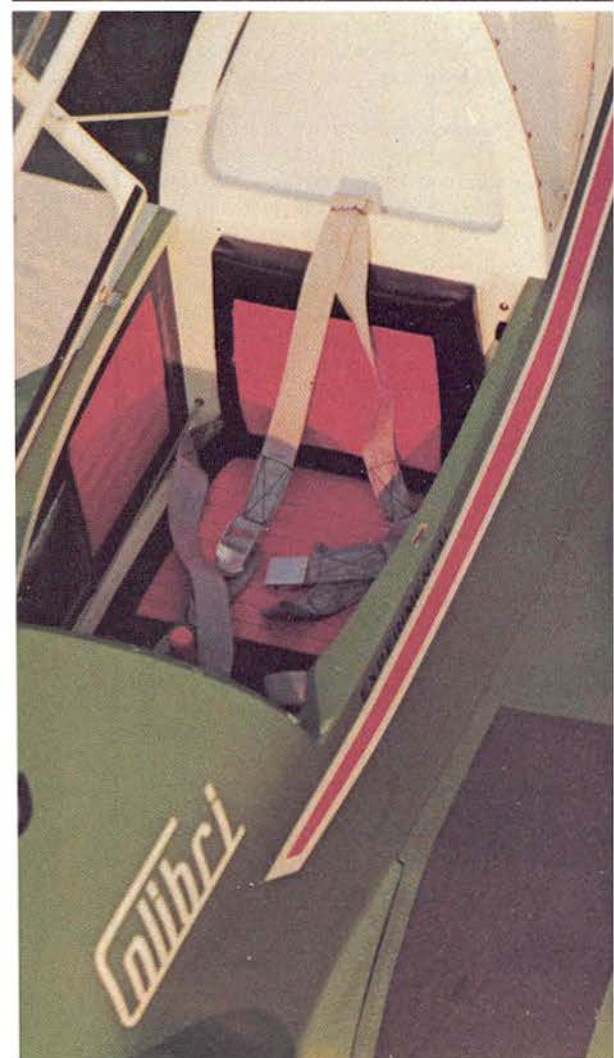
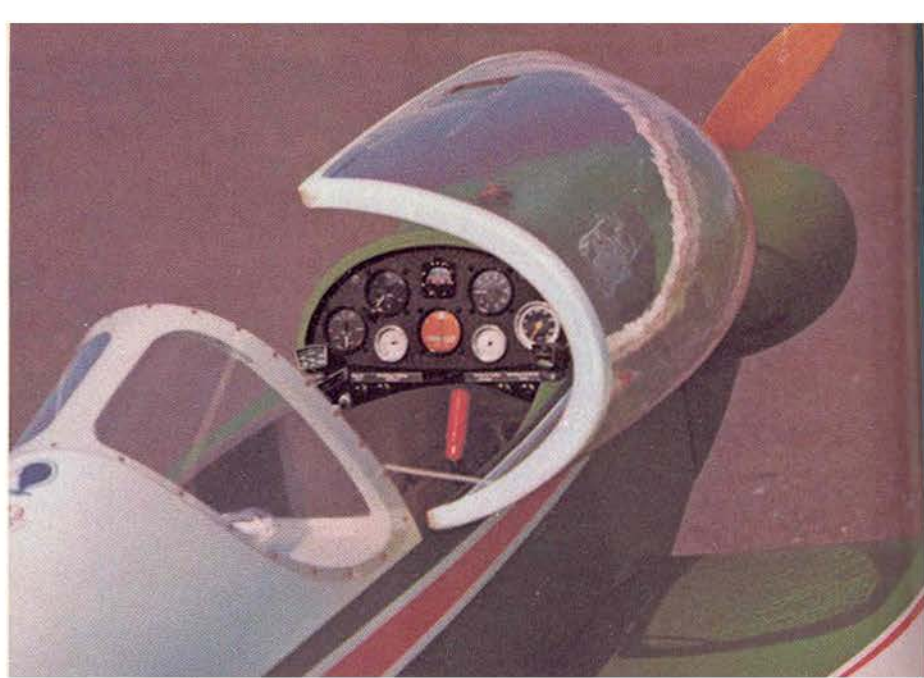


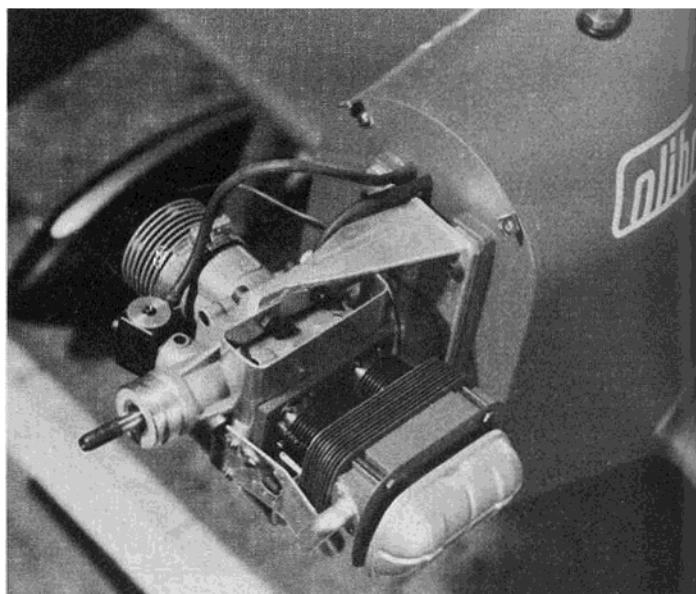
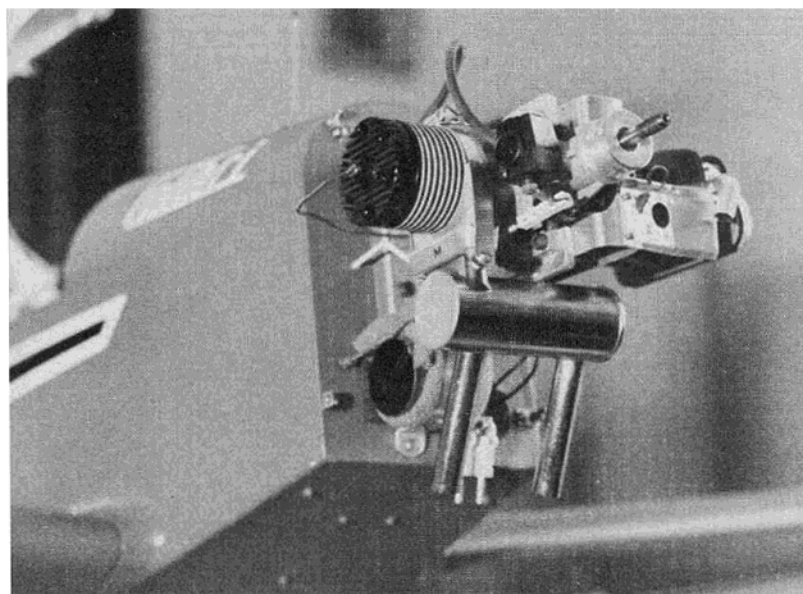
GOLIBRI MBZ

english translation by B. HUBER

photos and text by FRANZ MEIER







INTRODUCTION

The Colibri MB-2 is ideally suited for a scale model. With exception of the wing aspect ratio, all dimensions are perfect for a model and also the general impression is that of a scale model of the new generation. As for the Turbulent D-31 (described in the August 75 issue of RCM) I was very lucky to get a set of the original blueprints and the authorization to shoot as many pictures of the original as I liked. The home base of the plane is in Western Switzerland, about a 3 hour drive. To avoid this lengthy trip, the designer and owner of the original aircraft flew the MB-2 to a close airfield, where I could study it in detail and ask all the necessary questions. I appreciated this very much, since it is much more difficult to get adequate data for a scale model than to actually build it.

THE MODEL

The scale of 1:3.33 was chosen again, as for the Turbulent, since this kept the span below 2m. It is certainly an unconventional scale, but relatively easy, because you can multiply every dimension by .3 to get the scale dimension. Especially for the relatively small "home-built" aircraft I consider 1:3.33 to be a good scale, 1:3 would produce a relatively large, and 1:4 a small, aircraft. For the Colibri the wing span would have been 2m (78.7") and 1.5m (59") respectively. The model is built from the same material as the original, with some exceptions. The fuselage and wing are mainly constructed from plywood and spruce, while balsa mainly was chosen, where possible, to reduce weight.

While on this subject of construction material, I would like to talk about an experience I had with the .6mm and .8mm (0.024" and 0.031") plywood. Some of the glued connections got loose after a short time and it was impossible to re-glue them. In a water check I found, that the plywood absorbed water in various ways. On some surfaces it just dripped off. I assume that some silicones are used during manufacturing of the sheets to avoid adhesion on the

COLIBRI-MB2 Designed By: F. Meier

TYPE AIRCRAFT

Scale — Experimental

WINGSPAN

70% Inches

WING CHORD

16-9/16 Inches

TOTAL WING AREA

8.13 Square Feet

WING LOCATION

Low Wing

AIRFOIL

NACA 23012

WING PLANFORM

Constant Chord

DIHEDRAL, Each Tip

5 Degrees

O.A. FUSELAGE LENGTH

58-13/16 Inches

RADIO COMPARTMENT AREA

Very Large

STABILIZER SPAN

23% Inches

STABILIZER CHORD (incl. elev.)

8-9/32 Inches

STABILIZER AREA

5 Square Feet

STAB AIRFOIL SECTION

Symmetrical

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

12 Inches

VERTICAL FIN WIDTH (incl. rudder)

7-3/32 Inches

REC. ENGINE SIZE

.61 Cubic Inch

FUEL TANK SIZE

13-14 Ounce

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

Four

CONTROL FUNCTIONS

Aileron, Elevator, Rudder, Throttle

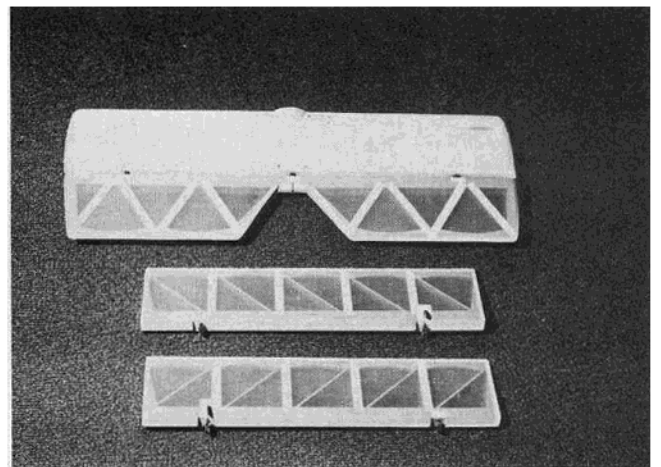
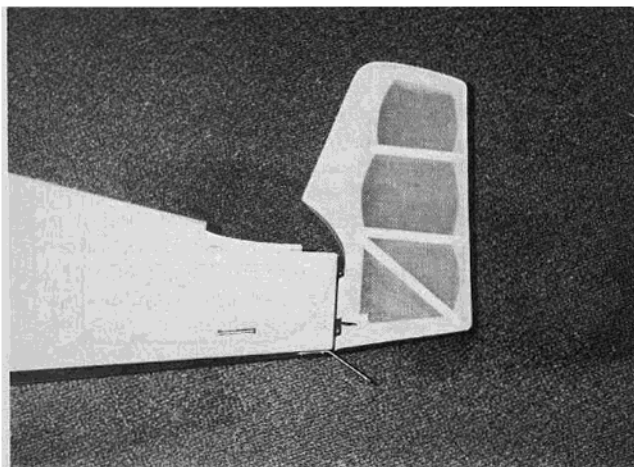
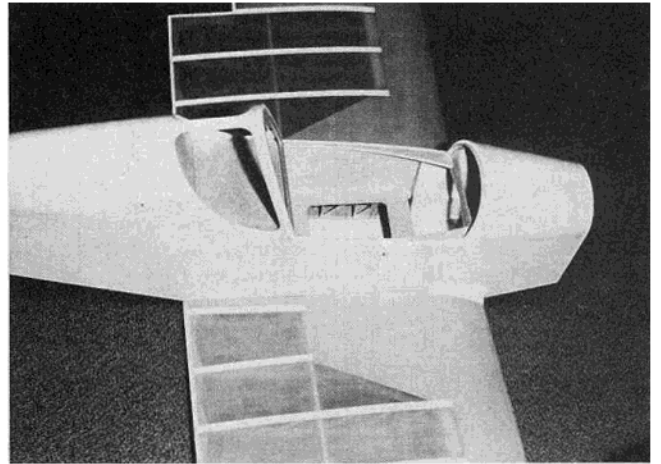
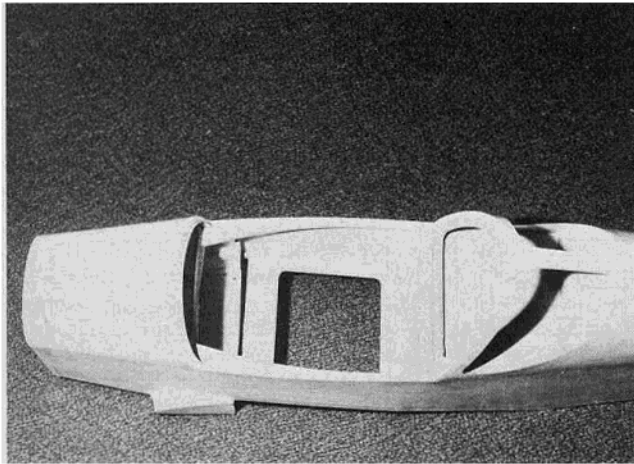
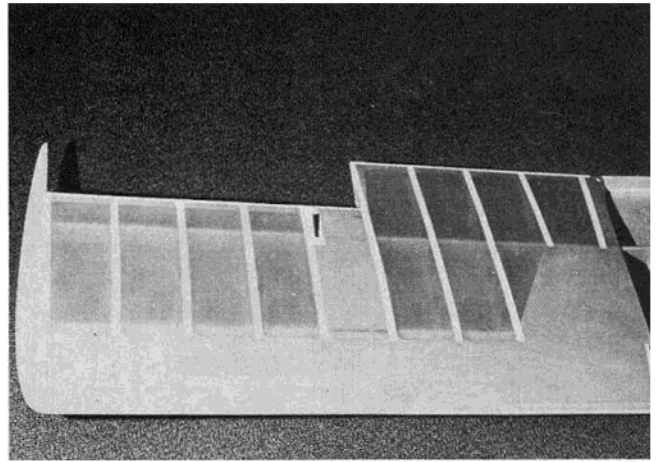
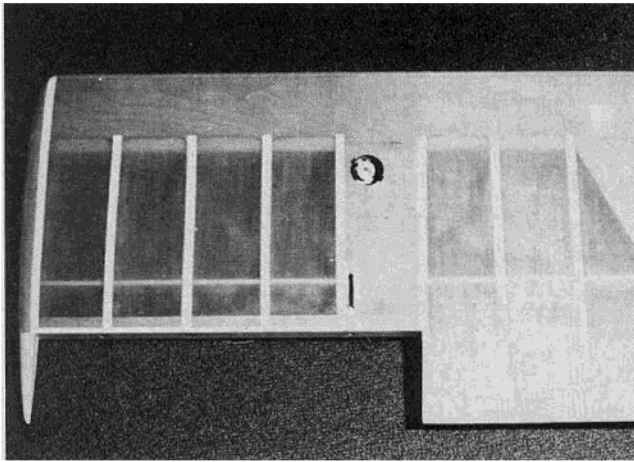
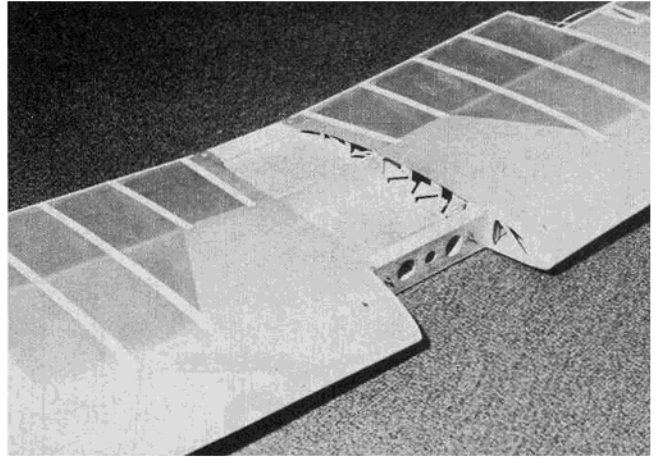
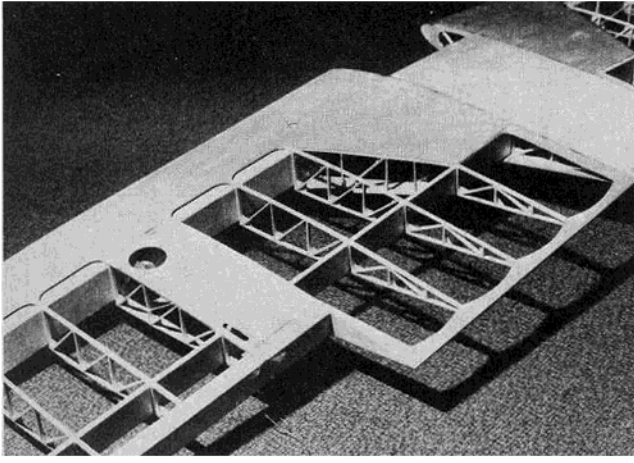
BASIC MATERIALS USED IN CONSTRUCTION

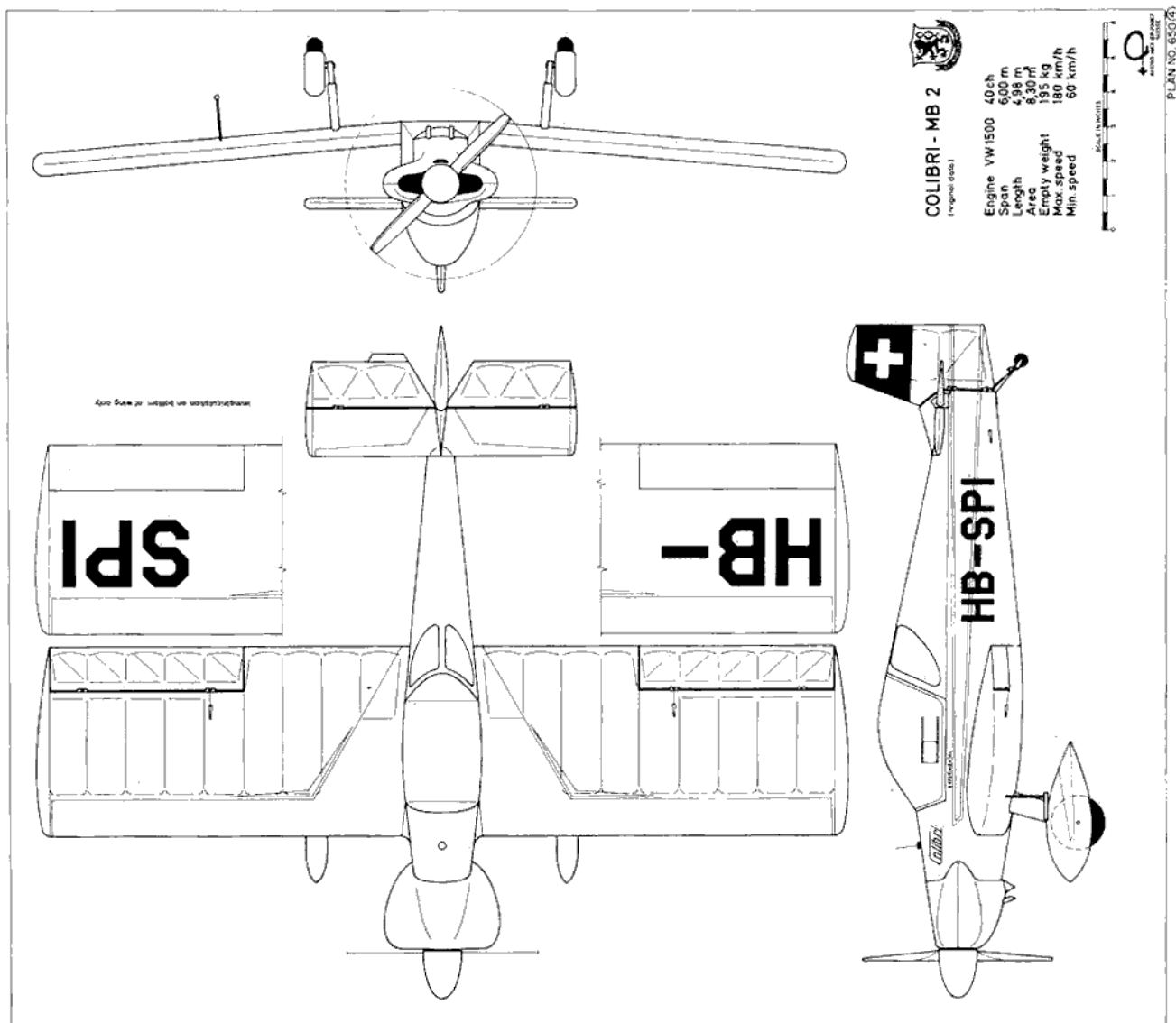
Fuselage	Balsa and Ply
Wing	Ply and Spruce
Empennage	Balsa
Weight Ready-To-Fly	177.11 Ounces
Wing Loading	19.75 Oz./Sq. Ft.

pressing plates. I started, therefore, to sand the areas where the glue is applied with medium grain sandpaper. A 100% connection resulted from this procedure.

The development and construction time for this model was approximately one year. This time has to be considered as relatively short, because a lot of time has to be spent in jigs and tools as well as samples. There were 4 dies produced for the MB-2, namely for the canopy, the engine cowl, the wheel cowls and the spinner. The original airplane is equipped with the NACA 23008 airfoil (like many well-known WW II fighters). All the ribs are assembled in a jig from 2 x 4mm (0.08" x 0.16") spruce. Even with the higher specific weight of the spruce, a comparison of a block of balsa ribs with the same number of fabricated rib showed practically no difference. The major difference is the "manufacturing time", on the other hand I could stay with the original construction method. The ailerons on the original plane use Abachi-plywood ribs, so that I decided to build the ailerons of the model entirely from balsa. Also the "box" design of the main spar was kept, however, balsa was used instead of spruce due to the weight problem. One interesting point is the attachment of the pulley for the control cables. They are mounted to equalizers and are, therefore, always in alignment with the aileron. The friction of the control cables is minimized, which is an advantage for the servos.

Due to some construction problems, the attachment of the landing gear had to be changed. The landing gear on the original is mounted to the main spar before sheeting of the wing. This would be a major problem for the model. The mounting method is unconventional, however worked out satisfactorily. An aluminum bracket with a standard M10 thread (approximately 3/8") is mounted to the spar. The landing gear strut is screwed into this thread and secured with epoxy. This connection is permanent. Tests on a prototype proved that the M3 securing bolts (approximately 1/8") are sheared off





first. The detachment of the landing gear is performed by unbolting the M3 bolts, which improves the maintenance of the wing and landing gear. The design of the landing gear is very similar to that of the original. Instead of rectangular steel tube, I used an equivalent aluminum extrusion (weight reduction approximately 70 grams [2.5 ounces]). The brakes are dummies only, while the wheel cowls are designed dimensionally and materially correct.

The fuselage is designed to be simple and built mainly from ply - - - only some non-visible formers and spars are made from balsa. I used a Graupner HB .61 engine with a 400 ccm (24.5 cubic inches) tank. The muffler is absolutely true-to-scale. The exhaust is lead through two exhaust tubes below the fuselage. Mr. Fung, the manufacturer of the "Minivox" mufflers, changed a "Sport-Q-Muffler" to a scale version of the Colibri muffler. This version is not only optically perfect, but it also reduces spoiling the model with exhaust residue very effectively. This muffler can be purchased directly from the manufacturer, the part designation is Muffler "Sport-Q-MB 2.

The dummy of the 1500 ccm VW engine is built similar to that on the "Turbulent D-31", but is, as well as the HB .61, completely covered by the engine cowl. There should not be any cooling air problems, however for increased safety, I cut a 30 x 10mm cooling slot into the cowl on the engine side. More problems were found with the current supply of the glow plug. A direct access was not available due to the engine cowl. Therefore, I had to attach a plug to former No. 1, which is connected to the plug and the engine housing with a cable.

On this model I also paid utmost attention to the interior of the cockpit. The instruments and inscriptions were drawn full size and photographically reduced to the models scale. The panel, itself, gave me some problems. The surface of the shrink-enamel should be three times finer than on the original. Since I could not produce it with paint, I used black wet-or-dry sanding paper (180 grit), which produced the correct appearance. A coat of clear lacquer was sprayed over it. The instrument housings are produced on a lathe from aluminum. The side

linings, as well as the seat cushions, are made from black and red self adhesive plastic. Of course, not even the map is missing in the cockpit. All important controls are fully operational, such as the control stick, foot pedals and throttle, which are linked to the servos. The R/C equipment could be ideally placed and is not visible on the fully assembled model. The receiver, as well as aileron and throttle servos, are mounted under the seat in the wing. The servos for elevator and rudder are mounted in the fuselage. The R/C equipment is easily accessible through the seat by lifting the cushion.

The canopy is mounted as a sub-assembly, and is lifted sideways. A lot of patience is required to make the canopy fit. Due to the size of the parts and the reliability, I could not produce this item true-to-scale. The lock is made in such a way that the difference in appearance between the original and the model is minimal. As on the original, the unlocking is performed through the ventilation opening.

The fuselage is covered with a thin nylon fabric, while the artificial silk, manufac-

... tured by Graupner, is used for the wing. As already used on the Turbulent D-31, the reinforcement strips are used on the wing and fuselage and the sewing is imitated by little "glue-worms." This finishing work takes a lot of time, but provides the final touch a scale model gets through these details. The details of the reinforcement strips and the sewing stitches are described in the article about the Turbulent (RCM August '75).

I was very lucky in regards to the paint. The designer of the original plane gave me the rest of his enamel, this model is painted with the original paint!

The first flights were carefully prepared. Special care has to be given to scale models, due to the excessive amount of labor involved and due to the fact that the whole system (model and controls), is more complex than on a standard R/C model. The engine run was checked in all positions and throttle settings. The taxi characteristics were carefully examined and a detailed check of the model, with regards to loose bolts, inadequate tension in the control cables, etc., was made.

Finally, the long expected moment of the first flight came. The model had a tendency to climb and had to be heavily trimmed down. The difference of angles of attack was reduced on the spot (it is easy due to the "mechanical trim"). The next flight was much better, however about 70 grams of lead was mounted to the engine mount before the third take-off. The flight characteristics were perfect now. Simple stunt maneuvers were performed, as well as low passes over the field. At safe altitude the low speed characteristics were tested. The model has to be forced into spinning and recovers by simply centering the controls and applying full throttle gently. The landings are very realistic and present no problems.

The Original Aircraft

There is not much to say about the original. Like many nice things in this world, the Colibri simply appeared one day. The first flight was made after about 3 years of design and construction. There was no publicity at all. The nomenclature says that this is the second plane by the designer. While the MB-1 was somewhat "square", with a wing utilizing a center flat portion and "ears", the MB-2 presented a true step forward. The styling is very elegant for a "home-built", and a lot of attention was given to the design on the airfields and "experimental" meetings. The MB-2 is, today, a very popular plane. Five Colibris have actually been built in Switzerland or are already finished. The plans are available from the designer: Mr. Max Brugger, 1751 Villarsel le Gibloux, Switzerland.

Building Instructions

General:

The Colibri MB-2 can be considered to be an all around model, be it a super-scale, semi-scale or even a trainer for large models, depending on the skill and the demands of the builder and pilot. The model was built and designed according to the original plans. The flight characteristics are superb and uncritical. During construction you always have to consider the weight problem and to build the model as light as possible, especially behind the C.G. Study the plans carefully before starting construction and plan every work sequence before beginning. It proved to be economical to buy large plywood sheets 0.6 and 0.8mm thick (0.025 and 0.03 inches). The bolts not especially mentioned are cylinder head bolts M2 (3/32").

Fuselage:

Cut the .8mm plywood sides (be careful about grain direction) and apply the 5 x 12mm balsa longeron according to detail "X". Glue the .6mm ply doublers and finish the sides. Cut the

formers and glue the sides to formers 1 to 3. (The edge of the ply is used as baseline, see detail "W"). Glue the formers 3A to 8, as well as the lower transverse members. Check the correct angle on formers 3A and 4. Inspect the symmetry and glue the fuselage floor front and rear and apply the sheeting on the fuselage top. The .6mm ply for the seat support is installed and the whole front section of the fuselage is treated with clear dope and the interior is painted white.

Before gluing former 2A and applying the front top sheeting, we have to install the rudder and brake pedals, as well as the carpet. I used a self adhesive foil as a carpet. Finish the canopy after that and finish the fuselage smoothly. Cut the openings for the windows and part 14 between formers 3A and 4. The fuselage is now treated with clear dope and then covered from bottom to top with a thin nylon fabric. The edge of the fabric is covered with a finishing strip, also the fuselage edges are reinforced with these strips.

Wing:

Build a jig for the ribs first. Use a plywood plate 6 or 8mm x 100 x 500mm (1/4 or 5/32 x 4 x 20 inches). The rib outside contour is cut out from 3mm (1/8") plywood, but without leading and trailing edge. Cut the rib drawing from the plan and glue it to the base plate, cover it with a thin polyethylene sheet and fix the 1/8" sheet with some nails on the jig. Cut some ply pieces to position the rib elements and nail them to the jig as well. In order to allow easy removal of the ribs, some holes are drilled into the baseplate, through which the ribs can carefully be pushed out of the jig with steel pins.

The spruce spars are cut to length and put into the jig. If necessary, they can be softened in hot water and pre-bent. Glue the front 4mm ply, after that the diagonal stiffeners, as well as the .6mm ply doubler are installed. The first and the last rib have to be symmetrical!

Build the spars now. On the main spar a 5 x 20mm balsa piece is glued at location of every rib. Before the assembly of the wing, all the holes for the landing gear, control cable pulleys and the control stick have to be drilled into the spar. The wing has a little wash-in, i.e. the angle of attack is reduced at the wing tip. This is achieved by putting the strips, during assembly procedure, as indicated on the plan. Before sheeting, wing parts 17 and 26 have to be bolted, and then the pulleys are installed. Apply the sheeting on the bottom of the wing first, check the wing for correct geometry, and apply the top sheeting. The circle segments are cut after sanding the wing, using a template. As section D-D shows, a balsa strip is glued on every rib and sanded down to the thickness of the plywood.

Section C-C shows the installation of the ailerons, as well as the rudder and elevator. These sub-assemblies are constructed conventionally from very light balsa. The wing, rudder and elevator are covered with fabric (I used Graupner No. 615), while the sheeted horizontal tail has a thin paper cover. Don't forget to install the control cables before covering the wing.

Landing Gear

Some mechanical skill is required to construct landing gear. After finishing all the detail parts, the steel tube 27 and axle 30 are brazed, then part 28 is brazed to the axle. Part 31 is slid into the rectangular tube 27, hole is drilled, and then the thread has to be cut into part 31. Part 31 is then inserted into steel tube 27 and the tube is then bolted to part 32 with an M3 bolt, as shown on the drawing. Check alignment of the wheel axle! Secure the M3 bolt, grind it smooth, and check for easy movement of part 32 in the rectangular tube. Slide parts 33 and 34 into the rectangular tube and drill the holes. Bond the balsa lining to tube 25, sand it into the form, and reinforce it by a fabric cover.

Now the spring strut can be assembled. Insert part 32 with some grease into the rectangular tube and bolt part 31. Insert the compression spring and bolt parts 33 and 34 to tube 25. The wheel cowls, which are custom made, are made to fit and are installed together with the dummy brake 29. A T-shaped brass tube is used as the guide for the brake cable. The end of the cable is bonded into the balsa sheeting. Lateral play of the wheels is compensated for by washers.

Also, for the tailwheel, we start to build all the detail parts first. Parts 41 and 42 are epoxied and cured hot, if possible. Re-drill part 41 after curing and bond the stiffeners. Bolt and epoxy parts 40, 43, and 44. The blade spring is made now and the tailwheel assembly completed. As with the main landing gear, also the tailwheel is mounted permanently only after completion of the model. The tailwheel is connected by little springs and drilled .5mm wire to the rudder.

Our model is now ready to be finished. After covering all the surfaces, all the free ribs, spars, etc., (i.e., all the edges, that are not sheeted) are covered with reinforcing strips. These strips are made by using a sawing blade with teeth about 2mm high and cut from blue-print type paper. After one coat of clear dope over the strips, the attaching stitches are simulated by applying little "worms" from white glue with a hypodermic syringe. After this, the plane is finished with clear dope.

Before installing the remaining details, the plane has to be painted. Note that only the bottom of the wing has the registration letters. After the application of the paint, I used a semi-gloss clear dope. The engine cowl and canopy are made to fit before the final coat, of course.

Now we start with the controls. Make the control stick and all the elements that belong to it. Tube 40 is epoxied to part 42. Part 41 is bolted to the spar, the stick guide 41 and 42 is slipped on, and part 43 is bolted and epoxied. Bolt aluminum tube 44 at this time. Note: The stick has to be removed for the assembly and disassembly of the wing to the fuselage every time - - - it is, therefore, just plugged into tube 44!

The servos are now installed, the elevator and rudder fitted to the fuselage and the aileron and throttle into the wing. The elevator is operated by a pushrod, while the aileron and rudder are driven by cables. For the adjustments, there are Kwik-Links soldered to the cables on the servo side. On the rudder horn side the cables are fixed according to detail "Y" with a brass fitting and M2 bolts. The cable ends are finished according to detail "X". Two 1.5mm diameter piano wires are used to connect the control stick to the servo. An electrical terminal is used for the adjustment and the disconnection for the disassembly of the model. The battery is attached to former 1. A switch can be installed on former 3 beside the seat cushion.

For the cushions we need 15mm foam rubber (3/4"). The cover is imitated by self adhesive foils. First the stitches are made on the red foil, then the protective sheet is removed and the foil glued to the foam rubber. Then the black foil is made to fit and glued carefully to the foam rubber. The back cushion is bonded to the former 3 with some contact glue, while the cushion is also used to cover the control equipment in the wing. The seat cushion is fixed as follows: On the back side, the seat cushion is slid under the back cushion. On the front side, tapered foam rubber is glued to the cushion. This rubber is then clamped under the seat support. The side linings are made with the same self adhesive foil as the cushions. Make the sewing stitches on the red foil and bond it to the sides. The black foils are made to fit, then the map-pockets are sewn on (do not remove the protective paper here!). The shoulder belt is attached with an aluminum bracket to the intermediate floor near former 3A. The seat belt is glued under the seat cushion on the rear side.

From RCModeler July 1976

At former 2A a 10mm wide, 0.8mm ply is installed. The frame for the instrument panel is made from 3mm ply. Cut the openings for the instruments into the cover panel and glue it to the frame.

The anti-glare surface is black wet-or-dry sandpaper (180 grit) bonded to the panel, then the instrument rings are installed. On the back side, the plexiglass is glued in, then the photos of the instruments are fixed with tape. The artificial horizon is colored orange with a felt pen. Part 9 is covered with black self adhesive foil. The control knobs (I use leather rivets) are attached with thin aluminum tubes. The throttle knob is made from wood or white plastic, bonded to a 3mm aluminum tube and installed free moving. In order to make it operative, connect it via a bent piano wire to the throttle linkage. The inside signs are bonded with double sided tape.

We now can manufacture the canopy frame. After gluing parts 10, 10A and 10B into the form (10B is made to fit the fuselage outline at the cockpit), they are connected according to detail "V". In order to give the correct cant to parts 10 and 10A, they are glued together on the fuselage. Make the canopy fit and cut out the ventilation window. The cut-out piece is then sanded smooth and glued to a piece of 0.5mm plexiglass (use a translucent glue!). The guide rails are also made from plexiglass and bolted to the canopy with very small bolts (M1). The ventilation window is then slid in and fixed in a semi-open position. The hinges are made to fit on the fuselage and the frame. Then a large radius is made on the inside of the frame, and painted white. Since it is critical to glue the canopy, it is screwed on the frame with very small wood screws with countersunk heads, then a cover of white tape is applied over it. Install the locking system now. The canopy can be opened by releasing the latch through the ventilation window. The latch is self-latching when closing the canopy.

An HB .61 engine is used with a 400ccm (24.5 cubic inches) tank. The tank can be installed comfortably between formers 1 and 2A. Due to the special muffler type "Sport-Q-MB 2" by Messrs. Fung, 586 Iserlohn, Germany, the exhausts are conducted like on the original. Two (2) Williams Bros. "Whirlwind 2" cylinders are required for the dummy engine, we just need about 30mm of the bottom part. The remaining parts have to be built-up. Part 52 is made in a block and planned conical according to the drawing. Bond parts 50 to 53, then bolt them with 60mm long M3 bolts with the Williams cylinders to the baseplate 54. The valve cover is available custom made. Make a 3mm plywood part, and fit and bond it to the cover, then the 5mm ply is epoxied and the whole unit is mounted to the cylinder block. The Williams Bros. valve pushrods are elongated with aluminum tubes, bolted to baseplate 54, and slipped through a hole in the 5mm ply. The cylinder block is painted metallic (Humbrol 53), use silver (Humbrol 11) for the valve cover.

Make the mounting brackets for the engine cowl first, making sure the thread is very tight. Bolt the brackets to former 1, and make the cowl fit now by using the spinner as a center. In order to avoid a big hole in the cowl, I used a plug to connect the glow plug to the battery.

First Flights

The C.G. has to be correct with an empty tank. Use some ballast in case the C.G. is not right. Use a 12"-5" wood propeller. It might be an advan-

tage to remove the wheel cowls for the test flights. Due to the wide wheelbase, the model is very stable when taxiing.

The MB-2 lifts its tailwheel from the ground after a very short run, however, do not take-off too early. If trimmed correctly, the MB-2 is very stable and responsive to controls. Simple stunt figures can be flown after a short training period. Don't fly "pushed" maneuvers. Make your landing approach with some throttle on, removing it shortly before touch-down. The elevator should be fully up, so that the model does not nose over.

Final Remarks

I tried to provide a detailed plan, however, I could not put everything on it. I can provide the following material to the interested modeler:

3-view scale drawing 1:10, str. 5.—

20 color pictures of the original, str. 25.—

1 set of instruments (model size), str. 10.—

1 set cockpit inscriptions, str. 10.—

Please write to my address: Franz Meier, Widenweg 10, 8630 Ruti, Switzerland.

The following parts can be purchased from Helmut Stamm, Krautgartenstr. 11, 6336 Solms, Germany.:

Canopy, DM 18.—

Engine cowl (2 pieces), DM 28.—

Pair of wheel cowls, DM 28.—

Spinner, DM 8.—

Valve cover, DM 4.—

Good luck and good flying with your Colibri!□