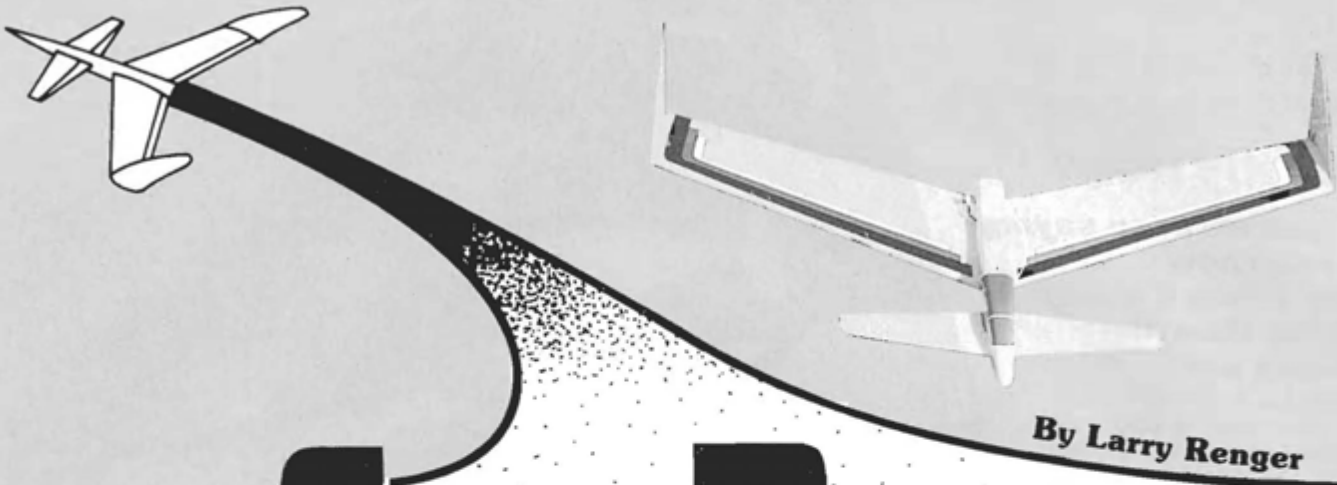


By Larry Renger

SKY BLASTER

Whether you're using a rocket motor or flying from your favorite slope, this little plane is a "blast"!

I guess you would have to describe it as a crackling snarl. That's the sound a radio control rocket glider makes as it blasts its way straight up into the sky. Why a rocket powered model? Because it can be done, of course. The SkyBlaster is capable of a 200' vertical climb on a standard Estes "D" engine, and a whole bunch more with a composite "E." From that altitude you can soar the model or do aerobatics. You can do vertical victory rolls and zooms during the climb with SkyBlaster; it is very rugged. Believe me, if you want attention at the flying field, you'll sure get it with this design.

The SkyBlaster is a developmental model for the recently announced Astro Blaster kit from Estes Industries. This article is intended both to give the modeling community more information about rocket powered models, and to provide an opportunity to build one from scratch. SkyBlaster is a rocket glider as opposed to a boost-glider. The difference is that a rocket glider may drop no parts, while a boost-glider uses a jettisonable power pod to provide a stability change and weight reduction for the glide portion of the flight.

Mike Dorffler of Estes, and I established some criteria for SkyBlaster before any design work was done. The first requirement was that the model had to use standard materials and equipment. Second, we wanted to achieve good sport model performance, and finally, the model had to be reasonably easy to build. SkyBlaster is a bit harder to build than the Astro Blaster kit with its molded wings, but no harder than the average slope soaring glider. Of course, by building from scratch, you have the opportunity to customize if you desire to do so.

The canard, pusher, swept-wing configuration has some major benefits for a rocket glider design. The main challenge with a rocket glider is to control the stability on the climb so it can climb out with no control inputs required. Due to SkyBlaster's extreme wing sweep, the motor is nearly at the C.G., so balance point shift is minimized as fuel burns. In addition, the model is essentially symmetrical around the thrust line, so no pitch is induced inertially. The canard provides the capability of pitch control without requiring a control mixer, and smooths out the pitch response a bit.

The tip fins are located to get the vertical area as far back as possible. Of course, it doesn't hurt that the whole thing comes out looking like something from a Sci-Fi movie.

By the way, SkyBlaster is also a very enjoyable intermediate slope flying machine. It is smooth and easy to fly, while capable of the usual aerobatic maneuvers.

SKYBLASTER

Designed By:
Larry Renger
TYPE AIRCRAFT
Canard Rocket Glider
WINGSPAN
34¼ Inches
WING CHORD
6½ Inches (Avg.)
TOTAL WING AREA
219 Sq. In. (Approx.)
WING LOCATION
Mid-Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Tapered, 30° Sweep
DIHEDRAL, EACH TIP
0
OVERALL FUSELAGE LENGTH
15¼ Inches
RADIO COMPARTMENT SIZE
(L) 4½" x (W) 1½" x (H) 1¾"
CANARD SPAN
14¼ Inches
CANARD CHORD
Tapered, 2⅜ Inches (Avg.)
CANARD AREA
33¾ Inches (Approx.)
CANARD AIRFOIL SECTION
Flat
CANARD LOCATION
Middle of Fuselage
VERTICAL FIN HEIGHT
3⅞ Inches (x2)
VERTICAL FIN WIDTH (incl. rud.)
4 Inches (Avg.) (x2)
REC. ENGINE SIZE
D or E Rocket Motor
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Elevator & Ailerons
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa
Wing	White Foam, Epoxy Impregnated Paper Skins
Empennage	Balsa
Wt. Ready To Fly	14 Ozs.
Wing Loading	9.2 Oz./Sq. Ft.

SkyBlaster uses any of the small radios with mini or micro servos. Mine have all flown on the Futaba Attack 4 glider system using a 225 mAh battery pack and Futaba S133 servos. Similar systems are available from most of the other manufacturers. Of course, you can save a couple of ounces if you use the Cannon Super-Micro system with a smaller battery pack. Weight definitely matters on a model of this size and makes a real difference in the boost altitude with a D engine.

No special skills are required to build this model after the wing cores are cut. By now I suspect most people know someone who cuts cores, or if not, there are some services advertised here in RCM which will do the custom cutting for you. The most sophisticated equipment required for covering the wings is a stack of bricks and waxed paper, so you ought to be able to handle it.

Piloting a boost-glider looks like it should be difficult, but it is really a pussycat. If you are careful with pre-flight and glide trim, the model boosts hands off with just a touch of down trim on the transmitter. At the top of the climb, push it over into a glide and crank the elevator trim back to neutral. A couple of pieces of masking tape on your transmitter will allow you to preset both settings without looking. The model is pretty stable in roll because of the high swept-back wings. It is also stable in roll while flying inverted! Pitch response is a bit sluggish, if anything. The hardest part of flying SkyBlaster is getting a smooth throw when hand launching to test the trim or launching on the slope.

I'd like to thank Barry Tunick, Mike Dorffler, and Mike Riggs at Estes Industries for asking me to do this glider project, it certainly has been a lot of fun!

Safety:

And now a word from our sponsor. Flying rockets is both legal and safe, but you have to follow the rules! Here in California, you have to get the permission of the local fire marshal to fly at any given site except Mile Square Park in Fountain Valley. No big deal, just go to the nearest fire department and ask, and they will be happy to help you. I am sure that this is the best course of action in any other state too.

SkyBlaster is legal under both AMA and NAR rules. That is, it is to be boosted vertically with a NAR approved model rocket engine which is electrically ignited. The model must be launched off a guide of some type which is at least 36" long. Horizontal shots, homemade engines and fuse ignition are all out! The NAR has a 14 point safety code which has proven effective for the last 25 years . . . **follow it!**

Here are some other vital safety tips. Epoxies are probable carcinogens, and definitely cause eventual allergic reactions. Use gloves on your hands, and **never** use solvent to clean up your skin, it carries the junk right through to your bloodstream — Bye Bye! Also provide adequate ventilation any time you work with glues and solvents.

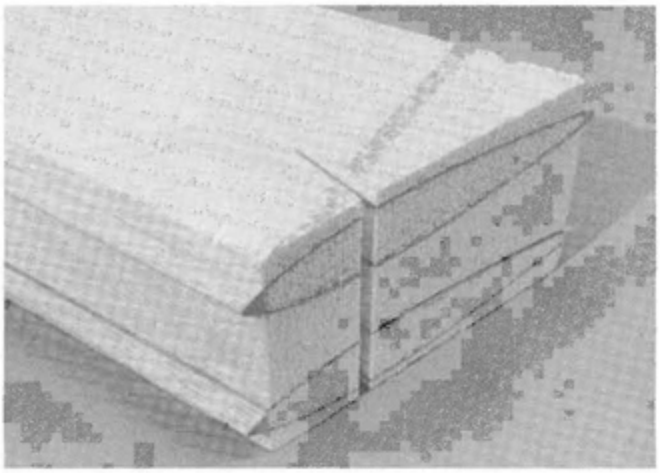
CONSTRUCTION

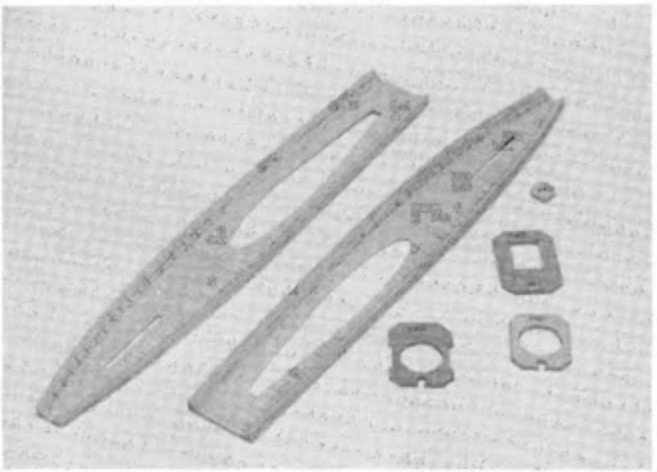
The plans provided with this article are not quite what you are used to. Since the entire construction sequence is shown in photographs, and none of the assembly is done over plans, the sheet shows patterns, dimensions and notes only.

Wing:

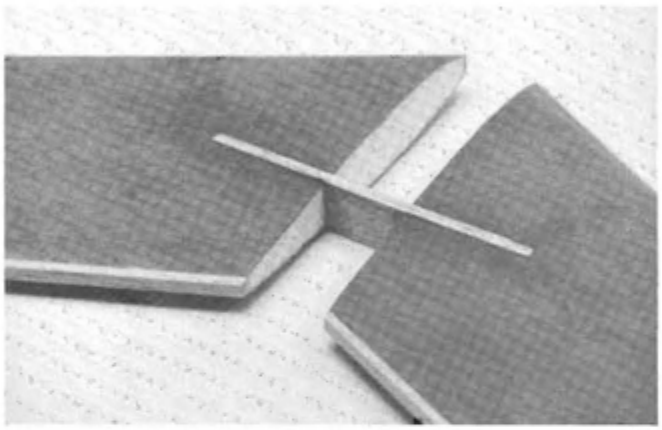
Cutting foam wings has been covered so often that I will not belabor the subject here. Be sure that the cores are 1 lb./cu. ft. foam, unless you are only going to fly SkyBlaster on the slope. Mark the five foam pieces on one end so you can always get them back together in the exact order. I also draw a vertical line on both ends for exact alignment. If you get creative and change the airfoil to one that is not symmetrical, be sure that the cores are cut one up, one down, or you will end up with two wings for the same side.

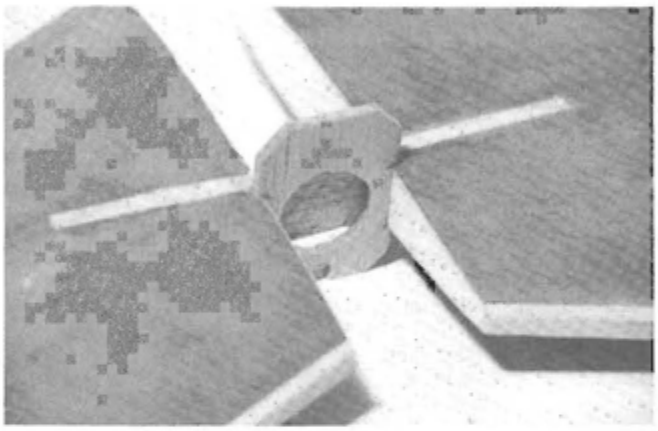
The cores must be more carefully prepared for covering than usual since SkyBlaster uses brown Kraft paper for the wing skins. This paper ends up about two thirds the weight of 1/32" balsa and provides a superb surface finish after sanding. The strength is surprisingly good, I have actually crashed one of the SkyBlaster prototypes under power twice, and the wings are still in good shape (the rest of the model is new, of course). For small foam winged models I don't know of a better



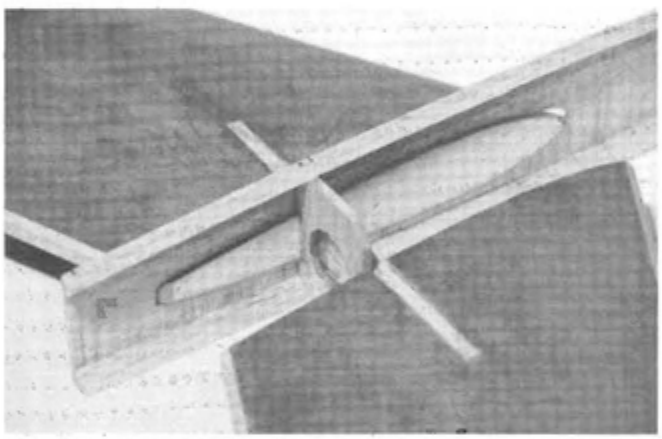


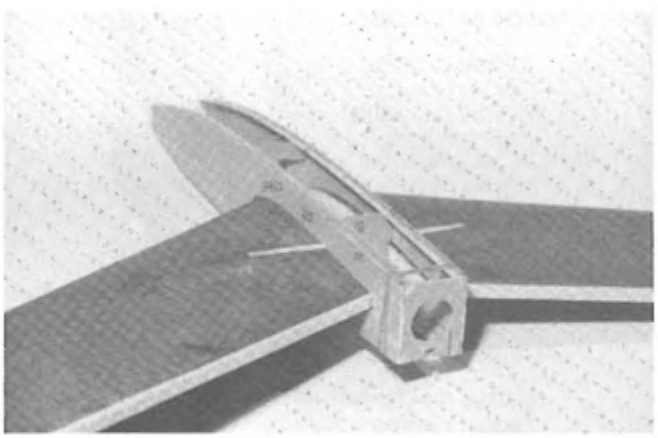
LEFT: To help ensure accuracy, the covered wing panels are stacked together, and the sweep angle is cut in both panels at one time. RIGHT: Fuselage sides and formers ready for assembly.





LEFT: Left and right wing panels are epoxied to the spar. RIGHT: Former #3 is glued in place at spar.





LEFT: Fuselage side is positioned on wing, but not glued in place yet. RIGHT: Everything is rubber banded together, aligned, then glued together.

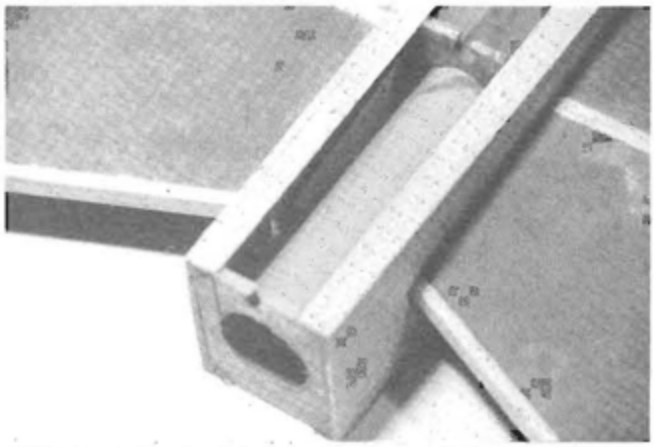
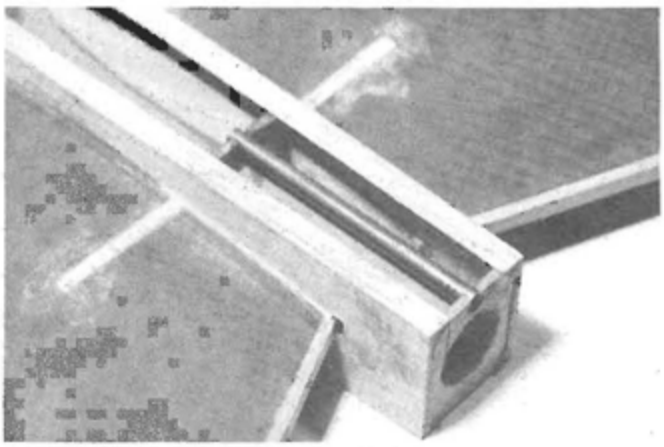
sheeting material.

After sanding the cores with a 12" by 2" wood block covered with 100 grit paper to remove the ridges, I fill in the valleys and holes with Goldberg's "Model Magic" filler. This material is very light and sands about the same as the foam so you don't get hard-spot ridges. Continue the sand and fill process until the wings are as good as you want the final product — **everything** shows through the paper covering! Give the cores a final fuzz removal with 400 grit paper and then brush the cores and the "nesting" pieces off very carefully.

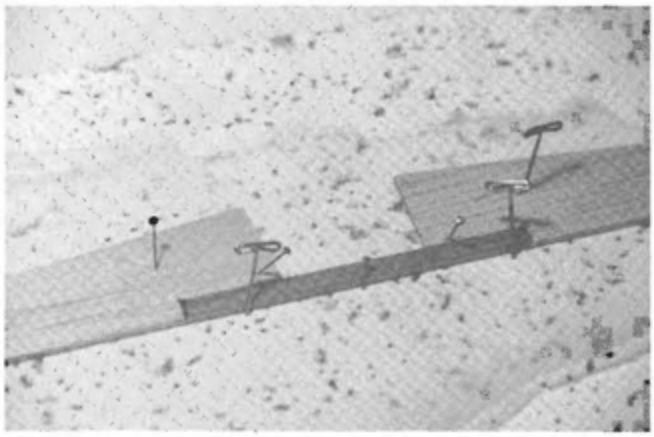
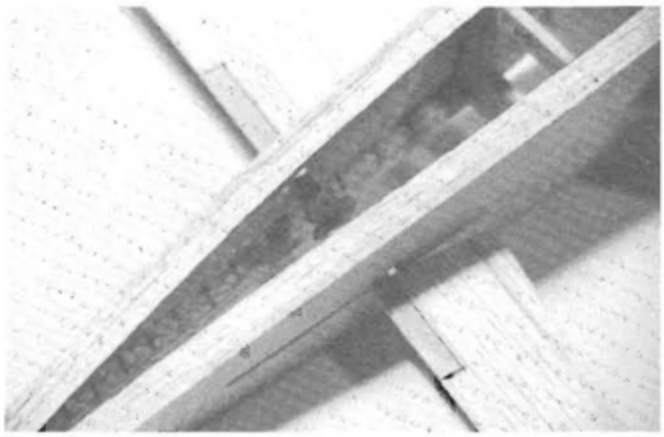
Covering the cores is done as follows: first, prepare thyself. Set up in an area at least 5 square feet so you have room for yourself, supplies, bricks (about 10) and, a floor covering of newspaper. Also, you need 30 minute epoxy, mixing sticks, a couple of old credit cards cut into thirds, mixing cups, wax paper, or thin polyethylene plastic, disposable gloves, measuring cups (K&B makes some nice ones), and lots of old newspaper.

The covering material is easily purchased as package wrapping paper at most stationery stores. Tear a corner of the material and you will find that it has a "grain." That is, it tears more easily in one direction than the other. You want to cut your wing skins out with the long dimension parallel to the easy tear direction. This improves the bending strength of the resulting wings. Gently draw the paper over a table edge to get it as flat as possible. Precut all four skins and maybe an extra; what the heck, it's really cheap stuff.

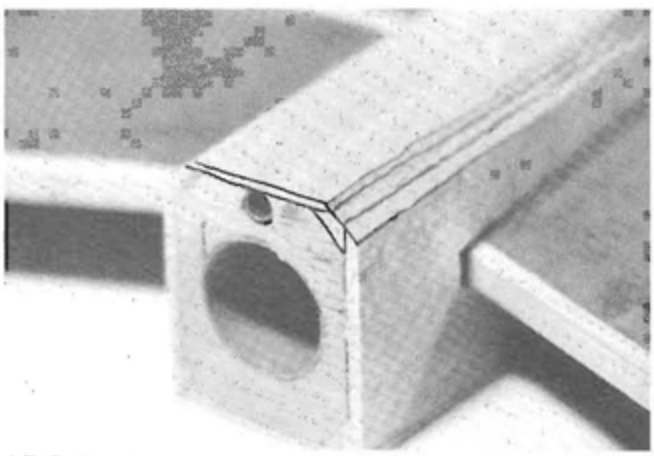
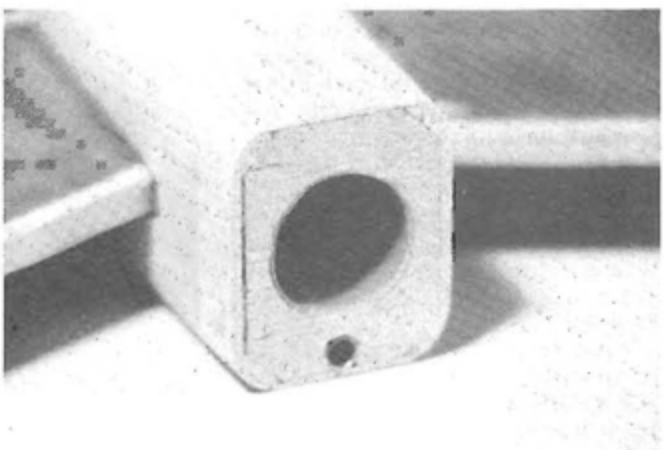
Cover the floor with newspaper, and set out a couple of extra sheets where you can get them easily. Place the lowest foam nest piece on the floor and lay a sheet of waxed paper in it. Now here is where it gets different from covering with other materials. You are going to completely

LEFT: Rocket motor tube glued in place. RIGHT: Launch rod guide tube is added prior to gluing top skin in place.

LEFT: Elevator assembly is built-up prior to installation in fuselage. RIGHT: Elevator control horn is slid into position and glued in place.

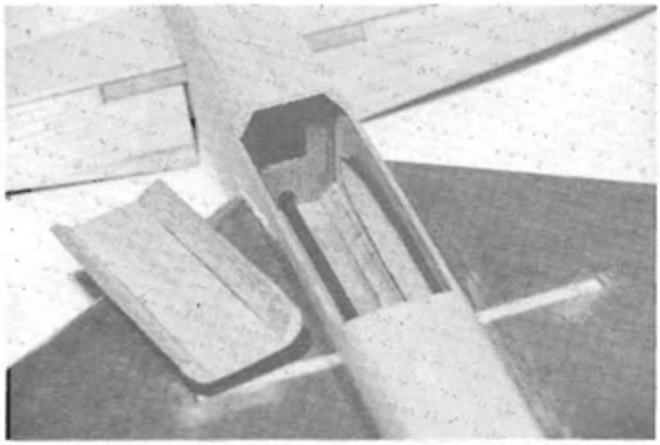
LEFT: Fuselage corners are cut down using a plane, then sanded to shape. RIGHT: Fuselage sanded to final shape. Note launch guide tube below motor tube.

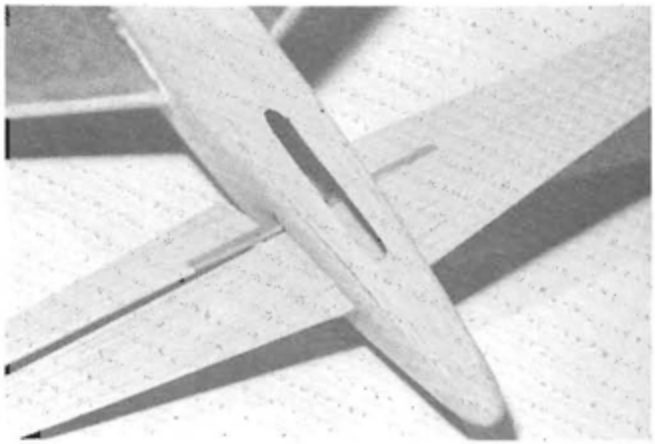
impregnate the covering with epoxy. Lay a skin on newspaper and pour some epoxy on it. Use the plastic cards not only to spread the epoxy around over the entire sheet, but then to scrape as much off as possible. Flip the skin over and then epoxy the second side. This time leave a thin layer of epoxy on for adhesion to the core. Prepare the core by putting a thin layer of epoxy in a half inch band around the perimeter of the wing surface. Finally, place the skin on the core and lay it in the nest.

Repeat this process with the remaining three skins while building up your stack of foam pieces. When your layer cake is complete, place one brick on each end of the stack. Now is the time to do your final alignment of all the five foam pieces and skins. All the corners should match and the whole thing be really square. Add the remaining bricks and come back tomorrow.

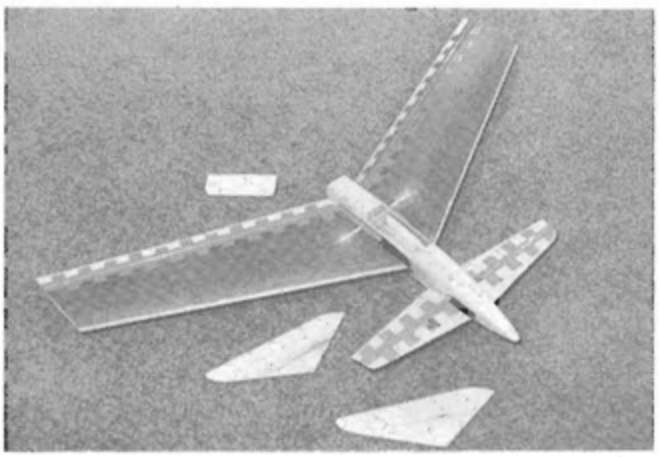
The next day, disassemble the stack, but save the nests. Trim the skins back to the leading and trailing edges and then, using thick UFO, rebond any bits which haven't stuck. Glue on the leading and trailing edge balsa parts, using lots of rubber bands to get even contact over the entire length. Shape the balsa to match the wing contours, but be careful; that covering is pretty thin (very tough, however).

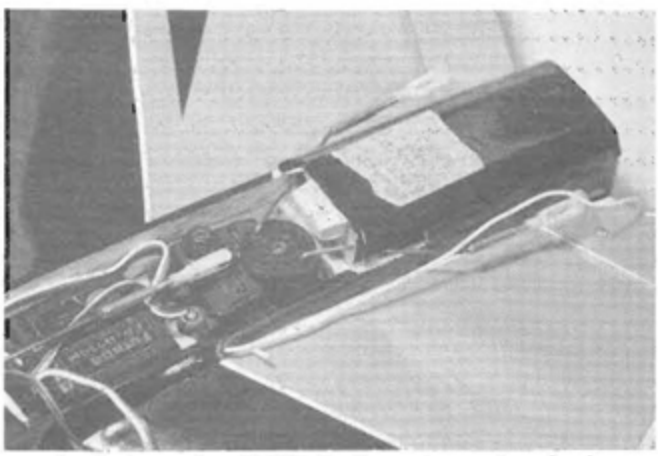
The final step in basic wing construction is to cut in the sweep angle and the spar notch. The cutting has to be done on a band saw, I can't imagine anyone accurate enough to do it by hand. Reassemble the wings into the nests, but use small patches of double stick tape to hold all five layers together. It is crucial that the entire stack stay in alignment while the cuts are being made. Be sure your alignment is as perfect as you can get it. Lay out your angle and slot cuts on the top surface with a good dark pen. Use a square to check that the saw blade angle is exactly perpendicular to the





LEFT: Access hatch is cut from top of fuselage. RIGHT: Hole in bottom is for the launch rod.





LEFT: UltraKote hinges used on all control surfaces. Model is now ready for final covering. RIGHT: Radio equipment location is very accessible. Battery pack is located under the receiver.

baseplate; the calibration markings and screw stops on saws are not accurate enough. Make the cuts in the entire stack at one time, and disassemble the pile. You now have two perfect wings ready to go! After sanding the surface of the skins thoroughly with that 100 grit block to eliminate major roughness, my best set of wings weighed 2¾ ounces. I finish sand the surfaces with increasingly fine grits down to 400.

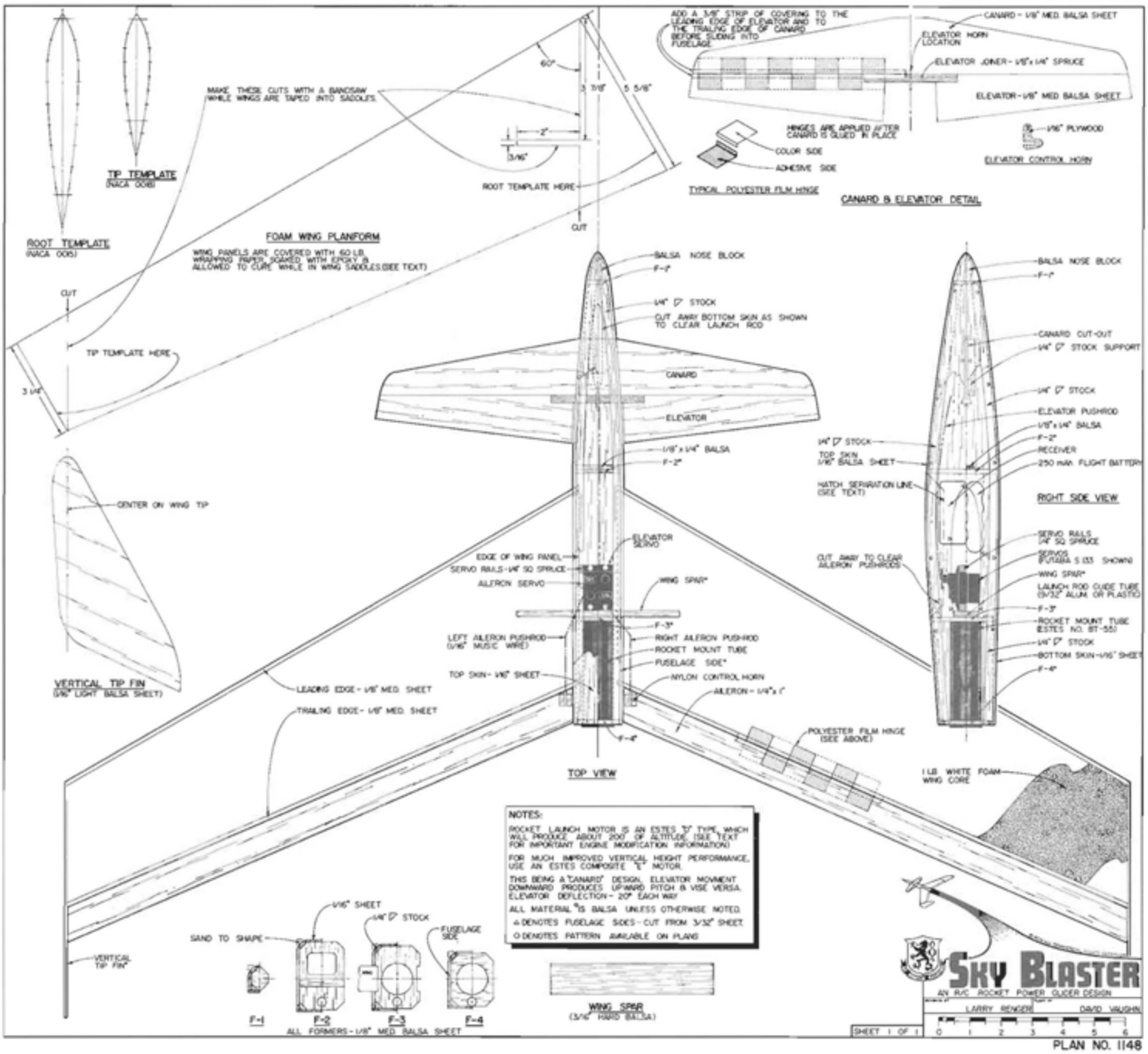
Fuselage:

Wood selection is important for the construction of the SkyBlaster. Since weight is critical and strength is important, you must really search for those exceptional

Z-Bend at elevator control end. This shape allows for easy installation in the horn.

Blast off!

FULL SIZE PLANS AVAILABLE SEE PAGE 213



PLAN NO. 1148

pieces of strong, consistent, light wood. For the canard, elevator, and ailerons, get C-grain wood for maximum twist resistance. The spar should be very hard balsa, but plywood is unnecessary.

Accurate patterns and matching parts from side to side are also of importance. Match the hardness of the triangle stock pieces and cut both fuselage sides from a single piece of wood. Copy the parts you need onto cardboard and then draw the outline onto your wood.

I use double stick tape to hold the fuselage sides together and cut them both out at the same time for a perfect match-up. After they have been cut and sanded to contour, you need to mark the former locations on the inside. The triangle stock is then cut at intervals with a razor saw (this is called kerfing) to allow it to bend and match the outer contours of the fuselage. Be sure you build right and left pieces, not two of the same.

CA glue is used to attach the kerfed triangle stock. Be careful not to let the tension warp the sides into a twist. Hold it flat on the workbench as you work. Be sure that the formers are each custom fit to their locations on the body. Triangle stock is not perfectly consistent in thickness, and nobody's perfect in putting the stuff on.

At last, we get to put some parts together and make something that looks as if it might fly! The spar is now epoxied into the wing slots. Get the alignment right, let it set up and then trim the spar back to the wing surface. There should be no dihedral. If you accidentally get some, make sure that the wingtips are higher than the root when you build the rest of the model.

Next, the third former glued in place and the first fuselage side butted up against it

(but not glued yet). The entire assembly is then rubber banded together. Double check all the alignments, including leveling the canard, and glue the entire assembly with thin UFO glue. Add the nose former, recheck the canard alignment, and glue the former (but not the canard yet) in place, too.

Add the rocket mount tube and the launch rod guide tube. Prepare the elevator for installation. The elevator is slipped through the canard slot and then has the control horn installed. You may find it convenient to put covering film strips on the hinging edges of elevator and canard before inserting and gluing in the canard. I used Neon UltraCote on my models.

Block sand the fuselage top and bottom to give a smooth, flat surface for the top and bottom sheeting. Sheet the fuselage top and bottom with 1/16" C-grain balsa. The grain runs lengthwise, the same as the sides.

Add the nose block at this time and rough carve it to match the top and sides. The fuselage can now be shaped. Carve a 45° bevel into each corner so that about 1/8" of the triangle strip shows. Then sand the contour round. At this point the hatch should be cut and also the hole for the launch rod. For the lightest possible model, you could get away with just a single clear coat of dope, urethane or epoxy on the bare wood, and use clear MonoKote for the hinges. I believe that sealed hinge gaps are crucial. You get them automatically with the overlapped film hinges.

Radio Installation/Finishing:

The remaining construction is straightforward. Add a couple of pieces of spruce for servo mounts, and put the equipment in with the servos in the rear and the battery under the receiver. Bend the end of the elevator linkage so you can attach it to the horn through the slot in the bottom of the fuselage; the wire hooks in with a twisting motion. A locknut on the clevis would be a good bit of safety insurance to resist rotation. Oh yes, just a reminder, on a canard model the elevator works in reverse of a normal one! The trailing edge goes down to make the model go up.

Cover and decorate the model and then, with a loaded engine in place, make sure it balances exactly on the rear edge of the spar. You need to make a spacer to use a standard D engine. The engine should extend about 1/4" behind the fuselage end. Use masking tape (wrapped around the engine) to get a snug fit.

Set the ailerons in the outer or second holes of the control horns, depending on your skill level. Set the ailerons slightly up to give the wing both some reflex and effective wash-out. Make sure that the aileron control throw is slightly more up than down to give you some differential. The elevator should be set at neutral with equal up and down motion of about 20°.

If you only intend to use SkyBlaster for slope flying, there are some changes you can make. First, weight is not as critical, in fact, I would use very light fiberglass on the whole fuselage. You can use balsa or 1/64" ply to skin the wings. Second, you don't need the rocket tube, launch lug, or the slot in the fuselage underside. Third, of course, is that the C.G. is set without an engine, and can be a bit farther aft because there is no shift of the balance point with fuel expenditure.

Flying:

Hand launching for flight trim is important. Be sure that you have a good grip on the model just ahead of the C.G. and throw it straight out with fair speed. The model is in trim if it travels 30' or more and shows response to both aileron and elevator. Adjust the pitch by raising or lowering both ailerons. The elevator should remain set to neutral.

Warning

Until Estes brings out the booster engines for Rocket Gliders, you have to do one small engine task. The engines to use are the D-12-0 booster engines. Each engine needs about 1/8" of epoxy cast into the top to eliminate the back-blast on completion of engine burn. Forget this and you will incinerate your radio.

That first boost is scary but not hairy. Use the checklist to be sure that all is ready, especially setting the elevator trim halfway down. As mentioned earlier, a couple of pieces of masking tape on the trim tab of your transmitter will assure you of getting the boost and glide trims right.

If you have done all the flight trim carefully, the model should boost essentially straight. A gentle touch on the controls is all that is needed under boost, as the speed is over 100 mph! I recommend that you have a helper fire the engine at least the first few times so that you are ready on the sticks. If there is a tendency to pitch up on boost, use more down trim on the climb; pitch down needs less down trim.

Well, that's about it. I hope you will try a Rocket Glider, they are fun, exciting, and really get you some attention.

Preflight Checklist:

- Be sure that all flammable materials are clear of launch stand
- Check that engine is one prepared with epoxy cap
- Install the engine, use tape around engine for snug fit
- Install igniter and tape in place
- Set transmitter elevator trim to 1/2 down position
- Turn on transmitter and receiver
- Check that the safety pin is pulled from the launch controller
- Slide the model onto the launch stand. Be sure it slides freely
- Attach the igniter leads
- Arrange the radio antenna so it is away from the launch stand and igniter cables
- Check that all spectators are clear by 50'
- Check that your airspace is clear
- Pilot informs launch controller he is ready
- Launch controller installs safety pin, verbally verifies continuity and starts countdown from 5
- Now the fun begins! □