Miles Magister

Building Instructions

The Miles Magister was one of the British Training airplanes of WW2. The above picture is a Shuttleworth Trust restoration and dates from 1937. The Magister was known for it's fly ability and performance that was achieved through its efficient aeronautic design.

Model

The model described here and the CAD plan is depicts a close following of the real airplane. The most significant departure is an increase of the horizontal stabilizer by about 10%. Due to the high thrust line and narrow nose, an optional nose is provided on the plan. The option shows a lower thrust line and a wider nose cross-section. The model has a 30-inch wingspan and the one built was powered by a GWS standard speed 280 with the modifications.

The model is designed to be controlled by a lightweight 3-channel receiver, 2 micro servos and a ESC. The controls were rudder, elevator and motor.

The 280 motor used 270mh nickel metal hydride rechargeable batteries of 8.4 volts.

In general, the model is built using standard stick and tissue construction, not unlike the rubber-powered models. This construction allows a 2-ounce airframe and about 10 ounces ready to fly.

Wing

The wing is of conventional rib construction. The center section is of constant cross section and uses the ribs marked "W1". The outer panels are tapered in chord and thickness. For lightness, shallow spars (1/8x1/16) were used. This allows stiffness due to the thick wing. The leading edge is cut from 1/8 sheet and tapered to fit rib fronts. The trailing edge is 1/8x3/8 and can be stripped from sheet stock or dimensioned material can be used.

To build the wing, cut out a set of ribs and wing tips. Prepare the leading and trailing edges. Place the wing plan on a flat surface that can accept straight pins. The wing is built in 3 sections. Build the center section first, then the outer panels. Cover the plan with "waxed paper" so that paper is not stuck to the balsa. Pin the bottom spar and the trailing edges to the plan. Place the ribs on the spar with the alignment shown on the plans. The ribs must be vertical. Pins through the ribs will assure they are flat against the work surface. Carefully glue (CA) ribs to spar and ribs to trailing edge. Cut and install the two top spars and glue. Each panel is built in a similar fashion with the spars left a little long where they join the center section. After the panels are built, the leading edge can be attached to the front of the ribs. Trim the spars of each outer panel to match those of the center section with each wingtip elevated 1-½ inches (dihedral is 1 ½ inches per side). The landing gear spar can now be carefully fitted. Sand the Leading and trailing edges to match the airfoil and set aside. Hanging from a pushpin on a wall is a safe place.

Tail Surfaces

The tail surfaces are flat and are built directly over the plan using "waxed paper". Other than the curved parts in the outline, 3/32 " square balsa is used. The spars on each side of the hinged area use hard balsa or light basswood. The parts are pinned over the waxed paper and plan then glued. Do not separate them until they are covered. Once built, carefully sand them using a sanding block and set them aside.

Fuselage

The fuselage is by far the more difficult to build and must be done carefully. This is the part that connects and aliens the flying surfaces and can have a great influence on the models fly ability. In general the fuselage is a rectangular box constructed carefully of 3/32" square balsa pieces. Other pieces are added to box to create the recognizable shape and features. At the same time space must be available for equipment installation and access for servicing this equipment.

Again, place the fuselage plan on a flat workspace and cover it with waxed paper. Carefully cut and pin the box frame sides to the plan and glue. Make two sides. The 3/32-sheet part that contacts the wings must be cut carefully. This piece determines the wing incidence.

If the modified nose is selected, some of the box frame is replaced by the upper and lower longerons and will be installed later.

After two side frames are completed, cross braces are added. The cross braces are shown on the top view. Start at the front and work rearward in upper and lower pairs. Be careful and make sure that the frame stays aliened and plumb.

The formers are cut and attached as shown on the plans. Stringers are installed in the former notches. The side stringer is glued directly to the frame. Sand carefully the nose and top areas that will be "planked". Plank the top first. Notice that a removable section of the top for equipment access is provided. Plank the top in two sections. Cockpit openings are to be cut later. Use pins and rubber bands to assure contact between frame and planking. The sides and button of the motor cowling area are to be planked next.

The nose block is made of two ¼ layers of sheet balsa glued together crosswise. Carve and sand to proper shape and fit.

Covering

There are many methoeds to cover a stick and tissue model. The methode used by the author has been in use for over 40 years and continues to work

well. In keeping with the light nature of the airplane, tissue or very thin silk span is recommended. Newer materials are available and may be applicable. The author selected 3-0 silk span since it as on hand.

The frame to be covered is inspected carefully and sanded so that no unexpected blemishes will show through the covering. Next the frame has a layer of dope applied with a brush. Dope the areas that the tissue is to be adhered. On the wings it is the leading and trailing edges, tips and last rib, on the tail it is the perimeter and the hinge spars. The fuselage it is the perimeter of the sides, the top and the bottom. Remember the more complex the shape the smaller the area to be covered in one piece.

Cut the covering to roughly fit the area to be covered. Wet the tissue and blot to slight dampness. Carefully position the moist tissue and remove any wrinkles. Using dope thinned to 50-75 %, brush over the frame perimeter and let dry. After dry, trim the excess tissue and do the next panel. Should a panel not please the builder, it can be removed with an application of thinner.

Keep in mind that flawless covering requires techniques that are developed over a period of time. With a light framed airplane, warping of the flying surfaces is to be avoided.

After covering and checking for warped surfaces, a coat of 50% thinned dope is evenly applied.

Assembly

The assembly is one of the tasks that is sometimes hurried. This is the time that a bunch of pieces come together to form the airplane.

Wings – Slide the tubing on the landing gear and install the wheels. The wheels are held on with small washer and CA glue.

Tail – Separate the moveable control surfaces from the stationary ones. Install hinges and control horns. Glue carefully to the fuselage making sure that everything is aliened correctly.

Fuselage – Attach windshields (can be done after painting), headrest, tail wheel. Install motor, receiver, servos and control rods. Glide tests over tall grass may be used to position receiver, ESC and batteries.

Color Scheme

The enclosed photo depicts the military color scheme used in 1937. The Miles Magister entered civilian service as they were surplused and appear in all colors. The scheme used by the Shulttleworth Trust shows the training yellow for the sides and bottom surfaces and camouflaged upper surfaces. The serial number was usually on the tail.