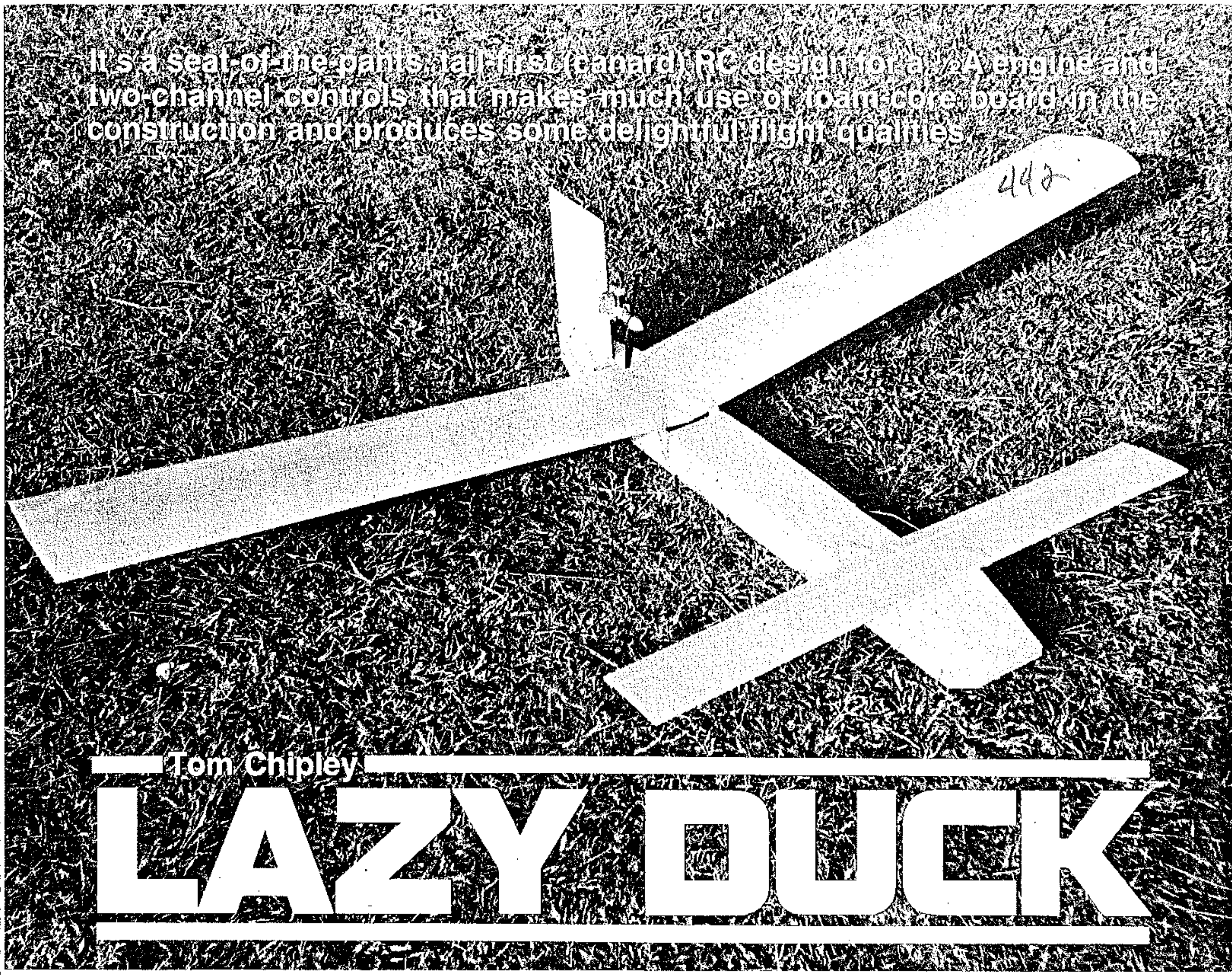


It's a seat-of-the-pants, tail-first (canard) RC design for a ½A engine and two-channel controls that makes much use of foam-core board in the construction and produces some delightful flight qualities.

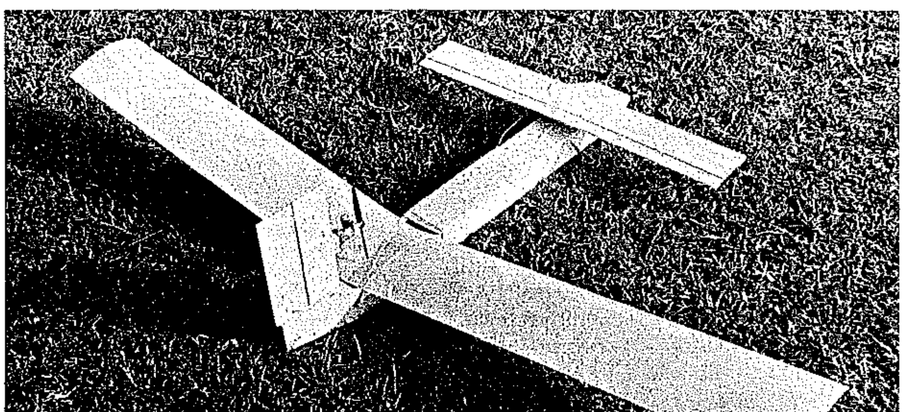
Tom Chipley

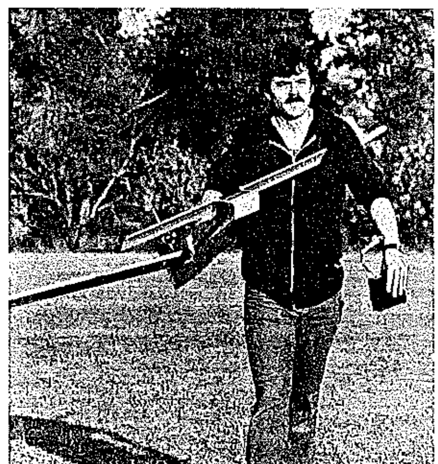
# LAZY DUCK

The prototype model. Note position of the engine on the vertical fin and how small it is relative to the total model with its 6-ft. span. The front of the plane is at the lower right. This configuration receives some astonished looks from fellow fliers when it is airborne.

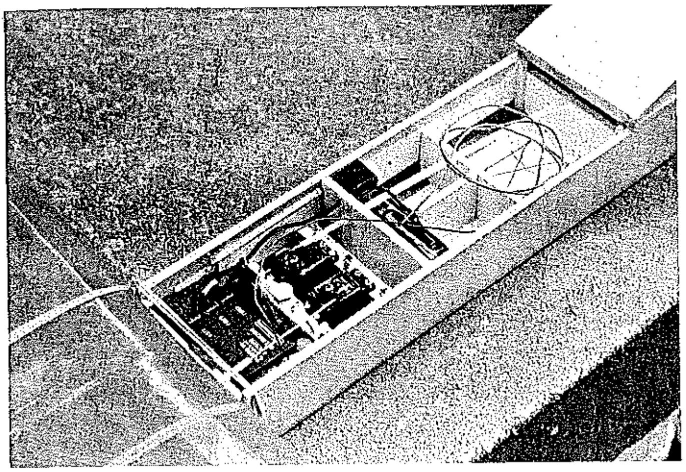
THIS DESIGN RESULTED from attempts to sidestep some of the problems and/or frustrations in conventional glow-engine-powered RC flying. Balsa is good but not sacred, engines don't have to be out front, planes don't have to be oily when you finish flying, and one big point, a personal philosophy if you will, flying models don't have to look like full-size planes. While Scale models really look good, there is great satisfaction in operating a plane designed just for the sake of modeling.

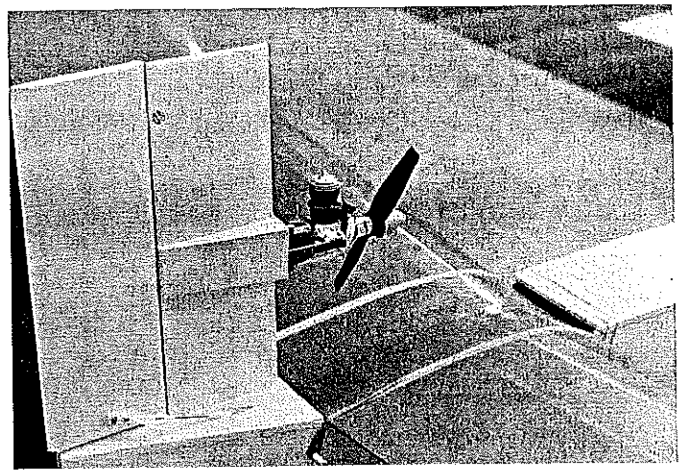
The result is this unique little plane (in



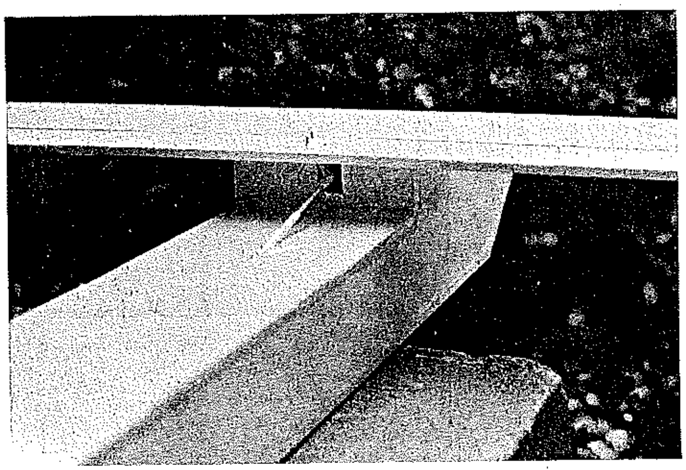


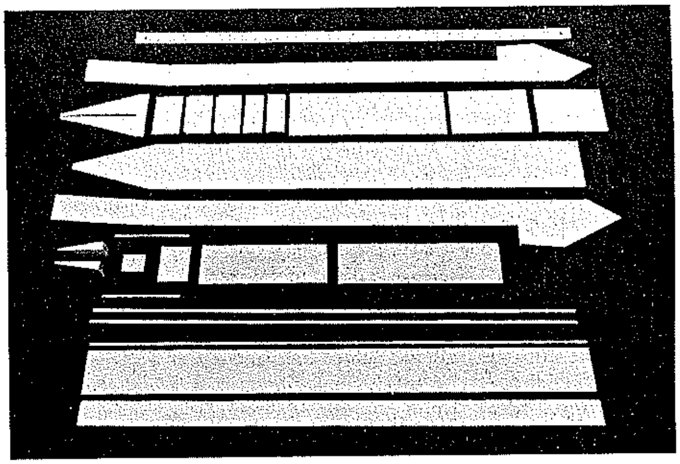
Left: Especially visible from this view are the large rudder area and relatively small elevator. Right: "Someday I will have to learn how to land closer to me," the author says as he walks back from retrieving the model. Note that simulated windows have now been added.



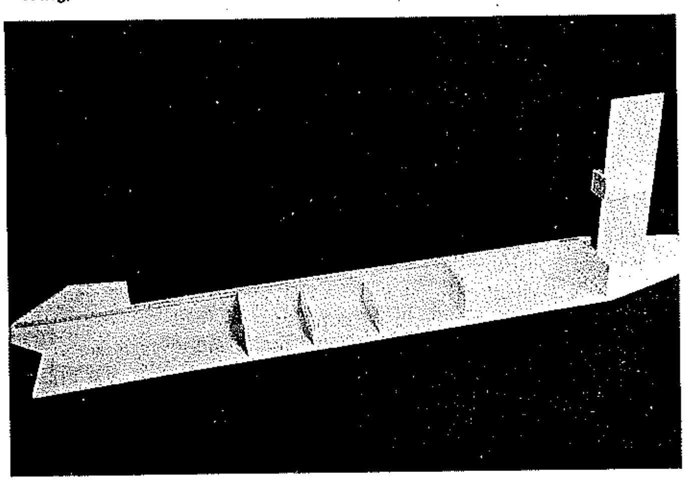


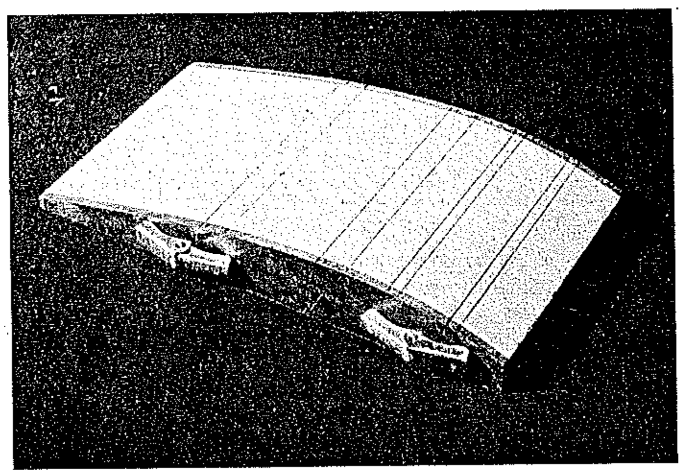
Left: Radio gear in an early version. (Antenna coiled for the picture; it's not flown that way!) Later versions have the receiver and servos moved far forward. Right: This Cox .049 hasn't much reserve power for the big plane. A bit stronger engine wouldn't hurt.





Left: Note the cutout for the elevator horn. Hinge for the elevator should be flush along the bottom side. Right: Major parts (except for the wing) have been cut out and arranged just as if they came from a kit. What you see is mostly foam-core board from an art supply store.





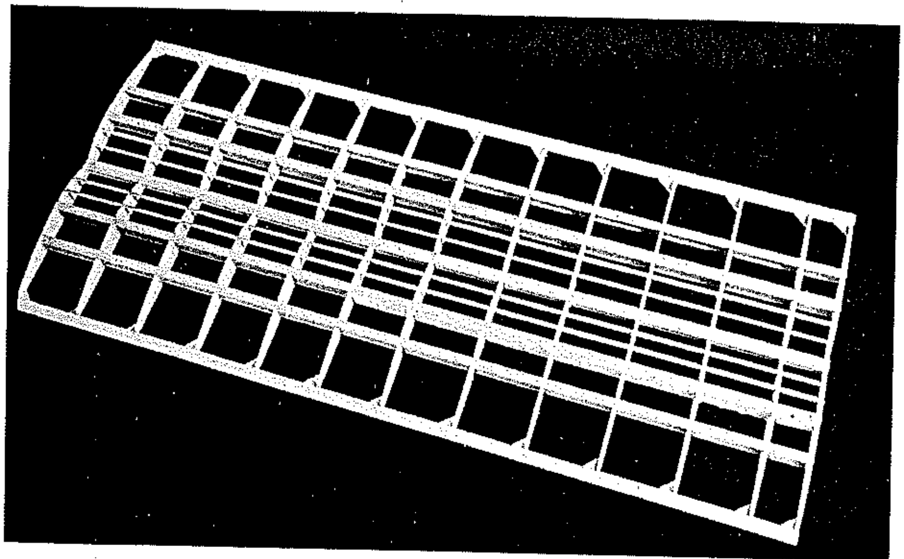
Left: Near side of fuselage has purposedly been omitted to show the method of construction. Note the butt joints of the foam-core board. The vertical fin and engine mount are the only balsa pieces in this picture. Right: Wing rib templates, tie bolts, and ribs all sanded to shape.

terms of cost, weight, and power—if not in wing area) that is fun to build and fly, doesn't cost a bundle, and attracts attention wherever it is flown. Basically a powered glider, the canard configuration plus the unique engine location and mixture of materials give this plane a personality of its own.

There is nothing quite like a canard for arousing the curiosity of both fliers and spectators on a Sunday afternoon. Most modelers are familiar with the configuration, but are uncertain about building or flying one. As the design is not used by many full-scale builders, RC fliers feel that there must be something inherently wrong with the concept . . . something waiting to "get ya if you don't watch out." Actually, I have had very good luck (and that may be a good choice of words) with this design from the outset. In fact, of the planes that I have flown, it is probably the easiest to control.

The design was arrived at by a mixture of scientific principles, the "eyeball," and the already-mentioned luck. While this method may not sit well with the more technical minded among you, there is probably good reason to believe that many planes, both full-size and miniature, are a result of the same process. This design, at any rate, was sketched on paper, mocked-up in cardboard, and tested with a wing borrowed from a Drifter II for the afternoon . . . and it flew "right off the board." Almost!

The very first tests were made with some simple "dime store" balsa gliders set up as canards. This gave me a feel for the desired center of gravity (CG) location. The first test fuselage was almost exactly the same as the one shown on the plan . . . just a box to hold



Wing panels laid out leading edge to leading edge after assembly. Surface spars provide strength without undue weight. There's no foam-core board here. The wing is balsa with hardwood spars.

the receiver, servos, and battery pack, and to form a rigid separation for the wing and horizontal stab. The engine, receiver, servos, and battery pack were weighed and then weight-matched with steel washers in a small plastic bag so I could shift the weight about to find the correct CG.

At this time I discovered that without about three degrees of negative incidence on the wing (the horizontal stab was glued flat and level with the fuselage center line) the plane would nose over (crunch), but with the three degrees added, flight was very smooth and flat. This angle was added to the horizontal stab on the production version, the wing then being mounted level on the center line. With the wing angled down, the plane flew with the nose slightly up (the horizontal stab attaining the required three degrees while the wing remained flat); it was tricky to land, as that attitude gave the appearance of an impending stall. With the wing level and the angle built into the stab, the fuselage remains level, and landings are slick and gentle.

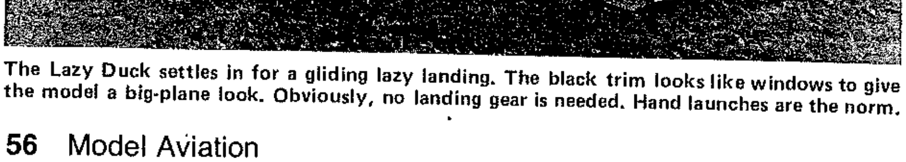
The center of gravity was first positioned about 3½ in. ahead of the leading edge of the wing . . . but this was to change!

The test flight showed three things. First, an .049 would fly the plane, but it only provided enough thrust to maintain flying speed. Second, the elevator was very sensitive, and extreme care was required to prevent terminal porpoising. Third, and this was most interesting, when the engine ran out of fuel and stopped, the plane nosed up slightly (a reaction to the sudden loss of a slight downward push caused by the high-mounted engine), stalled, stopped in the air . . . stopped still, and settled gently and slowly vertically to earth! There was no wiggle, no flutter, no forward speed—just slow, vertical descent. There was, of course, no control as there was no forward speed.

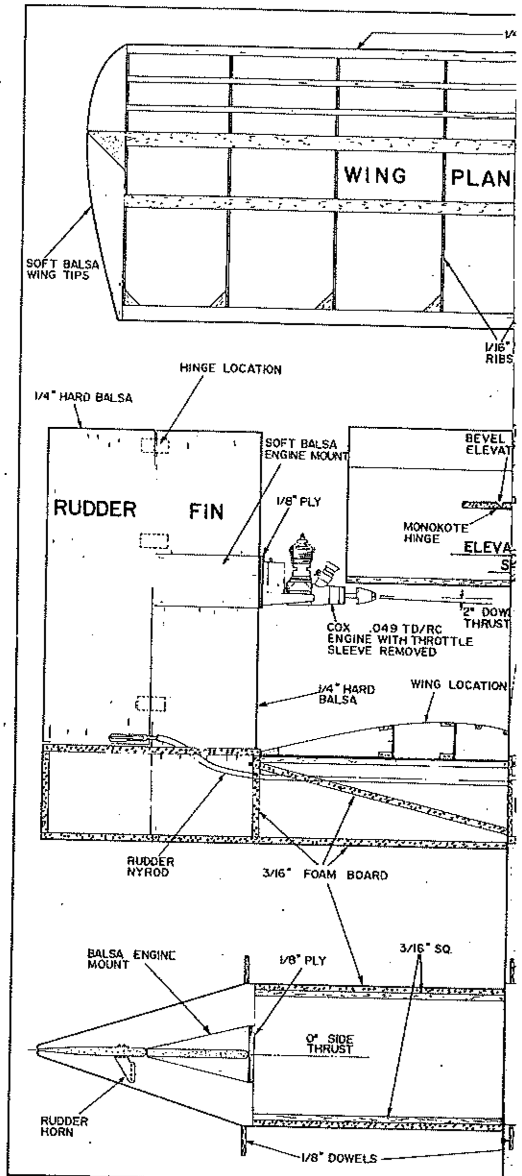
After a few more flights to verify that this was a characteristic of the design and not just an isolated event or trick of the wind, the CG was shifted forward about an inch. This corrected both the elevator sensitivity and the vertical descent trick. The plane responded well to control inputs. In fact, the plane could be flown easily with only trim control. The rudder proved to be equal to the task, but the response was less than crisp when the fuel ran out. Power-off turns were flatter and wider than many sport fliers may be used to.

With full power, the craft is sporty in a leisurely sort of way, and it can be flown in some rather confined areas. A slightly larger engine would permit more responsiveness to the controls from the increased forward speed, and it could climb much more rapidly. As it is, the Lazy Duck is a great trainer and/or relaxing change of pace from the sweaty palms of Pattern flying.

To keep awake, you may wish to fly close to the ground with the wing tip inches away during long, slow turns. Loops are possible by building up a bit of forward speed with full power and a steep dive. The plane is not intended to be fast, and in this respect it succeeds perfectly. With power off, I have not been able to do a loop; even with a vertical dive for many feet, the terminal speed is not sufficient to carry it on through the loop. She just climbs vertically, stalls, falls off, and resumes flying.



The Lazy Duck settles in for a gliding lazy landing. The black trim looks like windows to give the model a big-plane look. Obviously, no landing gear is needed. Hand launches are the norm.

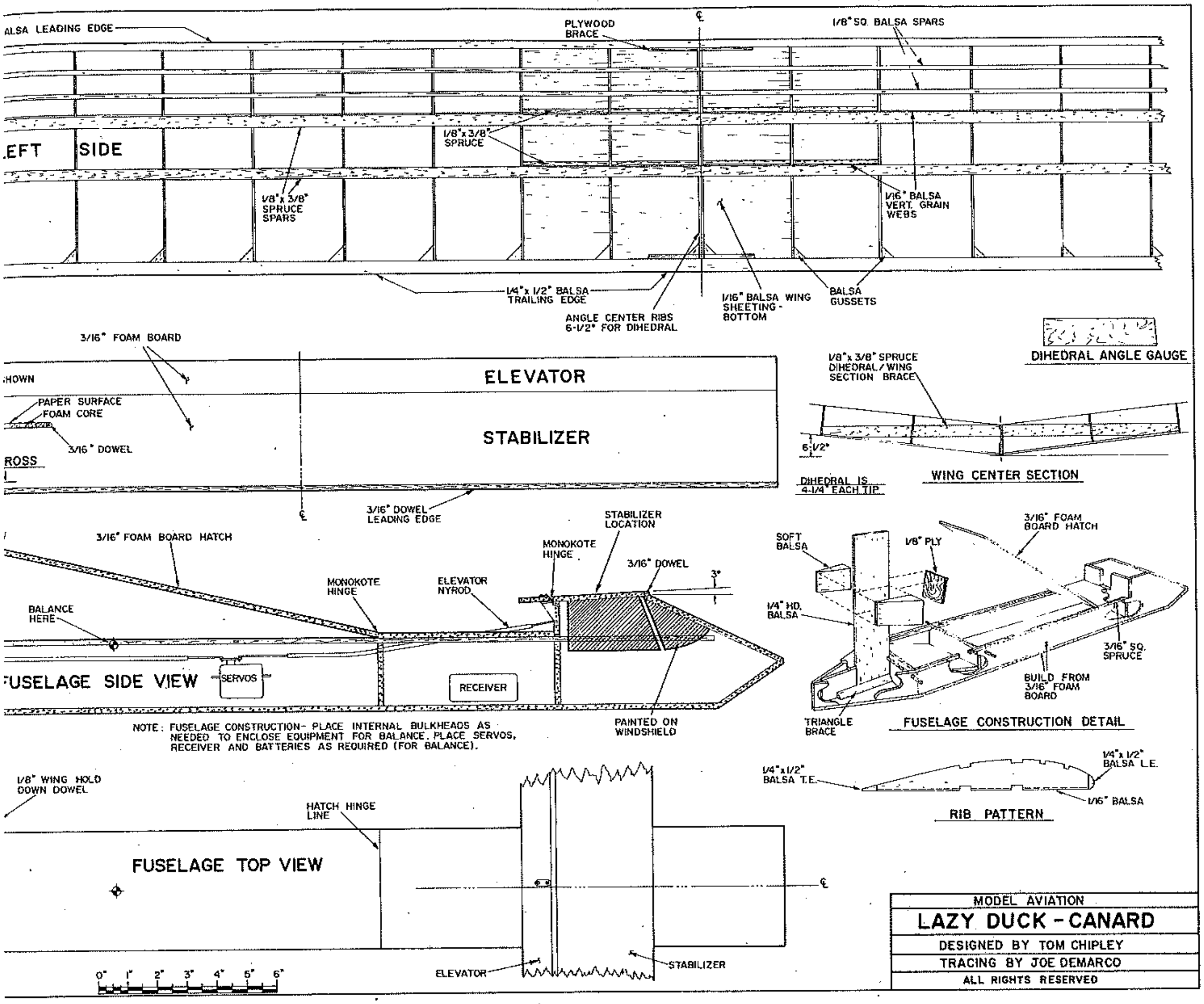



Stalls are very gentle and level unless you intentionally kick in some rudder, and even that will not produce much action. This is a great plane to learn the basic hand/eye coordination so important in RC before moving to fast and expensive planes.

To refer back to the very first sentence of this article, this design sidesteps the oily fuselage because the engine is at the rear, and because it is in the rear, it is less likely to be damaged in the event that you manage to nose this plane in. Fie on you if you do! By mounting the engine on the leading edge of the vertical stab in a tractor (pulling) position, cooling is no problem. Pusher props are not required, and starting and adjusting is very conventional.

**Construction.** The fuselage and horizontal stab/elevator assembly are constructed from styrene foam board sheeted with heavy

FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 180




paper. This is a commercial item generally referred to as foam-core art board, available at art supply or frame shops. This material is used by many industrial model builders (where I first encountered it), and it has proven to be a fine material if used correctly. It will not replace balsa by any means, but for applications such as this, where a box-like fuselage is required, it is very nice stuff.

I prefer not to notch and fold the foam-core board as others have done. I cut all the way through and butt-joint all the parts. While this does not produce as pretty a joint, it greatly simplifies the layout and assembly. The cut-and-glue method builds very quickly and allows for slight changes and/or adjustments as required. Lay out the parts carefully and cut them with a #11 X-Acto (or equivalent) using a metal straightedge as a guide. Make each cut lightly at first, followed by a through cut. This will minimize errors. When using a straightedge and very sharp knife in this way, be careful to keep your fingers from hanging over the edge of the rule.

The vertical stab and rudder are hard balsa; the leading edge of the horizontal stab is a hardwood dowel. Spruce stringers are run the length of the fuselage along the inside where the sides meet the top plate. Upon landing nose down, the structure may want to buckle along this top edge at the points where there are no cross members. The stringers minimize this possibility.

The foam-core board is crushable, and unlike balsa, it cannot be straightened and glued back together. It must be repaired by cutting out the crushed section and replacing it with new material. This is really very

*Continued on page 159*

The model dives into a confined area for the photographer. The trees in the background, the author notes, are probably typical of many flying sites, underlining the need for model designs that can fly from fairly confined areas. You aren't seeing things—it flies "backwards."

## Lazy Duck/Chipley

Continued from page 57

easy, and is necessary only after a severe crash.

The fuselage can be completely cut out and assembled in two evenings, allowing one day for the white (or similar) glue to fully dry. After building the basic box shown on the plan, locate your components to arrive at the correct balance point, then set in bulkheads as needed. Using the foam-core material, the added weight after the balancing should have little effect on the plane's performance.

**The wing** is a simple structure, but it is more time consuming than the fuselage. Making templates from Masonite and sandwiching the rib blanks between them for sanding to final shape cuts the time considerably. It also produces an identical set of ribs so that everything lines up during assembly, and you have no struggles with things that don't fit. Use two long, small diameter bolts to hold the rib patterns and blanks together.

I found a polyhedral design to be slightly more stable than the V-dihedral wing, but the extra time and bother of constructing and covering three angular joints rather than one makes the trade-off acceptable.

The prototype wing and fuselage were covered with MonoKote. This material works very nicely on the foam-core board (as would any iron-on covering). Since this plane is hand-launched and belly-landed, the covering on the fuselage will greatly extend its life. You may even wish to attach a couple of hardwood runner strips to further protect the bottom.

The wing uses two spruce spars for maximum strength. The main spar is webbed for about 24 in.; the second spar is webbed for only 6 in. Join the two wing halves with sections of straight spruce epoxied in place. This puts all the loads, whether tension or compression, in straight lines through the support members.

The bottom of the wing, for the first two rib bays, is sheeted with 1/16 balsa, and the joint where the two sheeted halves meet is reinforced with a glue and fiber composite. Making use of indigenous materials, and residing in the heart of tobacco country, I used a plastic, fibrous, paper-like material used to cover tobacco seedlings. I don't know what it is called, but when wet, wrung out, and put down over a coat of white glue, it makes a really strong and wrinkle-free reinforcement for any joint. It can be compared to fiberglass and polyester resin without the odor and with almost as much strength.

Under most conditions, the bottom of the wing center joint is in tension and the top in compression, and this design has held up fine even with loops, sharp turns, and three-bounce landings. I am a firm believer in gussets where the ribs meet the trailing edge. The extra strength is worth having. Wing tips are simply blocks of soft balsa sanded to shape.

**The engine mount** is a ⅛ plywood rectangle glued to two solid soft balsa wedges, which are glued to the hard balsa vertical stab. Build in about two degrees (plus or minus—it's not really critical) downthrust by sanding the soft balsa wedges to shape. (No side thrust is needed.) The rudder is also hard balsa (¼ in. for both the rudder and fin), and the hinges *must* be pinned. I did not do this on the prototype and almost lost the plane when the rudder hinges backed out due to engine vibration and caused the rudder to lock in the left position! It came back only because the wind was with me and some tall grass was convenient to nose into.

Speaking of tall grass, the hardwood dowel along the leading edge of the stab (in front) is necessary to protect the soft foam-core board from dings and such. Due to the length of the stab, a blow near the outer end is likely to break the part loose from the fuselage; you may want to add some triangular stock on the inside joint of the stab and fuselage to prevent that.

Remember that this is a lightweight plane, not intended to withstand the punishment taken by the "big boys," but we still need to build strong enough for reasonable conditions. On a "conventional" design, the sturdy forward parts generally take the brunt of the abuse when landing in rough terrain, but with a canard, the lighter structures are in the front and can suffer accordingly.

The prototype plane employs a Cox/Sanwa two-channel, dry-cell transmitter and receiver. Nyrod type pushrods were used, as both rudder and elevator controls must do a bit of curving to get to their destinations. The throw on the elevator is kept to a minimum; not much is needed for most conditions. The rudder, on the other hand, should have about a ⅝ in. throw at the trailing edge on both sides of center.

On the third stage of the prototype, I used a strip of vinyl tape along the entire length of the underside of the elevator/stab junction. As no fuel is present, this area need not even be covered except for looks, and the tape hinge forms a very smooth connection between these surfaces. Turbulence in this area resulting from loose flaps of material or poorly joined flight surfaces can have a noticeable effect on the flight characteristics causing the nose to react to control movements in sudden ways.

While my profession involves some model building, in my hobby I am not, I am afraid, always as meticulous as many of you when it comes to detailing. I am pragmatic enough to build them efficiently, but not overly concerned about the last detail. If it flies well, has not cost me next month's house payment, and can be crashed without requiring a trip to the family psychiatrist to ward off self-destructive tendencies, then I feel all is going as it should. The design given here should be used as a starting point to build whatever you would like. Detail can be added to create the look of a transport plane by adding a strip of black "windows" down the side, wheels would fit nicely and—along with a larger engine—would permit real takeoffs and landings (my next project, by the way). Or the plane can be quickly stuck together and enjoyed for hours up in the air when it belongs.

If you have a wing of about 550 to 600 square inches of surface area that you can borrow from another plane, just build the fuselage and carry it along for fun when you go flying next time. Above all, this is a fun plane . . . let it be just that.

**FLYING NEAR AIRPORTS? BE CAREFUL!**

**PROTECT YOUR RIGHT TO FLY!**

## CL Scale/Boss

*Continued from page 62*

point that the process Gene Hooker uses is different from the method described by Luther Hux.

Instead of using the Ulano system that has the light-sensitive emulsion on a separate film sheet, Gene uses the method in which the light-sensitive emulsion is in a liquid state and is applied directly to the silk-screen fabric as shown in the first sketch. In this case, the fabric used is a 305-mesh, monofilament material. After the emulsion has been applied to the screen in a good even coat, it is set aside *in darkness* to air- or fan-dry.

The second sketch illustrates the next step of the process used by Gene; that is, making the exposure of the screen's photo emulsion. As you can see in the sketch, the artwork film (photographic plate) is sandwiched between the photo emulsion on the screen and a piece of ⅛-in.-thick glass. Note that the glass should be as large as (or slightly larger than) the screen frame. The sponge rubber used inside the frame should be slightly thicker than the screen frame as shown. The sponge rubber will apply a small amount of pressure against the screen when the upper and lower pieces of plywood are put in place and held in a firm position with slight pressure from C-clamps. Once again, note that the two pieces of plywood are slightly larger than the screen frame, and that the top piece has a cutout that is at least as large as the photographic plate.

At this point, you are ready to expose the screen emulsion. Note that in the second sketch, a 20-watt GE blacklite tube (GE F20T12 BL) that fits into a 20-watt fluorescent fixture is shown as the source of exposure light. The light is set at about 13 in. above the assembly, and the exposure should be about 35 minutes. The use of this type of light source eliminates heat problems associated with incandescent light sources.

When the exposure is complete, the assembly is taken apart and the exposed screen is developed by washing it with a light spray of warm water. After washing is complete, wipe off excess water, and let the screen dry thoroughly. The screen is now ready for use.

The third sketch depicts the application,