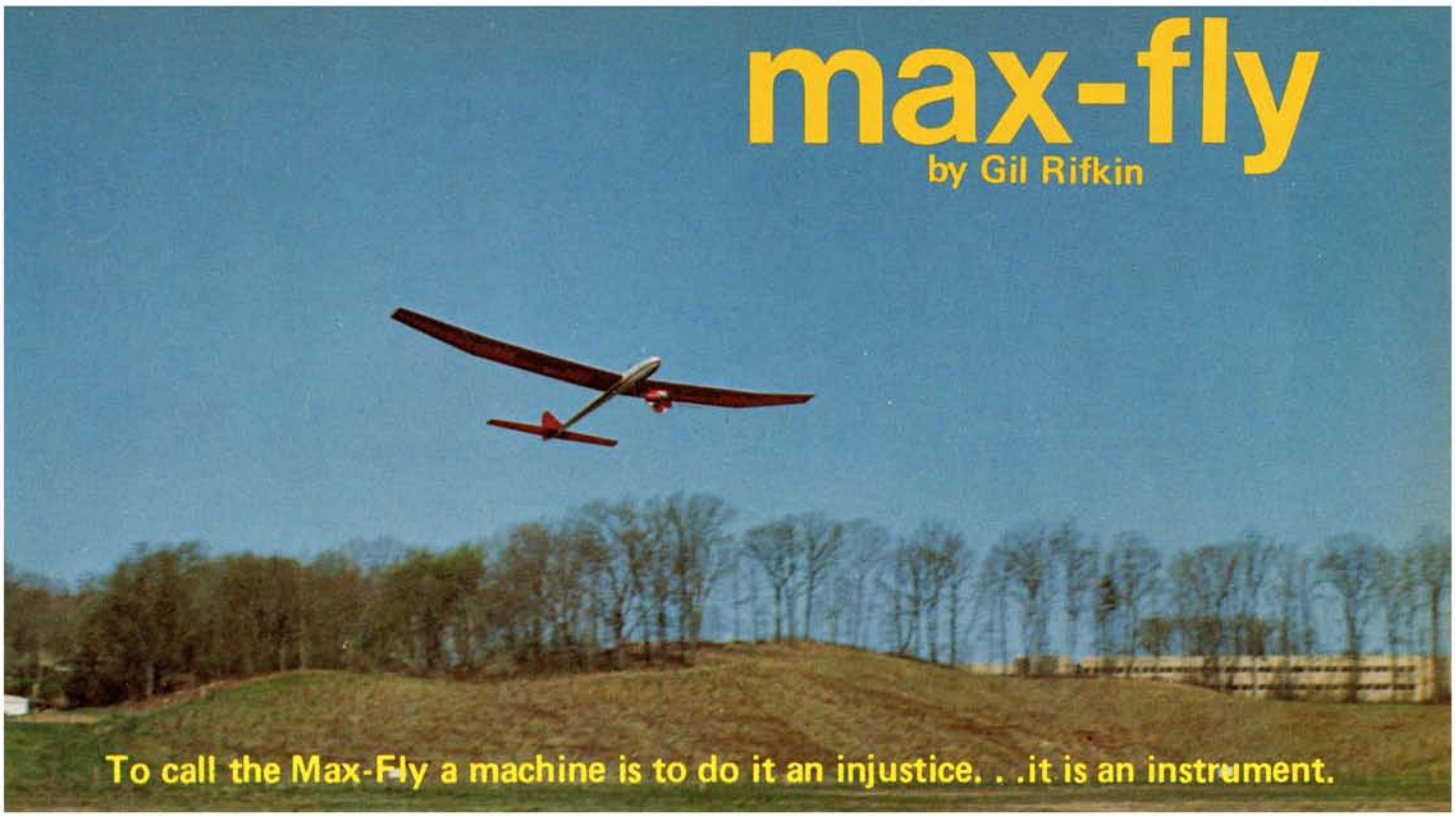
max-fly

by Gil Rifkin



To call the Max-Fly a machine is to do it an injustice. . .it is an instrument.

Every so often, an idea reaches out and seizes its victim. This is exactly how Max-fly came about.

For years, I subscribed to the concept that a glider is necessarily a machine heavier than air. . .but only slightly. A feather that could carry radio, be controllable as to landing location, and stay aloft on the stillest of air was the epitome—to my way of thinking. Of course, I was constantly frustrated.

In 1970, a very wise man named George Meszetler started me thinking about the differences between the undercambered wing sections that I had been using and the faster laminar airfoils. All of my thinking underwent an abrupt shift. (It would serve no purpose here to discuss the differences between the laminar and turbulator concepts. Any reader who is curious enough can research these differences easily, or call on my teacher George Meszetler.)

Then came some glider rule shifts, and some new tasks started appearing at contests. The glider that can fly thermal duration, step out and move around pylons, and fly goal and return events on the same day (with the same wings) wasn't my old feather.

The winter of 1970-71 was when that new idea seized me. Suddenly, I was hard at work, putting together this fresh idea and checking it out with George. The result flew well, but was not quite good enough for the thermal events. Back to the board, and this time George suggested the Eppler 387 airfoil, for the wing, with a symmetrical stabilizer and rudder configuration. This setup worked well, with one exception —the plane landed at 20 mph or better. To my consternation, I spent the summer of 1973 landing outside the spot after max flights.

To counterbalance my own weaknesses, I decided on flaps and spoilers. The result was mixed, so spoilers alone were tried and found to be the best way. As was readily apparent on this bird, the use of oversized spoilers (which act partially as brakes) seemed to make the most sense—they were the most effective configuration for me. After some practice, landing on target wasn't too much of a problem.

The Max-fly is not a small airplane. Fourteen feet of span certainly are an asset in performance.

For you technical buffs, the configuration shown in the plans will fly at a median speed of approximately 20 mph, with a Reynolds Number of about 157,886.4 for the center section of the wing. At the tip, the Reynolds Number will be 94,731.8, which is well above the magic danger number of 60,000. Additionally, it should be mentioned that, at 15 mph tip speed, the Reynolds Number would be 71,048.85, still well above that old 60,000 number where the lift-to-drag ratio frightens eagles.

Perhaps it should also be mentioned that the swept-back tips tighten turns almost to the point of winding in. You must start to correct the turn almost as soon as you go into it. The reward, however, is a tight flat turn, ideal for thermaling.

Please bear in mind that this is not a forgiving, slow-moving, easy-to-fly bird. It's a demanding, extremely efficient competition machine. Like a high-powered sports car, it requires time and effort to master, but will reward with tremendous excitement, superlative performance, and loads of fun.

CONSTRUCTION

Wings: (These must be built first to line up wing rod tubes in fuselage.)

1. Cut out center section ribs. You will need six of 1/16" ply, the rest of 1/16" balsa. Cut a root and tip rib of 1/4" ply, sandwich 12 pieces of 1/16" balsa between the ply guides and sand to shape. Cut the torque rod holes.

2. Lay the plans on a flat board and cover with Saran Warp. Place the 1/8 x 1/2" spruce rib header into position against a straight edge at its front to en-

sure alignment, and glue all the balsa center section ribs into the header.

3. Ribs 1, 2 and 3 are ply, since they will carry the wing rod tubes. Carefully measure and drill holes to carry these tubes, as per the plans. Make two of rib 1, two of rib 2 and two of rib 3 at the same time for alignment accuracy.

4. In step No. 2 you glued the balsa ribs to the header. Now glue the ply ribs 1, 2 and 3 to the header. Glue on the top front spar (skip the rear spar) and glue on the 2 x 1/16" sheet top trailing edge. After the white glue is dry, glue in the rear upright spar.

5. Do not glue on the front top sheeting until webbing is added.

6. Turn over the wing panel and glue on the bottom spar, bottom 1/16" sheet trailing edge and bottom front sheeting. Please note that the rib header has to be shaved so that the front sheeting rides on top of it, rather than butting against it. Now glue on the 1/2 x 1/2" balsa leading edge. The bottom sheeting and top sheeting for the trailing edge have to be bevel-sanded, in order to meet at the trailing edge at a thickness of 1/16".

7. Build the other three wing panels in the same fashion.

8. Using 1/64" plywood, cut and glue (with white glue) all the required webbing from top spar to bottom spar.

9. Glue on the top front sheeting, after carefully measuring the required polyhedral angle and epoxying the sections together and adding bracing, as per plans.

10. Note that the front sheeting starts at rib 4. Ribs 1, 2, 3 and 4 are still open and uncovered top and bottom. After fitting wings to fuselage, so that the tubing is inserted accurately, and after epoxying the tubing to ribs 1-3, cover ribs 1-4 (from spruce rib header to front edge of 2" trailing edge) with 1/16" ply. Cover the bottom section first, and load plenty of epoxy around the wing rod tubes and the spars against which they ride. It would be best to use a long curing epoxy, such as Hobbypoxy Formula 2, for maximum penetration and strength.

11. Build in spoiler assembly. Plans show full details; follow them explicitly.

12. Glue on capstripping, 1/8" ply root ribs and wing tips. Sand carefully, being sure to maintain the integrity of the airfoil throughout.

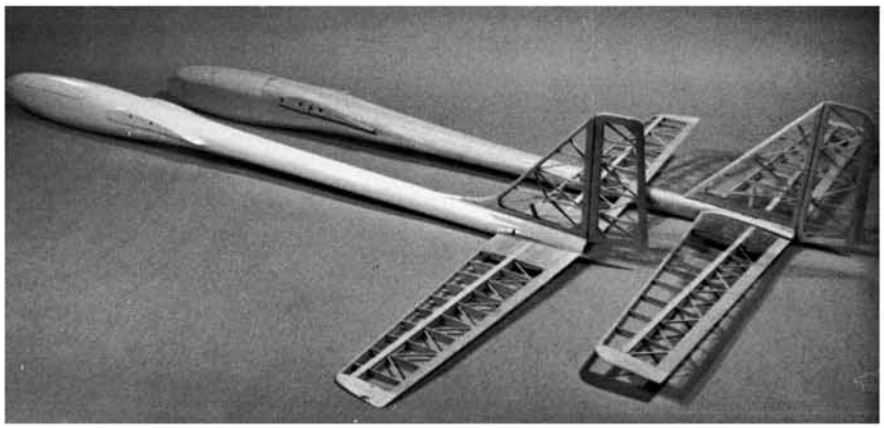
13. Carefully weigh each complete wing section and adjust equally.

Fuselage: Some time was spent in making a fiberglass fuselage which will be available at moderate cost to anyone who doesn't want to build the wooden fuse described in this article. Contact me (18 Carmen Drive, Nanuet, N.Y. 10954) and your request will be sent on to the glass fabricator, who will bill you directly.

1. Cut out sides and doublers. Splice with white glue where necessary. Cut out the 1/8" section ply bottom and the 1/16" ply top doubler. Cut out the balsa fuse top (from section D to tail).

2. Glue on the corner bracing (triangular stock as on plans) to balsa sides.

3. Glue on 1/8 x 3/8 x 10" spruce side wall supports for the hatch seat.



The Max-fly can be built with either a fiberglass or balsa fuselage. The soaring scene seems a toss-up on this subject, with an equal amount of each type to be found at most contests.

4. Epoxy (use Hobbypoxy Formula 1) the 1/16" ply doublers to the 1/4" balsa sides between the triangular stock.

5. Cut out the front balsa block side and bottom pieces.

6. Trim the top part of the 3/8" triangular balsa at the top of the fuse (from D to H) as a seat for the 1/16" ply top doubler. (Trim the inside 3/16" wide by 1/16" deep.)

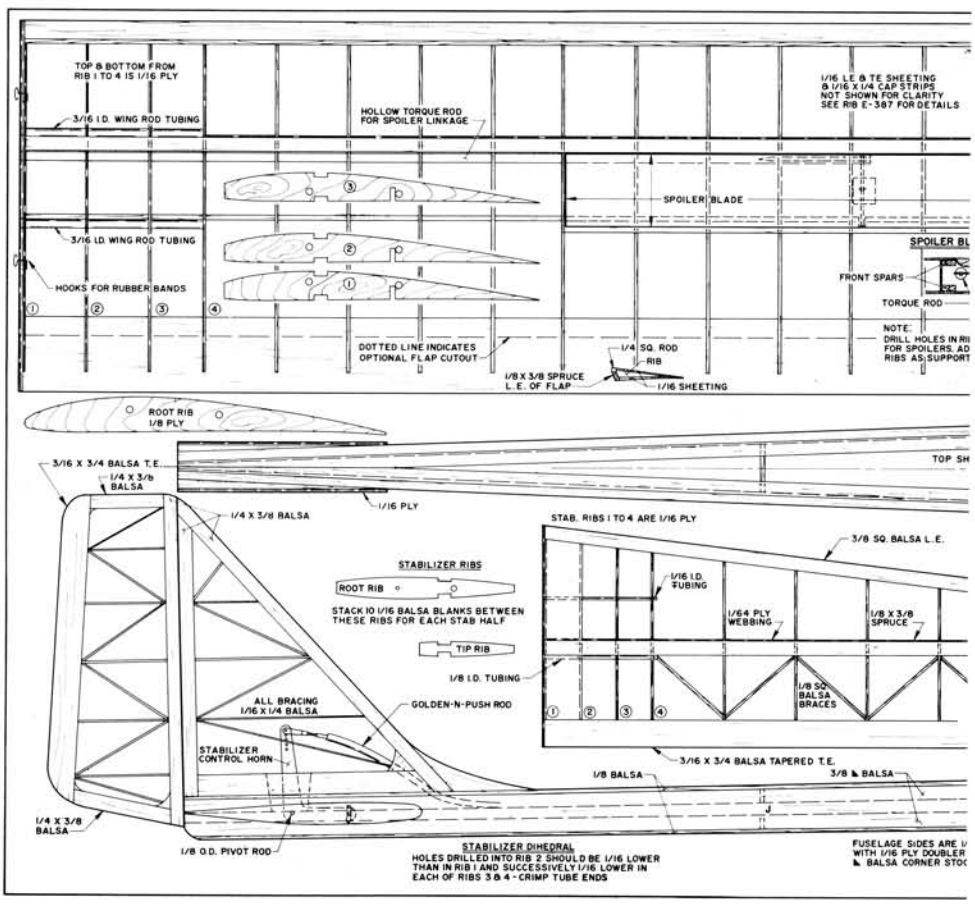
7. Trim the tail end of the sides so as to facilitate their joining.

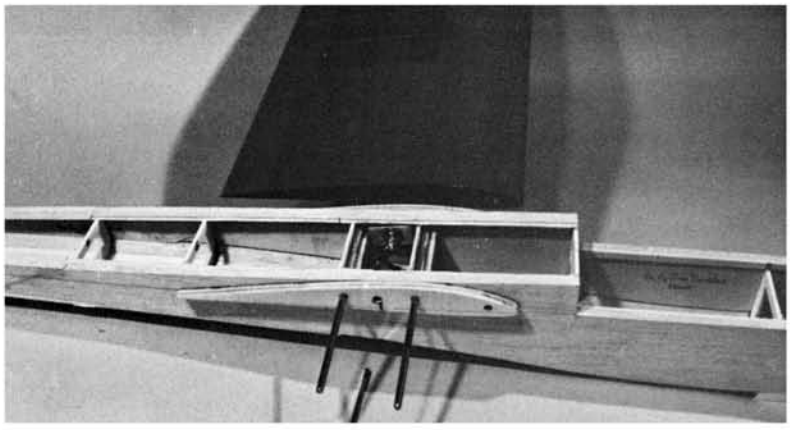
8. Glue in formers C, D, E, F and G. When dry, glue in H, I, J and pull the tail together.

9. Glue on the root ribs and epoxy (Hobbypoxy Formula 2 here) the wing wire tubing, using wings and wing wires as an assembly jig to ensure perfect alignment of both tubing in fuselage and tubing in wings.

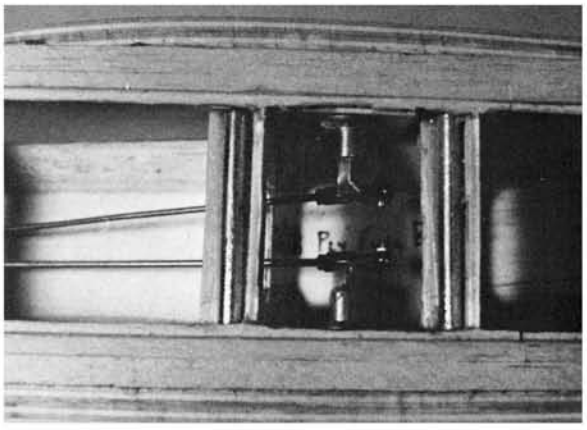
10. Make up the spoiler linkage. Study the plans. Epoxy the square tubing into wing torque rods only after all else is assembled and working, so that the blade opening angle can be set equally in each wing panel. Loosely mount linkage into fuselage and put in 1/8" OD square tubing (2¾" long) for test fit. Now epoxy 1/8" ID square tubing into wing torque rod. Make sure no looseness exists and no binding. When satisfied, epoxy the linkage mounts (plywood bearers) to fuselage. Note that there is an angle necessary, due to the 3° dihedral. Leave the wings attached when epoxying this piece in (with the 1/8" OD square tubing inserted so as to align correctly).

11. Glue in former B, drawing the fuselage together. Use masking tape to keep secure while drying.





The torque tube spoiler mechanism is installed relatively early in the fuselage building stages.



The actuating arms are made from brass tubes and missing links.

12. Glue the balsa block front sides to the 1/16" doublers. Also secure the bottom and top front blocks between B and C.

13. Fit and glue the 1/16" ply top (from D to H) and glue on the 3/16" top sheet from D to tail.

14. Fit, insert and epoxy in the Sup-R-Rod. Do it now, before fuselage is closed up.

15. Glue on the 1/8" ply flooring and sheet the entire bottom of the fuselage.

16. Fit, cut and shape the balsa hatch cover.

17. Glue on the front hardwood nose piece.

18. Glue a 1/16" ply stab root rib to each side of fuse. Make sure the mean line is at 0° incidence to the wing. Since the fuselage is tapering at this point, and you want the stab fillet to be square to the fuselage center line when viewed from the top, it will be necessary to fill with scrap balsa. See the top view of the rear of the fuselage.

19. Sand the entire assembly well and coat with Hobbypoxy Clear, and then two coats of Hobbypoxy filler. Sand wet with 400 sandpaper after each filler coat. Spray with Hobbypoxy color.

Stabilizer:

1. Cut out all ribs.

2. Drill holes for tubing in ribs 1, 2 and 3, drilling both ribs No. 1 together, etc. Proper holes will ensure same dihedral as wing.

3. Mark the spars and trailing edge for the rib locations.

4. Glue the ribs to the bottom spars.

5. Glue the leading edge to all ribs.

6. Glue on the top spar. Make sure that the spars fit flush with the tops of all ribs, so that covering will have less drag points.

7. Glue on the trailing edge and sheeting on one side.

8. Epoxy tubing into holes in ribs. (Use one piece of tubing and then cut to separate stab halves. This will ensure alignment.)

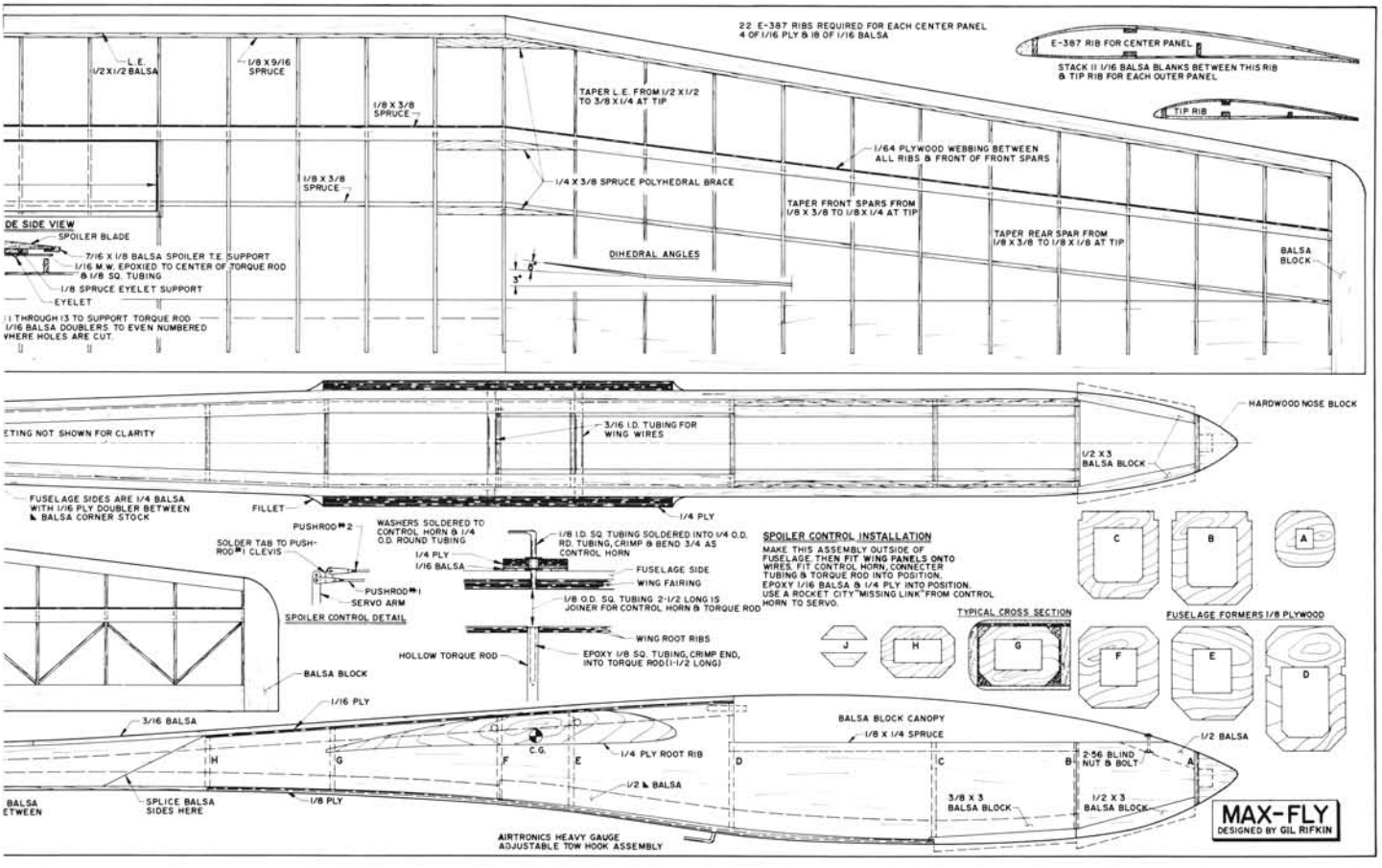
9. Glue on remainder of sheeting.

10. Glue in the 1/8" square balsa bracing.

11. Sand and glue the tips.

Rudder and Fin:

1. Trim the leading edge of 3/16 x 3/4 x 8", and the 1/2" balsa tapered trailing edge stock so that it is square to



FULL-SIZE PLANS AVAILABLE - SEE PAGE 86