PINATA

RCM introduces "Stressed Skin" construction, an all new building technique. Except for the firewall, landing gear support, nose block, cowl cheeks, and necessary balsa supports, this 600 sq. in. Formula II Racer is built entirely from corrugated cardboard for a cost of 30¢!

When plastic R/C models started to come into being, I can remember hearing remarks like, "too heavy," "never fly," "cost too much," etc. Well, they came, and are still here, and more popular than ever. The one point in their favor that keeps them popular is the speed with which a modeler can assemble the plane. They are, however, expensive.

This article introduces a new construction material, which is very INEXPENSIVE, as well as a new construction technique. The material is called, "stressed skin" or, in non-technical language, you will hear it called "corrugated board."

Competition Models, home of the "Starduster" the hottest "free flight" model in the country, (what's free flight?) is pioneering this new material and construction technique for R/C models. I can hear the critics now; "What does a free flight outfit know about designing, building and flying R/C models?" I guess I can't blame you for being skeptical, so read on and judge for yourself. To an old model builder this new material and building technique will not have the appeal of balsa, but it is less expensive and very easy with which to work. There is, however, enough balsa used with the "stressed skin" to keep that old model builder in touch with it. One of my friends commented, after viewing my "stressed skin" ship, "Look at this guy, he has a shop chuck full of balsa and he builds an airplane out of corrugated board!"

The day I developed the idea to try the corrugated board on a model, I hurriedly built a wing out of some regular corrugated box material, since we had received some furniture shipped in it from North Carolina. The wing looked so good I thought I might as well investigate the board to see if better sizes and weights were available. As you can guess I found that there is all types and sizes of corrugated board.

In evaluating the sample wing I decided not to investigate any board over 1/8" thick. At first, my main concern was to try and get the board as thin as possible. Flat cardboard was

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considered but it was found that a regular framework construction was necessary. In fact the flat cardboard had to be treated as a balsa skin. Something should be set straight here. Corrugated board is NOT cardboard. Cardboard is merely a thick piece of paper. Corrugated board is a board constructed with a corrugated paper center with a paper face sheet glued on each side. The investigation of the corrugated board resulted in selecting only two sizes with which to experiment. These two sizes are called "E" flute, which is about 1/16" thick and "B" flute, the board also comes in a number of strengths ranging from 125 lbs./sq. in. to 600 lbs./sq. in.

The "E" flute, being only 1/16" thick, I thought, would be the best bet, but to date it has been disappointing. To begin with, it is a special size and it is not readily available. The particular grade of "E" flute that I used turned out to be slightly heavier than the "B" flute. With weight being one of the prime factors in the completed model I chose to build the first model with the "B" flute board, having a strength of 200 lbs./sq. in. At the same time that I was trying to settle on which board to use, I was experimenting with the board, itself, to see how it could be properly worked. I found one characteristic of the board to be that it has more stiffness across the corrugations than it has parallel with them. Note the wing construction in figure 7 – the flutes run WITH the chord. The board, therefore is stiffer spanwise than it is chordwise.

You will note that all of the flying surfaces have the flutes running fore and aft while the fuselage has them running up and down and across the ship. Note the large arrows on the plan denoting the direction of the flutes. Another interesting fact is that what you build INTO your surfaces in the way of a warp CANNOT be taken out by steaming, doping, etc. There is no twisting the surface once it is complete. So a word of caution: Whatever you use as a building surface, MAKE SURE IT IS FLAT AND STRAIGHT.

On examining the plans and the construction figures you can see that the construction technique is quite simple, and that a model can be built very quickly and inexpensively. The construction figures are provided to show the step-by-step build-up and to familiarize you with the simplicity of this technique of construction. Regular model airplane cement was used throughout except for the top wing skin and the turtle back. Contact cement was used for these units.

FUSELAGE

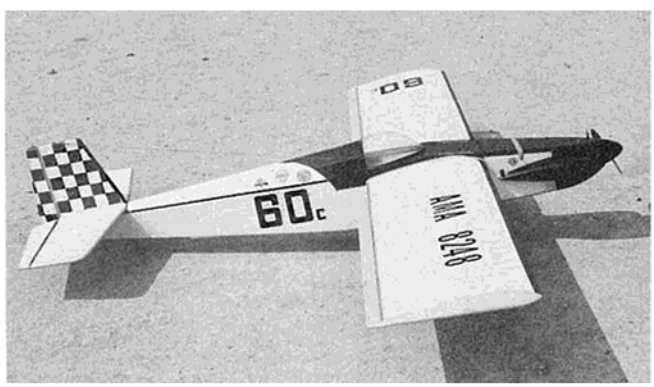
Cut two corrugated skin sides to the shape shown by the heavy outlines on the plans. If you are using a corrugated board with one white side make sure you have two opposite sides. Next, cement the stiffeners in place on each skin and then join the sides. Epoxy the 1/4" ply firewall and the landing gear support in place. Add the 3/32" sheet balsa doublers and then the 1/4" diameter dowels for the landing gear and wing. Add the 1/4" sheet balsa forward of the 1/4 ply landing gear support. Add the 1/8" x 1/4" balsa closeouts for the wing craddle and the fuel tank hatch area. Add the 3/32" bulkhead for the forward end of the turtle back. Cut the turtle back to size as shown by the flat pattern on the plans. Score and shape it as shown in figure 8. Cement the turtle back in place using contact cement. (Note: In fitting the turtle back the edges can be sanded much like balsa.)

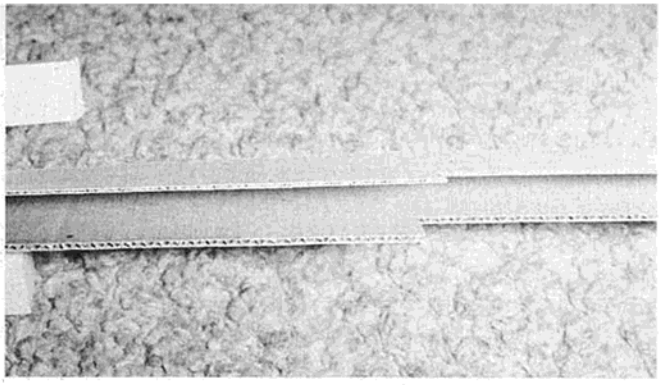
Now add the aft turtle back bulkhead and cut the bottom skin to size. Note that it is cut to allow for the 1/8" sq. balsa fill in on the corners in order to close out the flutes of the corrugated skin. After the bottom skin is cemented in place, add the 1/8" sq. balsa corner closeouts. Add the 1/16" ply face sheets to the firewall and the turtle back bulkheads. Now add the 1/4" sheet balsa fuel tank hatch. Cement 3/16" square balsa to the inside of the hatch to key it in place. Add the 1/8" x 5/8" balsa support at the tail. The "Pinata" was designed to the 600 sq. in. formula II racer rules so a .40 cubic inch engine is used. The photos show a K & B .40 cu. in. front rotor engine radially mounted. The nose block is built up from 1/2" thick balsa blocks with a 1/16" ply face sheet in front. The nose block is designed to be removable so blind nuts are epoxied into the back. (See photo.) In the photo of the engine, note that the screws through the firewall are used to hold the nose block in place.

The right hand cowl cheek is epoxied to the nose block. In order to be able to remove the nose block the left hand cowl cheek is removable and is held in place by one screw.

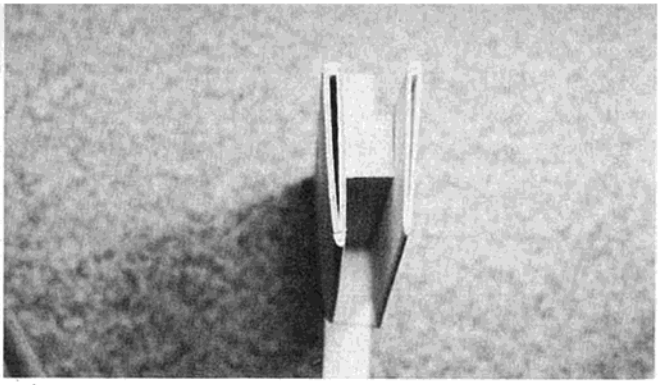
TAIL SURFACE

The tail surfaces require very little explanation as the construction figures 1, 2, 3, and 4 are quite detailed. Cut the skin surfaces to the sizes shown by the heavy outlines on the plans. Using the step-by-step instructions on the

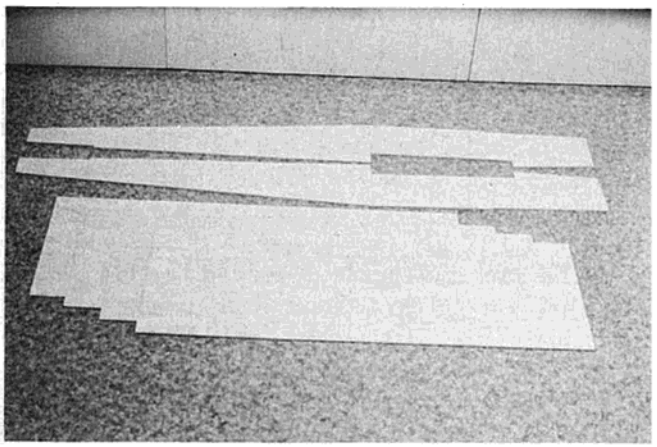




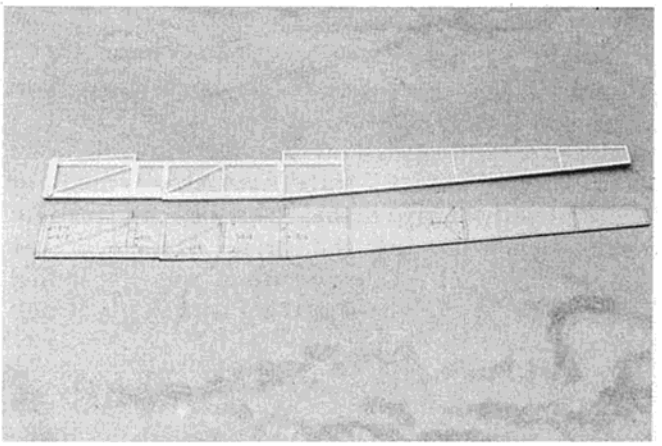
"E" flute (top), and "B" flute (bottom). "E" flute heavier!



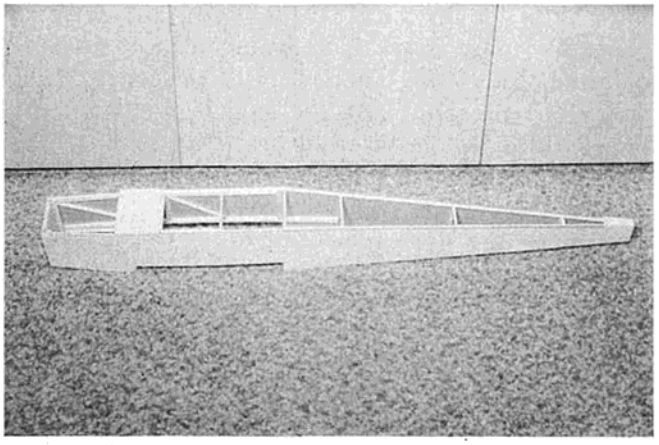
Tips of two stabs using "B" flute (left) and "E" flute (right).



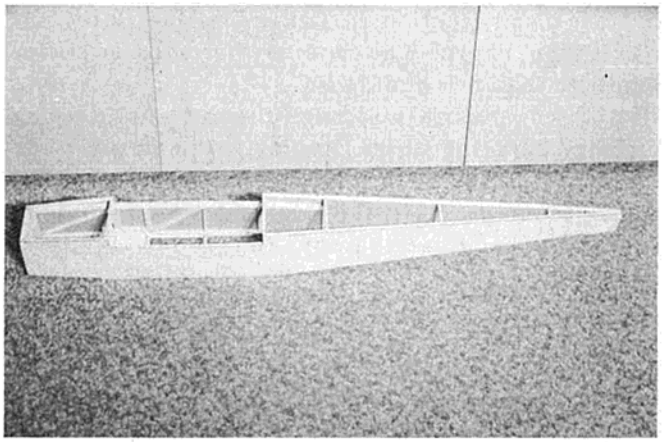
Fuselage sides and wing skins cut out, ready for construction.



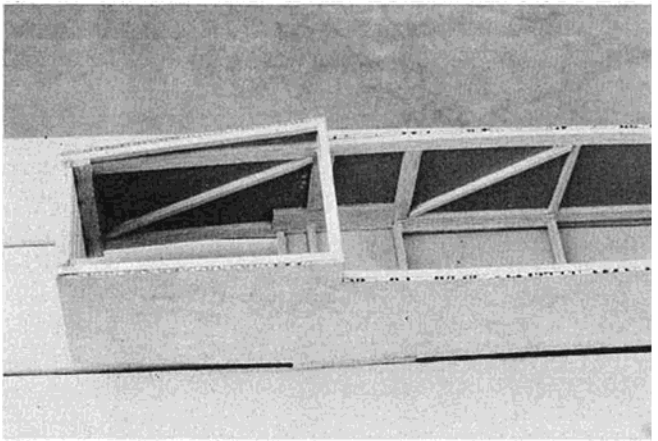
Vertical and horizontal longerons glued in place.



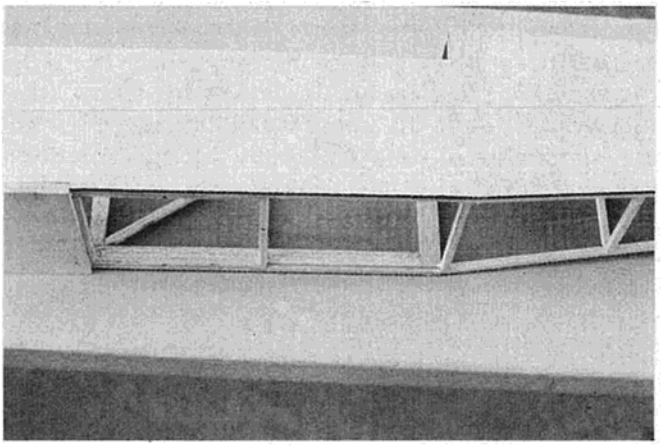
Bottom view of fuselage with sides joined together.



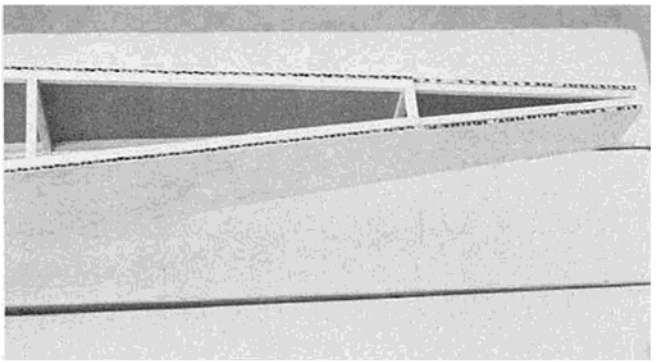
Top view of Pinata fuselage.



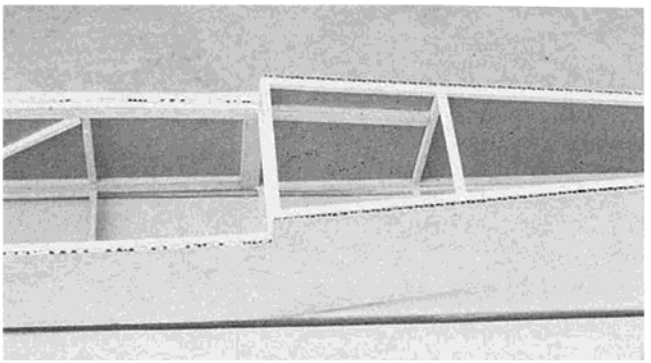
Close-up of fuselage top showing corrugation ends.



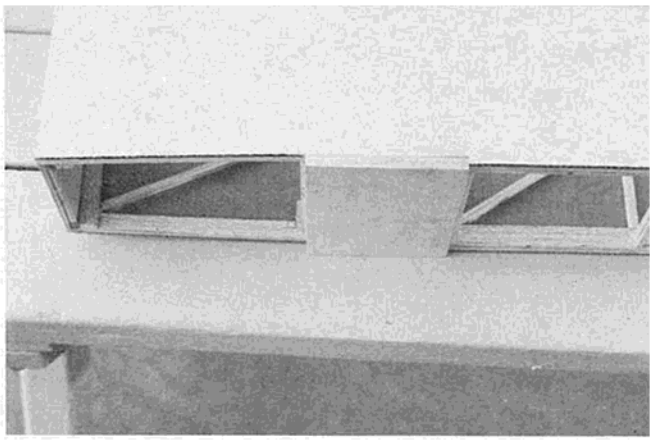
Close-up of fuselage bottom aft of L.G. block.



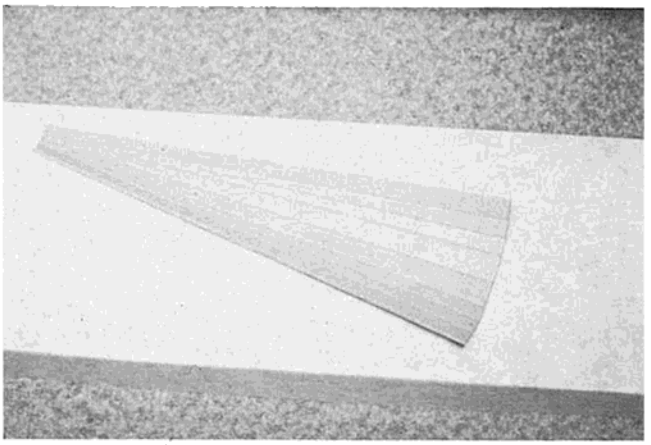
Top view of fuselage at stab position.



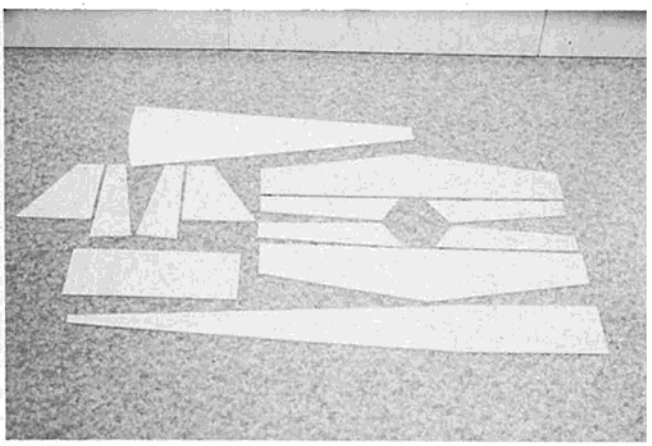
Top view of fuselage at wing location.



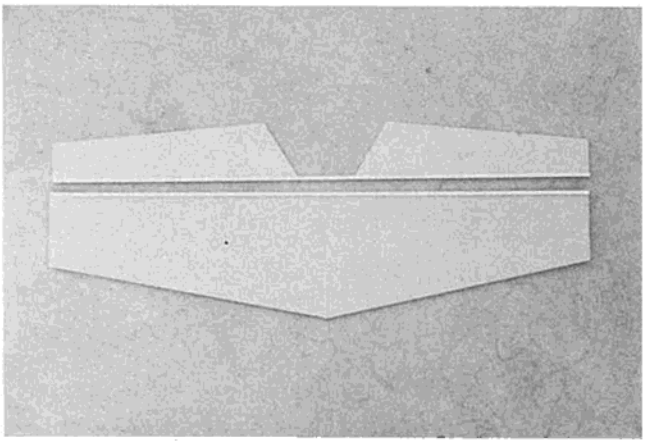
Close-up of bottom of fuselage at L.G. location.



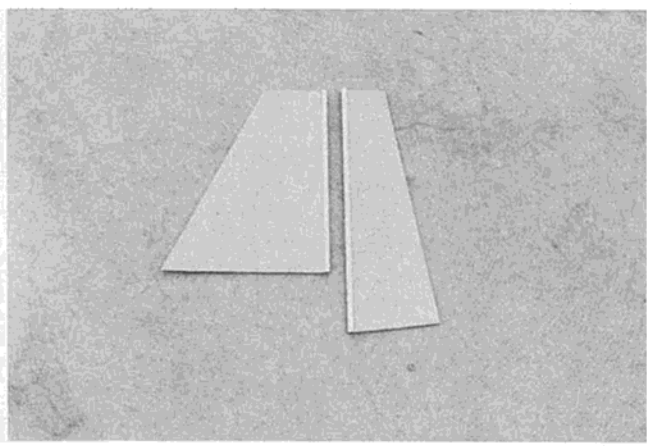
Turtle deck scored and pre-formed, ready for installation.



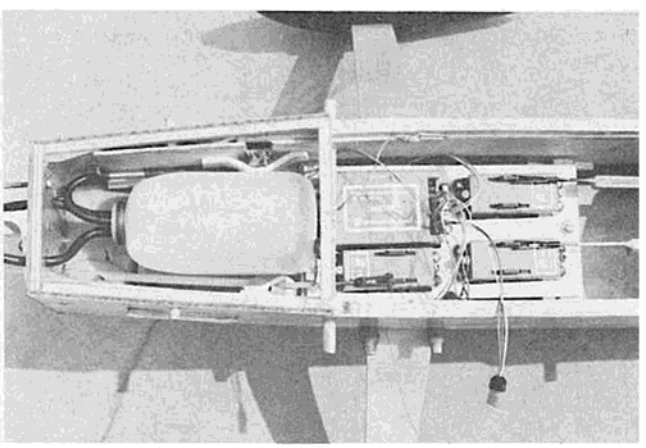
Tail, top and bottom fuselage skins ready for installation.



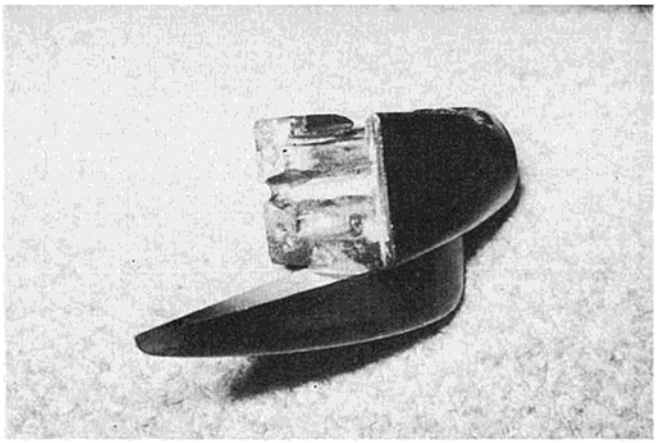
Horizontal stabilizer with wood bracing.



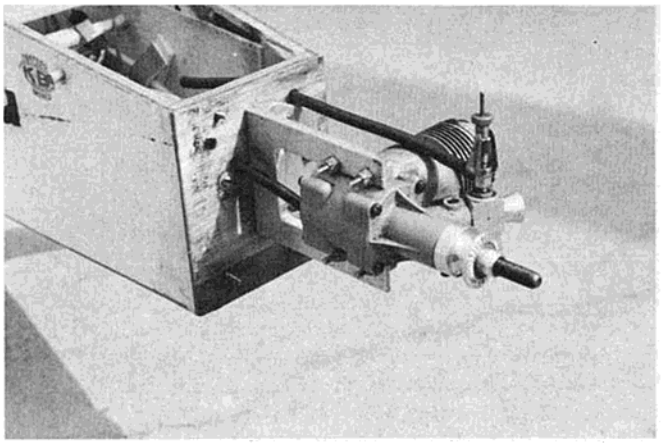
Vertical stabilizer and rudder.



View of tank compartment and radio installation.



Nose block with right cowl cheek in place.



Motor compartment with cowl and cheeks removed.

construction figures build the surfaces as noted. When building the horizontal surfaces build the stabilizer first, then build the elevator. When the tail surfaces are complete they may be cemented to the fuselage. Be sure to add the triangle supports. (See section B-B on the plans.)

Wing:

If there is a difficult part to build on this airplane with this construction method, I guess it could be the wing. Cut the skins to the sizes noted by the heavy outlines on the plans. Note that the top skin is wider than the bottom. Using the step-by-step instructions on construction figures 5, 6 and 7, build the wing as noted. Remember, make sure that your workbench is FLAT. If you end up with a twist in your wing it will be because you BUILT it there. (The wing will NOT warp.) Score the top skin on the inside as shown in figure 6. Pre-bend it until it maintains a slight curve as shown in figure 7. After the lower skin and the upper skin have been doped on the inside, cement the upper skin in place using contact cement. Add the tip blocks and sand the balsa parts to shape. Add the ailerons as shown on the plans.

Wing Saddle and Canopy:

To add the wing saddle, the wing should be set in place on the fuselage. Cement the front and rear balsa bulkheads in place, leaving room for the 1/16" ply face sheets. Add the two sides and the 1/8" sq. supports. The corrugated skin and 1/8" sq. corner fill-in can now be added. Cement the canopy in place and then the 1/16" ply face sheets.

Finish:

The natural finish on the corrugated skin makes it very well suited to take any of the finishes used on model airplanes. It will also take finishes that are not normally used on models such as enamel and varnish. The model in the photos is finished with clear butyrate dope and trimmed with black butyrate dope except for the bottom of the wing. To check out MonoKote to see how it would work in this application, I covered the lower surface of the wing with red super MonoKote. It works fine! The checkers on the tail are regular MonoKote. The white portions of the plane are the natural color of the corrugated skin. As with any model, to prevent oil from soaking into the skin or plywood firewall, make sure that the area around the firewall is well finished.

Radio Gear Installation:

A typical installation is shown in the photos. The rudder and elevator use the conventional balsa pushrods to transmit control. On the throttle control NyRod is used. The three servos and receiver are mounted in a piece of 1/8" plywood cut out to accept them with No. 4-40 blind nuts being used so that the individual components may be removed if necessary. I see now that you can buy a mounting plate that is similar to this. This type of installation also makes it easy to transfer the equipment as a unit from one ship to another. The wing servo installation is a typical pushrod type for strip ailerons. NyRod is used between the servo and the control arms. Servo mounting tape is used to hold the NyRod in place. The battery rests under the fuel tank and is installed on two strips of double sided mounting tape.

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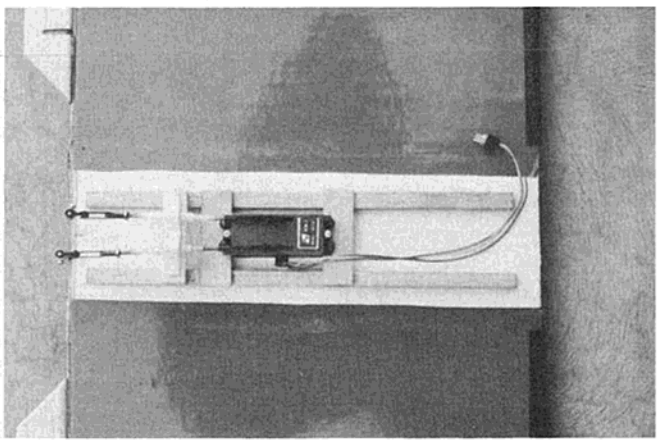
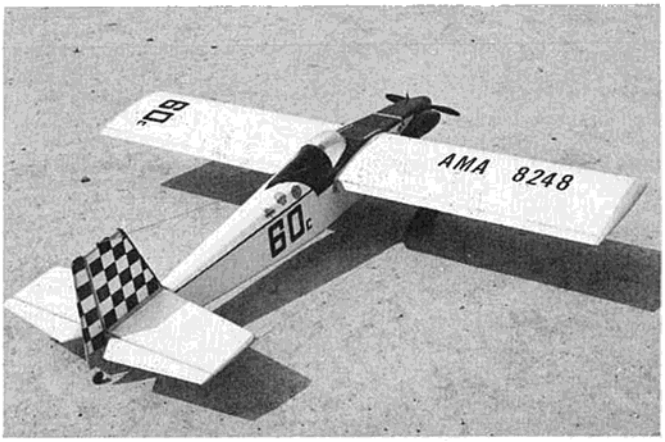
Aileron servo compartment with E.K. servo.



The completed Pinata, ready for racing.



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Flying:

The model is not extrmely fast due to the 600 sq. inches of area with constant thickness airfoil, and the .40 cu. inch engine. It should make a good trainer for pylon racing, on take-off with full power it is necessary to hold a little right rudder to compensate for torque. In the air the Pinata responds faster to the controls than a pattern type model so beware! The landing speed is a bit faster than a pattern ship so make sure that you touch down on the first third of the field. Any flier that can get an R/C up and down (in one piece) by himself should not have any trouble flying the Pinata. The test model in the photos weighed 5½ lbs. complete.

The model in this article deals with the easiest type of a wing to construct, i.e. a flat bottom airfoil, constant chord, constant thickness wing. My experiments have shown that symmetrical sections and tapers are also possible with this construction technique. The idea of "stressed skin construction" is SIMPLE and it WORKS! I'm sure there will be other approaches to its use.

I can just see the wheels turning now!