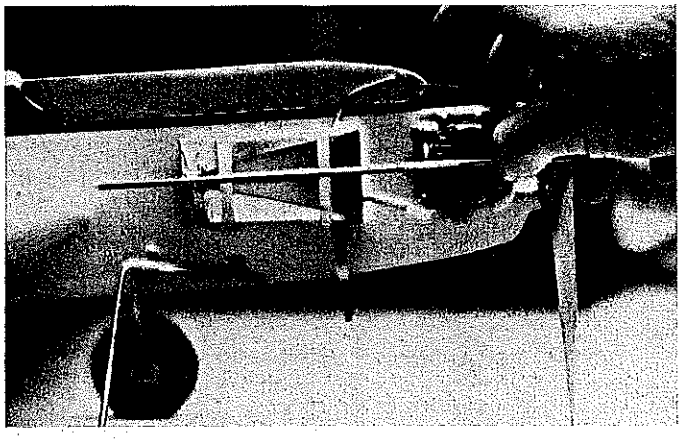
Megas Aetos

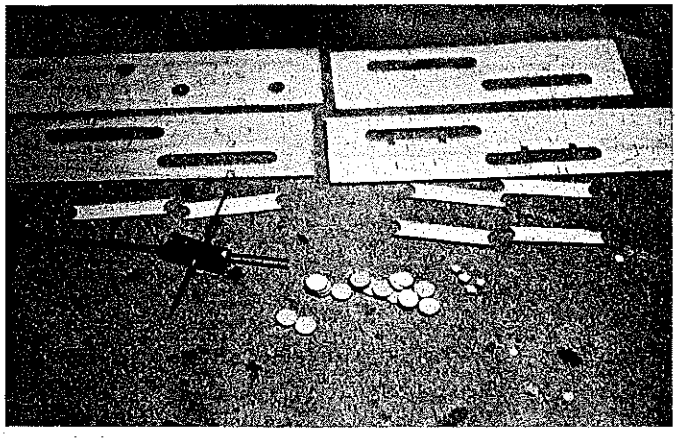
Top Picture. If this plane had a full, built-up fuselage, it certainly would be considered a full-blown Precision Aerobatics design. The profile fuselage builds quickly so that you can have more time for perfecting maneuvers—or just fun flying. Above: Roger Greene (L) and his son, David, show off the featured plane and the earlier Aetos, the latter now age five.

This is a design which can be used as a stepping stone to all-out Precision Aerobatics flying. However, if advanced fun-flying is your thing, it's excellent for that. Recommended engine size for the 54-in.-span ship is .35-.40 cu. in.

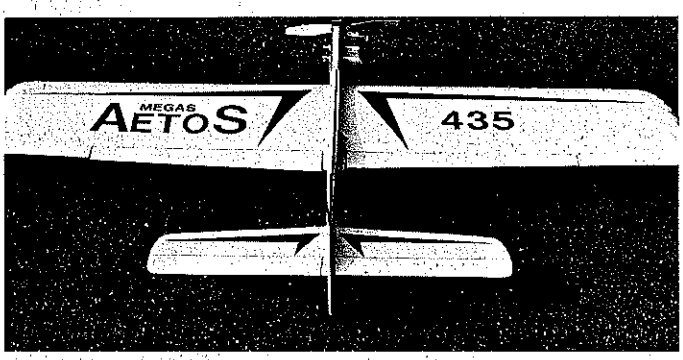
■ Roger S. Greene

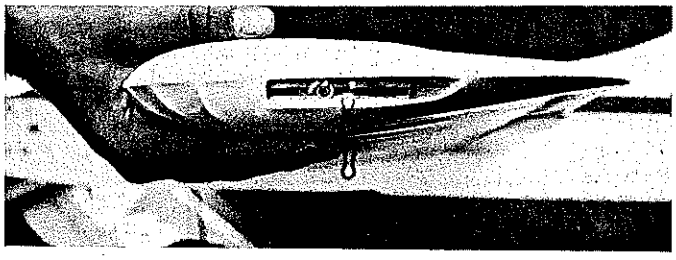
MY ARTICLE for a model named Aetos (a Greek word meaning eagle) for a Fox .25-size engine was printed in the March 1979 *Model Aviation*. This plane was intended to be gap-filler before going to a larger size plane.





Left: If the tank centerline isn't on the engine intake centerline, you won't be able to get the engine to run consistently in the air. A short length of music wire helps in placing the tank correctly. Right: A lipstick cap with 1/16-in. music wire through it, foreground just to the left of center, is sharpened to become a handy punch for making lead-out holes in the wing ribs and such. Device is simple but effective.





Above: If you haven't tried an adjustable lead-out guide before, you don't know what you're missing. With it, you can really fine-tune the amount of line pull. This one is easy to make. Left: Large tail surfaces and high aspect ratio wing (5.5 to 1) show up here.

I have now taken the original proportions and enlarged them to a wingspan of 54 in. to fit a .35- to .40-size engine. I call this new plane the Megas Aetos, meaning large eagle. It is a plane for the novice to get the feel of a large plane without too much expense.

The wing construction is a straightforward C-tube with a web to make it into a D-tube. What I like about the fuselage construction is that the tail builds up light, allowing a larger stabilizer and elevator for smoother control through each maneuver. The stabilizer and elevator could also be built-up, and this would save about an ounce in the overall weight—very important in the rear end.

The Megas Aetos has a torsion bar landing gear setup for bounce-free takeoffs and landings. The controls have a one-to-one ratio, which is the same as used for the flaps and elevator by many of the top Stunt pilots. The wing has a 5.5:1 aspect ratio with an average of 20% flaps for a great turning ability.

The fuel tank is a uniflow wedge type containing 3.75 fluid ounces. The slipstream vent goes directly to the back of the tank next to the engine pickup tube, which is in the wedge. Both are soldered in place. The overflow vent is capped before starting the engine. A Sullivan 4-oz. tank could be used instead of building your own.

Construction. After studying the plans carefully, make patterns out of posterboard. Use carbon paper for tracing the parts. Then cut out the pattern. Fine-sand the pattern edges so you can make a smooth line with a felt-tip or ball-point pen on the wood. Buy your wood carefully to get the proper weight and straightness. The text is arranged in the suggested building sequence.

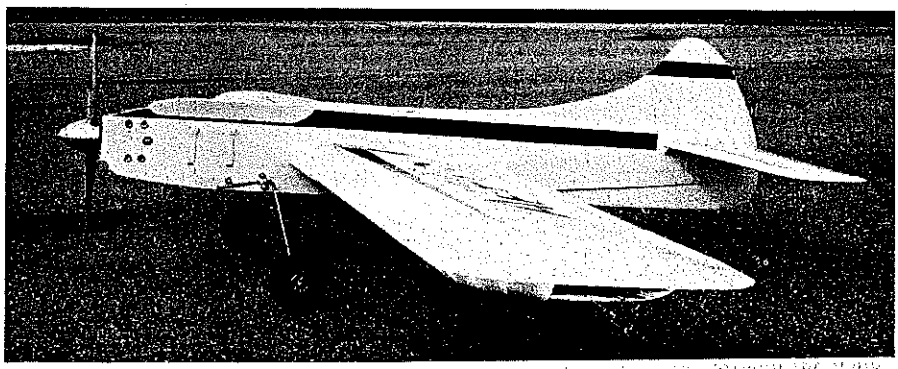
Fuselage. I always assemble the fuselage first so it can be drying while work is being done on the rest of the plane. Begin by cutting out the ⅛ balsa sheet sides and plywood doublers. Remember to put the engine cutout on the outboard side. The ½-in. balsa core can be made out of two layers of ¼" sheet.

Butt-glue the balsa and plywood fuselage sides together. Cut the plywood doubler first; where the doubler meets the balsa side, use the plywood edge as a guide to cut the balsa side for a perfect joint. Remember to keep the top edge of the fuselage straight for alignment. Glue this joint together using masking tape on both sides to pull the joint tight. Cut the engine beams to size.

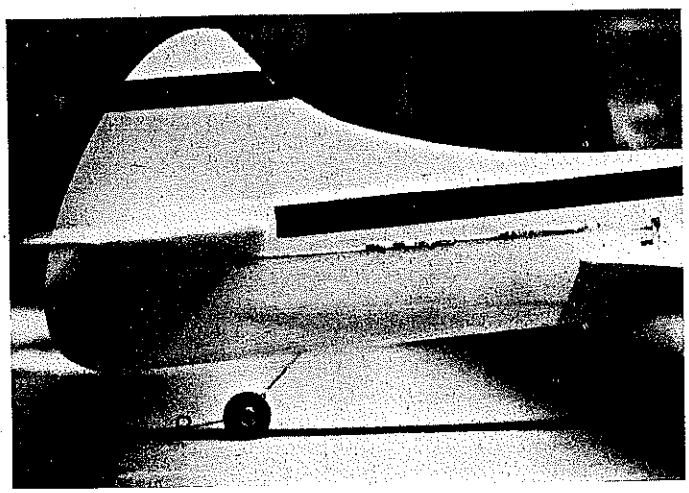
To help with construction of the fuselage I suggest making a vise out of ¼ plywood and eight 8-32 x 2-in. screws with washers and wing nuts. Drill the eight holes (three on the top, three on the bottom, one in the middle of the airfoil, and one where the Fox .35 bottom backplate will stick through the fuselage) of 1/16-in. dia. about ¼-in. away from the fuselage.

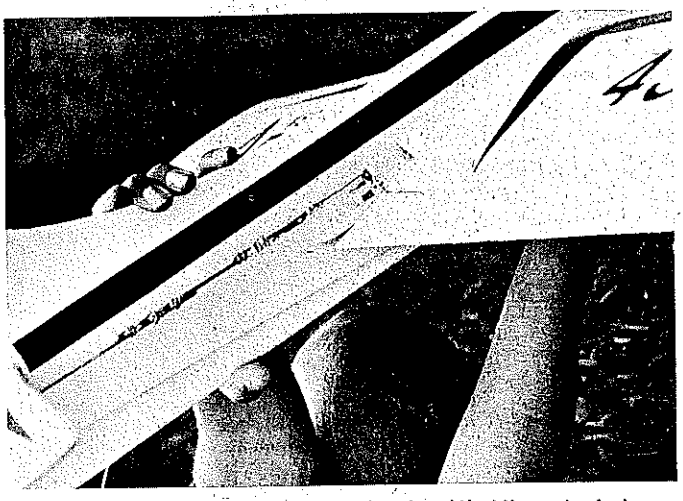
I used Titebond to glue the fuselage. Remove the tape from the fuselage sides just before gluing and then clamping in the vise. Slip the fuselage in, then tighten. Set aside to dry about 24-48 hours. While the fuselage is drying, cut out the wing parts.

Wing. Cut the ribs from sheet balsa of the indicated thickness on the plan. Punch holes for the lead-outs by using a metal lipstick top filed sharp. Drill and solder a piece of 1/16-in. music wire about halfway up the punch for a grip to help twist it. A hole at the top will enable you to push out the wood circles from the homemade

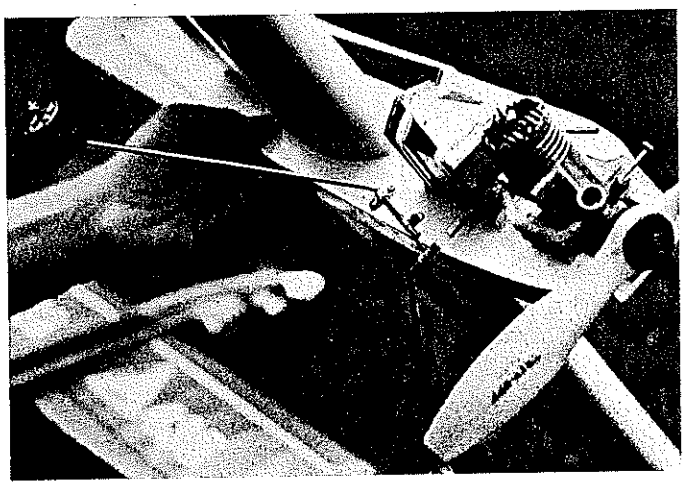


Author's model was covered with medium-grade silkspan and painted all over with Sig Diana Cream, trimmed with Chocolate Brown. Complete finishing steps are in the text.





These photos show you the exterior control linkages for the flaps and elevators. Notice the overlap of the pushrod and that the outer holes of the control horns are used for minimized control sensitivity. Yet the ship will turn sharply when full control is given. The little hook behind the tail wheel is for a "stooge" release—for those times when you want to fly but can't find anyone around to lend a helping hand.



Left: The author's model is powered by a venerable Fox .35—behind which is his homemade fuel tank. A 4-oz. Sullivan tank could be used instead. The shape and mounting of the landing gear provide excellent shock-absorbing qualities. Right: Roger and David get ready to fly.

punch. To avoid cracking the ribs, punch the holes before you cut the ribs out of the balsa sheet. Then fine-sand them to the airfoil outline.

Place a sheet of wax paper over the wing plan, and splice the trailing edge sheeting over the plan. Glue the ribs in place on the trailing edge sheeting. Don't forget to glue the two ¼ sq. bellcrank supports at the same time the center five ribs are glued in place. Also, glue in the bellcrank platform. Glue the top ¼ sq. spar and top trailing edge planking at this time as well. While the wing is drying, start work on the solid surfaces: flaps, rudder, stabilizer, and elevator.

The stabilizer and elevator are cut from 1/16 sheet balsa. If you can't find this size, ¼ in. will do. (I like to use 1/16 sheet because it's a little stronger for the length.) Draw a line on the edge side of each surface in the center. Use this line as a guide to sand and for hinging. Sand the leading edge of the flaps and elevator into a wedge with 30° on each leg. Shape the airfoil as per the plan, being careful to make the leading edge of the stabilizer blunt.

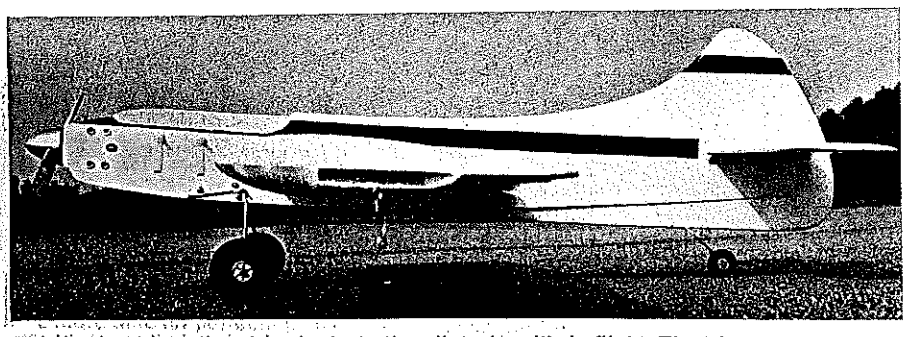
Use a Sig wire-type control horn, or make your own. I used three hinges per side on the flaps and two per side on the elevator. Glue the control horns with epoxy for strength. Epoxy the hinges in the stabilizer and elevator and the horn bearing to the stabilizer.

Cut and sand the flaps to the proper outline. Use a Sig offset horn. Epoxy in place. Remember not to sand the flap tips where they are glued to the wing trailing edge. (However, do not glue the flaps or flap tips to the wing just yet. The wing and fuselage must be glued first.)

Wing again, briefly. Remove the pins, and flip the wing over a line with the plan and secure with pins. Glue on the bottom spar (which is now on the top) and leading edge triangle. Let this dry thoroughly.

Fuselage. This should have had time to dry by now, a day or two at least. Bend the tail wheel gear out of 1/16-in. music wire. Cut out its bulkhead and bind with two wraps of copper wire around the notches; glue in the fuselage at the proper angle. Also glue in both top and bottom ¼-in. balsa blocks to the fuselage; pin and let dry.

Rudder. Cut from ¼-in. sheet with the



This is about how the plane looks to the pilot when it's in flight. The trim and the bottom of the under rudder provide a visual reference for horizontal flight. Photos by the author.

grain direction as shown on the plan. Sand in the airfoil; be sure that the airfoil curve is on the inboard side.

Wing. Connect the lead-out wires to the bellcrank, and thread them through the inboard-side ribs (left side for counterclockwise flying, right side for clockwise flying—as viewed from the rear). Bend the pushrod from 3/32-in. music wire, and solder a washer on top and one on the bottom, sandwiching the bellcrank. A wrap or two of copper wire around where the solder goes help to make a good joint. Have the pushrod come down from the top high enough so the crank's arms do not hit it. Secure the bellcrank, and wrap copper wire in the threads above the nut before soldering it.

Add the wing tips and also the adjustable lead-out guide. Don't be afraid to use an adjustable guide even if you haven't before. This one is simple to make. It uses 1/8 plywood for the slide housing and 1/4 plywood for the slider, plus a 4-40 x 1/2-in. screw and a T-nut. Add the tip ribs next and weight in the outboard wing tip. For the latter, I use 9 to 10 in. of 1/8-in. rosin core solder, which makes about 3/4 oz.

Bend the lead-out wires with the bellcrank in neutral position. Be sure to bend the ends the same length so that the neutral position can be found when the pushrods are soldered.

The leading edge planking is next. Glue it first to the leading edge triangle. If you use 36-in. wood, have the splice on the center rib. Make sure the planking edge is straight when you buy it. If it is not, you will be building-in a warp. When the glue is dry, moisten the outside of the planking only, and bend it to the spar; pin it carefully (a sponge should be used to "paint" on the water).

Do not finish gluing the planking just yet. Wait till the water has evaporated and the wood is dry. A hair dryer or heat gun can be used to speed the process. The reason we go through this step is so the leading edge planking will not be fighting the rest of the structure to get straight. It's just going to stay where you have formed it. Unpin the planking, and use a glue gun to run a bead of glue over each rib and spar. Pin and align to keep out warps.

Landing gear. Bend out of 1/8-in. music wire, and bolt it to the fuselage using two Sig nylon gear clips and two tin straps bent around the 1/4-in. music wire. If you can't find the gear clips, make them out of strips cut from a tin can.

The forward bend on the landing gear helps to absorb that first contact with the ground to make the landings smoother. You'll want to try for a transition from the glide to ground roll in one continuous motion.

Wing, last time. When the leading edge gluing of the planking is dry, a web can be made out of scrap 1/16 balsa sheet with the grain vertical; glue the web between the spars. This will add strength and help keep the wing in alignment.

Make marks on the leading edge and the trailing edge planking 1/8 in. on each side of the center rib. This will be the thickness of the fuselage (3/4 in.) and will help locate the place where the fuselage will go when the center planking is put on. Next, plank the center ribs with 1/16 sheet.

When the fuselage and the wing glue is dry, the time has come to put these units together. Slip the flaps through the wing

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CL Racing/Ballard

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Line entanglements. I have received several letters concerning problems involved by pilots entering and exiting the pilot circle—and most especially during takeoffs. I am enclosing a picture of Vic Garner of California entering the pilot circle at an angle to avoid a collision or line entanglement with the other pilot, who is already walking the center circle area. It is imperative that the pilot who has center circle position keep his hand high to avoid hanging his lines on the pilot who is entering the circle, especially if the pilot who enters is of tall stature. In several cases, I have seen pilots enter the circle directly after taking off and either have a collision with the other pilot or a line entanglement which causes one or more aircraft to crash.

During a recent contest in St. Louis, I observed the Sig Racing team's pit man with his left leg extended back to prevent the aircraft's wing hitting it on takeoff. On many occasions, I have seen pit men kneel down on both knees and, as the aircraft is released, the wing brushes the pitman's pant leg or knee, causing the aircraft to torque into the inside of the circle or chip the ends off the prop. This is especially true of the longer-winged Rat Racers and Scale Racers which have a 22- to 24-inch wing. Also, by pitting with the left leg extended, it allows the pitman to follow through with the hand holding the aircraft to guide it smoothly off the surface.

How about a .21-size Rat racer? I have had several calls from individuals who are building the smaller, .21-size Rats. There are a couple of modelers in Texas, California and Chicago who are building these to try out in the spring, and I will keep you readers informed as to their performance and handling characteristics. As always, your comments are solicited and appreciated.

John C. Ballard, 10102 Kimblewick Dr., Louisville, KY 40223.

Megas Aetos/Greene

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slot first, then the wing. Use a triangle to get wing and fuselage square with one another. This angle should be 90° at the wing leading edge. Also, the fuselage should be at 90° with the workbench (elevate the wing tips an equal distance from the surface). Have the fuselage just touching the workbench.

I used epoxy to glue the wing to the fuselage. When dry, drill a ¼-in. hole into the fuselage from the bottom through the wing near the leading edge as shown on the plan, and glue in a dowel. This will help keep them together through the years.

Flaps. Epoxy the three hinges on the inboard flap first, followed by three hinges on the outboard wing trailing edge. When dry, epoxy the other end of the hinges into the flap and wing. I found it best to start at the center and work to each tip. Do all the second-stage hinge epoxying at one time, remembering to push each hinge in as far as it will go. Leave only a very small gap, the smaller the better. Next, epoxy the horn bearing to the trailing edge of the wing.

Tail surfaces. Epoxy the stabilizer and elevator in the fuselage, being careful to have the unit aligned perfectly. Eyeball the stabilizer from the front by having the bottom of the stabilizer appear to just "sit" on the top of the wing. Also, measure the distance from the hinge of the stabilizer tip straight forward to the hinge of the flap. These should be the same on each side; if they are not, the plane will yaw each time control is given. Get the alignment perfect before the epoxy dries. Reinforce the stabilizer mounting with ¼-in. triangle scrap under each side of the fuselage. Glue the rudder in place, including the lower portion. (The lower portion gives a straight line for reference during the maneuvers.)

Controls. I start the hookup with the bellcrank and stabilizer in neutral. The pushrod from the stabilizer and bellcrank will overlap from one to two inches. Wrap this overlap with copper wire—not all in one wrap, but in small two to three wraps spaced about ¼ in. apart. Then solder. Many small wraps will be stronger than one long one. Next, solder the flap pushrod to the main control surfaces, connecting it in the same way.

I use the one-to-one hookup on the control surfaces, and the airplane responds very quickly. The pushrods should go to the holes farthest from the control surface. I like to use the hole closest to the pivot point on the bellcrank. This setup makes the control response very slow. However, the choice is yours.

Fuel tank. I like to build my own; however, a 3½- to 4-oz. Sullivan slant tank (or similar) will work just fine. Whatever tank you choose, make sure the center of the tank is on the center of the engine as you look at it from the outboard tip. A good way to check this is to take the glow plug out, and place a piece of ⅛-in. music wire across the cooling fins toward the leading edge of the wing and over the tank; the tank pickup should be on this centerline.

My tank is shown on the plan. Use 4 x 10-in. tin stock and ⅛-in. brass tubing. Use only rosin-core solder. The fuselage vise can be of help in bending the tank. I used a light-duty soldering gun, but a heavy-duty one should do a better job.

Finish. Fine-sand your model with 400-grit sandpaper on a block about 2½ x 4 in. (Using such a block will produce an even surface.) Brush on three coats of clear dope; sand with 400-grit sandpaper until smooth.

Cover the wings with medium-grade silkspan. Brush on another three coats of clear over the silkspan, and lightly sand with 400-grit wet-or-dry sandpaper. Just smooth the rough spots. Brush on one coat of sanding sealer over the entire plane. (The sealer can be made by putting about eight tablespoons of talcum powder per quart of clear—and some thinner to keep it from getting too thick. If you are using a light base color, some of it could be added to the sealer as well; this will help the base coat cover faster.) Sand the sealer with 400-grit paper. If the wood grain still can be seen, another coat of sealer should cover it. When the wood grain is covered, apply a coat of clear over the sealer.

Now, it's time for the color. For the base color, I used Sig Diana Cream. Chocolate Brown was used for the trim, letters, and numbers. When the color is dry dilute some clear at least 50% with thinner, and with a 1-in. or wider brush, single-stroke one coat. (If you brush in one place more than once, the color will come up.) It's good to wait 24 to 48 hours between the coats of color and the clear paint and a similar amount of time before you fly your Megas Aetos so the thinners in the paint can dry.

Flying. This model flies smoothly, and it can do the AMA Stunt pattern. It should provide the learner with a good base to get into aerobatics. The control surfaces move a maximum of 30 degress on either side of neutral so that the possibility of over-control is kept to a minimum. It is very stable because the stabilizer area is much larger than the elevator area. However, the Megas Aetos will turn very sharply when given full control.

I am sure that your Megas Aetos will give you as much enjoyment as mine has given me. Mine weighs 42 oz. Yours could be made to weigh less by using an iron-on covering and lighter wood.

Happy flying.

FF Duration/Meuser

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clarified to prohibit such models.

Walt Erbach pushed the record up to beyond what the Aeronuts had done, and Roy White came off with a couple of nice records, too. A couple of years ago, David Erbach ran an international postal contest for Ornithopters. To everyone's surprise, the Japanese came through to take home most of the marbles, and a lad from Australia was not far behind. The U.S. was left in the dust! Somewhere in the middle of all this, a little over a year ago, Pat Deshaye created the OMS out of thin air, established annual dues of zero, and started the publication of *Flapper Facts*.

Then, out of the woodwork came Al Rohrbaugh—he has been pecking away at Ornithopters for some time—who pushed the high-ceiling record to over 10 minutes! And, one of OMS's members, feller by the name of Paul MacCready, was awarded a contract by the Smithsonian Institution to study the feasibility of building an electric-powered, radio-controlled Ornithopter—a replica of a prehistoric flying beast—to fly up and down the Mall; he figured it was indeed feasible and is now in the process of proving it.

As membership in the OMS increased, it became more than Deshaye could handle alone, and out of his own pocket. And so, the organization got organized. Officers? ...we have officers! President (Frank Kieser), vice-president (Walt Erbach), secretary and treasurer (Shirley and Roy White). Pat Deshaye remains editor of *Flapper Facts*. Goals?...we have goals! Advancement and communication of the technology; encouragement of competition and fun flying; service as focal point for restructuring of competition rules; documentation of Ornithopter history; establishment as a recognized AMA special-interest group.

Dues?...we have dues! Any organization must have dues in order to survive ($7, coin of the realm, per annum, which includes a subscription to *Flapper Facts* and entry fee for the 1985 postal contest). Send it to Shirley White, Rt. 1, Box 241, Catawissa, MO 63015. Members?...we have more than a few, but less than a lot. How about you?

Fiftieth anniversary Chicago Aeronuts banquet: All interested parties may attend. April 20, 1985 at the Midway Motor Lodge, Elk Grove Village, IL. Cost, $20, full refunds up to April 13. Choice of prime rib or broiled sole. Rooms available at the Lodge, which has limo service to O'Hare, doubles are about $50 per night. Send reservation request, with check, or request for details to George Gordey, 2901 Prairie, Brookfield, IL 60513.

Come see the guys you read about in the magazines and Zaic *Yearbooks* of the Thirties, live! This event should be the model aviation reunion of the century (especially if all the *smart* Aeronuts, now living in California, attend. Right Carl, Pete, Ed, Walt, Teen, ...?).

Out-of-print NFFS Sympo reports. According to a recent survey, there are only three kinds of people in the entire world, namely: a) Those who would like to buy out-of-print Sympos, but can't find a seller, b) Those who have extra out-of-print Sympos, but can't find a buyer, and c) others. Well, now there is a sneaky scheme a'brewing whereby "a" can get together with "b," and vice versa. (The ones in "c" will just have to struggle on