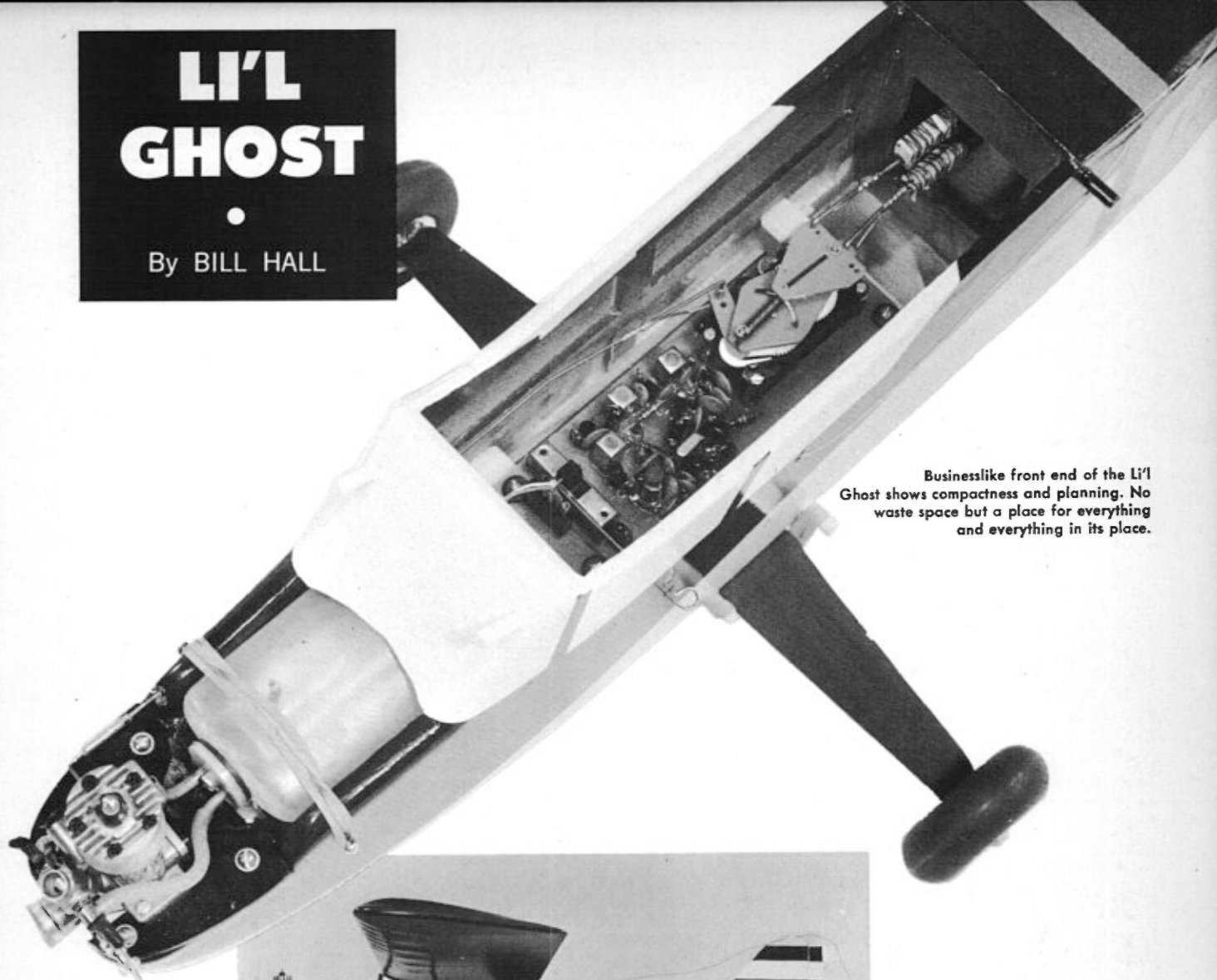


LI'L GHOST

By BILL HALL



Businesslike front end of the Li'l Ghost shows compactness and planning. No waste space but a place for everything and everything in its place.



Side view of the complete plane shows neat trim job, thick wing section.

Just imagine being the test bed for more than 100 radio systems. Bill Hall of Hallco developed the Li'l Ghost to test and evaluate the 103 system and used this exciting little plane to flight test the first 100 or more systems before they left the factory.



Three-quarter front view shows good ground clearance for touch and goes.

► The Li'l Ghost design evolved out of my extensive testing of our Hallco 103 System using two commercially kitted models and my past experience as an aeronautical structural engineer.

Testing a new radio system requires an easy to fly, forgiving, "bounceable" model. The Li'l Tri Squire kitted by Midwest does most of that if structurally improved. Much of our test flying was with such a model. At the same time, I was flying an Ugly Stick (with digital proportional gear) for my own pleasure and I was very impressed with its flying characteristics, much of which I attribute to the wing. The Li'l Ghost is the result of a combination of all the above with my fin and rudder. The Li'l (Continued on next page)

LI'L GHOST . . . Cont.

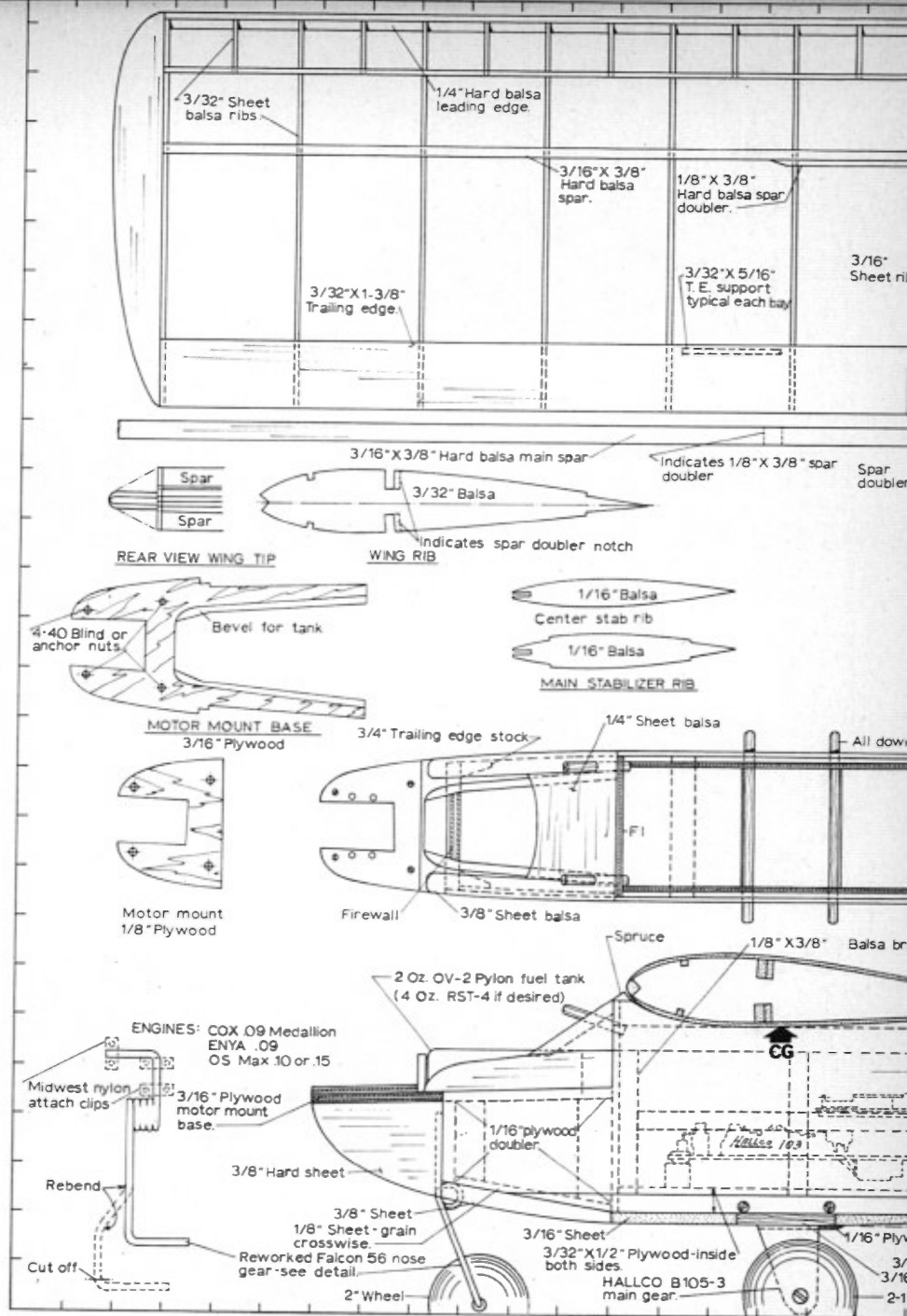
Tri Squire fuselage and stabilizer was structurally strengthened and used, The Ugly Stick Wing was scaled down to the 40" size and a vertical fin/rudder hinge line added. This improves the roll by locating the rudder area low. It also reduces the drag on the Galloping Ghost system since the clevis bind at the end of the travel is eliminated by having the hinge line perpendicular to the pushrod. The Li'l Ghost, with an OS MAX .10 or Cox .09 Tee Dee, will roll, loop, ROG, and fly inverted satisfactorily. With a .15 engine, it can even do it faster. However, don't start with a .15 unless you are an expert.

The Li'l Ghost will also bounce well, perhaps not off brick walls but you will be surprised at the abuse it will take from trees, bushes, weeds, sod on the nose, etc. Of course, if you never make a mistake this may not be important, but . . . Testing flying systems when you deliberately try to make a questionable system malfunction will allow plenty of opportunity for you to appreciate bounceability. If you can have some for free for normal flying, so much the better.

"Bounceability" is partially due to the light weight of this design. My models weigh 32-33 oz. dry ready to fly with the Halco 103 at 7 oz. included. I use colored silk and clear dope with dye added on the wing and tail, and silkspan with pigmented dope on the fuselage. A good spray booth is also available. Plenty of dope is used, usually 8 to 10 coats. There is only one coat, however, of pigment on the fuselage/fin in the build up which saves weight yet allows a fully filled, colorful, glossy, finish.

Construction - General: All the good design and correct use of material will not yield a durable model unless care is used during the construction to fit your joints as carefully as possible. Thick glue is very poor under load. A .003 to .006 glue thickness is ideal. You cannot have superior fits in every joint but you can try to and make sure that you do on the important joints. Excuse the lecture but I have seen many models last only one or two flights because the model takes after the "one hoss shay" by collapsing into kit form again on a hard but not really bad contact with the ground. I now use Titebond glue. I used to use white glue but changed since Titebond will sand easily compared to the white glues.

Tail Surfaces—The fin and rudder are straight forward as shown on the plans. The plywood fin post extends down to the bottom of the fuselage and is assembled into the fuselage as it is built. The stabilizer can be built as shown or all ribs can be the same as the center three and 1/16 x 3/16 cap strips used on the four outboard ribs. This is really

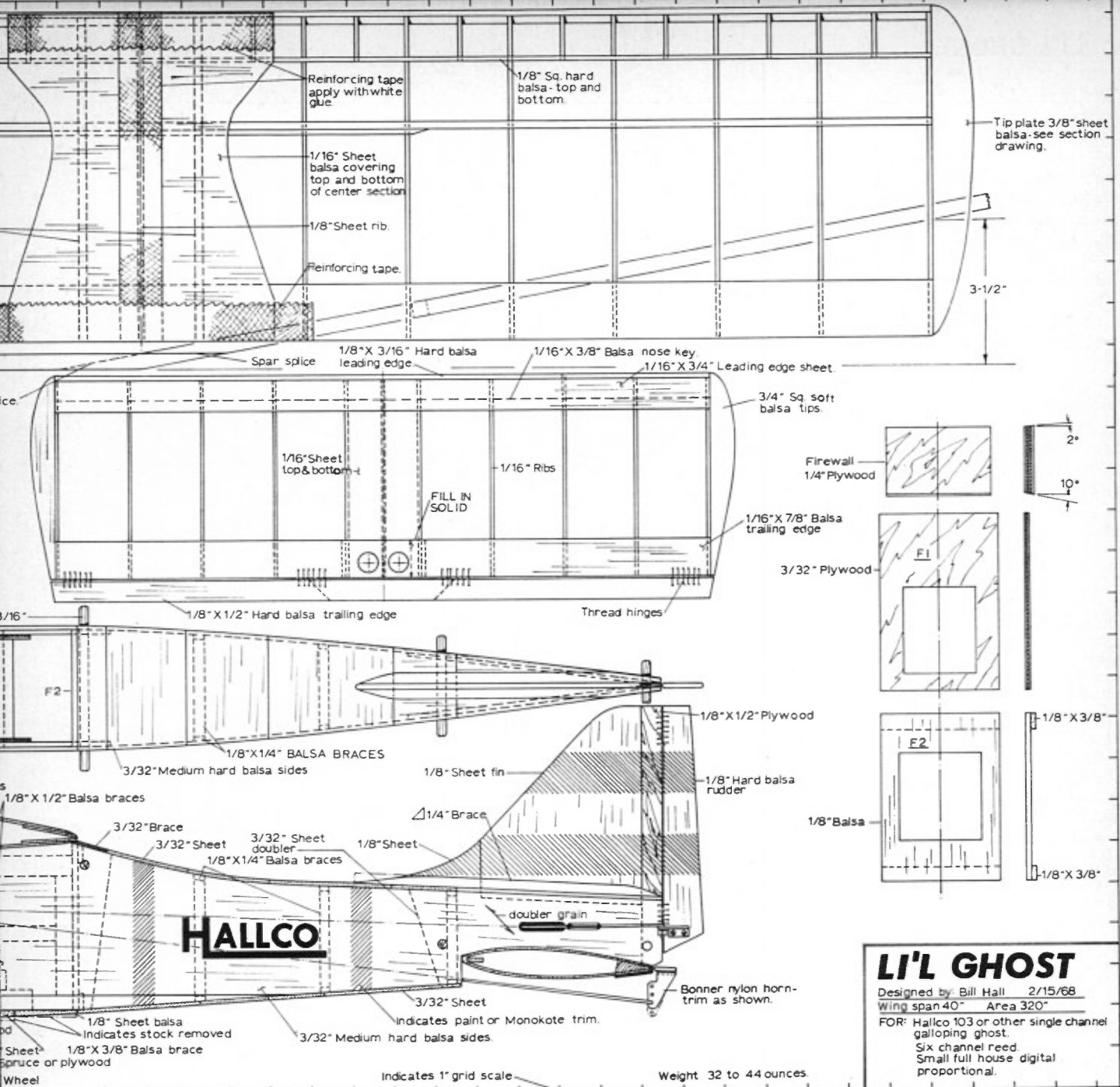


superior to the non-cap stripped version but it takes more time. Glue the stabilizer on at your own peril. I believe in rubber bands here to allow the required flexibility when you cartwheel on a landing. Without flexibility, you generally stop flying, go home, and rebuild.

The elevator is the proper size as shown. When I started Galloping Ghost, I thought that big surfaces were needed because the model only saw the average position, etc. It was found that the prop makes a better propulsion device than a paddle on the rear and all the large surfaces did was load down the Rand actuator. The rudder and elevator as shown will supply all the control you need.

Fuselage—Use 3/32 x 4 medium hard balsa (8 to 10#/cu. ft.) for the sides.

The excess out of the sway back will splice onto the bottom to give a full width side out of one sheet. The sides should be cemented up flat (left and right versions, remember) by adding the front 1/16 ply double, cabin bracing, rear 1/8 x 1/4 verticals and the tail doubler. Make the three bulkheads and cement the two sides together with the two cabin bulkheads first. Then pull the tail and nose in. Glue in the firewall and the 1/8 x 1/4 cross pieces. Do NOT glue the tail ends of the fuselage sides together now. When dry, glue the plywood fin post between the fuselage sides with the fin lined up true fore and aft. Note that the bottom of the balsa portion of the fin extends down below the tops of the sides.

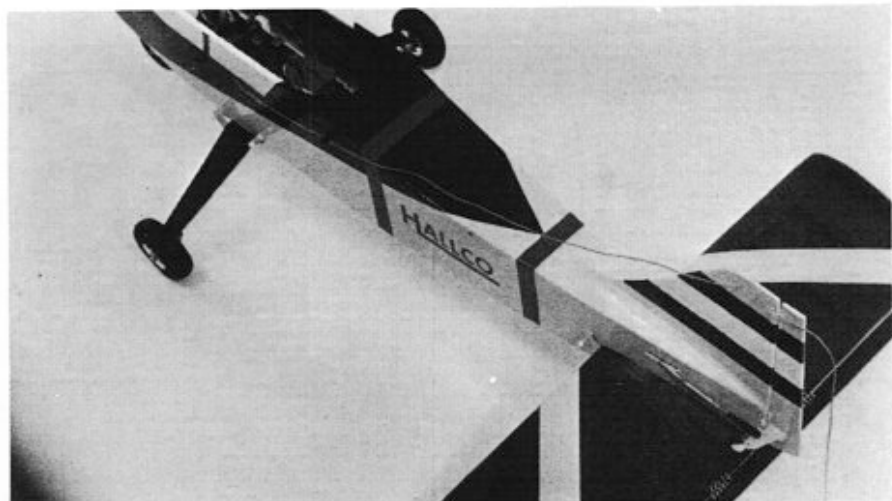


LI'L GHOST
 Designed by Bill Hall 2/15/68
 Wing span 40" Area 320"
 FOR: Hallco 103 or other single channel galloping ghost.
 Six channel reed.
 Small full house digital proportional.

The top fuselage sheet at the tail is notched for the fin. Its grain is fore and aft while all the other top and bottom sheets have their grain direction cross-wise.

The 3/16 plywood engine mount should be carefully fitted to the fuselage sides and the top of the firewall since it can take a beating whenever you run the nose into something. The plans show a 2 oz. OV-2 Pylon tank for those of you who want to use a .15 or .19 engine and a small digital full house installation. There is room for a 4 oz. RST4 Pylon tank if you trim out more of the windshield area. This job will do it if you can fly it.

I build my fuselages using a 6" belt sander running (Continued on page 38)



Here we see the off-on slide switch extension, antenna attachment to rudder, and sewn hinges.

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at slow speed, (1750 RPM motor) with 100 or 150 grit belts to smooth and square up the edges of the sides before adding the top and bottom sheets. Such a tool is extremely helpful when used with discretion. Balsa is soft. You can take off too much but with skill, resulting from a little practice, you can end up with those .003—.066 glue lines. The sander is also used for shaping the nose blocks, smoothing the sides (trimming off top and bottom sheet overhangs), smoothing and shaping wing and tail leading and trailing edges, squaring up bulkhead edges, etc.

Another good trick is to drill a long (2-4-6") small hole using brass tubing. The hole through the windshield block for the motor control pushrod is made by sharpening a bevel on one end of a 1/8" brass tube, starting it into the balsa block by hand, then chucking the tube into a 1/4" electric hand drill and pushing. With hand pressure, you can go through the plywood bulkhead too. You should stop and push out the core half way through on long holes. If you don't have an electric drill, you can go through balsa fairly easily with only hand power, by removing the cores frequently. I suspect some little effort would be required for plywood.

Wing—Build the two wing spars as units first. Make them longer than required and trim the ends after assembly flush with last

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rib. Carefully fit the center bevels and add the 1/8 x 3/8 reinforcements so that their splice is on the side which has the solid spar. The bottom surface of the wing is flat from the trailing edge to the spar position so the wing can be built on a flat surface.

Build one side by pinning down the trailing edge sheet and one spar. Then, add the full ribs, the top spar, top nose rib attachment, the leading edge and the top trailing edge sheet. When dry, build the other side. Add the bottom nose rib attachments, the nose ribs and the tips as shown.

The above wing construction is the same as that used on the 60" Ugly Stick except 1/16 sheet is now added to the center section. This sheet is added over the normal ribs/spars/trailing edge so it increases the thickness by 1/8" in this area. Bevel the edges of sheet before installing so the silk doesn't break over a sharp edge and it will come out fine on the finished model. Use reinforcement tape (pinked edge cotton or nylon) along the L.E. and T.E. and around the center joint. Apply with white glue and dampen the tape first so that the glue is thinned by some additional moisture. Make sure the glue penetrates the tape thoroughly. These pieces of tape keep the rubber bands from cutting in the L.E. or the T.E. in particular. Sand all over and cover.

Flying—You know the only way to learn to be a flier is to practice flying. Any individual must condition his reflexes by practice so that he can react without thinking about each individual set of circumstances. Li'l Ghost will help you do this because it will allow you to make some mistakes and you can try again.

Li'l Ghost will perform well with a single channel system. It is stable, and yet, very maneuverable. I am sure it will fly equally well or better with one of the new miniaturized proportional systems. I have been trying to work in such an installation but have just plain run out of time so far. The normally built model will allow such an installation with a 40-42 oz. flying weight which a .15 will handle easily while a .19 installation will keep you on your toes.

If you should install Galloping Ghost and have had no experience with GG, you should realize that it will be somewhat different from single channel bang-bang or digital proportional since the models response is not as quick. More stick movement is required by GG than digital to accomplish a maneuver and there is always the inter-reaction between rudder and elevator that is built in as part of any Galloping Ghost system. Remember that you get up elevator reaction with motor change so don't hold down on the motor switch but "beep" for engine speed change. Push rod drag is most undesirable because it robs the actuator of power and may foul up the failsafe action or motor control. The plans show the elevator operated by a push rod to a horn on the bottom. This allows a minimum drag connection but also results in the maximum up elevator reaction when obtaining motor control. A 120° Bellcrank can be inserted into the elevator control system and reduce the effect of upkick at the expense of control. If used, support the bellcrank on the rear cabin bulkhead and keep the short push rod from it to the actuator as long as possible.

The flutter of the surfaces which occurs with normal Galloping Ghost seems to bother people considerably but it does not bother the airplane model. There may be a barely perceptible gallop when you

are gliding dead stick with up elevator (the worst possible combination of conditions) but this is all. I flew a Li'l Ghost at the MATS Show last January and some of the audience commented about the flutter to the effect that "Guess it wasn't broken after all since it seemed to work fine."

You can only learn from practice how to cope with any model system characteristics. Therefore, start a Li'l Ghost, or two if you like, since they are small. Get out and fly. Good luck!