

PAWN

By PAUL SMITH . . . Developed as a result of the introduction of 1/2A combat at the Nationals, this little foam and wood fighter has all the performance needed to make it a winner at any contest.

• Half-A combat has been around as a local event for many years. I got started in combat with 1/2A's in 1959 at the nearest schoolyard. In 1977, the custom of having 1/2A combat at the Nats as an unofficial event began. To many people's surprise, the event was taken seriously by many of the established combat winners. It has grown in acceptance and this year AMA's contest board has made it a supplemental event.

The Pawn was originally designed and built for the 1980 Nats in Wilmington, Ohio. The name was chosen because I feel that the airframe is only one of many factors in winning a combat event. Also, the typical tough-guy names usually applied to combat models are a little exaggerated for a 1/2A. As in chess, with the proper strategy, the Pawn can defeat a more spectacular opponent. The '80 Nats was the first contest appearance for the Pawn, and my first 1/2A contest in five years. The result was a 2nd place finish with a 5-1 record, including four kills. In addition, the 1/2A practice made a noticeable improvement in my reflexes, and helped me get out of a slump in fast combat.

This is a simple model to build if you are already into foam. Building your first two models in one week should be no problem. If you haven't cut any foam yet, why not start out with the Pawn? It's a fun plane for aerobatics and sport flying in addition to contest combat.

MATERIALS

Foam is bought from a lumber yard in two-inch thick, 2 x 8 foot slabs. The density is about one pound per cubic foot. You won't have much choice in quality from this source, but a fine grain foam is better than coarse grain. Better foam can be obtained from professional plastic suppliers, but you will pay a

premium price and may not be welcome because of the small size of the order. The lumber yard foam has always been adequate for me. Avoid the light blue, genuine Dow Styrofoam. It's twice as strong, expensive, and heavy as the regular white stuff.

White glue or aliphatic resin such as Titebond is used for most foam and wood joints.

Hot Stuff and similar instant glues, with baking powder as filler, are used only on non-foam joints. These glues dissolve foam.

"Hot epoxy" is my term for Hobby-poxy Formula 2 heated with a heat gun to lower the viscosity. You mix a small batch of epoxy in a pot and stir while heating. When it is so hot you can just barely touch it with your fingers, apply it to the model. This method makes the glue penetrate deeper and spread on thinner and lighter.

Balsa: Small amounts of 1/16, 1/8, and 1/4 inch sheet are required. The spar is 1/4 x 1/4.

Plywood: A few scraps of 1/64, 1/16, and 1/8 will do the job.

Hardware: Carl Goldberg 1/2A controls (45¢), Ace RC 1/2A motor mount (\$1.29), .045 piano wire, .018 leadout wire, 2 sheet metal screws (1/2"), and 3/32" brass tubing.

FABRICATION AND SUBASSEMBLY

Cut the fuselage from 1/4 inch balsa, the fuse doubler and elevator reinforcement from 1/64 plywood, and the tail pieces from 1/16 balsa. Glue the doubler and nose blocks to the fuselage with Titebond. When these are dry, sand the joints, making sure the front end is perfectly square. Glue on the 1/8 plywood motor mount and 1/16 bellcrank mount with hot epoxy. Insert a scrap of 1/4-square through the spar hole and wrap rubber bands around the motor mount while drying.

While this dries you can start on the foam cores. The first step is to make all the required templates. Next cut the following blanks from the foam block: 6.75 x 12.25 inches (inboard wing), 6.75 x 11.25 inches (outboard wing), 6.75 x 2 inches (2 required, wingtips).

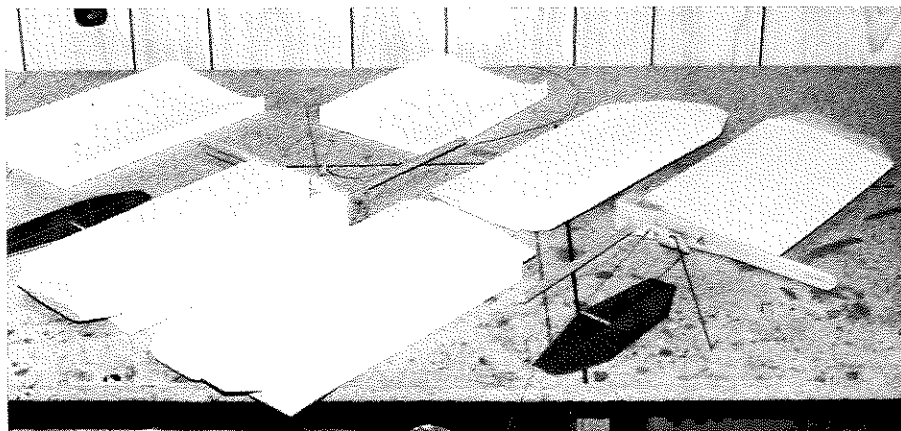
With the drop-wire fixture, pierce a hole through each wing panel on the centerline, 2 inches back from the leading edge.

Attach the core template to the blocks with nails, aligning them on a flat surface. Detach the wire from your cutter and thread it through the hole. Cut toward the trailing edge, then follow the top of the core up to the spar slot. Be careful to have the wire parallel as it enters the slot. Cut the bottom back to the trailing edge and you're done.

Use the same nail holes to attach the airfoil templates. One airfoil template should be labeled "root" and the other "tip". Also, draw an "up" arrow on each tip. By consistently using these markings you can cancel out any variation in the templates. Cut the airfoil surfaces starting from the trailing edge. Be careful not to squeeze the cores as this will distort the airfoil.

Tips are cut with the special fixture shown on the plans. The "tip" airfoil template is used. Cut the top surface first, starting from the trailing edge. Then, without removing the scrap, cut the bottom surface, also starting from

Three Pawns in various stages of assembly. Scrap foam is used for assembly fixture.

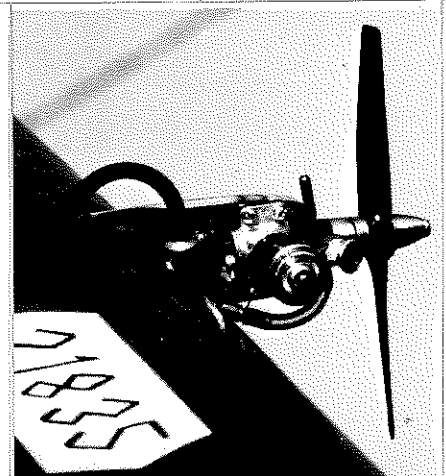


the trailing edge. Glue one tip to the outboard wing with Titebond. The inboard tip is notched out using the two "insert wingtip templates". Save the piece that is cut out, it will be glued back in after the leadouts are installed. Glue the 1/16 balsa insert into the tip and glue the tip to the inboard wing. When installing the tip, assure that the tips are glued to the thin end of the wing core.

While the foam cutter is still handy, make an assembly fixture. The foam blank is 6.75 x 24 x 2 inches. Nail the airfoil templates to the blank with the centerlines 1.5 inches up from the bottom. Cut only the bottom surface of the airfoil. This cradle forms the bottom of the fixture. The top is made from two pieces of scrap from the wing cores.

CONTROL SYSTEM

The Goldberg 1/2A system is used because it is so inexpensive and light, and it does the job. The leadouts are



Classic "little big plane" approach to 1/2A. It works, but not as well as plastic mount and pacifier system.

made from scrap .018 flying line. Lead-out guides are cut from 3/32 brass tubing with an X-acto knife. The pushrod is .045 piano wire. Bend only the bellcrank end now and do the horn end after final assembly. Bolt the bellcrank to the mount with a 2-56 bolt and nut rather than the wood screw supplied.

Be sure the handle you fly the Pawn with has line spacing of about 2 inches. Some very adequate 2 inch handles are supplied with ready-to-fly planes. A crossbar handle can be set at 2 inches or a crossbar can be added to an existing handle. A 4 inch handle as used with the bigger models will make the Pawn completely unstable.

Standard 1/2A lines are .012 x 35 feet from centerline of handle to centerline of the engine.

The Tail Assembly is cut from 1/16 balsa and sanded smooth with the trailing edge of the elevator sharp and all other edges round. The 1/64 plywood reinforcement is Hot-Stuffed in place. Cover the tail with Fascal or Monokote before installation. The hinges are also made of covering material. Be sure to leave the gluing surface uncovered. The hinges are made by the method de-

scribed in the article, "iron-on hinges" in the April 1979 *Model Aviation*.

FINAL ASSEMBLY

When the motor mount is dry, sand the fuselage assembly smooth. The wing spar is only 18 inches long, not a full 24. This is to save weight and cost. Who ever heard of a wing folding 3 inches from the tip anyway? Dry-fit the spar into the outboard wing and notch the wing to fit the fuselage. When the fit is correct, glue it with Titebond and bind the outboard wing to the fuse with a chain of rubber bands.

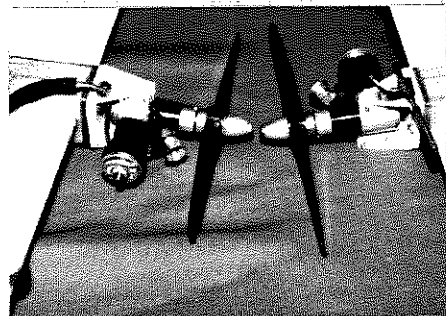
While the outboard wing is drying, cover the rear of the fuselage with Fascal, install the tail, and hook up the pushrod and control horn.

Remove the rubber bands and dry-fit the inboard wing, notching out for the engine brace and pushrod. Make sure the wing fits the "bottom assembly fixture". Glue the inboard on with Titebond, lay the wing on the bottom fixture, stack on the top fixture, and add weights. Press together from the wing-tips to assure a good glue joint.

Pacifier pod — The recommended fuel system for the Pawn is a pacifier. Bladders generally give too much pressure for the TeeDee, even with a fine thread needle valve. Hard tanks don't give a smooth enough run for such a tight-turning plane. The pacifiers used on the Pawn are interchangeable with those used in fast and FAI combat. A fine thread needle valve is not needed.

Cut two pod ends from 1/16 balsa. Use these as templates to cut a dummy pod from foam. Cover one side of each end with Fascal. The tube part of the pod is cut from manila folder or computer card stock. Wrap the tube around the foam pod, glue the seam, and bind around the center with one rubber band. Wrap the tube with two continuous bands of nylon strapping tape, one on each side of the rubber band. Remove the rubber band, push out the foam pod, and glue in the end caps, with the covered side in. Cover the exposed surfaces of the pod and leave the gluing areas uncovered.

Leadout Guides are installed after the wing has been removed from the fixture. Pin them to the balsa insert with wire wickets (two per line) and glue with Hot Stuff and soda. Trim the foam insert to fit and glue in with white glue. While this is drying, you can also glue some little foam fillers in any cracks or bad fits in the model.



Front ends of two Pawns. Either stock Cox needle valve or KirnKraft fine-thread remote unit will work.

Covering: Sand the model smooth with sanding block. Vacuum clean with a soft brush. Apply a continuous wrap of nylon strapping tape around the wing. This is very important to prevent flexing. Flexing breaks the glue joints in foam wings. Apply the AMA numbers and any other trim to the wing before covering (if you plan to use clear covering).

The material should be a low-temperature type such as Solarfilm, Econocote, or GBC laminating film. Use two separate pieces, top and bottom.

Cut the hole for the pod after the wing is covered, glue in the pod with white glue, and (after the glue is thoroughly dry) cover the cracks around the pod.

Mix a small batch of hot epoxy and seal the firewall area and the edge of the covering.

Motor Mount is an ACE RC 1/2A Mount cut down as shown on the plan. This is far better and less work than the conventional beam mounts as used on fast combat jobs. One prototype was built with wood mounts and I definitely recommend the plastic. Install the mount with two wood or sheet metal screws, about a 1/2 inch long. A brass fuel filler tube is also added to the mount. This tube is made from 3/32 brass, annealed with a blow torch and bent to shape. A 1/8 brass tube adapter allows the same pacifiers to be used in the 1/2A as in fast and FAI models. Clear neoprene is used to connect the tube to the engine, thus eliminating the common problem of the fuel line popping off the engine. Finally, the filler tube permits the model to be fueled from the top.

The completed model should weigh 5 ounces, give or take a 1/4 ounce. The balance point is 25% of the chord and slightly outside the centerline. Out-thrust is not required and wing tip weight is a last resort. Remember, the fuel and engine are already outboard and the lines are very light.

Engine department. There are already numerous 1/2A engine articles in print so I'll keep this part brief. Machine work or grinding is not needed to get good performance out of the TeeDee .049. Keep the engine clean and reset the conrod with the KirnKraft tool when it starts acting up. Use at least 30% nitro, more is better. Let it wind up on a 5/3 prop. I recommend a Master Aircrow 6/3 cut down and well balanced. Over-size props don't let the engine put out full power and they cause too much variation in RPM between level flight and maneuvering.

Flying is no different than any other combat job. I have never needed nose or tail weight on the Pawn. Any adjustments have been made at the control horn. If everything works as it should, you might even think you're flying an FAI.

I don't plan to enter the kit business, but if you wish to sample the Pawn without making all the templates and fixtures, I will supply one set of cores. Paul Smith, 11112 Dill Drive, Sterling Hts., MI 48077, (313) 939-1076.