

Gas-Powered "Cadet"

THE CADET, a cabin gas model of 87½" wingspan has been designed

By Ben Shereshaw

for FLYING ACES' readers as an intermediate step toward a larger and more intricate gas job. Many of the structural and aerodynamic features of the *Cadet* are conventional, and due to this simplicity the craft is easily constructed and will prove a reliable performer both in fair and gusty weather.

The original model was built from my plans by Dick Hergenrother, of Hillside, New Jersey. Up to the time of writing, it has made about sixty flights each averaging about ninety seconds' duration. The ship has survived a few minor crackups, and is still flying. She gave a creditable performance at the recent Eastern States Contest at Seversky Field, Long Island, New York.

BUILDING THE FUSELAGE

OUR first step is to select a flat work board upon which to construct the jigs for the fuselage sides and also for assembling the job. We must then scale up all of our necessary structural drawings—using an architect's scale—to full size. The side elevation of the fuselage (Plate 1) is laid out to full size on the board, and small blocks of hardwood are nailed around the outline and on both sides of the longerons and cross-members.

We now select our ⅜" sq. balsa for the longerons. Be sure that all of the four strips possess uniform grain and bending characteristics. The wood may be of medium grade, a shade on the hard side. The longerons can now be laid in the jig, and all of the fuselage and cross-diagonal braces cut to size. In cutting the cross-members, be careful not to force them in place between the longerons. Instead, cut them so they just fall into place with the slightest pressure.

After the insertion of the members, the first coat of a good grade of gas model cement is applied to them. After this has been allowed to dry for about one hour, the final coat of cement is applied in such a manner as to form a glue gusset between the longerons and members.

Note carefully the diagonal braces running parallel to each other on Bay No. 3 for shock strut accommodation. These members are made of 3/16" by ⅜" hardwood. The same procedure is followed in laying out and constructing the second fuselage side. After the sides are fully completed, they can be assembled. Start by binding together the stern posts of each side and the ⅜" diameter music wire tail skid.

The cross-members across the cabin should then be cemented in place. Note that at the cabin portion of the fuselage there are three separate longerons. All three are connected with ⅜" sq. cross-members.

Once this is accomplished, quick progress can be made by inserting the cross-members between the cabin and stern post. While inserting the cross-members, keep checking the alignment of the fuselage with a set of architect's triangles. The last step in this assembly is accomplished by pulling the nose of the fuselage together to its proper width and keeping it there until the cement has firmly taken hold.

As a brief summation, keep in mind the important notes up to this step—the long diagonal brace in Bay No. 1 with a two-piece diagonal intersecting it; the three longerons about the cabin; and the double diagonal shock brace.

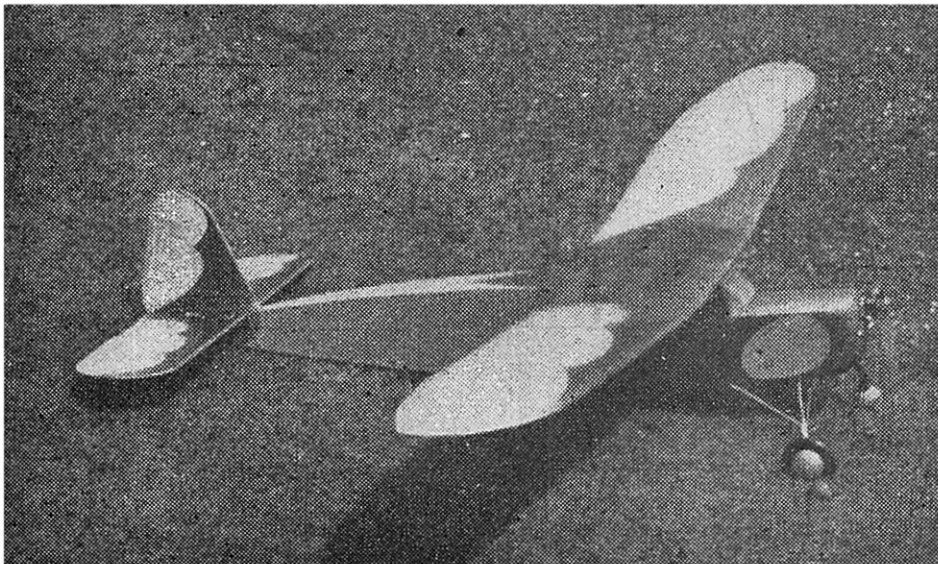
NOW the longerons can be planed or sanded to a radius, and the cutting of the internal motor mount bulkheads (see detail sketch on Plate 2) can be accomplished. The cross-section of the fuselage is obtained at Cross-sections Nos. 1, 2, and 3, and the internal bulkheads are then cut to size. These are laminated of two ⅜" balsa sheets with the grain of the two sheets running at right angles to each other.

The motor mount sockets are of ½" by ⅞" stock. They are cut into the internal bulkheads. On section No. 2, the internal bulkhead does not extend below the line marked A-A. This forms a small tunnel which allows the windstream to pass through to the screened outlet. The motor mount of basswood is cemented in place through the ½" by ⅞" holes on the internal bulkheads.

The landing gear tube—of either aluminum or brass—should be attached to the fuselage at section No. 2. The tube, which secures the forward portion of the landing gear to the fuselage, is bound and cemented to the cross-members with No. 6 thread.

Now the nose bulkheads should be cut, notched, and cemented to the fuselage. The stringer positions on the bulkheads should be laid out relative to the basic stringer locations. Two of the T-2 bulkheads (Plate 2) should be cut for the construction of a removable hatch. The entire nose portion is covered with 1/16" sheet balsa.

The lower portion of the fairing accommodates the screened air outlet from the "tunnel." This section is then covered with 1/16" sheet balsa, and a piece of 80-mesh wire screen is cemented across



Ta-rum-ta-ra! Atten—SHUN! Yes sir, fellows. Here's Ben Shereshaw's latest gas job, the "Cadet," all slicked up and polished like a West Pointer on parade. And just like those Army lads up the Hudson River, this consistent "Cadet" is able to perform as well as pose. For in more than sixty consecutive flights, never once did its time fall below ninety seconds on a thirty-second engine run. Dick Hergenrother built this original model from Ben's plans, and he tells us that he's well pleased with the results of his handiwork.

the bottom between bulkheads B5 and B6. The covering of the fuselage should now be completed with balsa, with the exception of the portion marked A, where 1/16" birch plywood is substituted.

The battery box is merely a simple chamber built from 3/32" sheet balsa on the floor of the cabin. The batteries are thus easily accessible whenever the wing is dis-assembled from the ship.

Our next step in the completion of the fuselage is to bind the wing hooks to the fuselage uprights. And before leaving the fuselage, a hardwood stop should be cemented in place between the shock diagonals in a position to allow the rear strut of the landing gear about two inches of up-and-down movement.

LANDING GEAR

ATTENTION should now be focused on the assembly of the landing gear. Because of the metal tube anchorage of the front strut, it is obvious that half of the forming of the member must take place while it is in the tube.

While bending the music wire, keep in mind that sharp or extreme bends are apt to encourage crystallization—and consequent weakness—of the material. A full sized layout of the landing gear members should be made before any of the bending is attempted.

After the struts have been shaped, they should be bound together with tinned wire, as shown, and soldered with half lead and half tin solder. Use acid as a flux.

The shock system is clearly illustrated on Plate 2. In the detail sketch, note the coils of 1/8" flat rubber wound about the landing gear member and the cross-brace. About fifteen loops are required.

And now we return to the fuselage and complete the nose end of the ship by carving out the nose blocks and the cowl. The cowl should be first cut to its outside shape, and then hollowed to a wall thickness of 1/8". The entire top portion of the nose is made removable for motor adjustments. It is held in place with rubber bands.

Cut a generous opening in the cowl for ventilation. The cowl should be cemented in place only lightly, so that it

Spanning slightly more than seven feet, this production from the drafting board of Ben Shereshaw was developed expressly for those FLYING ACES readers who are ready to "build something bigger" but who are not yet prepared to tackle the giant gas jobs. Conventional in design and construction—and thus built with a minimum of time, effort, and expense—the "Cadet" is a typical Shereshaw performer. And what better compliment can we give it than that?

may be detached easily in case of motor trouble.

RUDDER AND TAIL

WE next undertake the construction of the horizontal tail and rudder. Note that these are constructed as a unit. All of the ribs are scaled from the basic tail airfoil (Plate 1) to full size. A full sized drawing of the empennage should be laid out on your workboard.

And now you're ready to select your spar material and assemble the rudder.

Duplicate the procedure in building the horizontal tail. The horizontal tail and the rudder spars should be bound together at their points of intersection. The entire section of the rudder

at the horizontal tail juncture should be covered with 1/16" sheet balsa. The same step is taken with the horizontal tail at the rudder juncture.

The above covering allows us to cement the unit securely together by forming a fillet with several layers of cement. The trailing edges and tips of the horizontal tail and rudder are cut from 3/16" medium sheet balsa, the sheet balsa leading edge on the horizontal tail is then applied to both top and bottom of the surface.

All of the four tail hooks, H, which are bent from .0625 wire, are bound to the spars on the horizontal tail. The forward hooks are bound to a false spar extending to one rib on either side of the center rib.

The rudder is next cut away at point A and the lower portion cemented securely to the fuselage stern post. At this point, the 1/4" o.d. aluminum tubes indicated in the spars are bound and cemented between the spar strips. A 1/4" birch dowel is next sanded to fit. This serves as a pin in securing the tail unit to the fuselage.

A duplicate of the rib at point A in the rudder should be cut and cemented to the removable section of the rudder. The entire section above Point A is covered with 1/16" sheet balsa. The four hooks are used to attach the empennage to the fuselage with four strands of 3/16" flat rubber.

The tail assembly should possess no incidence, either negative or positive.

Bill of Materials

Complete plans will be found on the following pages—all wood is balsa, unless otherwise specified.

Fuselage

- Two pieces 3/8" sq. by 48" for longerons;
- Two pieces 3/8" sq. by 40" for longerons;
- Two pieces 3/8" sq. by 18" for longerons;
- Five pieces 3/16" by 3/8" by 36" for diagonal braces;
- Four pieces 3/16" by 3/8" scrap hardwood, for ditto;
- Four pieces 3/8" sq. by 36" for cross-members;
- Two sheets of 3/32" by 3" by 36" for internal bulkheads—additional stock of same size for regular bulkheads;
- Two pieces 1/2" by 7/8" by 8 1/2" for motor mounts;
- Four sheets 1/16" by 3" by 36" for covering;
- One sheet 1/16" by 6" by 12" birch ply for covering;
- Three sheets bamboo paper for covering;
- Three pieces 1/8" by 1/4" by 36" for stringers;
- One piece 1 1/8" by 2 1/4" by 3 1/2" for upper cowl block;
- One piece 2 1/2" by 3 1/2" by 4 1/2" for lower cowl block (this should be split to make two blocks 2 1/2" by 1 3/4" by 4 1/2" for hollowing-out);
- One piece copper screen, 80-mesh, 1 3/4" by 4 1/2" for air vent;
- One piece .015 celluloid 6" by 12" for cabin enclosure.

Tail Assembly

- Three sheets 1/16" by 3" by 36" for ribs;
- One piece 3/16" by 3/4" by 24" for trailing edge;
- One sheet 3/16" by 3" by 36";

- One piece 1/4" by 1/4" by 36";
- One piece .0625 music wire for tail and wing hooks;
- One piece 1/4" by 3/8" by 8" for false spar for elevator hooks;
- Three sheets 1/16" by 3" by 36" for leading edge and sheet covering.

Wing

- Two pieces 1/4" by 1/2" by 48" for leading edge;
- Five sheets 3/32" by 3" by 32" for ribs;
- Two pieces 5/16" by 1" by 48" for trailing edge;
- Eight pieces 3/16" by 3/8" by 48" for wing spars;
- Two sheets 3/32" by 2" by 36" for joiners;
- Two sheets 1/16" by 2" by 36" for spar boxing;
- One sheet 3/16" by 3" by 36" for wing tips;
- Four sheets bamboo tissue;
- Five sheets 1/16" by 3" by 36" for leading edge covering.

Miscellaneous

- One pair 3 1/2" airwheels;
- Music wire, .125 diam., for landing gear;
- Length of 1/8" flat brown rubber, for landing gear;
- Half-and-half lead-tin solder, with flux;
- Aluminum tubing, 1/4" outside diameter, for rudder fin;
- Aluminum tubing, 1/8" inside diameter, anchorage for landing strut;
- Cement, etc.