



inda Greer with Magic Dragon.

How's a Dragon grab you? No, No, Clyde, not the fire-breathing Gespiten, Gesmoken maiden snapp'en type; — a friendly flying machine sort; answers to the name, "Puff". Kind of a pretty thing and flies great. So, O.K., stay with us and we'll put you in the dragon taming business.

This beast has an ancestry that runs back to 1959. Over the years I've thrown up (now there's a good word for design) differentiated airframe assemblages (try, "toy airplanes", Clyde) all shooting for that elusive quality of flying that happens to be, "just right". Leaving out some of the less interesting designs, let's take a look at some of these weirdo's on the way to the current Dragon.

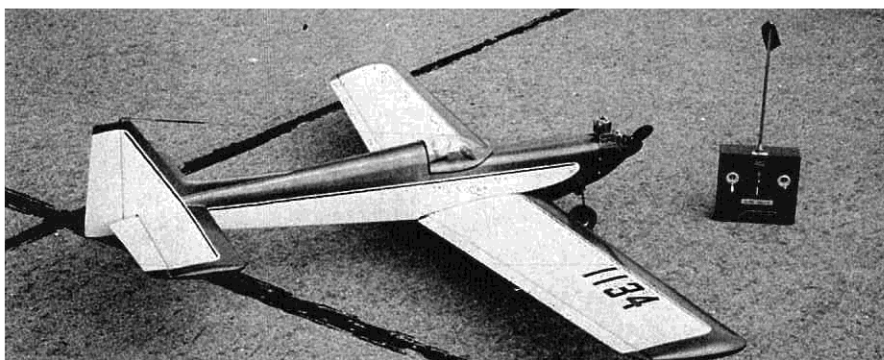
First off, back in '59, there was the "Big Meteor". I had a wild idea for a great big, well streamlined, low wing-loaded airplane, that I could stunt right in front of the judges noses and, "Boy-O-Boy", is that what I got. This thing had 1200 square inches with an all-up weight of under 5 lbs., and a 12% thick NACA 0012 symmetrical airfoil. (Yeah, under 5 lbs. with wings that big!) The whole monster was built like an overstressed eggshell with the thought in mind that, the first time I landed hard, it would probably explode into twelve jillion pieces. Fortunately, it had a long successful life, 'til I got it stuck in a flat spin one day and, would you believe, a jillion pieces! Anyhow, it was a real interesting design concept. I used a K & B .45 to provide the urge, such as it was, and it did just as I figured; complete stunt flights at altitudes never over 50 feet. Anyhow, I left it for a little more conventional approach.

Yeah, conventional, like maybe I went for the world's first mass produced fiberglass fuselage, or therabouts. Remember "Technical Model Products Company" and the "Meteor"? Well, that was the beastie. Shoulder winger again, 750 square inches, NACA 651-212 low lift airfoil. I built three or four of these jobs and we turned out over six hundred kits before we packed up the show for lack of customers. This was quite an interesting airplane. The particular airfoil was virtually stall proof. You could just keep dumping the tail down lower and lower on approach and never really drop out. Unfortunately, when

MAGIC DRAGON

Want to get in the dragon taming business?

Here's how . . . By Alan B. Greer

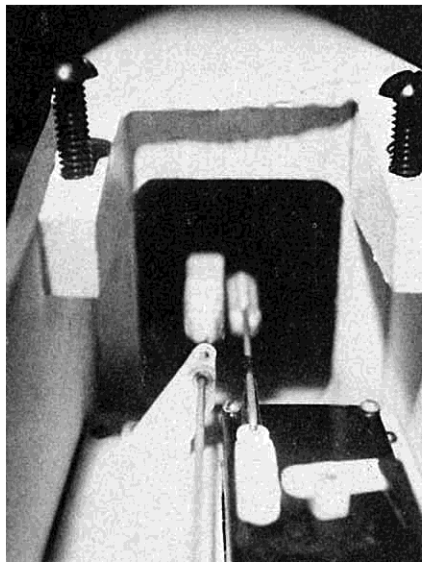


you tried to do outsides you got some wild, egg-shaped doughnuts and the inverted flight was something to behold – from an underground trench. It flew this thing around with both a K&B .45 and a Super Tigre .56; also had a Johnson 32 and Lord knows what else in it at one time or another. Built a “B” version, and when I propped up the trailing edge of the wings to give me 0-0 angular set up it flew a whole lot better than the kit job.

Next along in the series, I built a thing called a “Trident”, which was another 750 square incher, with a shoulder wing and the thrust line set up on the center line of the wing, with kind of an “over-cowl” that came back and quit in the middle of the wing to make the cockpit/instrument board. Yeah, I know it sounds kind of strange – it looked kind of strange, too. This thing used an NACA 0015 symmetrical airfoil, ran a K&B .45, weighed in at about 5 lbs. 4 oz. and it was just a real dandy flying machine. The only problem was, the 0015 airfoil didn’t give me quite what I wanted on landing characteristics. When you flared it out it would s-t-r-e-t-c-h the glide and you’d land somewhere down into the next county.

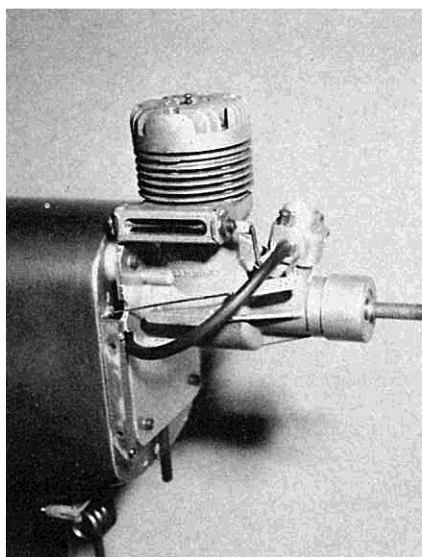
So, undaunted, I cooked up the first of the “Comets” – Comet 1, which was really a Trident with the wing moved down to the bottom – and I went to an NACA 0018 symmetrical airfoil. This job had about 780 square inches and as I recall weighed 5 lbs. 5 oz., or thereabouts. This was a pretty decent flying machine, too. An 0018 airfoil works just great as long as you keep your wing loading down under about 18 ozs. per square.

My flying buddy, Charlie Bossi says, “Let’s make two”. In a weak moment I said, “Why not! I’ll build the fuselages and you build the wings.” and away we went. The only problem was, I didn’t say what kind of wing we wanted. So very unscientifically he turns us out a pair of 750 sq. inch wings with a NACA 2415 airfoil. While I came up with a turtle-back type fuselage – looked quite a bit like the Dragon. We named this highly unscientific airplane “Comet II”, and it set back the science of aerodynamics or aerodesplurgics or whatever I’ve been indulging in, by multi many years by simply flying real, real well. Both airplanes weighed in at about 5½ lbs., and we used Veco .45’s for power. We were using reeds in those days (No, no,



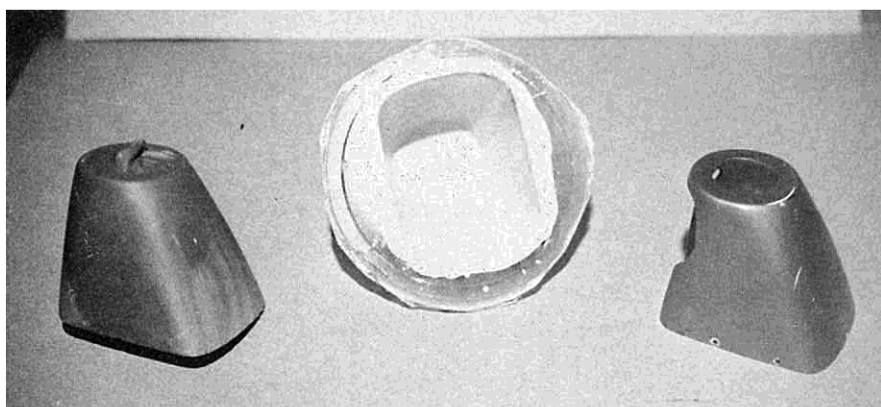
Wing hold-down dowels and nylon horn fairlead on elevator pushrod.

Nose wheel and brake installation.



Supre Tigre .56 engine installation with cowl removed.

Cowl steps: Baloon covered balsa form; female mold; finished cowl.



Clyde, not the kind they found Moses in, – the kind that go “Twang” and then quit wobbling when you’re inverted about 5 feet off the deck).

Since we had a good thing, my immediate effort was to see if I could louse it up by going scientific and I came up with Comet III which went all the way down to 625 sq. inches with a 633-015 symmetrical airfoil

with a Veco .45 up front. It went faster than free booze at a lumberjacks convention! The only way you could land it was to aim it towards the ground and hope you had the reflexes to get it more or less flared out when the wheels touched. I never will forget the sound it would make in landing in our grass field. Sort of like a wet pig

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Well, about this time the '65 Nats were barrelling down on me, and I decided to really do something different, so I cooked up a thing called the "Thunderbolt". This had fully elliptical surfaces, was 690 squares in the wing and a 632-215 airfoil. This is a somewhat lifting airfoil, about 15 percent thick. It figured that with elliptical wings I had to do something special for the fuselage, so I got hold of a monster block of pine and, with the help of another flying buddy, Frank Deis, we carved out a wooden mold; greased her up, and molded a bunch of fuselages out of epoxy/fiberglass laminate. I used a Merco .61 lying over on its side to provide the urge. The wings were fully built up inside and fully sheeted. With this fairly thin airfoil and only 690 square inches, (of course an elliptical wing gives you real thin tips), this baby was a bomb to end all bombs!

After all these "Kind-of-wild" machines, I figured it was about time I did something more or less middle of the road. So for '66 we stirred the brew and whoomped up a "Magic Dragon". We went up to 755 square inches of wing in order to lower the wing loading down somewhere between 20 and 22 oz., which checks in as a pretty decent place to be. We also used an NACA 632-415 airfoil which is a semi-symmetrical airfoil and is somewhat more of a lifting section than the one I was using in the Thunderbolt, though it doesn't run as much lift as the old 2415. Stuffed a .60 in the front of it, used a tail moment that was a little bit longer than what I had been using, and a nose moment that was a trifle shorter. The rudder size and fin area were around what seemed best coming up through the long design series and the stabilizer was the same kind of, cut, whack and chop proposition. We built two of these beasts in the spring of '66 and, man, was I delighted! The Green Box proportional hadn't arrived so I stuck reeds in one of them and went pantin' out to Wright Field to fly it on those long smooooth concrete runways. Actually, the wind was blowing about 30 miles an hour (what else for a first flight), but she handled it with "no sweat". Probably the best way to describe the flying characteristics is to say, "it flies with a real light responsive touch", if you know what I mean. Stability is dead neutral and it goes just exactly where you put it by just the amount you put it there. It moves out right quick and it seems to find a pretty good groove. Rolls are what I've

been looking for; it holds them right on a strung line; shows no yaw, wobble, flop, flip or flap; just turns over neatly and cleanly on the old chalk line at about 2 seconds per roll. Landing characteristics are kind of weird; you haul back on the stick and the wing just absolutely refuses to stall out. So you fly and fly and fly and fly. It's darn disconcerting to use 5000 feet of runway to land but it's been known to happen. I haven't really had too much trouble with it as long as I got it down fairly low and slow while we were far out and just let her settle in comfortably. It's awful nice to know that no matter how far you haul back on it, it simply won't drop a wing and snap roll. On the other hand, the airfoil gives mighty interesting inverted performance. Take a quick peek at it and you'll note that the maximum thickness on the bottom is well ahead of the maximum thickness on top. This tends to move your center of lift forward when you're inverted and you don't require so much down trim. Even more important than that, it gives you nice smooth, round outside loops.

Well, that's our Dragon - not the complete solution by any stretch but a darn fine flying machine - kind of a purty thing too. Of course, as far as that goes, I've yet to see any model that I thought was the complete solution although the Dragon will give you as much as anything I've seen so far.

If you're still with us, (Clyde, - Clyde - somebody give him a punch in the ribs, he's gone to sleep again) - we'll talk about building this gaflamin, gaspitten machine. First off, a quick word of caution, if you haven't built a full house contest type multi, don't start here. While this bird has no bad habits, neutral stability means just that, and if you're a beginner checking out for the first time, you're sure going to have your hands full.

My structure philosophy (bet you didn't even know a structure had a philosophy) was pretty straightforward. Build it simple, clean, put a minimum number of hours in it, and the minimum number of "kookie" features, and pick up as much in the way of modern time savers as I could. After some of my wild results with the fiberglass T-bolt, I decided to go for a

straightforward, wooden fuselage. One of the things I jazzed it up with was a foam turtleback; this eliminates the problem of the sheet skin making like a roller coaster between the formers giving you that "python-swallowing-an-egg" look and also stiffens the daylight out of the back end of the fuselage. It turned out to be a real good deal. Easy to make and very effective. effective.

Another novelty was the fiberglass engine cowling; which isn't much of a job to whip out and gives you a nicely shaped gook-proof front end. Nothing upsets me more than that little sump of sludge that collects in the pit between the wooden engine bearers. The fiberglass just whoops the whole thing; wipes out real easy too and lets you get at every part of your engine. Just bolted the engine in place with nylon spacers and it seems to work real well. It sure is handy for servicing the engine. By using an Allen screwdriver you can strip, plate, engine and all off the front of the airplane in something under five minutes. It's a good thing you can too, 'cause the next feature I went for was the completely integral fuel tank with no access hatches. I was carried away by Matty Sullivan's tanks and, when I got around to putting a 10 oz. job in, I put it in permanently with a solid bulkhead behind it. This turned out to be a great thing as it maintains the structural integrity of the whole front end (like it stays in one piece in a crash, Clyde). The only access to the tank is a one inch hole right behind the engine plate and this is just big enough to allow me to pull Matty's super snazzy top out of the tank and jerk all the guts out to change the surgical tubing or what-have-you. I was a little worried about this set-up when I first put it in, but it's caused no problem whatsoever and I heartily recommend it. Another deal was, real simple fuselage sides with just 1/16" ply and 1/8" inch balsa wood and a minimum of bric-a-brac. In other words, I got fed up with making up fuselage sides that look like an engineering model of a Warren Truss bridge.

To hold the wings in place, I used the famous two dowels in front and nailed the trailing edge down with nylon bolts. Now that's something I wouldn't be without. I've screwed this thing into the ground a couple of times and in both cases the nylon bolts snapped off cleanly with an absolute minimum of damage, leaving me with a repairable bird instead of a candidate

for kindling the yule log.

The nose gear was a DeBolt mount and while it worked satisfactorily, I'm giving some thought to sticking the nose gear right on the aluminum motor mount on the next one. No good reason, just might make it look neater.

The wings are foam, of course. I did some deep thinking about how to stick them together in the center (deep thinking — like flour and water won't hold, maybe I'd better try something else). So I cooked up a main spar that carries all the landing gear loads, the main wing loads, and just about everything else. This has been another good thought. It wasn't particularly hard to make; simplified joining the wings, and in a couple or three crashes and 500 odd flights, I've yet to have the wings come unstuck in the center.

The stabilizer is the construction type that originated with Jim Walker's Fireball, and I haven't seen anything to beat it yet. Uses a 1/16 skin on top and a 1/16 skin underneath with leading edge, trailing edge and some ribs. No spars, no nothing. I was tempted to use foam here, but this thing is easy to build and light as can be. The fin and rudder are nice soft, juicy 3/8" sheet for the good and simple reason that it doesn't warp up nearly as badly as the quarter inch stuff and, if you pick your wood carefully, it doesn't weigh much more.

So enough of this blathering about features and such, let's get with the building of this thing. Sweep the dog off the workbench, send the brats off to bed, give your wife a martini and a good book, and let's start construction.

WING

The wing, as we mentioned, is foam and if you haven't cut one of these things, you sure should. We've been using 1/4 inch thick masonite for templates and getting two wing panels, one above the other, in a 4 inch block of beaded foam. It took us about 2 1/2 hours to cut 4 panels on Fritz Breisch's dining room table. I don't know how you can do much better than that. The sheeting is more or less conventional except that I like to butt edge all my sheet before I start sticking it on the panels. This gives you a piece about 28 or 30 inches wide by 36 long. If you sand the whole mess down well before you stick it on you'll come up with a real nice finish. For what it's worth, I also stick it on at the trailing edge first and work my way up the bottom camber around the leading

edge and back over the top. But do it whatever way suits you best.

Before you sheet the wing, I hope you cut a big fat old slot for the main joiner and a hole for the servo, 'cause if you didn't — you have a problem. The joiners make up from 1/8" hard balsa front and 1/8" hard balsa rear and I do mean HARD — 8 to 12 lb. stock or R/C balsa. Maple landing gear blocks extend the full length of the joiner and are stuck in on the bottom with Hobby Pox. 'Cause of the way the wing tapers, the front edge of the maple landing gear block ought to be just a skeenteenth up from the bottom edge of the front joiner. If you're not sure about this, try laying out the whole mess on the section drawing before you stick it together. And, for Pete's sake, use Hobby Pox or something similar in the way of glue. This is the heart of the whole wing and if you don't stick it together with something better than old number 9 shoe polish you're liable to find yourself at two hundred feet devoid of lifting surface. Stick the balsa and maple separating blocks in the joiner with epoxy and drill the holes through for the landing gear wires and you've got yourself a pretty stout old bridge type beam. Take your two sheeted wing panels and sand them at the center with a block to the dihedral angle. I used a wooden cradle that holds the wing panel and supports the sandpaper block for this job. Lather a little Hobby Pox over the butt joint at the center of the wing and over the edges of the joiner which will grab on to the foam and balsa wood, slide the joiner in place, and shove the whole mess together. Surprise, surprise, all at once you've got a wing — unless of course, you did something wrong, in which case, I don't know what you've got. Wrap a four inch wide piece of fiberglass around the center section to give it a little extra strength and, while you're playing around with the epoxy, you might just brush a coat of it over the exposed foam in the servo hole. This protects the foam beautifully and a whole lot easier than lining this sump with 1/16 balsa wood. Ailerons are an odd size of wood, chosen to match in with the airfoil. The best thing I can suggest here, is find yourself a buddy with a tilt table power saw and a hollow ground blade to chop them out. You can hinge them on any old way that suits your fancy. I used nylon tape. The wooden wing mount dowels are a snap; just run the back ends of them through a pencil

sharpener to put on a point, shove them into the leading edge of the wing, pull them out, lather with epoxy and put them back in for keeps. They'll hold. The mounting holes for the quarter inch nylon screws are reinforced with a piece of sixteenth plywood on the bottom; I didn't find it necessary to use anything on the top. Tip blocks are whacked out of lightweight balsa and considering the amount of foam out near the wingtips, I didn't see any particular advantage to hollowing them, so I didn't. For the stab, make yourself up six cradles out of 3/16" balsa wood with the top of the cradles cut to the undercamber of the stabilizer and the bottom flat. Pin them down on the plans, and lay in a piece of sixteenth sheet about 5 1/2 inches wide. Stick in a leading edge, trailing edge, mit ribs in-between, and glue a top sheet over the whole mess. When the glue sets up, you can lift up the whole business out of the cradle and you'll have a very rugged lightweight stabilizer with a building time of about an hour. Flippers are 3/8" soft contest balsa. For a joiner I used a piece of straight 3/32" music wire, and chopped out an elevator horn from 16 gauge hot rolled steel. I polished it up with sandpaper, and slipped it on the music wire (I hope you drilled the 3/32 hole for the wire). Using a little bit of silver solder, flux, and an ordinary propane torch, you'll find you can stick the whole mess together in a trice-or-two-or-three-or... If you've never used silver solder before, get somebody that has to show you how. It's not hard to do, but it sure is hard to describe. Stick the horn assembly on the flippers with pieces of fiberglass and resin; shove on a couple of tips and you ought to have a stabilizer mit elevator.

EMPENNAGE

The fin and rudder are 3/8" sheet like we said. And if you don't know how to make one of these, Clyde, then maybe you ought to be reading "Playboy".

FUSELAGE

Make two sides out of 1/8" sheet, and epoxy on 1/16" ply doublers. There's some 3/32" doublers back near the stab, and some 1/8" by 1" braces that you might add at this time. There's also some 3/8" x 45 degree spruce braces up at the front end and 3/8" by 45 degree spruce braces just aft of the wing. You stick these in now to give you some reference points for your bulkheads, and you might just have a Chinaman's chance of getting

the cotton pickin' thing together. The bulkheads are pretty exotic, with the B and C bulkheads being made up of 3/16" balsa wood laminated with epoxy to 1/32" plywood. This makes a nice unit, and if you haven't tried it before, give it a whirl. The firewall, of course, is 1/4" plywood and, when you got everything chopped out and the sides are dry, you're ready to stick it all together. Put it together upside down on the bench, but note that the top line of the sides is not perfectly straight. Actually, it breaks off at an angle at the rear of the canopy. I recommend using epoxy for all bulkheads unless you're planning your crash for the first flight.

The foam turtleback is no problem; cut it out with a hot wire just like a wing panel. Be particularly careful with the hot wire near the rear template since, if you move too slowly the foam will migrate away from the template pretty badly. (Like migrate means melt, Clyde.) Since the body has a little belly to it in the turtleback area, you'll have to take a sandpaper block and dress the foam down so that it properly fits the top contours. This gives you a little bit of compound curve, but it's no particular problem if you wet the 1/16" sheet before you wrap it over it. Stick the foam turtleback in place (I hope you put the sheet on it first) and the whole thing suddenly becomes fairly rigid. Use good hard balsa wood for the bottom nose block and put your plywood landing gear mounting plate in place. Use a sheet of fiberglass inside the entire tank compartment to tie the firewall bottom block and sides and B bulkhead all into one unit. Stick your tank in and anchor it permanently in place with a little RTV silicone rubber (You know, Clyde, the stuff in the tube). Lay the top block in place and, "hot-diggity", it's beginning to look like an airplane. After you've got the top block, bottom block, and what-have-you, whacked down to size, wrap a sheet of fiberglass around the firewall and the whole front end running back about 3 inches along the sides. This, too, will help keep the front end on the beastie. If, at this point, you've just suddenly thought about blind nuts for your motor mount, then you do have a problem, — I can't help you — why don't you write Abby.

The blocks for the nylon wing mounting screws are 3/8" maple and, after you have them cut to size, you should use a number 7 drill and run a

hole up through them, rather carefully. You can use a regular 1/4-20 tap to thread the hole and you'll find that maple takes the thread fairly well. I didn't do anything fancy about keying the blocks into the fuselage, I just simply stuck them in place with a special high-strength epoxy. This is 3M-#EC2216 B/A which comes in a two tube kit for a couple of bucks. This is the stuff they use to stick the Hustler bomber together and I've never seen anything quite like it for strength. It never becomes real hard and brittle like other epoxys do, but seems to maintain a little bit of flexibility as well as having fantastic strength — I strongly recommend it. On the other hand, I suppose you can stick these blocks in place with regular airplane glue but please don't ask me to be present when you do your first outside loop; broken balsa bits upset me no end.

The fiberglass cowl, (Hey, come back here, Clyde, what's the matter, you chicken? You, too, can mold fiberglass by following these simple "howzy-dozit" steps.) First, get yourself a balsa wood block and carve it to the shape of the front end of the machine and sand it down fair to middlin', but don't exert yourself. Then go get a nickel balloon and blow it up until it is about half-way inflated; take balloon in one hand, and block in the other, and proceed to try to push block through balloon. If you've done it right, and let a little bit of air out of the balloon as you went, you'll wind up with the block neatly encased in a double layer of deflated balloon. Cut the balloon open at the neck and kind of strip it around the block like a nylon stocking (son-of-a-gun, that "Playboy" influence again) and you'll wind up with a single layer of rubber balloon all over your wooden block. For this much of the procedure, I give full credit to Bev Smith of some paint company or t'other out on the East Coast. Take your balloon covered block and stick it down to a plastic coffee can lid with contact cement and you've got a male form. Go on down to the local boatyard or marine supply and pick up some epoxy gel coat, some molding epoxy and some fiberglass cloth. Mix up your gel coat per instructions and paint it over the whole mess til it's about a 32nd thick all over. If you get a little thicker than this, it's O.K. but don't exceed a sixteenth. Let it sit until your gel coat is good and stiff but not really hard. You can now stick pieces of fiberglass

cloth on the gel coat and you'll find that it will be tacky enough to hold them. Start brushing on resin and cloth and build it up until the whole business is about an eighth of an inch thick all over. Set it aside and let it harden for 24 hours and you'll be able to strip out the balsa wood male form in the balloon with no great problem. This produces your female mold. Wax this up thoroughly with a good grade of automobile wax and give it a coat of polyvinyl alcohol mold separator (hope you bought some of this at the marine dealer, too). When this whole business is dried, you can paint a thin coating of gel coat inside, let it get semi-hard, lay in your glass cloth, saturate well with resin and — low and behold — you wind up with your fiberglass cowl. Should be about a 32nd thick all over, which will run 2 to 4 layers of middle weight cloth depending on how heavy a cloth you got. Of course, if you're chicken and don't want any part of the whole gooney mess, you can send me along a check for 5 bucks and I'll mod you one. (Yea I know, Clyde, the price is stiff — I do this for a hobby and I'm not really crazy about making anything for sale.)

After your cowling's molded or acquired or what have you, you want to chop it away to clear your engine. A rotary grinder with a burr in it does a first rate job although it will sure dull up your burrs in a hurry. Sand the cowl down with 280 paper and paint it with Hobby Pox in whatever color your fuselage is going to be. For mounting, I used 2 quarter inch square spruce rails, wood screwed to the firewall, running up and down the edges with just enough clearance to mount the cowling flush with the outside edge of the fuselage. Stick a couple 2-56 or 3-48 blind nuts in the inside of these rails, and just bolt the cowl in place with 4 screws. Seems to work.

For the engine mount plate you'll want to scrounge up a piece of .092 2024-T4 aluminum. This is the old 24ST. I wouldn't use any other alloy than this unless you can obtain some 7075-T6 which will also do the job. You might try Williams and Co. or some local non-ferrous metal distributor. Chop it out with saw, file, axe, can opener, or what-have-you and bolt your engine on. Be sure to leave a substantial clearance groove for the throttle control push rod 'cause if it rubs up against this plate — it gives glitches. Also leave a good size slot for the fuel tubing. For mounting the

whole mess on the front of the fuselage, I find 4-40 Allen screws work just dandy and I recommend them or some other type of hardened steel screw.

FINISHING

(Come back here, Clyde, you're going to suffer with the rest of us.) I give the whole bird two brushed-on coats of heavy clear dope, sand it well between each, then I cover the whole thing with wet silk. I use silk because it makes such a tidy little package to keep the broken bits in. After silking, I brush on a good thick coat of clear and dust it down with 220 or 240 paper, just enough to grab the raw edges but not enough to raise the fuzz. Now comes the tricky part. I load up the old spray gun with a filler made up of talc and dope, running a whole lot of talc and not too much dope and lots of thinner. You'll find this stuff sprays pretty good. I spray a pretty hefty coat over the whole machine, using a base coat followed by a wet pass before the base is dried. I usually use about a quart of mixture for the whole airplane. Set it aside and let it dry no less than 24 hours while you go watch television or indulge in some other indoor activity. Sand it down thoroughly with 180 or 220 paper and start spraying on coats of clear dope. Generally, wind up spraying on about 3 to 4 coats of clear to get a decent surface. When you're done with the clear, spray on your color and that's it. I find that spraying the filler gives you a nice even base without any brush marks to sand out and simplifies the finishing no end. If you haven't tried it yet, give it a go, you'll be surprised.

For color on the original pair, I used Daytona White with Whirlpool Copper trim. (What's that you say about Whirlpool Copper, Clyde? Well, it's a long story but it's the same copper color that is used on some Whirlpool appliances). You can make up a splendid metallic copper or gold by obtaining some bronzing powder from your local art supply house; mix it with clear dope; cut to spraying consistency so that you've got about 3 to 5% by volume of powder and spray it on. Makes a striking color scheme. The only problem I've had with it, is that the copper tends to react to perspiration. After a period of time, I get some of the wildest looking sets of fingerprints you've ever seen. Spraying a layer of clear dope over the top doesn't seem to help too much, so I figure it's the price of being different.

EQUIPMENT INSTALLATION

I've been using my Green Box for well over 500 flights and I've yet to have

any problems with it. Fearless Leader may or may not have run my lousy Polaroid picture of the installation that I made. If he did, I suggest that you take a good look at it, if not, then I suggest that you do some careful planning. Nothing louses up the flying of an airplane like some right hand bends in the push rods. Do a little sweat'n and get 'em straight and they'll pay off in the flying department. Another comment that I might make, is that, if you're relatively new to proportional, take heed and avoid electrical noise. That is, unless you really like to glitch. I used nylon tubing for my engine pushrod and my nose wheel steering. Put the holes in for the tubing after the bird is built. Do this by taking a long piece of music wire the size of the nylon tubing and grinding two flats on the tip so that it looks sort of like a screw driver blade, then turn it 90 degrees and grind a fairly shallow angle point on it. It'll wind up looking kind of like a tip of a drill and that's just what it is. Chuck it in your electric drill, aim it and go. Just be careful you don't drill through the fuel tank — with it completely sealed into the front end — my, but that gets messy. After you've got your holes you can usually stick through a long piece of skinny wire and thread your nylon tubing in along the wire. For a nose wheel brake, I used one of these dollar wrap-around spring jobs similar to the Rocket City brake, except I bought mine from a personable fellow at the Toledo conference last year. If you haven't tried this brake, get with it — certainly is the answer. I used monofilament nylon running through 1/16 diameter nylon tubing to operate it.

One other more-or-less novel feature; I had some problem with the elevator pushrod rattling around in flight and making tremendous noises. I took a nylon control horn, bolted it down to the servo board, and ran the front end of the pushrod wire through one of the holes on the control horn. Makes a first class fairlead. If you're having chattering push-rod-itis, try it.

TRIM

Well, you've got it built, Clyde, looks great and now you're going to take it out to fly it so you figure maybe I should sit here and give you complete instructions. Oh, no, you don't! Get your local expert to get you through the first flight or if you are the local expert, write and tell me how you did it. Anyhow, I hope you set up your surfaces for minimum travel. The elevator pushrod should be

connected to the lowest hole on the elevator horn about 1-5/16" out and your aileron horns ought to be somewhere between 1-3/8" and 1 1/2"; anything less than this and you don't have a Dragon — you've got a tiger on your hands. You'll find that it flies like we said — with a real light touch; but very smooth and responsive. Rolls are as pretty as a picture, right down the line and wingovers are something to see. I do my wingovers full bore — you haul back on that stick and she goes up, up, up, up like it's never going to stop — Finally, at the very top you kick her over and bring her back down. I swear, I must be doing wingovers 200 feet tall. For what it's worth I'm using an Enya .60 with an 11/8 Top-Flight Prop and, alternately, a Tigre .56 with an 11/7 1/2 Rev Up Prop for power. To get it to kick over at the top of the wingover, I'm using absolutely the inside hole on the rudder horn, so that the rudder kicks all the way over and just clears the stabilizer. This combination will produce a right smart looking wing walk as well. (You know wing-walking, Clyde, that's where you throw her over into a near vertical bank and kick in top rudder and hold it.) It's kind of a peculiar way to fly; the airplane slows down quite a bit, and your controls cross and uncross. You find yourself using both ailerons and elevator to maintain bank angle and you just keep the rudder crammed hard over in the corner of the box. You should play with it for awhile, it's a lot of fun, but just don't do any downwind corners in a 30 knot breeze too low to the deck.

Inverted spins are another speciality of the house and you'll find that no particular problem to flip her over, shove the stick forward, chop back your throttle and kick it in — full rudder and full opposite aileron. It will pop back out of the spin just wherever you tell it to with very little fuss and bother. Inverted snap rolls are the same sort of proposition, except that you get her up on the step full bore and really moving out in the inverted position, then cram your rudder stick hard over one way and your aileron full over the other way with full down elevator — all at once. At this point, airplane ceases to fly and begins to flop all over the sky, which is most spectacular.

I was playing around with Falling Leaf a little bit last summer but never got real good at it. This requires tremendous coordination; pull your nose up, hold it right on the step with power and then slide the bird from

side to side with rudder using your ailerons to maintain a level roll attitude and feeding in just enough elevator to hold it up on the step. Try it sometime if you want a challenge.

Square loops, both inside and outside, are no particular problem and you'll find that this airfoil will flip over on its back as smooth as glass. One of the maneuvers I was playing with was an Inverted Eight with descending rolls. This is a proposition where you flip over on the back, pull in a little up so that the airplane descends, come up over and around for 3/4 of a loop, do a half roll, cram in the down, and go up over for 3/4 of the loop, do a half roll, pull out inverted, then roll to level flight. Looks very much like a Cuban Eight with an entry at the top and exit at the bottom, except done inverted. You might give it a whirl.

Then there's the full power on touch and go. Now, with nice long concrete runways like we have at Wright Field, you can really lay it in there. But I want to tell you, it sure gives you a tight feeling in the bottom of the stomach. I quit doing this one when I hit a little piece of rubble on the runway and threw it up half-way through the underside of my wing. Took me about 10 hours to repair all the damage. Anyhow, there's some suggestions on flying — Now suppose, you go give it a try.

Well, you've hung with me this far, Clyde, so why don't you go slay yourself a Dragon, fling it around by the tail and who knows — maybe some fair maiden in distress will make your scene, too. ●