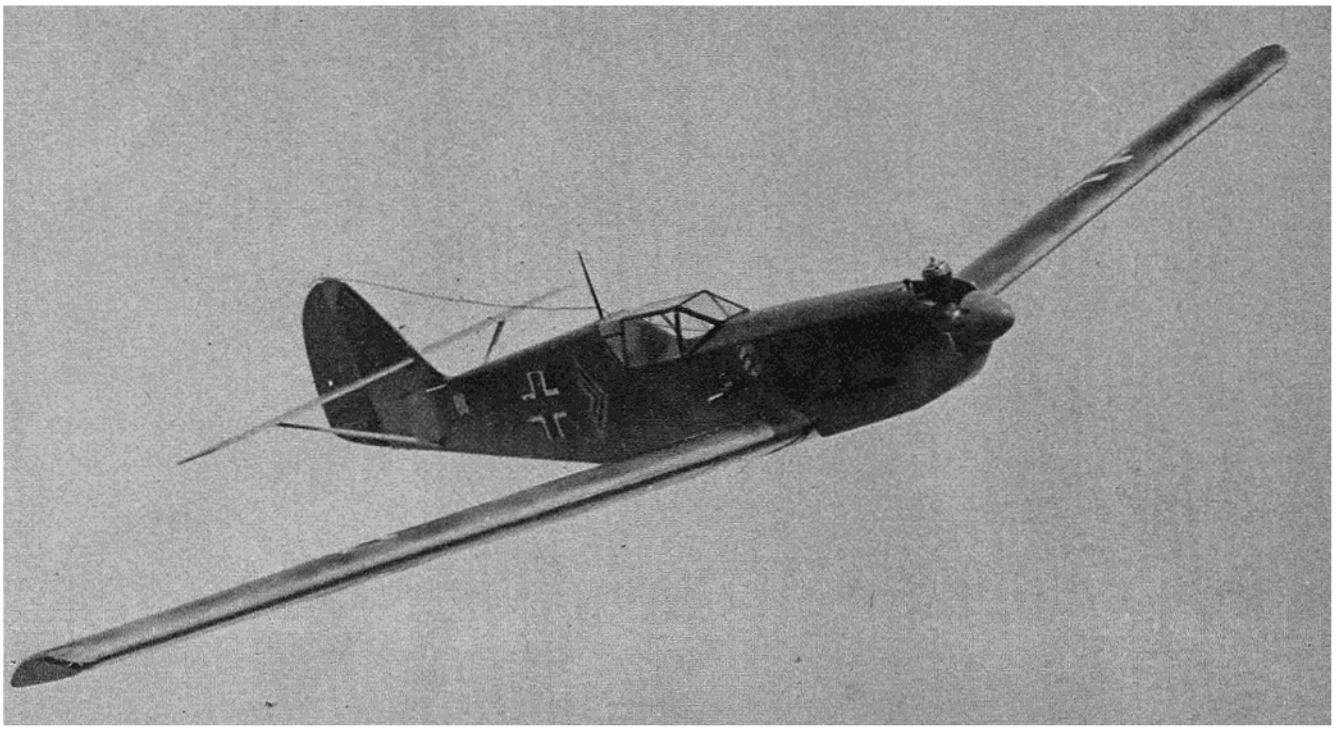


The Messerschmitt BF-109, one of three Warbirds you can build from a single plan.

WARBIRDS

BY ROMAN BUKOLT

Three variations on a single design, these 'Weekend Warrior's' are intended for a Cox .049 and single or two channel proportional. Ideal for schoolyard or vacant lot flying.

Three variations of a single design, intended for use with a Cox .049 Baby or Golden Bee and Ace Pulse R/C radio, the Warbirds are stable, docile and easy to fly. But, put a TD .049 in the nose and a small 2 channel radio in control of the ailerons and elevator and it's "The Battle of Britain" all over again!

"In an era of full-house Digital Systems, single channel system sales have hit an all time high." Quoting the lead sentence on page 6 of the December issue of R/C Modeler Magazine, the article on Pulse Proportional points out that more amd more modelers are returning to the small compact aircraft that can be flown from school yards, small fields, and vacant lots after work and before supper, by nearly any member of the family. Many flyers enjoy the simplicity and economy of single channel proportional flying, totaling up hundreds of hours of flying time where they would normally have logged only a few hours on their big expensive .60 powered craft with all their necessary pre-flight checks and adjustments, large selection of accessories required, and the larger and, often more distant, flying field. Then too, the small single channel aircraft is mighty nice to bring along as a back-up plane on those weekend flying sessions when you "prang" the big one.

In keeping with the trend towards small, uncomplicated, easy-to-build-and-fly aircraft, we bring you the "Warbirds." Basically one single design, the builder has the option of constructing the Messerschmitt BF-109 (Me-109), the Hawker Hurricane Mk IIc, or the North American P-51 Mustang either 'B' or 'D' model.

Designed around the thoroughly tested and proven Ace foam wing, the Warbirds proved to be as easy-to-build, trim, and fly as any high wing trainer. In addition, they offer scale-like realism in a relatively untouched area of small model design, that of low wing retracted gear, WW II fighter aircraft. No, the models do not have retracts! In fact, they have no gear at all! Models this small are normally hand launched anyway so landing gear would serve no useful purpose.

The aircraft looks quite clean in the air and every flight ends in a "Combat Mission" type belly-in landing. As flights are accumulated, minor repairs are inevitable, wear and tear of hard use begin to show on the airplane and, unlike other models, the Warbird takes on an even more scale-like "battle worn" appearance.

Once test flown and properly

trimmed, (which should always be done in the biggest field available), this model can comfortably be flown in the average school yard or large vacant lot.

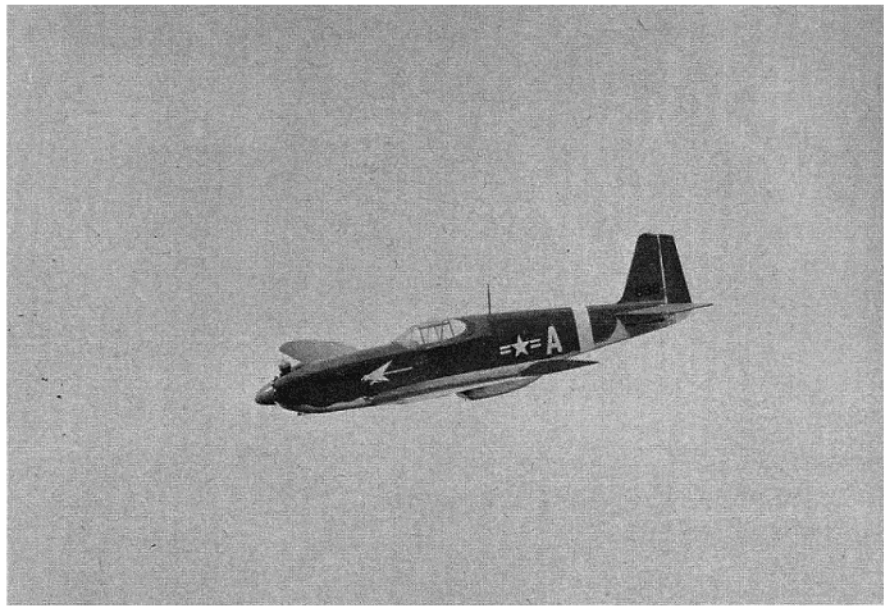
If you're the proud owner of the new very small Ace Digital Commander two channel airborne pack, or one of the other fine small digital systems, with a little careful planning and fitting you can install two channels for rudder and elevator or strip aileron and elevator controls. Weight is no problem. With a TD .049 in the nose, you'll have a "hot" fighter that'll give a A/2 pylon racer a respectable chase.

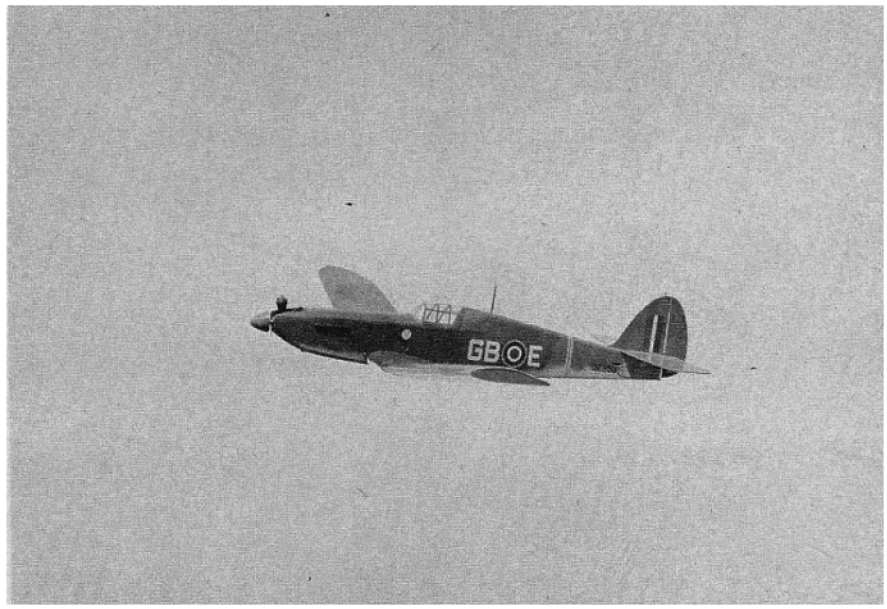
During the development phase of the Warbird design, eight prototypes were built by three modelers. Five of these were controlled by Ace Pulse R/O systems, two carried the Ace two channel system and one contained a two channel MRC system. The R/O models averaged 17 oz., the Ace two channel models, one with ailerons, weighed 22 oz., and the two channel MRC model weighed 28 oz. All models performed well. In testing the prototypes a number of design parameters were arrived at and should be closely adhered to, especially if the model is being built for pulse operation. These specifications are incorporated on the plan. I'm referring, particularly, to dihedral, angle of attack of the wing, angle of incidence of the stabilizer, Center of Gravity, and angle of the thrust line of the engine. A lot of adjusting was done between flights to arrive at these parameters and I believe if they're followed carefully, very little trimming will be necessary in order to have a fine flying model.

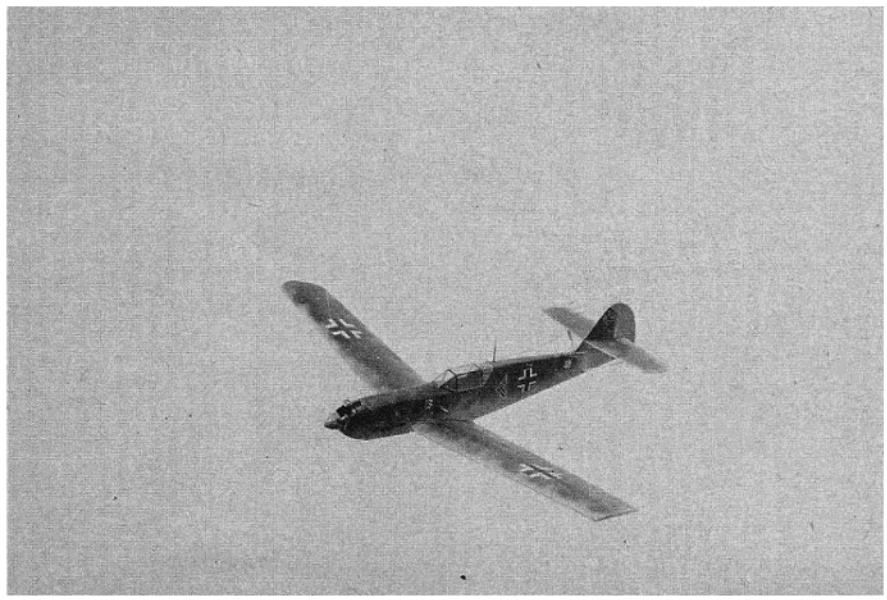
To build one of the three designs you're going to need the following materials:

3/32" x 4" x 36" med. balsa - 2-1/3 sheets
1/2" x 2" x 36" med. balsa – 1/3 sheet
1/4" x 2" x 36" med. balsa – 1/2 sheet
1/32" x 1/4" x 36" med. balsa – 1 stick
1/8" dia. x 36" dowel – 1/3 dowel
1/8" x 6" x 12" ply – 1/6 sheet
1/64" x 6" x 12" ply – 1 sheet

If the 1/64" plywood is not readily available, 1/32" ply can be substituted for fuselage doubler use. In addition to the wood, you'll need: 1 Ace Foam "Warbird" wing, complete with special balsa trailing edge stock and instructions for assembly and finishing; 1 Cox .049 Baby Bee or Golden Bee engine (a Kavan Tank Extender can be added to the Baby Bee for a longer engine







run.); 1 set 5–Minute Epoxy; Titebond cement; Dope; 26" x 24" piece of Topcote or Solarfilm covering material; control horns; hinge material and decals; a 1-3/8" diameter Williams Bros. spinner is shown on the plan and if you care to go one step further, install a 1" scale Williams Bros. pilot. Then, if you wish to build the 'D' version of the P-51 you'll need a 9" Sig WW II canopy. The other three designs require a 4" x 6" sheet of .075 – .010 thick Acetate.

All of the above material (except the wood) is available from Ace R/C Inc., Higginsville, Missouri 64037, if your favorite hobby shop does not stock it.

For added realism, KRD Products has just come out with a Camouflage Sheen additive to dope to provide a flat finish. I haven't tried it yet but you can be sure I will. It, too, is available through Ace R/C.

Before beginning construction, study the plan carefully. You'll notice that all three designs use the same formers, the same construction techniques and are essentially the same plane modified three different ways.

Probably what turns most would-be scratch-builders off the quickest is the problem of parts layout on the wood. It's not all that difficult. You'll need a fine line ball point pen such as a yellow or white Bic, a straight pin, a ruller or straightedge, a triangle or protractor, and a couple sheets of tracing tissue.

In addition, what would be a big help, would be to trace the foam wing airfoil section shown on the plan, on a piece of clear acetate, (such as the material you'll use for the canopy) using an X-Acto knife. Bend the acetate on the score line and the airfoil template will snap out of the sheet. You will find that most of the curves on all three designs were made using the airfoil and this template comes in very handy in laying out the pieces of wood. For the fuselage sides, place the balsa sheet under the plan, aligning the end of the sheet with the corner marks on the drawing. Then, with the straight pin, pin-prick the fuselage outline through the plan into the wood. Remove the sheet and connect the "dots" with the straightedge, curve, and ballpoint. For the remaining small parts, I'd recommend tracing them on the tracing paper and then pin-pricking onto the wood for ease and accuracy of layout. Notice that the grain direction is indicated on each part by the double pointed arrow heads.

A wing saddle and stabilizer tip will fit nicely in the cockpit area of the fuselage side layout. In the remaining space on one fuselage side sheet, you can fit the fin, rudder, F-3 and F-4. Use the remainder of the second sheet for the fuselage bottom covering. One third of the third 3/32" x 4" sheet is required for the stabilizer, and if you're cutting all three designs, all three stabs can come from this sheet.

If you lay out the Me-109 fin, notice that the shaded area of the stabilizer outline is a slot cut in the fin. The angle of the slot relative to the bottom edge is important and should be plotted carefully.

Cut the right fuselage side 1/8" shorter at the firewall than the left fuselage.

Cut the ½" x 2" cowl block at the correct angle at the instrument panel end, and leave perhaps an extra 1/16" overhang at the firewall end. No need to worry about angles, just saw it off. The same goes for the ½" nose bottom piece. Leave a little extra at the firewall end.

As you can see by the plan, construction is quite simple and conventional, however, if you follow the sequence suggested below, you might save a little time and avoid any trouble spots.

1. Cement fuselage doublers to fuselage sides using contact cement or 5-Minute Epoxy. Remember, the right side is the shorter one, so be careful to make sure you are applying the doublers to the inside surfaces of the sides. 1/64" plywood is very strong and yet can be trimmed with scissors so that you can cut the pieces oversize (except along the F-3 edge), cement in place, and then trim off the excess with scissors. However, if 1/64" ply is not available, 1/32" can be used.
2. Place fuselage sides over the plan and mark the locations of F-2, F-3, and F-4.
3. Cement wing saddles to each half of fuselage.
4. Cement F-2 former to the right fuselage half after checking for proper fit. Make sure it is square (perpendicular) with the fuselage surface and butted up against the front edge of the wing saddle.
5. This next step may sound a bit confusing so read it carefully. The object here is to tape the two fuselage sides to the top block, hinge fashion, then apply cement, "fold the assembly together," and tape "shut." (See assembly photo.)
   a. Position ½" x 2" cowl block on top edge of right fuselage half, with the front edge extending 3/16" beyond front edge of fuselage side and secure with a piece of masking tape along the joint.
   b. Align the left fuselage side with the rest of the assembly. Front edge of wing saddle should press up against F-2. Remember, the left side is longer so don't align the firewall edge of the left half with that of the right half. Here again, secure the left side to the top block with a strip of masking tape along the seam.
   c. Now you should be able to "unfold the assembly" as shown in the photo. Apply cement to all the mating edges, fold back together and hold with masking tape across the bottom of former F-2.
6. Cement the 3/32" x 1/4" brace into the notch cut in wing saddles. This piece should be cut the same width as the former F-2.
7. Pull the tail ends of the fuselage sides together, sandwich a piece of 3/32" stick in between, temporarily, but do NOT cement. Tape the tail together. Check the alignment, looking down at the top and forward from the rear.
8. Cement the cross braces to top and bottom of F-3 and F-4.
9. Position F-3 and F-4 between the fuselage sides, align with the marks made earlier, and trim the excess length off the bottom edges. Cement in place using masking tape to hold the fuselage sides, bent to conform to the curves of the formers.

While the fuselage assembly is drying, the stabilizer tips can be glued to the stabilizer, and the rudder post cemented to the fin (unless you are building the Me-109).

The Me-109 requires a slightly different approach. After the stabilizer tips are cemented on, slide the stabilizer into the fin slot, cement, add ¼" triangular fillets, and check for squareness of the assembly. Then, cement the rudder post to the fin.

Sand the top edge of the fuselage, from the cockpit to the tail, straight, smooth, and flat. Lay the fuselage upside down on a piece of ¼" balsa and trace the fuselage top piece outline. Notice that on the Me-109 the piece extends all the way to the tail end, whereas on the other two designs the piece stops at the leading edge of the stabilizer. Cut the vertical fin slot in the piece before cementing to the fuselage.

The nose bottom block is next. Cut to size, allowing a little extra extending into the firewall area, fit, and cement, unless you wish to make this piece a removable hatch. This would be handy if you plan to use a plastic bottle tank such as the Sullivan SS-2, 1 oz. Slant-top Clunk Tank. Construct the hatch after the firewall is installed.

Prepare the fuselage assembly for the firewall by sanding the front end flat and at the right angles to provide the necessary right and down thrust. Probably the simplest way to do this is to lay a sheet of sandpaper on the table, stand the fuselage on its nose, and "rub" it on the sandpaper until all the edges make contact with the paper.

Drill 1/8" engine mount holes in the firewall, press 3-48 blind nuts into the holes from the back side, and dot the flanges with a bit of epoxy, taking care not to get any epoxy into the threaded holes. Notice, on the plan, that the mounting holes are off center, so that with the right thrust, the propeller will still be positioned on the fuselage center line.

You are now ready to mount the firewall. Check the fit first to make sure all edges make contact. Up to now, no carving has been done on the ½" balsa top block, therefore take note, as shown in the side view on the plan, that the top edge of the firewall will be about 3/16" below the top edge of the ½" block.

If you plan to install a bottom nose access hatch, drill two 1/16" holes through the firewall as shown on the plan, place the previously fitted ¼" balsa hatch piece in position, and insert a round toothpick through the 1/16" hole and into the balsa so that it penetrates ½" into the ¼" balsa hatch. Cut off the remaining portion of the toothpick flush with the face of the firewall and carefully remove the hatch. Needless to say, the toothpick should fit fairly snug but not tightly in the firewall hole. The toothpicks can then be removed and cemented back in. Add the hatch retainer block to the former F-2 and install the hold-down screw.

The nose block can be built a number of ways. Decide whether you wish to mount the engine upright, side mounted or inverted. I've found that the Babe Bee and Golden Bee run equally well in any of these positions. Naturally, the tank assembly remains in the upright position with an access hole for the filler tubes and needle valve through the top regardless of the cylinder position and the type of cowling used. The cowl can be built out of ¼" and ½" blocks or out of one solid 2" x 2" x 3" balsa block with a U-shape cut-out large enough for engine clearance.

Once the cowl is installed, the front half of the fuselage is ready for carving and sanding to its finished form. Use tracing paper and the pin-prick method described earlier to develop the approximate nose shape. You might also locate the spinner in the correct location and draw an outline of it on the nose block as a further shaping guide.

Remove the 3/32" scrap from between the fuselage sides at the tail, and install the stabilizer and vertical fin. Add ¼" stabilizer fillets and square up the tail surfaces with the fuselage sighting down from the top and forward from the rear. On the Me-109, to assure proper angle of incidence of the stabilizer, the bottom edge of the vertical fin must be parallel and flush with the bottom edge of the ¼" fuselage top piece.

Now would be a good time to add the actuator guide rails or servo mounts, trial mount your actuator or servos, and cut, bend and fit the necessary torque or pushrods. Remember the torque rod or pushrod for the Adams Actuator should be absolutely free of any binding or rubbing surfaces that might cause any drag.

Close up the fuselage by covering with 3/32" sheet installed cross grained. Next, add the P-51 scoop assembly. The fuselage is now complete and ready for its final carving, shaping, and sanding, preparatory to painting.

Cut the canopy from acetate sheet by tracing over the plan with an X-Acto knife. Before bending to shape, add mullions to the canopy by painting on with a draftsman's ink ruling pen or by cutting strips of Solarfilm or pre-painted Topcote and applying directly to the canopy.

Everyone has their own pet method of painting models and I, for one, am no expert in this field so I won't delve into this subject. I just wish to point out that I painted my models in realistic WW II camouflage colors which looked just great except they were a little hard to see against a blue sky and even harder to find in tall grass and weeds! Just a little food for thought. Topcote covering can be easily used on the Ace Foam Wing and it accepts paint very well. Instructions on its use comes with the Ace wing.

Install the canopy after the fuselage is painted. I cemented mine on using Sears Household Vinyl cement which works well with acetate. Tom Runge installed his canopies using 1/8" wide strips of black Solarfilm, taping the canopy on and ironing the Solarfilm with a fairly cool iron so as not to melt or warp the acetate.

The builder is limited only by his ability and pocketbook in detailing the finished model. Finishing Touch Decals work very well on the three designs. Order sheet #B-201 for the P-51, B-202 for the Hurricane and B-203 for the Me-109. Aileron outlines, panels, hatches, "retracted" landing gear, elevator outlines can all be drawn with black dope with a draftsman's ruling pen.

Install the movable control surfaces, engine, and equipment. Add necessary weight to position the Center of Gravity correctly.

Prior to test flying, check all surfaces for warps or misalignment, especially the stabilizer. Warps can be removed by warming the surface with a "cool" iron and then applying a twist in the opposite direction, holding until cool.

An excellent guide to test flying and trimming a rudder only model is included in the Ace Catalog-Handbook. I wish to reiterate that the design parameters mentioned earlier should be closely adhered to for good flight performance. Minor shimming of the leading or trailing edge of the wing may be necessary to suit local wind conditions.

One interesting point is that, when using the Ace Foam Wing and the design parameters of the Warbirds, the builder can easily create any number of successful low wing designs such as the North American AT-6, Douglas Dive Bomber, Japanese "Zero," Beech T-34, Piper Cherokee, etc. Simply lay a sheet of tracing paper over the Warbird plan, trace the firewall, airfoil, stabilizer location and rudder post, then using these "fixed" points, fill in your own desired fuselage profile, and follow the same general construction methods. □

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