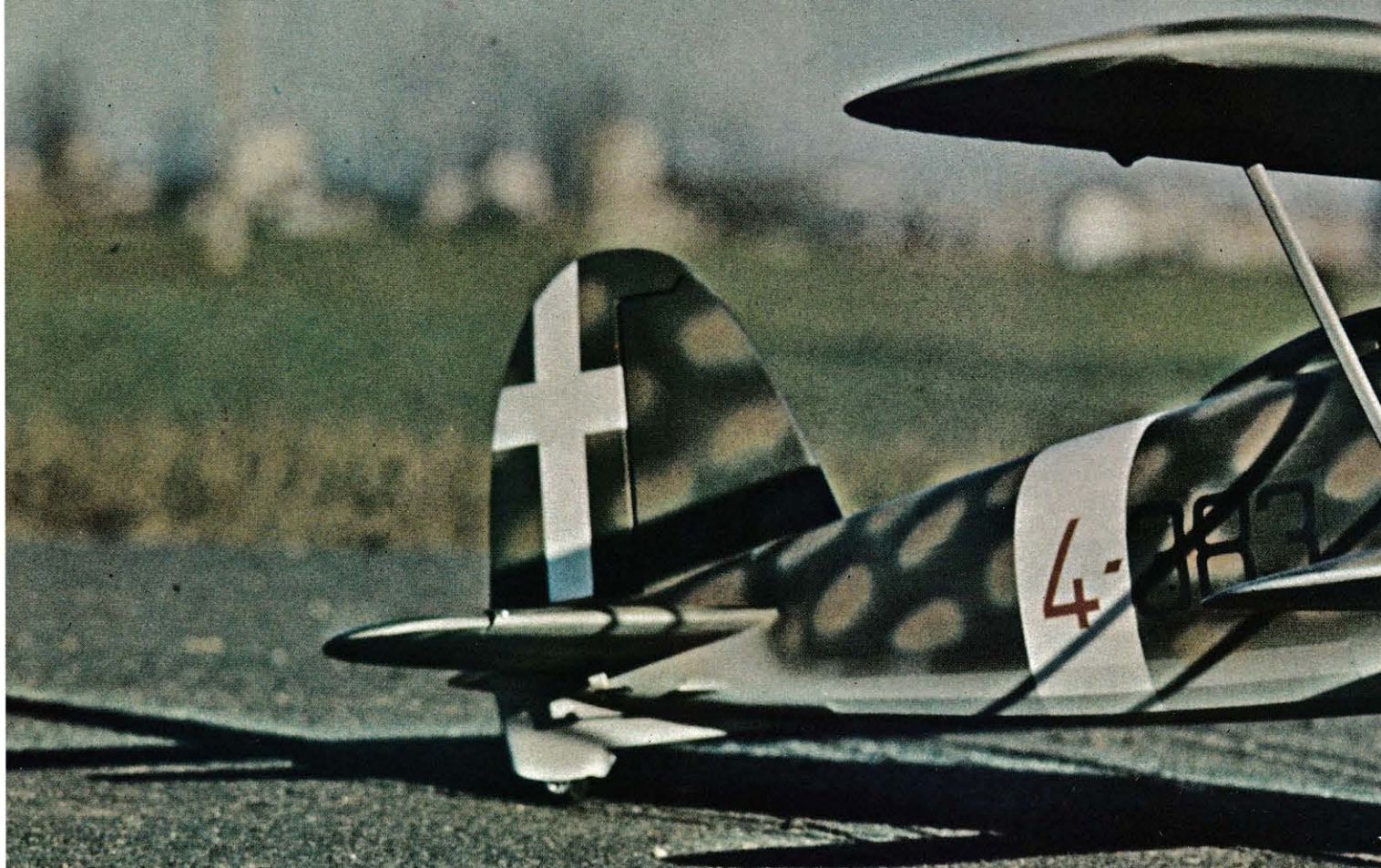
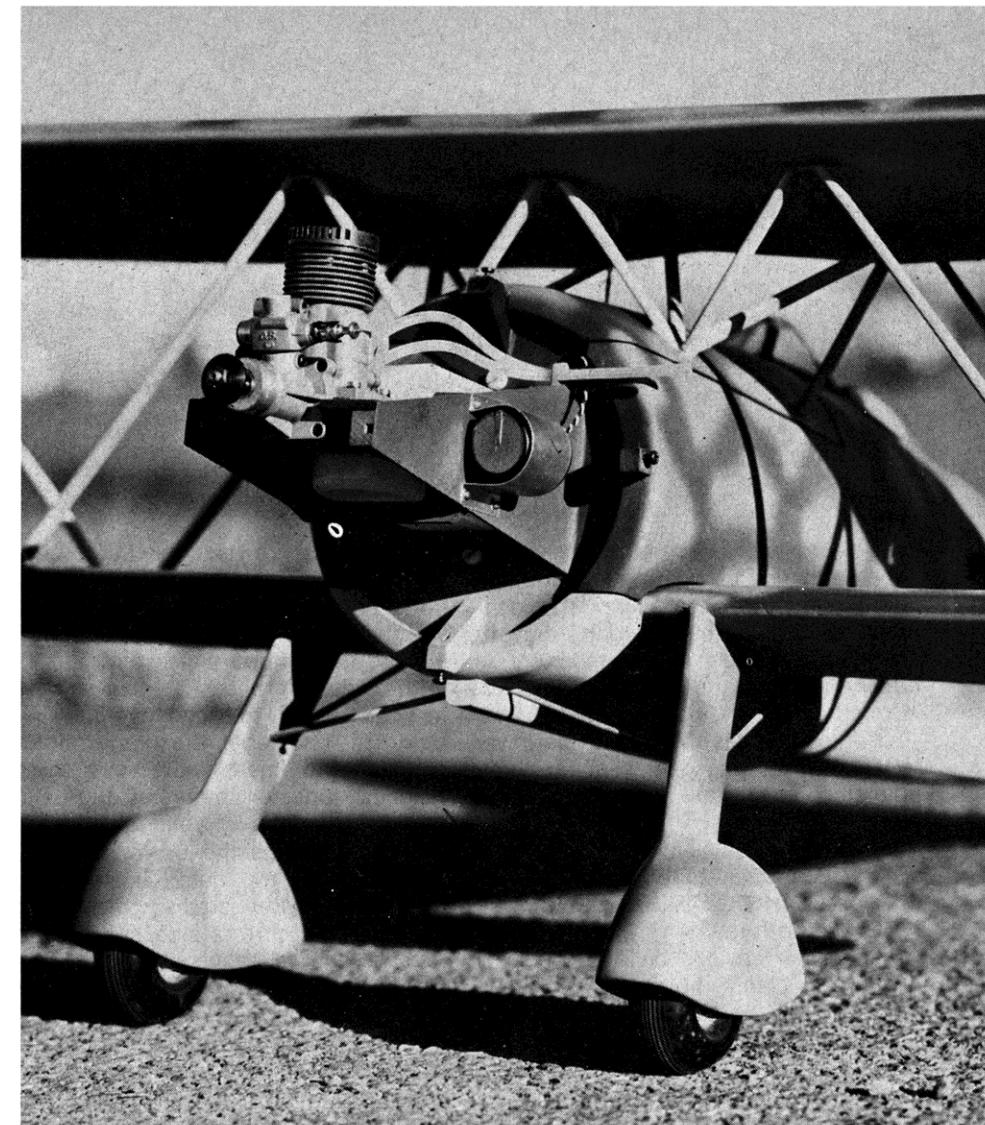


FIAT CR. 42 FALCO

(Continued on page 72)





Editor's note:

Tom Tjaarda (Tuh-jar-duh), model building aside, is one of the premier auto designers in the world. Best described as the Ford Motor Company's "Italian Connection," Tom was born in Detroit, educated in the U.S., and then moved to Italy where he has been instrumental in the design of such automobiles as Ford's Pantera as well as the current Mustang II. He is also an accomplished and sought after architect. Tom is 38 years old, a bachelor, and lives in an elegant studio apartment overlooking the Po River in Turin.

FIAT CR. 42 FALCO

During the Second World War every country involved had at least one aircraft which emerged amongst others in memory of that conflict. Paradoxically the sentimental favorite did not necessarily represent the most technically advanced machine of that era however reflected a period during which each country pinned their hopes for either dominance or just plain survival. At the beginning of the

**THE
FIAT
CR. 42
FALCO**

Staff Report
By Tom Tjaarda

Complete construction article
on the famous
Italian WWII biplane fighter.

Pacific War it was the "Jap Zero" (Imperial Japanese Navy Mitsubishi A6M2 model 21 type "O") even though later on the little known Ki.84 Hayate became an even match for the Mustang. The Messerschmit BF-109 no one forgets, but tend to forget that Germany produced the first jet fighter, the Me-262 operating for almost a year before things came to a close. Of course "England's finest hour" as Churchill described the battle of Britain brought on "the Spit" to ward off the Huns. Even after 35 years it seems that every London taxi driver of a certain age has some story to tell about that one. In America the sentimental favorite is the Mustang although Navy pilots who flew Hellcats and Corsairs will understandably argue the point. Not so prominent in Western history is Russia with their Yak, the French and their Dewoitine . . . and the Italian Fiat.

But this last one in the group is a curious one indeed for it happens to be a biplane. The Italians designed some very sophisticated aircraft during the war such as the Macchi 205

and Fiat G-50 however not enough were ever produced to bring them into prominence. But the favorite, the one people seem to remember years after is the CR.42 Falco. Even with its built in obsolescence this machine none-the-less gave a good account of itself on all fronts.

The success gained by the CR.32 in Spain had convinced the Ministero dell'Aeronautica in biplane configuration. Although a genuine war, it gave a false impression of how the big war would eventually be fought. In any case the first CR.42 lifted off successfully on May 23, 1938 from the Aeritalia proving grounds just outside Turin at the foot of the Alps. Very clean aerodynamically and using a very strong structure, the Falco was reputedly the best military biplane ever to come off the drawing boards and served well even against faster aircraft. It became in fact the Italian fighter produced in greatest number. The robust structure permitted every conceivable maneuver with a maximum level speed of 274 mph at 20,000 feet. A real pilot's airplane, until they

could get back to racing fast cars or skiing down treacherous slopes, the superlative maneuverability of the CR.42 combined all the qualities dear to the heart of the Italian pilot.

The biplane arrangement of rather notable unequal span was braced by a rigid warren-truss system, a trait used many years before the CR.42 by Fiat chief designer Celestino Rosatelli. The fuselage was a welded, steel-tube, triangulated framework of manganese-molybdenum with light alloy formers, the resulting oval section covered with metal skin forward and fabric aft of the cockpit. Basic structure of the wings was light alloy and steel with metal skinned leading edge and a fabric main covering. Ailerons were fitted to the upper wing only, fabric covered and of very efficient design. Tail unit was a cantilever monoplane in duralumin with the rudder and elevators covered with fabric. Powered by a Fiat radial putting out 840 hp at takeoff, the aircraft mounted only two machine guns of 12.7mm, and carried no radio aids.

During my years of R/C activity

many Italian colleagues often expressed desire to see their sentimental favorite reproduced in model form but strangely enough no one ever took the time to do so. True, it is not as a Spitfire and the Warren-truss wing brace system might be described as challenging, however the difficult part turned out to be making the drawings, not the actual building. None-the-less in all fairness it should be stated, even if a familiar cliché, that this model is not for beginners. The success of your CR.42 depends on light construction work especially rear of the center of gravity and can be flown very nicely on a strong 10cc engine providing that the heavy-tail-lead-ballast routine is avoided. Following instructions will help to avoid this. The final weight of the prototype (without fuel) came out to be exactly 3.72 kilograms. Being a stand-off scale model, all rib, former and longeron spacing is designed as per original. This structural system has the advantage of building up into a strong, light and interesting shape using a minimum of plywood parts.

Experience has shown that it is ad-



visible to evolve a general construction sequence so as not to waste time during each work session. The general rule is this; cut out parts only as needed so while one component is drying, other parts can be fashioned. Construction will be divided into two major sequences. The fuselage-lower wing plus landing gear sequence and the upper wing-tail group-wing brace sequence.

**FUSELAGE—LOWER WING—
LANDING GEAR SEQUENCE**

Once the formers n° 2 to n° 14 are shaped the fuselage builds up quickly over the plan. The isometric drawing shows how the half section builds up. Remember to use soft balsa for the tail plate n° 15 and medium hard balsa for the side former n° 16. Lay in and glue all stringers before turning over to complete the other side. Be careful not to let any distortion creep into the fuselage. Very few ply-

wood pieces are used on this model and when employed concentrated in front of the c.g. Before assembling the ply motor mount group and firewall it must be decided which fuel tank is to be used. If necessary cut a hole in the firewall to accommodate the tank. Cut and taper the maple motor mounts and make sure everything notches together before fixing with appropriate dabs of your favorite adhesive. Complete the basic frame by gluing in the top hatch base plates and lower wing cradle plates and shape to the correct side contours to receive the sheeting. Examine the structure for any uneven or rough spots. Shown on the plan is an isometric of how the sheeting should proceed. Start with the bottom tail cone area making a paper pattern of the approximate shape then fashion from 2mm medium soft balsa. Soak in hot water and tape to the area. Use lots of drafting tape, don't be skimpy

on this for one is going to tape it again for final gluing so get used to throwing away wads of the stuff. Only one piece can be done at a time so between operations proceed on the lower wing.

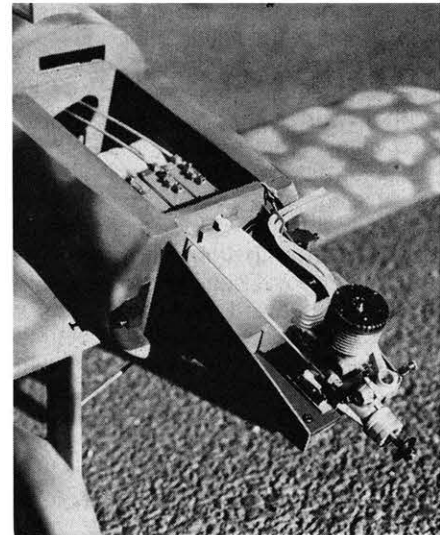
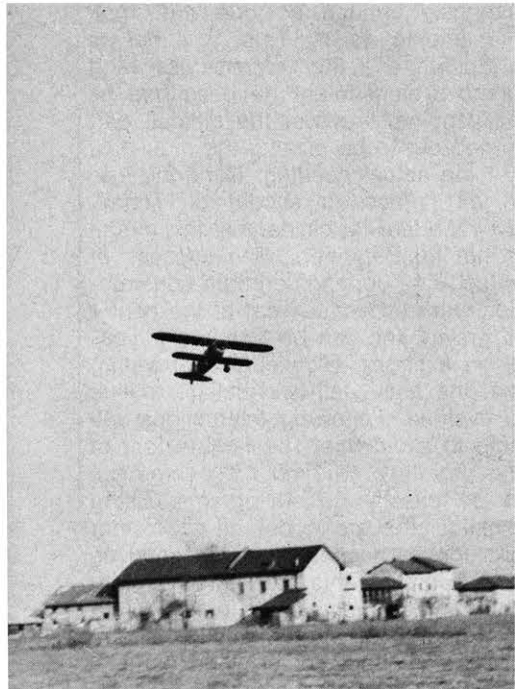
The wing ribs are spaced as per scale. There are a lot of them so use 1.5mm medium hard balsa. Cut the 10mm x 5mm beech spars (no warps) and splice to the correct dihedral shown on the plans. Cut the 8mm dihedral ply plates and glue over the splice. Glue the ply facings to the six n° 8 ribs. Slip all the ribs over the spars and shuffle into their correct location and tack glue in place. Fit and glue the trailing edges and wing tips. When this is dry lift off the plan and permanently glue the ribs to the spars.

While waiting for certain phases of the wing to dry, work on the fuselage skinning. Untape and fashion the molded balsa to the correct shape and glue down. Work from the lower tail cone to the upper deck, forward section and around to the bottom. When the sheeting is complete add the firewall balsa rings and fill in the small tail cone area. Shape and sand to a smooth contour. Sand well using cross grained motions and sandpaper mounted on a styrofoam block to absorb the slight compound curves. If you have done a good job very little filler will be necessary to hide the gaps. Add the false stringers and cut out the cockpit hole.

At this point it is a good idea to form and solder the wire base for the landing gear. Add the maple landing gear blocks to the lower wing and epoxy the landing gear structure permanently to the wing. Now proceed with the top and bottom sheeting and apply the wing-tip doublers (top and bottom). Before adding the leading edge, sand the surface which will receive this piece with a long sanding block. When satisfied then attach the l.e. and shape to final contour.

Now fit the lower wing to the fuselage making sure the fit is snug. The matching of components often distinguishes the novice from a craftsman with very little extra effort needed to make your point. When I saw Bob Wischers Emerald for the first time at the 1972 World Championships in France, it took me a half-hour to figure out where the wing separated from the fuselage. Fortunately the CR.42 is a stand-off model and being a complex configuration the whole project could get out of hand if we went to such lengths. But good fits, hinging, etc., are important.

Now where were we, oh yes, we have the fuselage, the wing with landing gear base and now we must build up the lower fuselage which completes



Detail of engine and radio installation on the CR. 42. Note how extremely clean and well organized the installation is.

Tom Tjaarda's Fiat drones off into the brisk Italian morning.

FALCO

the lower wing component—almost. This is a very simple structure of four cross formers plus a central brace, then sheeted and the firewall balsa rings added before final shaping and sanding.

To key the lower wing to the fuselage first apply a 6mm-ply facing to former n° 5 with the rectangular key-hole cut to shape. Make the key from two pieces of 2mm ply glued together and insert with a tight fit into the keyhole. Make a mask of wax paper around the keyhole so when gluing the wing component to the key the whole thing is not glued up to the fuselage. Add the front bolt-down plate n° 33 then drill through this and the firewall and tap for a nylon bolt of your choice.

To complete the landing gear build-up using soft balsa pieces shown on the plan. Use 5mm soft balsa core on the legs with 3mm balsa inner and outer plates. When building the wheel pants first secure a hard balsa base plate to the wire leg using a couple

When the stabilizer is complete, slip through the fuselage opening. Easier said than done right? Right, actually some careful handywork will have to be done here to open up the hole just right on the skinning. Do not glue this in yet, however make sure everything lines up true; fuselage, lower wing, stabilizer and fin.

Assuming that everything has gone well up to this point we have only one major building operation left, the wing brace system. Start by cutting the poplar ply hatch cover to proper shape then tape to fuselage. Next make a wood jig, for the correct wing incidence angle, that rests on the hatch cover and cradles the wing in the correct position. Form two cabine support wires from 2mm diameter wire bent to the proper angle (see plan) then secured to the hatch plate with clips, but do not epoxy yet. Tack glue the jig to the plate and set-up the top wing in a level position. Cut off an approximate length of beech wood (10 x 5mm, same as spar material) and drill a 2mm hole in each end. Shape the top wing hold-down wire to the proper angle and slip everything together to see how they match up. They won't of course so fiddle with the strut length and wire

wing and do the inter-wing struts; cutting, drilling, fitting, fiddling, fitting again, and again, then epoxy. One word of advice; make sure to shape the struts to their oval cross section before epoxying. With the truss complete build up the fuselage section upon the hatch plate in the same manner add the lower wing and key to the fuselage, again as the lower wing.

At this point the detail items can be constructed. These consist of the head rest, cowl supports, oil cooler air duct, windshield, tail wheel assembly and rudder fuselage fairing. Do not use solid pieces of balsa on these items should be covered first before last two items, make them light. Except for the cowl supports, the other permanent gluing to fuselage. Align the spun aluminum cowl and drill the four hold down points. Mark off and cut in 16 cooling flaps and adjust to slightly open position. This proved to be important since blocked air inside the cowl resulted in engine overheating.

RADIO AND ENGINE INSTALLATION

The boden-wire leads should be placed in the fuselage at this time and the radio equipment installed. Radio types and dimensions vary so the general rule is this; place the three fuselage servos side by side as close to the firewall as possible. Mount the receiver wrapped in foam under the servos and held in place by the lower wing. Strap the battery onto the motor mount as far forward as practical. The elevator is relatively big and proved to be very sensitive so a movement of plus or minus 8° is enough. The rudder left and right 30°. The ailerons proved to be sensitive but its good to have a little extra for takeoffs and landings so plus or minus 15° for these.

Mount the engine using hard 5mm ply or aluminum plate tailored to your engine and screwed to the maple bearers. Make two wedges to angle the engine thrust line minus two degrees.

COVERING AND FINISHING

This part is usually left up to the individual's "favorite method" system however if you have one, make sure it is light. It may seem that I emphasize the weight factor a bit much because the aircraft may even fly a bit better with another half kilogram added. However concentrating that weight at the center of gravity is one thing, hanging an unnecessary gram on the tail means counter balancing in front of the C.G. and eventually contributes to sluggish handling. Since the surfaces are rather vast aft of the C.G. lots of covering material and paint are needed. Some of the films

may be the answer, however I personally prefer lightweight Japanese silk for a scale reproduction of this type.

If you decide on the latter, brush on a couple of thinned out coats of clear dope, sand lightly and add a couple more thicker coats. At this point it might be appropriate to take photographs of the structure. The CR.42 builds up into a rather pleasing sculptural form and I have learned that balsa structures are more photogenic with a slight sheen. The fuselage can be covered with one piece of silk, slightly damp to adhere to the doped wood, and wrapped around the stringers to join down the top center line.

Fill the pores of the silk making sure there are no pinholes before spraying on a thin coat of grey auto primer. One coat of primer is enough, only retouching certain areas if necessary. Profile magazine No 16 was used to scale up the drawing for the CR.42 and presents interesting variations for coloring. Pactra military flats were used on the prototype model and cover well.

FLYING

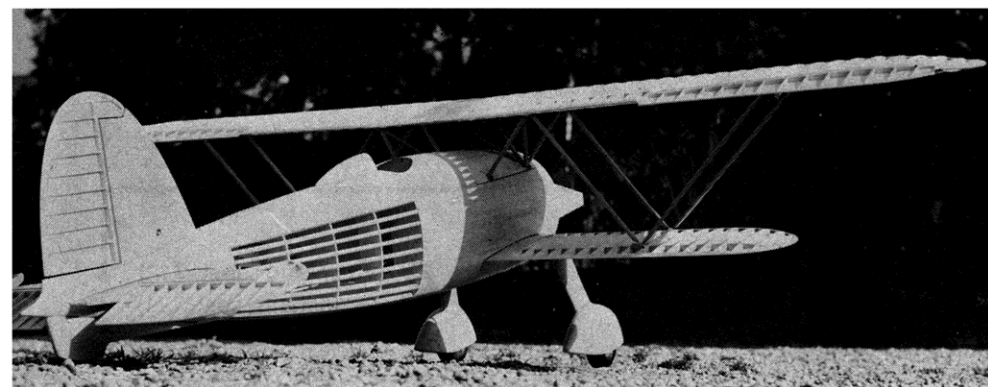
Our flying site in Turin is situated in an isolated corner of the Aititalia field which many years before served as the proving ground for Fiat prototypes . . . our CR.42 included. The field is now dedicated mostly to sailplanes and sky-diving activities. To the south are the charming hills just across the Po River which can be compared to the Piedmont Region of San Francisco. Towards the north are the Alps which on a clear day seem within walking distance. One such fine day was June 5, 1975, already hot at seven in the morning, so the completed CR.42 model was taken to the field along with Fausto, the photographer, and Oreste, the engine specialist, and myself, the pilot. Exactly 37 years and 12 days after the original event we were ready to go at it again, at the same place, even if a bit more modestly . . . naturally.

To be sure I had a few doubts about the model's flying abilities. While watching Oreste peak out the engine I thought how small those ailerons looked and that huge cowling with the 14/5 prop just peeking out over the circumference. The c.g. had landed a shade back of the 30% upper wing cord, maybe I should have eaten crow and added a little ballast. Soon find out, however decided that the best "method" for takeoff was to yank it off the ground, that is full throttle and a little shove. Oreste had peaked out the engine without the cowling but now it didn't seem to peak out with it in place. Finally Oreste turned to me

and I could read his thoughts. In any case he gave a nod and in seconds the CR.42 was airborne and twisting off to the left.

My skepticism proved to be a bit naive for the controls actually were dangerously over sensitive. I had a hard time controlling the plane for any elevator movement would jerk it up and down while aileron responded to slight stick pressure. I throttled back for it was zooming around at terrific speed on the un-muffled H.P. engine. The lower speed made it a bit more manageable . . . but not much. But I knew that the model was a winner, one can always tame an animal

ments made, it took very little trimming out. The controls were still a bit peppery but decided to leave them so. Throttling back for scale speed reduced this sensitivity however the model must be flown with a delicate touch. Jerky movements resulted in a couple snap-rolls which is rather unsettling for the nerves besides putting undue stress on the model. The model has since gone through fifteen flights and flown loops, slow rolls, Immelmans but has yet to spin. Flying characteristics from model to model will vary naturally but being a large model its final weight of 3.72 kilograms permits a lot of performance. Perhaps



aluminum scrap clips and epoxy. Attach the wheel and build up using soft balsa sections then cover with a piece of 5mm medium hard balsa epoxied to the hub for added support. Shape and sand to shape then fair the leg wheel pant joint using a bead of epoxy.

UPPER WING/TAIL GROUP/ WING BRACE SEQUENCE

The top wing builds up the same as the lower wing the only difference being the insertion of ailerons. The ailerons, elevators and rudder all use the same construction method, that is a 2mm soft balsa base with medium hard balsa riblets to simulate the actual CR.42 construction. The only word of warning for the fin and stabilizer construction is to use very light balsa. The stabilizer spar however should be made of medium hard balsa.

Another view of the framed up model before covering. Construction is the same as on the actual aircraft so that all ribs and stringer are as per scale.

angle until they do. There is no short-cut method for this and although not really difficult, just takes a little patience. When the upper wire matches the hold down block on the wing, make a clip from thin brass stock and screw into place. When one is satisfied with the fit, lay aside and complete the other three outward slanting struts. This will probably take a whole work session, or two, to accomplish but with the happy thought that the worst is over. This assembly can now be epoxied into position. When the epoxy is set the wing can be unscrewed, the wing jig discarded and the truss system completed. Complete the central part first, then mount the



Author Tom Tjaarda with his Fiat CR. 42. Model weighs in at 8.8 pounds ready to fly.

but putting spunk in there was something else. Not daring to bring it in close for Fausto, the photographer, I decided to land it. The glide was flat and pretty with the engine just a shade over minimum, then touched down coming to a halt with a ground-loop. The flying was over for that day.

The next time around was to be more convincing. It took off with slight right rudder/trim and down elevator trim. With all the necessary adjust-

more weight (at the C.G.) would make for smoother control however there is a lot of surface to push through the air so a larger engine would probably be needed. Just flying around in circles gets rather boring unfortunately this is often the fate of large models. Right rudder trim, is always used for takeoffs then taken out in flight. One modification I would consider is a steerable tail wheel. Just watching the model maneuver on the ground in preparation for takeoff helps generate suspense. The Italians have a knack for designing fascinating machines, and watching the CR.42 do its thing is a treat I highly recommend.