pockets placed right in front of the cylinder's tube fittings, forcing them out of the return lines during the cycles. This air will collect in the bladder and must be released as the final step of the priming procedure. After all air is out slide both outer wing panels on, secure them with the fixing bolts and increase operating pressure to 6 bar. Then cycle the system again to test the speed of movement. Ideally, the pump should operate in 1 second intervals, switching on and off during the cycle. If the pump runs constantly during the cycle, reduce the pressure in the accumulator. If the cylinders do not safely reach the end positions, especially in the DOWN position, increase the pressure in the accumulator. If the pump switches on and off in 1-second intervals approximately, you have found the correct operating pressure.

7. Paint and Finish

The surface of your Corsair with its silver top coat is almost ready to apply the final paint. Use a ScotchBrite pad to roughen the surface slightly, just so that it breaks the shiny gloss. Use some acetone or denaturized alcohol to clean the surface and remove any grease. Then tape off all externally visible components or openings to protect the inside from any overspray. Of course, remove engine and landing gear if you can. Do not use any primer!

Apply your scheme with any kind of 2 component polyurethane paint or base coat laquer. After curing you should apply all trims and decals, before you finally shoot a very thin layer of flat clear coat (or glossy, if the full scale plane you're replicating is a restored and shiny bird).

Now you can scratch the panel lines with a screw driver or steel ruler, chip color off the leading edge areas and around rivets and hatches, if you want to create a scale "patina" on your plane. The silver top coat of the fiberglass parts will shine through and look like beat up aluminum. Finally use a pad of ScotchBrite and rub the surface in flight direction. Add a little dust of black charcoal powder while you're doing this. The rest of patina will come by time…



Cut and shape the vacuum formed radiator intake details, paint and glue them in. Use some tape to grip and pull them firmly from inside against the radiator inlet

After trimming and painting the canopy frame, you need to fit the clear canopy to the inside, preferrably in two pieces, front and rear. Use ZAP canopy glue or 30 min epoxy. It is very important that you tape the canopy on to the fuselage during curing, so that it stays in undistorted shape.

8. Preflight Check and First Flight

This Scale-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 Corsair 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 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 experimenting with moving the CG back. 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 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 this time. If you fly with 2.4 GHz technology, please follow the radio manufacturer's instructions for range checking. Always check range before a flying session!

After starting your engine the first 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. Please follow the engine manufacturer's run-in recommendations and make sure that the engine is ran-in properly before you attempt the first flight.

The light- weight sandwich composite parts don't like too much vibration and they can suffer damage. The low mass of all the parts results in a low physical inertia, so that any excess vibrations can affect the servos and linkages. Check that the M3 bolts retaining the horizontal stablizers on to the aluminium tube are installed and tight, and that the hinge wires for the rudder, elevators and ailerons cannot come out. Make sure that your main and stab tubes are not damaged. If you have the wing fold version, make sure that the wings lock smoothly in the down position and that the wings are securely attached with the 4 bolts. Test cycle the folding sequence several times while the engine is running and make sure that the down-lock is always safe.

A special note if the Moki 215 or Moki 250 radial is used: Please make sure that no electric wire can touch any hot component of the engine. All wires should be protected by additional spiral tubing and should be fixed with cable ties on to the firewall. Any rubbing of wires needs to be prevented by using rubber grommets where they are fed through the firerwall. Do not assume that a radial engine runs without vibration. A radial engine with a single sided counter balance on the crank shaft does have very noticable vibrations, which seem "softer" than the vibrations of a

single or twin cylinder gas engine, but they are just as abrasive to any rubbing components.

Check the retract system for reliable function. You should be able to cycle the gear at least 3 times, after the gear was retracted for 10 minutes. Please take the time to confirm that the air system is not leaking. Depending on the many different possibilities for air leaks, the air system might seem perfectly sealed when the gear is down, but when the gear is up, a leak might show.

Make sure that all screws and bolts on the landing gear have been tightened and checked. We rely on the QC-procedures of our subcontractor "Sierra Giant Scale" and do NOT check the landing gear equipment before it is sent to you. Please, out of your own interest, please check every bolt and if necessary, secure it with Locktite or similar. Check the safe function of the gear before you install it permanently in the wing.

On the hydraulic system for the wing fold, please use ONLY T-Fittings which grab the tube from the outside, such as Festo "Push-In" Tees. An oil spill is not only very time consuming to clean up, it might ultimately be a high risk for the wing fold system to fail in flight.

If you have carefully checked all the points above and followed our advice exactly, you'll have a safe and successful first flight - and many hours of pleasure with your CARF-Models Corsair.

Important Note: NEVER attempt to take off with full power, especially when you use powerful engines like a Moki 250. The plane might nose over and this might create expensive damage. Under full throttle you will not be able to keep the tail down using the recommended low rate elevator settings. Always take off with 50% power only, retract the gear and then trottle up to a comfortable speed. You must manage your throttle stick.responsibly. Your CARF-Models F4U-1D Corsair **CAN BE DESTROYED in the air** if you exceed speeds of 200 km/h (125 mph) noticably! Fly scale!

Do not take off with flaps deployed and be careful to get used to the very powerful flap authority during landing approaches. We recommend to use a maximum flap setting of 30 deg. for a smooth elevator control during landing approaches. This is because the huge flaps can cause weak elevator response during slow speed. In any case, the Corsair wants to be landed tail up, that means, with a fairly horizontally aligned fuselage. A touch down attempt on 3 wheels will most likely end in a quite "challenging" situation.

Important Values:

Center of Gravity: 10-12 mm (1/2") in front of main spar, when looked from the top

Aileron Deflection: 20 mm up, 15 mm down

Elevator Deflection: 20 mm up, 20 mm down
(only for take off a higher up-rate of up to 35 mm is allowed)

Rudder Deflection: 70 mm each side

Flap Deflection: max. 45 degree, practically useful are 35 degree.

Included Hardware

Plug-In wing version (791000)

This kit includes: hardware bag No1, and No2, plus 4 wing tubes. Also included are 1x fuselage bag, 1x wing bag, 1x rudder bag and 1x elevator bag.

Hardware bag No1 (factory-installed in ARF planes)

Wing Fold Kit Version (792000)

This kit includes hardware bag No1, and No2, plus the complete wing fold system. Also included are 1x fuselage bag, 1x wing bag, 1x rudder bag and 1x elevator bag.

Hardware bag No2 (every version)

Wing Fold ARF Version (793000)

This kit includes hardware bag No2, the hydraulic components from the complete wing fold system, as well as1x fuselage bag, 1x wing bag, 1x rudder bag and 1x elevator bag. Hardware bag No1 and the mechanical parts of the wing fold system are already installed in the factory.

Wing fold system complete (partially installed in ARF planes)

fuselage bag

wing bag

elevator bag

rudder bag