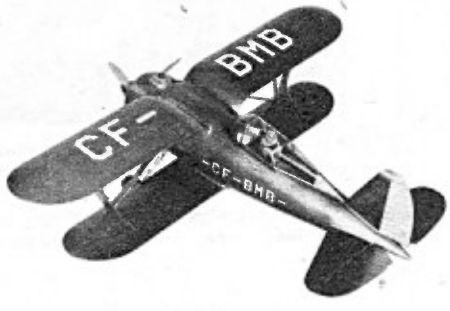
By S. CALHOUN SMITH

Last of the Biplane Fighters: the FDB-1

Canadian Car and Foundry Co.'s Gregor makes a fine Class D scale stunter for the realistic minded builder



REPRESENTING the last link in fighter design between World Wars I and II, the Gregor FDB-1 was probably the cleanest and smartest-looking biplane ever built. It could properly be called the last biplane fighter, since all succeeding designs have been monoplanes.

Before the United Kingdom entered World War II, the Canadian Car and Foundry Co. of Ontario was producing Grumman designs under license and various British aircraft types. The Gregor FDB-1 represented the company's first original design. Completed in late 1938, test flights proved the qualifications of the design, but because of the impending conflict the plane was never produced in quantity. Instead, United Kingdom production was standardized on the Spitfire and Hurricane, and these types bore the brunt of Hitler's attack on England.

Possessing the good maneuverability of the biplane, the FDB-1 carried light armament in comparison to the eight-gun Spits and Hurricanes. Power was originally the 750 hp P&W Twin-Wasp Jr., but the design was suited for engines up to 1200 hp. Wingspan was 28 ft. and top speed was 300 mph (at 9000 ft.).

The model presented here is scaled at 1¼" = 1 ft. directly from factory 3-view, giving a span of 35 in. and a wing area of 271 sq. in. Details such as spinner, aluminum cowling, canopy and wheels scale out to the sizes readily available at most hobby shops.

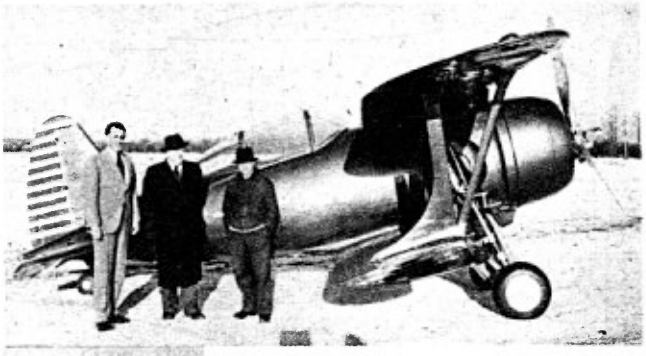
The ship is designed primarily as a good flying scale design; however, limited stunting is possible and has been done. A symmetrical wing section is shown on the plans and was used on the original model; thickness is the same as the scale lifting section. Although the wing loading is too high to compete against the pure stunt design, the final weight of 32 oz. giving a wing loading of 11.7 oz./100 sq. in. allows for plenty of loops, Eights and inverted flight. The good flying characteristics of full-scale biplanes seem to carry over to the model, and no difficulties were experienced even on the first flight with a good wind blowing. It's a real treat to see this baby stunt.

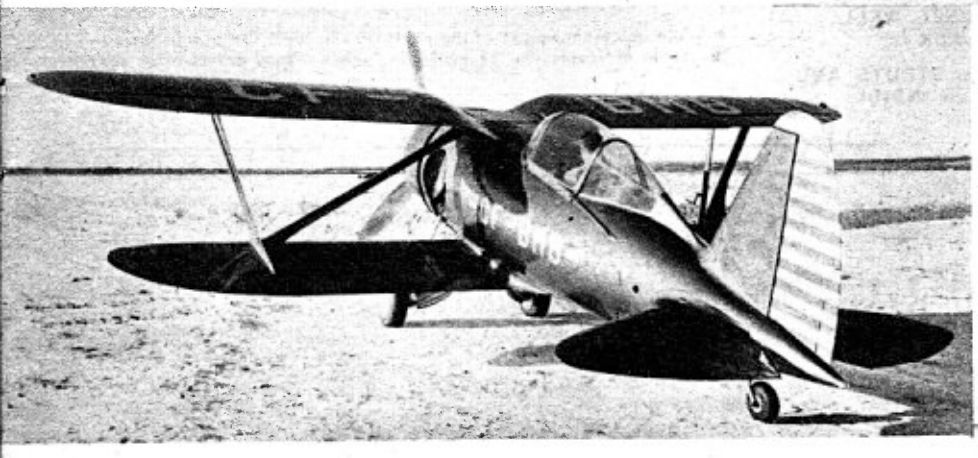
The only bug in the entire model proved to be balance. Because the nose is so short, about 1½ oz. of lead weight was added inside the cowling to bring the C.G. to its proper place. Needless to say, we haven't flown without the weight, because flights have been fine with C.G. as shown on the plans. If you want better stunt performance, overall weight reduction is the answer. To reduce the necessity of additional nose ballast, the tail surfaces can be built up, rather than solid, using ribs and 1/16" sheet covering, to prevent tail-heaviness. The rest of the structure has been cut to the bare bone, but additional narrowing of formers and keels, and lightening holes in plywood could effect slight additional weight saving. We suggest the use of a glow-plug engine to save weight of coil and batteries as was done on the original.

Construction can be started with the fuselage. If you have access to wood turning equipment the entire fuselage and cowl can be shaped from a single block or 2 or 4 blocks cemented together. If you build up the fuselage, first obtain the necessary wood sizes and cut out the firewall, plywood sides, backbone, keel and all former sections. Follow the "Fuselage Construction" sketches for proper procedure:

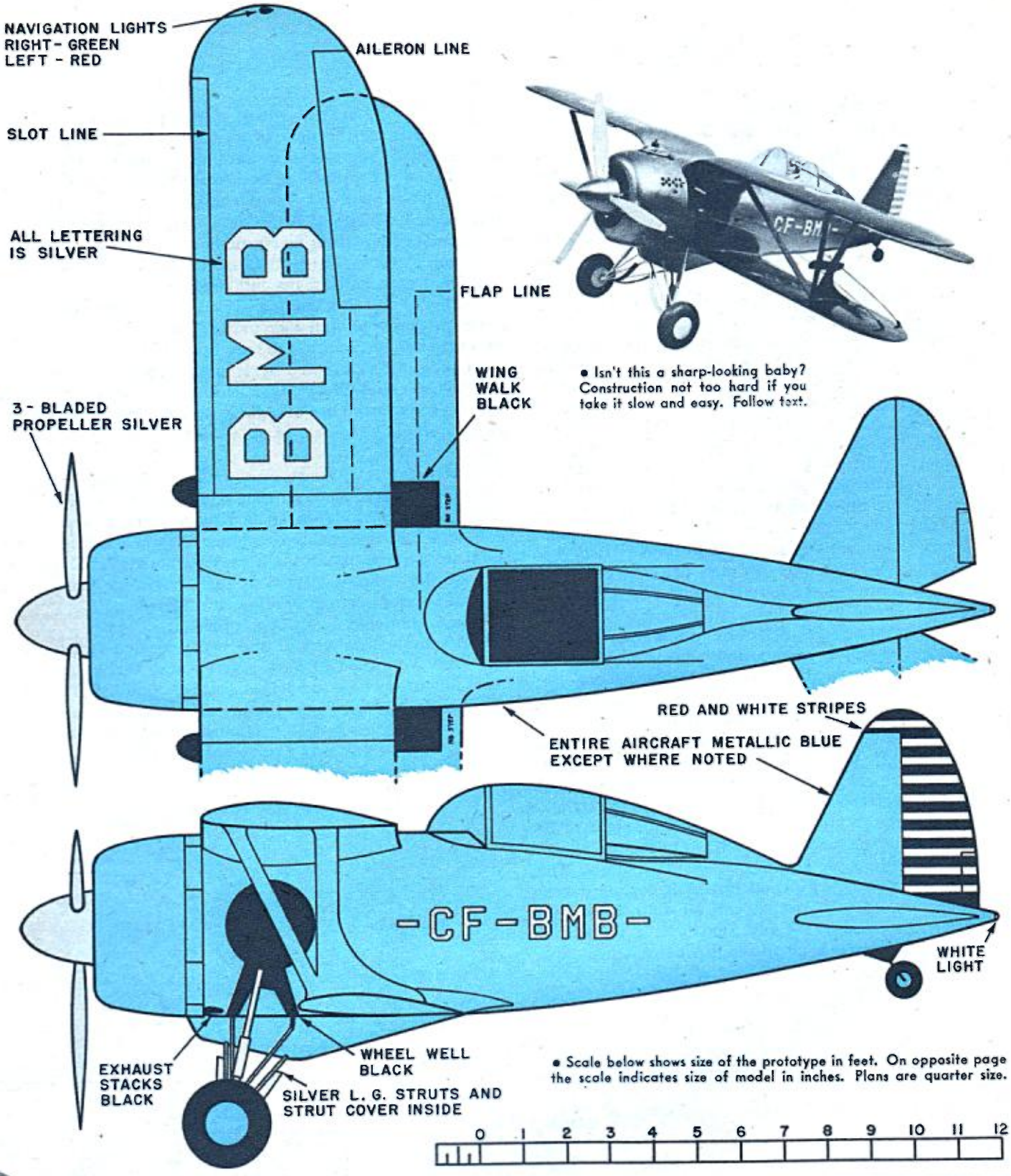
1. Assemble the firewall and plywood side structure. Use Weldwood or hard glue because this is the heart of the whole model structure. Small brads through the plywood into the firewall sides will add strength.

(*Continued on page* 72)





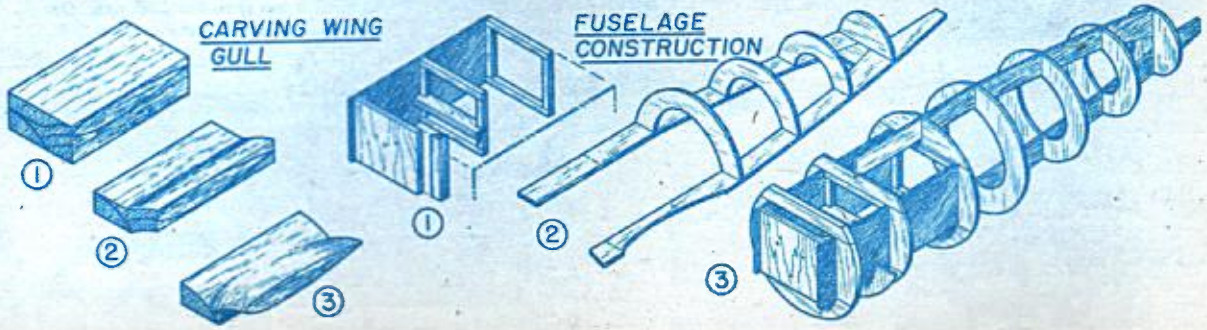
• One of the cleanest biplanes ever built, the Gregor missed going into service when Canada ceased her own development programs to assist Britain with the production of monoplane fighters. Shown here is the first FDB-1 which boasted a top speed of 300 mph. On model 1¼ inches equals 1 ft.



• Isn't this a sharp-looking baby? Construction not too hard if you take it slow and easy. Follow text.

• Scale below shows size of the prototype in feet. On opposite page the scale indicates size of model in inches. Plans are quarter size.

0 1 2 3 4 5 6 7 8 9 10 11 12



FDB-1

(Continued from page 41)

Locate the firewall between the plywood sides according to the engine used. The plans show location for the O & R 60 radially mounted. Other engines will change this location. Extend or shorten plywood sides as needed (see top view). Be sure the prop on your engine clears cowling front, and firewall is located accordingly.

Add bellcrank mount and ¼" sq. cross-pieces, cut to exactly the same width as the firewall. While this assembly is drying proceed to:

2. Lay the keel and backbone over the plan side view and cement former halves 4-5-6-7 in place. When dry take up and cement other former halves onto the opposite side.

3. Now cement former sections 1-2-3 onto the front section. Carefully align notches in top and bottom of 2 and 3 directly on the center line. Next join the rear fuselage section to the front section. Slide backbone and keel into place on formers 2 and 3. Check alignment from all sides and then cement in place. Add one strip of planking to the outside of formers 1 through 7 at the widest point of the formers on each side. This will help hold the formers while other work is done on the structure. Add the ⅛" sheet cockpit sides between formers 4 and 5. Cut out former 3A and cement in place. Duplicate keel strip between formers 2 and 3A and cement these two extra pieces in the notches in the former bottoms. This makes the saddle for the lower wing.

Cut out the ⅛" plywood landing gear former 1A. Bend the landing gear to shape and assemble to the former with Eye or "J" bolts. Fit the former into the plywood fuselage section so that the top edge rests against the front of the bellcrank mounting. Notch the plywood sides up ½" to receive former 1A. Glue with hard glue.

Bend the 1/16" dia. wire tailwheel strut to shape and cement it to the rear end of the keel. Cement on the left side because the push rod passes by on the right side.

Before further work can proceed on the fuselage, the horizontal tail should be built and the control system assembled. Carve and sand the stabilizer to a streamline section. Thickness should taper from ½" at center to ¼" at tips. Leave a flat section on the center top and bottom for assembly to the fuselage. The elevators can be made of two thicknesses of ¼" sheet sandwiched over the Veco control horn, or ½" sheet can be drilled for the wire ends. Carve to section and taper like stabilizer. Join to stab with fabric hinges. Cement stab to the keel end and former 7, being careful to align horizontally with fuselage structure. Add lower half of former 8 on left side of keel to help hold stab in place.

The control system should be installed at this point. Fit line leads to bellcrank and put push rod and bellcrank in place temporarily. Push rod will have to have a few slight wiggles bent into it for proper connection to control horn. A strip of ⅛" x ½" wood drilled for push rod should be cemented across former 5 to act as a fairlead to prevent push rod from buckling. Drill or punch former 7 for push rod also. Bend push-rod end for connection to horn so that neutral elevator position corresponds to neutral bellcrank position. Solder small washers over push-rod ends at bellcrank and horn to prevent working loose later. Check for full freedom of entire control system and remove any rubbing or binding. Scrap blocks can be added to bellcrank mount to limit travel and elevator movement to 30° up and down.

Fuselage planking can now proceed along with addition of fin, rudder and tail cone. Use fairly slow drying cement for planking and wet any strips needing sharp ends. This is a rather fussy part of construction; work carefully so that a smooth skin will result.

The wings can be built now. Structure follows the favorite Fireball type, resulting in light weight, simplicity and strength. The building procedure has been set down in articles on the "Long Midget," Air Trails Sept. 1949, and "T-6," Air Trails Jan. 1950, so it will not be dealt with at length here. Be sure to add the beveled strut mount blocks alongside the wing ribs before the top wing sheet is in place, or else you'll be in a heckuva fix. Wing skin should be carefully marked so that 1/16" wide slots can be cut later for assembly of wing struts.

When lower wing is completed it can be cemented directly to the saddle in the fuselage bottom. Shave planking as needed for a good snug fit. Use cement liberally when joining. A shallow fillet of Plastic Wood is built up along the Vee between the wing and fuselage. Smooth with a round stick or metal rod as the Plastic Wood dries to make a good smooth surface that will not need any sanding later. Fill areas behind former 2 and ahead of former 3A over the wing bottom and sand to shape, continuing fuselage contours onto wing.

Complete left and right upper wing panels before building the gull center section. The gull section could be a true whittler's nightmare, but no big difficulty should be experienced if you take little bites rather than big gulps. Follow the procedure sketches titled "Carving Wing Gull": 1. Cut block to proper size and layout section on ends and airfoil shape on side. Make one right and one left. 2. Carve and gouge lengthwise until proper cross section is reached. Use templates if necessary. 3. Gradually carve airfoil section into block. Leave root end a bit oversize so that when wing is joined a good snug fit can be made. Be sure that the airfoil shape has no incidence, otherwise undesirable wing twist might result. When the gull sections are near finished form, they should be fitted to the fuselage top temporarily; hold in place with pins. Place wing struts in position on lower wings and fit upper wings in place on struts and against gull section end. Sand and shave until wings, struts, and gull section all align properly, then dismantle and cement gull sections permanently to wing panels.

Before the gull sections and top wings are cemented onto the fuselage top, the engine and fuel tank should be fitted to the fuselage. The engine is bolted directly to the firewall. Use Elastic Stop Nuts on the bolts to prevent vibration from loosening engine. A wedge tank can be mounted on the fuselage at proper level, center line even with needle valve. Holes should be drilled through firewall and fuselage for fuel, filler and vent lines. Provision can be made for access to fuel tank and engine mount nuts after the center section is in place. A removable section can be cut into middle of the fuselage top between formers 1 and 2 if desired.

With all interior fitting-out completed, the lid can be put on. The V-wing struts and top wings are joined all in one operation. Squirt cement into upper and lower wing slots for struts and onto top fuselage members. Slide top wings onto struts and fuselage, pin securely while cement dries. Fuselage top between gull sections is filled with 3/32" sheet. Cement diagonal wing struts in place after all sanding and doping are done.

The fuselage should be sanded smooth and covered with narrow strips of lightweight Silkspan to strengthen the structure. Wings and tails can also be covered but this is not absolutely necessary. Wood filler should be used to fill all cracks, and sanded smooth.

The canopy can be built up after giving the turtle deck several coats of colored dope. Bend frames of soft brass wire to shape shown at formers 4 and

Check balance at point indicated on plans, add weight as necessary. Check lateral balance by suspending model on prop shaft and tail point, add just enough weight to outside wing to make model hang level or with outside wing slightly down.

With proper balance the model can be flown full power on the first flight. Our initial flights were made with 60-ft. lines with the O & R 60 swinging a 12" / 8" prop. No bad flight characteristics were evident and we were well satisfied with the performance. So here's wishing you luck in duplicating as trim looking a bipe as ever graced the end of a pair of .012 wires.

FDB-1—Bill of Materials

(Balsa unless otherwise specified)

3 pcs. ⅛"x3"x36", formers, keels, wing ribs. 12 pcs. 3/32"x¼"x36", fuselage planking. 1 pc. 1½"x3"x12", wing gulls. 1 pc. ⅞"x1¼"x8", keel block. 2 pcs. 12"x 12" of 1/16" plywood, fuselage sides, wing struts. 1 pc. 2½"x3" of ¼" plywood, firewall. 1 pc. 3"x5" of ⅛" plywood, landing gear mount. 1 pc. ¼"x3"x36", fuselage former, tail surfaces. 1 pc. ½"x3"x36", tail surfaces. 4 pcs. 1/16"x6"x36", wing sheets (or 3" widths as needed). 1 ⅝" and 13/16" scrap block, wing tips. 1 16" length ⅛" steel wire, landing gear. 1 24" length 1/16" steel wire, push rod, strut. 4 12" lengths 3/32" brass tubing, landing gear struts.

Block or sheet balsa as required for engine cowling (or spun aluminum). Two inch dia. Froom spinner, 2½" dia. Banner Streamlite wheels, 3" Veco bellcrank, Eye or "J" bolts for L.G. mounting. Seven-eighths inch dia. tailwheel. Veco elevator horn. Five-inch bubble canopy and sheet celluloid for canopy. Red, white and silver Trim-Film as required for decoration. Cement, lightweight Silkspan, wood filler, clear and colored dope as required. Approximate cost, $14.