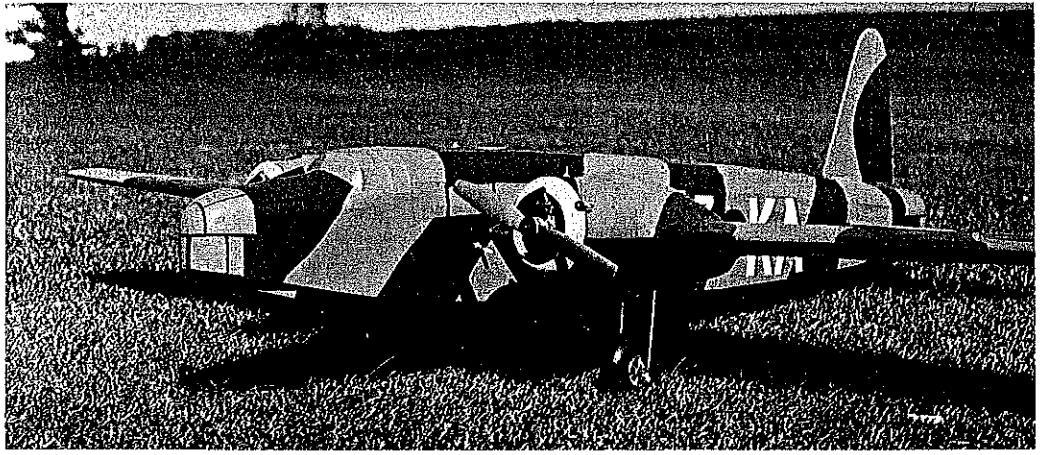
#320

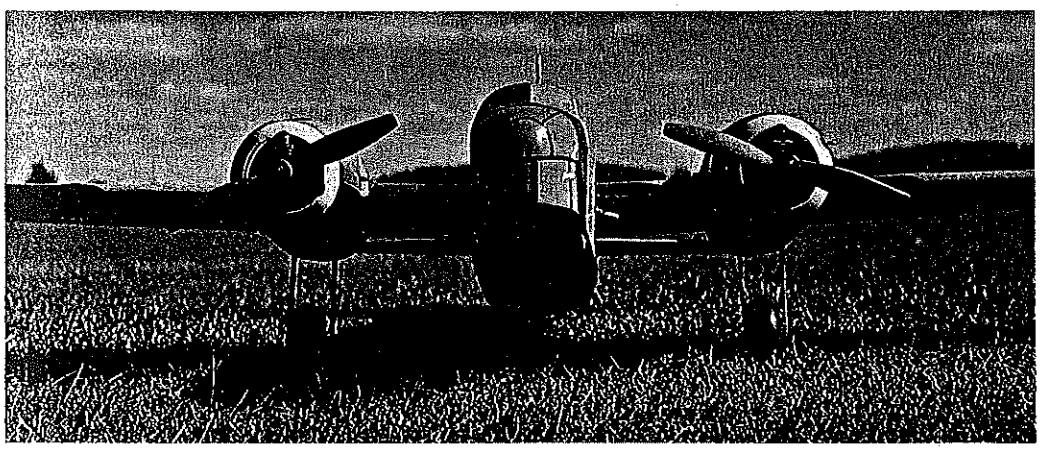
The Wellington has the precepts called for by the author for a successful twin-engine RC model: good flight qualities without brute engine power, a rather long fuselage, and lots of wing beyond the nacelles. Uses two .10s, has great single-engine performance.

Frank B. Baker

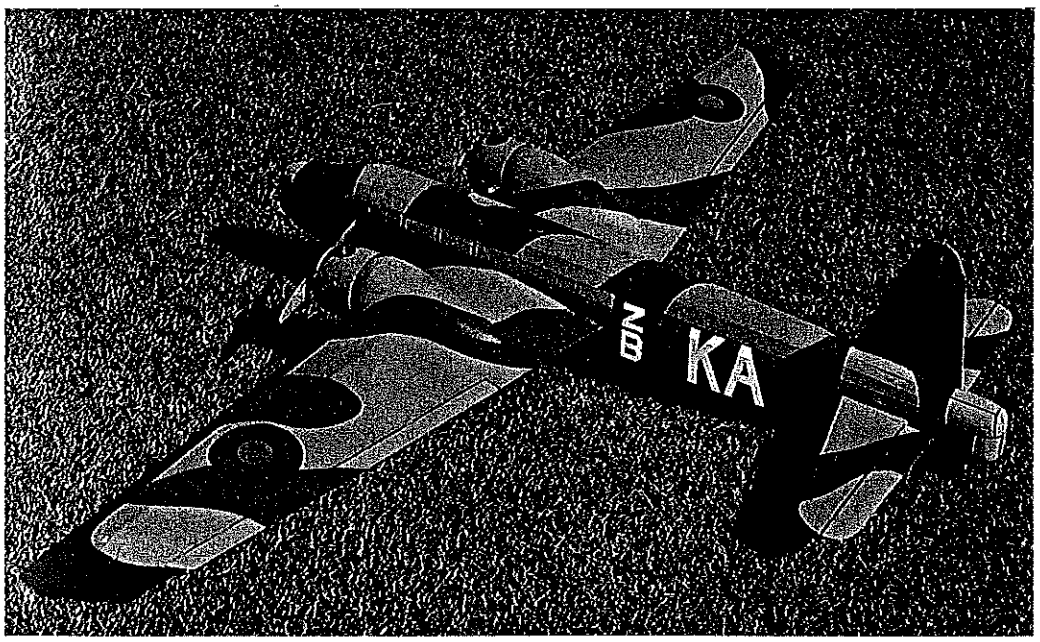
Vickers Wellington Mk I



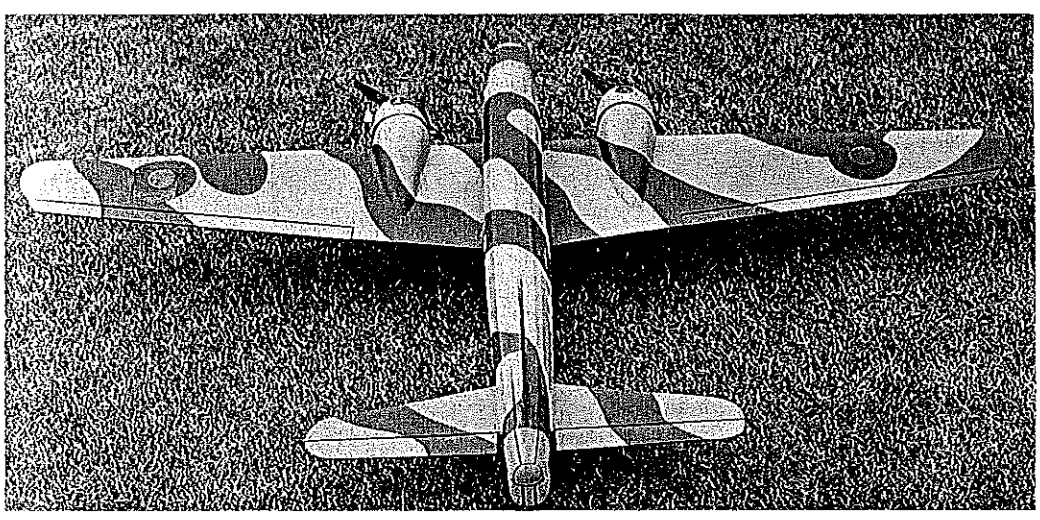
Long nose and tall landing gear keep props clear of the ground at all times. High angle of wing and stab does not result in early lift-off, but normal in-flight attitude is tail-high.



Close-in engines, combined with slight outward aiming of nacelles and additional slight angling of the thrust lines, provide excellent single-engine operation. Baker a whiz with RC multis.



Author's plane is covered with silk, then finished with Aero Gloss flat camouflage dope. Markings come from MonoKote trim film. Seemingly small rudder is actually very effective, Baker says. Combined with large ailerons, it provides excellent single-engine performance.



High aspect-ratio wings and long tail moment arm result in very docile flight characteristics. The only deviation from scale outlines was to widen the wing chord at the wing tips. Has 66-in. span.

THE VICKERS WELLINGTON was one of those not so glamourous aircraft that played a significant role in World War II. It was originally designed in 1933 by Barnes Wallis; however, the prototype did not fly until 1936.

The unusual feature of the Wellington was the use of geodetic construction, the airplane's framework having the appearance of a woven basket. This unique construction proved to be very rugged in combat. Large sections could be destroyed, while the multiplicity of members held the aircraft together.

During WW II, the Wellington initially was used as a daytime bomber, but suffering heavy losses, it was quickly withdrawn from this role. For the rest of the war, Wellingtons were a major component in the night bomber force, along with Lancasters, Sterlings, and Halifaxes. A total of 3,456 Wellingtons (of all models and mods) were built. Profile Publications Number 125 provides an excellent history of the aircraft, as well as many photographs.

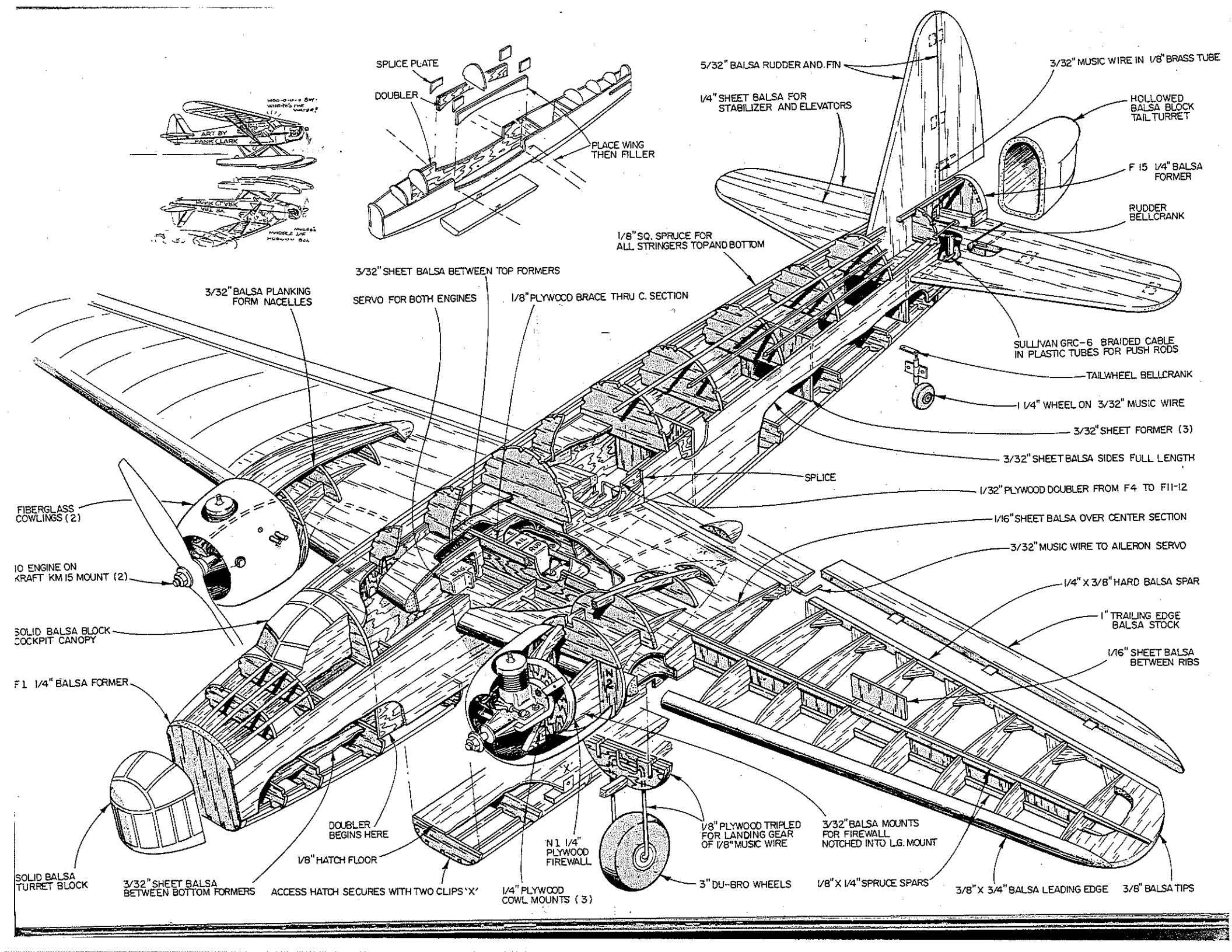
What attracted me to the Wellington as a modeling subject was that it met all the criteria I mentioned in my earlier B-25 article (March 1979 *Model Aviation*). In particular, the original had to fly well on its aerodynamics with modest power. The Wellington also has unusually good moments for a model, having a long fuselage and lots of wingspan beyond the engine nacelles.

I pondered the geodetic construction, and finally decided that, since it could not be seen, I would not use it on the model. The only deviation from scale outlines was to widen the wing chord at the wing tips; the Wellington had rather pointed wing tips, a feature that leads to poor stall characteristics in a model.

In keeping with my earlier dictum of building Scale models big and keeping them light, this model has a 66-in. wingspan, yet is powered by two O.S. Max 10 FSR engines. Because the engines don't weigh much, and we have a large model, the Wellington is prone to tail-heaviness. Consequently, we need to build as light as possible from the wing spar rearward. Wood should be selected carefully, and a minimum finish should be used.

Construction. While not a beginner's airplane, the construction of the Wellington follows rather standard practice. However, it must be built in a particular order. Let me go through this order and describe some of the most important construction elements.

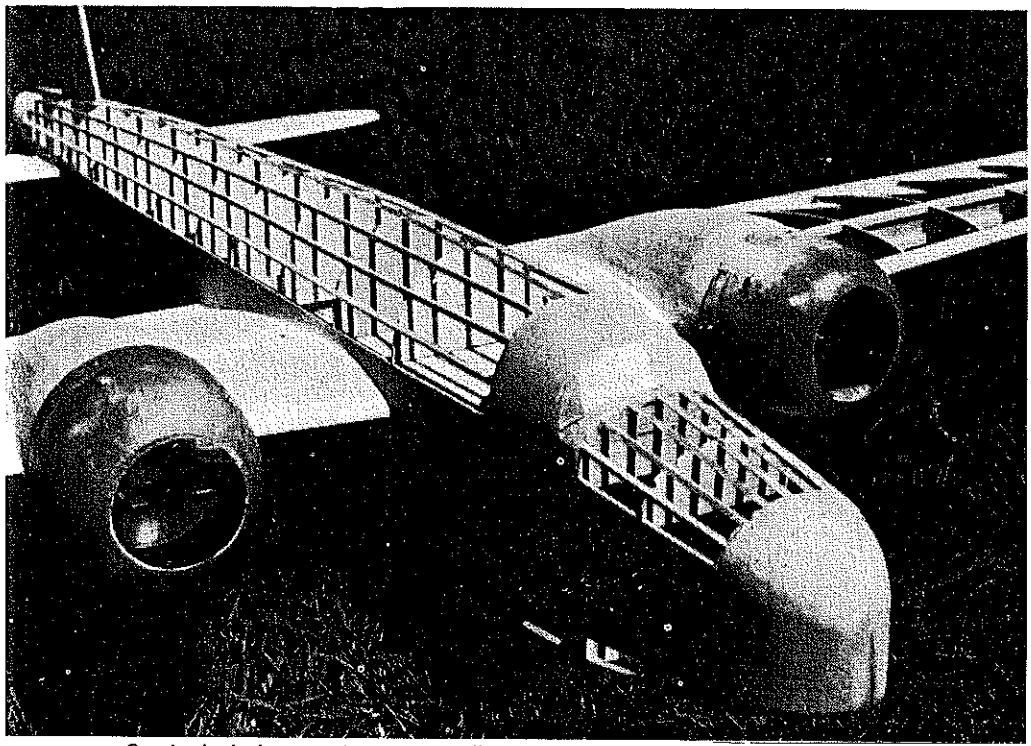
Start with the wing. Build the basic wing structure, join the panels, and sheet the top from


SPLICE PLATE
DOUBLER
PLACE WING THEN FILLER
5/32" BALSA RUDDER AND FIN
3/32" MUSIC WIRE IN 1/8" BRASS TUBE
1/4" SHEET BALSA FOR STABILIZER AND ELEVATORS
HOLLOWED BALSA BLOCK TAIL TURRET
F 15 1/4" BALSA FORMER
RUDDER BELLCRANK
1/8" SQ. SPRUCE FOR ALL STRINGERS TOP AND BOTTOM
3/32" SHEET BALSA BETWEEN TOP FORMERS
3/32" BALSA PLANKING FORM NACELLES
SERVO FOR BOTH ENGINES
1/8" PLYWOOD BRACE THRU C. SECTION
SULLIVAN GRC-6 BRAIDED CABLE IN PLASTIC TUBES FOR PUSH RODS
TAILWHEEL BELLCRANK
1 1/4" WHEEL ON 3/32" MUSIC WIRE
3/32" SHEET FORMER (3)
3/32" SHEET BALSA SIDES FULL LENGTH
SPLICE
1/32" PLYWOOD DOUBLER FROM F4 TO F11-12
FIBERGLASS COWLINGS (2)
1/16" SHEET BALSA OVER CENTER SECTION
3/32" MUSIC WIRE TO AILERON SERVO
10 ENGINE ON KRAFT KM 15 MOUNT (2)
1/4" X 3/8" HARD BALSA SPAR
1" TRAILING EDGE BALSA STOCK
SOLID BALSA BLOCK COCKPIT CANOPY
1/16" SHEET BALSA BETWEEN RIBS
F1 1/4" BALSA FORMER
DOUBLER BEGINS HERE
1/8" PLYWOOD TRIPLED FOR LANDING GEAR OF 1/8" MUSIC WIRE
3/32" BALSA MOUNTS FOR FIREWALL NOTCHED INTO L.G. MOUNT
N1 1/4" PLYWOOD FIREWALL
1/8" HATCH FLOOR
3" DU-BRO WHEELS
1/8" X 1/4" SPRUCE SPARS
3/8" X 3/4" BALSA LEADING EDGE
3/8" BALSA TIPS
SOLID BALSA TURRET BLOCK
3/32" SHEET BALSA BETWEEN BOTTOM FORMERS
ACCESS HATCH SECURES WITH TWO CLIPS 'X'
1/4" PLYWOOD COWL MOUNTS (3)

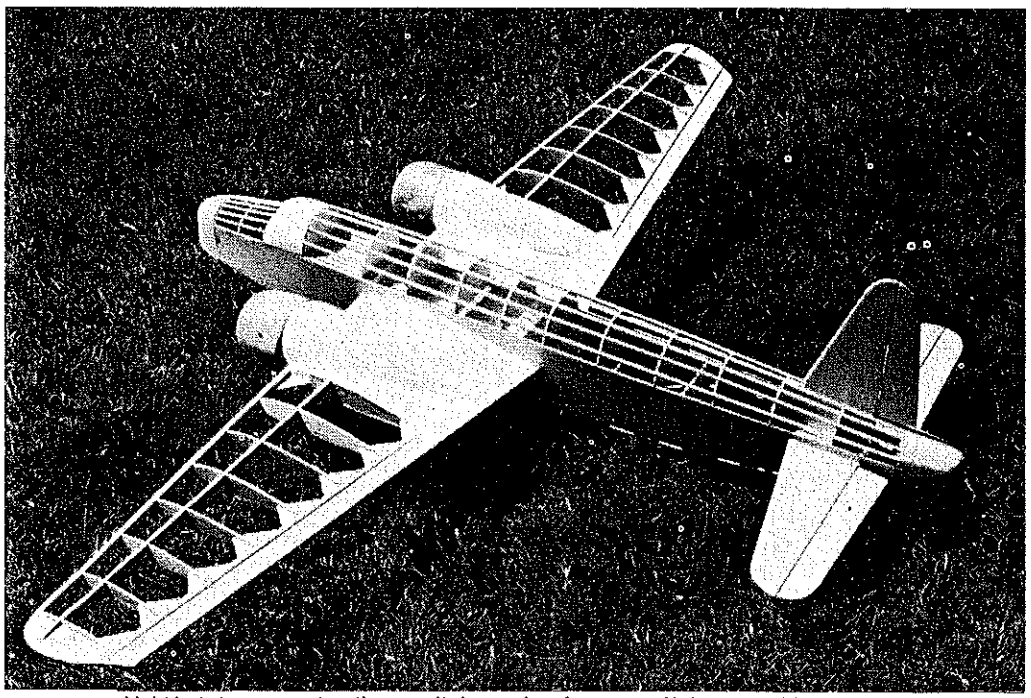
rib 1 to rib 5 only. Note that the ⅛ X ¼ spruce spars are flush with the top of the sheeting. Cut out rib 1, and install the servo mounting plate. Using ⅛ double-faced servo mounting tape, install the motor control servo.

Since both engines face right, the throttle linkages must work in unison. Poke holes in ribs 2, 3 and 4 to run the motor control cable (Sullivan GRC-3) to the location shown on the plans. The left cable should go to the servo arm hole nearest the mounting plate (down), the right cable to the upper arm. You may need to use some small balsa blocks to position and hold the cable firmly. The cables should come up through the top wing sheeting about 1 in. from the leading edge. Once the motor control cables are installed, the lower wing sheeting can be glued on to the ribs.

The same trick I used on the B-25 to achieve 3 degrees engine out-thrust is also used on the Wellington. The whole engine nacelle is built with 1½ degrees out-thrust, then the firewall is mounted with 1½ degrees out-thrust relative to the nacelle. This gives enough out-thrust for single-engine flight without an awkward visible impression. First, the 3/32 balsa firewall mounts are installed with 1½ degrees out-thrust. Be sure to pay attention to outer and inner parts here. Use a device such as a Robart Incidence Meter to measure the out-thrust of the front of the firewall mounts; sand until you get the necessary 3 degrees total. Cut the firewalls from ¼ plywood, and mount the Kraft-Hayes KM-15 engine mounts with blind nuts.



Quarter-inch clearance between nacelles and cowls aids in engine cooling and means that special exhaust openings aren't needed. Radio and servo access hatch on the bottom is hardly noticeable.



Light but strong construction results in good performance. Note spar webbing, triangles at trailing edge of wing ribs, and spruce stringers. Basically a box fuselage with formers, stringers.

Baker shows off the black underside of the Wellington in this view. The model has realistic long takeoff and landing rolls. Don't horse it off the ground, even though tail comes up after a short roll. To do so, or to climb too rapidly without proper airspeed, is courting disaster.

Build the fuel tanks at this time from shim stock or old fuel-can material. The filler tubes on both tanks face inboard, and should extend about ⅜-in. beyond the cowl. The fuel line comes out of the tank on top, and should be made of ⅛-in. copper automotive tubing. It is thick-walled, and can be bent without kinking. Push the fuel line through the hole in the firewall, and align the tank on the back of the firewall.

Jig the wing so that the chord line has 3 degrees incidence. Use epoxy glue to attach the firewall, but before gluing, check the mounts to ensure they have no up or down thrust.

Next, bend the landing gear legs out of ⅛-in. music wire, place the 5/32-in. brass tubing in the 3-in. Du-Bro wheels, insert the landing gear leg stubs in the tube ends, and solder. Cut the landing gear sandwich (N3B) out of ⅛ plywood, insert the top of the landing gear in the slots in the core former, and epoxy all three formers together. Glue this assembly in the slots in the firewall mounts. (Place each wheel in a plastic bag and tie it shut with masking tape, as the wheels will be on the airplane during the rest of the construction.) Add the rest of the nacelle formers, sheet the nacelles, and install the rear blocks.

The engine cowls are made with the aid of a balloon. Here's now. Turn a cowl form out of pine on a wood lathe, cover it with kitchen plastic wrap, and lay on two layers of fiberglass six-ounce cloth, wetting each with polyester resin. With both wet layers of cloth draped over the form, inflate a large balloon, and push it over the form. Secure the balloon with masking tape, and allow the resin to harden.

Trim the cowl to the dimensions shown on the plans. Cut out the triangular ¼ plywood cowl supports. Drill 3/32-in. holes at 120-degree intervals 1¼-in. from the rear of the cowl. Use small pan screws to hold the supports to the inside of the cowl with the rear of the supports ⅞-in. from the back of the cowl. Position this assembly on the firewall, and trim the supports to clear the fuel line. Epoxy the cowl supports

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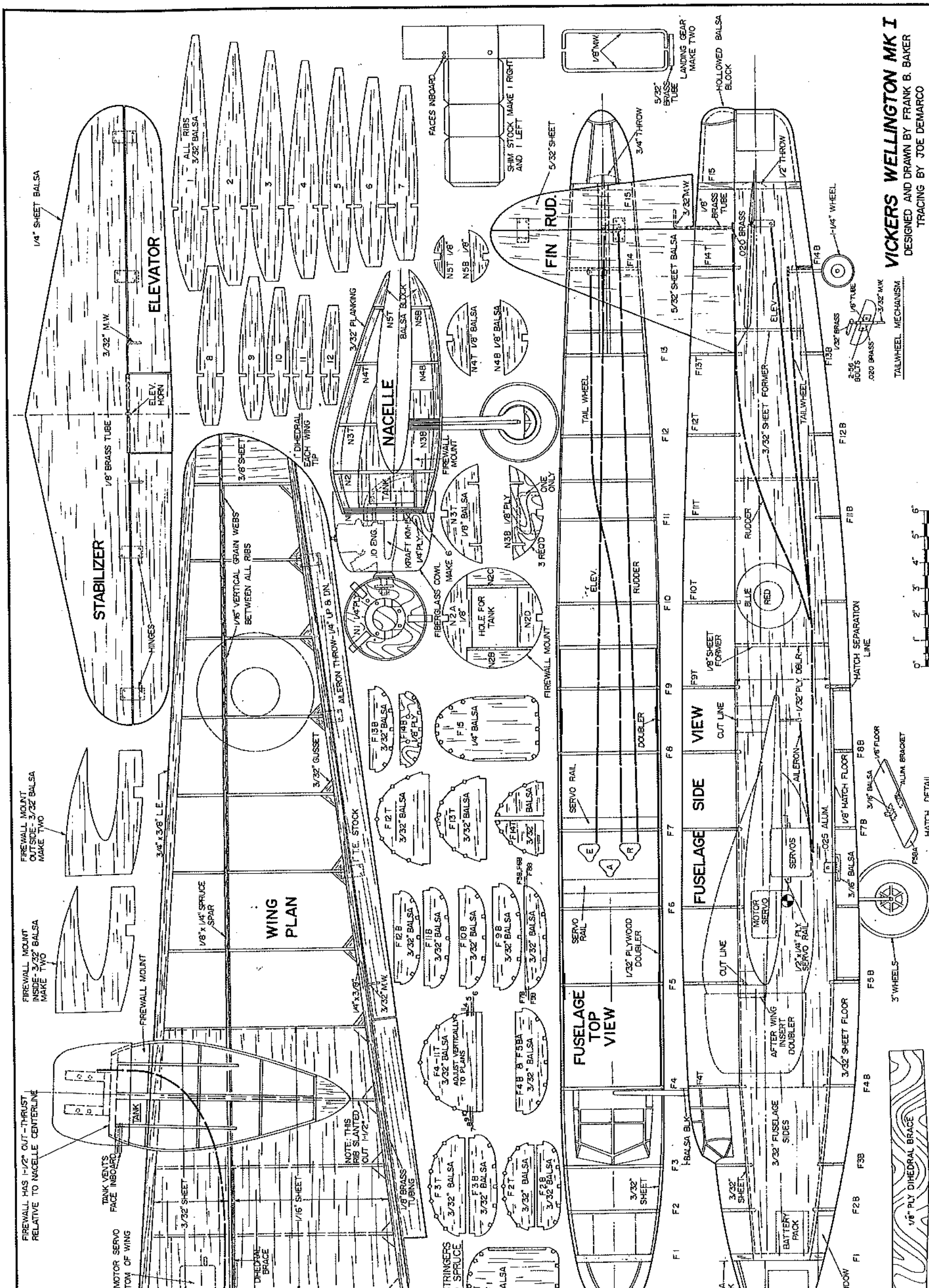
FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 128



Wellington/Baker

Continued from page 14

to the firewall, making sure that the cowl is properly aligned horizontally, vertically, and parallel to the firewall. Remove the cowl, install the engine, cut out the hole for the top of the engine and make a hole for the needle valve. Solder on brass tube needle valve extensions to reach about ¼-in. beyond the cowl. When the cowls are finished, install the airleron torque tubes, rods, hinges, and the ailerons.

The fuselage is essentially a box with formers and stringers top and bottom; it must be built in the proper sequence. Cut the fuselage sides out of 3/32 balsa, and glue on the 1/32 plywood doubler. Next, cut out the wing hole which has 3 degrees incidence. Also, cut the stabilizer slot in the body side, again at 3 degrees incidence. Don't change these settings as they determine the set of the airplane in the air. Place the body sides top down on the workbench. Spot glue a temporary 3/32 sheet cross-former at F-4, and permanently glue in the ⅛ sheet former between F-9 and F-10. When dry, install F-1 and F-15, then install formers F-5Bb to F-9Ba.

Construct the steerable tail wheel assembly; bolt it to F-14, and install the former. Glue in the 3/32 sheet fuselage floor between the formers from F-1 to F-5B. Remove the fuselage from the workbench, and install the stabilizer. Then mount the rudder on top of the stabilizer, and support it with F-14T. Next, install all pushrods. Since tail heaviness is a problem, use the lightest pushrods (such as Sullivan GRC-6, which is braided cable in a plastic tube).

Once the pushrods are in, install all upper fuselage formers. Then glue in all the lower fuselage ⅛ square spruce stringers. Formers F-4T to F-10T are all basically the same; however, the Wellington is "humpbacked," and the formers are placed as necessary to give the proper shape. Pin on the top stringer, and visually check the profile. Adjust until it is correct, then glue the formers.

When dry, use a razor saw to cut from the top of the fuselage down to the wing hole along the lines shown on the plans. Lift off this section of the body sides and the attached formers. Lower the wing onto the fuselage, and glue into position. Then replace the cut-out section, and glue on the 1/32 plywood doublers over the cut lines. Now glue in the 3/32 sheet between the formers from F-1 to beyond F-9T. Install the ⅛ square spruce stringers on the top of the fuselage.

Use a band saw to rough-cut the balsa blocks for the tail, nose and cockpit. Glue in the nose and cockpit, and do final shaping. Spot-glue the tail block in place, fully shape it, then remove and hollow to about ⅛-in. thickness before final gluing onto the fuselage.

Use a razor saw to remove the lower fuselage hatch. Reach in the fuselage and knock out the temporary former at F-4. Also, make and glue in the hatch retainers.

Unfortunately, none of the manufacturers of plastic film coverings make a WW II British color scheme. Because of this, I covered the whole airplane, including the sheet rudder and elevator, with silk. Brush on enough clear Aerogloss to fill the pores, and then lightly sand everything. Spray on a coat of aluminum Aerogloss for a base coat to provide a uniform opaque base for the color coats.

The bottom is given one spray coat of black, and the top one coat of earth tan of the camouflage paints. Pactra doesn't produce the "spinach" that goes with the flat earth tan. I made my own by mixing 25% flat earth tan with regular Stinson green. The result was a nice flat dull green. The windows are Cessna gray, with some black thrown in. I used Profile No. 125 as a guide to the insignia and markings that were cut out of Mono-Kote trim film.

Flying. Since this is a large model with small engines, it is prone to tail-heaviness; therefore, install all radio gear as far forward as possible. I had to put some lead in the nose block to get the properly placed center-of-gravity (CG), which should not be rearward of that shown on the plan. The O.S. Max 10 FSR engines are real jewels, and are ideally suited to multi-engine airplanes. Starting has never been a problem.

Due to the small engines and 7-4 propellers, the Wellington has a rather long scale-like ground roll. The tail comes up quickly, but it takes a while to lift off. Don't attempt to haul it off, or to climb steeply once off. Once airborne it flies quite fast, and must be throttled back to achieve scale-like flight.

I have looped and rolled the Wellington with ease, but if the roll is too slow, an engine will quit due to the fixed fuel pickups. Single-engine performance is outstanding, requiring no rudder correction at all. In fact, I often only know that I am on one engine when I see a stopped prop!

The only surprise in flying the Wellington is in landing. Being big and light, it does not want to come down even at minimum power! To land, set up a very wide pattern and throttle back. The plane will slowly settle in a very flat attitude until the wheels touch. Once contact with the ground is made, it will roll on the mains for about 25 yards before the tail settles. This makes for a very realistic landing, even if it does give a surprise the first time.

The Wellington is fun to fly, and in the air it presents a very realistic impression of the original.