

# HOW NOW, HAMMERHEAD?



**WE ARE PROUD TO PRESENT THIS OUTSTANDING  
EXAMPLE OF MASTER CRAFTSMANSHIP AND WINNER  
OF NUMEROUS AWARDS, INCLUDING THE RCM EDITOR'S  
TROPHY. THE OPINIONS AND COMMENTS OF THE AUTHOR,  
HOWEVER, ARE NOT NECESSARILY THOSE OF A  
SANE PERSON . . .**

"Breathes there the modeler, with  
soul so dead,  
Who never to himself hath said,  
I am an airplane designer?"

**A**ND so it was by me. After years in modeling, with the last few in radio control, I had to try. Experience with several of the recent favorites, plus a few ideas of my own, sparked the Hammerhead. I wish I could give you a learned dissertation about why things are as they are, momentwise, and all that, but the plain facts are that I drew my dream unscientifically, decided it probably wouldn't fly, and then built it anyway to get it out of my system.

The first flight was conducted in secret, of course. Darned if the thing didn't go right off, and no witness. I had amazing luck for about 25 hours of flying and then, prang!

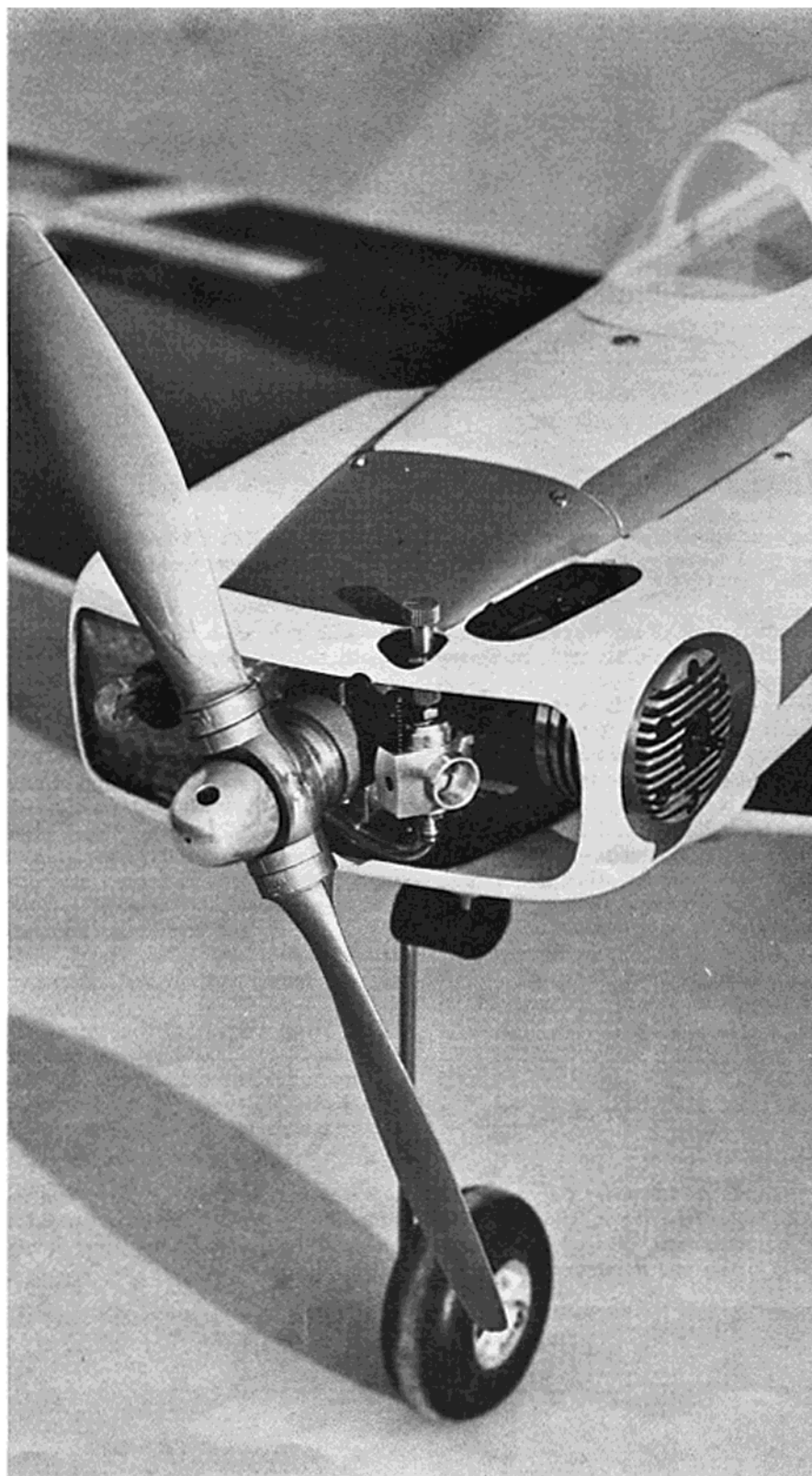
The second Hammerhead had "improvements." At 7-14 pounds, it was deliberately heavier by three quarters of a pound. I substituted a larger engine (which shall be nameless) for the Merco 49 which served so well in the first airplane, reveling in the heady promise of greater power at no increase in engine weight. Then several interesting things happened, some good, and some bad. When the engine ran well, the plane was breathtaking to fly, and capable of some marvelous maneuvers. Unfortunately, I was never able to master that engine and most of the time, it didn't run well. The fuel disappearance was also marvelous. I had to fabricate a 12-ounce metal tank that completely filled the right cheek, and 8 pounds was the weight at take-off. Flight was smooth and fast and I now believe that extra weight gives a definite edge in wind or rough air. However, all of a sudden rubber bands for mounting wings went out of style. I had no trouble in that department with the first plane, but speed plus weight equal lookout!

And how that engine did vibrate. I like to think I build fairly firmly, but things got loose quick. I tried different props and balancing to no avail, although Tony's "instant pitch" gave the best results.

Too late in the season, I was able to get a Merco 61 and life turned beautiful again. Like an electric motor it runs, compared to the other, with not quite as much power at the peak perhaps, but more than adequate. Fuel consumption seems scarcely greater than the 49, and an 8-ounce tank is plenty. Happily, grandly, carelessly flying along one day, Hammerhead Number 2 joined its ancestor, and now they both belong to the ages.

All things considered, they were good flying machines. I'm going to build more, and if you'd like to try one, here are some suggestions, but not a step-by-step formula.

You can see from the plans and pic-



**BY JAMES FIELDING**



The head called Hammer and a few of its many trophies. Editor's trophy at rear, left. Photo at right is Fielding's fluegenmeister. Clock wakes up dog on end of leash who bites Fielding who wakes up and lands Hammerhead. . . .

tures that some of my ways of building are different. Some say odd. Some say too much trouble. I say, no trouble at all, it's a hobby. My first suggestion then is suit yourself. Your methods are just as good for you, if not better.

The fuselage can be built in the conventional way if you like. You're on your own. I use fiberglass. I have made several fiberglass bodies several ways, but I like the method described here best.

The sides are balsa, built up flat, then joined for a basic crutch. The top edges of the sides are the reference lines for future rigging and alignment.

**I stretch a piece of light glass cloth<sup>1</sup>**

<sup>1</sup>Cape LP1240, roll width 60 inches, thread count 54 x 50, weight per square yard 2.8 ounces, thickness .004 inches, approved by FAA for airplane wing covering. Cape Plastics Missouri, Inc., 1157 South Kingshighway Blvd., St. Louis, Mo. 63119. Also in Alton and Mexico, Ill. and Oklahoma City, Okla. A source for glass cloth and resin, as well as nylon, teflon, and delrin sheets, rods, tubes and other plastics and supplies.

over one side at a time and paint a slightly thinned (use styrene monomer) coat of polyester resin through the cloth into the base wood. I flow a goodly coat on as evenly as possible and never go back over the work. The resin should penetrate well and the texture of the cloth should show without puddles of resin filling up the surface. The stretch should be maintained till the resin is set, lest the cloth float and permit air bubbles or resin accumulation between cloth and balsa. Edges should be kept as square as possible. When cured, they can be trimmed with file and sandpaper block.

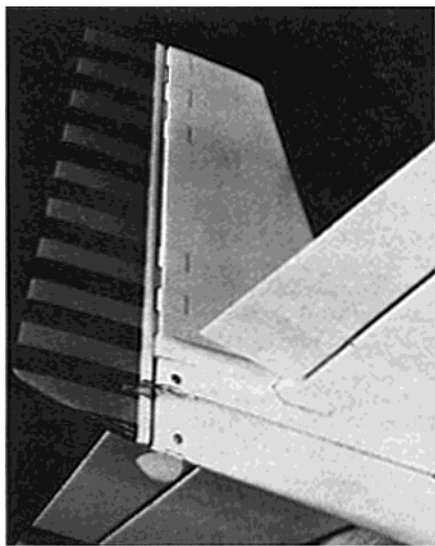
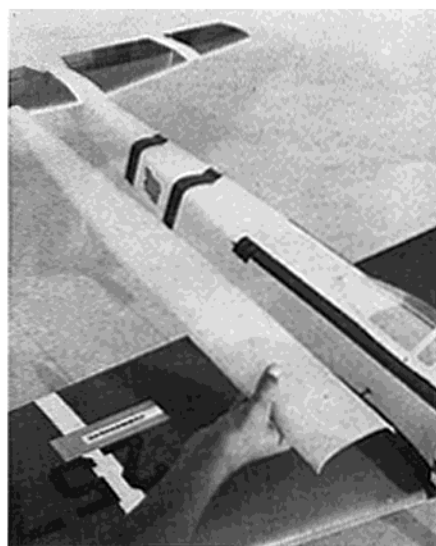
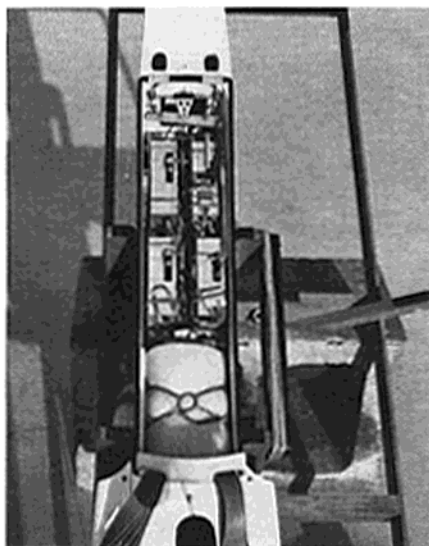
The front edges of the sides are routed to allow a flush lapped joint with the pre-formed fiberglass nose section. This is epoxied to the crutch assembly with tape over the outside joint to keep

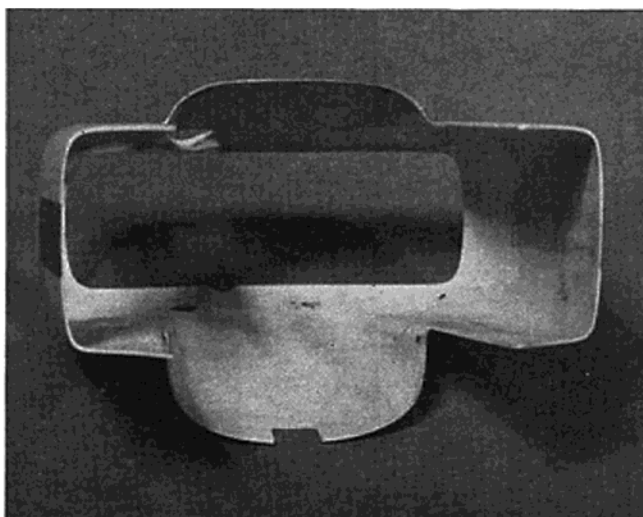
the epoxy tidy and hold the nose piece in place. Hobbypoxy glue cures quickly — others take longer. Whatever the cure time, it's best to wait till the nose is firmly set, because accuracy here determines fuse alignment and thrust lines.

If you want some balsa formers, fit now and epoxy top and bottom fiberglass shells in place. I don't think the formers are really necessary unless you do a lot of fuselage squeezing in the vertical plane.

I leave the fuselage alone for a few days, the longer the better, and then sand the sides with a block, knocking the top off the texture without going too deep. I fill any imperfections in joints, top, bottom and nose with heavy-bodied epoxy glue. Then I flow Hobbypoxy filler thinned at least 50% on the sides, one at a time, holding them flat to per-

Left: Inside reed version. Servos at rear. Author's lunch wrapped in baggie in foreground. Center: Hand with typical turtle back. Right: How the tail flaps — 2-56 in rudder fitting turns free.  $\frac{1}{8}$ " nylon rod fittings on cable tapped 2-56, permitting self-locking adjustment without twisting stainless steel fishing leader cable. Latter fits inside  $\frac{1}{8}$ " O.D. alum tubing. Single 2-56 in rudder fitting allows removal of rudder-fin cable harness. Yeah.





Left: Balsawood and plywood masters from which fiberglass female molds are made from which . . . . Right: Airplane's view of cowling, looking out. Another RCM first (?)

mit filler to settle without runs. The formed fiberglass parts usually don't need filler. After sanding sides, minor holes in all surfaces can be spot filled with Stuff and a final sanding overall makes the fuselage ready to paint. We'll get to that later.

That's all fine you say, but what about the fiberglass parts? Dwight Hartman of Argenta, Illinois, has agreed to make the parts available to those who may want them for \$15.00. You get top, bottom, nose section, cowling, and "cuff" for a Top Flite 8" canopy. All you do is trim, sand and fit. This sounds like a bargain to me considering the cost of materials and the work involved. I may get my futures from Hartman.

I am not trying to sell parts though, and if you want to make them, here's how. Make patterns or male molds for

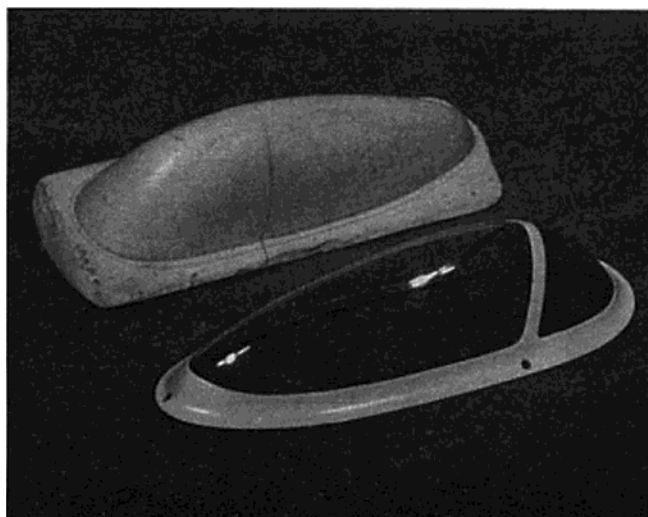
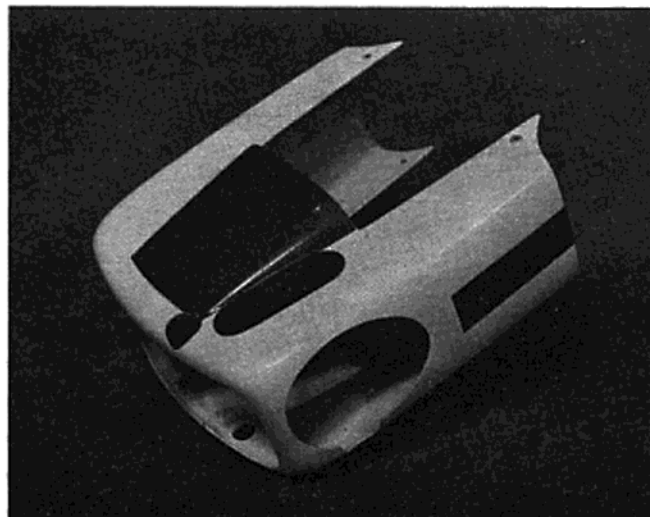
all parts needed to exact shape and size. Pine is good, but balsa will do. Seal with Hobbycoxy clear. Do any filling necessary to develop the finish you desire, remembering that the finish on the mold will be duplicated on the finished part. Spray a thin final coat of Hobbycoxy or any other paint that will not be attacked by the resin. Wax. Simoniz paste is fine. Coat with mold release. Try a polyvinyl water soluble release or any other (cuckoo) you like. Gel coat, meaning a coat of resin allowed to set. Using three or four layers of a cloth like Cope #181, 8.9 ounces per square yard, .0085 inches thick, to laminate a female mold of fiberglass over the pattern.

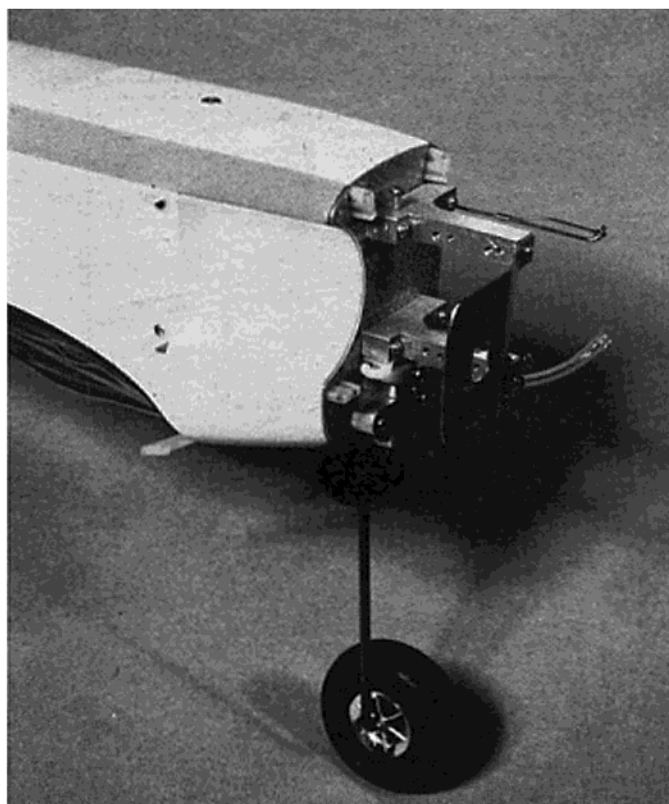
The cowl and nose section female molds have to be made in two halves. The cowl parting line is best horizontal, and the nose vertical. Lay up half of

the mold with a flange against a dam on the parting line. Try modeling clay coated with the release agent. The parting line doesn't have to be perfect, because when the first half of the mold has cured, you strip away the dam, apply wax and release agent to the antidam face of the flange on the first half mold, and lay up the second half against the first. When molds are removed from the pattern, small imperfections in parting flange faces will fit together to index or align mold halves very accurately.

When female molds are finished, wax, apply release agent and lay up finished parts inside molds. Cowl and nose section molds are clamped or bolted together before layup starts. You should gel coat and apply one thickness #LP1240 and one thickness #181 or equivalent for top and bottom. The

Left: Completed cowling thing with holes for mechanical protruberances. Right: The plaster mold over which the canopy "cuff" is laid up. The outside of the finished article must be sanded smooth. The inside fits canopy.





Translation: Charging jack at upper left. Molded nose section stops just in front of jack and fastens to the nylon angles at center left. Latter are cut from Midwest control horns and tapped 2-56. Cowl mounting blocks at top of engine mount are  $\frac{1}{8}$ " nylon and tapped 2-56.  $\frac{1}{4}$ " nylon hook on motor mount serves as top bearing for nose wheel strut and rubber band hold-down for fuel tank. Big holes in motor mounts for Merco . . . smaller foxholes for Fox .59. Nose wheel tiller is standard Top Flite with arm lengthened. Nose gear "boot" is G.E. "auto seal" to keep foreign material (dirt) out of coil spring. Nose wheel is big DuBro hub crammed in little DuBro wheel. . . .

cowl should have four to five thicknesses LP1240, applied in small overlapping pieces, and should weigh about 3 ounces when finished, without cut-outs for engine. The nose should have about five or six thicknesses LP1240 with extra cloth in the firewall and around front corners. The finished nose section should also weigh about 3 ounces, and the firewall should be between  $\frac{1}{16}$ " and  $\frac{3}{32}$ " thick.

The wing construction is conventional. I make spars first, egg crate with ribs, paint glue in joints, checking alignment frequently. I've tried various leading edges. The all-over sheet is a must for me. I like to leave the wing blocked or jugged in alignment for several days cure after the last gluing.

About ailerons. I don't happen to like strip ailerons, although I readily admit they're efficient, light, easy, and all. I seem to have a rule I unconsciously follow in model building — if there's a hard way, seek it out and do it that way. I've used top hinged conventional ailerons of 11 $\frac{1}{2}$ " and 14 $\frac{3}{4}$ " span. Both were satisfactory. The large ones produced a faster roll rate and had to have travel restricted for smooth flying. The small ones had to have more travel for acrobatics, of course, but seemed to make for less twitchy normal flight.

I mentioned earlier that I recommend bolts or camlock wing mounting, but I haven't settled on a system yet, and none is shown on the plans. If you figure out a good one, let me know. When I used rubber bands, I had them pass through holes in the nose section's small formed bottom bulkhead, secured by a

half round aluminum bar passing through the bands inside, but not projecting through the sidewalls of the nose section. The bands then hooked over  $\frac{3}{32}$ " steel pins looking aft, anchored in the plywood bulkhead at the trailing edge station. "D" shaped holes in the fuselage bottom immediately aft of this bulkhead allowed access to the steel pins. About the best thing you could say for the arrangement was that it was out of sight and oil for the most part.

The stabilizer and fin bolt on as the drawings and photos show. This is another fetish with me. I just gotta be able to take everything apart or I'm not happy. The same applies to the canopy. When I try to glue a canopy on, all I get is trouble. So I bolt it on and live happily ever after. The cuff is fiberglass finish, painted white first. I accidentally discovered that a white epoxy glue, "Devcon 2 Ton" by name, attacks neither paint nor canopy, and can be smoothed and cleaned up with water, of all things. Maybe all epoxy is so, I don't know. (Ed's Note: Most are — epoxy is a hydrocarbon or something.) Anyway, you smear to your heart's content gluing canopy to cuff, and when finished, the excess can be banished handily with a damp cloth, and the glue forms its own fillets. How sweet it is!

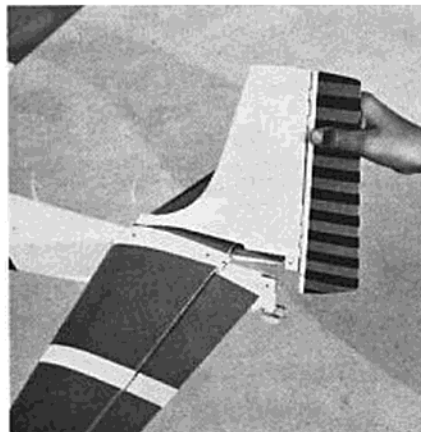
The 2-56 machine screws for the canopy screw into small tapped blocks of nylon epoxied inside the top shell. The nylon is self-locking, and the battle of the bulge is won. The stab is mounted with two 4-40 steel machine screws into nylon blocks secured to the fuselage sides. If you have good luck gluing on

tails and canopies, disregard the foregoing.

In the engine room — the mounts are made from  $\frac{3}{8}$ " or  $\frac{1}{2}$ " hard aluminum sawed by jig or bandsaw. I use a disk sander faced with medium carborundum paper to true up the engine mounting faces. Drill and tap holes and mount engine. I plug engine intake, exhaust, and other openings with modeling clay before grinding rear surface of mounts to proper thrust angles. In this way, a true surface on both mounts is easily obtained. The other sawn edges can be finished separately with file or any convenient tool.

The aluminum plate between engine mount and firewall protects the fiberglass. The aluminum engine mounts make a good engine heat sink and without the plate, the heat, vibration, and oil tend to soften the firewall.

I use two tapped  $\frac{3}{16}$ " square aluminum bars on the back side of the firewall that span the 4-40 engine mount bolts and the nose wheel bracket bolts vertically. Once in place, retained by the wheel bracket bolts, the bars permit the engine mount assembly to be put on and off at will without fumbling inside with blind mounting nuts or what have you. The bars also reinforce the firewall. I've never had a failure with this system. The bolts that pass through the firewall should be tightened after each of the first few flights. Soon they will settle in place and need no attention other than an occasional check. I use no lock washers on the engine or mounts.



The tank mount is sheet aluminum with a flat sided hole for the cork, mounted with two 4-40 machine screws into the flat front ends of the motor mounts. It is bent in such a way as to provide spring pressure to the rear when the tank is installed.

The cork is turned down from a #4 rubber laboratory stopper. Find the center and drill a #44 hole. Insert a length of  $\frac{1}{8}$ " music wire and chuck in a drill or lathe. Make at least a  $\frac{1}{8}$ " cut with medium and fine sandpaper blocks to a diameter suitable for the neck of your bottle. Reverse, and leaving a  $\frac{1}{8}$ " shoulder, cut to approximately  $\frac{3}{16}$ " diameter to fit the

hole in the tank mount. Cut flats back to the shoulder with a sharp knife or razor saw. Shorten cork to taste. Drill another #44 hole for vent and use center hole for supply. I silver solder tubes together to prevent vent from rotating, and insert in cork from rear. The neck should be cut off the 8-ounce bottle back to the raised rim at the base of the threads. With this tank arrangement, I never connect the fuel line until I am ready to start for obvious reasons. Choking is not necessary. A few drops of fuel in the exhaust port start the engine readily, and once running, the fuel pressure of a full tank seems to present no problem. This applies to the Merco 49 or 61. I can't testify about any other engine except the Fox .59, but it started and idled well enough with this arrangement.

The cowl fits closely, and the engine location must be right or you'll have trouble passing the cowl back over engine and mounted tank. The cowl is secured by four 2-56 machine screws in tapped  $\frac{1}{8}$ " nylon blocks bolted to firewall from behind. Also, four 2-56 machine screws go into angle brackets of nylon cut from the control horns in a "Midwest Builder's Accessory Kit." These are tapped and bolted to the fuselage nose section just forward of the fuselage joint. To assure locking, tap in a slightly undersized hole.

The landing gear is a stock design.

I used  $2\frac{3}{4}$ " main wheels on the light airplane and 3-inches on the heavy one, with DuBro brakes.

As for equipment, the first Hammerhead used an Orbit 10 and transmits. I have had a Logictrol 7 going for about 5 gallons now and I'm sure glad I waited for this. I had delayed the proportional plunge 'cause I never saw anything that inspired my confidence til K C last year. My rig has been absolutely perfect. I haven't done a thing except install, fly, and charge batteries. I've never had a glitch or other malfunction and I'm sure I'm the envy of all the boys in the neighborhood.

Learning to fly was no particular problem, but at this point, it still works better than I do, although I'm gaining. I think the transition was eased by the superior location of the elevator trim lever. Us excreeders can gain quite a bit of confidence from having at least one of the up handles where it ought to be.

Speaking of trim, the servo resolution is fantastic. I made some "click stops" out of  $\frac{1}{16}$ " sheet teflon for the trim pots with notches about  $\frac{3}{16}$ "ths apart all along and a slightly bigger notch in the middle. So help me the airplane responds to every one of those notches, and the middle is always the same the same the same. . . . Try that on yore ole brand X proportional.

Incidentally the first couple of times out, I was eager and went in marginal weather. I was caught in the air by rain twice with no adverse. I have heard that some proportional systems don't like humidity or rain in the face . . . or was that an Indian?

Forsooth, mayhap you will notice other non-standard knick-knacks in the photo. The piggy backer is Fielding's Flitetime Figurer. You see I get carried away and can't remember numbers of flights so I don't know when to quit. (I have been known to outlast batteries.) With this Jim dandy 4 ounce accessory, that is all in the past.

The watch is a Galco 12 hour Register that starts and stops by pressure on the stem. It has a big black hand that counts seconds and a smaller red hand that counts minutes on the big outer dial. The littlest hand counts hours up to twelve. To use, you start the watch when turning on TX and RX and stop it when you turn off. Thus the watch cumulatively totals system on-time during a flying session. I arbitrarily quit after 2 hours.

The outer white dial ( $\frac{1}{16}$ " teflon again) with three pointers is manually indexed to the red minute counting hand and can be used for timing each flight. Reading clockwise, when the first large red pointer is the index or start, the small black pointer indicates three minutes or don't pass go, don't collect \$200.00. The other large red pointer indicates 11 minutes or end.

Reset to zero is done at end-of-session with a probe in a small hole on top. I found that if I left that second button exposed, I couldn't leave it alone, and wiped myself out.

Some aluminum golf-tee-shaped handles with serrations around the edges were better for me than the standard levers.

The black holey thing under "off" is for the neck strap. It's made out of a Midwest nylon rudder horn dyed black. There's another one on the upper left hand corner. That's for alternate hooking to provide a more convenient carry when you have to portage both transmitter and plane on a windy day with greasy hands. It's also handy for dual instruction when you or he don't trust him enough to let him hold the box all by himself.

The aforementioned, on the upper left is attached to an aluminum block to which is epoxied a female Dean's plug, the parking place for the shorting plug so you don't lose it so much.

The shorting plug has a  $\frac{1}{4}$ " inch dowel epoxied on to provide a handle and its streamline shape makes for easy polarity reference. It also covers up those bare wires across which I would get some metal object sooner or later. But the four small holes still allow access for metering. It's painted yellow for the frequency, for finding when it's lost, and because it's pretty. (It's finished by the Hobbyoxy Easy-Does-It Method, as is the watch box, made of  $\frac{1}{8}$ " plywood, ho ho.)

The strap from the dog leash store is modified. It's something I started using long ago after a greasy handed transmitter drop cost me an airplane. I think it makes for steadier flying, too, especially propo. Besides one of my arms is put together with screws and I'm really only half safe, graspwise.

So ends the gripping story of "One Man's Transmitter." In a way, I'm sorry that E and K are raising L because soon everybody will have one and I won't have an edge anymore. But back to the Hammerhead. . . .

The last thing I do is cover and paint, after all structures have aged. The fuselage, at the stage described earlier, is ready and two coats of color should do it.

The wing and tail get a coat of Hobbyoxy clear on bare wood, after the final sanding. Twenty-four hours later, I brush or smear on a coat of Stuff. Sand away all Stuff possible with a block or pad, always. Spray a very light coat of Aero Gloss clear. Incidentally, I understand that all dopes are not completely compatible with Hobbyoxy, but I've never had any trouble. Then lay on wet silk and work taut and wrinkle free.

Control drying while working with a judicious hand atomizer spray of water. When satisfied, let the surface get almost dry and brush dope first around edges and then over all, avoiding heavy brush marks or accumulation of dope. Leave it alone for 24 hours. Trim. Brush or spray a fairly light coat of dope. Sand with fine sandpaper. Using a brush and very little dope, secure any frayed edges, et cetera. Spray another light coat of dope. By now, the surface should be sealed and smooth. Put it away for at least 72 hours. Apply a coat of Stuff and sand. If needed, give another Stuff coat and spot any stubborn with full strength Stuff. Wait another 24 hours. Do final fine sanding. Use a tack rag. Spray coat of Hobbyoxy color. Wait 24 hours. Wet sand with very fine paper. Stuff any holes. Wait 24 hours. Touch up stuffed holes. Spray final coat of color. Cuss all trapped dirt. Put it away for as long as you can stand it, hopefully a week, but at least 24 hours.

If you want stripes or whatnot, use bond paper underlying all but  $\frac{3}{16}$ " of  $\frac{1}{2}$ " cellophane tape in applying masking, and spray. As soon as paint sets up — 15 minutes or so — remove masking. Be extra careful with tape if you couldn't wait a week because it can pull the green finish right off.

Now you rub. The longer you let the paint cure before starting, the better. Use fine rubbing compound, and finish with Wright's Silver Cream. Any extra big dirt may have to be etched away with a sharp knife or small bit of sandpaper before the final rub and wax.

Balance. On a level surface, with fuel tank empty and main gear as shown on plans, balance so that tail just stays down when put down. As soon as any fuel is added, nose should come down. With fuel tank empty, support airplane by the tip of the prop and a flexible connection like tape to the top of the fin. Wings should be level. Add tip weight if required. The first Hammerhead refused to do tailslides, falling off to the left consistently. When balanced as above, by adding  $\frac{3}{16}$  ounce to the right wing tip, tailslides were as consistent as anybody's. I used all the heavy sticks in the right wing of the second one, and lucked out, needing no weight for balance.

I recommend starting with control surface travel as follows: Elevator—with root trailing edge centered on reference line — Up is  $\frac{1}{2}$ ", Spinup is  $\frac{1}{2}$ ", Down is  $\frac{1}{2}$ ", Trim up is  $\frac{1}{2}$ ", and Trim down is  $\frac{1}{16}$ ". An RCA printed circuit board inside the elevator servo with a micro switch on lowest engine gives Spinup. Rudder travel is 1 to  $1\frac{1}{2}$ " R and L depending on spin results. Large ailerons move  $\frac{1}{2}$ " up and  $\frac{3}{16}$ " down at the root. Small ailerons move  $\frac{3}{16}$ " up and down.

Wing: Span 67", root chord 14.25", tip chord 6.5"

Area 705 sq. in., 4.9 sq. ft.

Loading .1475 oz. per sq. in., 21 plus oz. per sq. ft.

Dihedral 4°, incidence 0°. Airfoil: 2415 modified, thickness: 14%

Aileron area 75 sq. in., 10.6% of wing area. Span  $14\frac{3}{4}$ "

Stabilizer — Elevator: Span 28", root chord 7.5", tip chord 3.75"

Total area 157.5 sq. in., 22% of wing

Elevator area 35.75 sq. in.

Airfoil, symmetrical, thickness 13%

Incidence 0° to plus  $\frac{1}{2}$ ° (empirical)

Fin-Rudder: Height: 8"

Approximate Area Total 50 sq. in.

Rudder: 20 sq. in.

Thrust: 2° right, 0° to  $\frac{1}{2}$ ° down (empirical)

If rigged and balanced as suggested, your ship should fly off in a slight climb with full up trim. Be ready to steer with aileron and curb the climb if it's too steep.

Good luck and Happy Hammerhead.