If you want to make the transition from high to low wing aircraft; or if you want an all-around, medium-sized sport model for .29 to .35 engines, then The Graduate is for you.

PHOTOS & TEXT BY JOEL CIMMINO

the graduate

Have you been flying high wing planes? Do you want to fly low wing planes but don't want a big .60? Did you say you want to use the .29 you have on your high wing plane, or have sitting around, because you can't find a good flying ship for it? If your answer is 'yes', then maybe the Graduate is the answer for you.

The Graduate was designed because I wanted a ship that was inexpensive to build, small but not TOO small, could use one of my two Enya .29's, and most of all would be a good Sunday flyer.

I started by looking through my back issues of RCM, and with the formulas I found, I came up with an intermediate size advanced trainer for a .29. After more figuring I saw that the same design with a .35 would become a hot Sunday flyer. How would it work out in the air? I had to find out! With all the calculations completed I now had to make it look like a semi-scale airplane from 20 feet away. I think I suceeded at this but how would it fly? I started construction the day after I finished the drawing. I found it easy to build and not too expensive. So far so good.

The day finally arrived. It was cold and windy but good enough to run the engine with the new carburetor. We went out to the field (Pennsylvania Avenue Radio Control Society of Brooklyn, N.Y.), and fired up the engine. And experienced our first problem - an engine that just wouldn't run properly. So it was back to the work shop to change the engine. How about the new Enya .35, would it fit the same mounting holes? There was one way to find out, and that was to try it. It fits but the shaft is 3/16 inch longer. Back to the field. The Enya started up with a couple of flips. The wind was blowing too hard and it was still cold, so tests were limited to taxiing. In order to find out if it would fly I would have to wait one more week.

Believe me when I say that the week couldn't pass fast enough for me! The big day proved to be not too windy and not too cold. Once at the field, I fired up the engine. With second thoughts I felt that I might not be able to handle this ship. After taxiing around, waiting for my friend to arrive and assist with the first flights, I realized it was getting late and I had to find out if it would fly! The wind was getting a little stronger and I couldn't wait any longer. I gave it high throttle and held my breath. After a thirty foot run it was airborne, climbing and banking to the left. Down and right trim was put in and 'There she goes.' It FLIES!

After a few 360's around the field I knew I had a ship I would enjoy flying. It was a little fast with the .35 in the nose but I still felt comfortable flying it. Well it was up there, and I had to get it down. The wind was much stronger now so I knew I had to make a short approach. Before I could line up with the runway the motor quit and I was committed. Finally, it was down for a three point landing. I was surprised at the control I had

without power and also at my own good fortune. I had successfully flown my own design without a mishap in spite of my rubber knees!

So that's the Graduate --- a ship that has good control at all speeds, will take a .29 for intermediate training, a .35 for advanced training, is still on the small side and has very good wind penetration. I think it's good looking too.

Before I go into the construction details, I would like to point out some of the features that you may dislike. First, is the inverted engine. I did this to give the ship clean lines. If you experience difficulty in starting the engine in this position, then put the ship on it's left wing tip and then start the engine. That is why I used plywood wing tip plates. Next is the fiberglass cowl. This also is to provide clean lines. I will go into construction of the cowl and show you how easy it is to make later. The last thing is the use of so much plywood in the fuselage. I felt that the 1/16" ply doubler is as light and as strong as ¼" balsa therefore it allowed me to make a slim fuselage with the added strength of the thick doublers. It also provides a plywood box around the equipment.

Fuselage: Cut out full size sides from 3/32" x 3" x 36" stock. Cut 1/16" ply doublers and glue together with epoxy or Tite-Bond.If you use Tite-Bond clamp the two sides between two pieces of 3/4" plywood and let it stand for about 2 hours, (Tite-Bond is as strong as epoxy when used this way.) Use wax paper between the sides and the 3/4" ply. At the same time you can cut all the bulkheads, F1 through F8, and the 1/8" x 9" x 3" ply servo tray. After the sides have dried, glue in F3, F4, and the servo tray, using Tite-Bond. This will align both sides to each other and also keep both sides square, (that is if you cut the servo tray square!) Next glue in F2 and the motor mounts. Make sure the motor mounts line up with the top of the sides. You will have to pull the sides together a bit. Install the ¼" square longerons and tail post. Pull the tail together making sure to provide room for the hardwood rudder post. After the glue has dried add the remainder of the bulkheads, elevator saddle, and F1. Glue in the bottom block and top stringers. Plank the top of the nose and add the bottom sheeting. The fuselage is now complete except for the hardwood block for the wing hold down. The hold down block is cut to size and then drilled and tapped to ¼-20. Epoxy the block in place. Sand the body to shape and give it two coats of dope. Mix up about 1 ounce of Hobbypoxy II and brush it in the motor compartment and tank compartment and both sides of F2. If you warm the epoxy it will thin out and be easier to work with. Let's stop here and talk about the fiberglass cowl. Most hobbyists shy away from making anything out of fiberglass because they think it's hard to do. It's easier than you think. This is how I do it: Get some styrofoam from a buddy who has just finished a foam wing. A piece about 3" x 4" x 3" will do. Cut it to fit between F1 and F2. Sand the foam to shape on the body conforming to the contour of the nose. Remove the foam and glue 1/8 sheet balsa to the top and back. This will strengthen the square edges which have a tendency to round out. Glue a ¼" dowel in the back as a hold down post. The foam is now given a coat of Tite-Bond and left to dry. When dry, the Tite-Bond will become hard and resist dents and digs. Cover the form with your wife's pastic wrap, and tape it on the top and back. In order to get most of the wrinkles out you must use your little wife's hair dryer too. Heat the plastic wrap until it shrinks. Don't get it too hot or the foam will melt. Cover with **three** layers of Sig light-weight glass cloth. Mix about 1 oz. of Hobby-Poxy II and spread it over the glass. Get the hair dryer again and heat the epoxy. It will thin out and saturate

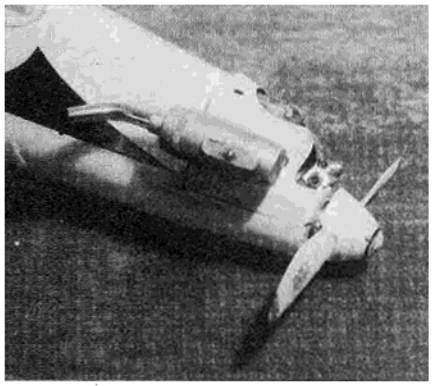
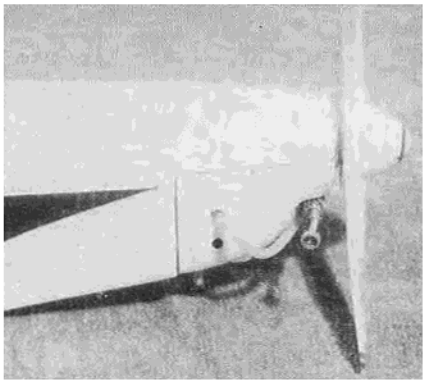
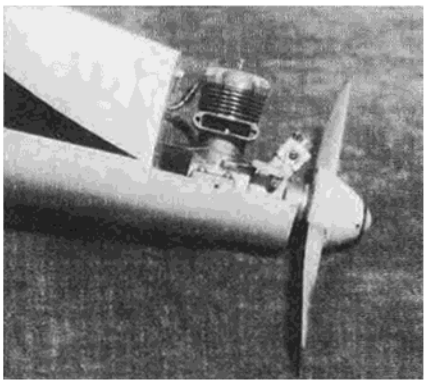


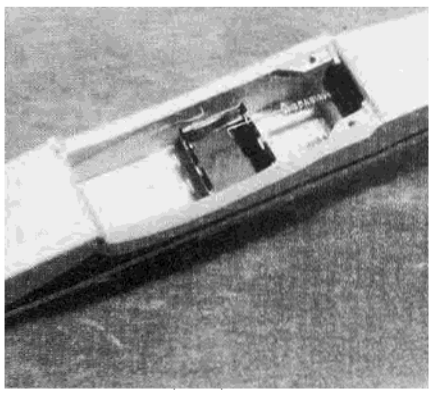
Photo of front end. Note vent behind glow plug.



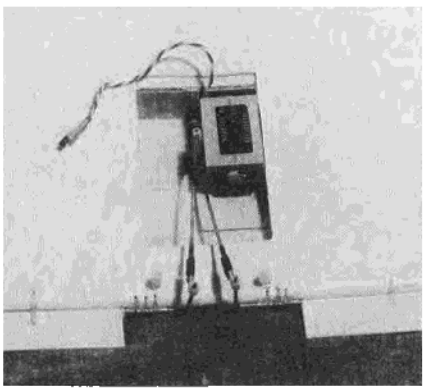
Topside of front end. Note 1/4" gap behind spinner.



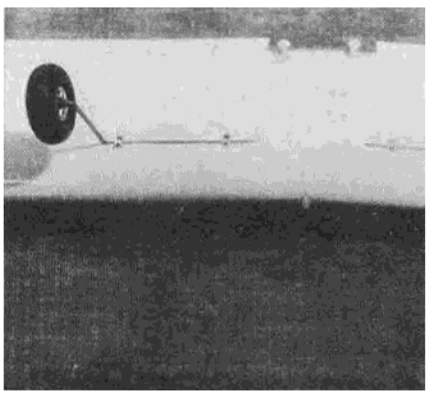
Front end with cowl removed.



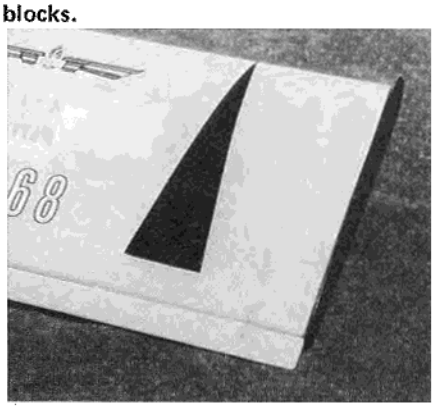
Note location of servos in R/C compartment and tapped hardwood blocks.



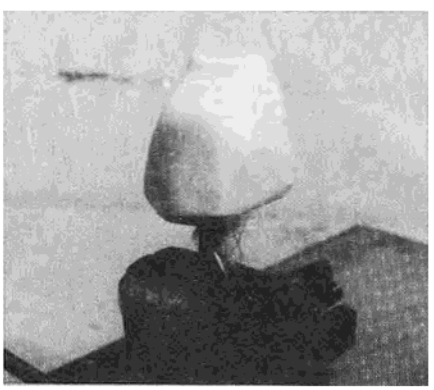
Note hookup to control horns and 1/4" x 20 nylon screws.



Bottom of wing. Note forward rake of L.G. struts.

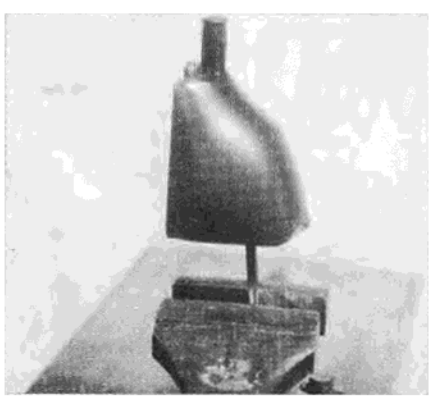


View of 1/16" plywood wingtip plate.

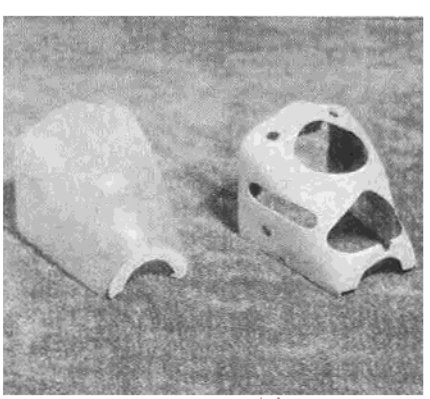


Balsa cowl form wrapped with fiberglass.

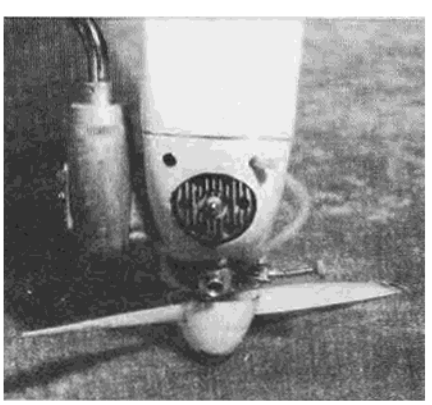
Balloon being forced down over form, glass, and epoxy glue.



Easy-Does-It balloon in place while glue cures.



Unfinished fiberglass cowl with finished unit.



Cowl and muffler in place.

the glass. Stop heating now and let cool for 5 min. Take a large, long (not round) balloon. Blow it up to full size and hold it for 5 min. to let the rubber expand. It will make it easier to put on the foam. Now with the form in a vise pointing up, slowly push the balloon down until it won't go anymore. Let some air out and push again. Do this until the balloon is past the bottom of the form and then let all the air out. Put some tape on the bottom of the balloon so it can't slip up on the form. Again take the hair dryer and heat the form so that the epoxy will even out. Not too much heat or you will break the balloon. After 24 hours the epoxy will be set and you can remove the balloon. You will have to cut the cowl off the form. Cut and trim to fit the fuselage and finish it with the rest of the plane. This is basically known as the Easy-Does-It balloon method. If you take your time and follow instructions you will be proud of your own fiberglass cowl.

Wing: Cut all ribs by stacking 3/32" blanks together and cut with a band saw or jig saw. When cutting ribs be sure to cut the ribs with the construction tab on them. This will insure a warp free wing. Lay down the bottom ¼" x ½" spar and add all ribs. Install the top ¼" x ½" spar. Cut a 3/32" x 3" x 36" sheet to length and then in half to give two pieces of 3/32" x 1½" x 26½". This will give you the top and bottom T.E. sheeting. Install the bottom T.E. sheet and 3/16" x ½" T.E. stock on top of it. Now add the top T.E. sheet. Cut a piece of 3/32" x 3" x 36" wood to length and then trim it to 2½" wide. You will need four for the top and bottom L.E. sheeting so cut all at one time. Add the top L.E. Sheeting and all top sheeting. Glue in the 3/4" triangular L.E. The bottom edge will lie on the building surface. Glue in the 1/16" vertical webbing. Use the 1/16" left over from the top and bottom sheeting from the stabilizer. Add the cap ribs and let the glue dry overnight. After all is dry, flip the wing over and add the L.G. blocks and 3/32" vertical webbing. Cut the construction tabs off and add the bottom sheeting. Sand the center section of the wing by blocking up each wing 1 inch to the proper angle. Add the center section braces and glue the two wing halves together. Cover it with 3" wide fiberglass. The ailerons are made from 1" wide, ¼" thick sheet. The wing tip plates are made from 1/16" ply and just about any shape will do. The ply will protect the wing tip when the engine is started with the ship standing on the wing tip. When the engine is started in this manner it is less dangerous than starting it upside down.

Stab: The stabilizer is built on top of the bottom 1/16" sheeting which is made by butt gluing a 3" wide to 1½" wide stock. Add L.E., T.E. and ribs. Add the top sheeting and let dry for 24 hours while pinned down to a flat surface. Make the elevator from ¼" stock and sand to shape. The stabilizer and fin are now glued to the fuselage using Tite-bond.

Finish: The entire ship is given two coats of clear dope before covering. I used silkspan on the entire ship except for the turtle back and the wing. Silk was used on the turtle back and Super MonoKote on the wings. Yes, that's right, I use two coats of dope under Super MonoKote. Two more coats of clear on top of the covering and you may do as you wish from here on out. **Don't** go overboard. Keep it as light as possible. Mine weighed 4½ pounds although I think it would fly as good at 5½ lbs.

Bend up the L.G. as shown on the plan making one left and one right. The tail wheel assembly is made with a piece of 1/16" I.D. nylon tubing inside brass tubing. 1/16" wire is bent to shape and soldered in the nylon at each end using small eyelets. Drill a 1/8" diameter hole in the tail post and insert the tail wheel assembly approximately 1/8" deep. Put epoxy on the brass tubing and push the assembly all the way in. Don't get any epoxy on the eyelets. This assembly has proven to be a very neat and workable tail wheel.

Install your equipment. I'm not going to say much here because the manufacturers state the proper way to install their individual systems. Keep the aileron movement to 3/16" up and down for the first flight.

Flying: Test your equipment before flying. If everything is satisfactory, then let's go. Get the feel of the ship on the ground by taxiing. You will find, in a good wind, the Graduate will weathervane a good bit. Head her into the wind and give full throttle. Hold some right rudder until you build up speed. In about 50 to 100 feet she will be airborne and, if in trim, flying flat out. Gain some altitude and have a ball. To land just cut the gas and come on in. You will find it a little faster than you are used to. If you do slow it down, you will find it won't drop a wing at any speed and you will have full control at all times. The Graduate wants to fly a little fast because of its low drag. So far I have been talking to you about the Graduate with a .35 in the nose but with a .29 she is a dream to fly and does fly much slower. ●

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