by GIULIANO RAIMONDI

An Italian WW II precision-scale masterpiece

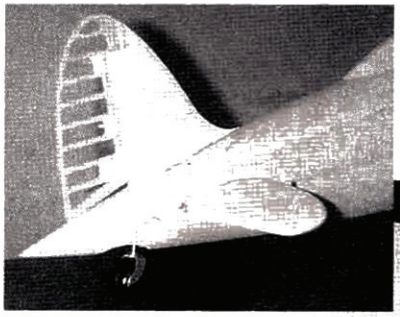
Macchi

MC.200 Saetta Fighter

THE WW II ITALIAN MACCHI MC.200 Saetta fighter was my first serious attempt at a true scale R/C model. As usual, I was unable to find accurately drawn 3-views, so I produced my own from measurements I had made of a full-size aircraft at a museum. Powered by a Webra* Speed .61 and a 12x6 propeller, my original 1/6.5-scale model had no bad flight habits. All maneuvers including spins showed no problems despite the model's small, scale tail surfaces and its asymmetrical wing design (its left wing panel is slightly longer than its right one). In the air, the model proved to be very stable despite a gross weight of almost 10 pounds that resulted in a very high wing loading. This hefty loading made takeoffs and landings especially tricky and inspired me to begin work on a second, 1/5.2-scale version of the Macchi, the subject of this article.

ITALIAN STALLION ON CAD

The plans took two years to develop and were CAD-designed. For the 1/5.2-scale model, the wingspan was increased to 79.9 inches, and all control surfaces were designed to be removable. The unusual wing-fuselage separation allows the best-possible access to the fuel tank and radio equipment. In addition, there is no visible gap between the fuselage and the Karmann (wing root) fairing. Two circular panels hide the rear wing-retaining screws, and the forward screws are accessible from inside the wheel wells. The removable control surfaces allow easy painting and repairing. The functional engine-cowl cooling flaps work with the throttle-control linkage; the two small canopy-entry doors are also functional.

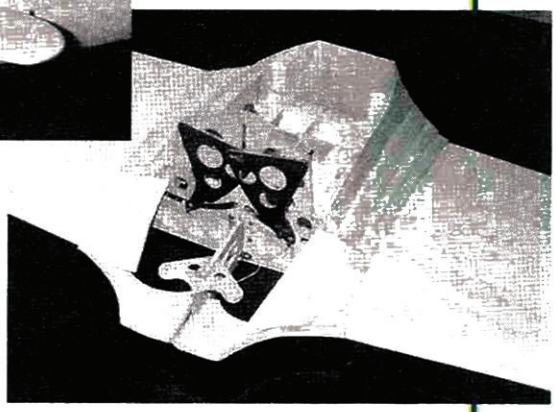


Left: the tail components are to scale and relatively small but provide adequate control and stability. Note the plywood skin on the rudder; it simulates the sheet-metal rib structure on the full-size Macchi MC.200 Saetta.

Because this project is complex and the drawings are highly detailed, here I'll concentrate only on the important details.

LANDING GEAR

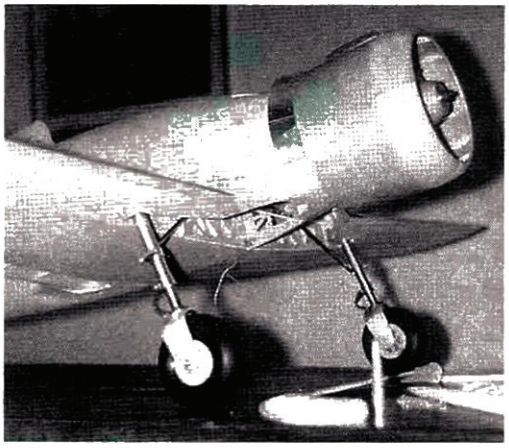
Start with the most demanding item—the landing gear; it's electrically driven and uses microswitches for travel stops. The geared motor drives two jackscrews with bevel gears; a diagonal strut that pulls the gear up is attached to the jackscrew with ball links. The gear rotates on and is supported by a long, chordwise-mounted steel tube in each wing panel. Balance springs help the gear retract into the "up" position. The struts use two coaxial springs of different lengths (the shorter one is stiffer) to absorb shock and the torque links (scissors) are functional and prevent the lower forks from rotating—an amazingly effective arrangement. I made a pair of pretty hard landings, and the model didn't bounce at all. The landing gear locks in the "up" position with spring-loaded hooks—a *must* in this kind of mechanism. The gear pistons and the rotation axles are made of medical-supply, stainless-steel tubes.



The center "wing-to-fuselage" section is built as part of the wing's upper surface—an unusual design. It houses the retractable landing gear's drive mechanism. Four bolts hold the wing to the fuselage.

Find the necessary hardware (the bevel gears are from model car accessories), then cut out of resin-impregnated fiberglass (or similar stiff material) and drill the main "triangle" that supports the jackscrew drive. If you can't machine the difficult shape of the wheel-supporting fork out of a solid block of aluminum, fashion it by bending sheet aluminum around a plywood mold, then form the conical blending between the basic fork and the circular strut base using a liquid-metal filler (J.B. Weld*). The torque links are made of Delrin plastic. The tailwheel has a double shock-absorber sys-

PHOTOS BY GIULIANO BIANCHINI



Left: the electronically driven retractable landing gear is shown here on the 1:6.5-scale version. The new 1:5.2-scale version is also scratch-built and is fully detailed on the plans. Some machining is required.

SPECIFICATIONS

Name: Macchi MC.200 Saetta

Type: 1/5.2-scale WW II Italian fighter

Wingspan: 79.9 in.

Weight: 13.3 lb.

Wing area: approx. 990 sq. in.

Wing loading: 31 oz./sq. ft.

Airfoil: semisymmetrical

Radio req'd: 6 channels (rudder, elevator, ailerons, throttle, retracts, flaps)

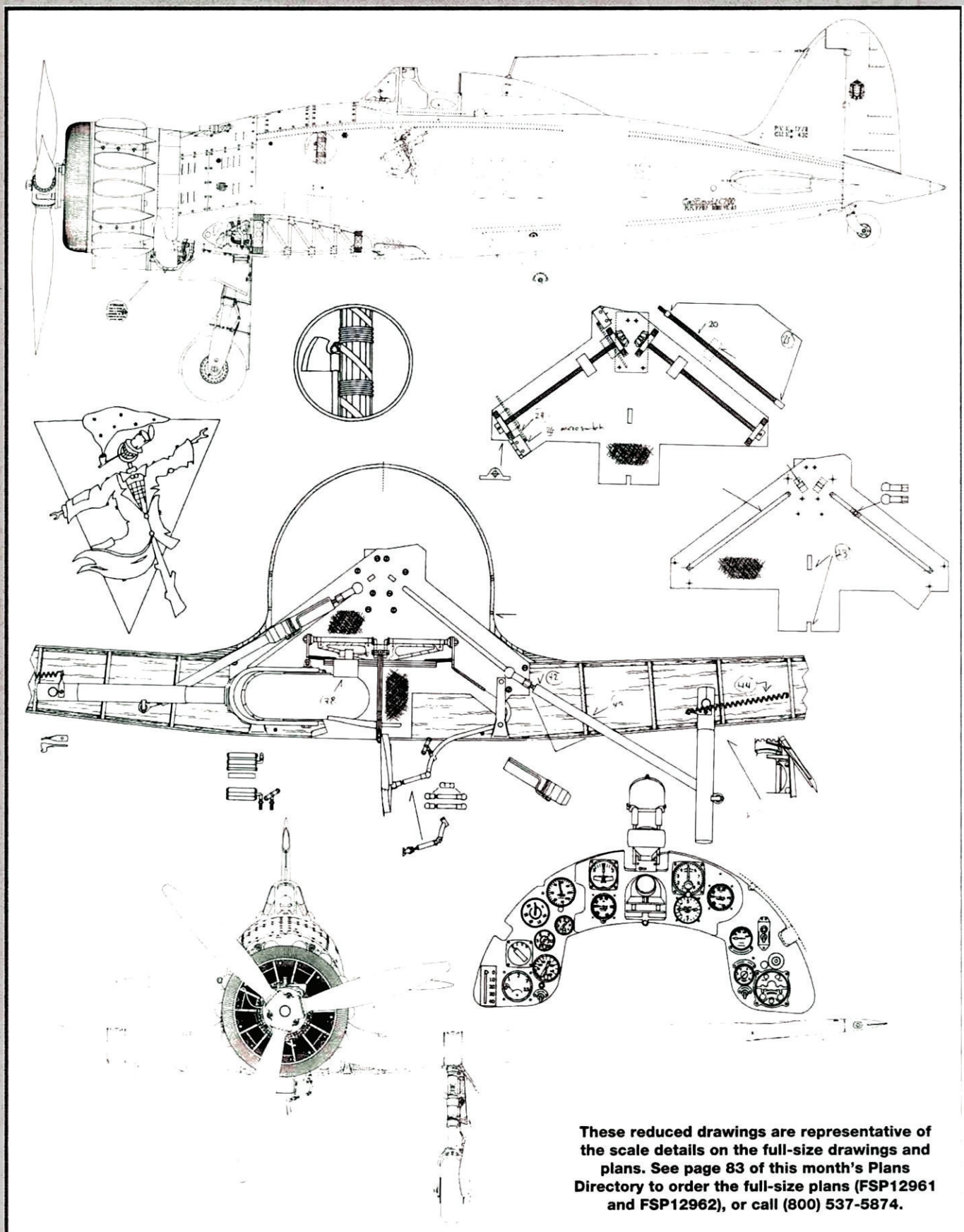
Engine used: ASP 1.08 2-stroke

Construction materials: balsa, plywood, pine, plastic, aluminum and stainless steel

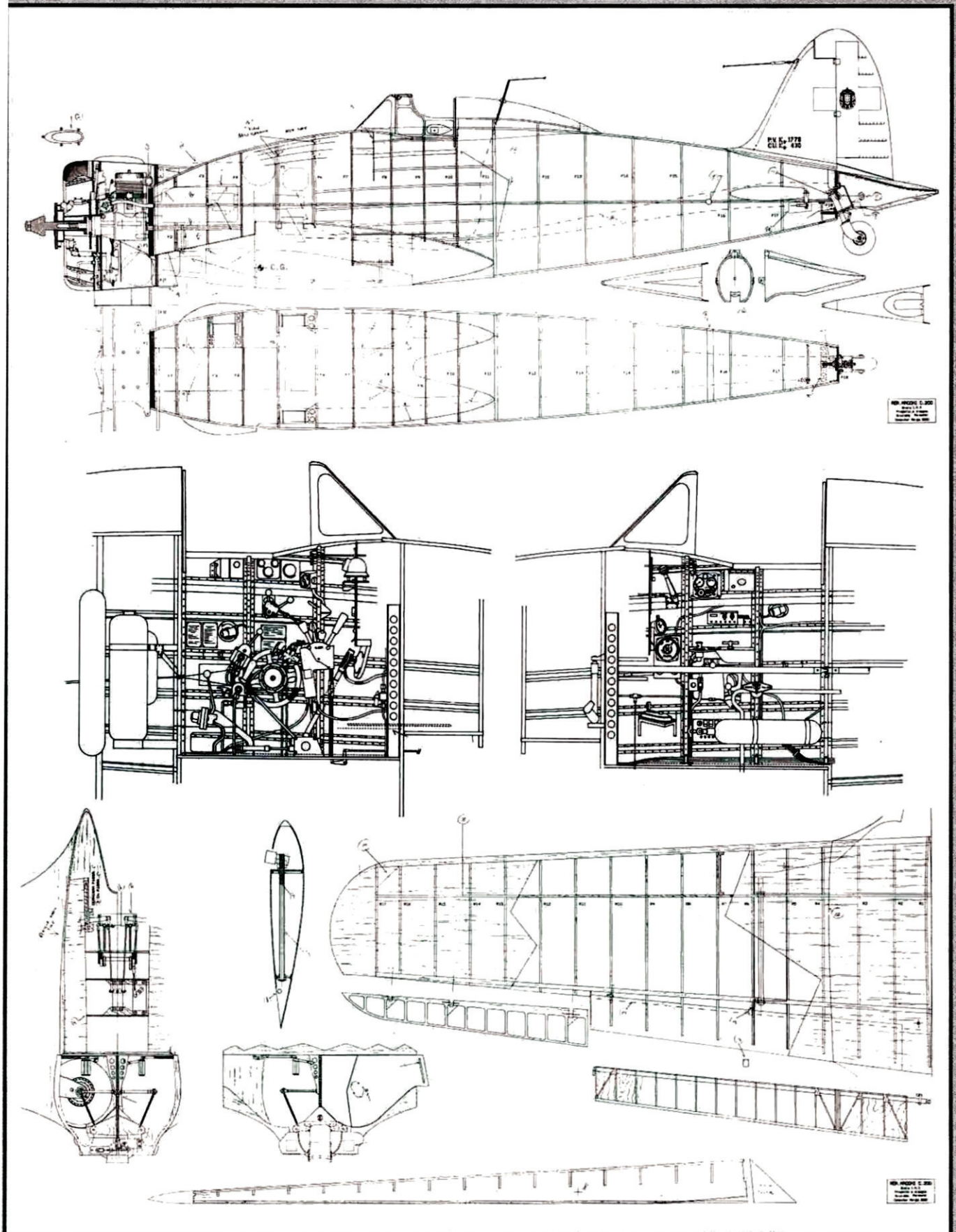
Features: the Macchi C.200 is a precision scale model of the WW II Italian fighter and is built of balsa and plywood. The fuselage is built in horizontal halves directly over the plans and is planked with balsa sheeting. The flaps and ailerons are controlled with torque tubes, and the hinging is removable and scale. The 9-page, highly detailed construction plans (FSP12961) show every piece of the model including the scale, electrically driven retractable landing gear. All scale fittings, the cockpit interior and control surfaces are shown, as is a dummy, double-row radial engine. The functional engine-cowl cooling flaps are hinged; and the cockpit doors are also functional. The wing is the same as the full-size Macchi's; the left panel is slightly longer than the right. Washout is built into the wing, and building tabs are drawn on each rib.

A set of five, full-size scale detail views (FSP12962) shows the top, left, right, front and bottom views, including rivet, screw and panel detail and insignia shape and position.

[Editor's note: more photos of the Macchi are available from Bob Banka's Scale Model Research.]*



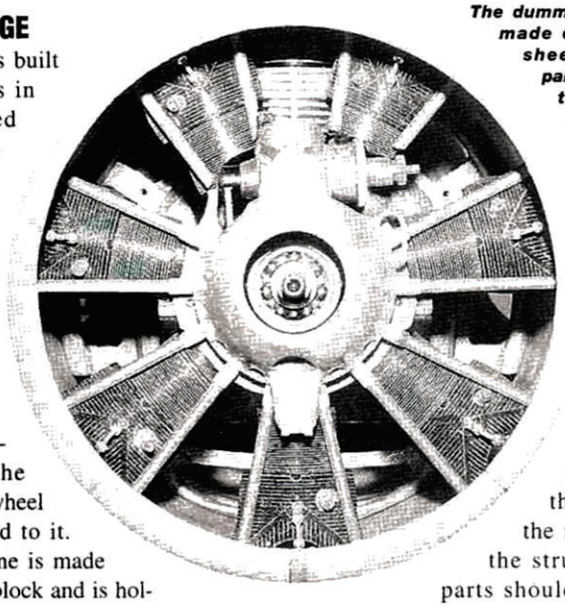
These reduced drawings are representative of the scale details on the full-size drawings and plans. See page 83 of this month's Plans Directory to order the full-size plans (FSP12961 and FSP12962), or call (800) 537-5874.



tem as in the full-size plane. You can, of course, simplify construction by building only one of the two shock-absorber systems shown on the plans.

FUSELAGE

The fuselage is built over the plans in halves joined along a horizontal plane. It's important to keep the halves of the firewall perpendicular to the building board. Former F-18 is made of plywood, and the completed tailwheel unit is attached to it. The aft tail cone is made out of a balsa block and is hollowed out as shown on the plans.



The dummy radial engine is made of thin aluminum sheet that has been painted black and has the lines scribed into it for effect. The ASP 1.08 engine is barely visible.

Apart from the cockpit interior (which I built and installed after I had joined the fuselage halves), the most annoying part of the fuselage construction is the "wing-to-fuselage" joining section; it's pretty unusual. Hoping that the plans are clear enough, my only suggestion is that you keep calm and be patient! The photos show the detail. This kind of arrangement gives the model a completely scale appearance. The radio-equipment layout shown on the plans is the best I could find; to minimize the nose-ballast requirement, keep the tail section as light as possible.

The engine shown on the plans is an ASP* 1.8. It offers a good performance-to-price ratio, but of course, you can install other powerplants in the nose with minor modifications. There's enough room to accept a 2-cylinder, 1.60 4-stroke, but some extra work on the firewall, dummy engine and engine bearers will be required.

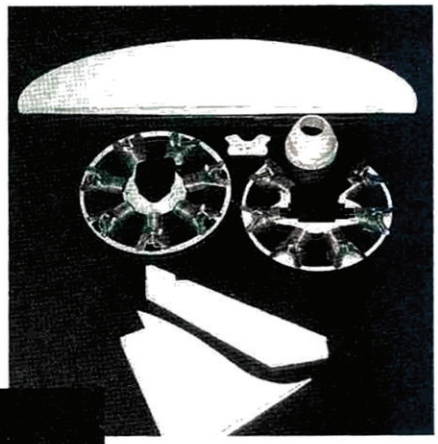
Before joining the fuselage halves, install all the pushrods and associated control linkages, including the receiver antenna-routing tube, and cut lightening holes in all balsa formers. Don't be afraid to cut these holes; the final epoxy-glass finish will add tremendous strength. If you aren't as crazy as I am, do the cockpit work now, or at least finish smooth the inner cockpit walls, and add the instrument panel.

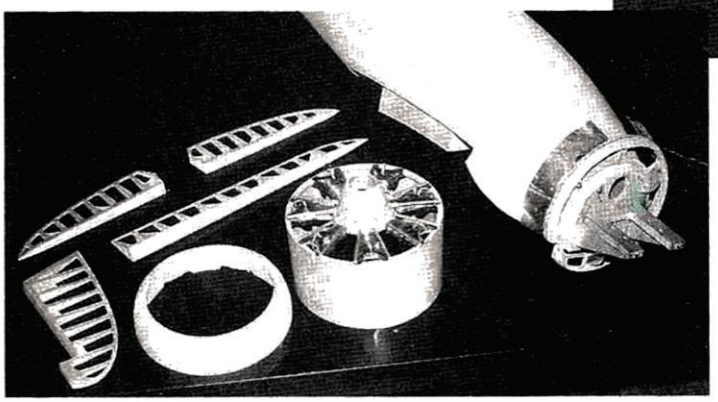
The vertical fin, rudder, horizontal stab and elevators are also built in halves; first build and sheet the top half over the plans, then add the lower half of the ribs to complete the structure. The tail parts should give no problems; their construction is typical of other scale models. The plans show all half-rib patterns as well as some cross sections. The leading edges are formed with laminated balsa. Use lightweight balsa and very thin plywood where indicated. Before you cut out the simulated rudder and elevator ribs, apply thinned epoxy to the plywood to strengthen the plywood and minimize the work needed later to seal and smooth the wood.

WING CONSTRUCTION

The wing is of conventional construction, with one exception. The full-size fighter has a longer left wing panel than the right (of course, the left aileron is a little longer than the right); my model duplicates this feature. The left wing panel has 17 ribs and the right, 16. The wing incidences are +1.5 degrees at rib 1 and zero at rib 16. The ⅛-inch-thick main spar is very easy to set up and is really strong, despite the longitudinal grain of the balsa section. To make construction easier, building tabs are included on the rib drawings. When you position rib 1, use the dihedral reference pattern provided on the plans. Note that the trailing edge of the inner section of each split flap is slightly curved, to blend into the shape of the lower Karmann fairing. The left wing panel is identical to the right, up to rib 16; then it has an additional rib, 17.

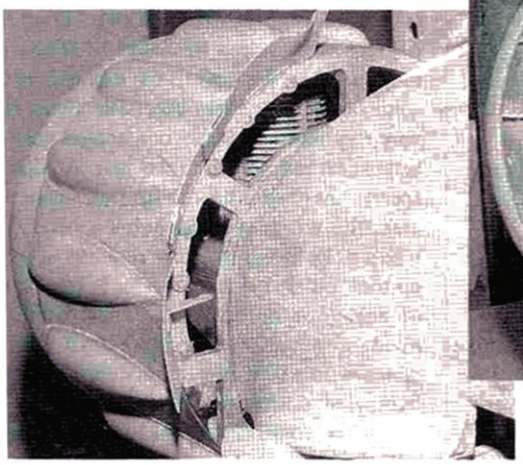
The flaps and ailerons are actuated by means of torque tubes—no visible hinges. The bases of the flaps are made of thin plywood (0.4mm). Ribs can be made of ply or plastic, but it's easier to drill the many small lightening holes in plastic. If you select plywood, be sure to apply epoxy* or CA before you saw and drill the holes. Cut the flap spar (torque tube) out of an aluminum tube. Also, cut the aileron torque tube (which runs through the flap's tube spar) out of a thin, stainless-steel medical tube. Close one end of the aileron tube with a small piece of hardwood; you will insert the fiberglass actuating arm into this and seal it with glue. Close the other end of the aileron tube with a small block of brass. Solder it into place, then drill and



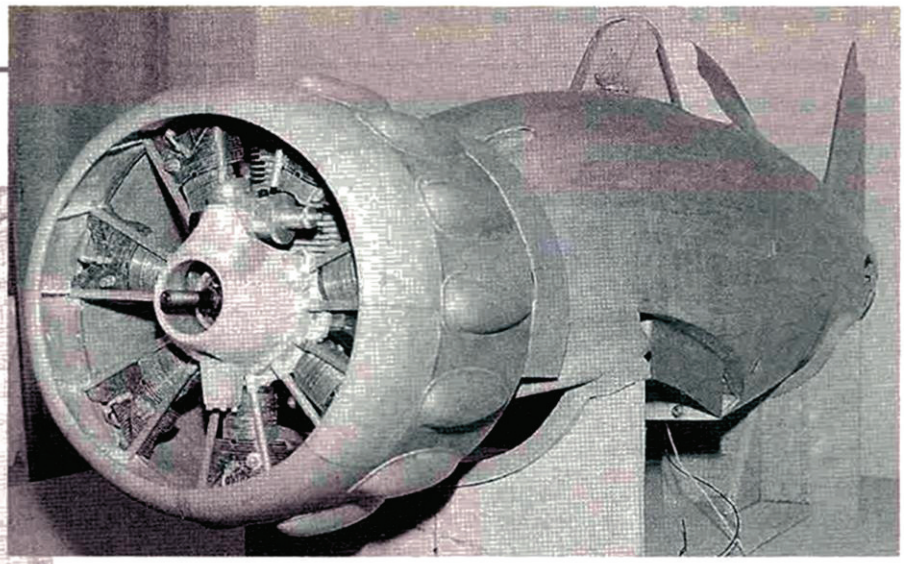


Above: at the top is the completed horizontal stab. Below it is the double-row dummy radial engine and the finished vertical fin.

Left: the ailerons and elevator are built in the same way as the rudder using plywood shims cut out to simulate the rib details. Here, you'll also see the engine-mount detail and the engine cowl with the dummy engine fitted into place on the original 1:6.5 version.



Below: the functional engine-cooling flaps are hinged; they are tied into the throttle-control linkage.



Above: the completed fuselage with the engine cowl attached. The rocker-arm blisters attached to the cowl are made by forming sheet aluminum over plywood molds. Note the gun-sight glass in the finished cockpit.

:ap it at the correct angle in relation to the actuating arm, to accept the screw that :nds with the ball-link control-linkage ittachment. It is essential that the inner ube has no play at all in relation to the outer one. Remember: there are right and eft tubes. Cut the plywood flap base, ipply thinned epoxy, and sand. Construct he hinges as shown on the plans. Cut out all ribs, and drill the holes for the torque tubes. After you insert the tube in the appropriate holes, position the ribs on the plywood base, and glue each to the base, but don't glue the ribs to the tube yet.

Slide the tube into position, and fit the hinges between the appropriate ribs. Complete the Karmann fairing, then cut the flap opening in the bottom of the wing and the slots for the forward end of each hinge. Next, glue into place the plastic doubler that holds the inner end of each tube to the false rib. Assemble the flap by first inserting the torque tube in the hole in the doubler, and then installing the two

Some of the landing-gear parts and the lower gear door. A lot of metalwork is involved.

hinges in the wing slots. When you are satisfied with their fit, remove them and apply slow-setting epoxy to the slots and to the hinges' fixed arms as well as to the tubes and the ribs. Slide the aileron torque tubes into the flap spar tube with the actuating arm on the correct side. Reattach them carefully, and align the trailing edges of the wing and the flap as well as the outer end of flap with the aileron cutout. Make sure the inner section of the flap trailing edge follows the shape of the Karmann fairing. Hold the two trailing edges together by your favorite method, and go to bed until the epoxy cures.

Aileron construction is simple, but pay attention while you position

PREWAR MACCHI

Faced with the problem of designing a new single-seat, cantilever low-wing fighter around the fairly low-powered Fiat A.74 RC.38 engine (rated at 840hp), Italian aircraft designers Macchi and Fiat came up with two fighters that looked very much alike. In fact, the superior airframe of the Macchi MC.200 Saetta (Macchi design team for this project was led by Mario Castoldi) made it the faster of the two. The prototype was first flown on December 24, 1937; although it wasn't able to match the German, French and British designs of that time, the Regia Aeronautica ordered the MC.200 into production as one of the replacements for the Fiat C.R. 32.

When Italy entered WW II, 150 were built and delivered, but the final production number was around 1,000. Most were flown with open cockpits, and the A1 and A2 versions were similar, but the A2 had a stronger wing that would carry heavier bomb loads. It first saw action in Malta and later in Greece, Russia and North Africa; its first real air opponent was the Hawker Hurricane. After seeing almost 10 years of service, it was eventually retired in 1947.

SPECIFICATIONS

Engine: Fiat A.74 RC.38 double-row radial

Span: 34 ft., 8 ½ in.

Length: 26 ft., 101/2 in.

Max. weight: 5,132 lb.

Max. level speed: 312.5mph

Range: 540 miles

Armament: two 12.7mm Breda-SAFAT machine guns

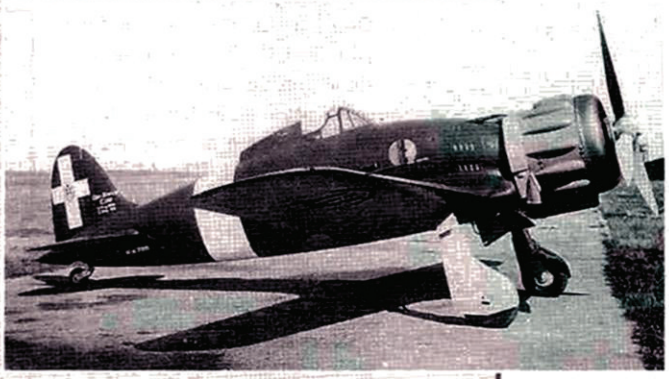
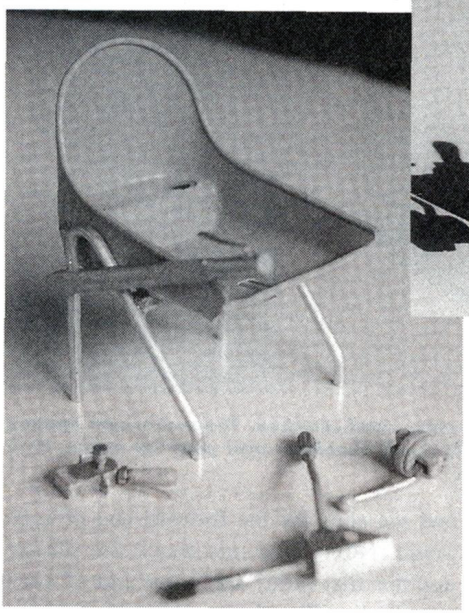
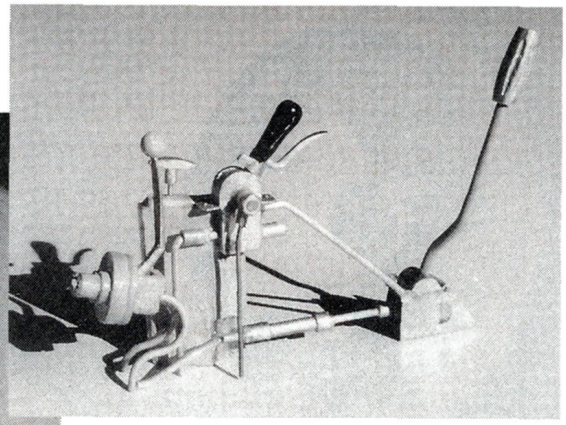


PHOTO COURTESY OF PETER BOWERS





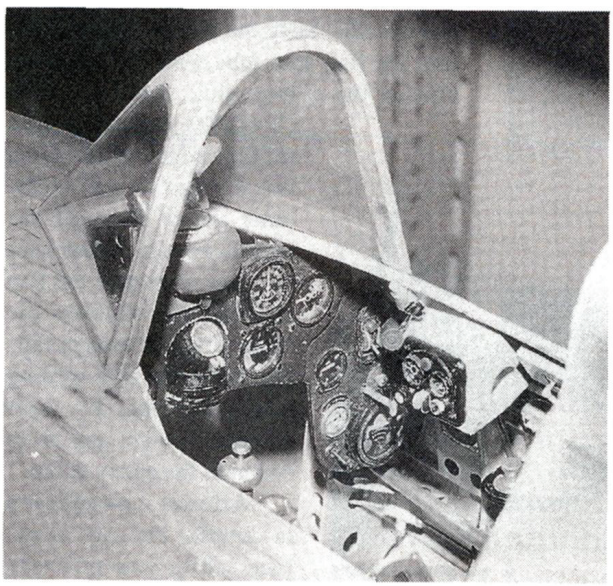
Some of the sidewall cockpit detail was built separately and then added to the cockpit after the model had been completed.

the plastic doubler at its root. The slot in the doubler must match with the actuating arm that is aligned with hinges' axis. Joining the aileron hinges to the wing is similar to attaching the flap. After the epoxy has cured, solder a small brass washer to the inner hinge pin, flush with the hinge side to prevent the aileron from moving laterally. You can make things easier by using commercial hinges for the ailerons, but I think that making those delicate, flapping things removable is worth the extra effort.

SCALE FEATURES

The engine cowl's rocker-arm blisters, cooling flaps, gear doors, canopy doors, cockpit floor, gear door support brackets, navigation-lights fairing and dummy cylinders are made of aluminum sheets of various thickness and stiffness, and they were cold-formed over wooden molds. The functional exhaust tubes are made from 0.1mm stainless steel. Except for the silk-covered ailerons, rudder and elevator, the finish is lightweight fiberglass cloth applied with thinned epoxy resin. All insignia, numbers, etc., were either sprayed on or hand-painted.

The simulated, double-row radial engine was made in two parts: the forward row was glued to the cowl, and the aft one was attached to the engine bearers. Each cylinder was made of three sections cut out of thin aluminum and painted glossy black; then parallel lines were scratched onto them with a sharp point. When they had been bent to shape, they were contact-cemented to the balsa-ply frame—time-consuming but easy and effective.



The cockpit detail is totally scale and finely appointed. The windshield frame was made of laminated wood, and the entry doors are hinged and functional.

FLYING

Don't try to fly your model with the CG aft of the location shown on the plans. The very small scale stab/elevator section requires a more forward CG than usual. The Macchi MC.200 Saetta is very stable, yet it has a quick, smooth response to every input. Of course, the model is fully aerobatic—just like the real thing! I even made it do the most beautiful spins (intentionally). On takeoff, I suggest that you use about 5 degrees of flap and be ready to feed in more right rudder than usual; this requires some tail-dragger experience. The model is very responsive and has good control characteristics, right down to the stall. At slow speeds, the model has no tip-stall tendencies; the wing washout helps a lot. On landing, lowering the gear requires some up trim; otherwise, its behavior is like that of any good pattern plane. The model needs about 20 to 30 degrees of flap, which works well in calm conditions or a light wind; otherwise, keep it clean.

For the controls throws, I would begin with these values:

- **elevator**—15 degrees both up and down;
- **rudder**—20 degrees left and right;
- **ailerons**—12 degrees up and down.

I also strongly recommend a gyro-assisted rudder for takeoff—at least for that first flight!

Giuliano's daughter Elena admires her father's handiwork.

If you want something a bit different in the way of scale WW II heavy metal, give this Italian stallion a try. The Macchi MC.200 Saetta will please even the most jaded scale modeler. I wish you all "one-piece landings."

**Addresses are listed alphabetically in the Index of Manufacturers on page 151.*

About the author

Born in Bologna, Italy, Giuliano Raimondi has been modeling off and on for nearly 32 years. He began in 1948 with small, rubber-powered models. In the '50s, he designed and built several control-line scale and aerobatic models, and in 1968, he began in R/C. He received his pilot's license in 1956, served with the Italian Air Force from '59 to '61, when he flew the Stinson L-5, T-6 Texan, T-33 Thunderbird and the Fiat G-91. From '61 to '94, he served as captain instructor for Caravelle on Boeing 727s and 747s and on MD-80s. His total flight time is more than 15,000 hours. He has also flown several sailplanes. His address is Largo Olgiata, 87 / A2, 00123, Roma, Italy; email mc2489@mclink.it.