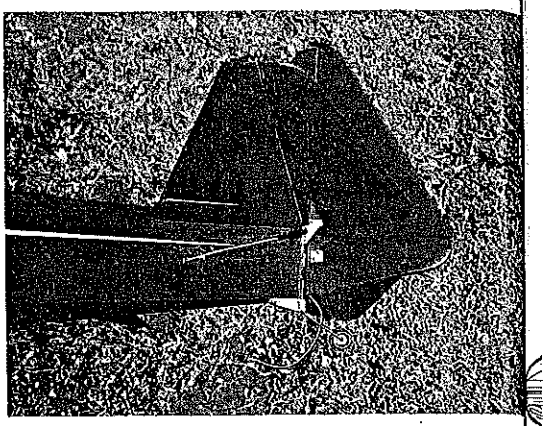
A-528

swallow

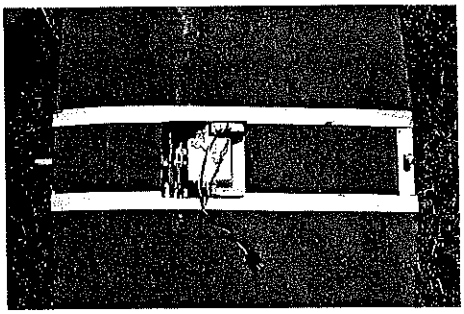
With Golden-age-type classic looks and a lightly-constructed airframe that makes the most of four-stroke engine power, this model is both docile yet Pattern capable. Requires a .40 engine and four channels. ■Fred Reese

Big Picture: Don't be overwhelmed by the vastness of this flying site; this model is the perfect small-field plane. Built-in lightness makes this plane work well with a four-stroke.

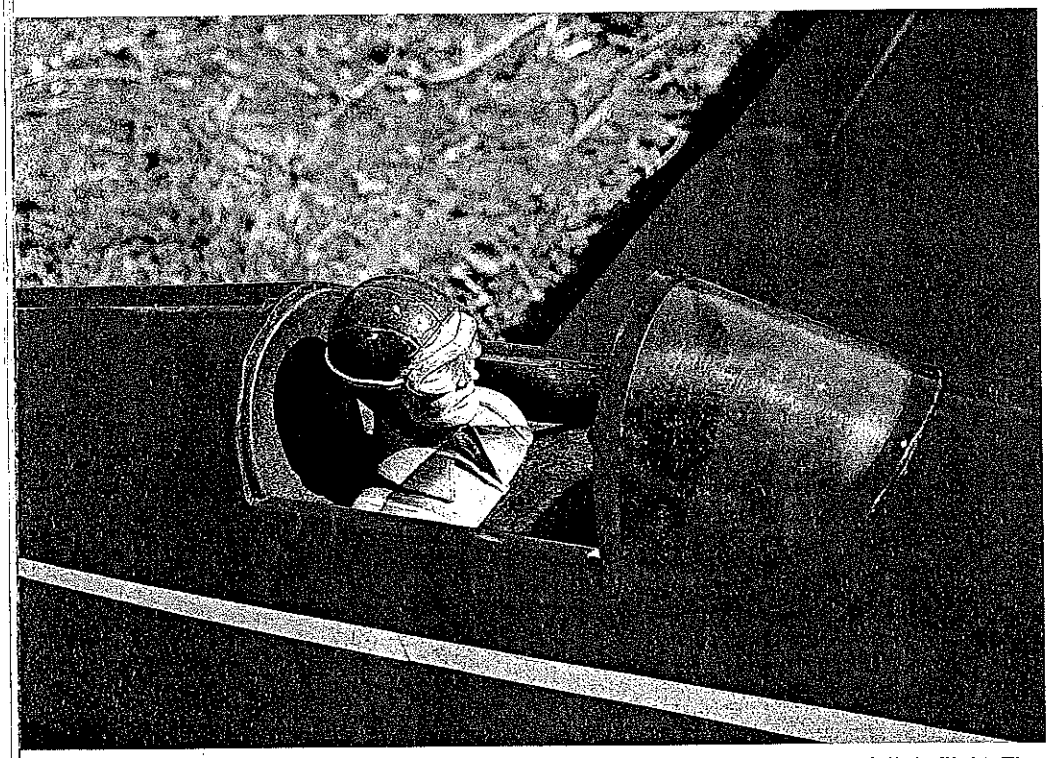
For trouble-free operation, full length, 6-in. landing gear blocks and 5/32-in. wire struts were used for their strength, reliability, and resistance to damage from rough landings. The control horns are secured to 1/8-in. Lite Ply plates in the ailerons with #2 sheet metal screws.



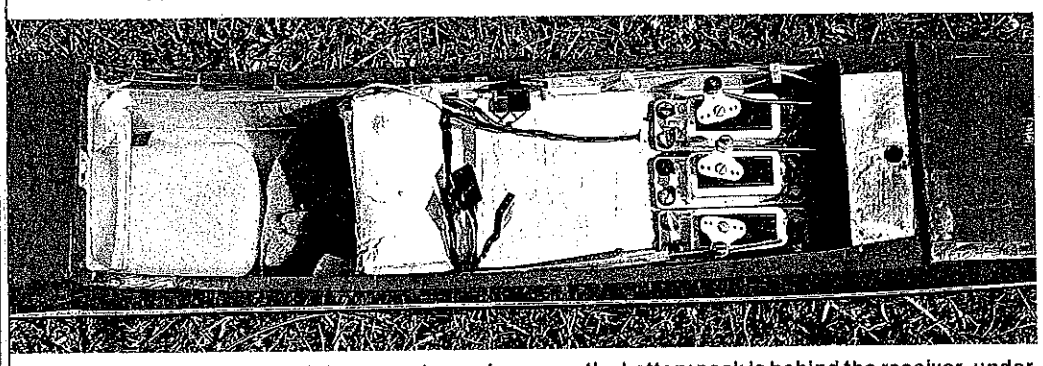
Author used Du-Bro ½A control horns; the small Klett hinges and tail wheel bracket are from Goldberg. Control movement and aft CG location were gradually increased in an effort to improve snap rolls, but were later returned to original settings. Adjust the control surface limits to suit your preference.



The 1/16-in. aileron pushrods and the link to the servo are all soldered together inside a brass tube which makes perfect alignment easy. The homemade servo mount is built of balsa and plywood and is mounted to rails glued into the wing. Foam tape (1/16-in.) is applied to the wing rather than the saddle.



The 2-in. Williams Bros. standard pilot really completes the model, especially in flight. The receiver switch is also in the cockpit, located just ahead of the pilot. Little dots of epoxy were applied to the windshield before the framework was painted for simulation of the rivets.



The author's model came out nose-heavy, so the battery pack is behind the receiver, under the sliding balsa cover, and the servos were mounted as far aft as possible. Flexible cable is used for throttle control. The charge plug is on the fuselage side opposite the exhaust.

THIS DESIGN actually came about two years ago in an effort to utilize the performance of the .40 four-cycle engines. At that time the Enya, Saito, and O.S. .40s our club members had were being flown in Falcons and the like, and most weighed about 5 lb. Performance was marginal but pleasant.

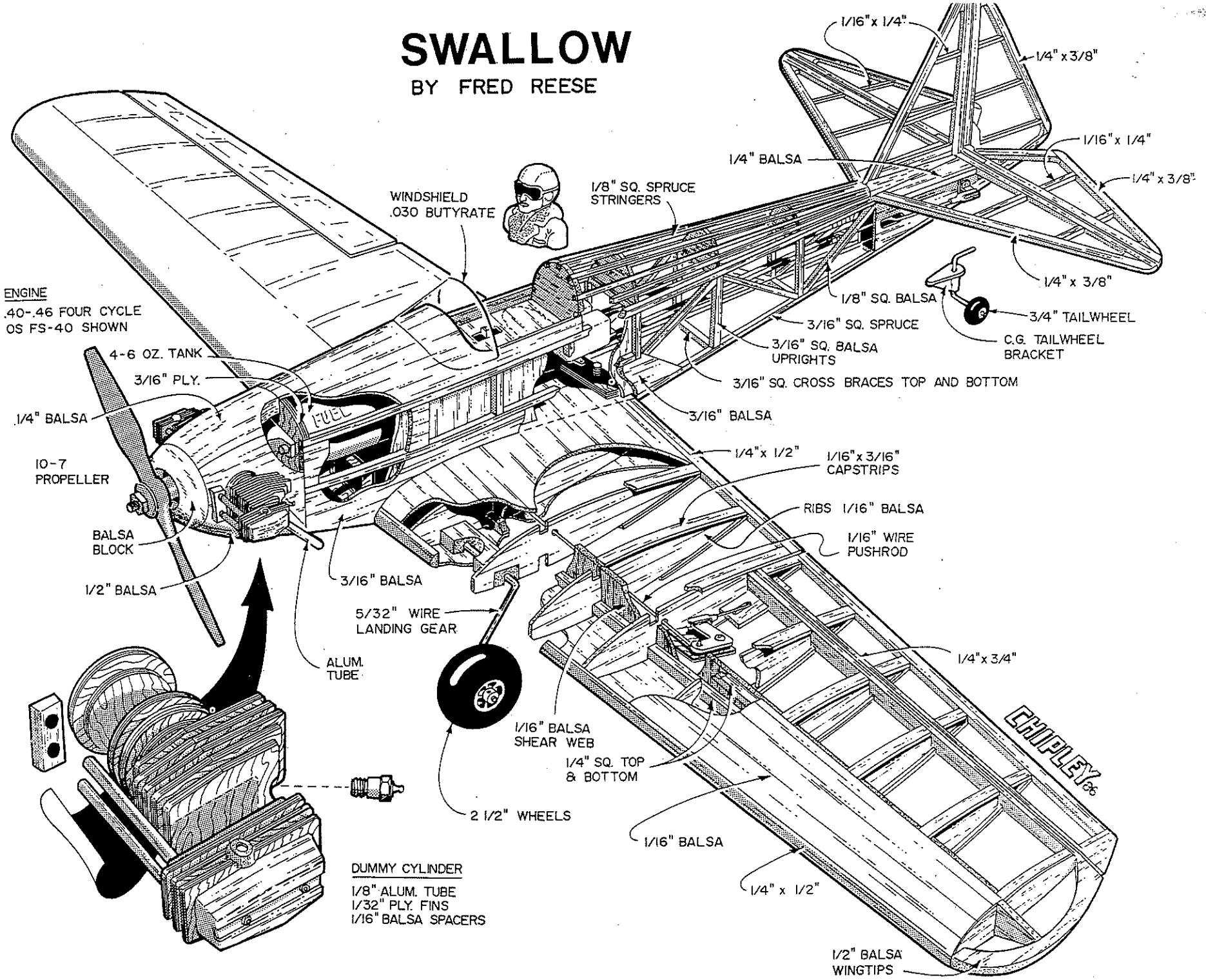
Then club member Harry Stewart showed up at the field with a modified Midwest Taylorcraft that weighed only 4½ lb. and had a strong O.S. FS-40. The performance of the Taylorcraft was outstanding. That little airplane opened up our eyes to the potential of these docile engines and the propeller to extract that potential. The Master Airscrew 10 x 7 is the perfect propeller for this type model design and the four-cycle .40s.

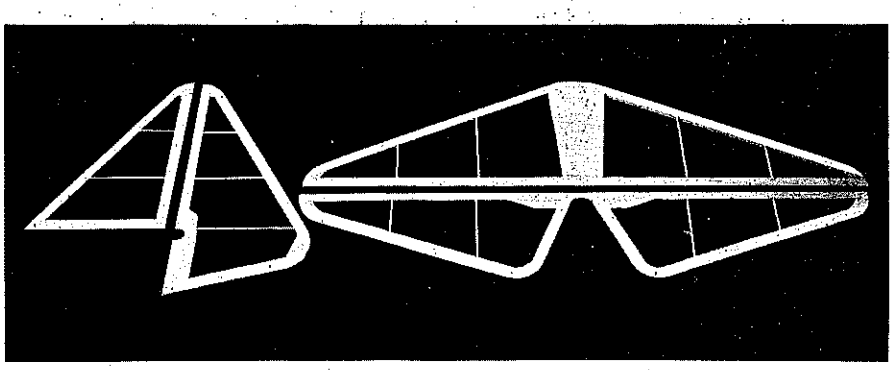
After much discussion, it was reasoned that to fly the way we wanted, the model should weigh less than 3½ lb. and have a wing area over 500 sq. in. Some of the club members were flying the IMAC pattern, and we felt that the .40s could be competitive in the Sportsman category.

I had drawn an airplane a couple of years earlier that sort of fit the requirements. I liked the concept, so I redrew the plans to update my ideas. The other major flying characteristics that had to be incorporated into the design were good inside and outside looping ability and neutral knife-edge flight.

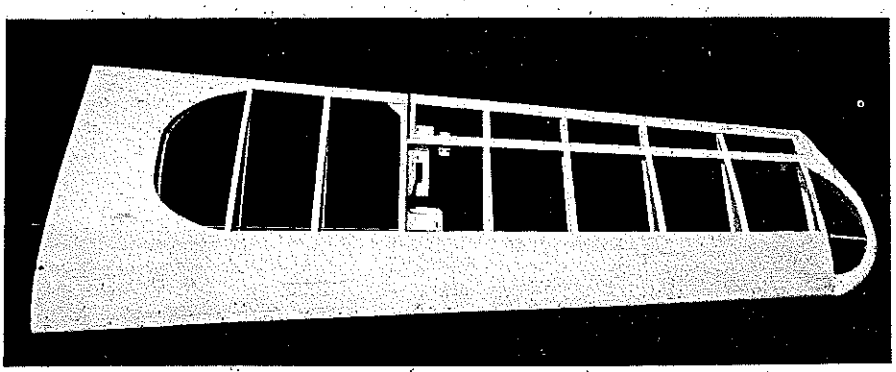
SWALLOW

BY FRED REESE

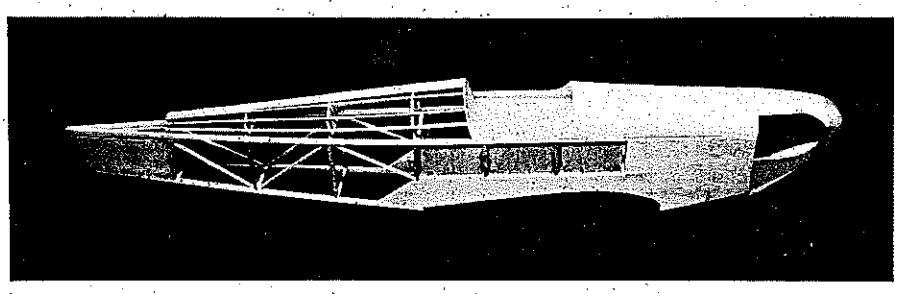




Each part of the tail surface is triangular, making the structure strong and rigid—yet light.



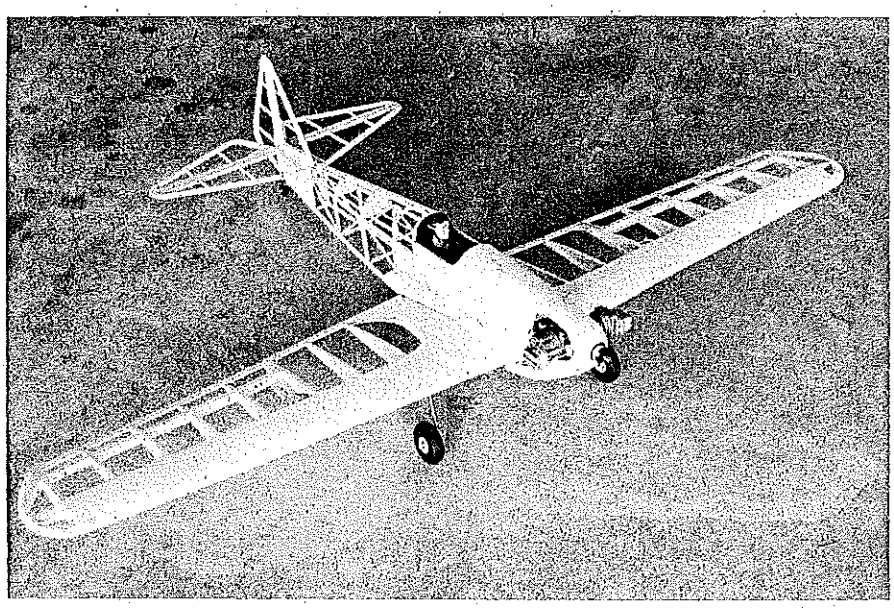
The wing panels are built flat on the work bench for accurate alignment. The forward portion of the wing is a full D-tube with balsa shear webs between the spars. Panels are then joined with a piece of 3-in.-wide fiberglass cloth/resin; this makes the center section very strong.



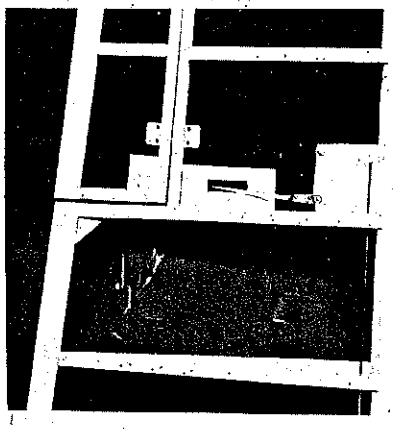
The fuselage longerons and stringers are spruce for extra strength. The uprights, diagonals, and crosspieces are balsa, as their stress loads are less. Top sheeting is only 1/16-in. balsa, and care must be taken when handling the model—but there is adequate flight strength.

In effect, I was designing a balanced Pattern model—and a cute little airplane at the same time.

What evolved is the nicest-flying machine I have ever had. It's not perfect, but it's very good. The Swallow flies easily with its light wing loading. Takeoffs are straight, and it will slow to walking speed on landing.



The bare bones of a "5-lb. model" that weighs 3 lb., 7 oz. A lighter airframe performs better.



The aileron linkage as seen from the top. A solder link attaches the Goldberg 1/16-in. aileron pushrod to the bellcrank. For the pushrod from the servo to the bellcrank, 1/16-in. wire is used. Note 1/8-in. balsa gusset between the trailing edge and Rib W-5.

It has no bad habits. Inside and outside performance is almost equal, and it will turn square corners like a Control Line Stunter. Knife-edge flight is balanced with no need for aileron correction, but speed and side area are not enough for sustained knife-edge flying. Yet it is capable of knife-edge to knife-edge snap rolls if you are. Outside snap rolls are easy, but inside snap rolls are difficult and must be forced. The plane is just too stable.

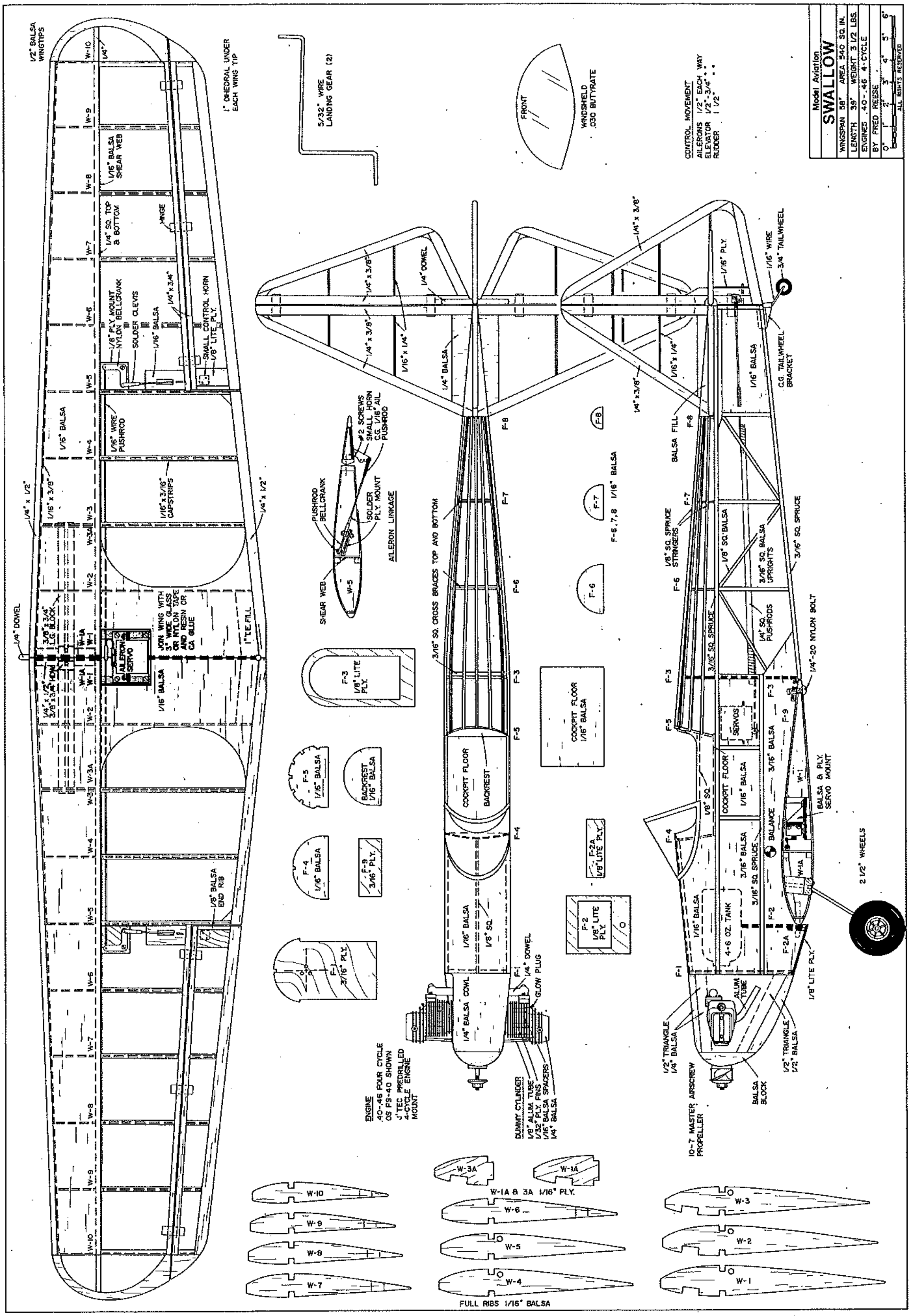
What is most impressive about the Swallow is how quickly it becomes comfortable to fly. It is not very fast, and it feels docile. Still, it is very responsive and will do whatever maneuvers you want it to do.

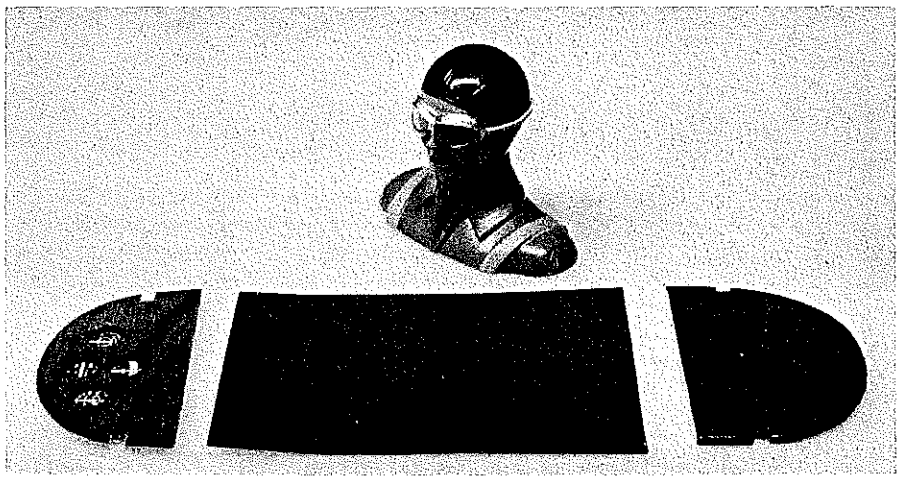
Construction. To build a "5-lb. airplane" that only weighs 3½ lb. requires some changes in building habits and thinking. I did not use any special techniques when building the Swallow nor did I use only super-light wood. Most of the wood used was medium weight; I just used less of it. Zap CA+ was used for all construction. Avoid epoxy.

The structure of the Swallow is engineeredto be strong, so it does not need larger wood sizes or any additional reinforcement. To add weight requires a stronger airframe which is heavier and throws us into a vicious circle. Just build carefully and thoughtfully. My Swallow with large wheels, dummy engine, and pilot weighs only 3 lb., 7 oz. ready to fly.

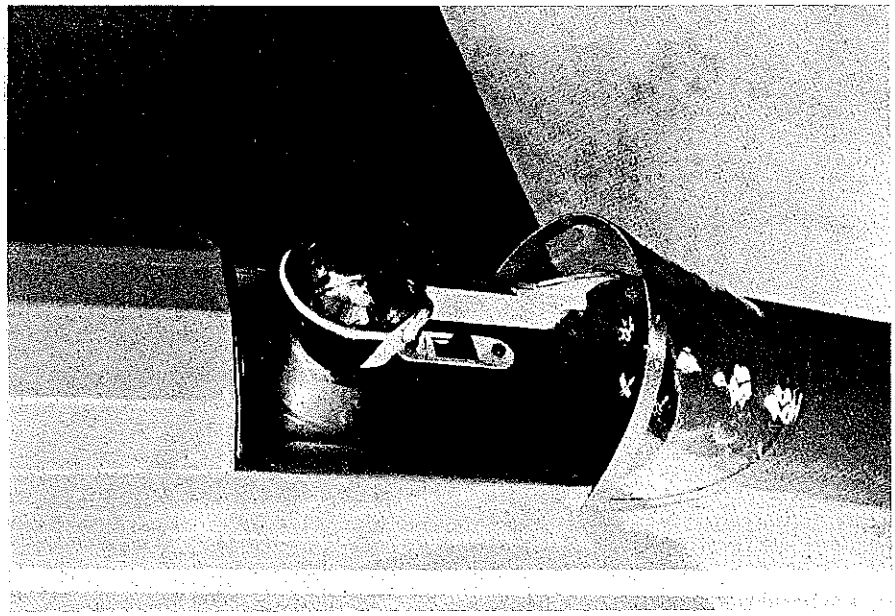
Fuselage. I built this first. Make the two sides over the plan covered with wax paper or Saran Wrap. Use 1/16 sq. spruce for the longerons and balsa for the uprights, crosspieces, and diagonals. Drill the engine mount, and attach it to the firewall, F-1. Glue F-1, F-2 and F-2A, and F-3 to one fuselage side, then add the other fuselage side.

Pull the tail together, and add the rear crosspieces. Glue in the cockpit floor, F-4 and F-5. Glue in the 1/8-in.-sq. top, forward stringer and the 1/16 top, forward sheeting. Glue on F-6, F-7, F-8, and the top 1/8-in.-sq. spruce stringers. I originally planned to


Model Aviation
SWALLOW
WINGSPAN 58" AREA 540 SQ. IN.
LENGTH 39" WEIGHT 3 1/2 LBS.
ENGINES .40-.46 4-CYCLE
BY FRED REESE
ALL RIGHTS RESERVED
CONTROL MOVEMENT
AILERONS 1/2" EACH WAY
ELEVATOR 1/2"-3/4"
RUDDER 1 1/2"
1/2" BALSA WINGTIPS
1" DIHEDRAL UNDER EACH WING TIP
5/32" WIRE LANDING GEAR (2)
WINDSHIELD .030 BUTYRATE
AILERON LINKAGE
JOIN WING WITH 3" WIDE GLASS OR NYLON TAPE AND RESIN OR CA GLUE
COCKPIT FLOOR 1/16" BALSA
ENGINE .40-.46 FOUR CYCLE OS FS-40 SHOWN J'TEC PREDRILLED 4-CYCLE ENGINE MOUNT
10-7 MASTER AIRSCREW PROPELLER
2 1/2" WHEELS
W-1A & 3A 1/16" PLY.
FULL RIBS 1/16" BALSA



Lightweight and easy-to-construct cockpit details. The instrument panel is 1/16-in. balsa covered with paper wood grain cut from a magazine. Paper instruments are glued behind holes cut in the balsa with a sharpened brass tube. Panel front was then covered with clear plastic packing tape to seal the paper and give the instruments a clear glazing. The cockpit floor is covered with lightweight card stock spray-painted flat black. Balsa backrest was pre-finished with resin and painted brown. Pilot figure was painted with Pactra enamels.



Finished cockpit complete with radio switch. Inside of the cockpit was painted silver before covering the fuselage and adding the cockpit details. Windshield was first formed over a tin can in the oven. Glue the windshield in place with RC-56 for a nice finishing touch.

use lighter balsa stringers but kept breaking them when handling the model, so I replaced them with spruce. Glue in a little wedge of 3/16-in. balsa between the bottom longerons at the tail for the tail wheel bracket. Glue in F-9, the wing mount.

Wing. Build this before going any further with the fuselage. Make photocopies of the wing ribs, and cut out each paper rib pattern. Rubber cement two sheets of 1/16 x 3 x 36-in. balsa together, and rubber cement the paper ribs to the wood. (Spray contact cement can also be used for this.) Cut the ribs out a little oversized with a Dremel jigsaw or X-Acto knife, and sand them to final shape. Glue the 1/16 plywood rib doublers W-1A and W-3A to W-1 and W-3. Cut away the aileron portions of W-6 to W-10.

The wing builds flat over the plan covered with wax paper. Glue the bottom 1/4-in.-sq. hard balsa spar to the edge of the 1/16 bottom sheeting, and pin them to the plan. Pin down 1/16 x 3/16 shims about 1/4 in. ahead of the 1/4 x 1/2-in. trailing edge and one ahead and one behind the 1/4 x 3/4-in. aileron spars.

Glue Ribs W-1, W-5, and W-10 to the bottom wing spar. Pin and glue into place the trailing edge and aileron spars. Add the remainder of the ribs. Glue on the 1/16 x 3/8-in. inner leading edge and the top 1/4-in.-sq. spar. Pull the lower sheet up, and glue it to the ribs and the leading edge.

Cut away the sheeting for the landing gear block, and glue the block into the wing. Add the 3/8 x 3/4-in. pine or hardwood vertical gear block to W-1 and reinforce with scraps of 1/4 x 1/2-in. balsa between the top spar and the leading edge. Glue in the 1/16 sheet balsa vertical-grain shear webs between the spars and the ribs. Add the 1/16 center sheeting and the wing tips.

Cut away the ailerons, add the cap strips, and sand the wing panel to final shape. Install the aileron linkage now, letting the pushrods extend past W-1 by about 1/2 in. The two pushrod ends and a link to the aileron servo will be joined later with a piece of brass tube and solder. Zap the two wing panels together, blocking up one wing tip 2 in. I used 3-in.-wide fiberglass cloth from Ace RC and K&B finishing resin to reinforce the wing center joint. The glass cloth was first spot-Zapped in place and then flowed with resin to saturate the weave. Excess resin was blotted off with Kleenex. Only a little sanding and some Model Magic filler was needed along the edges before covering.

Fit the wing into the fuselage, and drill the leading edge for the 1/4-in. dowel using the hole in F-2 as a guide. Drill the trailing edge of the wing down through F-9 with a 3/16-in. bit and follow with a 1/4-20 tap. Drill out the wing hole to 1/4 in., and Zap the hole and the threads in F-9. Glue on the bottom 1/8-in. Lite Ply between F-1 and F-2. Add the cowl.

Build the tail surfaces over the plan using medium balsa. The little piece of 1/16 or 1/32 plywood in the rudder will prevent the tail wheel from ripping out.

Final details. Cover all of the parts of the airplane separately, and then trim away any covering between glue joints. Glue the rudder and stabilizer to the fuselage, and hinge all the control surfaces. Keep all of the hinge gaps to a minimum; preferably seal all of the gaps with tape or strips of covering. I used red EconoKote covering and white MonoKote Trim sheets for the numbers and trim.

The dummy cylinder for making the O.S. FS-40 into a "twin" was the most fun part of the airplane. It looked real, and people tended to stare at it perplexed until I told them it was fake. The 1/32 ply fins were cut out with scissors to match the engine fins, and 1/16 balsa circles were cut for spacers. The cylinder was painted with Aero Gloss silver. Real screws could be used, but I used 1/8-in. lengths of Nyrod painted black for the screw heads. K&S 1/8-in. aluminum tube was used for the pushrods and 1/4-in. aluminum tube for the exhaust. Use your own engine as a guide for the size and shape of the parts.

Micro servos are not necessary for this model but are nice if you have them. I used the Ace RC Silver Seven receiver, Micro servos, and the 250 mAh battery pack. I glued the servos into the trays with little dabs of silicon. I made a balsa-and-plywood servo tray for the aileron servo which was screwed to balsa-and-plywood rails glued into the wing.

Flying. No surprises here. Just point it down the runway, push the throttle to the stop, push in some right rudder and a little up elevator, and the airplane will be flying almost instantly.

I hope a lot of you will build this airplane or apply some of the building techniques of this design to reduce the weight of your next project. Everyone should have an airplane that flies like this one.