Construction Article

Groover 46

by Greg Thompson

In this day of ARFs and RTFs, there seem to be almost endless choices when it comes to good quality, easy flying sport models. They are generally well built and finished – often better than we can do ourselves – and go together in just a couple of nights.

Having said all that, there is a price to pay, and I'm not talking just about the purchase. For every model you buy already assembled, there is one less opportunity to develop and expand your building skills and gain the satisfaction of producing something of substance from just a few sheets of balsa and ply. In addition, if and when you damage your ARF in a crash, repairs will be more difficult because you may not have the basic understanding of how the model was first assembled. These fundamental problems can easily be addressed and corrected by building a simple sport model, and even if it is the only one you ever build from scratch, I highly recommend that you consider doing just that. Following on from there, you could attempt one of the simpler scale models and who knows – you might just discover one of the best kept secrets in model aviation – it's fun to build!

Scratch-building isn't for everybody, and there will always be ARF models for those folks. Even I have a number of pre-built models so I'm not criticizing that. However, if you've ever thought it might be fun to try scratch-building, rest assured that it isn't as difficult as you might imagine, and it IS fun. So if you're ready, let's talk about the Groover 46.

I have been building and flying model aircraft since 1973 and consider myself to be a competent pilot. I've always been attracted to designs that go fast and manoeuvre well, and although my preference is for scale models, a "hot-dogging" sport model is certainly attractive to me also. To that end, I decided to design the low wing model that would eventually become the Groover 46. It had to be simple to build, easy to maintain and repair, and allow for some personalization and modification as necessary. As for its flying characteristics, I wanted it to be neutrally stable, predictable in every way and docile at low speed for circuit work. It was also important that the model be fast and highly manoeuvrable, and it wouldn't hurt if it was attractive as well. I will leave it to the reader to decide just how close I got to my targets, but suffice to say – I am very pleased with the results.

Flying this model is a pleasant and fulfilling exercise. It makes you look good and treats you right – providing you now both your own limitations and those of the model. It's predictable in every way, but like all aircraft (models and full size), it will bite if you push the limits without due regard for the consequences! Takeoff is a simple task as there is ample power available from any modern .46 and the model is generally airborne in only a few feet and climbing strongly. First flights should be conducted with low rates but as you become more familiar with the flying characteristics, you can flick that switch and unleash the animal. The Groover will happily fly any

manoeuvre you wish to try, positive or negative, and it just loves inverted snap rolls and spins. It is a great confidence builder as the wing is very strong with its tip to tip sheer webbing. I've flown the Groover in all weather conditions and it handles turbulence and wind without difficulty. Landings should be conducted on low rates as they can get exciting otherwise. Also, try to avoid dragging it in at low speed as the elevators are not large and lose authority in low-speed flares, resulting in a safe but untidy touchdown. About the only other thing I'd recommend is use a high contrast colour scheme and ensure that the upper and lower surfaces are very different, as this model rolls very quickly and orientation is easily lost, especially in cloudy conditions.

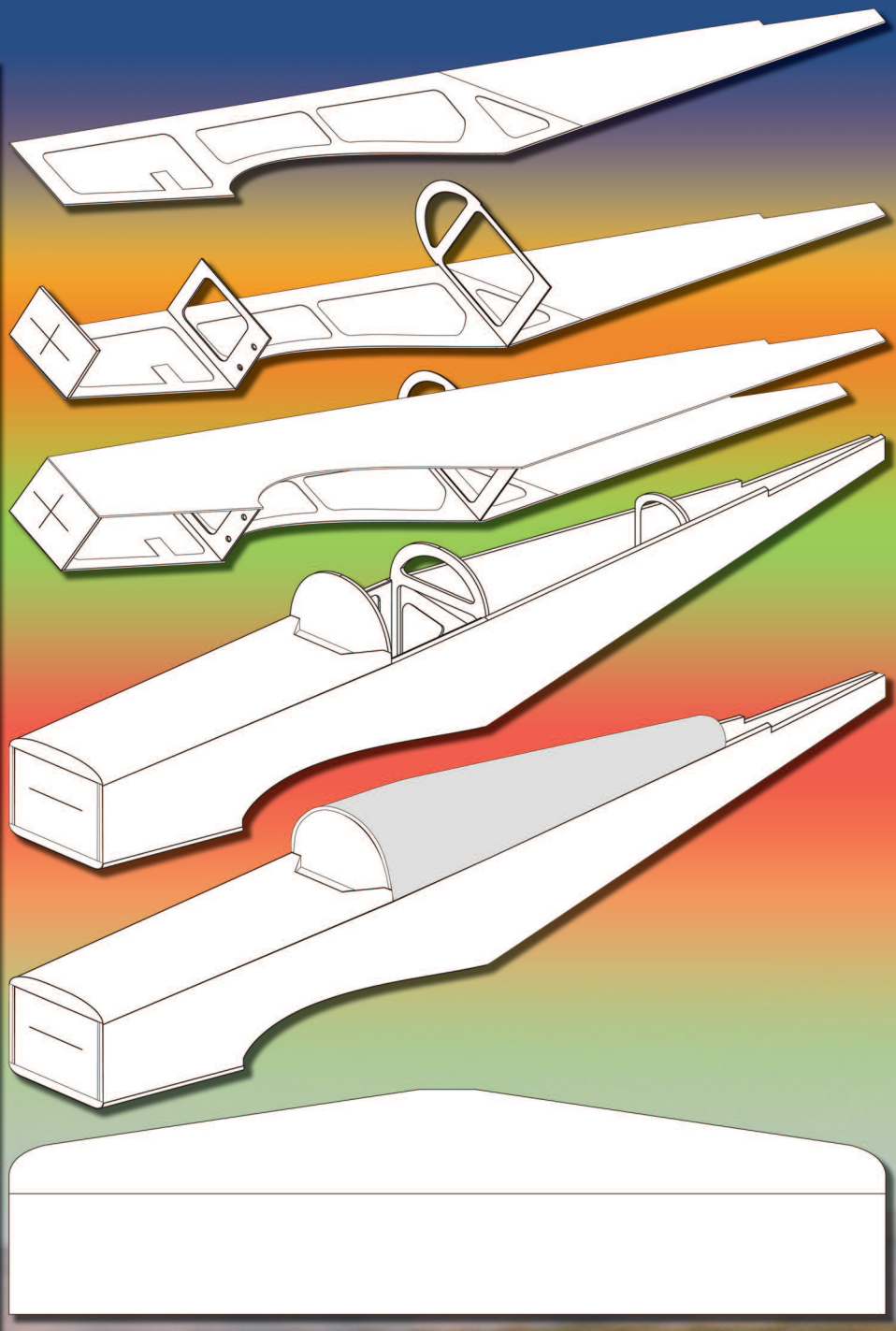
Construction begins with assembling the firewall from the two identical F2/3 formers. Epoxy should be used for this task, making sure the parts are aligned and clamped whilst the epoxy sets. Next, the fuselage sides are assembled; using either ply or balsa doublers, remembering that you need a left and a right hand side, and the right hand side should be short by 3mm at the front to allow for the right side-thrust required for the engine. Once dry, pin the right-hand side to your building board.

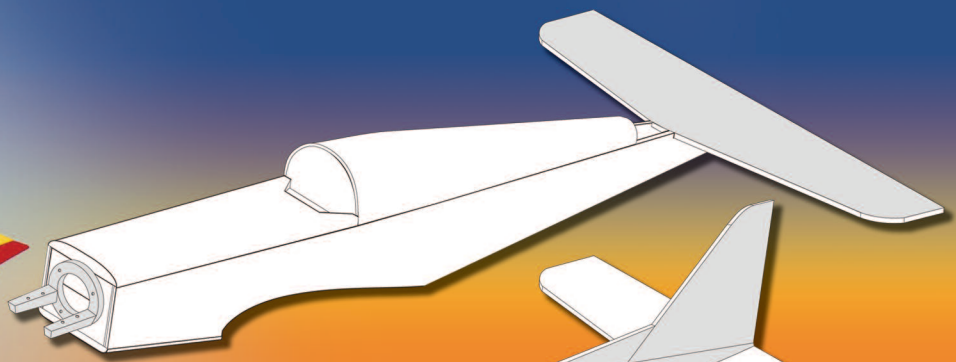
F6 and F8 should all be epoxied at right angles to the fuselage side, and the firewall should be angled 2 degrees forward.

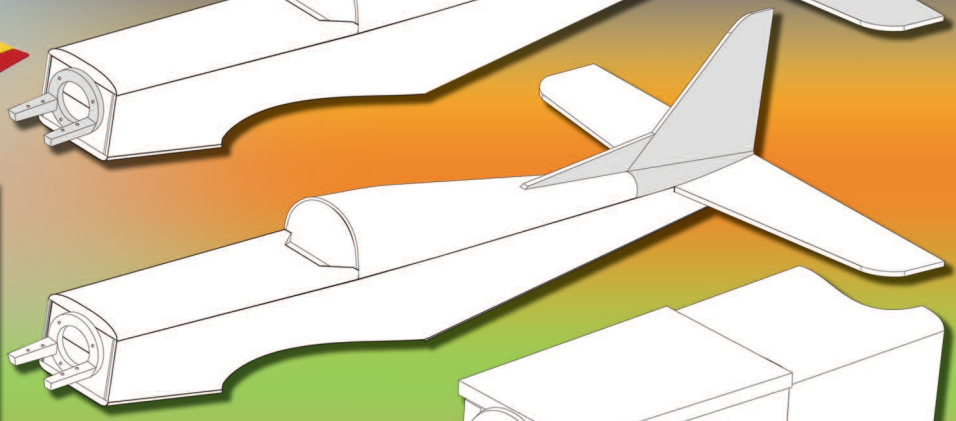
Once this basic assembly is complete, epoxy the left-hand fuselage side to the formers, making sure to carefully align the sides to be parallel. Do not pull the tail together at this stage. Set the assembly aside until the glue is set.

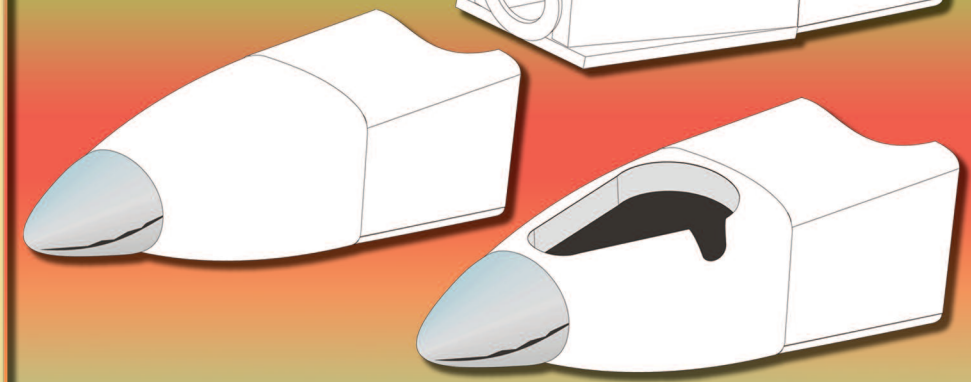
Using a straight line drawn on your building board, or the plans, set the fuselage upright and pull the tail together sufficient to hold F9 whilst you glue it in. Once set, you can then pull the tail completely together and glue it at the rear edge. F7 can now be added, along with F4 and F5, making sure that F4 is flush with the lower fuselage edge. This will be the landing gear mount so it needs to be strong. Use triangle stock as necessary to strengthen the joints, but make sure you don't obstruct the holes in F6. The upper nose section is sheeted with several layers of 12mm balsa sandwiched as necessary. At this time, you can form the cockpit area by trimming the upper sheet to the desired shape. Also, the lower sheet may be trimmed internally so that the end result is a hollowed section to allow for the fuel tank. Carving this area once the laminations are joined will be much more difficult and likely to cause untidy errors.

The fuselage top sheeting is applied next. It is best to use two pieces of 3mm balsa joined side by side prior to use. Pin and tack glue the sheeting to the centreline first, and then, using water to dampen the top surface, gradually bend the sheet around the formers until it conforms to the desired curve. Use masking tape to keep the balsa conforming to the curve, and set aside until the balsa dries. Once you are happy that the edges of the upper sheeting will meet the fuselage sides squarely and neatly, go ahead and glue them down. Take care at this stage as any gaps or errors will be quite noticeable, and will take more effort to fill and sand.









Join the two tailplane pieces, making certain they are pinned down on a flat surface until set.

Fix the tailplane to the fuselage, aligning it both fore and aft, and at right angles to the fuselage sides, and double check that all is square. Carefully measure and fit the engine mount, noting that the offset centreline shown on the front of F2/3 is to allow for the required 2° of right side thrust. Fit and then remove the engine to ensure that it will fit in the desired position. Drill suitable holes in the firewall to allow for the throttle linkage and fuel tubing etc. Fit the upper and lower blocks to the nose section, using epoxy for strength. Trial fit the undercarriage and mount it using T-nuts.

Assemble the fin and rudder parts, again making sure that they are pinned to a flat surface whilst they set. Now glue the fin to the tail, making sure that its lower surface is sitting on the horizontal stabilizer. Use balsa blocks to form the fillets and carve/sand to the desired shape. Cut the hinge slots for the rudder and elevators at this time, but do not fix them to the empennage. This will wait until they are covered or painted. Sheet the lower fuselage, aft of the wing, making sure to fit the ply tail wheel support at the same time.

Fit 12mm balsa blocks to the firewall, firstly the sides, followed by bottom and top surfaces. When dry, align the nose ring with the offset thrust line and glue it to the front of the blocks. Use triangle stock to build up the internal corners and allow for carving and sanding to final shape.

Once you are happy with the shape, carve the necessary hole for the engine. The inside surface may also be carved at this time to lighten the nose section and allow for better engine cooling. A Dremel with a sanding drum is ideal for this purpose, but take care not to go right through to the outside surface. Fit mounting blocks for wing bolts and brace them as necessary.

Sand and finish the fuselage at this point using your preferred method. The prototypes were initially sanded, and then a layer of 3/4oz glass cloth was applied with epoxy resin. Once set, another light sanding, followed by primer and paint brought the fuselage up to a high gloss. This finish is very durable and strong, and quite easy to do.

The canopy is made from either the front or rear of a commercial “teardrop” canopy, or you may choose to cut material from a plastic drink bottle. Either way, prepare and fix the canopy once the paintwork has been completed and a pilot fitted as desired.

At this time, the fuselage is completed by adding the control surfaces and wing mounting block.

Wings

Begin the wing construction by pinning the main spar to the plan, as well as a suitable piece of straight balsa running parallel at the rear to support the ribs and ensure the wing is free of twists. The ribs are then fitted, making sure to use the four W2 ribs and the two W3 ribs in the required positions. Insert the servo rails at this time as they will be difficult to fit later.

Fit the top spars and ensure all ribs are properly spaced and aligned prior to gluing them. Thin CA is ideal for this purpose. Fit the leading and trailing edges and glue in place.

Fit the sheer webbing to the front of the main spar, all the way out to the wingtips. Take care to ensure there are no gaps between the web and the ribs as a great deal of strength is to be had for very little weight penalty.

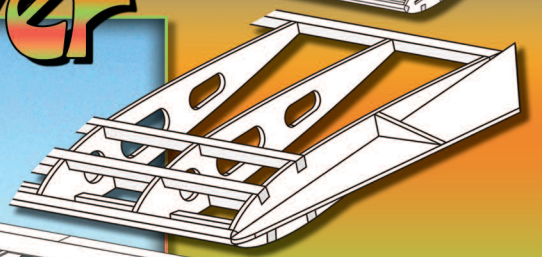
Fit the dowel plates at this time and once satisfied that they are correctly positioned, epoxy them in. Once set, drill the leading edge and "dry-fit" the dowels. Fit the wingtips and scrap braces at this time also.

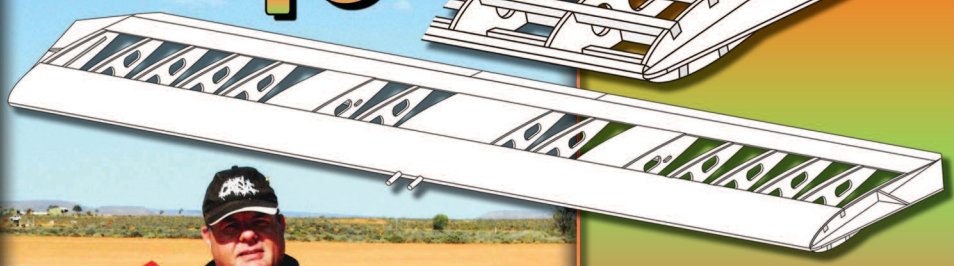
Sheet the leading and trailing edges, and once set, apply cap strips and centre section sheeting. Once finished and set, remove wing from board and turn over to finish the lower surface. Shape and sand the leading edges and ensure the cap strips are also flush with the sheeting. Cut holes for servos on lower surface and a hole in the upper centre section for the servo wires to exit.

Wrap the centre section with 2oz fibreglass cloth and epoxy resin and set aside to harden. Lightly sand the edges of the glass cloth to ensure a smooth surface and trial fit the wing to the fuselage. Epoxy the wing dowels at this time. Adjust dowel holes and wing saddle as necessary to ensure a neat and square fit. Drill holes for wing bolts and fit T-nuts behind the mounting blocks.

Cover and finish the wing, fuselage and control surfaces in the normal manner, fit the engine and radio gear as per your choice. You are now the proud owner of a Groover 46 – Enjoy!

Groover 46





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