Building instructions

Fournier RF-4D

Scale 1:4

RC model aircraft
Order No. 1355/00

Specification

Wingspan:	approx. 2815 mm
Length:	approx. 1510 mm
Wing area:	approx. 71.6 dm^2
Tailplane area:	approx. 11.7 dm^2
Geometrical aspect ratio:	approx. 11.06
Total surface area:	approx. 83.3 dm^2
All-up weight:	approx. 4700 – 5000 g
Wing loading:	approx. 65.5 – 69.8 g/dm^2
Wing section, root:	Aeronaut, 14.5 % thick
Wing section, tip:	Aeronaut, 12 % thick
Tailplane section:	Selig-Donovan SD8020, mod. 11 %

RC functions:

- Ailerons
- Elevator
- Rudder
- Throttle
- Airbrakes
- Retractable wheel

Replacement parts

GRP fuselage:	Order No.	1355/02
GRP cowl:		1355/03
Canopy:		1355/04
Pair wing panels – styrofoam + obechi:		1355/05
Tailplane – styrofoam + balsa:		1355/09

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Power system
Our RF-4D is an excellent choice for electric power thanks to its efficient aerodynamic design in general, and its wing loading and high aspect ratio in particular.

Power system for 16 cells

actro 24-4	Order No.	7002/14
13.5 x 7" propeller		7234/60
or 14 x 7"		7234/64
or 14 x 8"		7234/68
actronic 40-18 speed controller		7002/52

actro 24-5	Order No.	7002/15
14 x 8" propeller		7234/68
or 14 x 9"		7234/67
Actro hub, 35 mm / M8		7002/65
actronic 40-18 speed controller		7002/52

We strongly recommend that you install the motor using our rubber buffers, Order No. 7002/75.

The flight battery should take the form of two packs (2 x 8 cells). The packs must be installed projecting into the motor compartment (cowl) in order to obtain the correct C.G. (balance point).

Glowplug motors
An appropriate engine sound is an important factor in the full experience of flying any powered model aircraft. Certainly with scale models a completely non-scale sound should be avoided, otherwise the overall image is spoiled. In short - the RF-4D deserves a four-stroke motor.

We recommend the use of our motor mount 7153.11 with rubber buffers, which will accept all the recommended single-cylinder motors. This mount reduces the transmission of motor vibration to the airframe, and thereby reduces the noise emitted by the airframe itself.

The 9.1 cc Saito FA-56 provides plenty of power for realistic scale flying, but any Saito motor from the FA 56 to the 15 cc FA 91S will fit. Of course, the perfect choice would be an opposed twin such as the 15 cc Saito FA-90TS or the 16.4 cc FA-100T.

To increase power system reliability we recommend that you fit an on-board glowplug regulator; there are plenty available commercially. These units also offer an additional advantage: they eliminate the need for a separate glowplug battery for starting, together with the ugly hole for the plug clip.

Incidentally - all the motors mentioned above disappear completely under the cowl.

Description of retractable wheel
The plan shows all the parts of the system in schematic form, including the connecting hoses.

In the “wheel down” position the system is not under pressure, and the coil spring installed in the air cylinder moves the piston (= retract) to its end-point, and compressed air is released through the control valve. The cam disc mounted on the servo does not exert pressure on the control valve in this position.

“Wheel retracted”: the cam disc operates the control valve, opening the path for the compressed air from the air tank to the control valve, pressure reducer and air cylinder. The piston runs to its end-point (against the pressure of the coil spring); the piston rod retracts the wheel.

The purpose of the pressure reducer is to adjust the transit time for retraction and extension to simulate scale speed.

The only extra item that has to be purchased is the air pump (we recommend the Robart unit). The system adaptor for connecting the pump to the model’s compressed air system is included with the retract unit.

The wheel door guides (15) serve to ensure that the doors (10) open and close at the correct time.

Preparation
The wooden parts are drawn to reduced scale in these building instructions; write the part number on each component with a soft pencil, using the drawing as a guide. Remove the parts from the die-cut sheets using a balsa knife where necessary. Check all parts for proper fit before installing them.

If you are an experienced builder you may wish to alter the sequence described in these building instructions, but please think through the results of such changes.

The building instructions, photographs, parts list, motor, retract unit and servos should be used constantly as aids to building. Note that the receiver and glowplug battery must be installed in the nose section.
Before starting construction sand the surfaces of all the GRP parts thoroughly using 400-grit wet-and-dry abrasive paper. Make good any minor defects in the moulding using polyester filler paste, and finish off the edges of the cockpit area using the marked lines and photos as a guide.

Important! the original machine was of wood construction, whereas our model features a moulded GRP fuselage. It is therefore important to keep the weight of the model's tail end to an absolute minimum during construction. Items such as the receiver battery and similar must be installed as far forward as possible in the fuselage. You will almost certainly need to add nose ballast, especially if you fit a single-cylinder motor.

Adhesives:
Since the parts contained in the kit are very highly pre-fabricated, this section only calls for a few tips regarding the use of epoxy laminating resin. Compared to quick-setting epoxy glues this resin offers important advantages: it can be applied more accurately to the actual glued joint; it also penetrates into the narrowest of gaps, ensuring that joints are really strong. For some processes the resin should be thickened with a thixotropic agent; in this form it can be applied in exactly the right location, with no tendency to run off.

Use coarse abrasive paper to roughen all areas of the fuselage which are to be glued. This is the only way to ensure that glued joints are really strong and durable.

Construction starts with trimming the motor bulkhead (77) to fit in the fuselage - just sand the bottom edge to a slight bevel to match the curvature of the fuselage. The position of the motor crankshaft axis is shown on the plan. Be sure to mark the axes clearly on part (77).

Cut a piece 195 mm long from the wing joiner sleeve (2) and fit it in the appropriate holes in the fuselage. Sand the outside of the sleeve if necessary, as it must not be a tight fit in the holes (risk of deforming the fuselage). Tack it in place with thin cyano, then reinforce the joints with laminating resin.

Cut the opening for the wheel doors in the bottom of the fuselage. Take care - the front edge must be wider than the rear to match the shape of the wheel doors (10), which are not symmetrical.

Place the retract unit centrally on the retract unit support (3) and align it carefully. Drill 4 mm Ø holes as required. Fit the support (3) through the bottom opening in the fuselage in front of the joiner sleeve (2) as shown in Fig. 2, and raise it into position. The sides of part (3) must be trimmed so that it fits against the joiner sleeve (2) as shown; use a pencil to mark where it has to be trimmed back, trim it, then offer it up again until it fits as described.

The retract support (3) now has to be soaked in laminating resin. Apply the resin repeatedly to the trimmed periphery; the plywood will absorb the resin. Finally apply more resin to both sides of part (3) and allow it to cure fully. The retract unit can now be screwed to the support, and a fillet of thickened epoxy applied round the retaining nuts. Roughen the joint surfaces of the retract support and place it in the fuselage.

With the retract unit and part (3) in the fuselage, set it to the "retracted" position. Cut a spacer about 2.5 mm thick (e.g. balsa) to size, place it on the bottom of the fuselage and slide it under the wheel; this ensures that there is a little clearance between the retracted wheel and the closed wheel doors (10). Position the retract unit support (3) in the fuselage and tack it in place with cyano. Remove the retract unit again and apply plenty of thickened epoxy to the joints. Fig. 4 shows a method which ensures good contact between the parts and the flat fuselage bottom.

Gluing the wing joiner sleeves (2) in the wings: cut the remainder of part (2) in half and slide the sleeves into the wing panels. The sleeves must not project beyond the root ribs; shorten them slightly if necessary. Seal one end of each sleeve with a piece of balsa about 8 - 10 mm thick. The sleeves must be sealed

completely, otherwise the PU adhesive might be forced inside them - this would be catastrophic! Please blow into the sleeves to check that they are sealed. Sand the sealed end of the sleeve to a taper over a length of about 5 mm, as this helps to distribute the adhesive when it is applied to the hole. Roughen the surface of the sleeve thoroughly using abrasive paper.

The model can now be assembled “dry” (without glue). The wing dihedral should be 4° on each side, measured at the underside of the wing; this corresponds to 90 mm of packing under each wingtip. When the fuselage is resting on its skid, the packing should be about 100 mm high on each side.

The next stage is to glue the joiner sleeves in the wings using PU adhesive, but the material is very difficult to remove, so certain protective measures are necessary. Apply Sellotape or similar to the root wing fairings of the fuselage, and cut through the openings neatly using a sharp balsa knife. Wipe Vaseline over the joiner tube (66), the inside of the joiner sleeves (inside only!), and the wing panel root ribs.

Apply PU adhesive to the entire surface of the hole in each wing root using a length of hardwood dowel (approx. 5 - 6 mm Ø, 200 mm long); use a torch to check glue distribution. Apply a light coating of adhesive to the joiner sleeve (2). Spray a light mist of water into the hole in the wing and allow any excess water to run out again. Fit the joiner tube in the fuselage and slide one joiner sleeve onto it. Carefully slide the wing onto the joiner sleeve, working slowly and carefully. Remove excess PU adhesive as it is squeezed out, until the wing is resting against the fuselage root fairing.
Now fix the wing to the fuselage thoroughly using adhesive tape, applied all round the root joint. Repeat the procedure with the second wing panel, then place the model in the established position and pack up the wingtips to the correct height.

Important: the pot-life (working time) of the PU adhesive is about 30 - 45 minutes after application (i.e. after exposure to humidity). Initially the consistency of the adhesive is similar to honey, but humidity causes it to foam up and start to harden. At 20°C the adhesive sets in two hours; it reaches full strength in 24 hours.

In an enclosed space the foaming action generates considerable pressure, and this is quite sufficient to push the wings away from the fuselage. Check the joints constantly for a period of at least an hour.

The plywood air cylinder plate (6) bears a marking which denotes the centre of the holder for the retract air cylinder. Fix the holder to the plate using three M2.5 x 16 countersunk screws and nuts and fit the cylinder in the holder. Connect the air cylinder (5) to the retract unit as shown in Fig. 3, then re-install the assembly.

Important: set the retract unit to the “extended” position (the air cylinder is under zero pressure in the “wheel down” position). Roughen the fuselage side and glue the air cylinder plate (6) in place as follows, facing fore- and aft: first press the plate in position and run a pencil round it along the fuselage side, then drill a 2.2 mm Ø hole in the centre of the marked area. Apply adhesive tape to the outside of the fuselage to protect it.

The plate (6) should now be held to the fuselage side from the outside using a 2.2 mm Ø self-tapping screw. To avoid the screw pulling the fuselage out of shape, cut a flat piece of 5 mm plywood about 100 x 50 mm in size, drill a 2.5 mm Ø hole in it and place it against the outside of the fuselage. Apply thickened epoxy to the plywood plate (6), position it carefully and fit the self-tapping screw into the plate from the outside. Don’t over-tighten the screw or you could distort the fuselage. Allow the epoxy to set hard, then remove the retract unit and air cylinder again.

Now we turn to the motor mount. The instructions supplied with the mount describe in detail how to set the correct “hardness” to suit the motor you are using. In its standard form the motor / motor mount assembly may not fit under the cowl; to make the assembly as narrow as possible remove both “L”-section rails and remove about 3 mm from them. Fig. 6 shows how the rails are attached to the outriggers - see also Fig. 7.

On the plan the overall length of the motor assembly to the front face of the propeller driver is stated as 130 mm - please keep strictly to this. The motor and motor mount have no “visible” downthrust, but the geometry of the wing and tailplane produces an effective downthrust angle of about -2°. The tailplane is set at positive incidence, with the effect that the model flies tail-high - like the full-size machine.

The original prototype was powered by a Saito FA-100T, and for this reason some of the photos exhibit obvious discrepancies compared to these instructions - please don’t let this confuse you. Both carburettors of this engine are mounted on top of the crankcase, so the fueltank has to be mounted higher than normal. The motor is also extremely short, so a plywood box has to be constructed, and this houses part of the

fueltank. With this installation the throttle servo has to be installed on the left-hand side of the fuselage. If you install a single-cylinder motor “side-winder” style, the servo will be mounted on the right-hand side.

Back to the standard version; installation of a single-cylinder motor. Remove the machined inside section from the motor bulkhead; the two circular stiffening plates are parts (64). Fig. 5 shows the motor bulkhead with an extension to accommodate the fueltank (see above) to suit the Saito FA-100T. The plywood bulkhead (77) must be soaked thoroughly in laminating resin; see above re. part (3). When the epoxy has cured, fix the motor to the motor mount, position it as accurately as possible and drill the 5 mm Ø holes. Remove the motor mount and open up the holes to 6.5 mm Ø to accept the captive nuts supplied. Install the motor mount and motor and check that it is correctly positioned. Check also the distance to the front face of the propeller driver. The holes for the fuel system tubes and throttle linkage sleeve can now be drilled.

To prevent oil and dirt entering the fuselage, the front face of the fuselage (= motor bulkhead) should be closed off using one of the plywood plates (54). Lay the motor bulkhead on part (54) and mark the holes on it from the bulkhead (77). Fit the M5 mounting screws through the holes. Now mark the outline of the bulkhead (77) on part (54) and saw it to size. Soak part (54) with resin to prevent it absorbing fuel.

Figs. 8 and 9 show the retract unit and air cylinder installed.

Cut out the mudguard (35) using tin-snips, leaving a strip about 7 mm wide on both sides. Cut a slot in the side of the moulding to clear the actuating shaft of the retract unit. Cut the two parts (36) (15 - 20 mm long) from hardwood strip and glue them to the side strips at the bottom; 2.2 Ø x 6.5 mm self-tapping screws are fitted into these parts to attach the mudguard (35) to the fuselage floor. Fig. 38 shows approximately where the screws should be fitted in order to coincide with the blocks. Fig. 29 shows the mudguard and fueltank, which in this case is positioned to suit the Saito FA-100T.

The co-ordinates for the screws should now be marked as accurately as possible on the fuselage bottom using the mudguard as a template. Drill the holes 2.3 mm Ø. Place the mudguard in the fuselage (retract unit installed), drill the first 1.5 mm Ø hole and fit a screw to secure it. Carefully drill the remaining holes, taking care not to deform the moulding. The mudguard must be located centrally in the fuselage.

Figs. 10, 11 and 12 shows the plastic cockpit components. Please take a close look at Fig. 12, which shows how the instrument panel has to be trimmed (the side areas are located in the fuselage recess).
Fig. 13 shows the hinge and actuating system of the wheel well doors (10). Important: the doors are not symmetrical in the fore-and-aft direction. Align them carefully, and mark the front end. Bend the final 20 mm of the mild steel rods (11) at right-angles. Cut two pieces 78 mm long from the brass tube (12) and file a notch in the centre of each using a round file (lubricating point). Slip the tubes onto the steel rods (11). The second bend at the front end of parts (11) should be located about 145 mm from the rear bend. Important: this bend must be located about 8 - 10 mm forward of the front face of the mudguard. Don’t forget: these parts are “handed”, i.e. there are left-hand and right-hand hinge assemblies.

Cut two pieces 15 mm long from part (13), fix them to the formed rods (11) with soft binding wire and solder the parts together as shown in the photos and on the plan.

Detail “X” on the plan shows a cross-section through the hinge system for the wheel doors (10) on the bottom of the fuselage. Note that the inside of parts (10) must be flush with the fuselage floor where the brass bush (12) is located. The entire hinge / actuation system can now be glued to the wheel doors (10). Place a piece of 1.5 mm plywood between the tongues of parts (10) and lay the brass tube on the spacer; the shaft (part 11) should have about 0.5 mm clearance above the tongues, i.e. the wall thickness of parts (12). Position the parts as accurately as possible (the dimensions are stated in detail “X”), and glue them in place using plenty of thickened laminating resin.

Fig. 14 shows all the servo mounts. Please note that the elevators are actuated using two micro-servos, as this arrangement allows the snake outers to be glued directly to the fuselage sides. Install a high-quality mini-servo for the rudder. The throttle servo should be mounted on the right-hand side of the fuselage for a single-cylinder motor. Figs. 15 - 18 also show how the servos are installed. Position the mounts in the fuselage, tack them in place with cyano, then reinforce the joints with laminating resin.

The next step is to install the “snakes” in the fuselage; start by drilling the exit holes in the fuselage. File these out at a very flat angle to avoid kinking the snake inners (40). Fit an M2 nut and clevis (71) on each threaded coupler, slip them through the fuselage interior and out of the appropriate exit holes, then connect

the clevises to the servo output arms. Slip the snake outers (39) onto parts (40) from the tail end. Align the projecting outer sleeves as shown on the plan (inside the fuselage they must run in smooth curves), press them against the fuselage and tack them in place using cyano. Secure each snake outer at three points with cyano, then apply thickened epoxy at each point, preferably with a patch of glass cloth. Withdraw the inner tubes and slice off the excess outer sleeves (39) using a sharp chisel. The remainder of the snakes is used for the throttle linkage.

Next comes the air exit - Fig. 20 and the plan tell you all you need to know here.

Cut ten pieces about 15 mm long from the limewood strip (42) and glue them round the outside of the opening in the fuselage floor, spaced out evenly as shown in Fig. 24. These blocks support the 2.2 Ø x 6.5 mm self-tapping screws which retain the hatch cover (54). We recommend that you tack the pieces in place with cyano, then run 1 - 2 drops of laminating resin into each joint.

Section B-B on the plan shows the method of simulating the stiffeners of the full-size aircraft. Sand the spruce strip (7) to a slight angle, tack in place with cyano then reinforce the joints with laminating resin.

Figs. 21 - 23 show the installation of the pneumatic control valve and its servo on the cockpit floor (26). Fig. 21 shows the wheel extended, Fig. 22 the wheel retracted. Fig. 24 shows the transverse strip (36) on which the cockpit floor rests; see also the fuselage side elevation and the drawing of the servos on the left-hand fuselage side.

The method of mounting the air tank is shown in section B-B, the side elevation and Fig. 26. We recommend that you make up two supports as shown in section C-C and secure the tank using Velcro (hook-and-loop) tape. Caution: apply a coat of laminating resin to the surface under the Velcro to obtain a strong bond. Glue the whole assembly in place using laminating resin.

Carefully position the wheel well doors (10) inside the fuselage and tape them in place. Glue the brass tubes (12) in place with a fillet of thickened laminating resin. Take care: they must be very free-moving, otherwise you may end up with a belly-landing!

Bend the return springs to follow the shape of the fuselage bottom and fit them into the brass tube guides (13). Tack them to the fuselage floor with cyano, then reinforce the joints. The photo also shows an alternative method.

Fig. 31 shows the bottom fuselage hatch with the filler and one-way valve and a latch at the front. This hatch provides access to the wing retainer. The hatch is supplemented by a second opening which gives access to the receiver battery for recharging.

Now it is time to make the cockpit rather more comfortable for the pilot. Single-sided foam pads are an excellent means of simulating the padding: use pads 5 mm thick for the sides and 3 mm thick for the pilot's seat. Apply 50 mm wide double-sided carpet tape to the second side of the pad. The pads are covered in fabric; the choice of fabric is important - it must be pliable.

Cut two strips 210 x 50 mm from the sheet for the side padding, and apply carpet tape to them. Lay the fabric flat, and align it perfectly "square". Place the foam strips and carpet tape on the fabric and press them together. Now cut the fabric slightly oversize. Peel off the backing film from the edges of the foam tape, and press the strip against the table using a ruler or similar. Raise the excess fabric with a second ruler and press it onto the exposed adhesive layer. This way the edge stays neat and straight - see Figs. 36 and 37.

The next stage is to assemble the parts permanently, but not until you have painted the cockpit area. Note that the top edge of the padding should be about 15 mm below the top of the cockpit flange.

Figs. 32 to 35 show the method of making the seat padding. This presents absolutely no problems - the first phase is simply a repeat of the procedure already described. Apply UHU Greenit Kompakt-Kraft contact adhesive to the side parts and press the excess fabric against the sides with your fingers, holding it under slight tension. Cut off the excess with a small pair of scissors, apply the adhesive to the inside of the edges and pull the fabric over. Job done.

The seat is simply held in the cockpit with Velcro: stick the in-fill panels (32) to (34) in place and apply resin to the faces before applying the Velcro.

Cut pieces of aluminium tubing (44) about 5 mm long and press them into the GRP rudder hinge lugs (43). Trim the slots for the hinge lugs (43) in the tail post and insert them. Take a length of 3 mm Ø steel rod as a temporary rudder hinge shaft and slide it through the lugs: fit a 2 mm thick spacer (e.g. part 48) between the trailing edge of the fin and the shaft at the top, and a 3 mm plywood spacer at the bottom. Align the shaft as accurately as possible (it must be central) and tack parts (43) to the tail post with cyano. Glue the sleeves in the lugs at the same time - see Fig. 43. Apply a drop of laminating resin to each joint for reinforcement.

Cut four parts from the aluminium tube (44) as shown in Figs. 44 and 45; the bottom piece should project slightly below the line of the fuselage. Press the rudder (46) against the fin to mark the position of the hinge lugs (43), and cut the slots for them using a balsa knife - Fig. 46. It should be possible for the whole length of the rudder leading edge to rest against the tube (44). Fig. 47 shows how the rudder is aligned with the fin. Position the rudder as accurately as you can, then tack the four pieces of tubing (44) to it using cyano. Reinforce the joints in the usual way, but not before removing the shaft and rudder - see Fig. 48.

Divide the rudder leading edge (47) as shown in Fig. 49, and cut small recesses to clear the pieces of tube (44) glued in the hinge lugs (43). Determine the length of the leading edge sections (47) from the rudder itself, and glue the pieces to the front face of the rudder.

The rudder leading edge should be 8 mm thick at the top, but full thickness (12 mm) at the bottom. Round off the leading edge step by step as shown in sections D-D and E-E on the plan. The gap between fin and rudder should be narrow and even, but must permit rudder travels of at least +/- 30° - see Figs. 50 and 51.

Cut a slot for the tailskid actuator (48) using a fine-bladed fretsaw - see fuselage side elevation and section E-E. File a notch in the front edge of part (48) if necessary to avoid obstructing the rudder hinge shaft (44). Cut a slot for the rudder horn, but don't glue it in place until the rudder has been covered; the same applies to all the control surface horns. Important**:** all horns (5 off) must be roughened with coarse abrasive paper before gluing them in their slots. Drill out the linkage holes to 1.6 mm Ø beforehand to accept the clevis pins.

For the tailskid bush (machined aluminium part) drill an 8 mm Ø hole about 48 - 50 mm forward of the tail end of the fuselage. The coil springs (56) must be installed under light tension. Roughen the bush and de-grease it before fixing it in place with plenty of epoxy.

The fuselage is now almost complete, and we can turn to the fuel supply. If the usual rules are followed (carburettor level with centreline of fueltank) the usable space for the tank is somewhat restricted. If you wish to install the tank above the mudguard, it should be of a very low-profile type; a very good choice is the Simprop "square" type of 340 cc capacity. It has to be located slightly higher than the ideal position, but with a single-cylinder four-stroke mounted side-winder the carburettor is fairly high in any case - an acceptable solution.

If you wish to carry more fuel than that, two smaller tanks can be connected in series, as shown on the plan. In this case you can also set the "ideal" installation height for the actual motor you are using. Important: the filler / drain line for the system must be sealed for flying (e.g. by fitting an M3 x 10 mm screw in the end). Oval fueltanks of 240 cc capacity are ideal for the twin-tank arrangement.

The two tailplane panels are glued to the fuselage using a pair of CFRP joiner tubes (60). First cut the tube (60) in two as shown on the plan, and check that the tubes are an easy sliding fit in the fuselage. Trim the holes if necessary.

We recommend the following method of gluing the joiner tubes (60) in the fin:

- Apply adhesive tape over the moulded-in tailplane root fairings and apply a coat of mould-release wax to the tape. Open up the holes using a sharp balsa knife.
- Glue pieces of balsa in both ends of the tubes (60) to seal them.
- The front joiner tube (60) should now be glued in (say) the left-hand tailplane panel, the rear tube in the right-hand panel using thickened laminating resin. This is the procedure:
- Apply plenty of epoxy to the inside of the holes and distribute it carefully using a length of dowel or steel rod. Slowly push the tube into the hole, twisting it to and fro as you do so. Watch the depth! If no epoxy is squeezed out of the root rib, apply more epoxy. Remove excess resin then clean any excess epoxy from the tube using acetone.
- Now leave the epoxy to semi-harden; the time this takes depends on the room temperature. The tubes should now be slightly difficult to move. At this point fit both tailplane panels into the fuselage, align them

carefully and leave the epoxy to cure fully. When the epoxy is hard, withdraw the parts from the fuselage and - if necessary - trim the tailplane panels to match the root fairings on the fuselage.
- The tailplane panels should not be installed permanently until the fuselage has been painted and the tailplane covered.

You have already rubbed down the fuselage, but it must now be thoroughly de-greased before painting. An excellent method is to wash it using water with liquid detergent added. Wipe the entire surface with a wet cloth to remove grease, then rinse it more using clean water. Seal all the fuselage openings beforehand.

Our RF-4D was sprayed with a base coat of Orapaint and sealed with Orapaint EKS clear lacquer (gloss finish). A highly convincing finish is obtained if you thin the clear lacquer very greatly (approx. 300% thinners).

Installing the tailplane is now extremely simple: first roughen the joint surface of the integral root fairings using coarse abrasive paper. Apply sufficient thickened epoxy to the holes in the tailplane panels and distribute it evenly. Apply the same epoxy mixture to the root face of the tailplane panels. Apply a thin coating of epoxy to the joiner tubes (60) (already bonded-in) and slide them through the fuselage. Remove excess resin with a paper towel and clean the surfaces with petrol. Apply a few drops of epoxy to the inside joints between fuselage and joiner tubes, working through the openings in the tail post.

When the resin has started to cure, press the parts together finally, clean the area once more and tape the tailplane panels to the fuselage.

Now it's the rudder's turn: apply Vaseline to all parts of the hinge system, and only then fit the hinge shaft (45). Secure the shaft at the bottom.

Thread the coil springs (56) into the tailskid actuator (48) and connect the other end to the lever on the tailskid. Apply a drop of thread-lock fluid to the threaded part of the tailskid retaining screw. Now place the coil springs under light tension, fit the screw in the actuator and tighten it. Apply a drop of oil for lubrication.

After covering the elevator panels, glue the elevator horns (49) in the slots and attach the panels to the tailplane using the hinges (61). Grease the snake inners lightly and slide them into the outer sleeves from the front end. Connect the inners to the servo output arms. Connect clevises and threaded couplers to the elevator horns and establish the correct length of the snake inners (servos and elevators neutral / central). Cut off excess pushrod length and crimp the threaded couplers firmly onto the pushrods.

The fuselage and cockpit can now be fitted out permanently. Important: before fitting the mudguard check the operation of the retract system carefully. It is important that the wheel doors work reliably every time.

To install the retract unit we recommend a right-angled 3 mm A/F ball-end allen driver at least 125 mm long. This tool makes it relatively easy to reach the retract unit retaining screws through the opening in the motor bulkhead. Tighten the screws really firmly, and check again that they are really tight. Install the air cylinder and ensure that the control pin of the retract unit reaches the end-point of its guide. If not, adjust the clevis until it does. Tighten the actuating arm really thoroughly on its shaft.

The air lines can now be connected: fit the hoses full-depth onto the nipples; this is easier if you first soften the hose slightly with heat from a match. Tighten the grubscrew in the pressure reducer until it is about 0.5 - 1 mm below the surface of the body. The retraction time should be set to about two seconds. Pressurise the system - it is not necessary to set a pressure higher than 6 bar.

Completing the wings starts with gluing the incidence tubes (67) in the root ribs: saw two pieces about 25 mm long from the brass tube (67), and seal one end of each. Check that the tubes are an easy sliding fit in the holes in the fuselage root fairings. Fit the wing joiner tube through the fuselage and provisionally plug in the wings. Check that the trailing edge of the wings and the root fairings line up correctly. If necessary adjust the hole in the root rib. Apply thickened epoxy to the hole in the root rib, press the tubular incidence peg into it and wipe off excess resin. Allow the epoxy to harden slightly, then clean any resin residues from the tube using acetone and apply mould-release wax to it. Now push the wing against the fuselage as far as it will go and check that the end of the incidence tube does actually protrude inside the fuselage. Align the trailing edge of the wing and root fairing, then tape the parts together.

Fig. 52 shows how the threaded sleeve for the wing retainer system (75) is installed. Use an M5 screw and,

say, a captive nut to screw the sleeve in place. Fit the joiner tube in the wing and set the M5 screw parallel to it. Tap the sleeve into the root rib. The threaded rod of the retainer (75) must lie parallel to the wing joiner tube.

Stick a sheet of new abrasive paper (approx. 180-grit) to a flat sanding block, and use this to sand the wing surfaces to a fine finish. Three templates are supplied (S1 - S3) for shaping the wing leading edge to the exact profile; sand the root to match the fuselage root fairing. The trailing edge should also be carefully sanded down to an even thickness of about 0.5 - 1 mm. Trim the wingtips (63) roughly to follow the wing section, glue them in place, then finish them off using a balsa plane and the sanding block.

Remove foam from the servo wells to provide proper clearance, keeping the servo cable openings free. For the aileron linkage we recommend mini-sized wing-mounting servos, whereas good micro-servos are sufficient for the airbrakes. Figs. 55 and 56 show how the servos are mounted on the plywood plates (68). Glue the plates in the wings using thickened epoxy.

Dismantle the airbrakes (69) as shown in Fig. 53 (just push the levers out of the bottom pivots using a screwdriver) and place the box in the slot in each wing. The top edge of the box should be recessed about 1.5 mm under the top surface; adjust the brake slot if necessary until this is the case. Roughen the aluminium box with coarse abrasive paper, de-grease the surfaces and glue it in the slot using thickened epoxy. Cut in-fill pieces (73) from the balsa strip to cover the top flanges of the box. When the glue has set hard, trim the edges of the strips to provide clearance for the brake, and install the airbrake. Cut the airbrake capstrip from part (73) leaving about 1 mm clearance all round the edges. Tack the capstrip to the airbrake blade using cyano, then carefully sand all three strips flush with the wing surface. Extend the airbrake, remove it and reinforce the joints with epoxy.

Important: each airbrake servo should be connected to its own receiver channel, i.e. please don't use Y-leads. This way it is much easier to synchronise the brakes. The servos are already in place (but not permanently); run them to the "brakes retracted" end-point.

The servo linkage consists of the threaded rod (70) and clevis (72). The rods (70) must first be cut to correct length. Connect the clevis (72) to the airbrake, slip it into the box and press it onto the pivots. The pushrod (70) projects into the servo well. The pushrod (70) must be pulled forward (towards the wing root) to its end-point to give access to the brake mechanism. Using a soft pencil mark the position of the hole in the servo output arm on the pushrod (70), then remove the brake again. Bend the pushrod (70) at right-angles as accurately as you can at the marked point, cut off the excess rod length and file the end smooth. Re-install the brake. The position of the bend will probably not be exactly right, so screw the pushrod (70) in or out of the clevis (72) to correct the length. Check the operation of the airbrake system from the transmitter. Remove the airbrake again and cut two washers about 5 mm Ø from the scrap vacuum-moulding material, with a 1.6 mm Ø hole. Slip these onto the bent pushrod (7) and fix them to the rod with Loctite when the airbrakes are finally installed (wing top surface covered).

Remove the stiffening plates (64) from the motor bulkhead, drill 2.5 mm Ø holes in them as shown and push the outboard wheel supports (76) into them. Cut channels for the 4 mm Ø hardwood dowels as shown on the plan and Fig. 62, and fit the outboard wheels together with the aluminium spreader plates in the plates (64). Apply a drop of oil to the end of the three M2.5 mm pan-head screws. Fit these assemblies in the wing, and drill 4 mm Ø holes as shown on the plan and section F-F to accept the hardwood dowels (65). Remove all the parts and clear away the scrap foam from the recess. The parts are glued in place using thickened epoxy: apply plenty of resin in the recess, then press the complete assembly into place. Mix up some fresh low-viscosity resin and gradually fill the side holes until you are confident of a really strong glued joint. The dowels (65) ensure that the landing loads are spread adequately in the wing.

We recommend using twisted 0.25 mm² cable for the servo extension leads. Solder the aileron servo directly to the extension lead, and attach the airbrake servo cable to the aileron lead using a heat-shrink sleeve or similar (the airbrake servo cannot be soldered to the extension lead until the loom has been fitted through the wing). The cable can easily be drawn through the wing using a length of 0.8 mm Ø steel rod: form a loop in one end, fit this through the root rib and tie the extension cable to the loop using soft binding wire or similar; the lead can now be pulled through the wing. Solder the brake servo to the extension lead - see Fig. 57 - and a 6-pin plug. Glue the matching socket in the fuselage.

Sand the top edge of the aileron leading edge to a chamfer as shown in section G-G and cut slight recesses to accommodate the central knuckle of the hinges - see Fig. 59. Cut slots for the aileron horns; these must

be sanded at a slight angle as shown in Fig. 54. Tack the horns in place using cyano, then reinforce the joints with epoxy.

Cut in half the threaded rod for the wing retainer system (75) and screw the locknut and locking mechanism onto it. The outer locknuts should be about 196 mm apart (outside of nuts). Ensure that the locking mechanism is in the centre, so that you can reach it through the opening in the hatch cover (54). Open the locking mechanism, screw the threaded rods into the wing roots and fit the wings on the fuselage. Carry out any fine adjustments to the length, then tighten the locknuts.

Fit the cowl over the motor on the fuselage and fit the spinner or the spinner backplate. The cowl can now be trimmed: first trim the bottom section to fit, and secure it with four 2.2 Ø x 6.5 mm self-tapping screws. Add the top section and mark the position of the dummy exhausts. Cut three pieces of limewood strip (36) each about 12 mm long, and glue them to the inside top edge of the bottom cowl section (the overlap) as shown in Fig. 42. Drill 1.5 mm Ø holes to accept the remaining 2.2 Ø x 6.5 mm self-tapping screws. Place the top cowl section on the model, align it carefully and tape it in place. Drill 1.5 mm Ø holes for the retaining screws. Open up these holes in the top cowl section only to 2.3 mm Ø.

This completes the construction of your model, and all that remains is to set the correct control surface travels:

Ailerons	+ approx. 12 - 16mm
	- approx . 7 mm
Elevator	± approx. 15 mm
Rudder	as much as possible

Test-flying:
The most important point to note here is the wind direction: please take great care to line up, take off and land directly into wind, as any sideways drift places an unnecessary strain on the main undercarriage.

Once airborne the model is completely straightforward to fly. The characteristics of the wing ensure absolutely docile handling. Moderate “classic” aerobatics are possible; carefully flown loops, impressive stall turns, reversals, rolls and similar manoeuvres present no problems. At landing time use the airbrakes to control the final approach (glide angle).

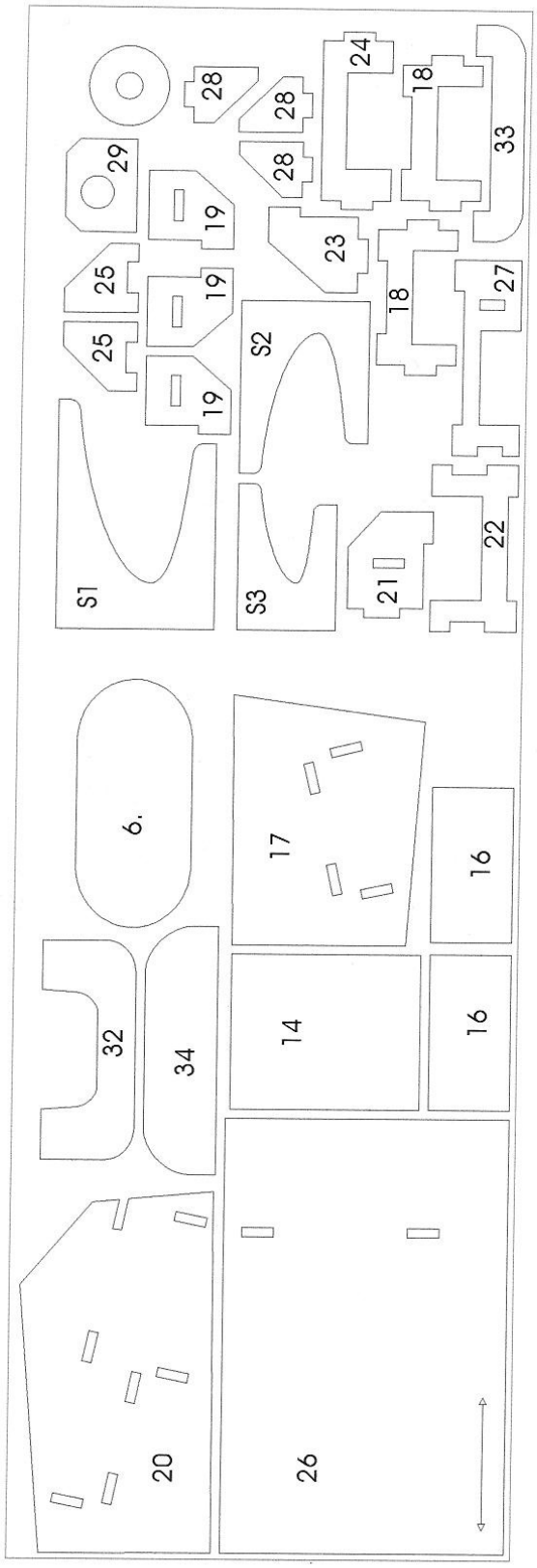
If your motor should quit in flight and you have to carry out an out-landing, we recommend that you complete the emergency landing with the wheel retracted - just as the full-size pilots do - unless the landing surface is very smooth.

We hope you have loads of pleasure flying your model. Happy landings!

Fournier RF-4D Parts List

No.	Description	No. off	Material	Dimensions in mm
1	Fuselage	1	GRP	Ready made
2	Wing joiner sleeve		GRP	Ready made
3	Retract unit support	1	Plywood	Ready made
4	Retract unit	1	Dural + steel + rubber	Ready made
5	Air cylinder	1	Dural + steel	Ready made
6	Air cylinder plate	1	Plywood	3mm, die-cut
7	Hardwood strip		Spruce	5 x 3 mm
8	Instrument panel	1	ABS	Ready made
9	Baggage compartment	1	ABS	Ready made
10	Wheel door	2	Plywood	Ready made
11	Wheel door lever	2	Plated mild steel	2 mm Ø
12	Wheel door bush	2	Brass tube	2 Ø / 3 mm Ø x 78 mm
13	Guide	2	Brass tube	0.9 Ø / 1.3 mm Ø x 15 mm
14	Air exit	1	Plywood	3 mm, die-cut
15	Wheel door guide	2	Steel rod	Ready made
16	Compressed air tank support	2	Plywood	3 mm, die-cut
17	Servo plate, R.H.	1	Plywood	3 mm, die-cut
18	Micro-servo support	2	Plywood	3 mm, die-cut
19	Side part	3	Plywood	3 mm, die-cut

20	Servo plate, L.H.	1	Plywood	3 mm, die-cut
21	Side part	1	Plywood	3 mm, die-cut
22	Mini-servo support	1	Plywood	3 mm, die-cut
23	Side part	1	Plywood	3 mm, die-cut
24	Throttle servo support	1	Plywood	3 mm, die-cut
25	Side part	2	Plywood	3 mm, die-cut
26	Cockpit floor	1	Plywood	3 mm, die-cut
27	Retract servo support	1	Plywood	3 mm, die-cut
28	Side part	3	Plywood	3 mm, die-cut
29	Control valve support	1	Plywood	3 mm, die-cut
30	Pilot's seat	1	ABS	Ready made
31	Seat backrest	1	ABS	Ready made
32	Seat in-fill piece	1	Plywood	3 mm, die-cut
33	Seat in-fill piece	1	Plywood	3 mm, die-cut
34	Seat in-fill piece	1	Plywood	3 mm, die-cut
35	Mudguard	1	ABS	Ready made
36	Hardwood support strip	1	Limewood	6 x 6 mm
37	Joystick fairing	1	ABS	Ready made
38	Triangular strip	1	Balsa	15 x 15 mm
39	"Snake" outer sleeve	3	Plastic	2 Ø / 3.2 mm Ø, white
40	"Snake" inner sleeve	3	Plastic + steel	2 mm Ø
41	"Snake" outer sleeve	1	Plastic	2 Ø / 3.2 mm Ø, red
42	Hardwood strip	1	Limewood	5 x 10 mm
43	Rudder hinge lug	3	GRP	Ready made
44	Aluminium tube	1	Aluminium	3 Ø / 4 mm Ø
45	Aluminium tube	1	Aluminium	2 Ø / 3 mm Ø
46	Rudder	1	Styrofoam + balsa	Ready made
47	Rudder leading edge	1	Balsa	12 x 12 x 370 mm, slotted
48	Tailskid actuator	1	GRP	Ready made
49	Control surface horn	5	GRP	Ready made
50	Motor mount	1	Dural + steel	Complete set
51	Bottom cowl section	1	GRP	Ready made
52	Top cowl section	1	GRP	Ready made
53	Canopy	1	Plastic	Ready made
54	Hatch cover	2	Plywood	1 mm
55	Tailskid, complete	1	Steel + aluminium	Complete set
56	Coil spring	2	Steel	Ready made
57	Spinner	1	Dural + plastic	Ready made
58	Tailplane panel	2	Styrofoam + balsa	Ready made
59	Tailplane tip	2	Balsa	Oversize
60	CFRP tube	1	CFRP	6 Ø / 8 mm Ø
61	Control surface hinge	14	Plastic	Ready made
62	Wing panel, L.H. / R.H.	1 + 1	Styrofoam + obechi	Ready made
63	Wingtip	2	Balsa	Oversize
64	Stiffening plate	2	Plywood	25 Ø x 8 mm
65	Hardwood dowel	1	Beech	4 mm Ø
66	Wing joiner tube	1	Dural	16 Ø / 18 Ø x 498 mm
67	Tubular incidence peg	1	Brass	4 Ø / 5 mm Ø
68	Servo plate	4	Plywood	1 mm, die-cut
69	Airbrake	2	Aluminium + brass	Ready made
70	Threaded rod	4	Plated mild steel	M2 / 1.6 mm Ø
71	Clevis	10	Chrome-plated steel	Ready made
72	Clevis	2	Nylon	Ready made
73	Plate	1	Balsa	2 mm, oversize
74	Servo well cover, L.H. / R.H.	1 + 1	Plastic	Ready made
75	Wing retainer system, complete, including instructions	1	Plastic + steel	Ready made
76	Outboard wheel, complete	2	Dural + steel	Ready made
77	Motor bulkhead	1	8 mm plywood	Ready made
S1-S3	Profile template	1 each	Plywood	3 mm, die-cut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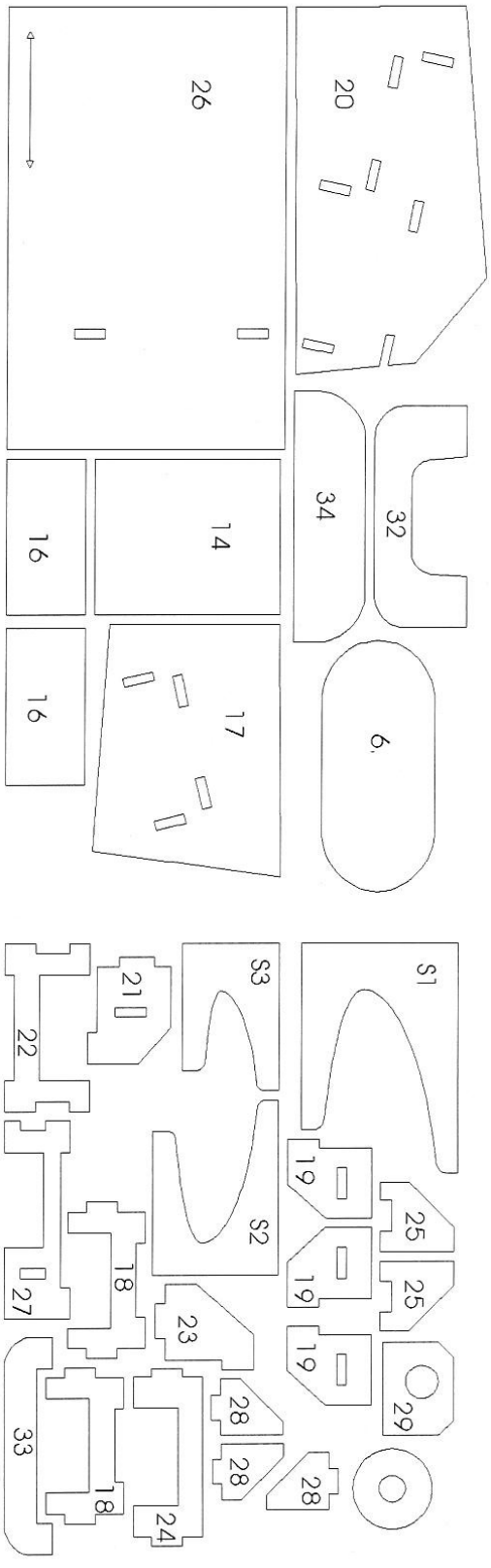
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Plan text

1 Adjust shape of spring
2 There is plenty of space in front of the mudguard for two fueltanks connected in series; approximate position of tanks shown.
3 Carburettor
4 Diagram of fueltanks connected in series; see building instructions
5 System fill / drain line
6 System vent / overflow line
A Fuel supply tank
B Secondary fueltank
7 Retract unit air system installation shown in “wheel down” position; see building instructions.
8 Pressure reducer
9 Cam disc
10 Air cylinder
11 Air exit
12 Control valve
13 One-way filler valve
14 Compressed air tank
15 Adaptor
16 Air pump
17 Trailing edge of GRP fin
18 Pivot axis of rudder - see sections D-D and E-E
19 Left-hand fuselage side
20 Right-hand fuselage side
21 See Figs. 21 - 24
22 Centre of Gravity (C.G.), 100 - 115 mm
23 Propeller driver
24 Lever (11) shown in “door (= wheel) retracted”
25 Opening for wheel doors (10); extend forward to overall length of 152 mm
26 Full-height view of part (35)
27 Installation of plate (6); see building instructions
28 Support for cockpit floor (26)
29 Section C-C
30 Velcro tape
31 See building instructions
32 Section B-B
33 Section D-D
34 Section E-E
35 Chamfer top edge of aileron as shown
36 Soldered joint
37 Section G-G
38 Section F-F
39 Cut grooves in part (64) before gluing in place - see building instructions.
40 Disc: see outboard wheel
41 WE RESERVE THE RIGHT TO MODIFY ANY FEATURE IN ORDER TO IMPROVE OUR PRODUCTS
42 Wheel extended
43 Wheel retracted
44 Detail “X”, scale 2:1
45 Wing retainer system: see instructions supplied with set
46 Seal end of part (2) with balsa!
47 Servo connection: see building instructions
48 Parts (70) and (72); see Fig. 61