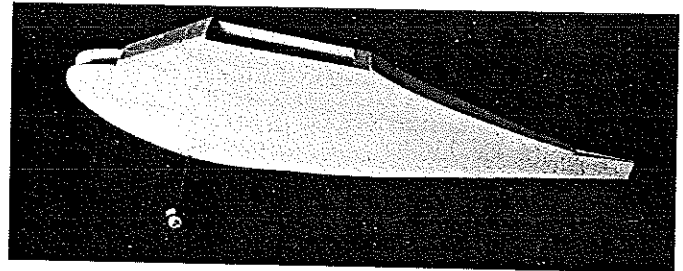
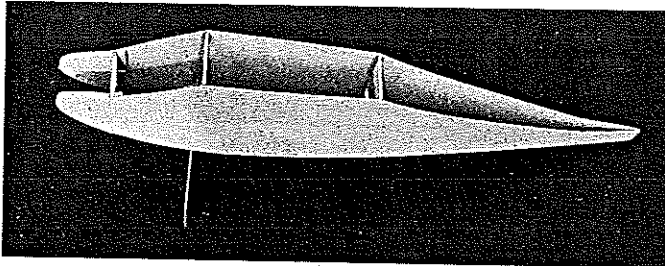
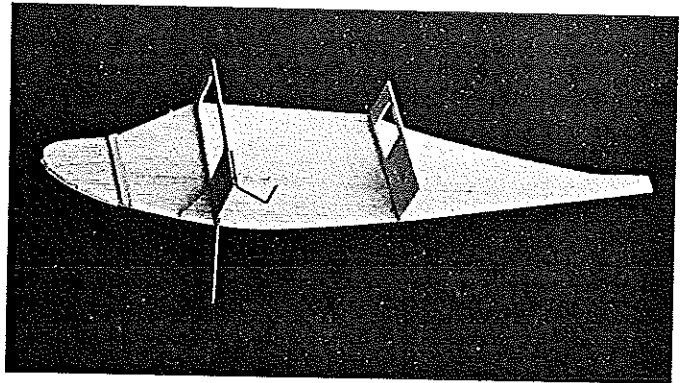


Left: Glue the doublers (F-1, F-6, and F-7) to the fuselage sides. Glue the engine mount blind nuts into the firewall. Bind the 1/16-in. wire landing gear to Bulkhead F-3 with strong, heavy thread, then coat the thread with epoxy or other glue after F-3 is glued in place. Cut out Bulkhead F-4 and the 1/8-in. plywood wing hold down (F-5). Right: First assembly step is to glue Bulkheads F-3 and F-4 to one fuselage side.



Left: Glue on the other fuselage side. Glue the sides together at the tail, and glue in the firewall. Right: Glue on the top and bottom sheeting; sand well. Give the wood a coat of Balsarite before covering it. Components of the airplane can be covered separately before assembly.

I HAVE ALWAYS liked little airplanes. Actually, I like all airplanes, but I prefer to build small ones. I especially like simple little airplanes so that, once I get the idea, I can get into the air quickly. I also like a change of pace. I will spend months on a Scale project, then turn around and build something like the Buttercup in a few days.

This particular small, simple model is actually a caricature of an airplane that I doodled while on the phone. I thought it was kind of cute, so I built it. When it came time to cover the model, I chose yellow, as I had a lot of yellow Super MonoKote. I like yellow, so I named it Buttercup.

In addition to being very simple and small, Buttercup really performs well. Especially when pushing limits, sometimes simple things are best. Buttercup is not the smallest RC that is possible, but it is a practical small airplane that does not require any special techniques, and it uses all stock components. It is designed to use the Ace (or other) micro-sized radios or the Ace micro servos and your receiver along with a 100 mAh battery pack. Two different-shaped 100 mAh battery packs are available from Ace RC, and either one of these will fit. There is room enough for most any receiver.

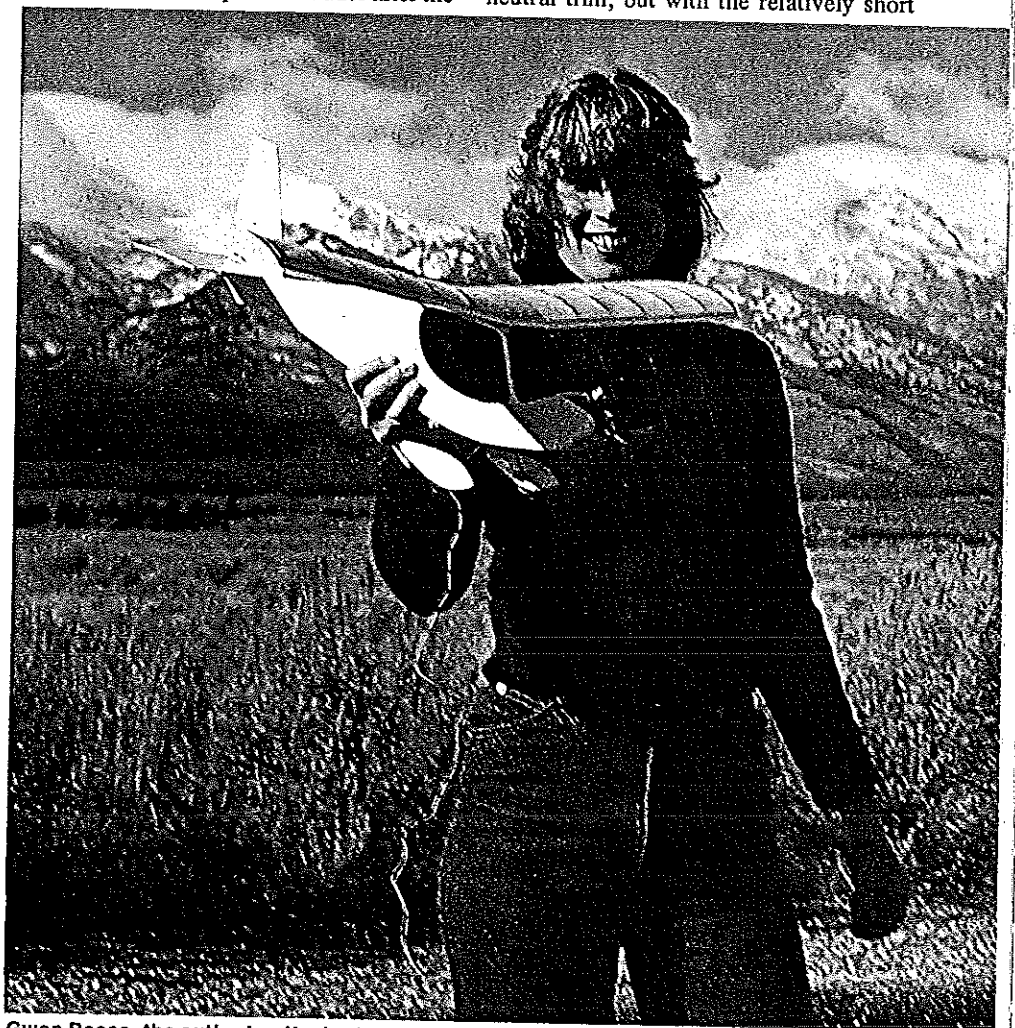
Buttercup was three years old when this was written, and it was still going strong. I have taken it traveling on vacations. I have flown it everywhere with what seems like reckless abandon, and it still survives.

My goal for the weight of Buttercup was 10 oz., ready to fly. With the wheel pants and a few repairs, it now weighs 10½ oz.

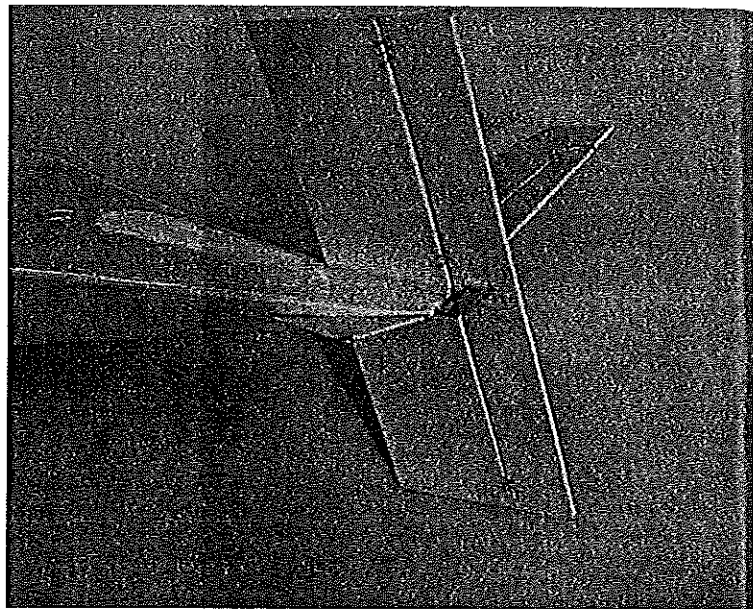
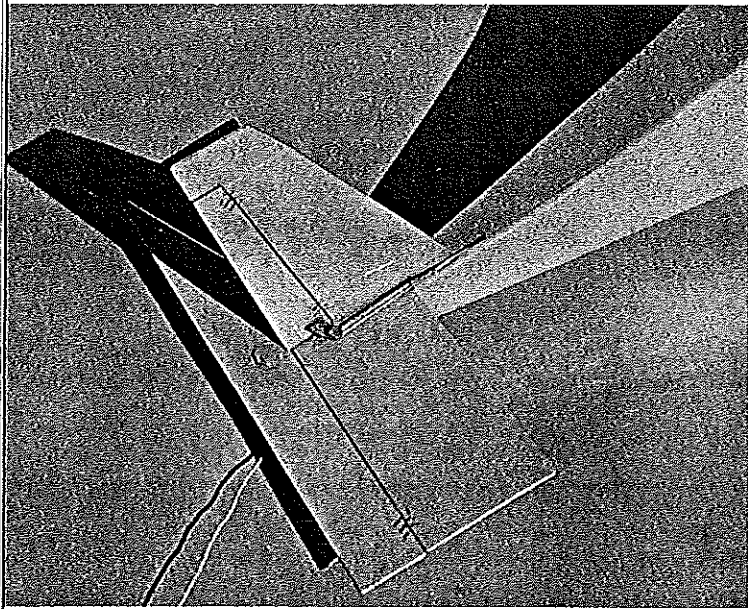
This airplane is not a docile "putt-putter." With a TD .020 engine, it really zips along and will keep up your interest. At 6,200 ft. elevation, where I fly, Buttercup will easily loop and roll from level flight.

The rudder needs to be tall to offset the large fuselage side area up front. In fact, I added ½ in. to the top of the rudder after the

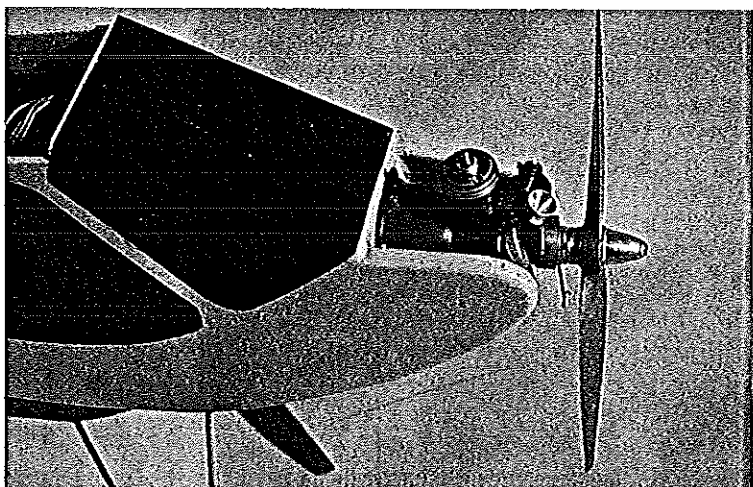
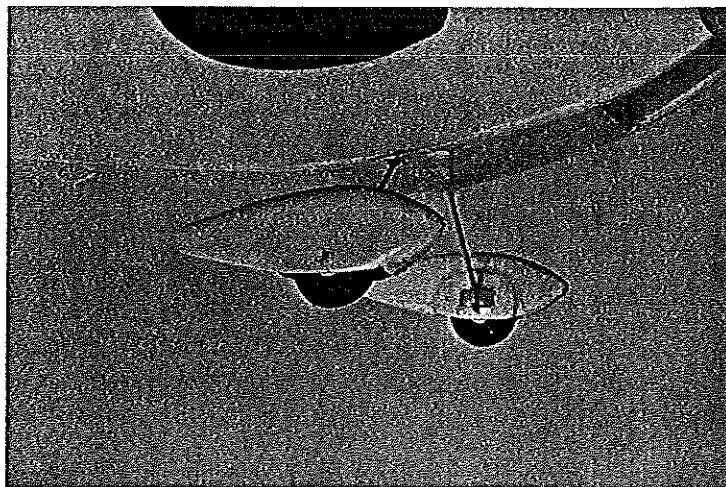
third flight to smooth out the rudder response. Buttercup climbs continuously at neutral trim, but with the relatively short



Gwen Reese, the author's wife, is shown holding Buttercup in Grand Teton National Park. The sky looks big enough to swallow the model; as the author suggests, "Keep it in close."



**Left:** Cut away the covering film for the glue joints, and glue the stabilizer and fin to the fuselage. Hinge the elevator and rudder by sewing them with a figure-eight stitch. Secure the .045-in. wire pushrod to the plywood rudder horn with a brass washer and solder. **Right:** Bring the elevator pushrod out through a hole in the rear of the fuselage. Cut away the covering, and epoxy-glue the plywood elevator horn.



**Left:** Cover the balsa-and-plywood wheel pants with your favorite yellow material. Solder brass or tin can metal clips to the landing gear, and epoxy-glue the wheel pants to the clips. The wheel pant is the wheel keeper; no collar is needed. **Right:** Cut out the windows from a sheet of black MonoKote trim. Use of Cox Racing Fuel and a Cox 4½ x 2 propeller on the Cox .020 TD engine gives best results.

engine run, I feel more comfortable when the airplane naturally regains lost altitude from maneuvers. A little down-trim will level it right out.

Since Buttercup has a built-in climb, it is ideal for the Ace Pulse rudder-only system. I did not show the installation on the plan, but if you go this route, you should make the stabilizer and elevator in one piece, and cut a little hole for the oscillating wire to pass up through the elevator to a yoke on the rudder. I have very fond memories of a little Piper Cub of this size that I built about 15 years ago—using the Ace Pulse system. If you fly closer to sea level than I do, you might consider the little G-Mark .03 throttleable engine from Cannon and three micro servos.

#### Construction

I used Zap CA+ for all construction, except for some 5-min. epoxy to join the wing panels and to glue on the wheel pants.

**Fuselage.** Cut out the sides, and glue on the

nose doubler, F-1, the ¼ x ¼ strips behind the firewall, and the landing gear braces, F-6 and F-7. Bind the 1/16 wire landing gear to F-3 with heavy thread. Glue Bulkheads F-3 and F-4 between the fuselage sides. Glue the sides together at the tail.

Mount the engine to the firewall, F-2, using 2-56 x ½-in. bolts and 2-56 blind nuts. Glue F-2 into the fuselage. Glue the wing mount, F-5, in place, and add the ½ balsa top front sheeting. Glue on all of the top and bottom 1/16 sheeting with the grain crosswise. Sand and cover the fuselage with your favorite yellow covering film.

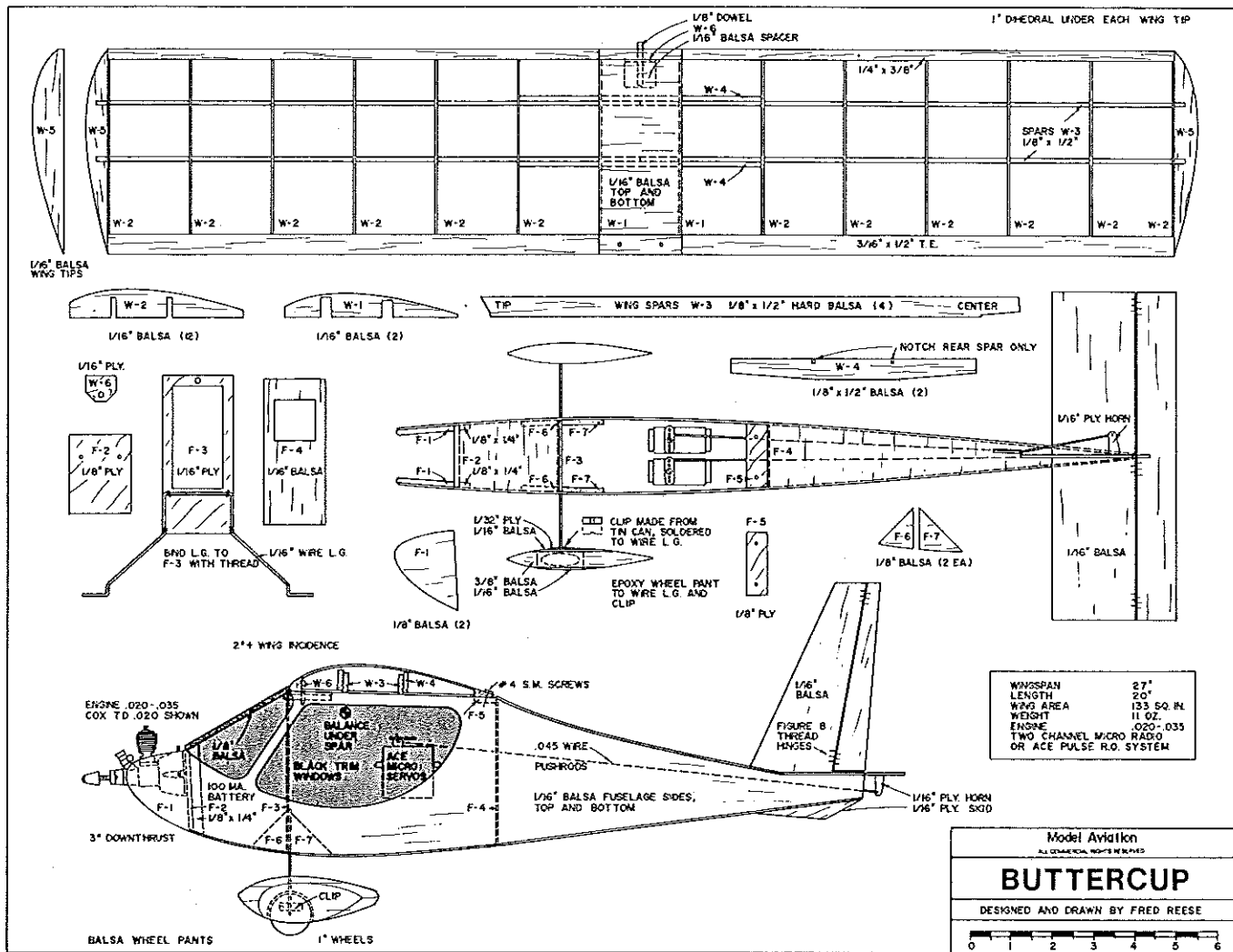
**Wing.** Start building the 2-in. center section by pinning down the bottom 1/16 sheet. Glue on the two W-4 center spars. Notch the rear spar for the ribs, and glue on the two W-1 ribs. Add the leading and trailing edges and the top sheeting to complete the center section.

Build the outer panels by gluing all of the W-2 ribs onto the W-3 spars over the plan.

Note that there is no rib at the center end. Add the ¼ x ⅜ leading edge and the 3/16 x ½ trailing edge and the W-5 wing tips. Epoxy the wing panels to the center section, blocking up each wing tip 1 in. Sand the leading edge round, and cover the wing.

The wing is held to the fuselage by a dowel into Bulkhead F-3 in front and two ½-in. #4 sheet metal screws through the trailing edge into F-5 in the rear. Reinforce the holes in the trailing edge and F-5 with Zap after once running-in the screws. To hit the hole in F-3 as shown, the ⅜-in. dowel must be spaced 1/16 in. below the wing. Trim away the covering, and glue a ¾-in. square of 1/16 balsa to the bottom of the wing as a spacer. Cut a slot for W-6, and glue in place at the same time as the dowel.

**Tail surfaces.** Cut out the rudder and elevator from 1/16 balsa, and cover them. Trim away the covering where it is to be glued to the fuselage, and glue in place. Cover and glue on the 1/16 plywood tail



skid.

Hinge the rudder and elevator with thread sewn with a needle in a figure-eight stitch. Start by pushing down through the stabilizer, up through the hinge gap, down through the elevator, up through the gap—and repeat twice. Pull the thread tight, and apply a drop of Zap where the thread passes through the wood (but not in the gap).

**Miscellaneous.** Give the inside of the fuselage a coat of fuel proofer or clear dope. I used foam servo mounting tape for securing the servos to the fuselage sides. Bend the .045-in. wire pushrods to match the plan. With the servos centered and the pushrods attached to the servos, glue the 1/16 plywood control horns to the rudder and elevator while holding them straight. Be sure to cut away the covering under the horns and reinforce the glue joint with a little epoxy.

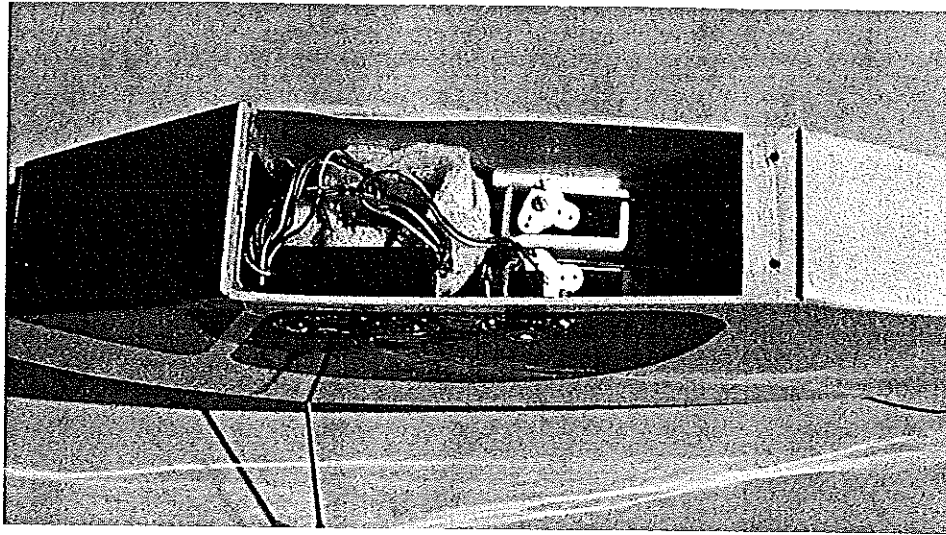
Further adjustment to center (or trim) the controls is done by adjusting the servo center with an eyeglass screwdriver down the hole in the square output shaft of the servo. Check the service sheet that comes with the servo for details.

Stuff the battery, wrapped in foam rubber, through the hole in F-3, and place the receiver (also in foam rubber) just ahead of the servos. Bring the antenna out of the fuselage bottom.



Buttercup on the flight line ready for taking off. ROG is possible, but it is easier just to hand launch the model with a gentle toss. Smooth landing spots protect the wheel pants best.





Give the inside of the airplane two coats of Balsarite, clear dope, or fuel proofer. Attach the servos to the fuselage sides with foam servo mounting tape. Mount the switch and charge plug in the window area, and paint them black. There is room in the deep fuselage for most all receivers. Ace micro servos and 100 mAh battery pack were used by the author.

The balsa wheel pants were added after the first few test flights. As it turned out, I had trouble with the silicone fuel line coming off the little tank nipple right after launch on the first two flights. I landed OK the first time, but hit into the sagebrush the second time, breaking off a wing panel. I repaired the wing and Zapped-on the fuel line. I also enlarged the wing spars to  $\frac{1}{8}$  x  $\frac{1}{2}$  (as shown on the plan) from the original  $\frac{1}{8}$  x  $\frac{3}{8}$  size.

**Flying.** Buttercup is a fun (but easy) to fly little airplane. The rudder response is smooth, and the plane rolls easily into turns. Pull up the nose a little and hold full rudder, and Buttercup will do an easy barrel roll.

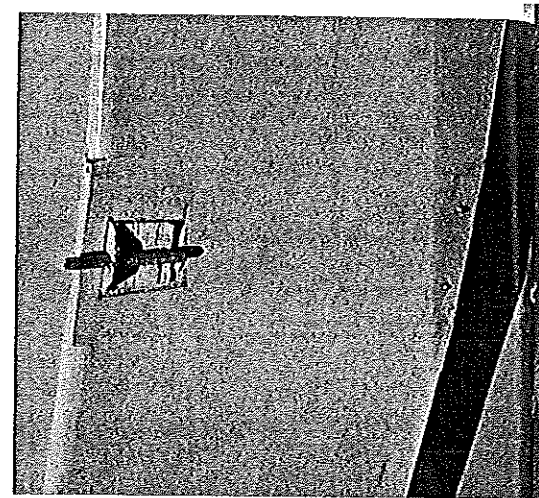
Not much area is needed to fly Buttercup, as you tend to keep a model of this size much closer than a larger model. Just pick a smooth landing spot, preferably paved, as the wheels are small, and the wheel pants will get scuffed on gravel.

Buttercup will take off the ground, but I usually hand launch it. Just give it a gentle toss, and it will practically fly out of your hand. The 100 mAh battery pack will give about 30 min. flight time (about five flights) without recharging. All of my flights have been with use of the Cox gray 4½-2 props and Cox Racing Fuel, which is recom-

mended for these little engines. I am sure that Buttercup would fly with the Pee Wee .020 engine, but it would be much more docile.

When the engine quits, the nose will drop a little, and the glide speed will be fairly fast. In order to maintain good rudder response, don't slow it down until on final, then hold it off for a gentle landing.

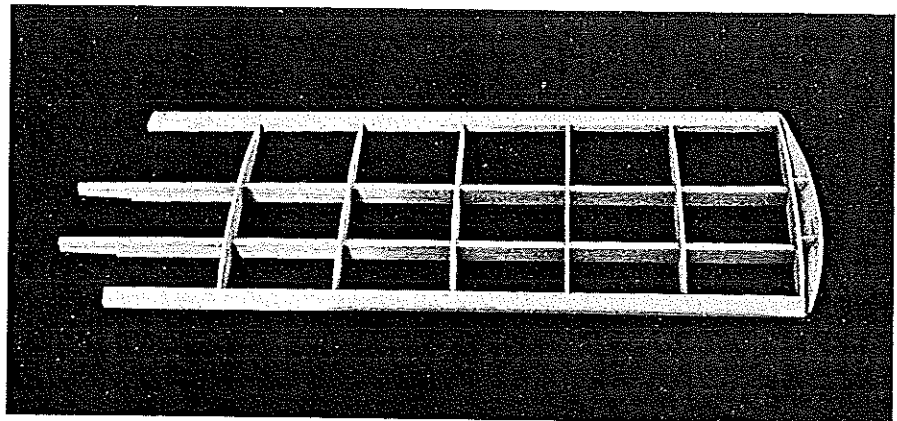
Buttercup has given me a lot of pleasure. I hope you will enjoy yours, too.



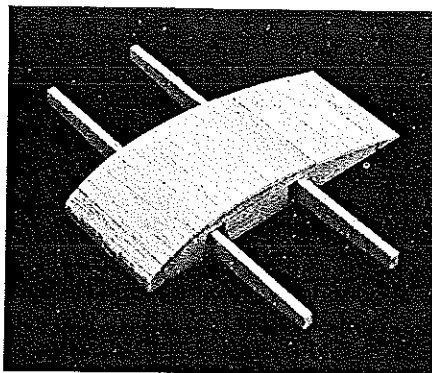
The front wing hold down is a  $\frac{1}{8}$ -in. dowel through the plywood W-6—spaced with a piece of 1/16 balsa. The dowel then fits in a Bulkhead F-3 hole to ably secure the front.

#### Materials List

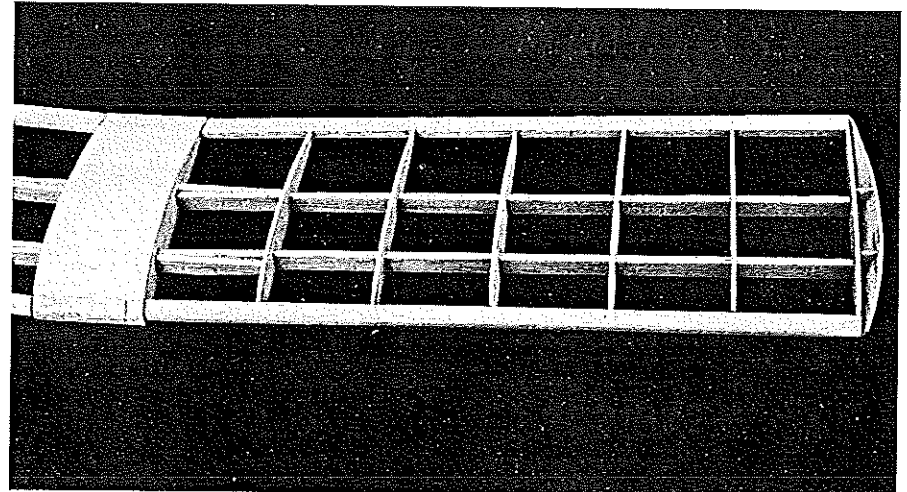
- Three 1/16 x 3 x 36 medium balsa.
- One  $\frac{1}{8}$  x 2 x 36 hard balsa.
- One  $\frac{1}{4}$  x  $\frac{3}{8}$  x 36 balsa.
- One  $\frac{1}{2}$ -in. x 36-in. trailing edge stock.
- 1/16 Plywood.
- $\frac{1}{8}$  Plywood.
- One pair 1-in. wheels.
- 1/16-in. Wire, 12 in. long.
- .045-in. Wire, 30 in. long.
- One-half roll of iron-on film covering.
- Black MonoKote trim for windows.
- $\frac{1}{2}$  oz. Zap CA+ adhesive.
- 5-min. Epoxy.



Above: Build the wing panels by gluing the ribs onto the spars, then adding the leading and trailing edges and wing tips. Note that there is no rib at the inboard end. Below: Block up each wing tip 1 in., and epoxy outer wing panels to the center section. Sand and cover the wing.



Build the wing center section by gluing the two spar joiners and ribs onto the bottom sheeting. Add the leading edge and trailing edge, and then glue on the upper sheeting.



## Material list for BUTTERCUP, plan # 478

1/16" x 3" x 36" – medium balsa .....	3
1/8" x 1/2" x 36" – hard balsa .....	2
1/8" 1x 2" x 6" - medium balsa .....	1
1/4" x 3/8" x 36" - medium balsa .....	1
3/8" balsa scraps	
3/16" x 1/2" x 36" - medium balsa trailing edge stock .....	1
1/16" x 4" x 4" – plywood .....	1
1/8" x 2" x 4" – plywood .....	1
1/32" plywood scraps	
1" diameter wheels .....	2
1/16" diameter music wire – 12" long .....	1
.045" diameter music wire – 36" long .....	1
# 4 sheet metal screws – 1/2" long .....	2
1/8" diameter x 1 1/4" long hardwood dowel .....	1