



Sukhoi SU-27 / 30

Instruction Manual

V 1.2



Thank you very much for purchasing our SU-27/30 built with pride in our Total Area Vacuum Sandwich technology (TAVS).

Before you get started building and setting up your aircraft, please make sure you have read this manual and understood it.

If you have any question, please don't hesitate to contact your dealer, your Rep or CARF-Models directly.

Email: feedback@carf-models.com

Telephone: Call you CARF Sales Rep - he will be there for you! A full list of dealers and reps can be found on the CARF 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's for loss, damage or cost 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 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 is unable to monitor whether you follow the instructions contained in this instruction manual regarding the construction, operating and maintenance of the aircraft, nor whether you install and use the radio control system correctly. For this reason we at CARF Models are unable to guarantee, or provide, a contractual agreement with any individual or company that the model you have made, functions correctly and safely. You, as operator of the model, must rely upon your own expertise and judgement in acquiring and operating this model.

Attention!

This jet aircraft is a high end product and can create an enormous risk for both pilot and spectators. If not handled with care and use according to the instructions. Make sure that you operate your SU-27/30 according to the laws and regulations governing model flying in the country of use.

The engines, landing gear, servos, linkages and control surfaces have to be attached properly. Please use only the recommended servos and accessories. Make sure that the Centre of Gravity (CG) is located in the recommended place. Use the nose heavy end of the CG range for your first flights. A tail heavy plane can be an enormous danger for you and all spectators.

Fix any weights and heavy items like batteries, very securely into the plane. Make sure that the plane is secured properly when you start the engines. Have a helper hold your plane from the nose before you start the engines. Make sure all spectators are far behind, or far in front of the aircraft when running up the engines. Make sure that you range check your R/C system thoroughly before the 1st flight. It is absolutely necessary to range check your complete R/C installation first WITHOUT the engines running. Leave the transmitter antenna retracted or in case of 2.4GHz depress the range check button and check the distance you can walk before FAILSAFE occurs. Then start the engines, run at about half a throttle and repeat the range check. Make sure that there is no range reduction before FAILSAFE occurs. If the range with engine running is less then with the engine off, please don't fly at that time. Check that the wing and stab retaining bolts are tight and that all linkages are secured.

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

Important/General Notes

Servo Choice

We strongly advise that you use the recommended servos and equipment listed in the manual.

Servo Screws

Fix the all the servos into the milled plywood servo mounts using the 2.9x13mm or 16mm sheet metal screws provided in the Kit, not the standard screws normally supplied with the servos by the servo manufacturer. This because all the holes in our milled servo mounts are 2mm diameter, due to our CNC manufacturing process and this is too big for the normal screws.

Building Sequence

The actual building sequence is your choice but it is usually most efficient to start as suggested in this manual, which has been created by building several airplanes by several experienced modellers.

Adhesives and Solvents

Not all types of glue are suited to working with composite parts. Please don't use inferior quality glue you will end up with a inferior quality plane. That is not strong or save. Jet models require good gluing techniques, due to the higher flying speeds, and hence higher loads on many of the joints. We highly recommend that you use a slow curing epoxy such a 24hr resin and fill it with cotton flock or thixo for gluing highly stressed joints.

We take great care during production at the factory to ensure that all joints are properly glued but of course it is wise to check these yourself and regular any might just have been missed. When sanding areas on the inside of the composite sandwich parts to prepare the surface for gluing something onto it, do not sand trough the layer of lightweight glass cloth on the inside foam sandwich. It is only necessary to rough up the surface, with 120grit and wipe of any dust with acetone or de-natured alcohol before gluing to make a perfect joint. Of course, you should always prepare both parts to be joined before gluing for the highest quality joints. Don't use ACETON for cleaning external painted surfaces as you will damage the paint.

TIP:

For cleaning small spots or marks off the painted surface you can use liquid cigarette-lighter fuel.

Tip:

Use only high quality 5 or 30 min epoxy, since the cheap brands of this kind of glue are not moisture resistant like a proper resin. You will notice this as older bondings change their color and get more and more soft until the bond eventually fails.

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

Email us : feedback@carf-models.com.

We know that even good things can be made better!

Accessories:

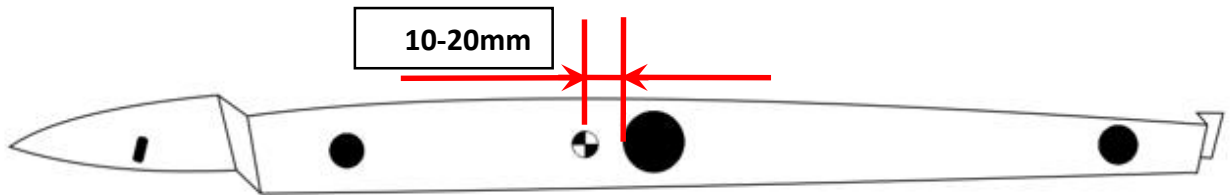
This is a list of suggested accessories which will help you to complete your project:

- 1 9 x Standard size digital servos with at least 25 kg (JR 8911 or similar*)
- 2 2 x 10mm digital servos with at least 6 kg (Savöx 0211MG, MKS 6625, or similar)*
- 3 1 x Pneumatic pack for speed brake (130650)
- 4 1 x Cockpit (360104)
- 5 1 x Tank set (360106)
- 6 1 x Retract set for SU27 (360500) or Su30 (360510)
- 7 1 x Wheels and brakes set for SU27 (360550) or Su30 (360560)
- 8 2 x Receiver Batteries
- 9 1 x Powerbox receiver and power management system
- 10 2 x Turbine Jetcat P100 RX or similar

* use Aluminium servo horns only!!!

Center of Gravity (CG) and rudder deflections:

The CG is located 10-20mm in front of the big wing tube.

**Rudder deflections:**

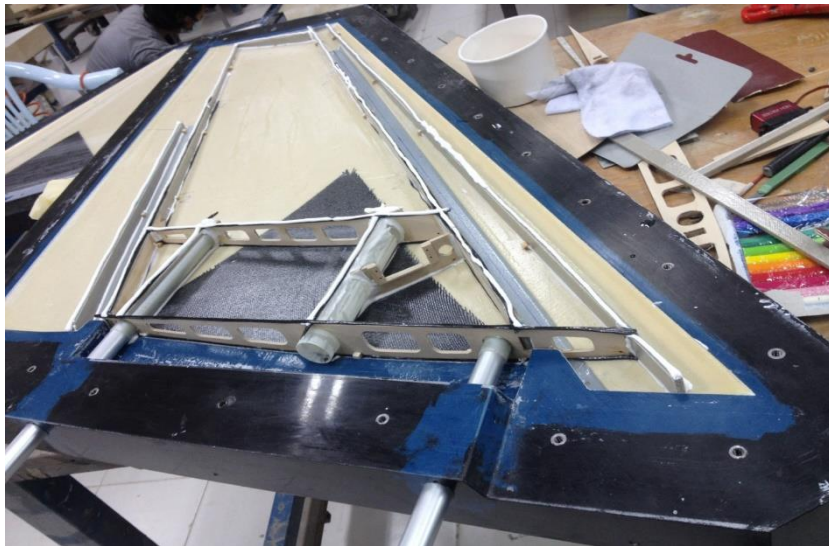
The SU-27/30 is flown with tailerons only. Thus you have to mix elevator and aileron function.

- Neutral position of the taileron is approximately 90-95mm from fuselage edge (see page 21)
- Elevator up: 50mm (measured at the leading edge of the taileron)
- Elevator down: 45mm (measured at the leading edge of the taileron)
- Aileron up: 40mm (measured at the leading edge of the taileron)
- Aileron down: 45mm (measured at the leading edge of the taileron)
- Rudder left/right: 30mm (measured at the bottom of the rudder)
- Flaps: 35mm for take off, 35-50mm (optionally up to max possible mechanical deflection) for landing (measured at the outside chord of the flap)

Please note:

The above values are suggestions based on the first flight tests. It is always possible to adjust these values to your personal likings but it is advisable to start with the moderate values given above!

General information



The fuselage and the wings are made of total area sandwich technology (TAVS) and are reinforced with carbon in the highly stressed areas. Carbon reinforced gear formers are installed and aligned.

Included hardware

Fin Pack



Fuselage Pack



Gear door Pack



Taileron Pack



Wing Pack

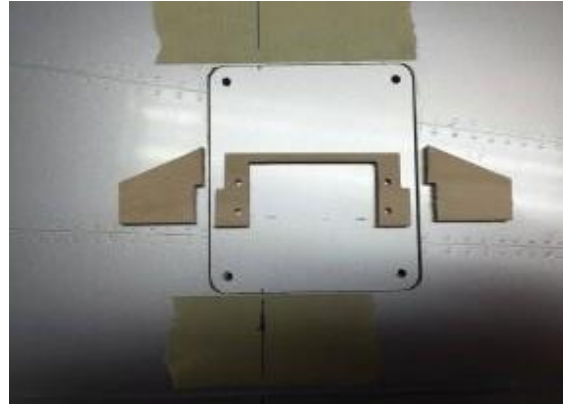


Accessories

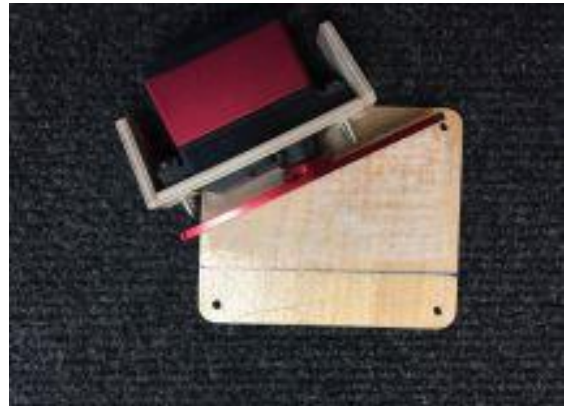


Slat servo installation

Assemble the servo mount for the outer slat servo. Mark the exact position of the linkage on the outside of the servo cover. Then copy the mark to the inside of the servo cover.

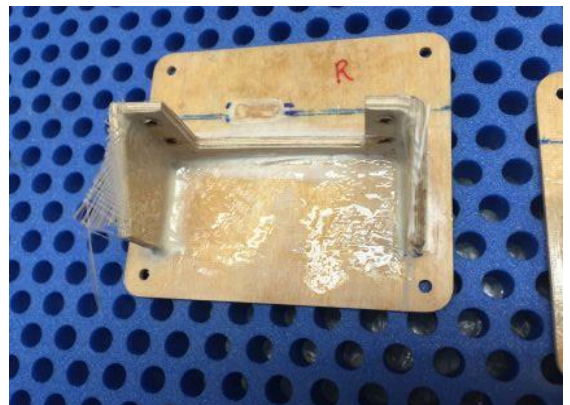
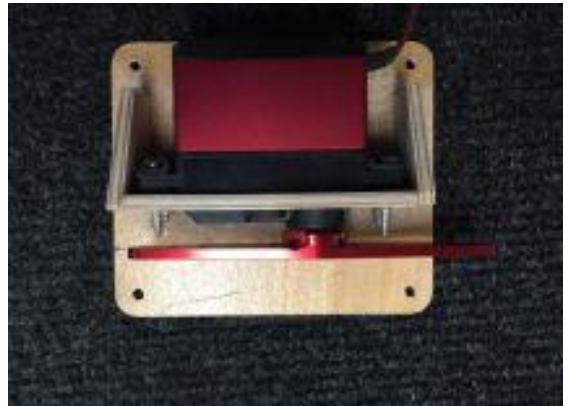


Glue the servo mount (with temporarily installed servo) in correct and centered position.



Important: After removal of the servo reinforce the servo mount with Hysol and fiberglass patches.

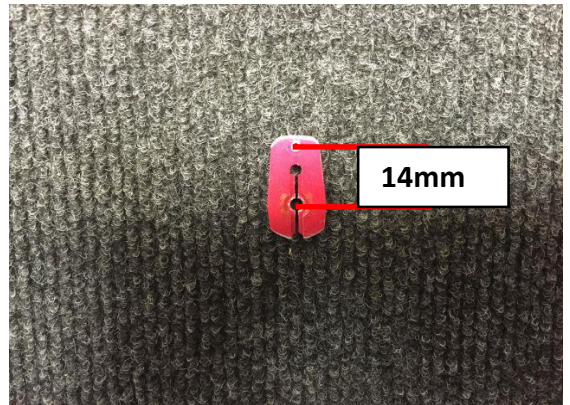
Enlarge the linkage hole as needed. Don't damage the carbon string.



Slat servo installation

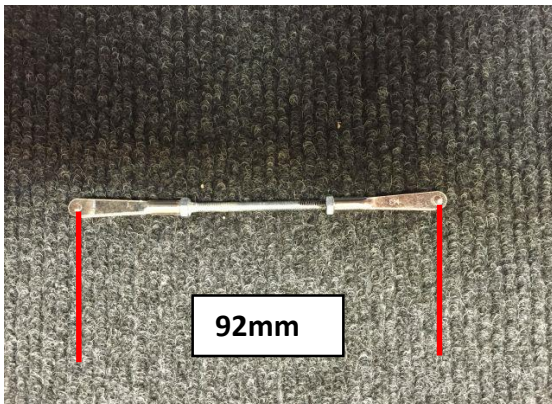
Prepare the servo horns for both slat servos with a length of 14mm.

Mount the servo horns with a servo tester right-angled. Then rotate both servos in this position (slat – in).



Adjust the linkage for the outer servo to approx. 92mm. Glue 1 of the 2 counter nuts to the rod. Then remove the clevis of that side.

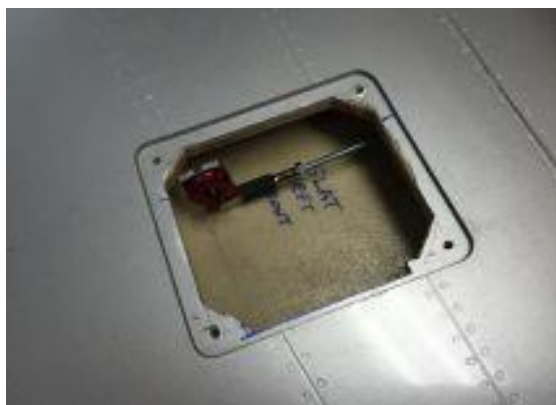
Clip the removed clevis to the slat horn.



Slat servo installation

Insert the linkage with a little Loctite from the servo side and screw it into the mounted clevis.

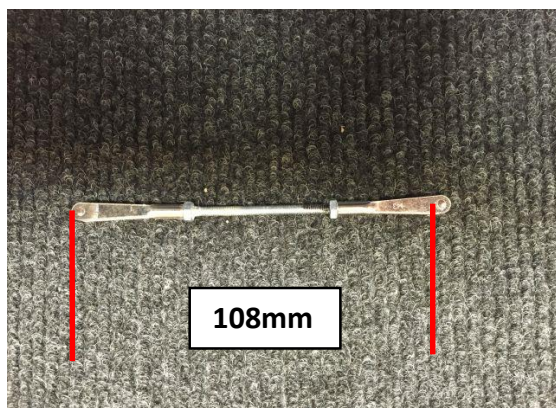
Clip the clevis into the servo horn. It might be helpful to set the servo in a right-angled position again, remove the servo horn, connect it to the clevis and then permanently install the servo horn right-angled.



Tighten the center screw with Loctite. Install the wiring for the Slat servo through the wing root.



For the inner slat servo, adjust the linkage for the inner servo like to approx. 108mm.



Then grind the linkage hole the bottom of the rip. Don't damage the CFK string.



Slat servo installation

As already done for the outer slat servo, glue 1 nut to the threaded rod and remove the clevis from that side.

Mount the servo horn with a servo tester right-angled.

Install the removed clevis to the inner horn of the slat.

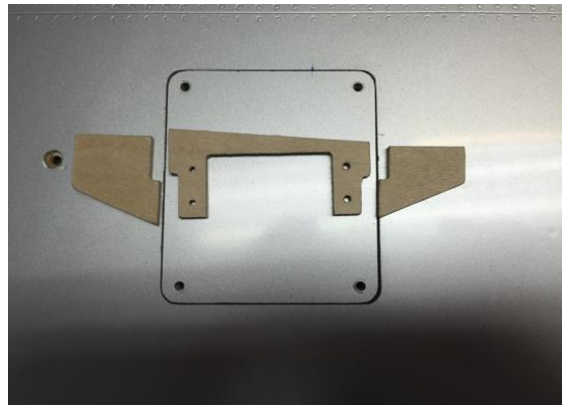
Mount the servo in the wing and install the linkage analog to the outer slat servo.

Now it is important to match both servo connection extreme exact. Modern radios will give you enough channels, but it is recommended to use a servo matching device such as a PowerBox, JR Match Box or Futaba MSA10.

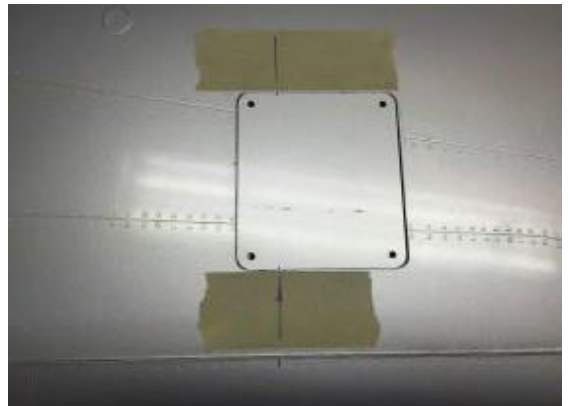


Flap servo installation

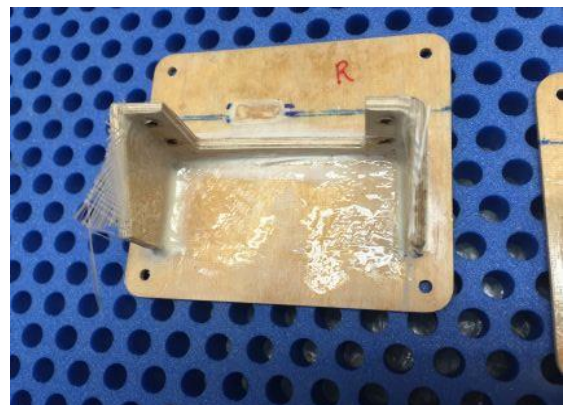
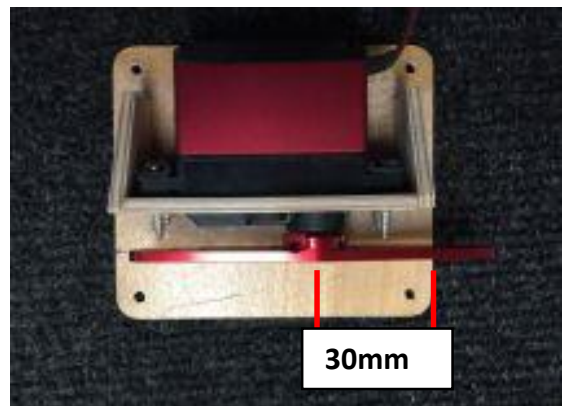
Assemble the servo mount for the flap servo exactly like done for the outer slat servo.



Mark the exact position of the linkage on the outside of the servo cover, carry over to the inside, glue the servo mount with temporarily installed flap servo to the correct position and reinforce with epoxy and fiberglass patches after removal of the servo.

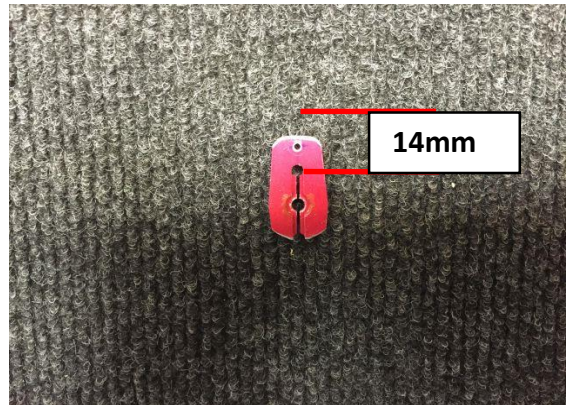


Enlarge the linkage hole to both edges of the spar. Don't damage the carbon string.



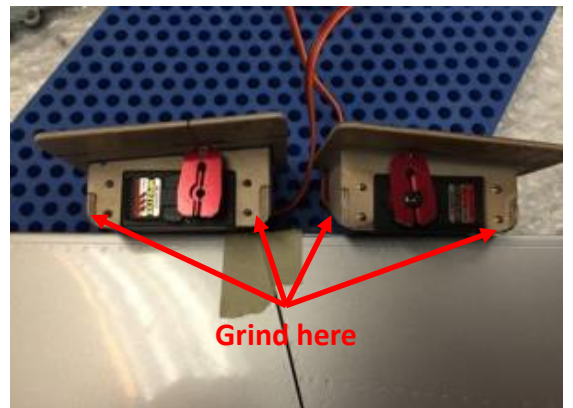
Flap servo installation

Prepare for the flap servos of both wing halves the servo horns with a length of 14mm.



Mount the servo arms in center position (servo tester).

Grind the corners of the servo mount for easier installation.

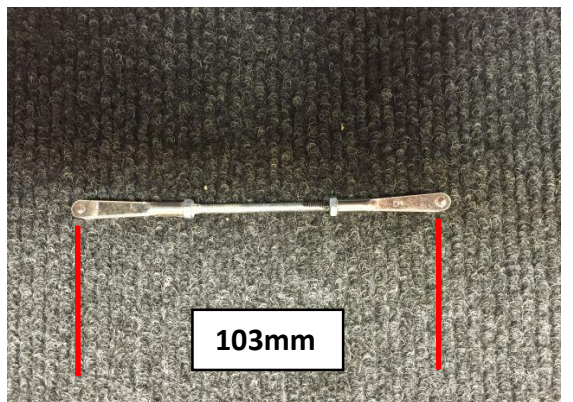


Grind the lip-cover as shown on the photo for easier installation of the clevis.

Note: Only grind away as much as necessary...

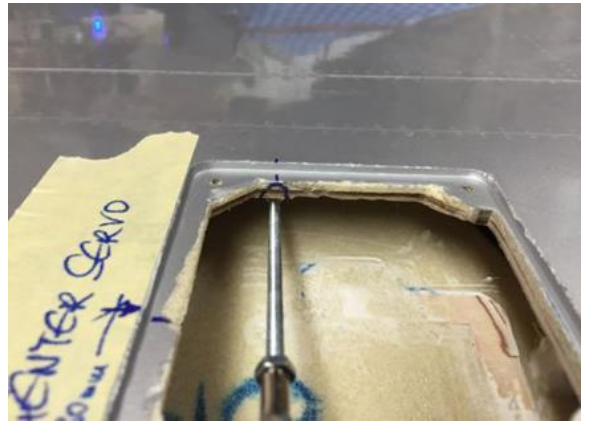


Adjust the linkage like this for both servos to 103mm.



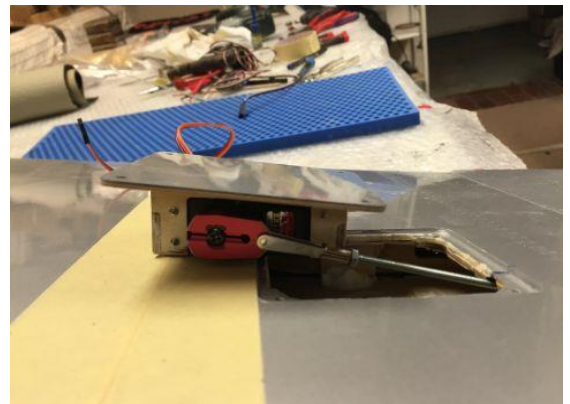
Flap servo installation

Mark the position of the linkage and grind the wooden reinforcement frame for maximum space as shown on the photo.



Protect the wing surface first and install the servo as shown. Installing the flap servo is a bit tricky because the linkage crosses over from the bottom side of the wing to the top. However, this is the best geometrical way to do it.

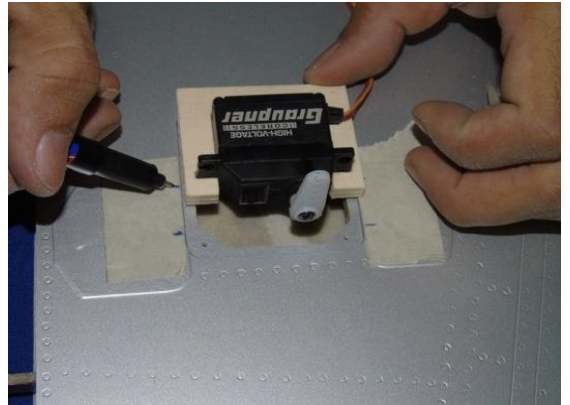
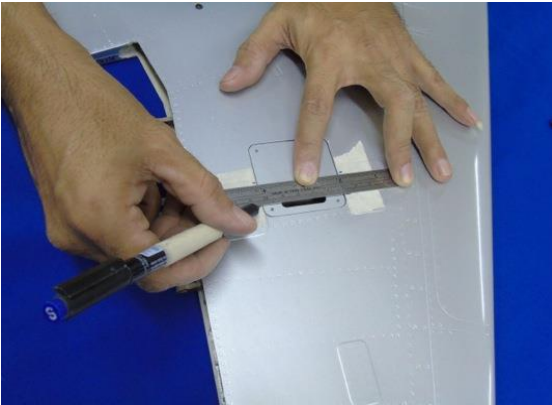
Connect the clevis with the flap horn. Then close the cover with 4 sheet metal screws.



Please note: The first kits manufactured in 2015 had the flap control horn installed too deep inside the flap (too close to the spar) so that the angles didn't work properly. We have a simple solution to correct this and provide a short leaflet to describe the fix. If your flap control horn doesn't look like on the photo on the right, please contact us and we will email this little instruction to you!



Vertical fins / servo installation



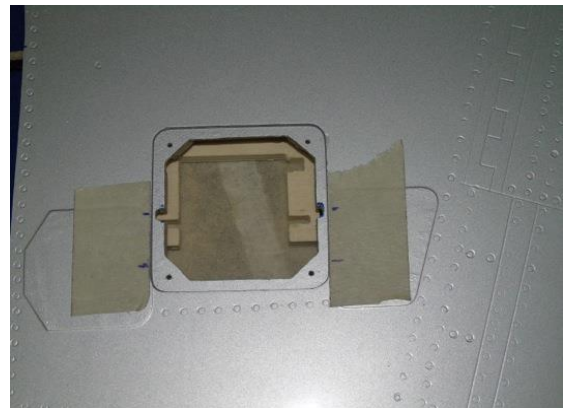
Note: Even at the full scale version both fins are identical and not in mirror!

Regular 15/16 mm servo:

Mark the exact position of the linkage to the fin. If necessary mark areas which have to be cut to fit the servo and cut those areas out.

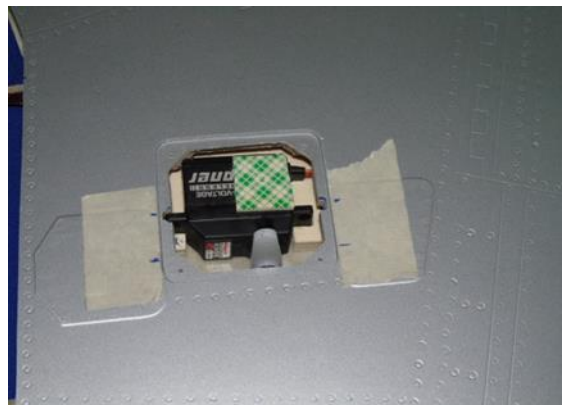


Glue the wooden framework into the fin. Check your marks!



Install the servo horn (15 mm) and center it with a servo tester! Use a little Loctite for the center screw. Make sure it is strong enough to transfer the torque safely!

Apply some double sided tape to the top side of the servo. This is not to "glue" the hatch to the servo but to have a soft cushion between hatch and servo to hold it safely down.



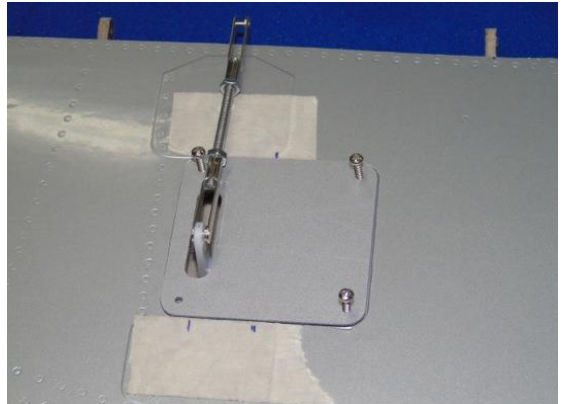
Vertical fins / servo installation

Then add some silicone to the servo and permanently install it in its place.

Note: The silicone is very important as it makes sure that the servo will not move in the servo frame. You will always be able to remove the servo by pulling it gently. Not using Silicone can cause rudder flutter!



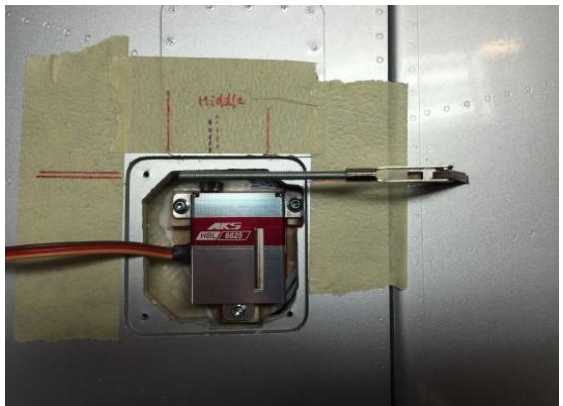
Close the servo hatch with 4 sheet metal screws and install the linkage. If necessary, enlarge the slot in the servo hatch so that the servo can move freely its full throw without binding.



10 mm low profile servo:

Please note: Only the latest examples of 10 mm HV servos with 70+ Newton torque are allowed.

We show the installation of a MKS HV Servo but there are others like Savöx or Graupner or Hacker as well. The installation is easier and self explaining, matching wood frames are included in the hardware bag.



Vertical fins / fin installation



The fins are connected with the fuselage by 2 solid carbon rods. For packing reasons the rods are not yet glued into the fuselage. Also because there are 2 different fin options available, slight tolerances can be caught and corrected in this work step.

However, it is absolutely necessary to glue the rods into the fuselage.

Drill 2mm holes from below into the fuselage in the center of the tube positions. These will act as vent holes (see picture above).

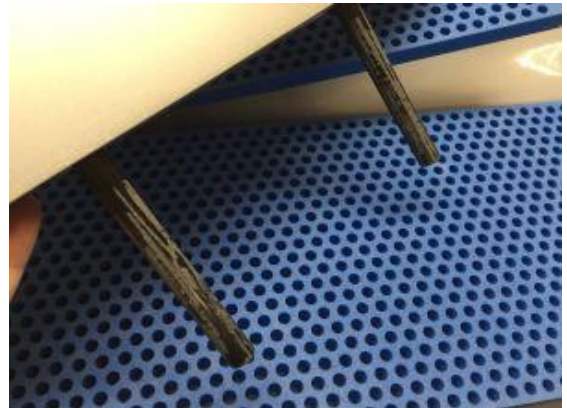
Grind both carbon rods in the gluing area.

Insert the carbon rods into the fins and bolt them securely in place! Apply very little Epoxy/Hysol on the lower part of the rods and ample Epoxy/Hysol inside the sleeves in the fuselage.

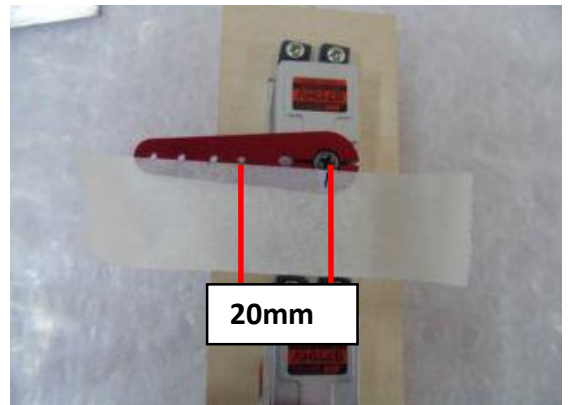
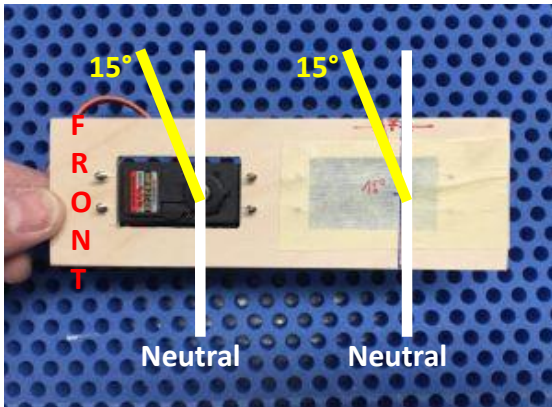
Then slide the fins slowly on to the fuselage and remove the excess glue.

Removing the glue is important otherwise you risk glueing the fin permanently to the fuselage.

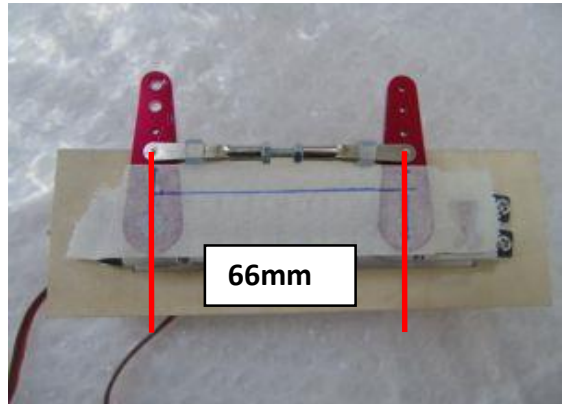
After the glue has set remove the fin fixture bolts and remove the fins.



Horizontal stab / servo installation

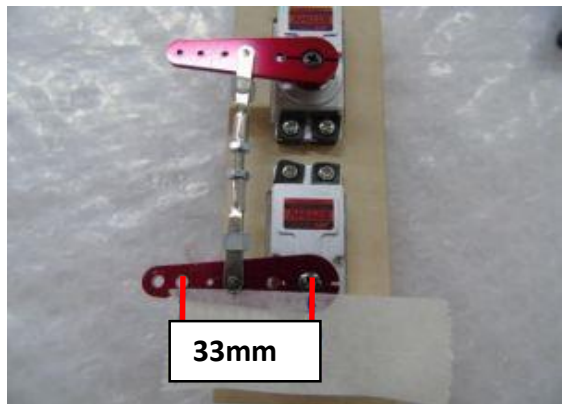


For redundancy and flight safety each taileron should be controlled by 2 servos. To make the installation of the rods and the adjustments of the servos easy please use the included mounting jig which has the same dimension as the servo mounts in the fuselage. It is important to match both servos extremely exact. Either with your transmitter or even better, with a matching device like PowerBox, JR Match Box or Futaba MSA10.



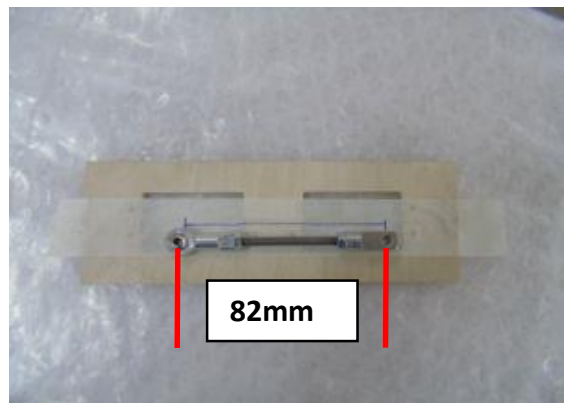
Note: The neutral position of the elevator servo arms is 15 degree forward!

The connection linkage between the two servos should be installed at the 20 mm holes. Start with 66 mm length and fine tune VERY precisely so that the servo arms are exactly parallel.

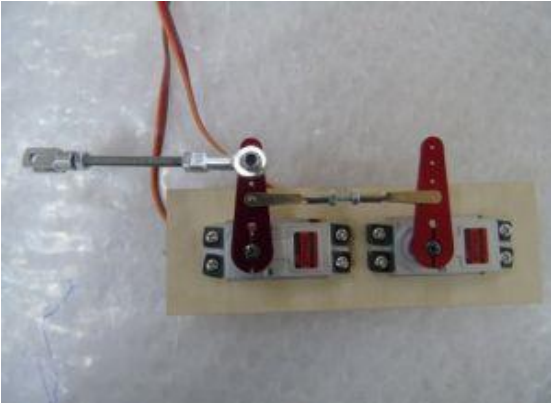


The distance for the actual elevator pushrod from center axis is 33-35mm.

The length of the actual taileron pushrod connection is 82mm hole-to-hole. Obviously strong aluminium servo arms have to be used!



Horizontal stab / servo installation



The photo above shows how your dummy servo installation should look like. To start the fuselage installation remove the servos from the jig but leave the linkages on the servo arms, only disconnect the two servos by removing the clevis from the REAR servo.

Insert the rear elevator servo first with taileron linkage attached and screw it carefully into place by using the included 2.9 mm sheet metal screws. Then insert the front elevator servo and screw it into place. The connection linkage must stay on the servo arm while inserting and installing this front servo.

Through the access hatch clip the clevis of the connection rod into the corresponding hole of the rear servo using a screwdriver.

Note: Using spring steel clevises is the only way to install and remove the servos without great hassle. The included clevises are of HIGHEST QUALITY and will NEVER fail if they are not overstretched during installation.

Note: The taileron control horns are made from phenolic material because this only won't wear the steel pin of the main clevis over time. Due to place constraints a ball link cannot be used. DO NOT CHANGE ANY COMPONENTS IN THIS ASSEMBLY!!!



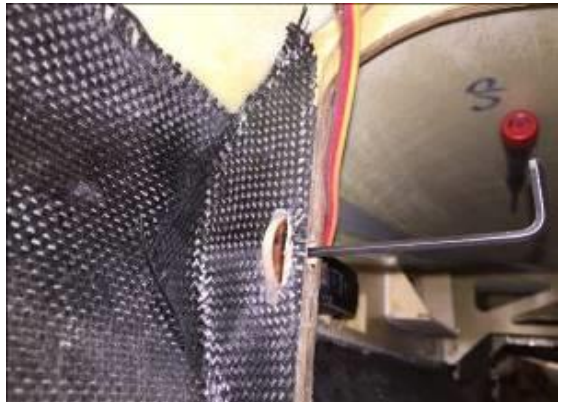
Horizontal stab / stab installation

Slide the taileron rods into the tailerons and secure them with the M3 bolt. Then Insert the assembly into the corresponding sleeve in the fuselage.

Put the phenolic washer in place and screw the center bolt in with Loctite!



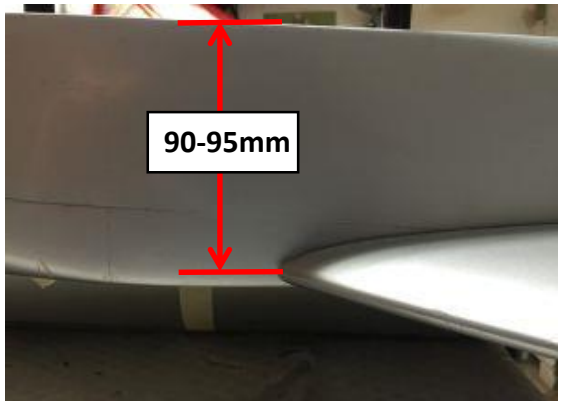
This will hold the stab in place when it is bolted on to the rod. Make sure the phenolic washer is properly fixed and secured, it will never have to be removed again.



Connect the push rod with the taileron by clipping the large aluminium with steel pin on to the phenolic control horn. The taileron must be moved to full down position in order to access the control horn and the clevis. If you followed the instructions precisely until here, you will have no problem to deflect the tailerons far enough (you remember that the servo horns must point 15 deg forward from at neutral position? Now you know why...).

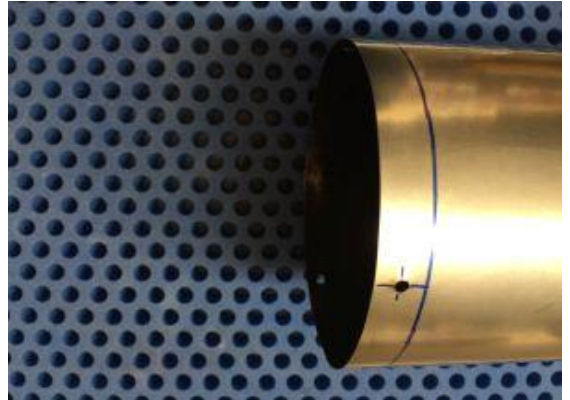


The neutral position of the LEFT taileron is approximately 90-95mm from the lower fuselage edge. The right taileron must be aligned with the left taileron by a sharp eye, as the hand made plug does not guarantee 100% symmetry for measuring purposes.

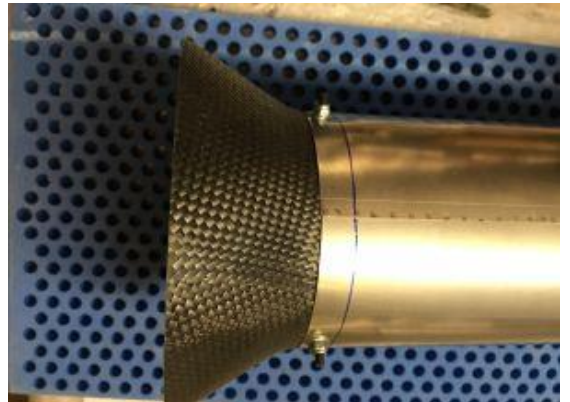


Thrust pipe installation

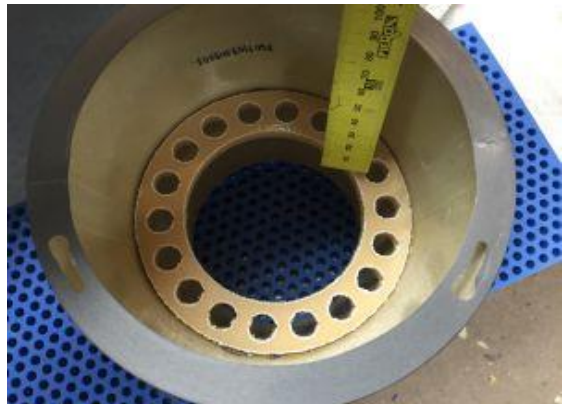
Drill 3 holes into the trust pipe and carbon entry cone.



Bolt trust pipe and entry cone together.



Glue the centring former for the into each nozzle. Right and left former should be at approx. the same position, measure around the distance and align accordingly.

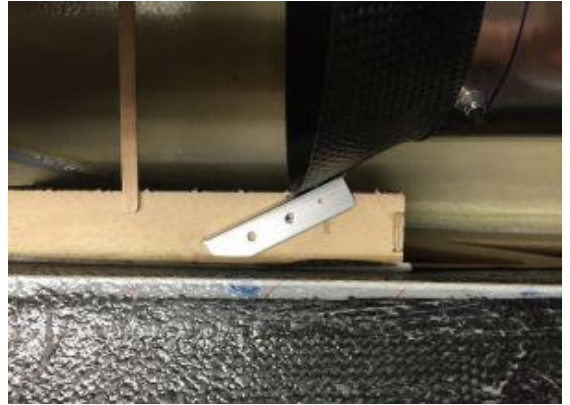


Install the nozzles and insert the trust pipes. Align so that you have a distance of approximately 10mm between end of trust pipe to the end of the nozzle (the thrust pipe's rear edge 10 mm inside of the fiberglass nozzle)



Trust pipe installation

Drill 2 holes 3mm into one flange of the aluminium brackets to mount to the wood board and 1 hole 3mm into the other flange to mount against the carbon entry cone. Cut the edge of one flange as seen on the photos.



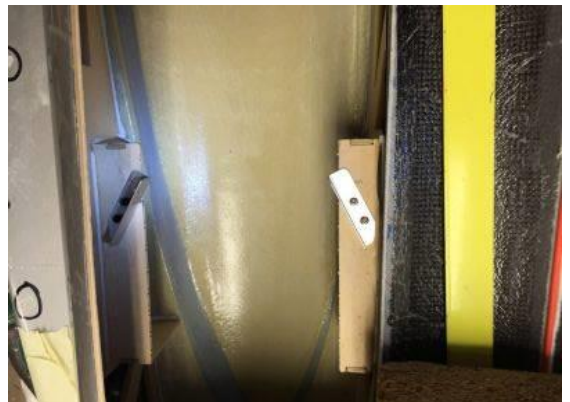
Trial assembly everything and mark the end of the funnel and the hole positions to the wood construction. Use a sharp and red glowing 3mm rod to drill (resp. "burn") the holes on the outer side of the fuselage.



Use 3mm screws with stop nuts for the outside brackets. For the inside brackets you get along with sheet metal screws.

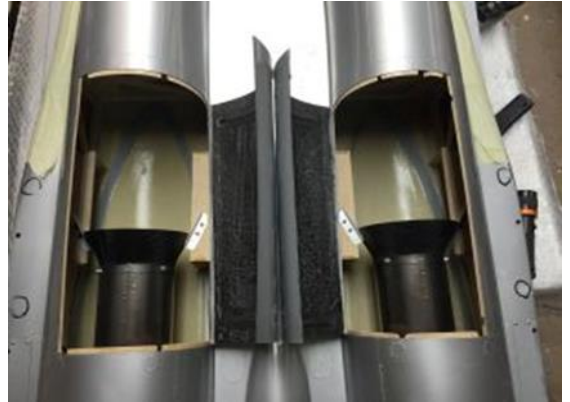


Mount the brackets with M3 bolts, stop nuts and sheet metal screws to the wood boards and to the carbon entry cones of the inserted thrust tubes.



Turbine, ECU and receiver installation

Use an actual engine to align the entry cone properly.



Then mount the turbine in centred and straight, aligned with to the thrust pipe.

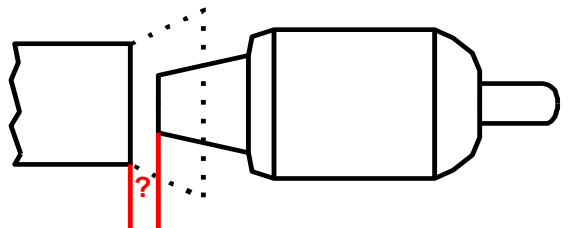


To be safe, ask your turbine manufacture for the correct distance between rear edge of the engine's exit nozzle and the front edge of the stainless steel thrust tube!

At the engine sizes commonly used for this aircraft, 20-25 mm is a good starting point.

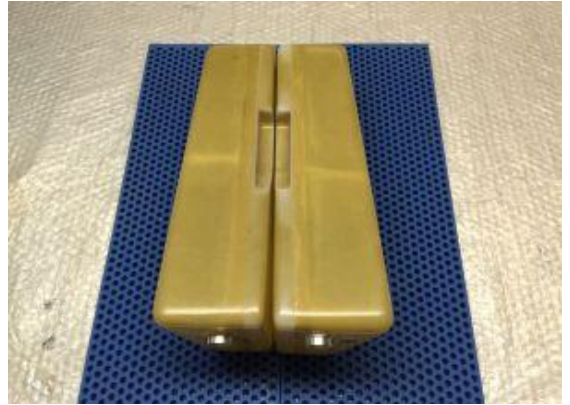
With this information you will be able to place your engines correctly.

Please also note that some engine mounts are not symmetrical, so it might be necessary to use plywood spacers between mounting rails and aluminium engine mount to center the engine properly.

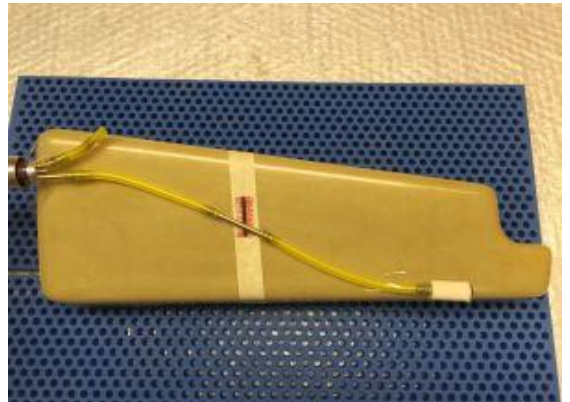


Fuel tank, Hopper and turbine pump installation

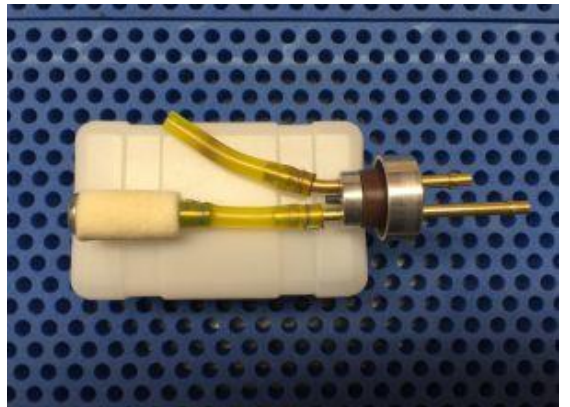
Both fuel tanks are made especially for the SU and fit perfectly into the fuselage.



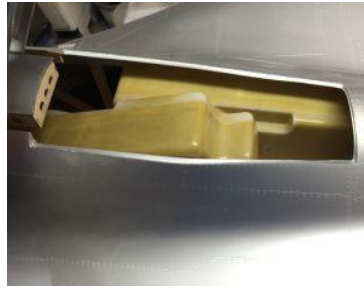
Make the internal tubing like the picture. Check the tubes, position of the smashing and the clunk.



Build the hopper tank like the picture.



Fuel tank, Hopper and turbine pump installation



Install the tanks in the order shown in the following pictures. Use the reverse order to remove the tanks.

Push both tanks towards the wing tube.

Prepare the aluminium bracket as shown on the photo...



...and the wood with the drive-in nut. It will be easier if you double it up to 6mm thickness.



Close the hole of the drive-in nut with a little tape before glueing the part into the fuselage and use a very short M3 bolt to attach it to the aluminium bracket.



Fuel tank, Hopper and turbine pump installation

Then glue the 2 mount assemblies to each fuel tanks and to the bottom of the fuselage with Hysol or other epoxy glue.

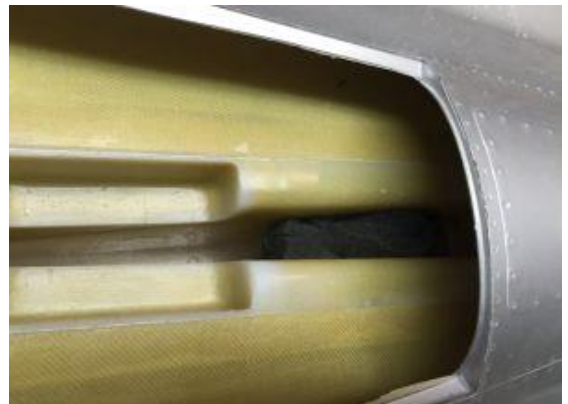
Don't forget to sand the glueing surfaces properly and then let the glue set over night.



After the glue has set the 3mm bolts are removed you can remove the fuel tanks. Now you should fill the glue joint of the wood to the fuselage bottom and also take a patch of fiberglass cloth and reinforce the joint between the aluminium brackets and the fuel tanks



After the final tank installation put some thin foam between both tanks.



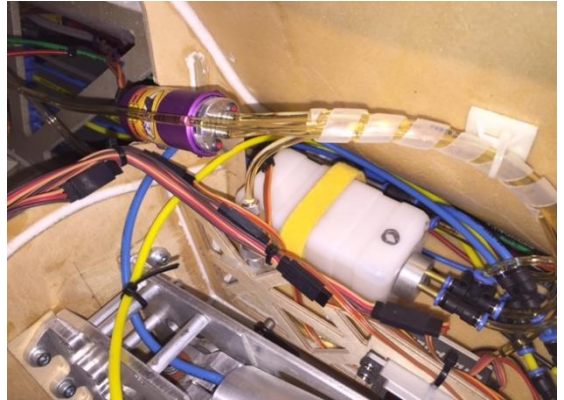
The tank volume is 2.9l each. You can mark the tank 2.4cm from the bottom (rest fuel = 0.5l) and 4.3cm from the bottom (rest fuel = 1.0l). With these marks you can adjust a safety flying time.



Turbine pump and ECU installation

Engine and RC equipment placement is usually very much at the liking of the builder, but there are a few useful positions we found during practical flying.

So we recommend to place the hopper tanks like shown in front of the nose gear former, where they are visible through the canopy opening.



The two fuel pumps should be bolted against the same nose gear former as shown in the photo, filters placed vertically downwards, from there the fuel lines should be routed backwards to the engines.



At that time also think about placement of the ECU and the receiver. It is easy to open a large access hole in the area where the intake attaches to and then place ECU and receiver with a distance of approx. 100-150 mm from each other in this area. So all electronic components are accessible within second, while the air intake acts as a hatch. Even a Powerbox could be placed the same way, moving both engine ECUs to one side and keep Powerbox and Receiver on the other.



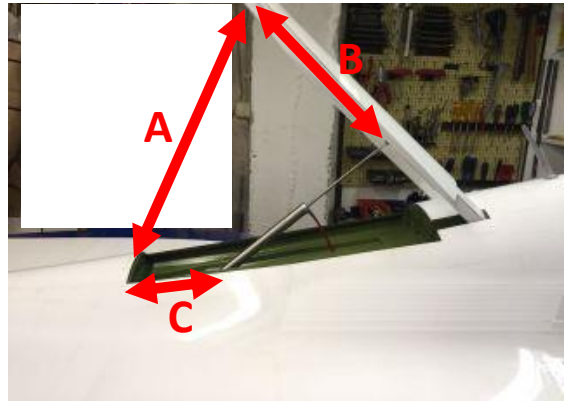
Keep installation clean, protect wires against rubbing at formers or other sharp edges.

It is obvious that receiver and turbine batteries should be mounted as far forward as possible for CG reasons.



Speed brake installation

The operational speed brake is an option for this airplane, but it is highly recommended to be installed and used. The speed brake is very efficient and has no pitch up or down effects when deployed. A skilled use of the speed brake will always be the best option to control speed and sink rate during landing approaches, for formation flying and anyway will be very impressive for slow fly-bys.



It is the easiest solution to mount the pneumatic cylinder of the speed brake door right on to the tanks.

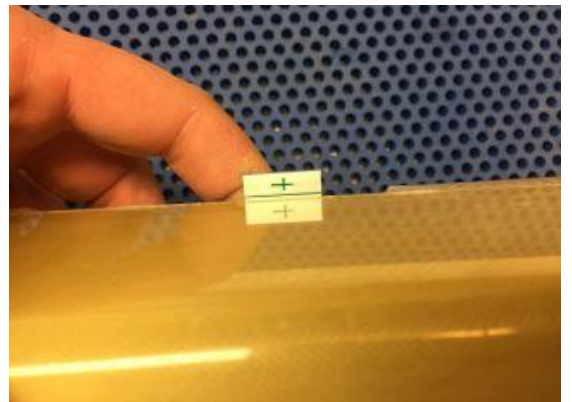
The distance A is 36cm at the maximum opening angle.

The distance B is 26cm and the position of the connection point (control horn) at the speed brake door. The distance C is then the resulting mounting point of the air cylinder to the tanks.

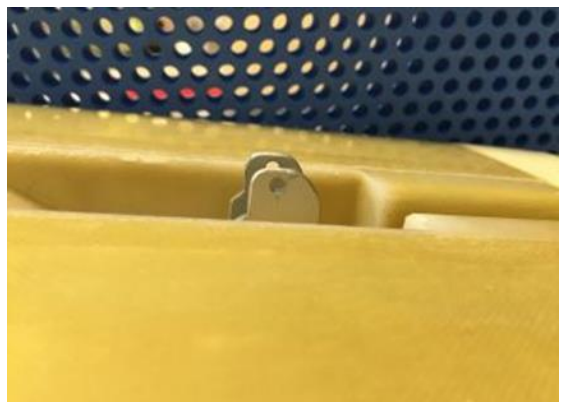


Prepare a pair of aluminium brackets like shown on the photos.

The hole is located just above the top wall of the tank.



The outer contour of the brackets with the rounded edges and recesses is necessary to fit the pneumatic cylinder and allow free movement.



Speed brake installation

Glue the brackets to the tanks at the correct position and reinforce with epoxy and a patch of fibreglass.



The installed pneumatic cylinder in its extended position.



The installed pneumatic cylinder in its retracted position.



Cut a rectangular hole in the cover of the speed brake opening for the pneumatic cylinder like shown in the photo.

Fix the cover with velcro on to the tanks. Adjust the exact height with some spacers made from scrap balsa or light ply wood.



Landing Gear installation

Start with the nose gear. Screw the nose gear with 2 self tapping sheet metal screws to the nose gear former. Check alignment and gear movement. It's easy to correct at this time. Extend the front edge of the nose gear cutout slightly, so that the wheel passes without touching the edge. The little opening remaining when the door is closed can be ignored, it will have no negative effect on function or looks.



Once you are satisfied with the movement and alignment, drill the other 4 holes with a battery drill. Then remove the gear, drill the remaining 2 holes, enlarge all holes to 5 mm (for the T-nuts) and permanently mount the nose gear with 6x M4 bolts and T-Nuts.

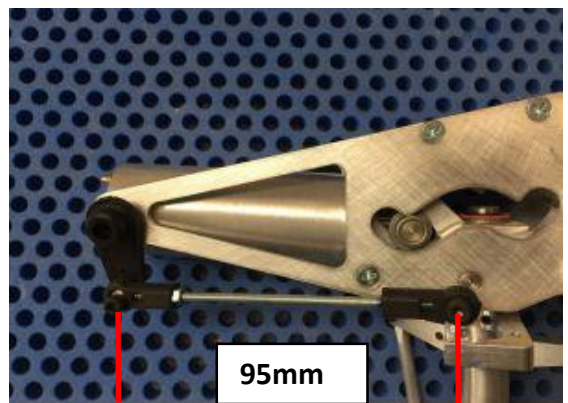
Connect the airlines to the cylinder (preferably color coded gear-up and gear-down) and secure every tube connection.



The airlines protect the cylinder inside from dust and dirt. Close the ends with some masking tape.



Install the steering servo and the linkage as shown in the photo. The steering linkage is approx. 95 mm long from hole to hole.



Gear Installation

The SU-27/30 gear is a complex piece of craftsmanship. The main gear turns 90 degree during the extending and retracting process. The space for the wheel is tight, so it is necessary to place the gear carefully and precisely into the fuselage's gear mounts.

Since the wooden gear formers have been installed in the mold, the alignment of these cannot be guaranteed 100%. So a few degree up or down, in or out, have to be fine tuned when the actual gear is being installed.

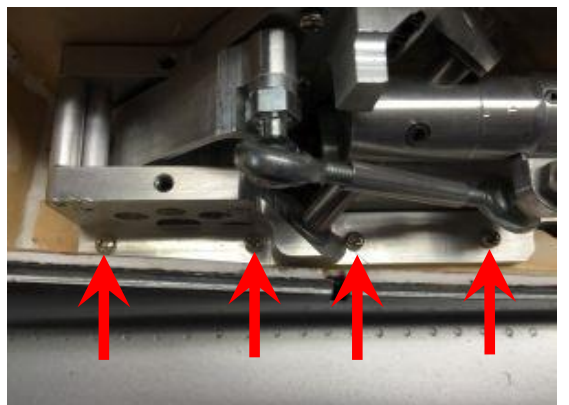
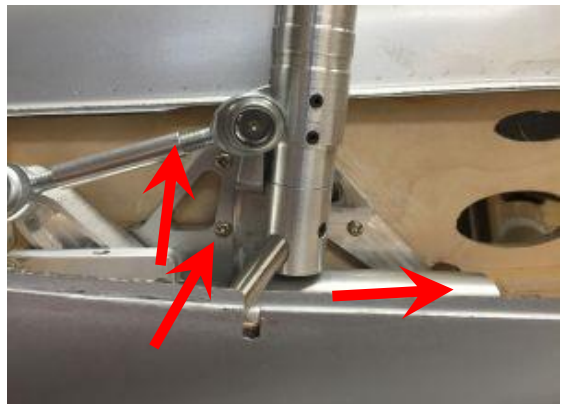
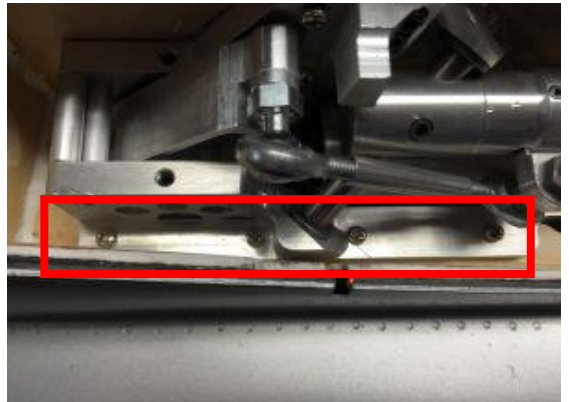
The easiest way to align the gear is:

- screw the gear in place with 2-3 sheet metal screws. Cycle the gear by hand and see if the alignment is acceptable. Important: Have a sharp view from the front and from the side to make sure that the struts are symmetrical when extended.

-if the gear is not aligned 100%, use very small, thin plywood shims to re-adjust. Once the gear is aligned properly and cycles without binding or hitting into the wheel well, remove it from the airplane. Make sure the little spacers stay in place, secure these with a drop of CA glue.

-Put tape on the aluminium surfaces contacting the wood formers and wax it well. Then apply thickened resin to these surfaces and mount the gear again with the 2-3 sheet metal screws. Let it cure overnight. This layer of resin will create the perfectly aligned seat for your main gear.

-Finally mark all 7 holes, drill, enlarge for the T-nuts and permanently bolt the main gears in place.



Gear Installation

Note: If it appears that you need to grind down some areas of the gear formers and you really cannot get the same effect by using spacers on the opposite side, there will be no choice but actually grinding a little off the gear formers. As long this is only 1-2 mm thickness, it will not harm the structural integrity. It might be also necessary to round a few edges on the aluminium frame for easier insertion and better fit.

Note: If you get the gear to actually fit but either extended angle or retraction angle doesn't seem 100% right, you can turn the ball link a few turns in or out to make fine adjustments of its length. Once all is perfectly set, please use a little Loctite on the thread to stabilize the ball links on the rod.

Main wheels and brake installation

We are using light weight Dubro wheels not only to reduce total weight, but also to support the retraction movement against gravity and air flow.

Note: It can be necessary to drill the main wheel hubs with a 6.1 mm drill bit to create the correct tolerance for the 6mm axle.

At A: Glue the black rubber with CA glue to the hub (we already recessed the hub for this purpose).

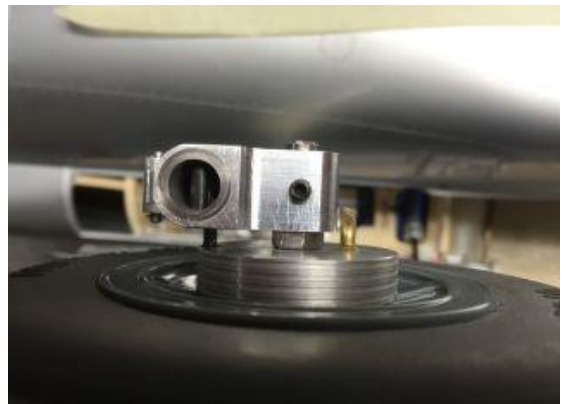
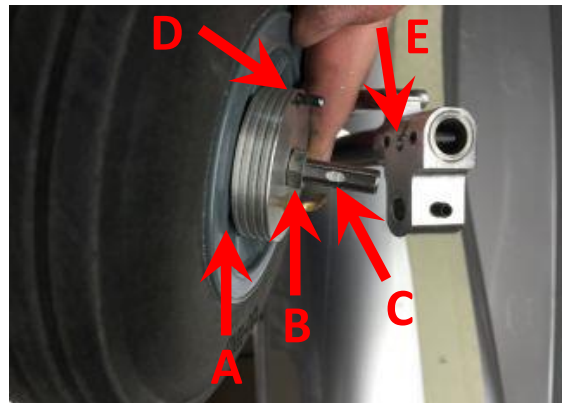
At B: It is necessary to use here a pack of washers to adjust the wheel spacing to the strut, also how the wheel gets to lie in the wheel well when retracted

At C: **IMPORTANT:** Grind a flat spot into the axle for the grub screw!

At D: Screw the grub screw into the brake

At E: Drill a hole into the axle mount of the main strut so that the grub screw can act as an anti rotation pin.

IMPORTANT information to B and D: it is mandatory to have the plane in normal flight position to check the amount of washers packed between brake and strut and the correct length of the anti rotation grub screw.



Glue the hub covers to the wheel rims with some silicone (removable) and paint the hub grey or olive green, which will give the wheel a 100% scale look, even though they started out as regular DUBRO light wheels.

Door Cylinders and Valve

For the door cylinder installation mount under every bracket of the cylinder a 3mm plywood with small sheet metal screws. Cut the protruding tips off.

Connect the airlines with sufficient length and secure them with thin safety wire if you feel that it's necessary.

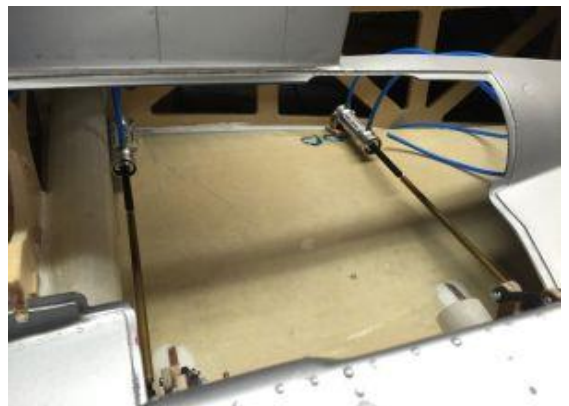
Connect cylinder, push rod and ball head. The short brass rod is for the nose gear door, the long for the front main gear door. For the rear main gear door the plastic ball link needs to be shortened 3mm before assembly.

Connect the ball links with the M2 bolts and nuts to the control horns as shown on the photos. Fully extend all cylinders and glue all cylinder's wooden bases to the fuselage's sandwich skin.

Note: Opening angle for main gear doors is 45 degrees towards the outside!

Note: Before mounting the cylinder for the rear gear door you might have to grind a little bit away from the wood. Space for this rear gear door cylinder is very tight.

(The photo shows a spacer between ball link and rear main gear door control horn, which should not be necessary anymore at any further production kits.)



Door Cylinder and Valve Installation

The CARF Pneumatic Completion kit consists of 2 pcs 2-way valves for retracts and gear doors and 1 pc 1-way valve for wheel brakes. As the speed brake is such a highly recommended accessory, we describe the valve installation of the speed brake pneumatic kit in this manual as well. So, a total of 4 electronic valves will have to be installed.

As the photo shows, the valves should be placed beside the nose gear.

All pneumatic plumbing is very straight forward and does not need much description, follow the instructions in the valve packs of the manufacturer to connect and to program.

Note: In order to avoid a “gear door crash” between front and rear gear door it is mandatory to connect the rear gear doors into the main retract loop and have the front main gear door, together with the nose gear door, put on a time delayed separate circuit. Either use separate channels and a gear door sequencer or program the switch points of the two valves apart from each other and set a slow function on the gear channel.

If you experience that the gear retracts too slowly for your flying style, you can add one separately purchased electronic 2-way valve parallel to the first retract valve. This will double the air put through the system, increasing speed and momentum of the retraction cycle.

Install the air bottle into the nose of the plane. It is recommended to somehow fix it in the fuselage, even though it will stick out of the fuselage, so that the nose cone can be removed without having to disconnect airlines. Install the batteries in the very front part of the fuselage, too.



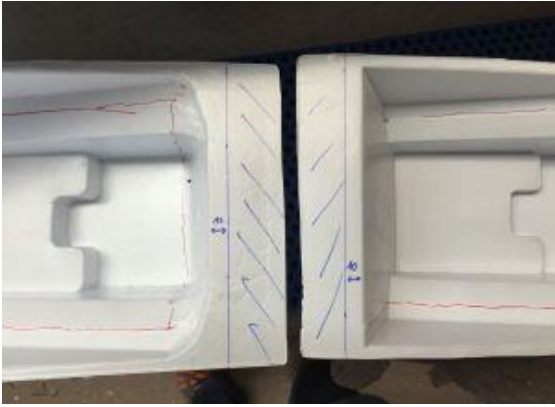
Cockpit installation / overview

The cockpit is an optional accessory, but its installation is shown in this manual. The SU-27/30 cockpit is a basic cockpit kit, which can be enhanced individually if required. All parts are hand laminated composite parts: 2 trays, 2 dash boards with covers and 2 seats. Several die cast plastic parts complete the kit.

Here you can see the important measurements. They are all measured from the front edge of the fuselage with removed nose cone.

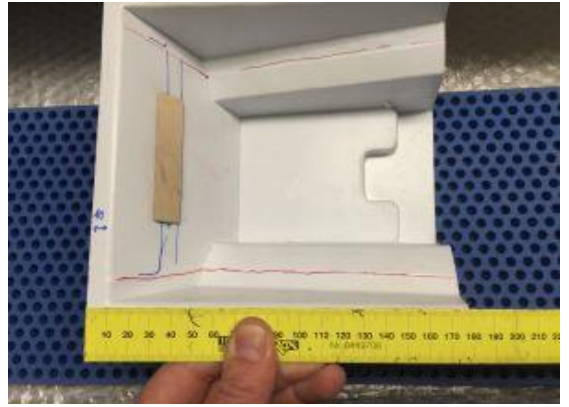


Cockpit installation



Cut the cockpit tubs like this to have a 10mm edge left. On the photo left is the rear tub and right is front tub.

Shorten the front tub on the upper side to 180mm length and on the bottom side to 130mm.



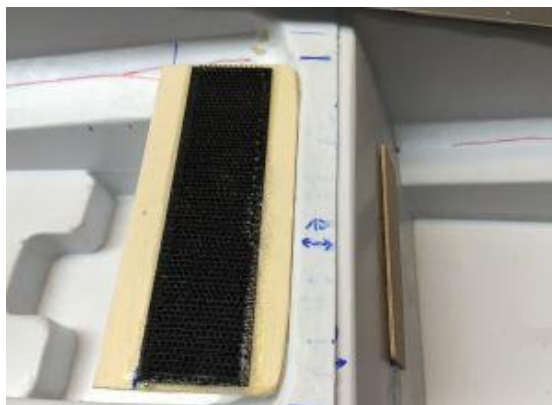
Trial fit the cockpit tub into the fuselage and mark the position where the tube contacts the fuselage. Install a support from scrap balsa pieces as shown.



Place the longitudinal stops so that the tubs are placed according to the measurements shown at the cockpit overview photo. Position of stop. If you have a bumpy flying field it make sense to support the cockpit tubs with a bottom of wood to connect to.



Cockpit installation



Glue a scrap wood with velcro to the front edge of the rear cockpit tub as shown on the photo. Stick some Velcro on it. The rear cockpit tube is overlapping the front cockpit tub.

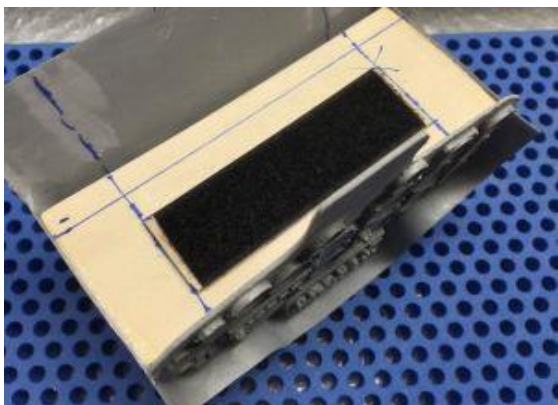
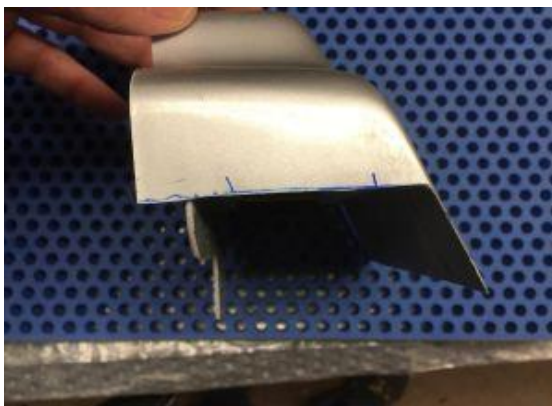
See the top view on both cockpit tubs on the right.



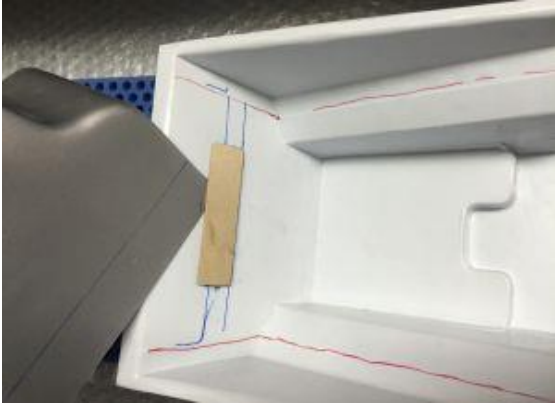
Cut the instrument holder like shown here.

Glue a scrap light ply piece to the instrument holder as shown on the photo and stick Velcro on it.

Glue the panel into the holder and cut the instrument panel like shown here.



Cockpit installation



A little wooden lip glued to the rear wall of the front tub supports and stabilizes the instrument holder a lot.

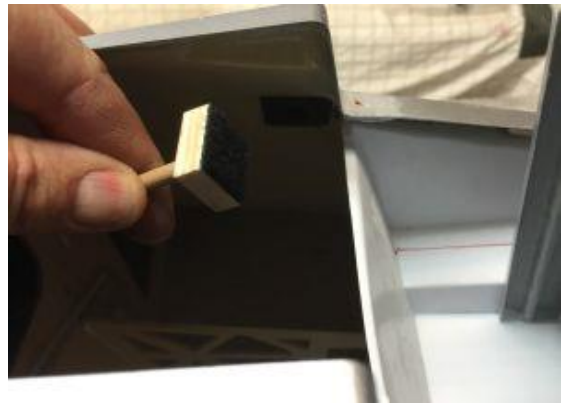
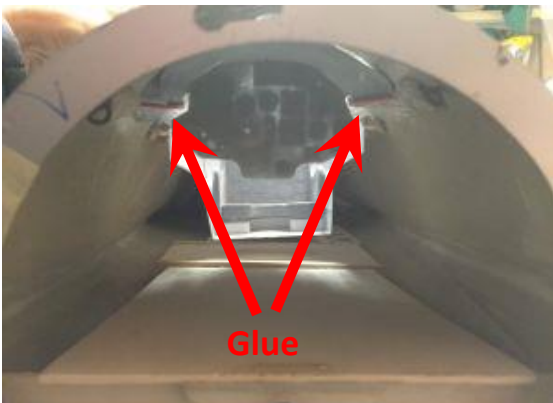
Cut the front dash board cover like shown on the above photo.

Glue the panel into the cover and cut the instrument panel like shown on the right.



Before you glue the front dash board cover into the fuselage it is highly recommended to glue in the front canopy glass.

Finally make some stoppers for the rear cockpit tube from wood with velcro.



Cockpit installation

Stopper installed.



Place the seats like the measures from cockpit overview page.



Cockpit front.



Cockpit rear.

Feel free to add details as you wish, then paint the cockpit. Finally cut out and apply the instrument stickers accordingly.



Canopy installation

First roughly cut the canopy, so that it could be put from the outside on the canopy frame, which should be mounted on the fuselage. Mark the exact cut lines then. Allow 3-5 mm overlap for glue surface.



Do this for the main canopy and the front canopy glass.



Then glue the canopy permanently with Canopy Glue, or silicon or any other method you normally use to glue in clear canopies. There are plenty of methods.

If you use CA glue, use only very little and do not use any accelerator.



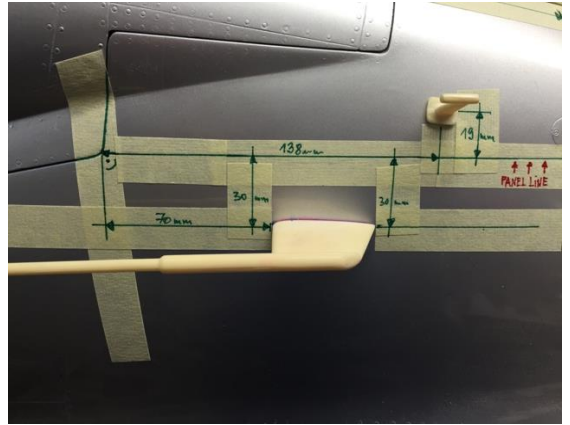
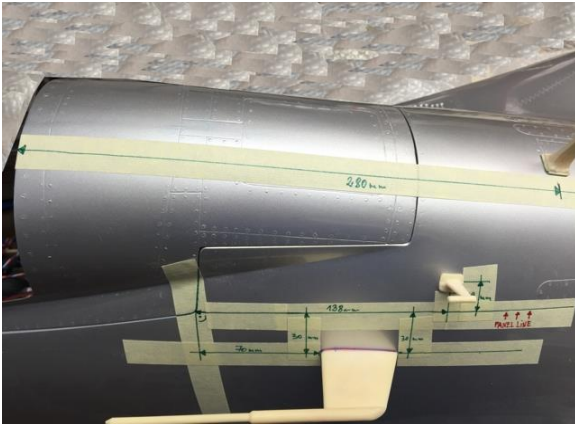
10 pairs of small magnets also do the job well as a fixture during the gluing process.

It is absolutely necessary to do this while the canopy frame is mounted on the fuselage. You can access the inside, if necessary, from below through the nose gear door.



Antenna and pitot tube installation

Check pictures for correct position (right side of the fuselage gets 1 big pitot tub only). See next page how you can install them removable.



There are two versions of the infrared camera. The SU-27 has it mounted in the center, in front of the wind screen. The SU-30 has it mounted on the side as shown on the photos. However, this should be sanded and puttied in before painting.

Antenna and pitot tube installation

There are plenty of methods to make an antenna removable, which otherwise would be at risk to be broken off during transport.

Drill 1 or 2 holes into each antenna and tap M3. Reinforce the fuselage from inside with a piece of plywood or fiberglass to screw on the antennas. This is a very fast solution but requires a little time to remove and re-install the antennas and pitot tubes.

You can instead use any kind of electrical connector which is usually spring loaded, such as single pin gold connectors. This allows a very fast removal of the antenna but might be a little more difficult to create in the first place.

Thirdly you can work with 2mm carbon pins, short sleeves from Bowden cables and a pair of magnets, which hold the parts on the fuselage.

The very small items can and should be glued directly on to the fuselage.

The IR camera with its glass bulb and fairing should be glued directly to the fuselage. You can build a dummy camera and lens and glue to the fuselage before you attach the glass bulb and rear fairing over it.



Thank you!
Your CARF-Models Team