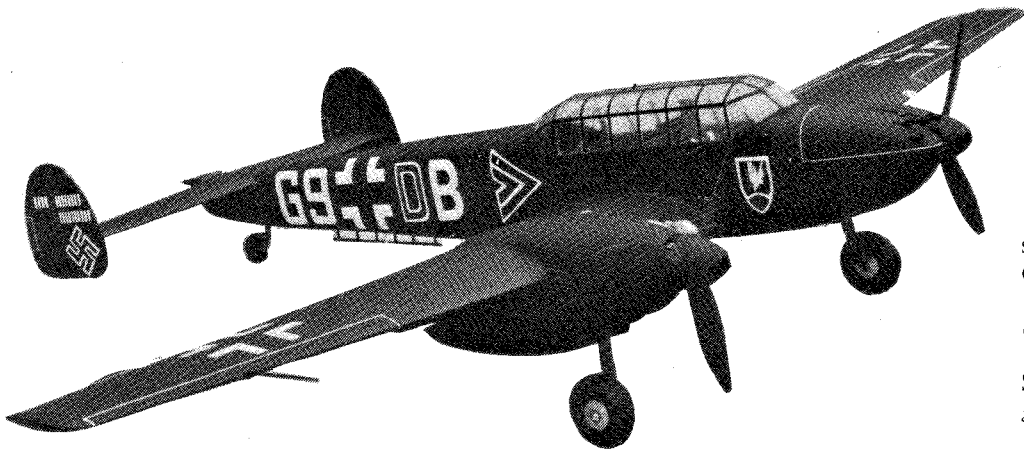
Bf110 NIGHT FIGHTER

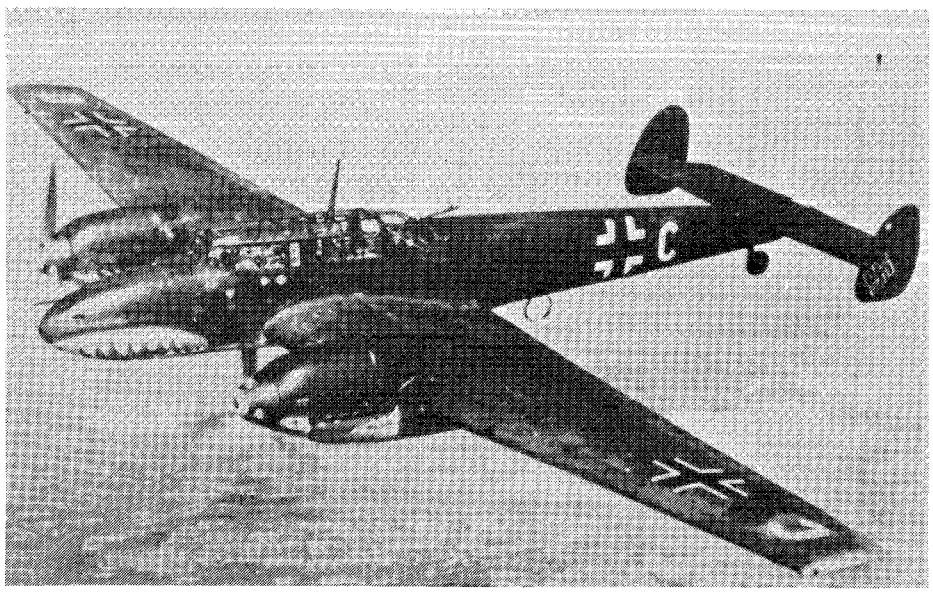


by Walt Musciano

A standoff-scale control line model of a unique and interesting aircraft.

MESSERSCHMITT Bf110
TYPE: Control Line Scale
WINGSPAN: 39½ inches
WING AREA: 227 square inches
LENGTH: 30 inches
ENGINE: Two .15-.19

• The full-size Messerschmitt Bf110 has so captured my interest that this model is the third Bf110 I have built, in varying sizes, and all have been very interesting and successful projects. The Messerschmitt Bf110 was one of the first attempts to develop a true strategic fighter with long range and heavy fire power. Designed originally to clear the sky of enemy fighters, the *Zerstorer,* or "destroyer," failed in its task during the Battle of Britain, but went on to become the most successful night-fighter in the world, with more nocturnal victories than any other airplane. The twin-engined, two-seater Messerschmitt Bf110 became a destroyer of bombers instead of fighters.



This Bf110C-2 belonged to ZG76, the unit that scored the first night-fighter victory even before an official night-fighter force was established.

Our model is a ¾" standoff scale replica of one of the Messerschmitts flown by famous German night-fighter ace Werner Streib when he led *Gruppe I* of *Nachtjagdgeschwader No. 1* in 1941. Engines from .15 to .19 cu in. displacement can be used; if funds are short and you have two similar but not identical engines, it is possible to fly the model with a .15 and a .19. Mount the larger or more powerful engine in the inboard nacelle and throttle the engines to equalize power if necessary. The prototype model is powered with two Fox .15 engines. Our model is not difficult to build; no complex structure or planking is necessary, and the cockpit canopy can be made from a flat sheet of plastic in one piece! Because it is impossible to enclose the engine cylinders, we elected to use horizontally mounted engines to make the powerplants as obscure as possible in profile.

WING STRUCTURE is made first. Trace and cut out the hard balsa spar halves and plywood spar joiners. Glue the joiners to both sides of the spar halves, which will automatically align the spars to the proper dihedral. Set aside to dry, with heavy weights or clamps holding the joint. While the spar assembly is drying, trace and cut the ribs to shape. Glue the ribs into the spar notches, egg-crate fashion, and glue the bellcrank mount into this assembly by fitting it into the slots in the spar and ribs. Attach the wire leadout lines to the bellcrank and bind and solder the ends. Pass the wires through the holes in the ribs. Attach the clevis and forward portion of the pushrod to the bellcrank and bolt the bellcrank to the mount. Sand the wing structure lightly with sandpaper mounted on a large sanding block to be sure that the ribs and spars are smooth before covering is applied. Re-glue all joints after sanding.

WING COVERING is cut from ⅛" sheet balsa, and the various pieces should be butt-joined together very firmly and then cut to the wing outline shape, about ¼" oversize to allow for camber, etc. The

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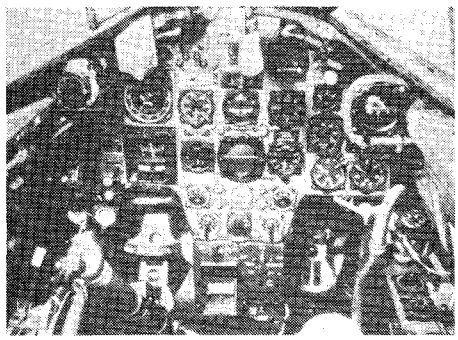
wing is covered in four sections: the top and bottom of each half. The bottom is covered first. Mark off the location of the spar on the assembled covering and then apply glue to the bottom of the spar. Press the framework against the covering, and be certain the spar is in the proper location on the covering. Hold with pins until dry. Now apply glue to the ribs forward of the spar and press the covering against the ribs. Hold with pins. Repeat this for the ribs aft of the spar and set aside to dry. Using a sharp knife or razor plane, gently bevel the leading and trailing edges of the bottom covering to follow the contour of the upper camber of the ribs. When trimming is complete, finish off with sandpaper on a block. The upper covering is installed as described for the lower, except that when glue is applied to the ribs it must also be applied to the bevelled surface of the lower covering for attaching the upper covering. Again, hold in place with pins until dry. Repeat for the other wing half. Remember to firmly attach a one-ounce piece of lead to the inside of the lower covering of the outboard wing tip (right wing when looking from the rear) before the upper covering is cemented in place. It is also important to trim the covering sheets at the root ribs so the covering sections meet neatly at the center line. This should be done before the covering is glued in place; cut, fit and cut again. When everything is thoroughly dry, the covering is carefully trimmed along the leading and trailing edges. Cut the covering flush with the tip ribs and add the wing tips. Trim and sandpaper the entire wing with a block and move on to the fuselage.

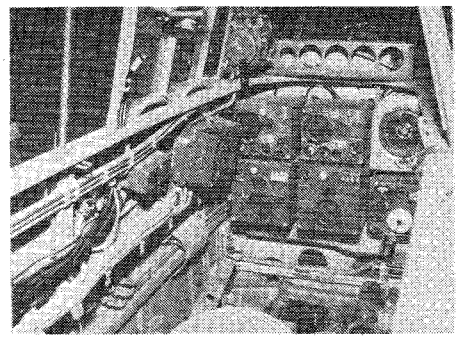
BASIC FUSELAGE construction consists of sheet balsa sides and bulkheads with 1/2" and 1/4" top, bottom and nose. First cut the fuselage sides and bulkheads to shape and glue the bulkheads between the sides in the proper location. When cutting the fuselage sides, be certain that the wing and stabilizer cutouts are accurate because they control the incidence angle—which should be zero. Also bevel the sides at the rear as shown in the plan top view and glue the sides together. Use pins, rubber bands or clamps to keep the fuselage sides pressed to each other and against the bulkheads until the glue is dry. Now carefully pass the control rod through the holes in the bulkheads, and cement the fuselage sides and bulkheads to the wing. Apply several coats of glue to the inside of the fuselage/wing joint and set aside to dry thoroughly.

STABILIZER construction begins by gluing the ribs into the spar notches. When dry, sandpaper the frame and cover with sheet balsa. This should be done in the same manner as the wing. Sand smooth.

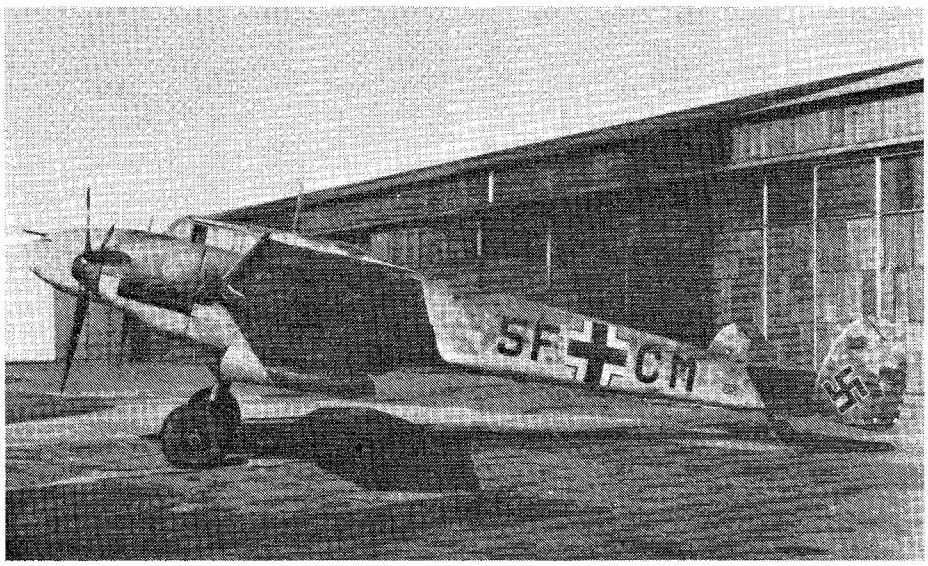
ELEVATOR halves are cut to shape and carved or sanded to the proper section. Join the two halves with the control horn. Glue the ends of the horn wire into holes in the elevator and hold the wire against the elevator halves with strips of cloth wrapped around the wire and to the elevators, well glued. Sandpaper the elevator assembly and hinge it to the stabilizer with cloth hinges or with commercial nylon or metal types. *(Continued on page 85)*



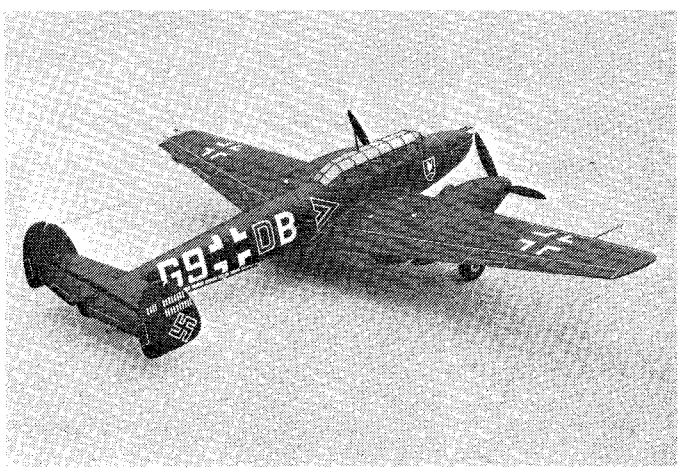
Pilot's cockpit. Notice the console on each side, throttles on left.



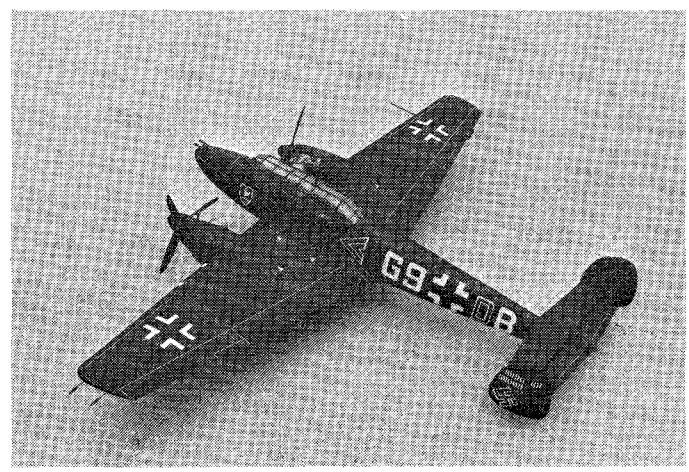
Radio operator's (rear) cockpit, looking forward. Machine gun faces aft, not shown.



Bf110C-4 in mottled camouflage of light blue and gray, which was found to be more effective than all-black for blending in with the glare from searchlights.



Large clear canopy requires some cockpit detailing; see plans, and cockpit photos on this page. Canopy is one piece of plastic.



Small tabs on wing trailing edge should be bent so that outboard one is up, inboard is down. All trim is from tape and decal sheet.

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(Continued from page 54)

CONTROL SYSTEM is completed by attaching the rear portion of the pushrod to the control horn after first passing the unit through the holes in the bulkheads. Fit the stabilizer atop the fuselage and cut away the inner surface of the fuselage sides to clear the pushrod and horn. When the fit is good, and the horn and pushrod can move freely, glue the stabilizer to the fuselage. Slip a length of 1/4" aluminum or plastic tubing loosely over one of the pushrod sections. This will keep the rods from snagging on the bulkheads when the tube is attached later. With the elevator and bellcrank temporarily taped in neutral position, the ends of the two pushrod sections are joined by binding with fine, soft wire and soldering. Check controls for easy movement and then glue the aluminum tube to the bulkhead.

RUDDERS AND FINS are cut to shape, trimmed to a streamline shape, and bulkhead to shape, drill hole for the fuel line, and glue firmly to the engine/landing gear mount. Now cut the 1/2" balsa pieces to fit over the mount to form the correct nacelle profile and glue in place. Slip the fuel tank into its space in the mount and glue firmly. Cut the 3/8" hardwood auxiliary landing gear mount to shape, drill the 1/8" holes, and glue very firmly to the engine/landing gear mount, being certain to align the holes. Bend the landing gear struts to shape—being sure to make one right-hand and one left-hand strut. Cut out and drill holes in the LG clips. Bolt the landing gear in place running the bolts through both the engine mount and auxiliary LG mount. Check the alignment and then smear glue over the clips and nuts and bolts. The 1/2" balsa nacelle laminations are each cut in two pieces divided along the center line. Trim each piece to clear the fuel tank and landing gear, and trim carefully to fit the contour of the upper and lower wing camber. Be certain to add the plastic fuel-line extensions to the fuel tank before the tank is entirely enclosed.

When all layers have been fitted, and the glue is thoroughly dry, the engine cowl should be constructed in the same manner, but the 1/2" balsa should not be glued to the engine mount. Glue only to each other, and spot glue to the bulkhead. When dry, carefully carve the entire nacelle to shape with a sharp knife, remove the cowls carefully, and hollow as shown. At this time it is advisable to bolt the engines to the mounts and cut away the cowl to clear the engine cylinder and air intake. Check the balance of the model, and if tail-heavy, remove the nose piece, hollow, and add lead weight to balance the model. Re-glue the nose in place, and add the propeller and spinner. At first I used scratch-built three-bladed propellers and scratch-built fiberglass spinners; I later installed Graupner No. 180 1 1/2" three-bladed spinners and Grish Bros. 7 x 6 three-bladed propellers, all of which proved very successful on my model. Shape the cowl to fair into the spinner. Remove the engine and apply several coats of sanding sealer to the cowl interior, engine mounts and bulkhead. Secure the engine mounting blind nuts to the engine mounts and glue the cowl in place. Make a small Plastic Balsa fillet around the nacelle installation.

RADIATORS are cut from 1/2" balsa and carved to shape. Notice the notch near the middle of the radiator. This is in line with the flap outline and, on the full-size plane, the rear of the radiator housing moves with the wing flap, hinging in the notch. Make a small fillet all around the radiators after they are cemented in place.

PAINTING should not be started until the entire model has been well sandpapered with fine and extra fine sandpaper and the small Plastic Balsa wing fillet is complete. You can use any finishing method you're familiar with, but here's my technique: Apply several coats of Aero Gloss Sanding Sealer to the entire model and, when thoroughly dry, sand with extra fine sandpaper. Be sure that each coat is dry before the next coat is applied. Continue the application of sealer, sanding between coats, until the surface is smooth and free from grain. Then thin the sealer about ten percent, apply a few more coats, and sand gently with No. 500 finishing paper. The prototype model has fourteen liberal coats of sealer. The cockpit interior should also receive a few coats of sealer. Holes should now be carefully made in the nose for the machine guns and the cannon tunnels. Apply sealer in the cannon tunnel holes and sand. The entire model is painted flat black. We used Aero Gloss Military Flat Hot Fuel-Proof Dope—Flat Black 30-4. Thin the dope with about ten percent thinner for brushing. Apply two coats.

EXTERNAL DETAILS such as exhaust stacks, machine guns, landing gear doors, wing tabs, plastic tube landing gear covering, fuselage bottom antenna, and machine guns are now added before further painting. Drill 1/64" holes in the aluminum tube to add realism to the guns. The exhaust stacks can be carved from hardwood, sealed and glued in place.

COCKPIT interior is painted light green, and while this is drying the equipment can be fabricated. The pilot's seat is made with 1/16" balsa sides and stiff card bottom and back, and is the full-width between the consoles. The pilot's seat, armor plate and instrument panels, radio blocks, ammo stowage, and bulkhead "D" are painted gray after sealing. Radio operator/gunner's seat is light brown. Paper instruments can be cemented in place, or Tatone or similar instruments can be used. Shoulder and lap harnesses can be added to the pilot's seat and lap harness to the gunner's seat, made from stiff paper. Control stick is wire.

COCKPIT CANOPY has no compound curves and can be cut from a flat sheet of plastic. Trace onto stiff paper and cut out. Bend and tape to shape as a test, check the fit on the fuselage, and make corrections as necessary. Then tape the paper pattern to the plastic sheet and cut the plastic to the shape of the pattern. Bend the plastic to shape and hold in position with thin strips of tape. The curved portion on each side of the canopy top can be molded with the fingers for gentle bending. When the canopy has been formed and the fit is good, the seams should be glued with Hot Stuff or other cyanoacrylate. This glue is colorless and very strong, but will not bridge a gap between the two pieces to be joined—the pieces must be in contact with each other for this thin glue to work properly. With the tape in place holding the plastic to the proper shape, apply the glue on both sides of the tape strips and from the inside and outside of the canopy. When thoroughly dry, remove the tape carefully and apply more glue. *Read the precautions before using the glue in order to avoid injury.* Allow a half-hour drying time and then final-fit the canopy to the fuselage. If the fit is good, glue the canopy to the fuselage and, when dry, add more glue all around the canopy joint with the fuselage. Cut out and attach the thick plastic bullet-proof windshield to the canopy windshield with Hot Stuff.

FINAL PAINTING consists of two or more coats of Flat Black dope that is thinned with about fifteen percent thinner. Be sure to protect the canopy with masking tape during this painting. Remove tape when dry.

MARKINGS can be added now and these are cut from solid color decal sheets such as those sold by Sig. Notice that the insignia crosses on the bottom of the wing are larger and located closer to the fuselage than those on the top of the wing. The chevron, letter "D," night-fighter insignia and swastika are made with layers of cut out decal pieces. For example: The letter "D" is made by tracing and cutting out a large white "D" and a smaller green "D" from the decal sheet. First apply the white "D" and, when dry, apply the green letter directly atop the white decal, centered carefully so the white outline thickness is constant. The chevron and swastika are prepared in the same manner, i.e., cut the white as a base and then add the smaller black image directly over the white, centering carefully.

The night-fighter insignia requires several layers of decal because of the many colors. This marking appeared on most early German night-fighters and represented a white hawk riding a red lightning streak on a black sky, striking England on a blue sea in a map of northern Europe. First trace, cut out and apply the large white shield; not just the white outline, but the entire shield. Then cut out and apply the black sky, followed by the blue sea. Don't forget to leave the white separation line between the blue and the black areas. Next is the red lightning flash and then the white hawk. When tracing the image on the decal, trace on the reverse (paper) side, in reverse image of course. Cut to shape with very sharp scissors and apply with

tweezers.

The canopy frame is cut from black DJ or Sig tape and is applied now. The antenna mast is glued firmly into the hole in the canopy, painted black and then black thread is run from mast to fins with connecting lines to each side of the fuselage. Ailerons, flaps, slots and trim tabs, plus the machine gun hatch outlines, were simulated with thin white tape, 1/32" wide, on the prototype model. We used DJ Multi-stripe white plastic tape cut into 1/32" strips. The tape is well suited to our model because it can bend around curves such as around the engine nacelles and around the nose. Tape is best cut by sticking it to glass such as a window and cutting with a single-edge razor blade along a metal straightedge.

FLYING should not be attempted until the final balance is checked. All should be well if the preliminary balancing, previously described, was completed. The added weight of the sealer and paint on the rear should be offset by the spinners and propellers. Test flights should be from a paved surface using fifty-foot lines. The engines should be run and adjusted before the model is brought to the flight circle so that the needle valves are properly adjusted for reliable operation and quick starting. Never use balky engines on a multi-engine model. I start the outboard engine first and then the inboard engine so the outboard engine will stop first. If a long delay is encountered in starting the second engine, the fuel tanks should be topped off just before takeoff. Flight lines up to seventy feet can be used once you become familiar with the model. Happy flying!

Materials (wood is medium balsa unless noted otherwise):

(3) 1/4" x 3" x 36" for fuselage sides, top and bottom, spars, elevators, rudders, and nacelle sides

(2) 1/2" x 3" x 36" for wing tips, fuselage top and nose, radiators, and nacelle laminations

(8) 1/8" x 3" x 36" for fuselage bulkheads, wing and stabilizer ribs, and wing covering

(1) 1/16" x 3" x 18" for stabilizer covering, pilot seat sides, instrument panels, and pilot armor

(1) 1/2" x 3" x 18" hardwood for engine/landing gear mount

(1) 3/8" x 3" x 6" hardwood for auxiliary landing gear mount

(1) 6" x 12" x .015" clear plastic for cockpit canopy

1/8" dia. x 18" music wire for landing gear

1/8" x 6" x 18" plywood for spar joiner, nacelle bulkheads, bellcrank mount, and tailwheel strut support

(1) 1/16" dia. x 12" music wire for tailwheel strut and LG door brace

(1) .020" x 3" x 12" aluminum for landing gear doors and wing trim tabs

1/16" dia. x 6" aluminum tubing for pitot tube and trailing antenna housing

3/32" dia. x 8" aluminum tubing for machine gun barrels

(2) Sig R-C Links (or equivalent) for control rod

Miscellaneous: Large bellcrank; control horn; Williams Bros. small nylon hinges; Graupner No. 180 1 1/2" three-bladed spinners; Grish Bros. 7 x 6 three-bladed propellers; 16 ounces Aero Gloss Sanding Sealer; 10 1/2 ounces Aero Gloss Military Flat Black 30-4 Dope; 1 1/2 ounces each Aero Gloss Swift White and Stinson Green (mix to a light green for cockpit interior); 1 1/2 ounces Aero Gloss Camouflage Brown Dope; 1 1/2 ounces Aero Gloss Gray Dope; 3 1/2 ounces Aero Gloss Thinner; fine, extra fine, and No. 500 sandpaper; medium and extra large plastic fuel line for tank connections and landing gear covers; Veco T-23A (or equivalent) fuel tanks; glue of your choice; Aero Gloss Plastic Balsa; 1/16" dowel; Sig Solid Color Decal Sheets in the following colors: Red, White, Blue, Black, Green; Fox .15 Glow Plug Engines; one ounce lead weight; straight pins; .032" music wire; Hot Stuff; DJ Multi-Stripe White and Black Tape 1/16" wide; assorted nuts and bolts. ■