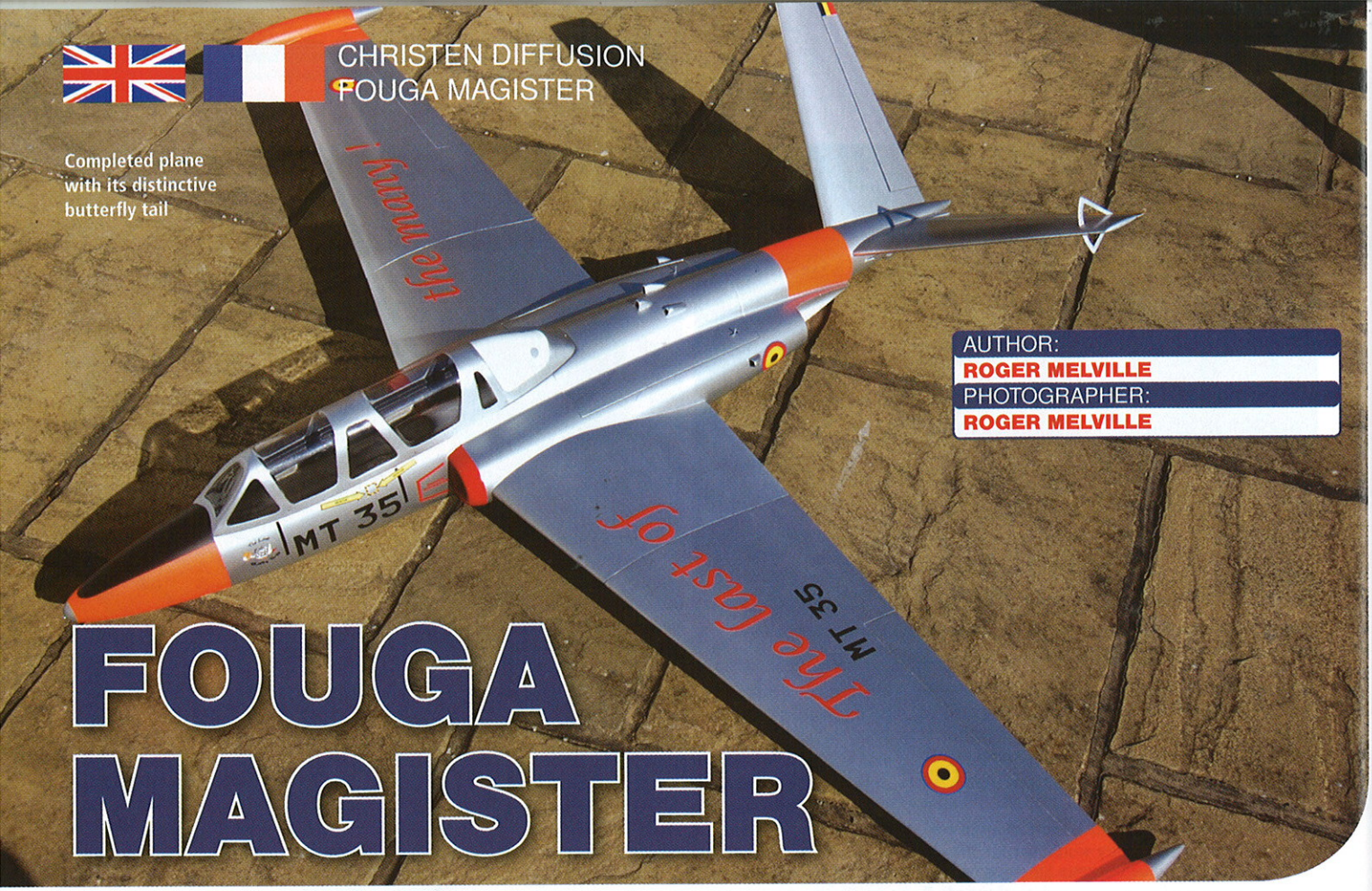

CHRISTEN DIFFUSION
FOUGA MAGISTER

Completed plane with its distinctive butterfly tail

FOUGA MAGISTER

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Roger assembles the Christen Diffusion Fouga Magister for MW44

Background

The Fouga Magister was a French two seat jet trainer developed in the 1950s and continuing in active service until the early 2000s. The Belgian Air Force continued use of the Fouga until 2007, but mainly in a support role. The aircraft is recognisable by its distinctive V-tail and relatively large wing, which is no surprise as it was originally designed as a glider.

This model, by Christen Diffusion, has a span of 1.7 m and a typical weight of 4 kg and is available as an EDF version, or can be turbine powered. This kit was produced before the switch in production to full GRP instruction, so has foam/obechi wings and tail, but has epoxy/glass fuselage components. The model was built for Trevor Skedge, who didn't have the time for the build as he was moving house.

The Kit

The main fuselage moulding is of glass, carbon and Kevlar, with inner wing panels made of glass/ Herex foam construction. Jet efflux tubes are also GRP mouldings. The quality of the mouldings was very good, with most components fitting well, although the jet efflux tubes did not fit particularly well and required filler and re-enforcement over the joints. Marked on the fuselage mouldings were reference lines for inner wing panel and tail plane alignment, which was a useful addition.

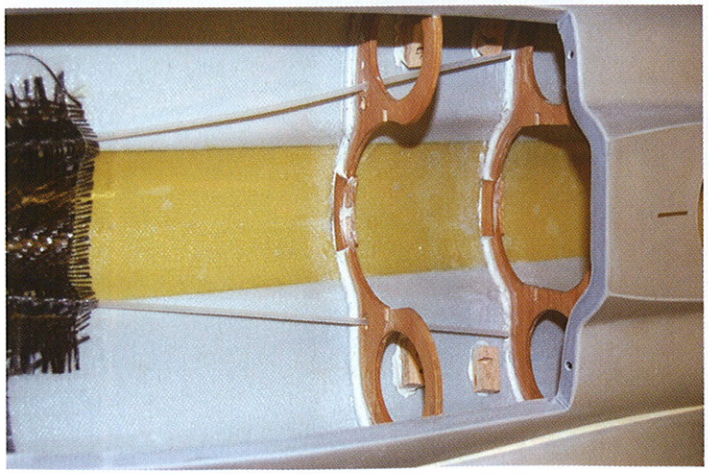
The wing panels were light, accurate and had live hinging on the ailerons, while the tail plane halves had to have the elevators cut and hinged by the builder.

The other components of the kit included pre-cut ply parts, GRP moulding for the air intakes, ABS mouldings, carbon wing joiners and aluminium tubes, bifurcated jet pipe and shroud with a carbon entry duct, carbon and ceramic cloth, plus a set of French instructions including pictures and some decals.

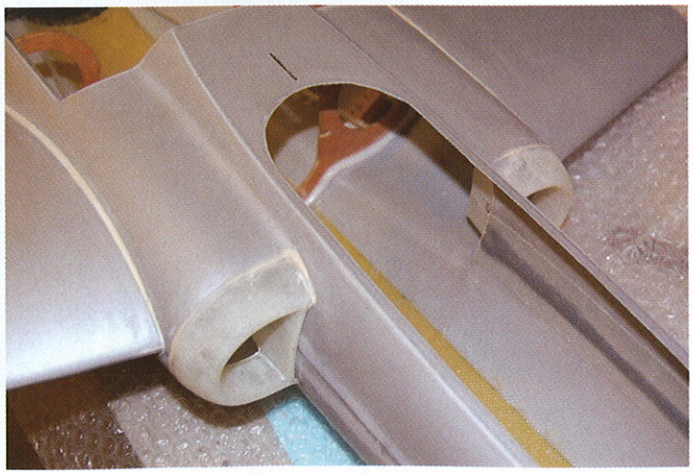
Construction

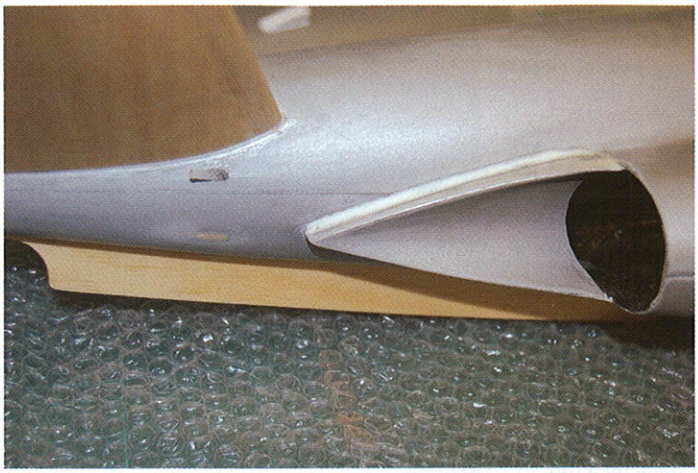
Work starts by assembling the pre-cut ply fuselage formers that extend into the inner wing panels and support the main retracts. These were fitted into the fuselage using Aeropoxy, after carrying out a dry assembly with the inner wing panels. Fitting these panels was quite straightforward and very little sanding was required to achieve a good fit to the fuselage. At the same time, the

Engine bay compartment with formers nicely glued in place with Hysol. Note the snakes held in place with carbon tape



Under the cockpit floor looking to the rear of the plane. Fillets around the intakes and the wing roots to correct fitting deficiencies in fibreglass parts





Exhaust outlets faired in to fuselage

Wing stubs hold the retract mounting plates

aluminium wing joiner tubes were fitted to the retract mounts. At this stage I didn't fit the engine mounts, but waited until the main construction had been completed, so that the exact position of the captive nuts used for the engine mount could be determined.

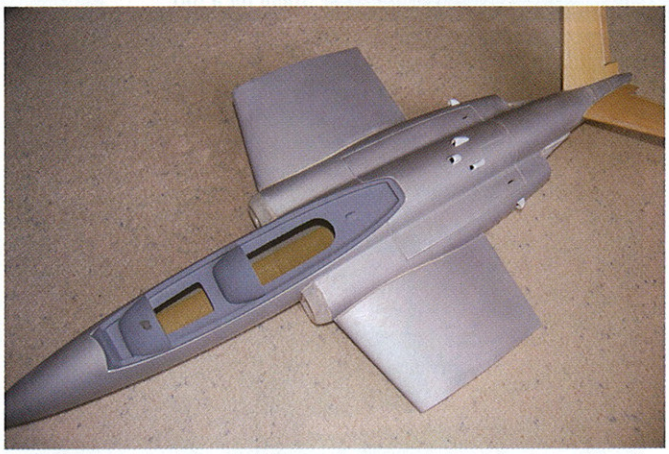
Each tailplane half is supported on two ply spars that are epoxied into pre-cut slots in the fuselage and this was done after cutting the pre-marked elevators from the tailplane.

The jet efflux tubes were quite awkward to fit, but by initially using cyano and then epoxy and glass re-enforcement, they were successfully aligned to the fuselage. Epoxy and micro balloons were used to fill the join and smooth out the tubes.

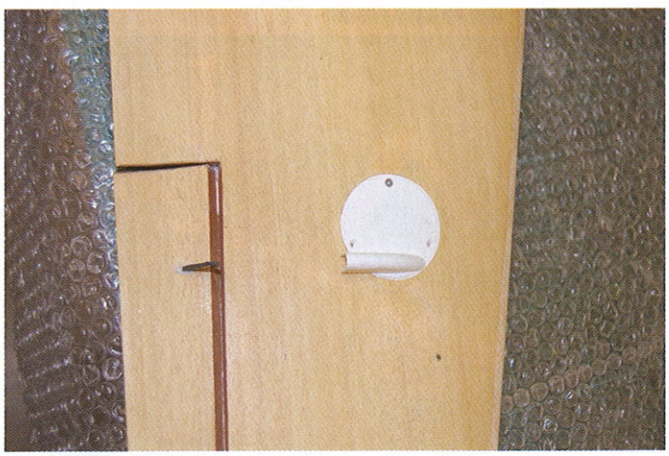
The servo mounts for the elevators were fabricated from ply and epoxied in position after installing the tubes for the piano wire pushrods from the tail through to the front of the top hatch opening. Some of the supplied carbon cloth was used to retain the tubes in the bottom of the fuselage. JR DS 3301 servos were used for the elevators and these have side mounts, which make them ideal for this application. Each elevator was capped with balsa where it had been cut from the tail plane and hinging was done with 4 wire-pinned flat hinges.

The GRP air intakes were carefully sanded where necessary to achieve a good fit to the fuselage and epoxied in place.

Work on the wings, required the fitting of the joiner tubes, ply root ribs, wing tip tanks, edging the aileron faces and fitting the servo boxes. The joiner tubes were epoxied in place after blocking one end to prevent loss of the carbon joiner. The incidence angle of each wing panel was checked during the gluing operation to make sure nothing moved. The supplied 0.8 mm ply root rib was fitted and trimmed and attention turned to the tip tanks. These are supplied as two



View from above of the fuselage with the one half of the butterfly-tail glued in place



Ailerons fitted into wing and neat servo cover

Wingtip tank secured to wing with glue

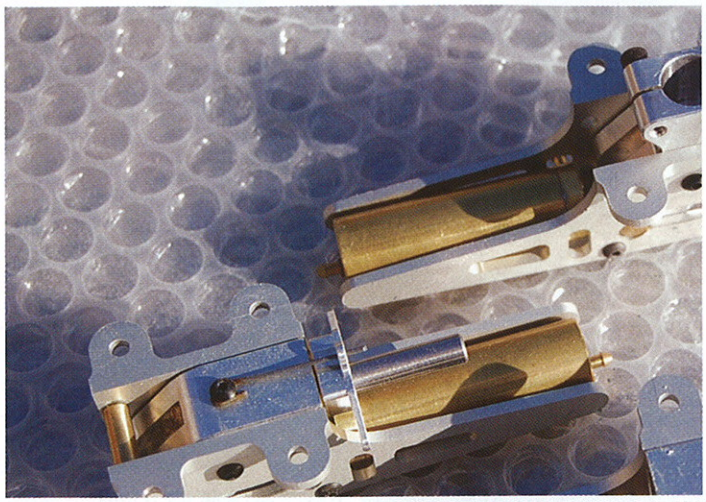
part ABS mouldings that fit over a 5 mm balsa crutch. After assembly, the joins were filled with Milliputt putty to give a smooth surface.

The position of the aileron servo cut outs was already marked on each panel so they were bored out using a Dremel sanding drum and Graupner servo boxes suitable for the JR DS 362 servos epoxied in place. Using a saw tooth edged tube; a hole was bored between the root and the servo box, for the servo cable.

The wings and tail were covered in lightweight glass cloth and epoxy, rubbed down and then a second thinned coat of epoxy applied to smooth out the surface. When cured, the epoxy was wet sanded ready for priming. BVM carbon horns were fitted to both the ailerons and elevators.

The top hatch was fitted using carbon rods at the front and a pair of hatch latches at the rear. The canopy base, which was accurately cut to size, is made from 0.8 mm ply and after taping in place 1/4" square balsa edging was fitted after pre-steaming it to retain the curved shape. Retention of the canopy was by a carbon hook at the rear and a piano wire pin running in a tube from the nose. Two instrument binnacles were made from blue foam, covered in glass cloth and epoxy and sanded.

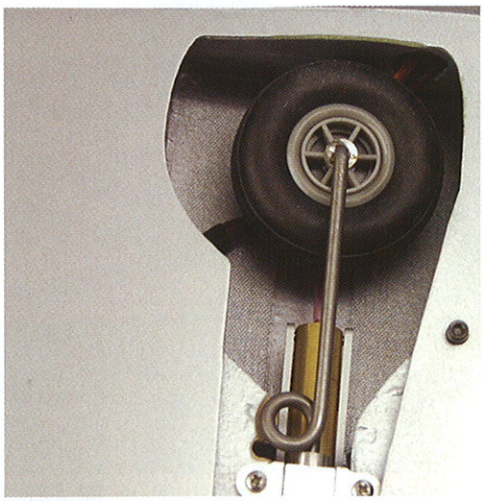
The retracts used were Model Aviation Products 375-90R air up/down units, obtained from Motors & Rotors and whilst the mains fitted easily, the nose retract required a ply former to be accurately positioned. This was epoxied in place and the joint re-enforced with carbon. The mains were designed for 3/8" legs and as wire legs were to be used, a pair of adapters was machined to overcome the



Left: MAP air up air down retract units, not units often seen in the UK

Right: Retracts fitted with wire legs have plenty of room in the cut-outs and deserve doors

Below: Very simple and lightweight Wren MW44 installation for manual start. Just room for a UAT



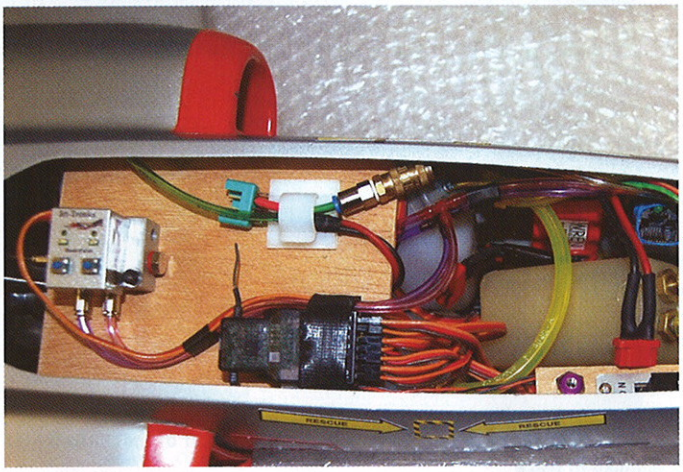
difference in hole and wire sizes, thanks to Mick at Motors & Rotors. With the mains installed, the length of the wire nose gear could be assessed so that a slight positive wing angle was achieved with the model sitting on the ground.

The ply engine mounts supplied were too narrow for the Wren 44 and so a new pair was made and captive nuts installed to retain the engine mounting bolts. A trial assembly of the bifurcated pipe, its secondary shield and the carbon inlet to the exhaust, showed that achieving the 20 mm gap between the carbon exhaust inlet and the rear of the engine would be difficult. By slightly shortening the exhaust ducting, the required spacing was almost achieved. In the 'hot' areas of the fuselage, the supplied ceramic blanket material was applied using silicone sealant and aluminium tape was also used to help shield the fuselage moulding.

Finishing

The whole airframe was first sprayed with a 1K etch primer and after rubbing down the colours applied using acrylic sprays. The colour scheme chosen, was that of the last Fouga Magister, MT 35 also known as 'the last of the many', which was written across the wing. After having sprayed the silver, where the fluorescent orange was to going, white primer was initially applied and then the orange. Over these areas only, a clear lacquer was sprayed to provide a satin finish and help prevent the fluorescent orange fading from UV.

The decals were all produced by RC Graphics and are either vinyl cut, or printed, depending upon the requirement.



Close up of cockpit and the decals

Installation

The exhaust ducting and its shroud were screwed to the carbon cone with small self-tappers and the motor installed using screws into captive nuts. As a safety precaution, litho plate was glued to the area immediately behind the exhaust pipe outlets, to prevent burning of the paint.

I knew the space available for the fuel tank would be limited, but it was found that two Sullivan 12 oz tanks could be used ahead of the motor, without restricting the airflow too much. In addition an

Below: View from the rear

Below: The team preparing for the first flight, hard to believe this was only taken 2 months ago

The fluorescent orange bands help the silver plane to stand out against the grey, wintry background

Above: Very low pass, a sign of confidence in the planes handling

Left: Another side view at tree top height, only needs a pilot

MAP air trap header was used, so the total fuel compliment was 28 oz, not ideal, but sufficient. It would be possible to put two additional circular tanks above the tail servos, but for the first flights this was not attempted. In an ideal world, conformal tanks could be made to fit in the wings and near the motor, but time did not permit.

Fitting the remainder of the components was difficult in the limited space within the fuselage, but with a little ingenuity all the parts were installed so that the C of G was 105 mm from the leading edge with the header tank full. A spectrum AR7000 Rx was being used and this was located on the removable ply tray fixed above the tanks, along with the JetTronics retract valve.

The finished dry weight of the model was 7.2 lb, which seemed very reasonable, considering the wing area and thrust of the Wren.

Flying

After a perfect Friday with light winds and reasonable temperatures, the first Sunday in April dawned with snow on the ground, but that didn't stop the Motors & Rotors team heading to Chalgrove for the first flight. With the snow clearing the runway, the model was fuelled, started and taxied out ready for take-off. The noise generated by the bifurcated pipe was louder than normally expected, but with full power applied the model accelerated and took off smoothly, requiring some up elevator trim and slight aileron correction.

The up elevator trim, was thought to be necessary because of the forward C of G made worse by the weight of the fuel that was all ahead of the balance point.

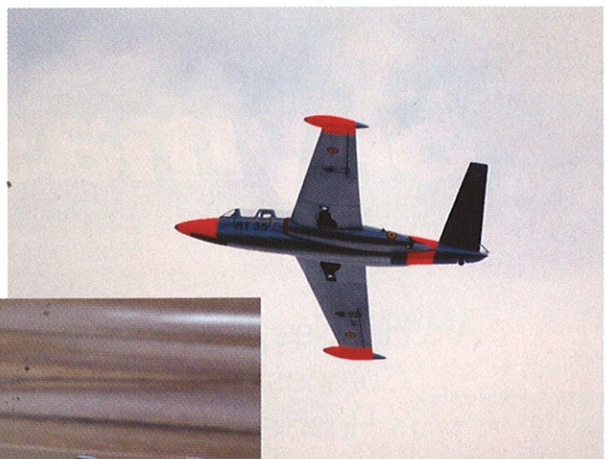
The model flew smoothly and required only half power unless climbing for a loop or Immelman, although after the first flight more exponential was added, to smooth out the excess of movement rather than down-rate the travel. Inverted flight required more down elevator, again indicating a forward C of G. After 4½ minutes a landing was called and the model floated in due to its large wing and relatively low wing loading.

Five more successful flights were made on that cold, but bright Sunday, with the flight times being extended to 6½ minutes and even at that time, there was still fuel left in the main tanks.

Conclusions

Not a simple model to build, but the quality of most of the mouldings was very good, as were the flying surfaces. The lack of space in the fuselage made finding room for all the components rather difficult, but eventually everything found a home. The flying performance is very good requiring little power for most of the flight and only full power for verticals. Landings tend to float due to the large wing area, but are very controllable. In the air the model is quite different from the normal scale jet with its distinctive V-tail and as can be seen from the photographs now only needs a pilot, or two.

There is a video of the second flight on Youtube at this address; http://youtube.com/watch?v=5mXv5I5mceM



Right: Banking turn, turning away from the camera

Below: Landed!

Contacts

Christen Diffusion
http://christen.diffusion.online.fr

Motors & Rotors
www.motorsandrotors.com

RC Graphics
www.rcgraphics.co.uk