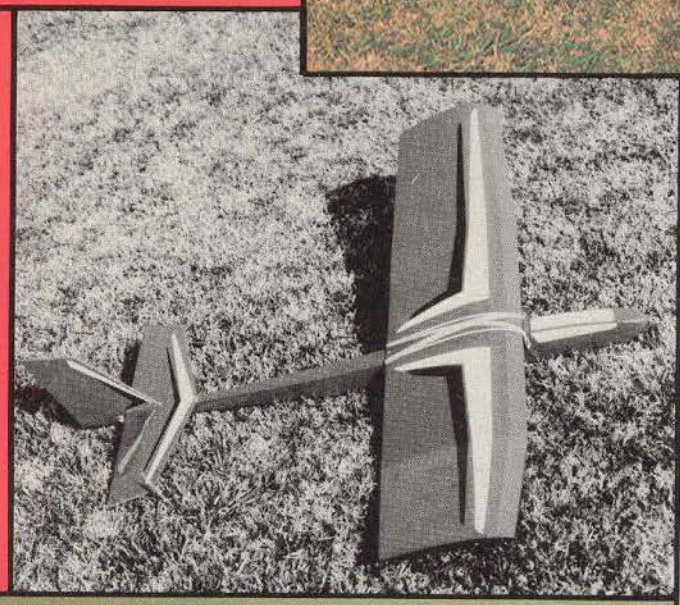
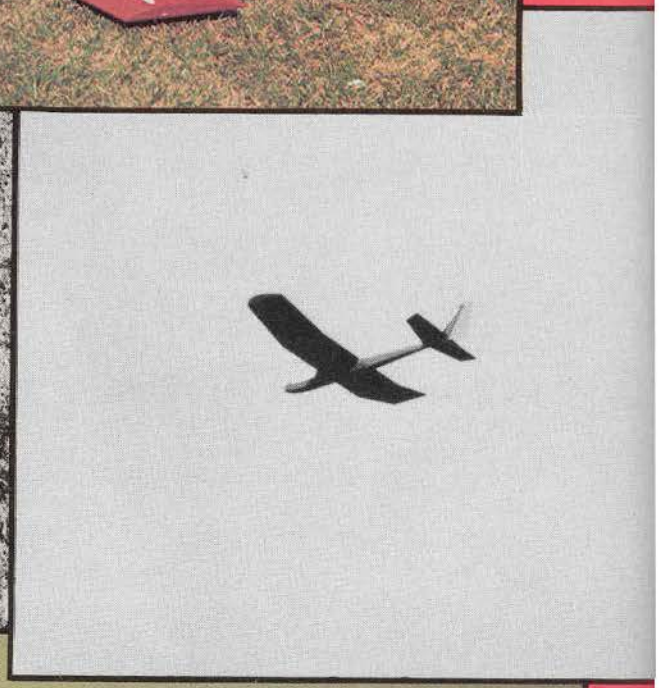
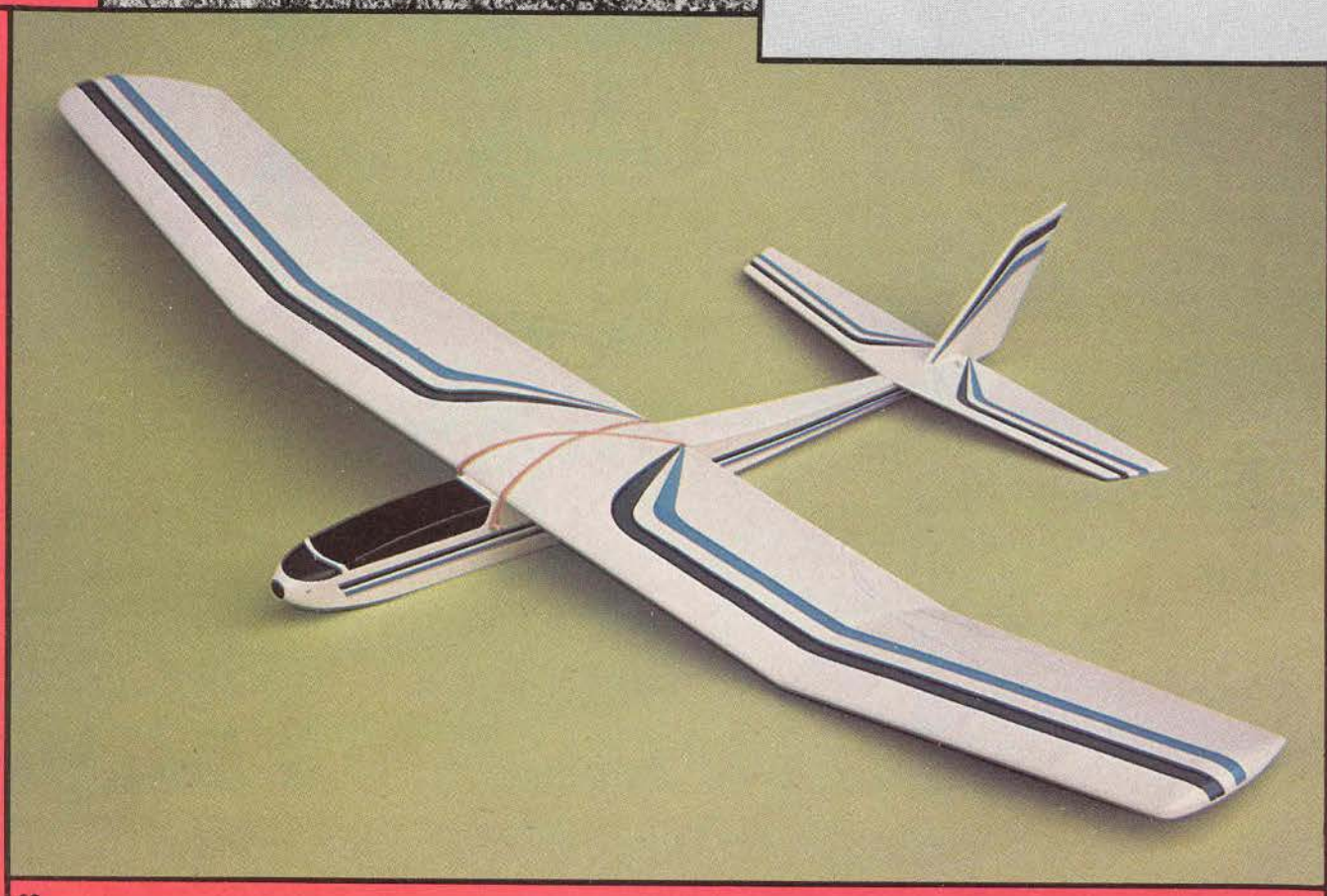
2 X 4

This superb little sailplane was designed for the newcomer into R/C. Built around a standard radio with standard servos, this 2 channel, 49½" span sailplane will amaze you at its flying ability.







By Gene Wallock

I spend a lot of time observing beginners at R/C glider flying, helping them where possible and listening to problems they have. Allow me to list a few:

A. "The radio I bought won't fit in the model I bought. I spent $70.00 for the radio and $105.00 for the mini-servo and small battery pack."

B. "My model is too weak for the Hi-Start that the guys are using and no one wants to even try it on the winch."

C. "My model doesn't respond to commands for 3-4 seconds and I'm always over controlling."

D. "I can't fly if the wind is blowing."

E. "The MonoKote costs more than the model kit."

F. "Every time I land, something breaks."

To my way of thinking, the problems are driving people away from the hobby so it's time to do something about it. Let's call it a primary trainer, a basic element in building --- a "2 x 4."

The 2 stands for 2 channel standard airborne package (my Futaba weighs 10 ounces). The 4 represents the span — about 4 feet (49½"). The area is 409 in^2 and the prototype weighs 28 ounces. This combination gives a wing loading of 9.8 $oz./ft.^2$ The moments and aspect ratios were set up along proven free flight criteria for stability and quick response to slight trim changes (minimum throws).

The low aspect ratio wing lends itself to simple but very strong structure, so I used standard parts out of a House of Balsa Two-Tee wing. Spruce spars and cedar arrow shafts are the basic elements of a very strong wing center section. Balsa spars are used in the tips because of the low loads but the arrow shaft is retained for abuse strength.

The single elevator should not raise eyebrows. It's been around since the 1938 Blohm Und Voss BV 141 full size aircraft. Blaine Rawdon used it on his "Mirage" design in current times. Basically, it simplifies elevator construction, allows flexibility in tail group layout and helps to dampen the galloping effect novice fliers seem to produce. With the short moments and low flying speed it doesn't produce a roll.

Fuselage cross-section was dictated by radio component sizes. The battery is the biggest item no matter which way you turn it, so width was established. Standard servos and receiver width established depth. It's interesting to note that the on-off switch is longer than the battery is wide, so side mounted space had to be provided in the receiver compartment so that all standard leads would reach their proper destination without extensions.

Fuselage construction is standard lite-ply with balsa aft planking. A balsa crutch is used to eliminate the uneven bowing of sides when they're pulled together. It also provides additional stabilizer gluing area.

"2 X 4"
Designed By: Gene Wallock

TYPE AIRCRAFT
2 Channel Glider
WINGSPAN
49½ Inches
WING CHORD
9 Inches
TOTAL WING AREA
409 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Constant Chord Center
Tapered Tips
DIHEDRAL EACH TIP
3 Inches
O.A. FUSELAGE LENGTH
38½" (inc. rud.)
RADIO COMPARTMENT SIZE
(L) 15" X (W) 1⅜" X (H) 2¼"
STABILIZER SPAN
20 Inches
STABILIZER CHORD (incl. elev.)
4" (Avg.)
STABILIZER AREA
79 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
6½ Inches
VERT. FIN WIDTH (incl. rud)
4¼" (Avg.)
REC. ENGINE SIZE
Cox .049
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder and Elevator
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Lite Ply & Balsa
Wing	Balsa & Spruce
Empennage	Balsa
Wt. Ready To Fly	**28 Oz.**
Wing Loading	**9.8 Oz./Sq. Ft**

The construction photos and captions cover the construction steps so there is no need to duplicate verbage. Lets discuss some very important items that are usually overlooked by both beginners and experts:

(1) Glue:

I do not use epoxy for construction. The weight penalty to strength attained is poor at best. The entire model was built with Zap. All joints were double glued with Zap-A-Gap. The weight added was negligible and the strength astounding. Total framing time was 6 hours.

(2) Sanding:

Sanding is minimal because the L.E. is pre-formed, the fuselage is a box and the tail surfaces are flat. The ribs and turbulator spars usually cause a problem because normal tendency is to maintain the rib contour. Stop and think about what the MonoKote is doing 1/4" either side of the rib. You're right --- it's flat between the spars. I sanded the ribs flat between the L.E. turbulators and main spar. In effect, the top wing contour from the main spar forward has three facets or flat surfaces. This technique comes from early multi-spar rubber model designs. Dick Korda didn't do bad in 1939.

(3) Covering:

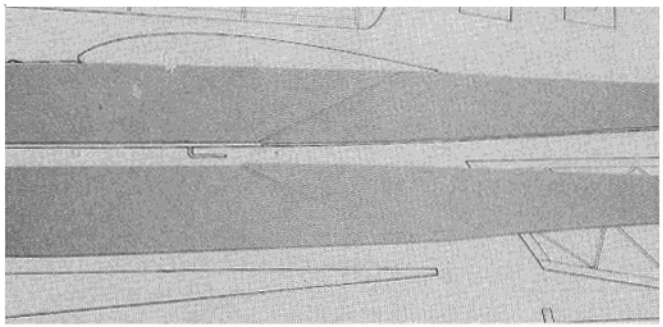
If any uncovered structure you've built can't be twisted, ignore this section. If you can twist it, then do the following: Attach the MonoKote to every piece of structure it touches in its entirety. That means the whole T.E., all ribs, all spars, and all planking. If you don't, you haven't covered it; you've sacked it and haven't made use of the skin strength that's there for you to use. Before covering, vent the wing by cutting 3/16" holes in the ribs and tips so that air won't be trapped, causing your wing to bulge on hot days. Vent the tail feathers with a pin hole through the MonoKote in each bay.

(4) Balance:

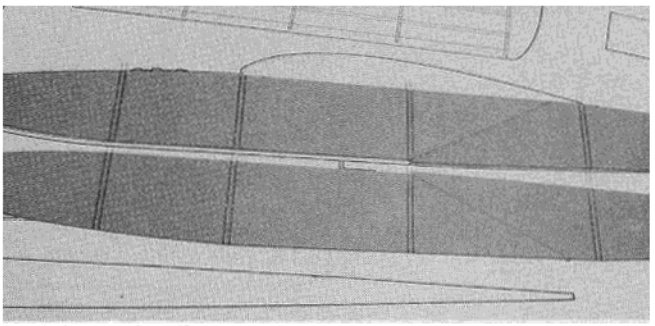
Balance the model where shown on the plans. If it takes nose weight, add it. A natural tendency is to add down trim or remove wing incidence because of an old wive's tale that anything above 4 oz. wing loading will kill performance. Remember, you are flying the model, it's not parachuting down like a free flight model. You must be able to penetrate upwind to get back to the field on windy days and maintain speed so you can make a down wind turn.

(5) Launching:

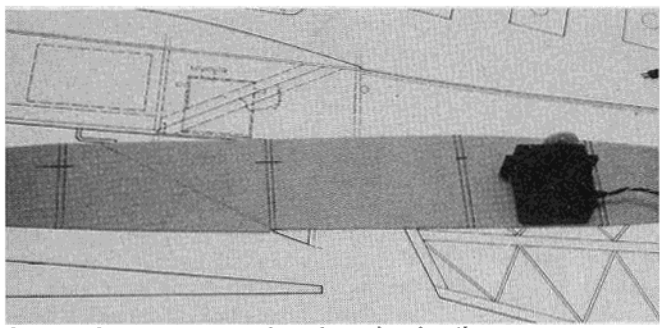
I believe in the "shoot them in the air for max altitude" theory of launching. "Finesse" is a slick move in bridge but not applicable to maximum flying time. I used a standard 5/16" diameter Hi-Start for initial flights. I did make sure the surfaces were warp free and that the wing tips were both



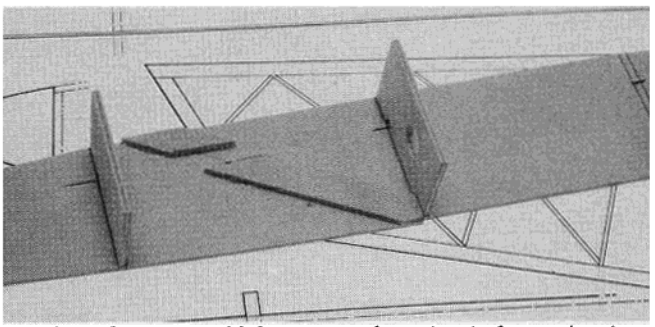
Fabricate side pieces and join over plan.



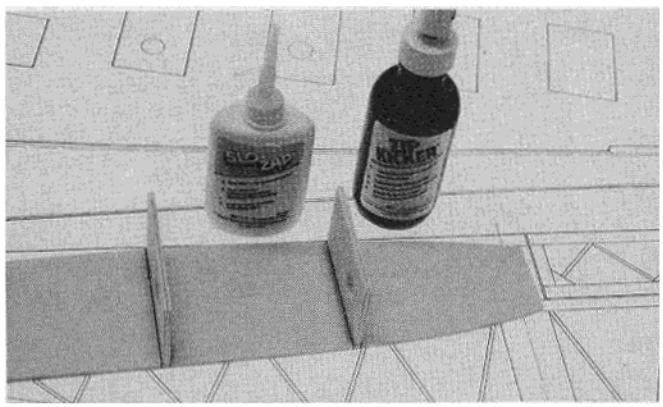
Mark former locations.



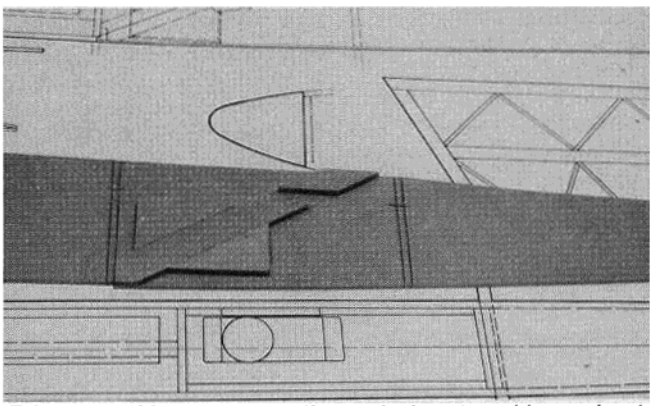
Locate elevator servo and mark pushrod path.



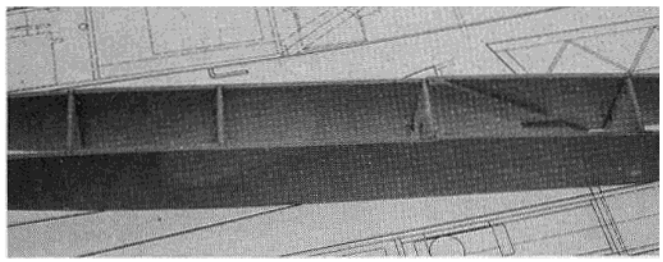
Fabricate formers and joiners — make cut-outs for pushrods.



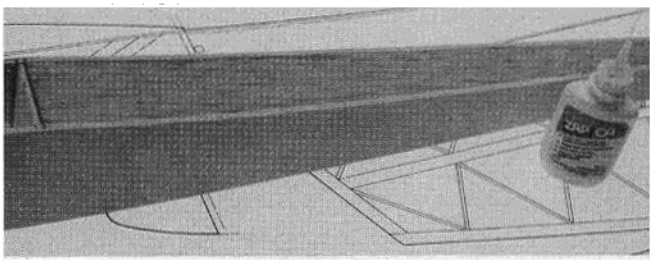
Zap and Kick formers and joiner to left side.



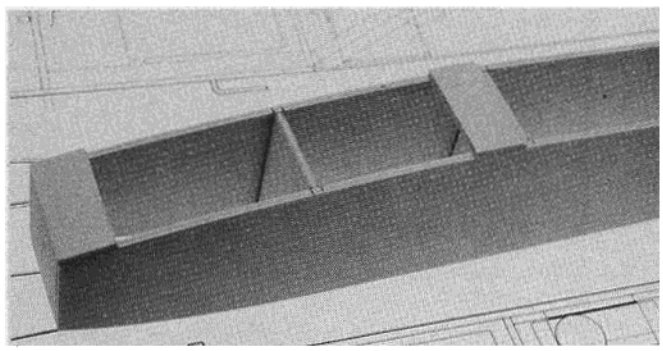
Fabricate rudder servo mounting pads. Locate rudder pushrod path. Notch joiner and former; Zap and Kick.



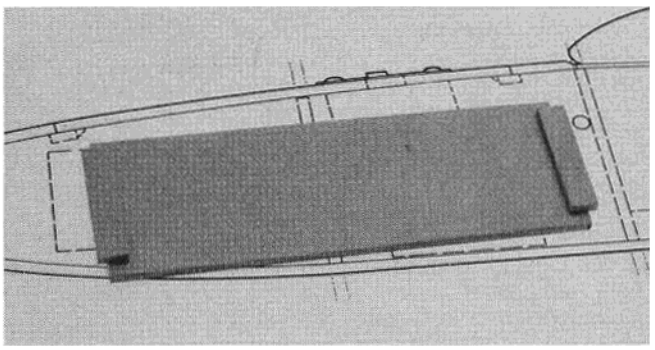
Join right hand side to formers.



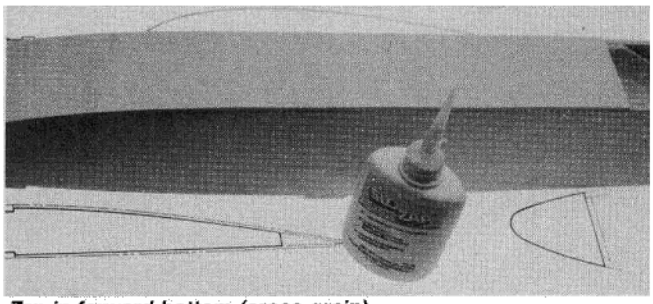
Fabricate aft crutch and Zap in flush with top side edges.



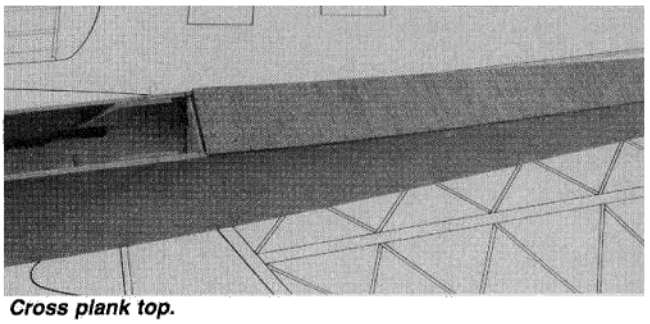
Zap in hatch hold-down plates.



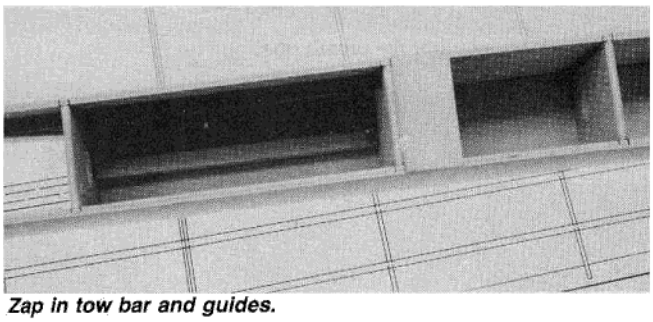
Fabricate hatch (cross grain) and Zap on cleats.



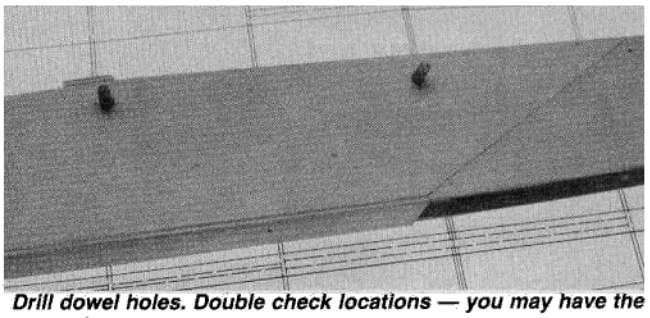
Zap in forward bottom (cross grain).



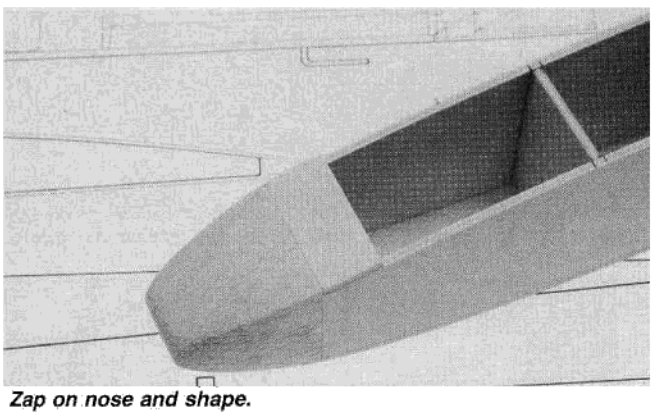
Cross plank top.



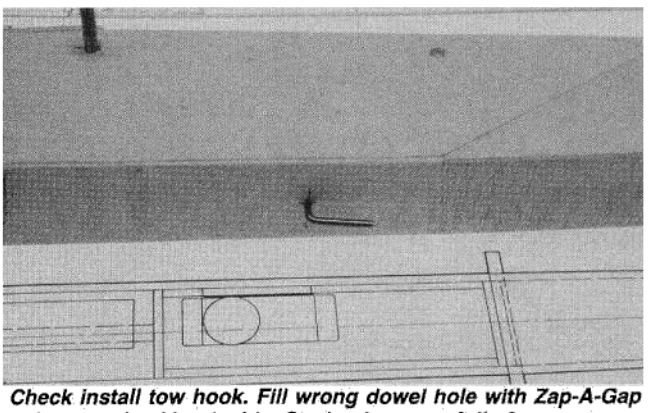
Zap in tow bar and guides.



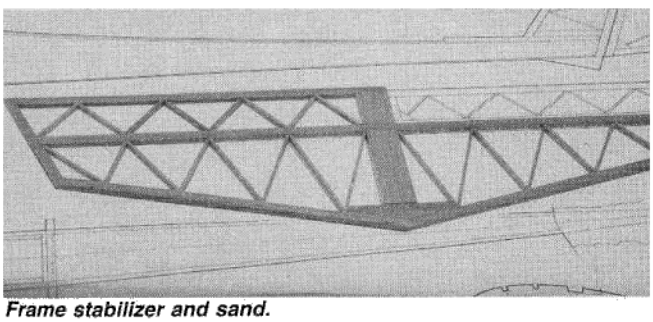
Drill dowel holes. Double check locations — you may have the wrong bay.



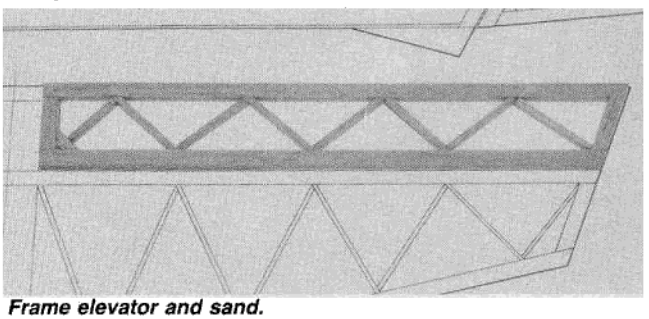
Zap on nose and shape.



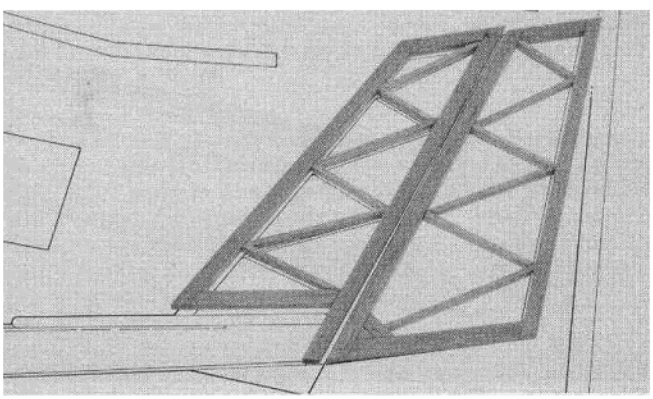
Check install tow hook. Fill wrong dowel hole with Zap-A-Gap using tape backing inside. Study plans carefully from now on.



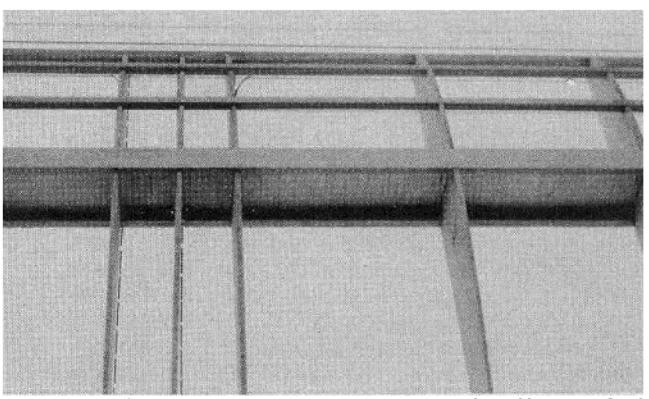
Frame stabilizer and sand.



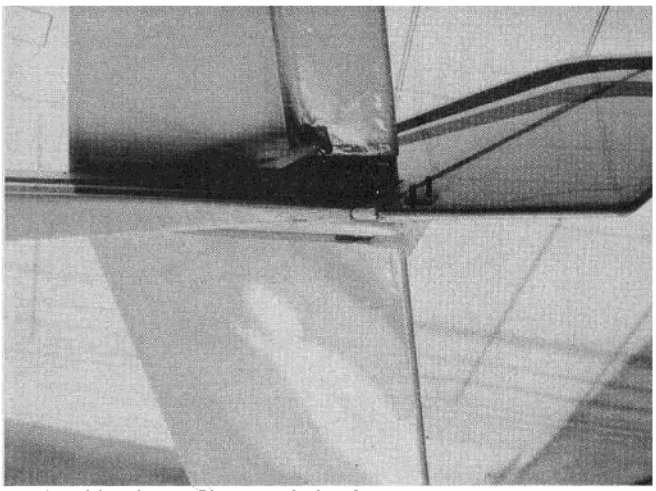
Frame elevator and sand.



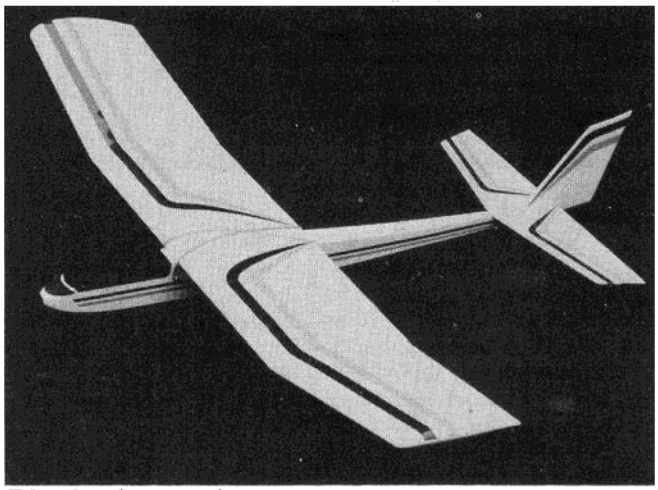
Frame fin and rudder and sand.



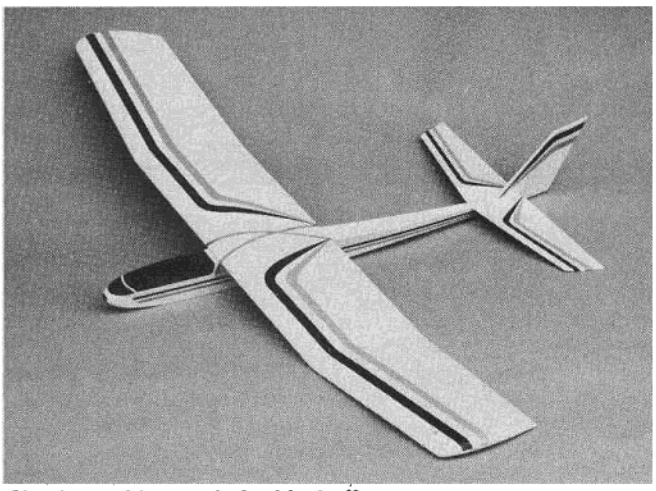
Fabricate wing parts. Zap center section together. Note vertical shear web grain.



Pushrod hook-up. Clean and simple.



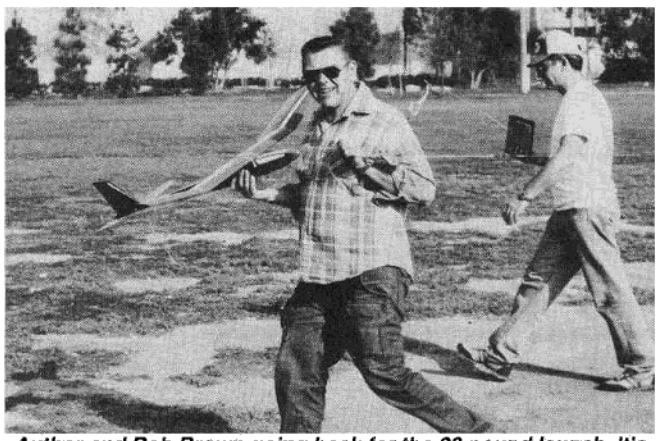
Trimming does wonders.



Simple machine ready for blast-off.

Author demonstrates proper launch angle. Note wide open spaces.

Bob Brown making a realistic landing. Did you ever see a full size glider spear a runway?



Author and Bob Brown going back for the 20 pound launch. It's important to dress casual and maintain composure during test flights!

washed out 1/8". I used a fish scale to determine line tension. The first flight was at 10 pounds, the second at 15 pounds, and the third at 20 pounds. You know you're at 20 pounds because your knuckles are white and your feet are slipping. The "2 x 4" shoots up the line and, if you're fairly proficient, you can get a zoom out of it. Six foot diameter circles are no problem and it's quite happy in a fair to middlin' breeze.

(6) Performance:

My good friend, Ed Slobod, stated that performance is hard to measure when tree stumps are going up in the same thermal you're in. I prefer to measure performance by the degree of satisfaction of the pilot. At the last flying session at a high school football field, I asked three flying buddies to take it up and see what they could do. The flight lasted 20 minutes and 49 seconds. The pilot skills ranged from intermediate to expert. All three were pleased with the performance.

(7) Conclusion

(1) The design accepts standard airborne radio configurations.

(2) The model may be launched on standard Hi-Starts.

(3) The model responds quickly to command with minimal throws.

(4) Wind is an advantage for high launch altitude and wave soaring.

(5) The entire model can be covered with one roll of MonoKote.

(6) The only thing that almost broke was my thumb when I tried to catch it on a down wind landing.

(7) The model is suited to small obstructed fields. You'll spoil it on a wide open plain.

If slope soaring is your mode of pleasure --- enjoy. Remember, you must have wind to slope soar. Flying buddy, Paul Strona will have a ball with this in his Hawaii hurricanes.

My sincere thanks to Bob Brown, Keith Kindrick, Bob Goldie, and Les Wilfong for taking the time to fly the model and evaluate performance objectively. □

From RCModeler May 1983