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RCM radio control MODELER

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THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

R/C MODELER

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THIS MONTH'S COVER: Judy Mosier admires two magnificent old-timers - - - an R/C Curtis Condor built from Sid Morgan plans, by Ken Long of The El Paso Radio Controllers, resting on the top of a totally restored 1936 Rolls Royce. Ken's Condor is powered by two .40 engines, guided by a Hobby Lobby radio, and took ten months to build. Ektachrome transparency taken at El Paso International Airport by Warren C. Weaver.

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FROM THE SHOP

DON DEWEY

● Are you tired? Run-down? Overworked? Perhaps there's a reason why.

We have come across some absolutely irrefutable statistics that show exactly why you are tired. And, brother, it's no wonder you're tired! There aren't as many people actually working as you may have thought; at least, not according to this recently completed survey.

The population of this country is 200 million, but there are 72 million over 65 years of age, which leaves 128 million to do the work. People under the age of 21 total 75 million, which leaves 53 million to do the work.

Then there are 24 million who are employed by the Federal government, and that leaves 29 million to do the work. Thirteen million are in the Armed Forces, which leaves 16 million to do the work Deduct 14,765,000, the number in the State and City Offices, and the 520,000 in hospitals, insane asylums, etc., which leaves 715,000 to do the work.

But 462,000 of these are bums or vagrants who refuse to work, so that leaves 253,000 to do the work.

Now, it may interest you to know that there are 252,998 people in jail — so that leaves just two people to carry the load. That's just you and me, brother, and I'm tired of doing everything myself.

• • •

The preceding was purloined from the 'Clanking Armor' of the Lincoln Sky Knights Newsletter and I thought you'd enjoy it. And speaking of overworked — whatever happened to the nice little 40 page magazine we started back in 1963? Somehow it's developed into a monster with a record high of 168 pages in this issue.

And, since we carry 50% advertising, that means 84 pages of editorial material devoted exclusively to R/C — more actual R/C material than all other magazines combined together!

On top of the monumental task of putting out an issue of this size, and despite any propaganda you may hear from the Chamber of Commerce, it rained the entire month with the exception of two days. On one of those days I ventured outside of the city limits of Sierra Madre (which I rarely ever do) to go slope soaring at the beautiful R/C Bee's field in Orange County, with Ron Neal and Carl Maas.

This was really exciting! The wind was blowing 30 to 40 mph, the temperature was approximately 40 to 45 degrees, and we were standing on top of a mountain top flying Hobie Hawks and Gryphons. You can imagine the chill factor at that temperature and with that wind velocity! In three hours I managed to stack in an equal number of aircraft. Each crash was due to pilot stupidity but, you can imagine the inner thrill the two guys from RS Systems experienced when I screamed "radio failure" each time I put one into the side of the mountain. Since it was their sailplanes, equipped with their radios, this endeared me to them forever! The high point of the afternoon was watching Ron Neal do the FAI power pattern with his Gryphon and then execute a beautiful downwind landing with a 40 mph tail wind. The landing, by the way, was inverted and on asphalt! By the time we left, we were gathering up pieces of five sailplanes in a giant trash can baggie.

The R/C Bee's consist of some of the nicest guys in the hobby and with one of the most beautiful flying fields I have seen. I just can't understand why they offered Ron and Carl $100.00 each to make sure I didn't fly there anymore . . .

On the only other day that it didn't rain during the past month, I set up to spray a Hughes 500 helicopter body which had been carefully primed with Superpoxy primer and then sanded until it was glass smooth. After mixing the two part epoxy paint, I broke out my super exotic spray gun, which is guaranteed to almost paint your airplane for you, hooked it up to the compressor, and the darn thing blew 60 pounds of pressure back down into the pot and splattered paint all over me, the shop door, and the ground. After taking it completely apart, carefully cleaning every bit of it in M.E.K., the thing still didn't work. By this time, ominous dark clouds were rolling back in and I had no choice but to break out the little Binks Wren airbrush.

Now, using a tiny airbrush to paint a large helicopter fuselage with a base coat of white epoxy is not exactly the recommended procedure for fast and efficient coverage. After about two hours, the job was finally finished, in spite of the fact that it was so dark I could hardly see what I was painting. Just as I finished the last pass with the airbrush, a low flying bird did his thing on the wet paint! That topped off an otherwise rotten month!

They call Ken Willard the Chief Sunday Flier. Me? I'm the Grand Hacker - - - if you don't believe it, ask just about anybody . . .

●

This month is our Toledo Conference issue where we will try to take you on a photo tour of the greatest R/C show on earth. And we're not kidding! This show is so big, so overwhelming, that it's virtually impossible to see it all, much less present it all to you in a single issue. With six RCM staff members in attendance at Toledo, and with virtually hundreds of pictures taken by Dick Tichenor, we've had the task of selecting the best photos and presenting them in a random "walk-through" fashion in order that you can get some idea of what this fantastic show is all about. We couldn't possibly present all of the photographs of all

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RADIO SPECTRUM

BY JIM ODDINO

● I received a call from my good friend Frank Capan the other day just after he had read the April issue on the expanded scale voltmeter. He said, "Hey, that was a great article. What did it say?"

I told him I didn't think any of the words were too tough and he ought to read it again. A few days later he called and asked when he could come over and get "his" meter because it sounded like it might do him some good.

Frank's original comment is typical of many I've received. Many of today's modelers don't seem to have that desire to learn more about the things that can make the hobby more enjoyable like we did years ago. I guess it's because the equipment has improved so much that most people are satisfied. Oh, they're happy to take something if you hand it to them on a silver platter, but if it requires work, well that's not for them. I maintain that if you **don't** work, **don't** make a few mistakes, and always wait for **someone else** to figure things out, you won't learn as much as you could have and you'll enjoy the hobby less. In fact, if everyone took that approach we'd have no progress and we'd all remain "novices" relative to what we could achieve.

I recommend you read everything you can get your hands on and ask all the questions you can think of. You'll be surprised how the pieces will fall into place and you'll find out a lot of what you thought was a big mystery is actually straightforward.

With that introduction, let's look at our first letter of the month.

Jim:

I have read your articles with anticipation. I expected to see some solid construction articles on equipments that are urgently needed – Charger/Discharger, Receiver (low cost), Expanded Scale Voltmeter.

Your April issue article is full of holes; what is wattage rating of 2K and 10K variables; what information is given on shunting for meter movements; calibration information is vague. Why don't you write complete articles that a **novice** *(not an engineer) can build.*

E.G. Wehrle
Canonsburg, Pennsylvania

Well, what can I say? I told you in an early issue that I wasn't going to prepare construction articles. What I **will** try to do, is present items that I think you might be interested in, discuss how to use them, give a general description of what is required to accomplish the task and give you a **schematic for one way** of accomplishing it. If such an item is available on the market, I will tell you about it and discuss its pros and cons.

We have discussed expanded scale voltmeter battery testers which can be used to discharge batteries and we discussed battery charging. When a receiver comes along that will be an improvement to the state of the art we will discuss it.

I thought the April article was too long as it was and to discuss meter shunting and voltmeter calibration in more detail would have made it worse. Any potentiometers you can get will have adequate power rating. Power is equal to I^2R, E/R, or EI. For example, for the 2K which is set at about 1K, $P = (.001)^2\ 1000 = .001$ watt.

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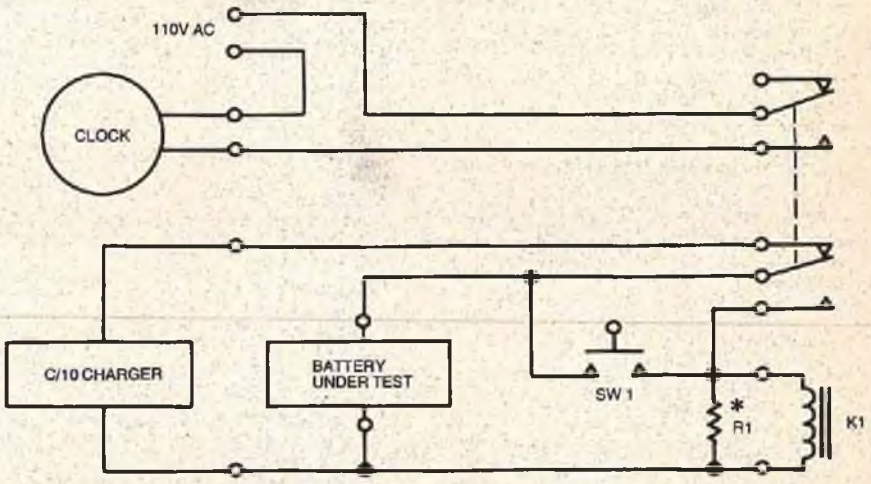


SW1 — NORMALLY OPEN PUSH BUTTON. PUSH TO START DISCHARGE.

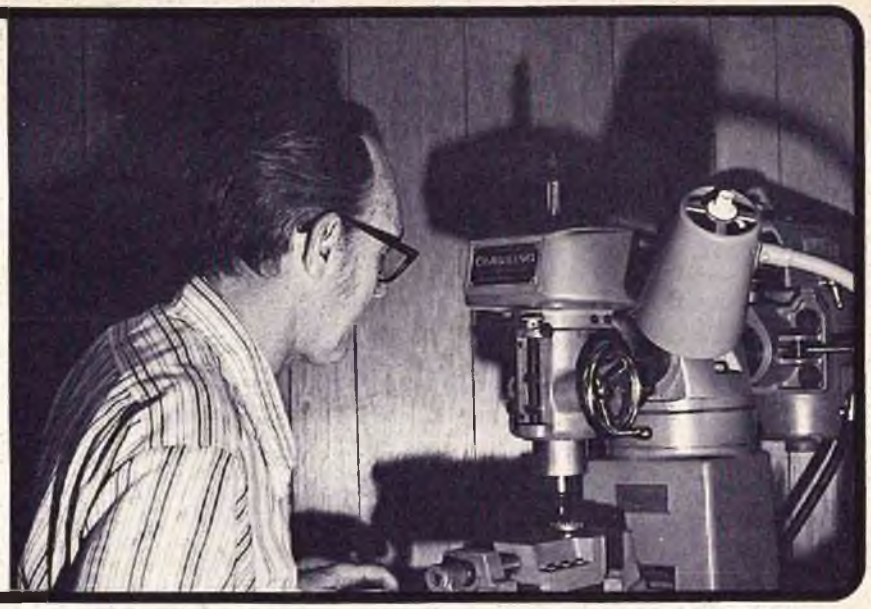
R1 — LOAD RESISTOR. VALUE DEPENDS ON RESISTANCE OF K1 COIL. TOTAL RESISTANCE ON FOUR CELL 500 MAH BATTERY SHOULD BE 10 TO 20 Ω.

K1 — DPDT RELAY. RELAY MUST BE ADJUSTED TO DROP OUT AT 4.4 VOLTS FOR 4 CELL BATTERY OR 9.2 VOLTS FOR 8 CELL BATTERY.

FIGURE 1: BATTERY DISCHARGE TIMER/CHARGER

engine clinic

By Clarence Lee



Dear Mr. Lee:

On the subject of the general maintenance of Model Aircraft Engines, the dismantling and cleaning of our engines, I believe would be of interest to all of us.

If the subject has not been covered previously, perhaps you would comment on the beneficial effects, if any, of using an ultra-sonic cleaner manufactured by the Heath Company.

Especially, I would like to know what cleaning agent(s) should be used, and for which parts.

Also, will the ultra-sonic cleaner remove varnish?

Are there any parts (i.e., glow plugs, or bearings) which should not be subjected to this method of cleaning?

It is possible, I presume, that the ultra-sonic method will damage plastic parts.

Once the cleaning process has taken place, should one use 3-in-1 oil, for example, in reasonable amount during the re-building stage?

Yours very truly,

J.W. Halls
Ottawa, Ontario

Dismantling and cleaning of our engines was covered in an early column and reprinted in the RCM Anthology Library book "The R/C Engine — Volume I." Since the writing of the original article the ultra-sonic cleaners have become more popular and I have been receiving quite a few inquiries regarding their use in the last few months.

I do have and use an ultra-sonic cleaner myself but do not claim to be an expert on their use. I can only report on my own findings.

There are many small units available such as the Heathkit, those sold by Edmonds Scientific Labs, and even the small dental plate cleaners. The Branson Co. puts out a complete line which they call Bransonic Cleaners and I have one of their model number 220's which is large enough for several complete engines. Some of the smaller units are fine if you are only going to clean bearings, or a head, etc., but most modelers interested in ultra-sonic cleaning of their engine will require a unit large enough to hold a complete crankcase, crankshaft, etc.

Ultra-sonic cleaners are fine for many applications. I use mine more for restoring the old time ignition engines I collect, than anything else. The ultra-sonic cleaners will clean up an old gunky crankcase so that it sparkles like new. They will remove old oil accumulation, varnish, and even rust, if the appropriate solutions are used. They will not remove corrosion stains on aluminum, and I have never found a solution that will do so. If any readers know of such a solution please let me know.

Just about any type of solution you would normally use to clean parts can be used with these units. Heat is generated by the action of the ultra-sonic cleaning so you do not want to use any volatile solvents such as gasoline, lacquer thinner, etc. Kerosene mixed 50/50 with light oil can be used for cleaning ball bearings. I have tried just about all of the commercial cleaners and have found ordinary automatic dishwasher detergent to work as good as anything. The brand I use is Cascade. It works best when very hot. The cleaners, themselves, generate heat with use but it takes an hour or so for them to get really hot. The solution to this is to purchase one of these small heating units intended for heating a cup of water to make coffee, tea, etc. They are inexpensive and will heat the solution in your ultra-sonic tank right now. Some of your more expensive ultra-sonic cleaning units can be had with built-in heaters and if you purchase a unit that has this feature I certainly recommend getting it. The Bransonic 220 that I purchased came with or without the heater. I purchased mine without because I was told the units would get hot enough on their own. This is true if you want to wait an hour. But many times when you want to do a job right now, the heater is a convenience. The ultra-sonic cleaners work best with distilled water or tap water with softeners or a wetting agent added. Most of your automatic dishwasher detergents contain these additives.

Ultra-sonic cleaning will remove all of the carbon, varnish, and gunk from your engine. It will not remove the baked on varnish formations on the head that have practically become part of the metal. For this you still have to use Sunbeam "Metal-kleen" available from any Sunbeam appliance dealer. And please guys, don't write and ask me where the nearest Sunbeam appliance dealer in your area is. Drag out your phone book and look him up!

There is one shortcoming of ultra-sonic cleaners that does effect their use for the job most of you intend. After you stick your prized engine into the ground and it is covered with sand, mud, or whatever — can you clean it up in an ultra-sonic cleaner? Not too well. The cleaners do not have any means of filtering the solution so, although they will remove all of the foreign residue from the engine, it still stays in the solution that is being used to clean the engine. All the rocks, sand, etc., are all still in the cleaning tank and solution that also contains your engine parts. So, a thorough flushing with clean water is a necessity. In the case of ball bearings, they are going to have to be flushed in clean solvent by hand or run through the ultra-sonic cleaner again with clean solution. Supporting small parts such as this in a wire strainer off of the bottom of the cleaner tank helps considerably, allowing the heavier sand and rock particles to fall to the bottom.

All parts of your engine can be cleaned by the ultra-sonic process. I don't believe it will harm any of the hard plastics, although my use in cleaning plastics has been limited — mostly to Perry carburetors which it does not harm. You would be surprised at the foreign material that can be gotten out of a carburetor that would otherwise be

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CUNNINGHAM ON R/C

BY CHUCK CUNNINGHAM

● It must be a sign that this Hobby/Sport is coming of age. The gadgets, and gimmicks that line the hobby shop shelves are almost uncountable. There is a "whatsit" to do almost everything. Some items are status symbols, and some items are something that you simply cannot do without, and you wonder just how you were able to get along before the item was invented.

Yesterday afternoon I was enjoying a simple, fun-filled Saturday afternoon of flying with a few friends. A relatively new flier, and friend, pulled up at the flying field, and unloaded his bird — a beautifully constructed and painted pattern aircraft. He got his plane ready for flight while I stood by and conversed. Then, as it came time for his turn to fly he pulled out a meter and checked his transmitter batteries. Satisfied, he then unloaded a different meter from his tool box and checked his flight batteries. Again satisfied, he fueled up with his electric fuel pump (no meter this time), put his glow plug clip on his plug and checked the meter on his starting battery to see if everything was in good shape. Finally, he picked up his electric starter, and fired the engine to life. Everything worked fine and his bird was off to the wild blue.

I walked back to my resting bird, hand cranked the fuel into it, hooked on the glow plug clip from the door bell battery, hit the prop a couple of licks with my finger, and got my finger knicked just a bit at the same time, and took to the air. The interesting thing is that the new flier is more correct than I am. He will know that, when he takes to the air, everything is working properly, while I just plod along trusting to my faith in my equipment. As Buck, the new flier said when he got on the ground again, and I was chiding him about all of his equipment and meters, "It's just part of the mystique of R/C. Just look how all of those meters look to the spectator, makes him believe that we're real scientific!"

• • •

The airplane that I was flying yesterday, and have been flying for the past several months is one that I have mentioned before. It is the fantastic Senior Telemaster, a German kit that is no longer in production due to the difficulty of getting long sheets of balsa in Germany. It has an 8' wing span, and is just about as ugly as an airplane can get, but is simply a ball to fly. It will take-off at one quarter throttle, and do just about anything in the air. I powered mine with an Enya IIIGB, which yanks this bird about the sky perfectly. Yesterday I was doing a rolling circle with it. I increased the aileron throw by the use of an EK extendable servo arm and, then, when starting into the rolls, hold full rudder all of the time that I am holding in aileron and feeding in up and down elevator. The reason that I am going on about this aircraft is that I sincerely hope that either the kit can be started up again in Germany, or someone in this country can get the kit rights to it and produce it here. Each time that I fly it someone wants to borrow the plans. It is really a shame that such a super fun machine is not any longer available. (*Ed's Note: RCM will be presenting the construction article and plans in the next couple of months, and kitting rights have been assigned by the author to an American company).*

• • •

I have received several letters in the past month asking the same question — to provide the letter writer with a list of all of the best four channel models the beginner could use to get started. Well, it is possible to compile this list, if several dozen modelers got together and compared kits, plans, ease of building and flyability, but this is what we try to do each month in our numerous kit reviews. But, the letters we receive always fail to mention just what the specific conditions are with the writer. What size engine does he have? On what type of flying field does he fly, or hope to fly from? How much help is there for him to draw upon, and so on.

There are so many really outstanding aircraft on the market today that you can almost read down the lists of models advertised in the pages of RCM and come up with a good selection. The real point is that someone seeking to get started in R/C should first observe what is being flown successfully at the local field in the way of trainer aircraft, and then ask questions of the local fliers. Then check with the hobby shops to see what they recommend. Just be sure that the kit that the hobby shop does push at you is similar to those that are in local use. Do some questioning, and some evaluation on your own. It really is impossible for us sitting behind a typewriter to solve all of your problems, We try, but we are limited as we simply can't test out all available aircraft. You would be well ahead of the game to spend $10.00 on RCM's Flight Training Course, Vol. I. It is the most comprehensive book for beginners ever written.

• • •

In the March issue of RCM I talked about pinning hinges to be sure that the moveable surface did not part company from the rest of the aircraft sometime in flight. Harold Weeden of West Belmar, New Jersey wrote me a letter telling of his method of hinging surfaces and it seems great so I would like to pass his ideas along to you.

"First pull the hinge pins from the number of Du-Bro or Klett hinges required for the job. Then drill them out to accept 1/32" music wire. Next cut 1/32" wire to the length of the surface to be hinged. Slide on the number of hinges that you wish to use and space them as desired. Next mark off and cut slots for the hinges in both surfaces. "Rat-tail file a groove in the fixed surface and round off the leading edge of the moveable surface. Next, if you are going to use plastic covering film, cut 3/4" strips and cover the fixed surface edge, making sure to get the plastic film in the groove, then cover the moveable edge. Line all inside surfaces and ends with film. Slit the film at the hinge slots and place the hinge assembly into the fixed surface and then place the moveable surface.

"You will now have a tight and true hinge line. Next, drill small holes – two per hinge half through the trailing and leading edge, 1/4" from the hinge line. Dip round tooth picks in Titebond and push through the holes. Cut off the excess on both sides and sand flush. Now cover both the fixed and moveable surfaces as one surface. Cut the covering flush with the fixed surface edge, then seal both seams with a sealing iron.

"This should give you a very true and neat system and, if you wish, you can extend the 1/32" music wire to the end of the fixed surface and bend two 90° bends so you can pull the hinge pins to make repairs or to change damaged surfaces, etc."

Thanks, Harold, for sharing your technique with us. No matter how you install the hinges on your aircraft, be **sure** that they are fixed so that they will not pull out under stress or age.

• • •

Last month we did some investigation into how to locate the CG of your model for various type of wing planforms. This month a letter asking for help dredges up a few more thoughts on weight problems.

"I purchased a Guillow kit, number 1004 Vought F4U-4 Corsair. I plan to install a Cox Medallion .09 engine. The plans in the kit call for only a control line version of the F4U-4 and I want to install a 3 channel airborne system. I would like some advice on how to strengthen the airframe in order to carry R/C gear, a powerful .09, and a 2 oz. tank by Perfect.

"I'd like to say from the outside that I am sure the total weight of the extra items, depending upon the mode which is best for a particular kit and for the type of operation you eventually end up with, will determine the preparations of the individual parts to strengthen the airframe as well as allow for protection of the R/C equipment and installation of same.

"I want to use the rotary throttle and the two basic control functions, rudder and elevator, as any other additions tend to make the model more for display purposes because of the extra weight. I'd like to learn

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THERE'S ALWAYS A BETTER WAY

Here is one RC'ers suggestions for a few of the problems that can be utterly frustrating for the lack of a simple answer.

BY R.J. SWARTWOUT

Here are a few ideas that I have found useful in my shop, and which may prove of value to you.

First, you can give that Du-Bro EZ-Connector a little added security by using small diameter heat shrink tubing on either side and shrinking it up after final adjustments are made as shown in Figure 1.

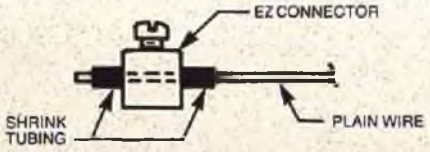

FIGURE 1

To securely hold non-threaded plain wire inside the inner nylon pushrod tubing, simply lock on a wheel collar as shown in Figure 2. This makes for a tight set-up and is always easily adjusted when necessary.

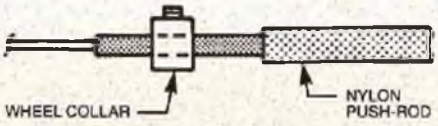

FIGURE 2

If you ever had the problem of "dropping" a nosegear out of your aircraft while in flight, you will appreciate the following suggestion. Slip a tight rubber grommet onto the top end of the landing gear wire that extends above the gear mount to prevent losing the gear if the set screw in the collar happens to loosen up from vibration during flight. See Figure 3.

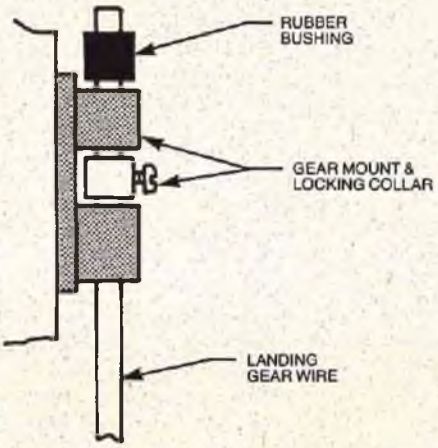

FIGURE 3

If you fly with a K & B .40, you can extend the short needle valve by heating up a piece of inner nylon pushrod tubing and pressing it on to the valve extension, using a dab of epoxy to secure it in place. The ribbed inner rod makes a good finger grip as well as a handy extension. See Figure 4.

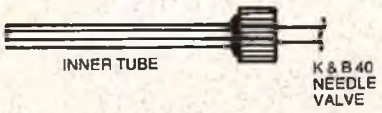

FIGURE 4

If you want a simple way of securing pushrod ends in control horns, and the like, use a small length of thermoshrink tubing, taking care not to melt the nylon when shrinking the tube. Figure 5 shows you how.

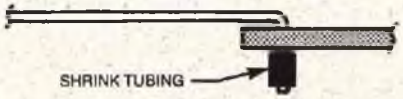

FIGURE 5

As shown in Figure 6, a threaded stud, epoxied in place with a short length of inner pushrod tubing, makes a handy and secure fastener for mounting a variety of parts. The ribbed inner rod provides a good finger grip.

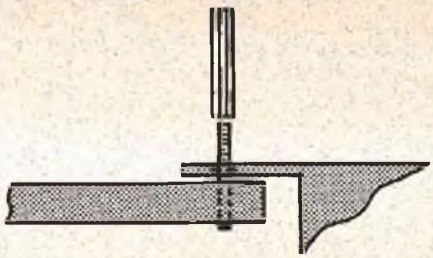

FIGURE 6

If you like the rakish, jet-like look of the Midwest Strikemaster, also featured as a construction article in RCM, but you are not inclined towards shaping the bombs for this ship, try the suggestion detailed in Figure 7.

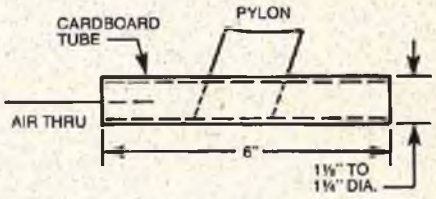

FIGURE 7

Using cardboard tubes, such as those that kite string comes on, you can come up with a relatively good looking pod. Insert the plywood pylon through a slot cut in the tube and let it bottom out for a good epoxy joint on the inside top and bottom. Cover the pod with wing covering material and paint the inside black. Note minimum air resistance.

Need a supply of flexible washers? Try filling a small diameter cardboard tube, such as containers holding lead for mechanical pencils, with RTV Silicone Rubber and, when it cures, you have a supply of elastic washers that just need to be cut off as required. As shown in Figure 8, cut off to the required length, peel off the cardboard, and there is a washer ready to use.

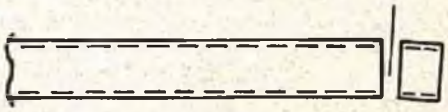

FIGURE 8

If you want an effective isolation mounting system, try filling a hole in a piece of wood with RTV Selastic and, when it cures, shave off the excess, drill a hole in the middle, and you have a virtually vibration proof, isolated mount. See Figure 9.

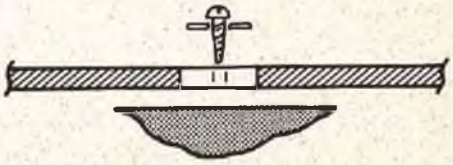

FIGURE 9

Those are just a few of the ideas that I found worthwhile using in my shop. I hope that one or more of them may solve a problem or two for you. □

QUARTER MIDGET

BY DON DOMBROWSKI AND FRED REESE

DON DOMBROWSKI

FRED REESE

● This month we will be talking about new products that were seen at Toledo and will be useful or of interest to Quarter Midget Racing enthusiasts. Don just got back from the Toledo show yesterday and appears to have aged some over the weekend! Toledo is not just a trade show, it is an **experience** as the airplane talk sessions go on 24 hours a day.

There were big crowds, as usual, in spite of really bad weather. There were only two Quarter Midget airplanes shown at Toledo this year, House of Balsa's "Miss Dara", and a new "Miss Cosmic Wind", a Skyglas kit from Bob Reuther's Hobby World. The mid-winged Miss Cosmic Wind design has done very well lately in races in Kentucky, Tennessee and North Carolina among some of the nation's fastest pilots. Bob's Miss Cosmic Wind is tailored to the competition in his area and builders may have to install a wider, contoured canopy to meet the rules in a different area — notably New York, Chicago, and California. As the picture shows, the airplane looks very good and is extremely fast, as are all of Bob's kits. The semi-kit consisting of fiberglass fuselage and foam cores sells for $49.95.

Rev-up props has added a new narrow blade, Speed Series 400 7/6 propeller to their fine line of props. We have been using their Speed Series 400 7/5, which is also new, and their 7/6 with good success and we expect the new narrow 7/6 will be very effective. Rev-up props are of very high quality, made from hard maple wood with a very smooth durable finish. All of the Rev-up props are shipped in one dozen packs.

This may be the year of the new engines as, at present, there are five new .15's about to hit the market. A lot of details are still sketchy, but these engines will be available later this year. Fox has introduced an all new front intake, Schneurle ported racing engine with large bore throttle and side exhaust. The engine has an exceptionally large crankshaft, rear ball bearing, and a cast bronze bushing in the front.

Fox has also released a new conical shaped spinner that will be available in all the same sizes from 1½" to 2½". The Fox spinner, in my opinion, is the best available in the small sizes for Quarter Midgets, but I sure wish Duke would make an adapter nut that would fit a Super Tigre .15!

Misjon Industries is importing a new front intake, rear exhaust .15 with Perry carburetor that is being manufactured for them by Rossi. I understand the engine runs very well but the price will be high.

Midwest Model Supply will be importing the Hornlein Profi .15 engine. The Profi engine has a front housing like a Cox TD but with a conventional cylinder and head. The carburetor is also quite unique.

Shamrock Competition Imports will be importing from Japan the very impressive looking HKI .15 which features rear intake, rear exhaust and Schneurle porting, of course. Shamrock will also be importing from Italy a new OPS .15, also featuring rear intake and exhaust, ball bearings, and Schneurle porting. all prices to be announced.

Bob Reuther and 'Miss Cosmic Wind.' Bare fuselage weighs only 6 oz!

Conversely it does not appear that we will be seeing an R/C ST X-15 this year.

As an accessory, Semco will be offering an exhaust extension for a ST .15 with a cut-out for the baffle. A very useful item.

From BWT systems comes the Acutak which was featured in a past Engine Clinic review by Clarence Lee. First of all it is very accurate and is very easy to read. Twelve rpm ranges are available by turning the selector knob. A broad range of 0-30,000 rpm and an idle range of 0-6000 rpm and, then ten expanded ranges from 0-30,000 rpm in 3000 rpm steps. You can easily see if a different prop or glow plug gains or loses a hundred rpm. The Acutak is a very useful tool and is available from your dealer or directly from BWT Systems, 4523 Keeler Drive, Columbus, Ohio 43227 for $99.95 plus $2.00 postage and handling.

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Yesterday I received a pleasant surprise in the form of a phone call from Bill Cooper back in Winston Salem, North Carolina. My wife and I spent a couple of weeks with Bill and Carnii in Kentucky two years ago. Last year the Coopers moved to Winston Salem and are managing a very successful little restaurant in that area. The Louisville, Kentucky region is very active in Quarter Midget racing but Bill says North Carolina is even more active, especially around Monroe and Charlotte. Bill's current airplane is a Miss Cosmic Wind which he has been developing since 1973. In fact, I even did some sketching on a preliminary

Bill Cooper and his Miss Cosmic Wind, powered by a 3 year old S.T. .15 and Rev-Up 7/5 Series 400 prop. 1:47 time on 2 mile course.

drawing while I was there. Bill's Cosmic Wind design has been very successful as they were first, second and sixth at last year's Quarter Midget Nationals at Rough River, Kentucky. Bill's airplane currently holds the record of 1:47 on an official two mile course. Bill said his 1:47 heat with D.C. May was the most exciting race of his life as they both were clocked at 1:47 but D.C. cut the last pylon on the last lap trying to nose out Bill at the finish. Bill also notes that his airplane is about 8 seconds slower with the engine cheek cowl removed.

Bill, as you probably know, is Executive VP of the NMPRA and is in charge of Quarter Midgets. Bill called me as he had strongly urged Quarter Midget flyers to join the NMPRA. Since then he has been thoroughly frustrated by NMPRA's uninterested attitude towards our racing class. As you probably know, Quarter Midgets are replacing FAI at the Nats.

Bill sent along a race report from Monroe from last October: First — Bill Cooper, Miss Cosmic Wind, ST .15 with Rev-Up Ser. 400 7/5; Second — Tom Baker, Minnow, ST .15; Third — D.C. May, P-51, ST .15; Fourth — Dave Pearce, Miss Cosmic Wind, ST .15; Fifth — Greg Doe, Minnow, ST .15.

Bill Cooper had the fastest time of 1:47 on the two mile course.

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Reprinted from the MARA Newsletter of Jamaica, New York.

"We have what is called the 'Standard Class' of racing QM which we gear to the advanced Sunday Flyer, the beginning racer, or the guy who wants to race, but not with the all-out types. Since this is a big drawing card for MARA, and since you may not be familiar with it, let me elaborate.

At the start of your racing with us, you decide which class to compete in. We have a board of referees that will move you up to the Expert Class if you turn out to be too good for Standard.

In the Standard Class, we stretch the AMA rules a bit to allow Mini-Sticks and other sport type aircraft to compete as long as all the other AMA rules are met. (Fuselage height and width, wing thickness and area, etc.) We have some pretty good flyers in our Standard Class. On a good day some of them are down around 2:20 for the 2 mile course. Last year, we found that consistency is more important than just going fast. Mark Weinstein can tell you all about that. Mark placed second in the Standard Class Season point total while averaging 3:14 and with a best time of 2:42. In case you are wondering what the average guy does, it's somewhere around 3:06 while their best efforts are around 2:33. As you can see, it's mainly for the fun and experience."

◆ ◆ ◆

George Zink, editor of the MARA newsletter would like to trade newsletters with anyone interested in pylon racing. The MARA newsletter is outstanding with many hints and technical articles. Write: George Zink, 80-28 222 St., Jamaica, N.Y. 11427.

◆ ◆ ◆

A handy hint for pylon racers and pattern flyers who do not like to take a lot of tools to the starting line comes from George Berko of Glen Head, N.Y. Epoxy a Sears screw driver tip from the screw driver attachment for a 3/8" drive ratchet wrench into the unused end of a four way prop wrench. One now has a combination prop wrench and screwdriver!

Another handy hint — this one suggesting the use of Hot Stuff — to seal edges of MonoKote trim and striping tape. Also, you can use acetone or water (if you get to it quick enough) to prevent fingers, etc., from sticking together while using Hot Stuff. □

RACING CALENDER

JULY

5	FI — Muir Field, Indiantown Gap Military Res., PA (IGMR)
6	QM — Muir Field, Indiantown Gap Military Res., PA (IGMR)
12-13	QM-FI — Fort Wayne, IN (CPC)
13	1/2A & SP — Centerville, VA (NVRC)
13	QM & Quickie — Tamiami Park, Miami, FL (Tropic Aero)
13	QM — Denver/Colorado Springs, CO (Pikes Peak RC)
19	QM — Charlotte, NC (CAM)
19-20	QM-FI — Montezuma, IA (Sig)
20	Quickie — Charlotte, NC (SEMPRA)
20	Quickie — Yorba Linda, CA (RC Bees)
20	QM — Bridgeport, CT (RCCC)
20	1/2A — Long Island, NY (LIRCS)
20	1/2A — Sunnyvale, CA (Pioneers)
27	QM — Du-Bro Mufflers Mile Square, Fountain Valley, CA (QMRC)
27	Quickie — Sacramento, CA (CMM)
7/28-8/3	Canadian Nationals.

AUGUST

2-9	Nats — Lake Charles, LA
3	Quickie — Whittier Narrows, CA (San Gabriel RCL)
3	Open Pylon — Sacramento, CA (CMM)
10	QM — Du-Bro Mufflers, Mile Square, Fountain Valley, CA (QMRC)
10	SP & Quickie — San Ramon, CA (EBRC)
16-17	FI — Chula Vista, CA (Chula Vista RC)
17	QM — York, PA (WSFS)
17	1/2A — Sacramento, CA (CMM)
24	Quickie — Sepulveda Basin, CA (Valley Flyers)
24	QM — New York, to be announced (MARA)
24	QM-FI — Chicagoland, IL (CPC)
24	FI-Sport — Detroit, MI (RC Club of Detroit)
26	Quickie — Valkari, (SEMPRA)
30-31	QM — Detroit, MI (Signal Seekers)
31	QM — Denver/Colorado Springs, CO, to be announced (Pikes Peak RC)

SEPTEMBER

6-7	Balston Spa, NY
6-7	Air Circus — Whittier Narrows, CA
6-7-8	QM — Rough River State Park, KY
13	Quickie-SP — Monroe, NC (SEMPRA)
14	FI — Monroe, NC (SEMPRA)
12-13-14	Reno National Air Races, Reno, NV
13-14	FI — Sepulveda Basin, CA (Valley Flyers)
14	1/2A-SP — Centerville, VA (NVRC)
14	QM-Quickie — Tamiami Park, Miami, FL (Tropic Aero)
21	QM — to be announced (MARA)
21	1/2A — Long Island, NY (LIRCS)
21	QM-FI — Woodland, IL (CPC)
21	1/2A — Sunnyvale, CA (Pioneers)
27	QM — Charlotte, NC (SEMPRA)
27-28	FI — Oxnard AFB, CA (Conejo Valley RC)
28	Quickie — Charlotte, NC (SEMPRA)
28	1/2A-SP — Centerville, VA (NVRC)
28	QM — Lebanon, PA (CPNA)
28	Quickie — Sacramento, CA (CMM)
28	QM — London, Ontario (Forrest City Flyers)
28	QM — Bronx, NY (Blue Angels)

□

FLYING PROFICIENCY PROGRAM

BY NORMAN STIRLING

Can you fly your airplanes as well as you can build them?

Has your flying ability remained about the same as when you got into R/C?

When you go out to the flying field, do you fly with some purpose in mind, or do you just punch holes in the sky?

If you fall into one or more of the preceeding categories, you've missed half the fun, pleasure, and feeling of achievement that the sport and hobby of radio control has to offer.

One thing that became apparent to me soon after I got the R/C bug, was the lack of interest that many R/C fliers exibit towards improving their flying ability once they are able to get their ship off the deck and back on it in one piece. In fact, there seems to be a plateau where many beginners are content to remain, once they are able to manage reasonably well on their own — a plateau where getting into the air and getting back down intact, appears to be the only challenges and accomplishments.

There is no doubt about it, building radio controlled aircraft is a great source of pleasure and satisfaction. No matter how you slice it though, the name of the game is **flying**. If it wasn't we could content ourselves by building plastic models at much less expense. And even though it is hard to beat the thrill of putting up a new plane, the feeling begins to dull after the first dozen or so flights, unless you have subsequent flying challenges sustaining your interest. If all you have to look forward to is the next airplane you are going to build, I personally think you are cheating yourself out of much of the real pleasure associated with this hobby.

The feeling of satisfaction and accomplishment that comes with learning to make your airplane do everything that it is capable of doing, and at your command, and knowing that you are its master in the air as well as on the ground, just can't be equalled. And yet, how many R/C fliers put the same dedication, effort, and attention to detail in learning to **fly** their airplanes as they do into building them?

After a year or so as a member of the Oshawa Radio Control Club, I began to agitate for some kind of flying program that would challenge and motivate our members to become more proficient fliers and, at the same time, allow them to have fun doing it.

Initially, there was some resistance to such a program. Nevertheless, after several months of lobbying and discussion, the membership began to realize that the purpose of a flying program was not to put them on the spot, or to make them competition fliers, but to maximize their enjoyment of the sport and to impart some purpose to the time they spent in the air.

Over a year ago our Flying Proficiency Program was approved by the membership. During the 1974 flying season it was initiated. Speaking for myself and for those members of our club who have participated in the program so far (whether they have been successful in earning their wings or not), I can honestly say that the examination sessions have evoked a type of spirit among the participants which few other club acitivities have been able to duplicate. I fully expect the spirit engendered by the Flying Proficiency Program will continue during the 1975 flying season. More of our members will earn their wings and, as a result, realize that there is a great deal of personal pleasure and satisfaction to be gained in learning to fly **well**, no matter what kind of aircraft you own.

The Oshawa Radio Control Club Flying Proficiency Program has its roots in the MAAC Wings Program — although it has been expanded considerably beyond that in order to provide additional levels of challenge to all members.

The Program is strictly voluntary and consists, essentially, of four flying proficiency levels that members can aspire to. Before describing these proficiency levels, the basic purpose of the Program is as follows:

(1) To provide an interesting and challenging flying achievement program that will encourage individual club members to improve their overall flying ability.

(2) To develop a core of competent fliers to assist new club members regarding all aspects of the sport that pertain to powered flight.

(3) To minimize safety hazards and accidents by encouraging all club members to develop better and more proficient flying habits.

(4) To encourage competition flying both within and outside the club.

(5) To make radio control flying a more meaningful and satisfying experience for all club members.

There are four flying proficiency levels — A through D. After successful examination at each level, beginning at Level A, a candidate will receive the appropriate wings which can be worn on a cap, jacket, or shirt. In addition, the current flying proficiency level, attained by each club member, will be recorded on the club membership list. The following is a description of the Flying Proficiency Levels.

A LEVEL: BASIC CONTROL

The candidate must demonstrate, on two successive attempts, during the examination period, his ability to:

(1) ROG or hand launch unassisted.

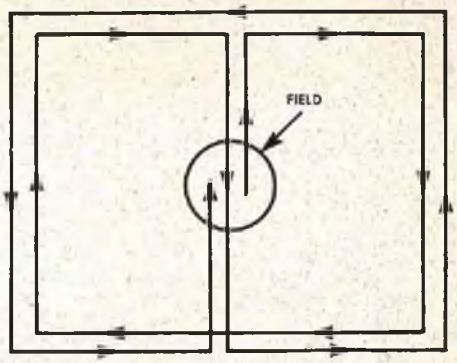
(2) Fly straight and level and maintain altitude.

(3) Execute right and left hand, 90 degree turns.

(4) Execute a 360 degree, left hand landing pattern.

(5) Land under power.

The candidate will fly the basic control pattern shown in Figure 1 in order to demonstrate the foregoing procedures. The candidate will, after becoming airborne, maintain a reasonable altitude and range, while being judged. The candidate will not fly over spectators, parked cars, or the pit area, while executing the pattern and procedures. The candidate must complete his pattern and procedure on the first try, during each of his two attempts.



BASIC CONTROL CIRCUIT

FIGURE 1

B LEVEL: INTERMEDIATE CONTROL

The candidate must demonstrate, on two successive attempts, during the examination period his ability to:

(1) ROG or hand launch unassisted.

(2) Fly straight and level and maintain altitude.

(3) Execute right and left hand, 90 degree turns.

(4) Execute two consecutive inside loops.

(5) Execute left and right hand, tight, 180 degree level turns.

(6) Execute a 180 degree, right hand landing pattern.

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This article is about a model building technique that should fire up your imagination for that pet project you have had stored in the back of your mind just waiting for a way of building it. This combination of foam and fiberglass, along with small amounts of balsa and plywood, can be modified to allow you to easily build anything that your mind can envision. It can be used to produce simple shapes, but it really shines when you find that you can produce a very complex fuselage with ease. Well, enough of the why of the technique, let me tell you a bit of the why of the model that is the subject of this construction article.

The first Styros was born 8 years ago when I was an Air Force F101B VooDoo pilot at Tyndall Air Force Base, Florida. I wanted a model that resembled the F101 without needing to be a scale project and one that would have good acrobatic performance. The first attempt at a nearly all-foam model was very successful from both an appearance and performance standpoint in spite of a near disaster on the first flight. This model even won honorable mention in the first RCM Design contest. The near disaster I mentioned came shortly after I advanced the throttle for take-off on my well used set of reeds. Many hours of vibration wear on my none-too-good solder joints finally parted the positive lead to the switch, shutting off all power to my radio. That first command was the last command for that flight and my shiny, new bird increased speed across the concrete and lifted off by itself due to the up elevator trim that was applied prior to the throttle advance. The aircraft climbed out like a homesick angel until at about 200 feet where it had become nearly vertical and out of enough horsepower to take it up any farther. The bird rolled over to the left, presumably because of engine torque, and headed for the dirt beyond the lip of the taxiway at Tyndall AFB picking up speed all the way because of the combined effects of gravity and full engine power. It hit the ground in two foot high grass, dead vertical and I knew that was the end of my sleek "TEE" tailed beauty. I didn't hurry over to sweep up the pieces because I knew they would be all there in one small heap whenever I arrived.

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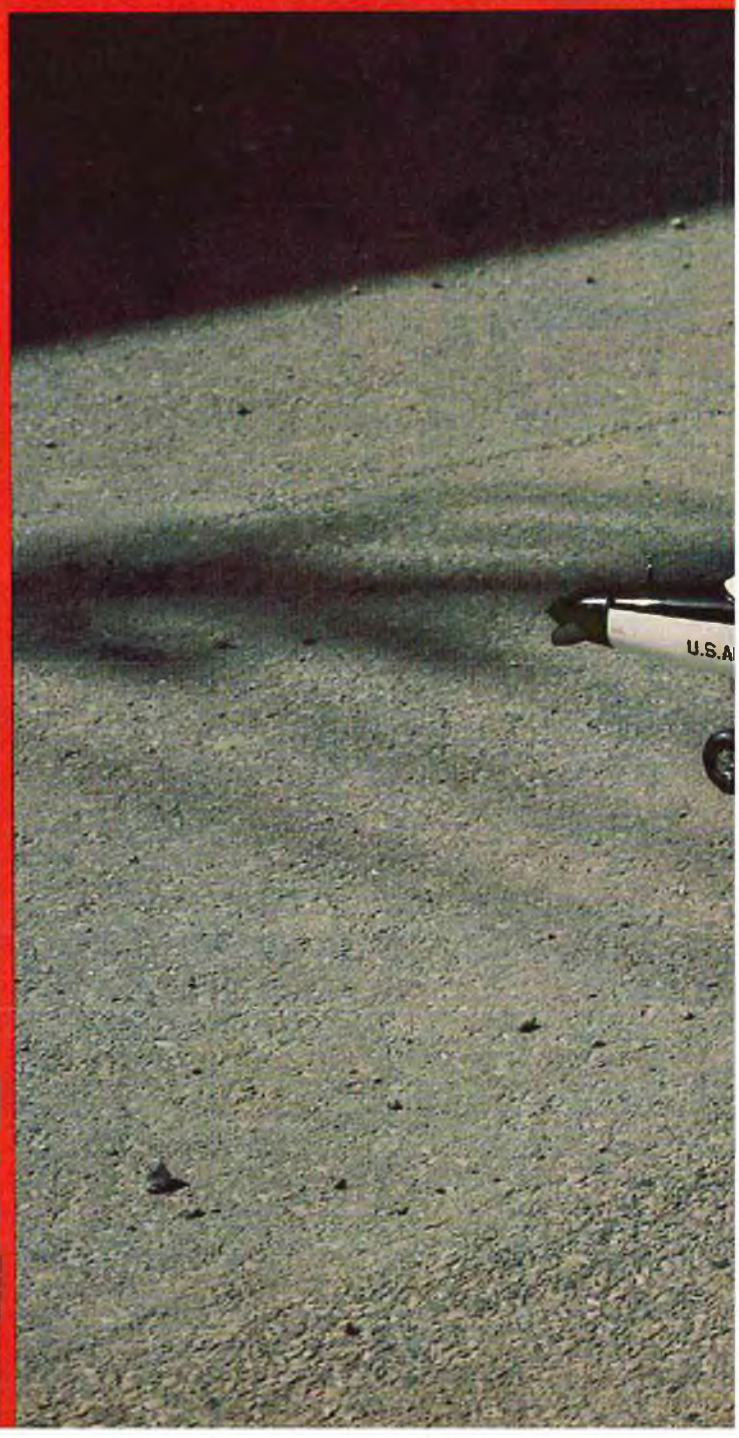
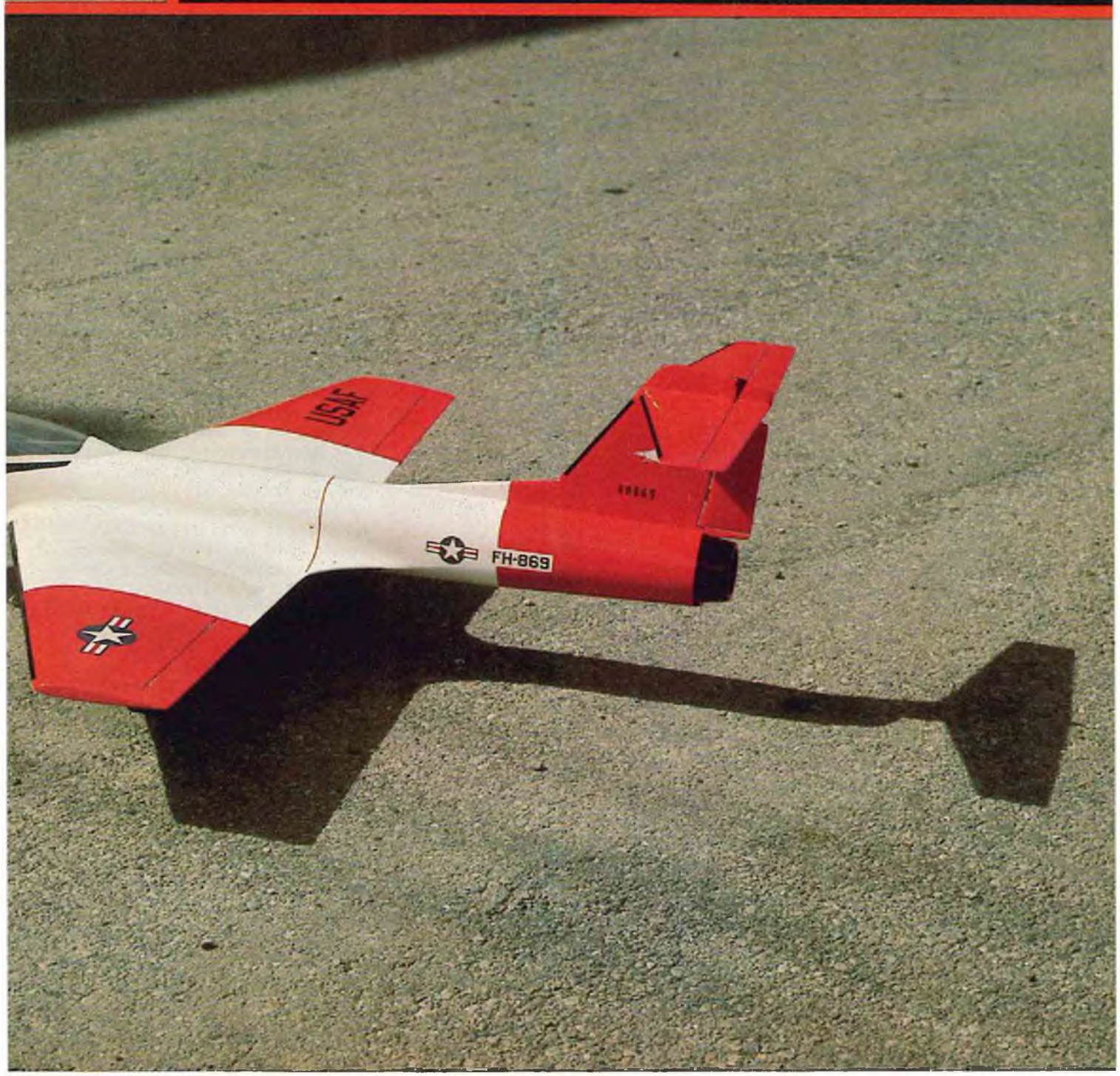


STYROS XV

Following his three part series on the use of foam as one of today's best ways to build a model aircraft, John D. Woods puts it all together in this jet-like .15 powered pattern ship.

Photos by Monroe Pinkleton.



To my surprise, however I found the model intact. The total damage consisted of one broken prop, one smashed Veco spinner, one split maple motor bearer and one crack vertically on the left side of the fin about 1½" long. Unbelievably, that was the sum total of the damage. Granted the ground was damp, but the nose only dug an 8" hole and I would venture to say that a conventionally constructed model would have been a complete wipe out in a similar crash. I went through this complete story only to illustrate the other attribute of the foam, balsa, plywood and fiberglass model-**strength.** If the model had not hit the ground exactly vertical the damage would certainly have been more extensive, but even considering that, no other type of construction offers the kind of strength-to-weight ratio that foam does.

Now that you know how Styros was born, let's get into the model and how to build it from block foam, sheet balsa and epoxy, and fiberglass cloth. Let me caution the novice not to attempt this model and recommend that even the accomplished modeler have some foam wing cutting experience. Also, the airplane itself is no trainer. It does not exhibit any vicious characteristics, but it is an active, responsive bird that will go just where you point it. Strangely, landings are slow and docile with the nose proudly pointed skyward. All-in-all it is a rewarding model for the accomplished flyer.

The design has gone through many changes over the 8 years since its inception in 8 separate airplanes. Each new model incorporated changes that improved it over the one that preceeded it. All were .40 powered except this one. The idea with this size model was to see if the slightly heavier construction method could be appplied to a small airplane without degrading the extremely good performance of the design. Happily, it can, and the results justified my confidence in the wide range capabilities of this radical airframe. If you are ready to start after this windy sales talk, follow the steps religiously and your Styros 15 should be a rewarding modeling experience for you.

The pictures accompanying the article should clarify each major construction step for you and ease your way through the project. By the way, the Styros was one of the design winners at the 1975 Toledo Conference.

Let's start with the fuselage. First cut two 3¼" x 3½" x 13½" foam blocks making certain that they are squared up and that all opposing faces are parallel. I cut these blocks with a hot wire cutter using 1/8" x 3/4" balsa strips pinned along carefully measured pencil lines on the foam. Allow the strips to extend a couple of inches outside the foam blocks on each side to enable you to lead the wire into the foam.

Next, cut 1/16" plywood templates for cutting out the hole in each side of the foam blocks. Pin these templates on each end of one block at a time and cut out the hole keeping in mind that the desired hole diameter is 1/16" shallow to allow for the 1/8" balsa strips that will be glued between the two foam blocks, top and bottom. Cut these 1/8" strips from medium balsa and epoxy in place on one side. Mark the intersection of the fin leading edge on the top and bottom strips and cut out the areas to allow the fin to key through the center of the aft portion of the fuselage.

Cut out the fin leading edge from 1/8" balsa, 3/8" wide, and use a marking template. Cut the fin trailing edge from 1/8" balsa, 3/8" wide, and mark the slot for the T.E. to slot into the top strip. Cut the rear slot 1/4" longer than required for the T.E. strip to slip the rudder arm through later on in construction. Cut the front and rear rings from 1/16" plywood. Glue both halves together, aligning carefully and tape together — glue the front and rear rings on making certain the front ring aligns perfectly with the vertical center line of the aft fuselage. Shape the rear section using a coarse wood rasp cutting in one direction rather than rubbing back and forth. Rubbing back and forth will roll out the foam beads. Shape the section down to about 1/8" from the desired size using the ply rings and the longitudinal balsa strips as sanding templates. Finish down to the final shape using 80 grit garnet paper on a sanding block. Construct the vertical fin using 1/8" x 3/8" balsa strips surrounding 1/8" foam sheet and cap both sides with 1/16" sheet balsa with the grain on both sides running vertical.

Allow the 1/16" sheet sides to extend forward of the 1/8" leading edge 1/8" of an inch making a channel to accept the nylon tube for the elevator push cable. Construct the horizontal stab using the same procedure as the fin. Glue the stab to the top of the fin and fillet the underside with 3/8" triangular stock sanded to shape. Cut the foam "Horseshoe" that forms the center of the fuselage from a 10½" x 3" x 3" single foam block. Use the same cutting template on the front and rear to cut out the hole that continues on toward the front from the previously constructed rear fuselage section. Use the foam piece just cut from the center section to sheet the cavity with 1/32" balsa. Simply wrap the balsa sheet around the cut out piece and brush 5 minute epoxy into the cavity. Tape across the bottom with enough pieces of tape to hold secure until cured. Make the inside sheet 1" too long in the rear and 3" oversize in the front. These extensions will help key the front and rear sections of the fuselage to the center section. Cut the rear extension to one-half the diameter of the hole across the top so it will key into the rear hole. Epoxy the center and aft sections together, align carefully, and hold together with masking tape until cured. Cut the center section crutch from 1/16" ply using the template from the plan and epoxy in place across the bottom of the horseshoe. Install a 1/8" x 3/4" balsa tripler on the inside of the center section, both sides, and allow to extend to the front of the 1/32" balsa inside sheeting. Install two 1/2" x 3/4" balsa cross pieces on top of the ply cross members. Cut two 3/32" balsa full size wing root ribs using the ply wing cutting template and glue to the sides of the fuselage. Be sure to align carefully at 0° incidence.

Next cut two (2) 3/8" x 5/16" x 14" balsa longerons and epoxy along the underside of the crutch, one on each side. Cut two 3/8" x 3" x 1" balsa filler blocks and epoxy above the front of the longerons and flush against the extended inside sheeting and butted against the front of the center foam block on both sides. Cut three (3) 1" half rings and carefully fit and epoxy in place over the top of the extension of the inside sheeting that extends out in front of the foam center section. Now razor saw off all projecting pieces that extend beyond the front block and sand smooth in front.

Note: If you glue two of the half round pieces that came out of the three half rings together and saw on a 5° bias inside and outside you will have the balsa extension of the aft portion of the tail pipe. Epoxy in place about 1/4" inside of the end of the foam tube.

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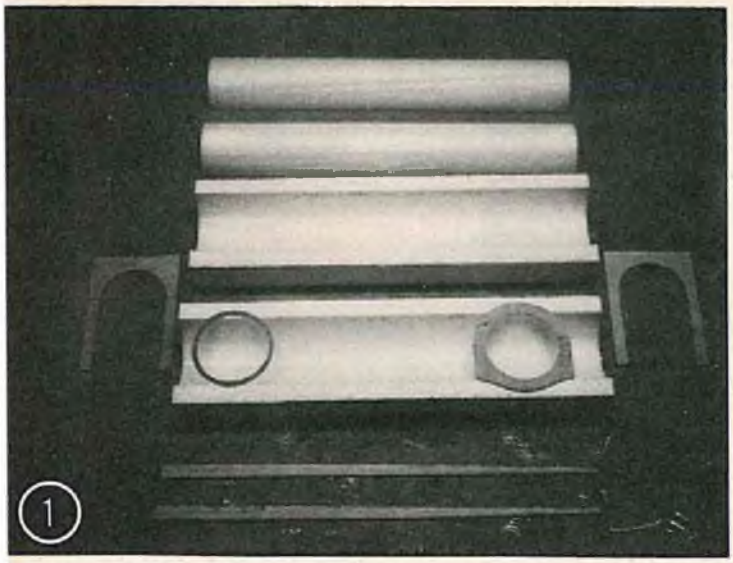
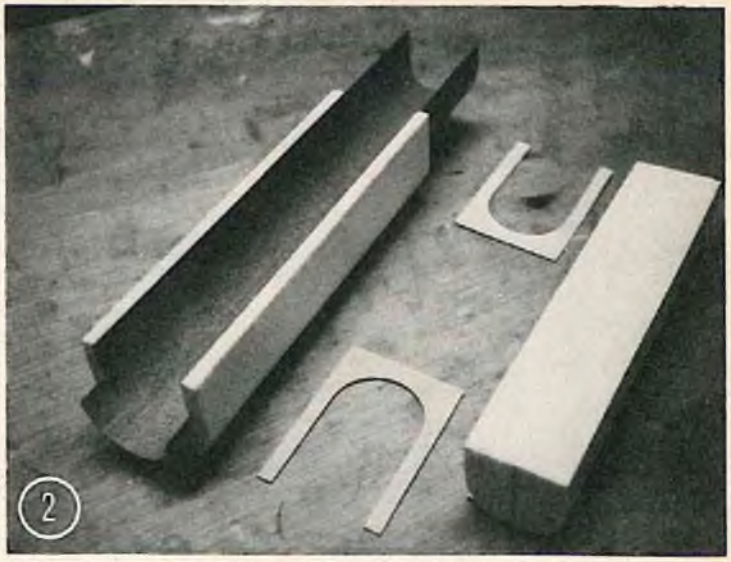
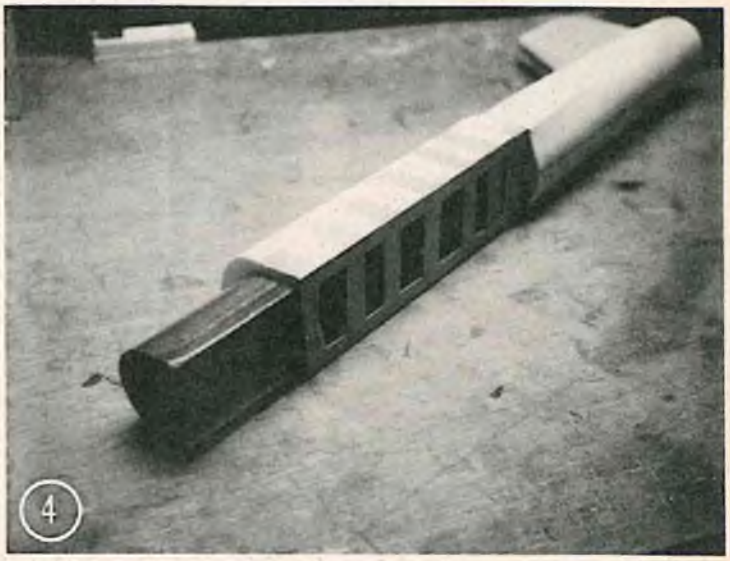
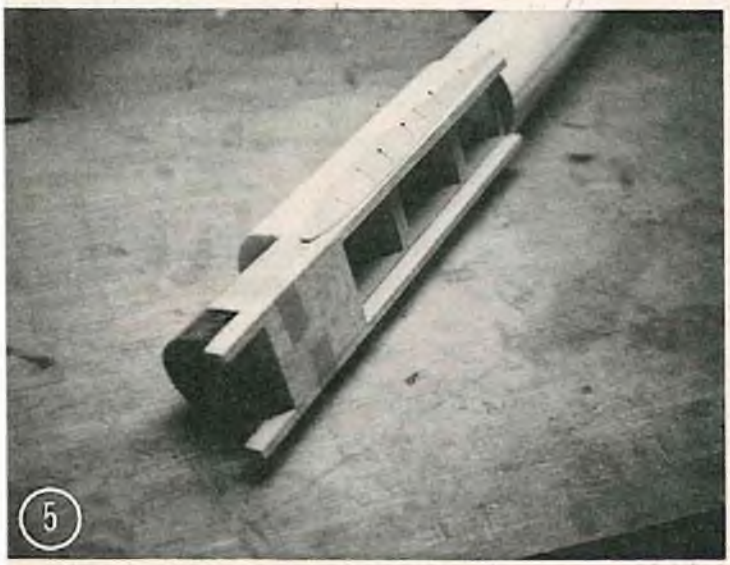
STYROS
Designed By: John D. Woods

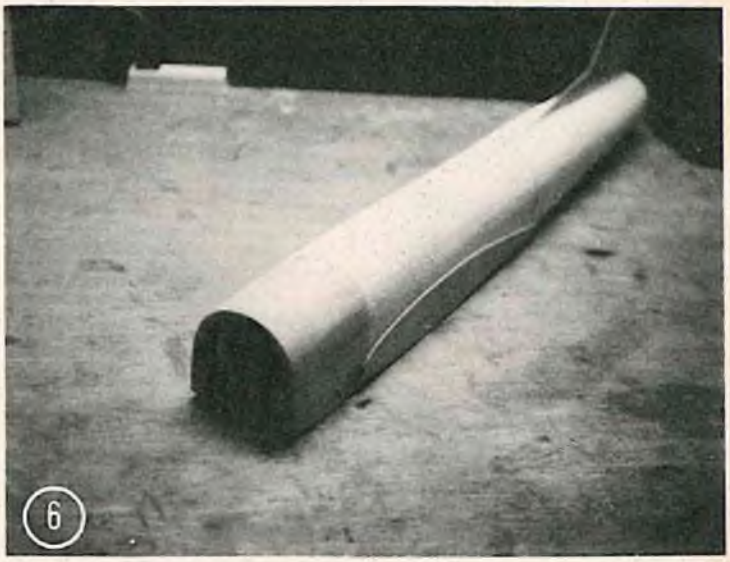
TYPE AIRCRAFT
Sport
WINGSPAN
35 Inches
WING CHORD
12" Root / 4¼" Tip
TOTAL WING AREA
306 Square Inches
WING LOCATION
Fixed/Low
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Modified Delta
DIHEDRAL, EACH TIP
1"
O.A. FUSELAGE LENGTH
35 Inches
RADIO COMPARTMENT AREA
(L) 10¼" (W) 2⅝" (H) 2½" (Avg.)
STABILIZER SPAN
15 Inches
STABILIZER CHORD
4¼" Root / 2" Tip
STABILIZER AREA
46.87 Inches
STAB. AIRFOIL SECTION
Symmetrical
STABILIZER LOCATION
Top of Fin
VERTICAL FIN HEIGHT
5¼ Inches
VERTICAL FIN WIDTH (Incl. rudder)
7" Bottom / 4" Top (not incl. dorsal)
REC. ENGINE SIZE
.15 Cu. In.
FUEL TANK SIZE
4 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
Four
CONTROL FUNCTIONS
Rudder, Ailerons, Elevator, Throttle
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Beaded Styrofoam
Balsa, Ply, Fiberglass
Wing ..... Beaded Styrofoam, Balsa, Fiberglass
Empennage ..... Balsa, Styrofoam, Fiberglass
Weight Ready-To-Fly ..... 48 Ounces
Wing Loading ..... 22 Oz./Sq. Ft.



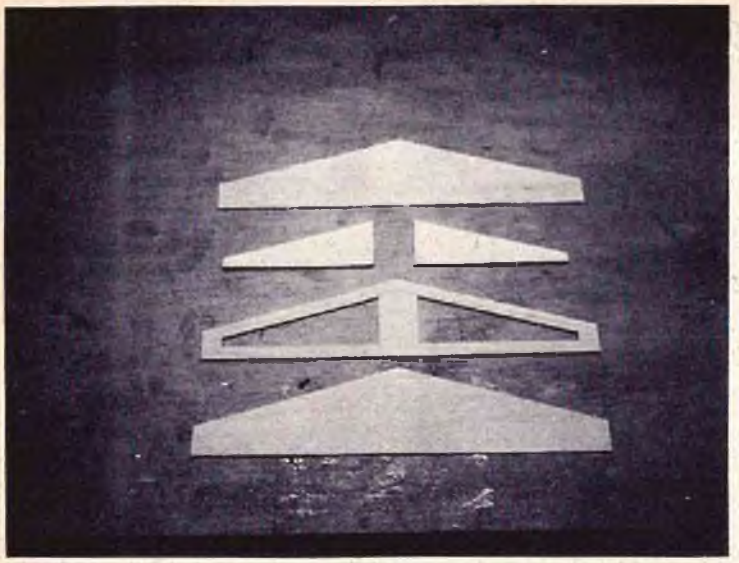


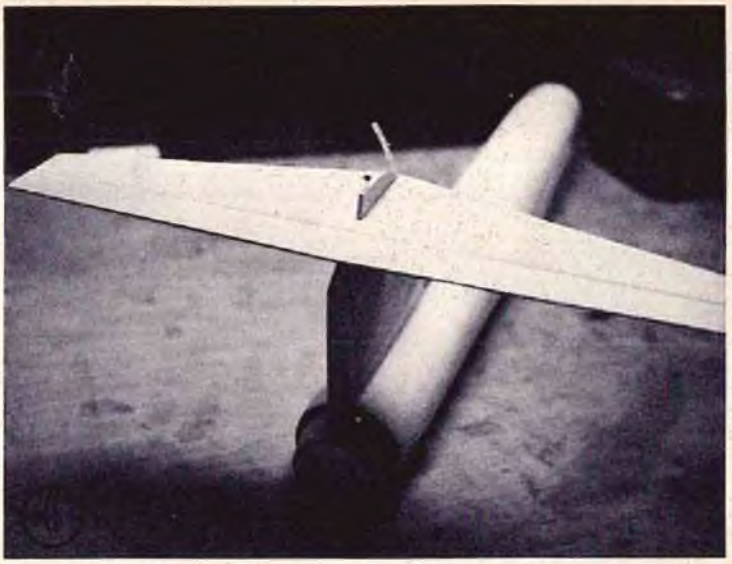


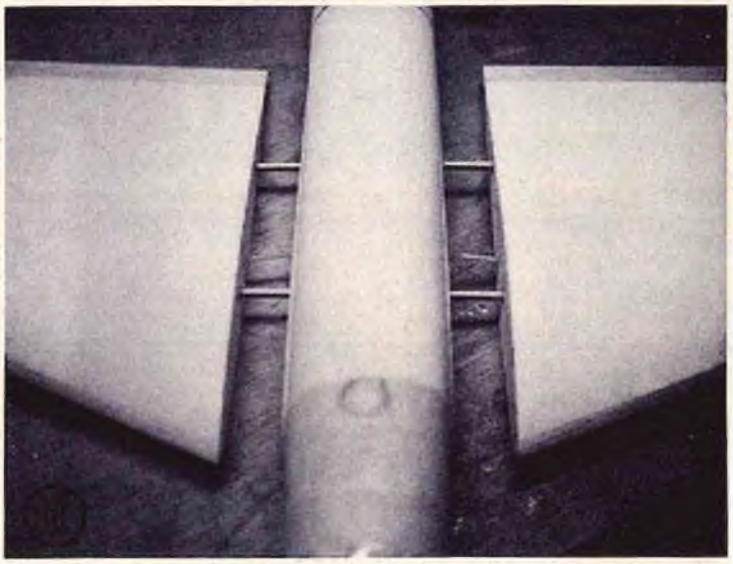


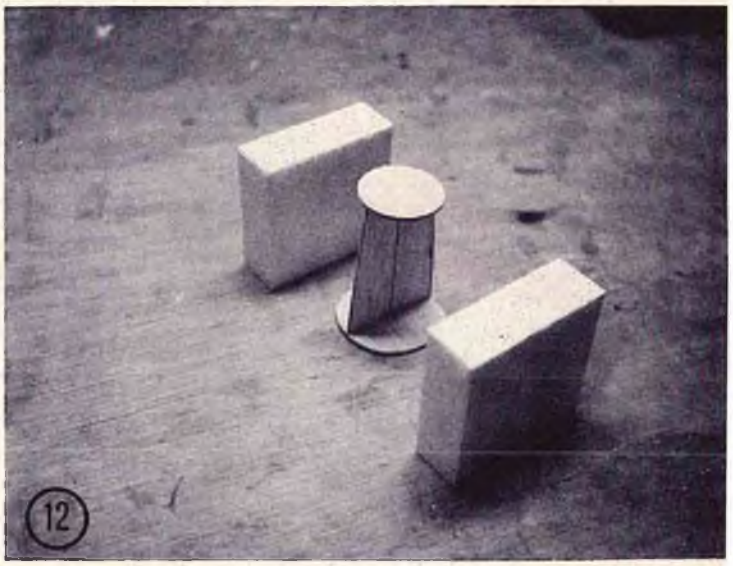


(1) Aft fuselage assembly showing foam halves, bulkheads, balsa longerons and cutting templates. (2) Center fuselage assembly including inner fuselage sheeting, cutting templates and foam core. (3) Aft fuselage assembled with fin and rudder in place. (4) Center and aft fuselage sections joined with 1/16" ply crutch in place. Note tape holding center section foam member and ply crutch together and correct angle on aft extension of fillet/fuselage line. (5) Forward extension of balsa fuselage members and balsa wing root members epoxied in place. (6) Sanded foam center section and forward balsa section.

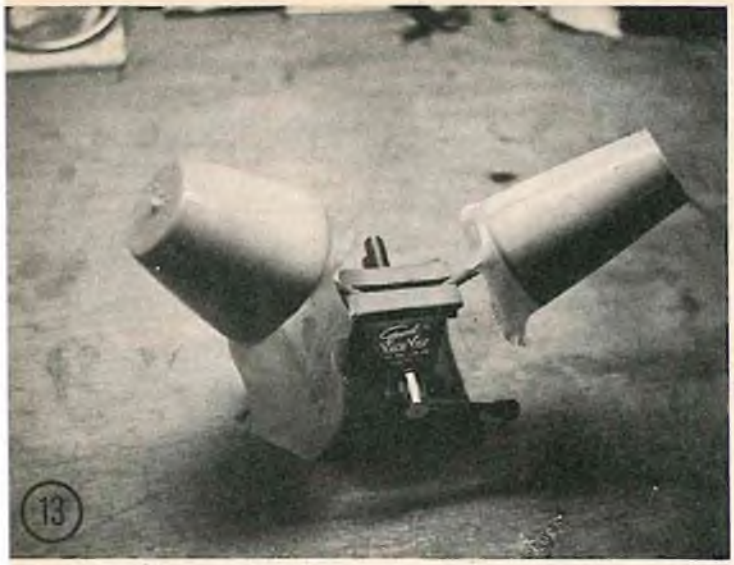


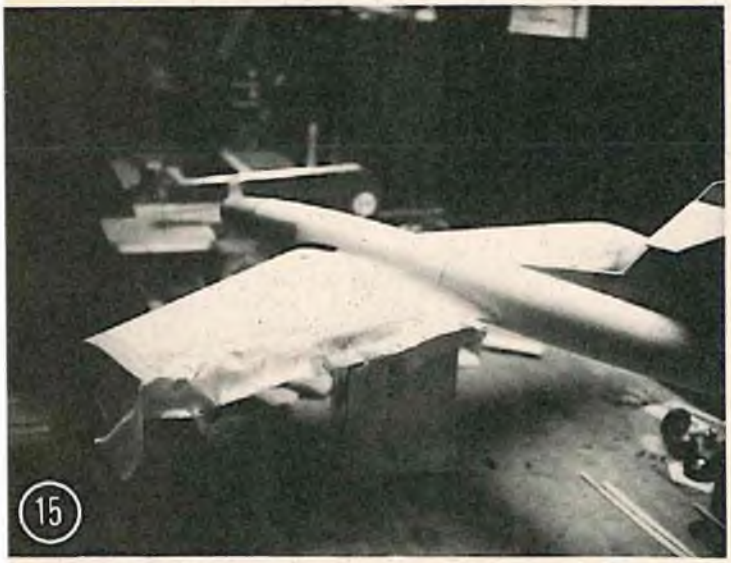






(7) Component parts of the horizontal stab prior to laminating. (8) Empennage detail showing nylon cable housing and support prior to addition of upper fin cap. Note: Balsa exhaust tube glued in place. (9) Wing detail showing aileron cable detail and balsa edging prior to aileron cut out. (10) Wing assembly detail. Note: Nylon aileron cable housings projecting from wing roots. (11) This picture shows both foam fillets in different stages of completion. (12) Component parts of the foam/balsa cowl mold.





(13) Cowl mold with first layer of fiberglass cloth epoxied to balloon over mold. The one on the right is the Styros mold. (14) Completed fiberglass cowl and balsa/ply insert combine to form the complete nose section of the model. Notice that the nose wheel steering, throttle and tank holes are pre-drilled prior to the assembly being glued on the front of the fuselage. (15) Fiberglass applied to both upper surfaces of the wings. (16) Completely fiberglassed and sanded model ready for spraying. (17) Rear view of completed model. (18) Side view of completed model.

Glue the triangular strips into the lower edges of the tank compartment. Next, sand the balsa front and the foam center section to shape back to the trailing edge of the wing template, being careful not to sand a cup in the foam either side of the ply bulkhead that separates the center and aft foam sections. This is easily done using 80 grit garnet paper on a sanding block and sanding slowly in one direction. You will find that the foam quickly comes down to the desired shape. Do not sand the balsa bottom of the center section under the wing ribs that were glued to the fuselage sides. Also, be sure to leave the sides of the center section and forward part of the aft section flat and vertical so the fillets can be glued against a flat surface. Cut the 1/8" O.D. nylon tube to length and epoxy into the groove in the leading edge of the fin and cap the slot with 1/4" square balsa and sand to shape. Add the forward fin to the top of the fuselage and sand the complete empennage to a shallow airfoil shape. Saw a 3" square, 1" thick block of balsa to the outside shape of the front of the fuselage. Saw out the inside of this block on a Dremel saw using a 5° taper from back to front. A paper pattern can easily be made to simplify this job. Place a piece of bond paper on the front of the fuselage and rub the inside edge and outside edge with the side of a pencil; cut out the pattern and glue it on the balsa block and saw around the paper pattern. Note that only the inside cut-out is sawn with a 5° taper — the outside is sawn straight and sanded to shape after it is glued to the front of the other three balsa blocks. Cut the firewall from 1/8" ply and epoxy in place on the front of the 4 balsa blocks. Now finish sand the front to shape.

Next make a styrofoam and balsa mold 1/16" undersize to the shape indicated on the plan. Epoxy the balsa sanding templates and the vertical separater together and allow to cure. Cut 2 foam blocks to fit between the front and rear balsa bulkhead templates and epoxy in place. Hold together with tape until dry. Push a 6" length of 1/4" dowel into the center of the rear of the mold and clamp in a vice at about a 45° angle. Blow up a small Hobbypoxy balloon and run it down over the projecting mold until the rear of the mold captures the advancing inside of the balloon, then slowly let the remaining air out of the balloon. Cut the neck of the balloon off and pull the top layer of the balloon to the back of the mold leaving just one layer of rubber over the mold. Brush on a thin coating of Hobbypoxy II glue and wrap a layer of fiberglass cloth (2 oz.) around the mold, patting and smoothing the wrinkles out as you go. Overlap the cloth about 1/4". Cut the excess cloth off from the front leaving approximately 1/2" sticking out and snip all the way around the front toward the front cowl ring at about 1/2" intervals. Fold these 1/2" strips in toward the center, lapping each over the last until the cloth is stuck to and saturated with the Hobbypoxy II glue. Allow to cure overnight. Sand any lumps, blobs, etc., from the first layer and apply a layer of Hobbypoxy cloth in exactly the same manner as you did the fiberglass layer. Allow to cure overnight. This second layer will look and feel like coarse sandpaper when cured and must be sanded nearly smooth before the next step. Now apply the third layer, again using 2 ounce fiberglass cloth and the same method as the first, allowing to cure overnight.

Sand this layer as smooth as you can without fuzzing up the fiberglass cloth using 80 grit garnet paper. Brush on a "gel" coating of Hobbypoxy II glue and allow to cure. Sand smooth using 80 grit garnet, then 180 silicon carbide "No Fill" paper. Trim the projecting cloth from the rear of the mold-block sand the rear face until the balloon is cut away by the sandpaper and remove the cowl from the mold by cutting a 1/4" to 3/8" hole in the front and pushing the mold out with a 1/4" dowel. Next build the balsa and ply insert that goes inside of the mold that includes the front cowl ring, nose gear block and motor mount. Sand to shape until it fits inside of the fiberglass mold and glue the two together using Hobbypoxy II. Next, epoxy the whole assembly to the firewall and finish sand the front of the fuselage.

Cut the wing cores with a hot wire and install the landing gear blocks, nylon tubing for the aileron cable, and cap all the way around with balsa as indicated on the plan. Cut out the aileron cut outs using a razor saw and an X-Acto knife and cap the cut-out with balsa. Cut the ailerons to size from 1½" trailing edge stock and bevel the front to a 30° angle.

Drill 1/4" holes in the balsa wing seat in the position indicated on the plan — three on each side. Two are for positioning dowels and one is for the aileron cable to go into the equipment compartment. Drill 1/4" holes in the foam in the proper place to accept the wing joiner dowels and epoxy glue the wing in place over the dowels. Stick masking tape over the fuselage/wing joint on the underside of the fuselage to keep the glue from running out and prop up the wing tips with 1 inch blocks. **Make certain** that the wings are even and straight on the fuselage longitudinally — that the fuselage is held flat against the table and the horizontal stab and wing are properly aligned. Now allow to cure.

Install the triangular wing fences/aileron cable housings on the underside of the wing. Notice that these are a 3 layer sandwich of 1/8" balsa center and 1/16" balsa on each side.

Place 2" masking tape over the foam on the bottom of the wing right up to the edge of the balsa of the fuselage to protect it while sanding the hatch area to shape. Build the 1/2" balsa 1/16" ply laminate for the bottom hatch 1/16" smaller than the hatch hole all the way around and wedge into the hatch hole with 1/16" balsa strips. Place 1/16" balsa under this hatch to allow for later addition of a wing saddle tape seal. Sand the hatch and fuselage to shape.

Next, cut the two fillet blocks of foam 15" x 2½" x 1¾". The 2½" dimension is the height. Use the wing root cutting template and mark the lower edge of the block with a pencil following around the top half of the template to form the shape of the lower edge of the fillet. Notice that the fillet sweeps up from the end of the trailing edge of the wing. Your block should look like Figure 1.

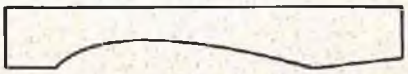


FIGURE 1: SIDE VIEW

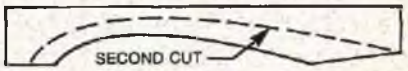


FIGURE 2: SIDE VIEW

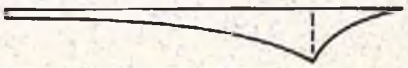


FIGURE 3: TOP VIEW

Next, mark the top outline of the foam blocks with a pencil. Cut out the fillets on the Dremel saw to the side profile and what you have left should look like Figure 2.

Now mark the top of the fillet to the plan view of the fillet and saw out on the Dremel. See Figure 3.

Glue the fillets into the upper wing fuselage joint using a very thin layer of 5 minute epoxy glue and hold in place until cured. Roll a piece of 80 grit garnet paper around a short length of 1" dowel or broomstick and sand the fillet to shape. Note: Protect the fuselage and the wing from damage during sanding by placing a 1" strip of masking tape along these joints, just as you did on the bottom of the wing.

Make the fin cap from a 1/8" and 1/16" balsa laminate and glue in place on top of the horizontal stabilizer. Be sure to align carefully. Also, make sure that you do not allow glue to fill the holes in the nylon tube when installing the fin cap and the wing fence/aileron housing.

Build the aileron horns and the elevator horn from 1/16" phenolic and 1/32" balsa and glue in place with 5 minute epoxy.

Now, apply a layer of 2 ounce fiberglass cloth over the whole airplane including the fiberglass cowl. Start with the fin and horizontal stab and apply the cloth by brushing the Hobbypoxy II glue on one surface at a time as thin as possible, i.e., one half of the top of the horizontal stab, one side of the fin, etc. Apply the glue first then lay the fiberglass cloth on it, gently smoothing the wrinkles with your index finger. Most wrinkles can be eliminated by laying the cloth on carefully in the first place. Two people work best for this step. Smooth out the edge of the cloth along the fin lower edge and fuselage. Allow the cloth to overlap the fuselage about 1/4". Allow the empennage to cure at least 12 hours before proceeding with the fuselage. The top of the wings can be done while the empennage is curing to speed the covering step. Allow the glue to cure, then trim off

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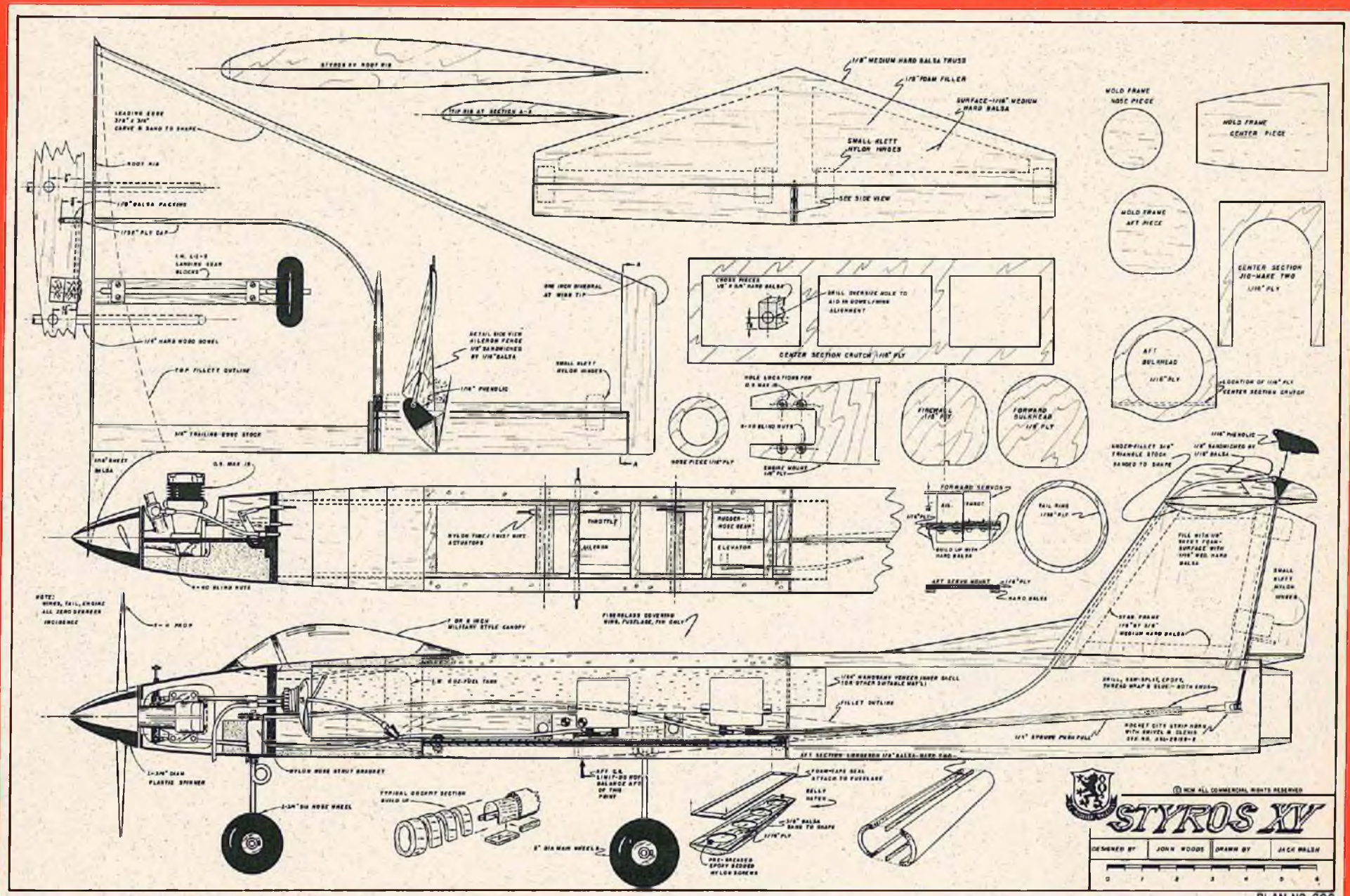
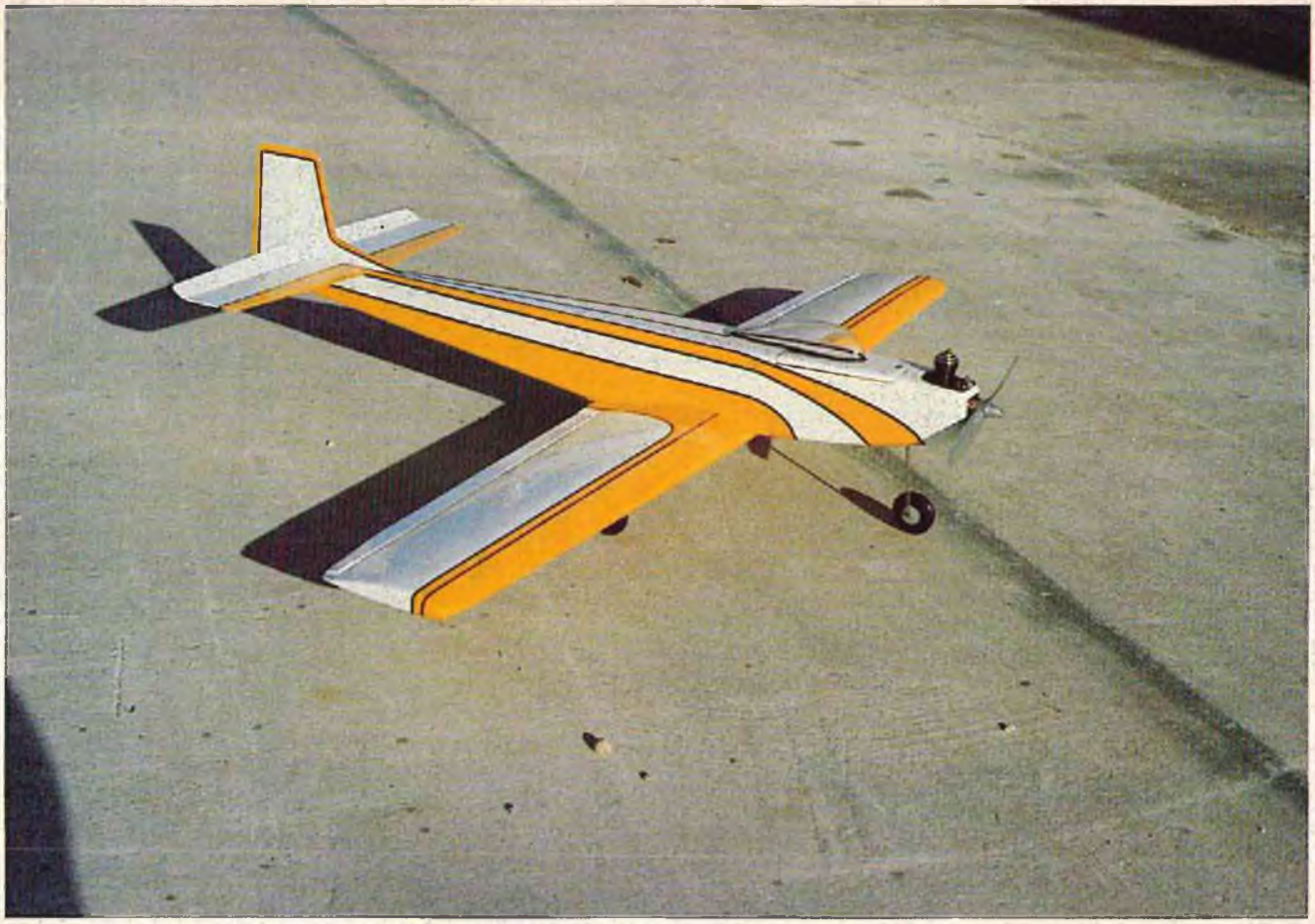

STYROS XV
DESIGNED BY JOHN WOODS
DRAWN BY JACK WALSH
PLAN NO. 606



HALF
A
STIK

Half-A-Chaos

Two Half-A models designed with performance in mind. A hot, scaled down version of the popular Kaos and a Half-A Kwik Stik. You can build them both in less time than it takes to lay up the wing on a sixty powered job. And once you put them through their paces you'll have every guy at the field waiting for his turn at the stick. By George Chabot and Ted Bozanich.

HALF-A-CHAOS
Designed By: Ted Bozanich & George Chabot

TYPE AIRCRAFT
1/2A Sport/Pylon
WINGSPAN
36¾ Inches
WING CHORD
6¼ at Center
TOTAL WING AREA
206¾ Square Inches
WING LOCATION
Low Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Double Taper
DIHEDRAL, Each Tip
1/2 Inches
O.A. FUSELAGE LENGTH
27⅜ Inches
RADIO COMPARTMENT AREA
(L) 6¼" X (W) 2⅜" X (H) 2"
STABILIZER SPAN
14 Inches
STABILIZER CHORD (Incl. elev.)
3½" Average
STABILIZER AREA
49 Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
4 Inches
VERTICAL FIN WIDTH (incl. rudder)
4¾ Inches (Average)
REC. ENGINE SIZE
.049-.051 Cu. In.
FUEL TANK SIZE
2 Ounces
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
2-3 Channels
CONTROL FUNCTIONS
Ailerons/Elevator or
Ailerons/Elevator/Rudder
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Foam and Balsa
Empennage ..... Balsa
Weight Ready-To-Fly ..... 20-24 Oz.
Wing Loading ..... 13.9-16.7 Oz./Sq. Ft.

● This is really a two-in-one article — featuring two Half-A aircraft with an ease of construction and a performance potential that will please the Sunday Flier or the guy who wants a quick building small aircraft that flies exactly like its .60 powered cousins — but at a far less expenditure of time and materials cost.

The first of the two is the Half-A-Chaos. Actually, what's more normal than a model of a model? The Kaos, designed by Joe Bridi, is one of the finest pattern ships ever built. We decided to scale this superb machine down to Half-A size in order to enable anyone to build and fly this ship from even the smallest of fields. We took into consideration all of the lengths and moments, wingspan, etc., and tried to combine all this into a small fun-type aircraft that would fly the pattern like the big one.

With a little assistance from Jim "Banzai" Barnes, who loaned us the butchers wrapping paper on which to draw the plans, the Half-A-Chaos was born.

All of the construction notes regarding the modifications to the Ace tapered foam wing is called out on the plans. Follow those instructions to the letter in order to achieve maximum performance from this little pattern machine. Insofar as an engine is concerned, we would recommend a Kirn Kraft modified Cox TD .049 or .051 engine with oversized venturi, Kirn Kraft Needle valve assembly, and crankcase pressure. If you don't mind a slight sacrifice in power and speed, a standard Cox TD .049 or .051 without pressure can be used.

So, without further ado, order the full size plans from RCM and let's get on with construction.

Half-A-Chaos Construction

(1) Cut out all the parts shown on the plan.

(2) Glue the balsa sides to F2 and F3.

(3) Glue the sides to bulkhead F1.

(4) Cut out the horizontal stabilizer, install it on the fuselage and glue the rear of the fuselage sides together.

(5) Glue on the top and bottom 3/32" crossgrain sheeting.

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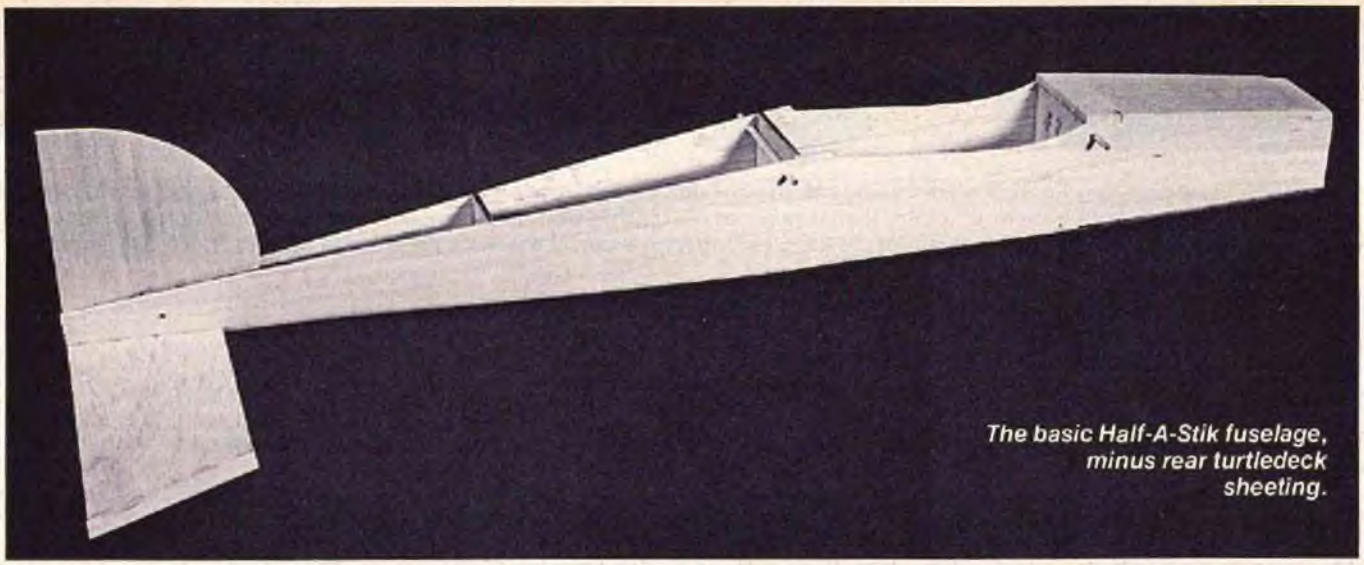
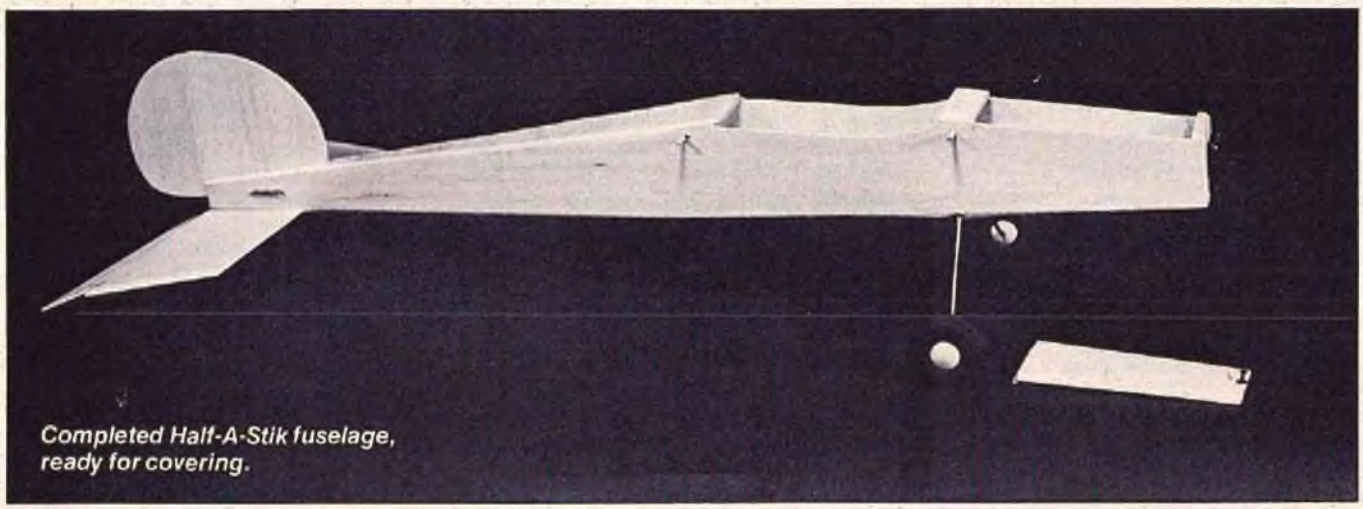
HALF-A-STICK

TYPE AIRCRAFT
1/2A Sport Pylon
WINGSPAN
35 Inches
WING CHORD
5½" Rudder Only
5⅞" W/Ailerons
TOTAL WING AREA
201.5 Sq. In. (R/O)
222 Sq. In. W/Ailerons
WING LOCATION
High Wing
AIRFOIL
Semi-Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
W/Ailerons 1" — W/Rudder 2"
O.A. FUSELAGE LENGTH
26½ Inches
RADIO COMPARTMENT AREA
(L) 6¼" X (W) 2" X (H) 2"
STABILIZER SPAN
12½ Inches (Average)
STABILIZER CHORD (incl. elev.)
3¾ Inches
STABILIZER AREA
46⅞ Square Inches
STAB AIRFOIL SECTION
Flat
STABILIZER LOCATION
Bottom of Fuselage
VERTICAL FIN HEIGHT
3¾ Inches
VERTICAL FIN WIDTH (incl. rudder)
5⅞ Inches
REC. ENGINE SIZE
.049-.051 Cubic Inch
FUEL TANK SIZE
2 Ounces
LANDING GEAR
Conventional
REC. NO. OF CHANNELS
Two Channel for Elev./Ail.
Single (Pulse) R/O
CONTROL FUNCTIONS
Rudder Only or Ail. & Elev.
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa, and Ply
Wing ..... Foam/Balsa Ail. & Tip
Empennage ..... Balsa
Weight Ready-To-Fly ..... 20-24 Oz.
Wing Loading ..... 14.3-17 Oz./Sq. Ft. (R/O)
13-15.6 Oz./Sq. Ft. (W/Ail.)

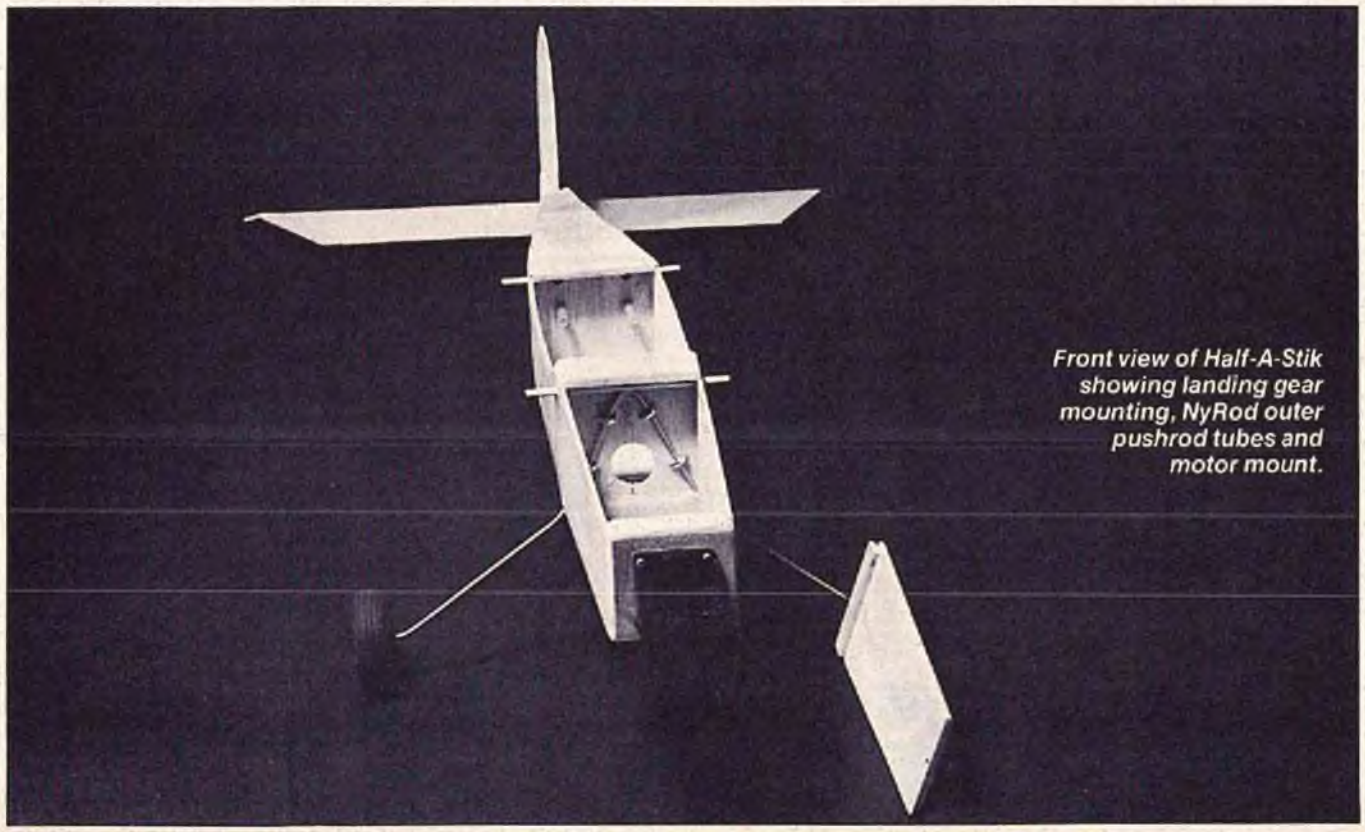
Half-A-Stik



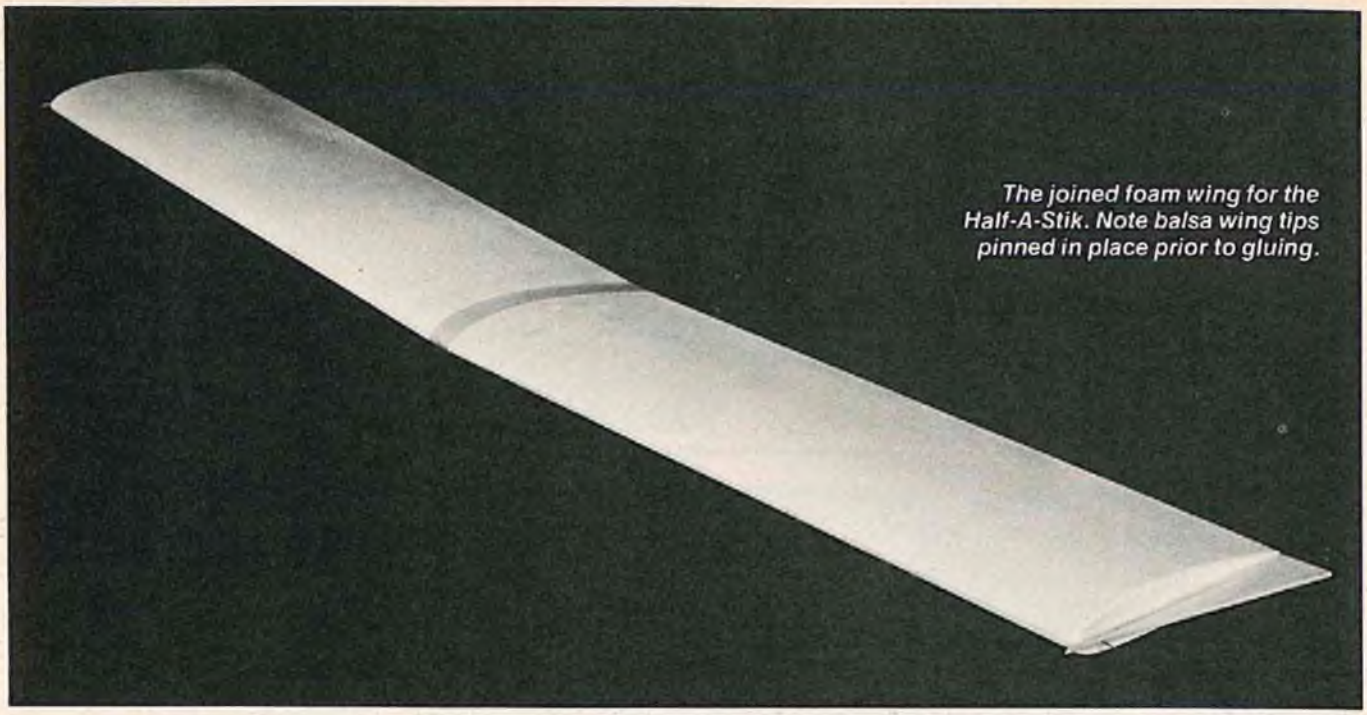
The basic Half-A-Stik fuselage, minus rear turtledeck sheeting.



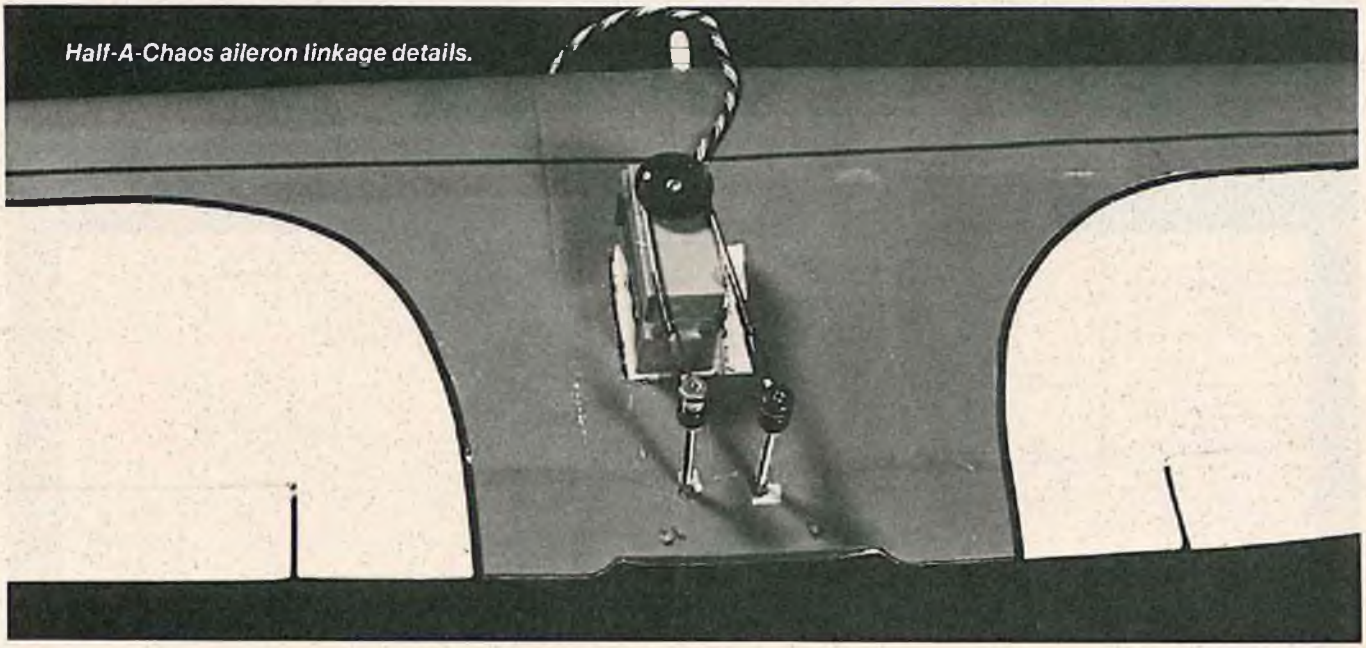
Completed Half-A-Stik fuselage, ready for covering.



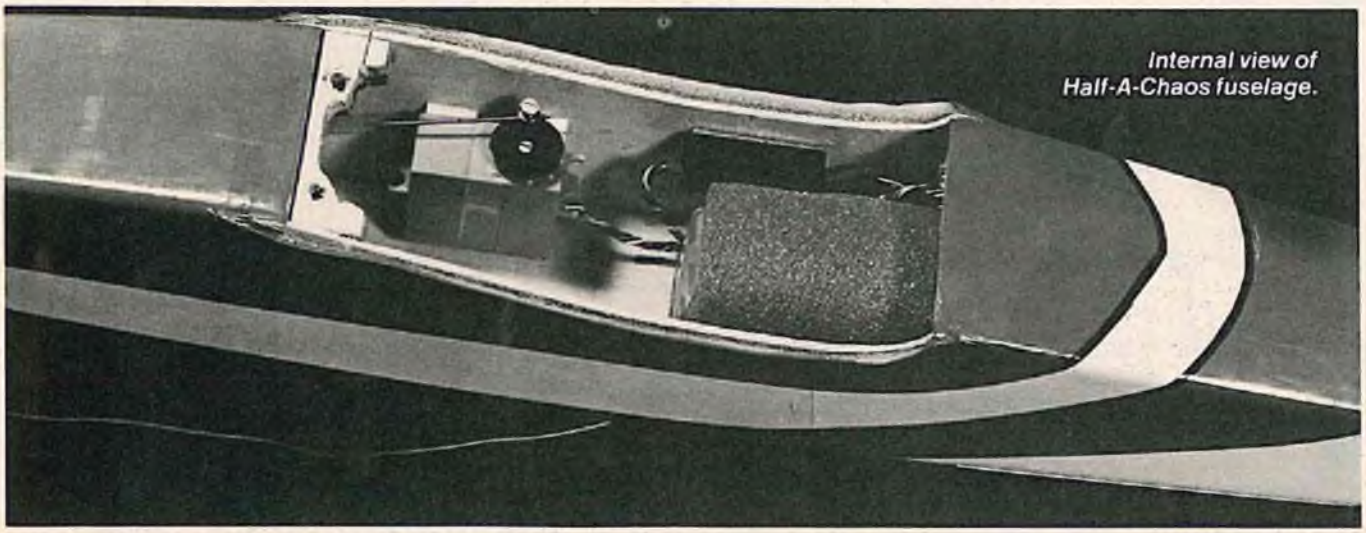
Front view of Half-A-Stik showing landing gear mounting, NyRod outer pushrod tubes and motor mount.



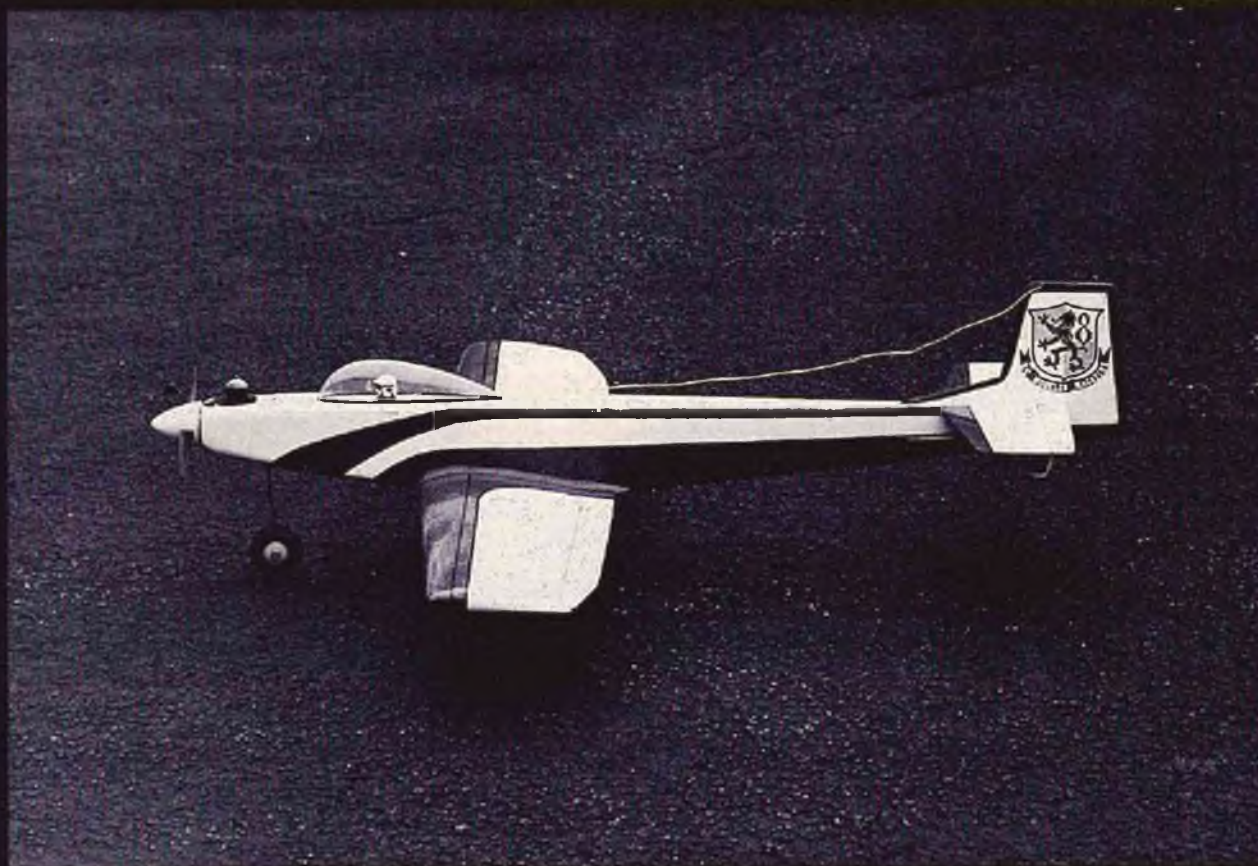
The joined foam wing for the Half-A-Stik. Note balsa wing tips pinned in place prior to gluing.

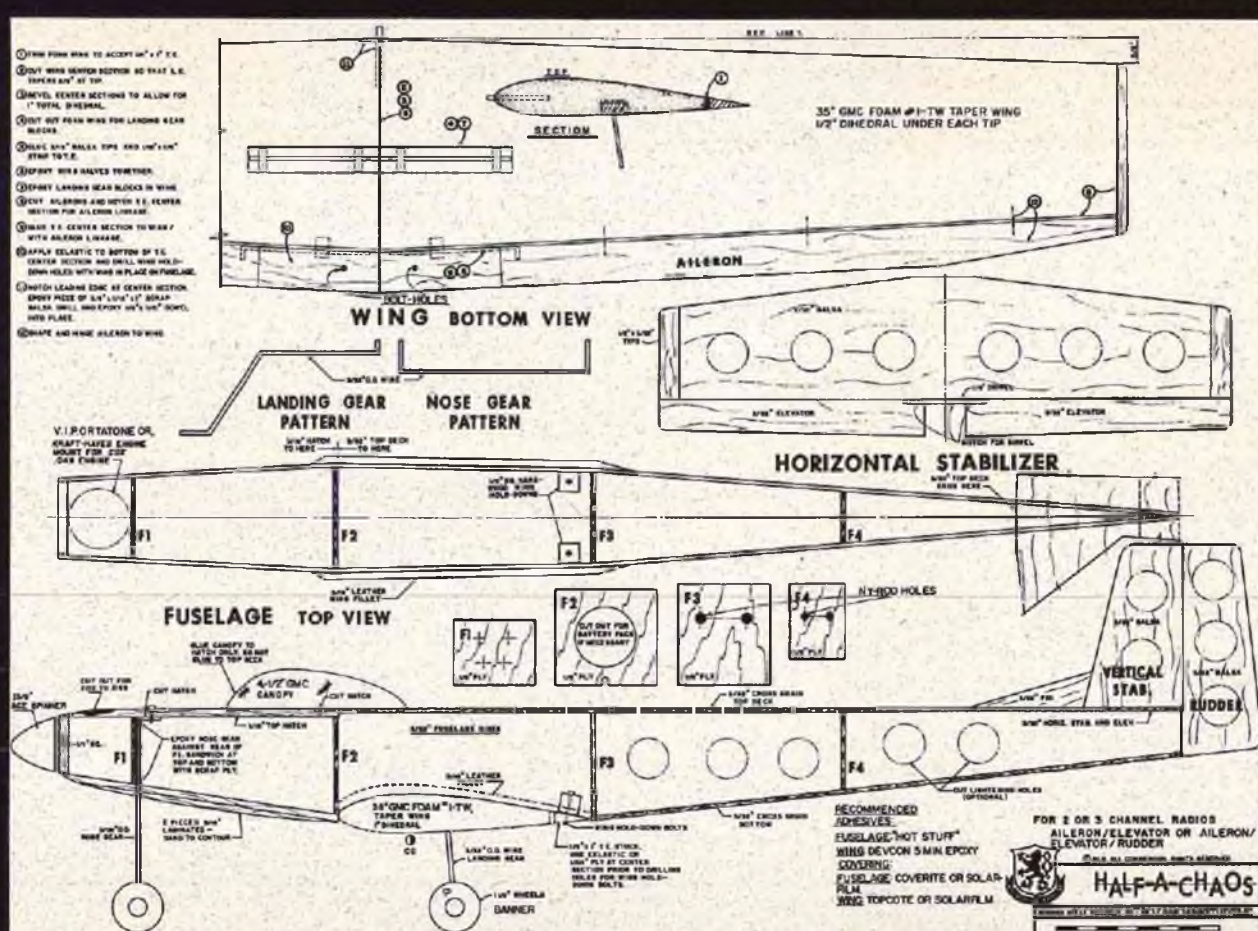


Half-A-Chaos aileron linkage details.



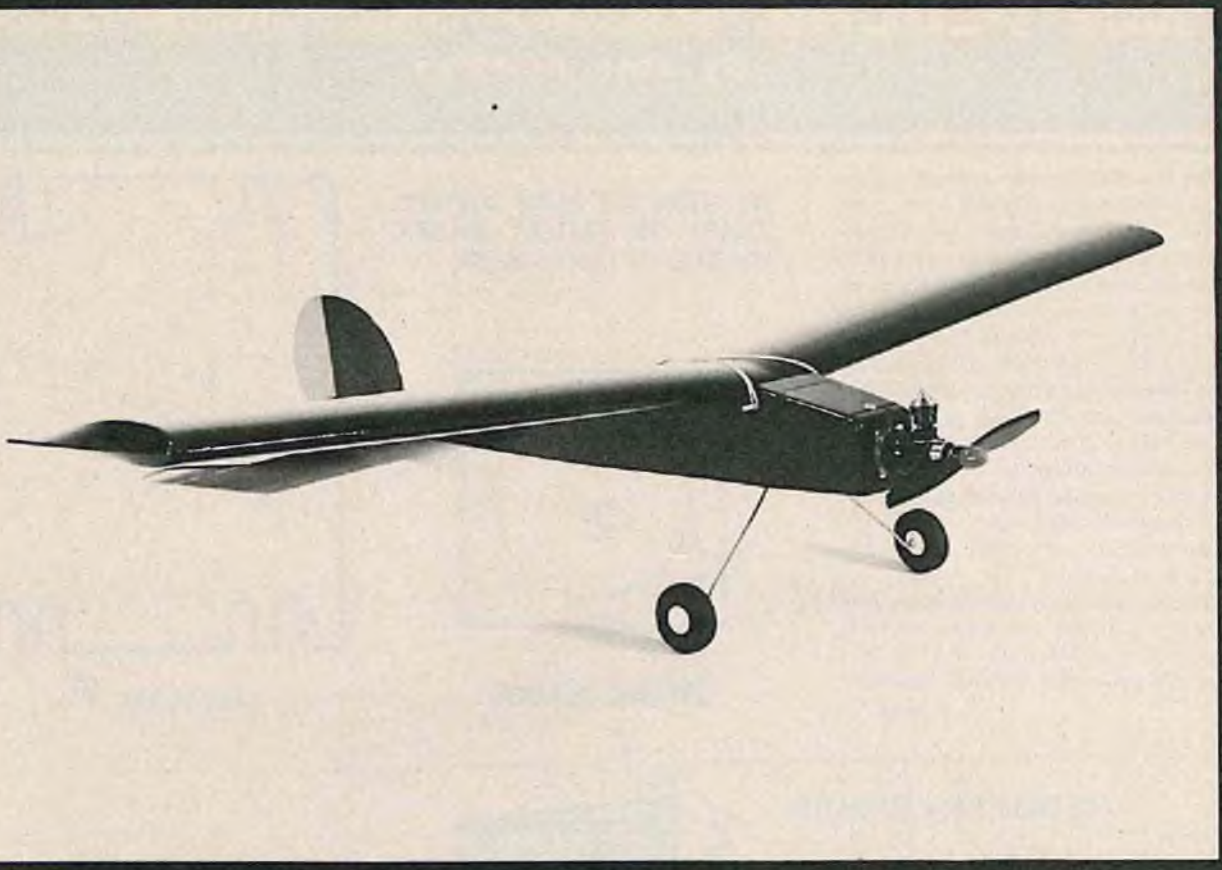
Internal view of Half-A-Chaos fuselage.

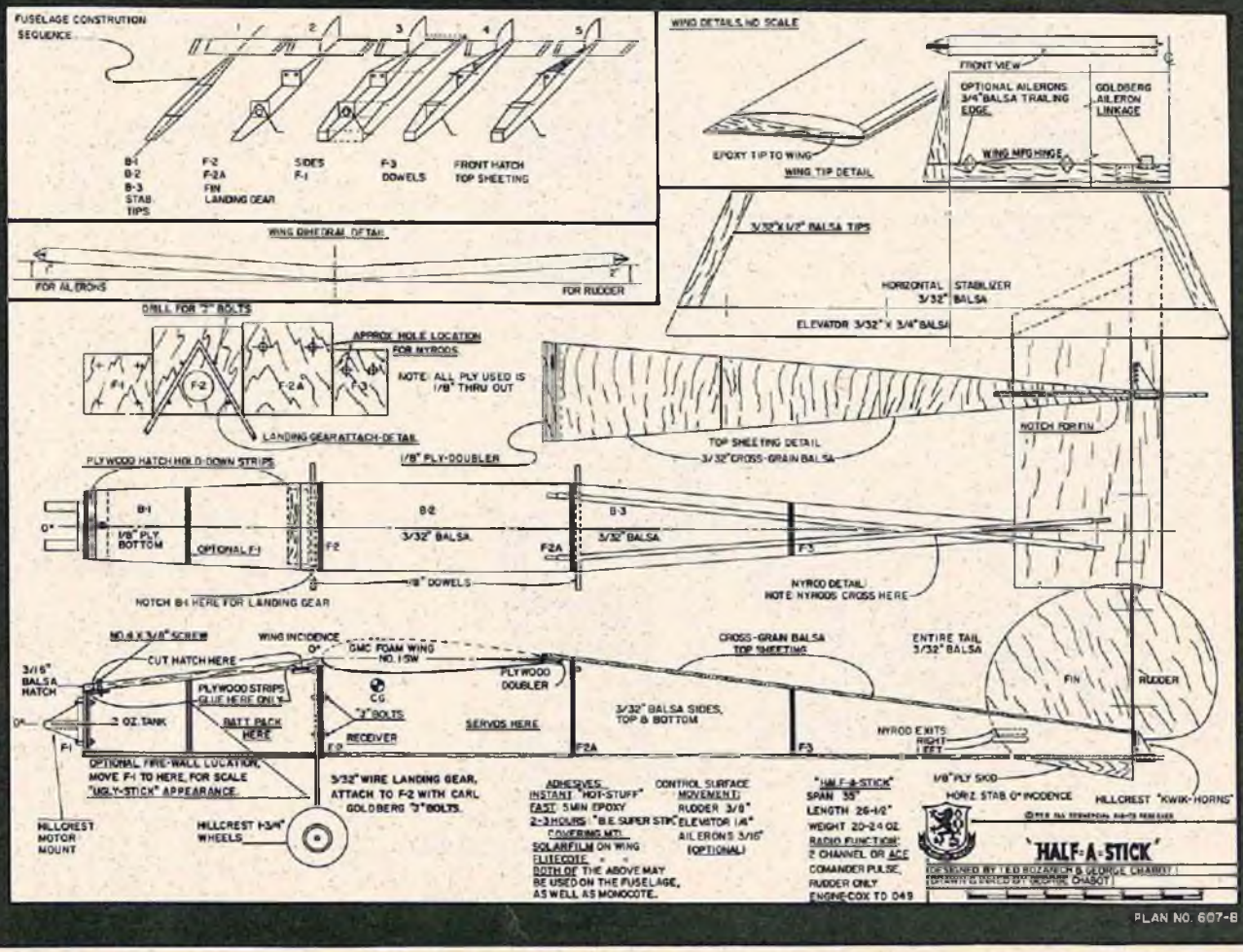




35" GMC FOAM #1-TW TAPER WING
1/2" DIHEDRAL UNDER EACH TIP
SECTION
AILERON
BOLT-HOLES
WING BOTTOM VIEW
LANDING GEAR PATTERN
NOSE GEAR PATTERN
HORIZONTAL STABILIZER
V.I.P. ORTATONE OR
F1
F2
F3
F4
FUSELAGE TOP VIEW
NY-ROD HOLES
VERTICAL STAB.
RUDDER
4-1/2" GMC CANOPY
34" GMC FOAM #1-TW TAPER WING 1" DIHEDRAL
BANNER
RECOMMENDED ADHESIVES:
FUSELAGE: "HOT STUFF"
WING: DEVCON 5 MIN. EPOXY
COVERING:
FUSELAGE: COVERITE OR SOLAR-FILM
WING: TOPCOTE OR SOLARFILM
FOR 2 OR 3 CHANNEL RADIOS
AILERON/ELEVATOR OR AILERON/ELEVATOR/RUDDER
HALF-A-CHAOS

PLAN NO 607-A





FULL SIZE PLANS AVAILABLE — SEE PAGE 166

ACE PLUG-IN RADIO INSTALLATION

By Jack Headley

● Why is it that the radio is always in the model I don't want to fly and never in the one I do? (Want to fly, that is.) There must be some sort of law that makes sure nothing is ever where it should be, not never. So that's why I'm usually tearing out pieces from one glider to stick in another when everyone else is out flying. (While we are on the subject of removing radio pieces does anyone out there know an easy way to remove old and hard servo tape? My tape always seems to split in the middle, and I'm left with a rock solid piece in the fuselage which requires chiseling away.) But back to the first problem, how to move radio A from model B to model C?

As usual, most of my problems are easily solved by a minute application of brain power, a little midnight oil, and a glob of elbow epoxy (we modelers don't use elbow

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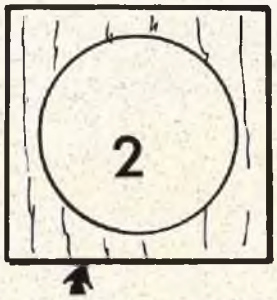
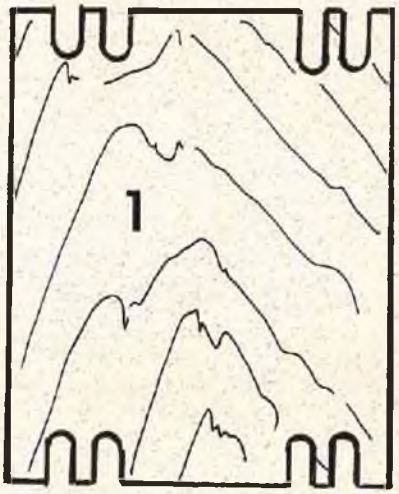
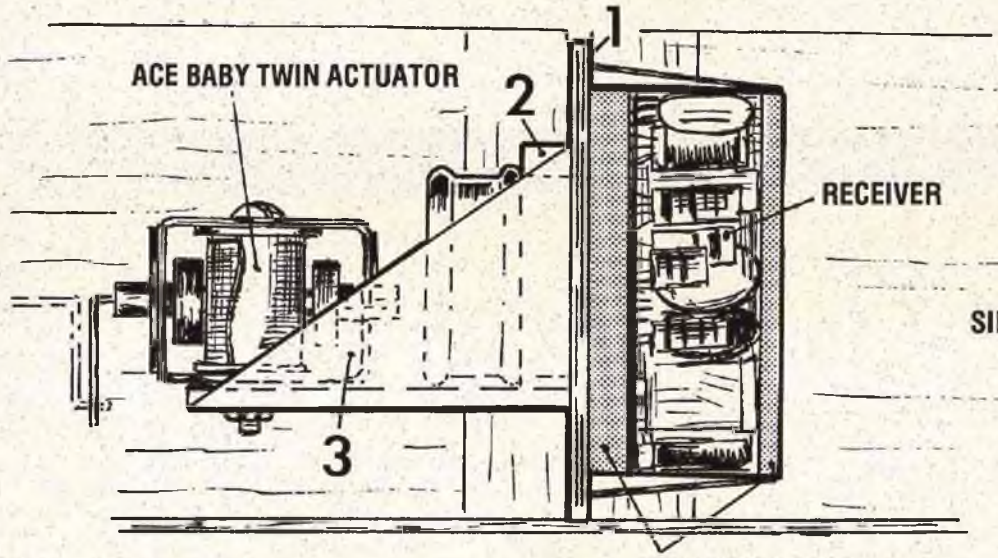
ALL ITEMS ARE FROM 3/32"PLY, EXCEPT THE BATTERY HOLDER, WHICH IS 1/4" SHEET BALSA.

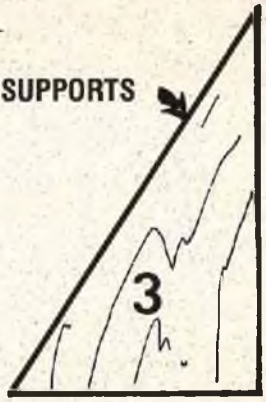


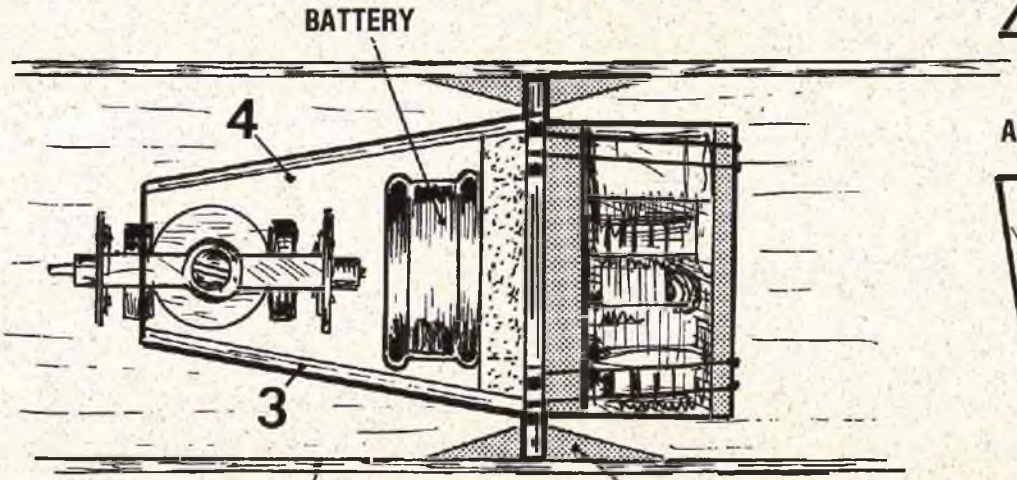
BATTERY HOLDER

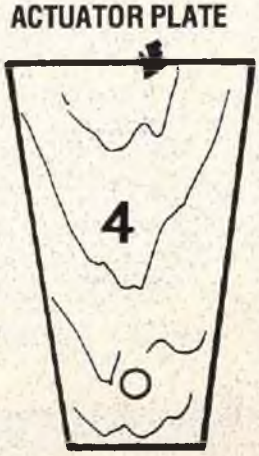


BASE PLATE









FLIGHT TRAINING SEMINAR

Part IV Of Learning To Fly Your R/C Helicopter Is A Discussion Involving The Heart Of The Machine - - - The Radio System.

BY AUBREY RADFORD

Editor's Preface: In this installment of RCM's Helicopter Flight Training Seminar, we are substituting an article by Aubrey Radford of Orange Park, Florida, for the one we had written and previously scheduled. The reason for this is that we feel that this is one of the most valuable articles ever presented to the helicopter enthusiast. The style in which it is written is unique – the information contained in the following paragraphs may well be of more value to you than any other segment in this series of articles - - - Don Dewey

I am Joe's Radio.

I was happy that Joe had selected me from all the other radios on the shelf. At last I could fulfill my designed intentions of zipping around the sky in a neat pattern ship and performing flawless maneuvers. Or maybe Joe had one of those graceful gliders that soar the wild blue yonder so majestically — it would be so quiet and peaceful. On the other hand if Joe was a 'go faster' I would fly the pylons with a precise response to his every command. In my wildest nightmare I would not have believed that Joe would turn out to be a rotary winged freak — yep, Joe's bag was helicopters! Little did I know that this would be the ultimate challenge. Oh, I didn't mind the accommodations — there was plenty of room for everything, in fact, cavernous would best describe my 'living room.' But my cavernous living room turned out to be the underside of a lawn mower! Joe didn't realize that a helicopter, hovering in ground effect, creates a high pressure area inside the fuselage. This swirling high pressure area circulates exhaust, oil, dirt, asphalt, grass and anything else in the vicinity through all my servos and connections.

Joe likes to oil the machinery and the excess oil is 'injected' into my parts, too . . . and there's that awful vibration that leaves me tingling after each flying session. The large fan on top is turning at one given rpm and the small one at the tail at an even faster rpm. Dynamic as well as harmonic (sympathetic) vibration is something I had to learn to live with. Joe couldn't understand why my servo pot wipers would wear out so soon, to say nothing of motors (brushes) then batteries and crystals — maybe if I could hook 120 volts to his battery powered toothbrush he would get the idea!

Joe has had a few unkind words for me too — like when he found out that I didn't have as much ground range as he thought I should have — half what it should have been — he said. How could I help but be a little spastic with all that metal-to-metal noise and my antenna wrapped around the transmission box?

But then Joe is not so dumb either. Before me there was another brand of radio and another brand of helicopter. This other radio was one of the 'cheaper' brands with a wide dead band on the servos — obviously not too precise but then he was flying a 'chopper' with a not-too-precise main rotor control. Minute interruptions of signal and imprecise servo neutrals were of little consequence since his main rotor lag time was measured in seconds. This combination complimented each other — up to a point. The problem was Joe's skill level reached the point where he was no longer satisfied to fly in general areas of choice. He wanted to fly **exactly** where he wanted — with confidence. So he bought a radio (me) with positive neutrals, a narrow dead band, fast and powerful servos and a receiver with extra noise rejection capability. I was installed in a helicopter with main rotor controls precise enough to utilize my superior abilities, with rotor lag time measured in milliseconds. Joe's learning curve is on the up-swing again now — but there are still some things he should be aware of — if I could just talk to him.

"Joe," I would say, "I'm getting tired of all this inverse 'bleeding'." I want you to tape up all the cracks in my servos, wrap my receiver in plastic wrap, and tape all the wiring connections to keep oil out. And another thing, wrap my receiver in a soft rubber (**not** synthetic) sheet. Then you can make oil shields for all those gear wheels and pulleys you so love to grease.

And Joe, one dirty servo pot can interact with the entire system to simulate interference or other dastardly things. The point here is please clean my pots on a regular basis. Now Joe, if you've recovered from your assignment as a pot cleaner — imagine this — your bare butt is strapped to a steel chair that is being simultaneously attacked by 50 air hammers. That's what it's like in your chopper, Joe, 'cause you don't take the extra time to balance all blades and paddles and you complain to the manufacturer about premature failures! If you have doubts, Joe, look at the landing gear during a hover. The landing skids act as a resonator, if they are not vibrating, chances are everything is okay.

Joe, you made me mad when you called me all those names when you were getting your first range checks. For your future reference a 30 to 50% less range (than a fixed wing craft) is normal. The truth is you **don't** have as much range in a helicopter. But listen, Joe, neither do you! Most of your flying is the 'up and around' the parking lot variety during which you aren't more than 100' away. Even the best pilots can't fly safely more than 250' to 350' away. Why? Because the helicopter turns into a Bic Bananna as far as your eyes are concerned and the range that you fly out of is not the radio's.

Next on the list is how to locate equipment in the helicopter for maximum performance and durability. Now I'm going to tell you just once, Joe, so listen carefully.

Servo location is, of course, dictated by the design of the machine. The battery will be located as far forward as possible — (most 'copters are 'tail' heavy). The receiver should be located as high as practical and as far from the engine/transmission as possible. The antenna location is critical. 'Hidden' (inside fuselage) antennas have (for me) not been practical. The first time out with a new radio gear, strap the helicopter down with the engine on idle. Turn the radio on. Walk around the helicopter with the antenna on the transmitter fully extended. Move the transmitter antenna from vertical to horizontal as you walk around. Make fast 'jerking' movements with the transmitter. If it is still 'solid' walk up from behind the helicopter with the transmitter in one hand, with the other hand 'grab' the tail boom. Still okay? Then slowly increase power while your hand rests on the tail boom. If you can go from idle to full power with no surges the chances are that you will have no radio problems. If you **do** have problems, change the receiver antenna location. In severe cases run the antenna **directly** through the side of the fuselage from the receiver location and allow it to hang vertically. You may have to experiment with this — there are no absolutes! The point is; antenna location is (usually) critical.

Finally, if I could talk, Joe, I would tell you to be empathetic in your expectations regarding your radio equipment.

If you do your 'ground work'
to cranal capacity –

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STANDARD PLANK

BY CHUCK CLEMANS AND DAVE JONES

PHOTOS BY JOHN C. CLOSSON

The Standard Plank is the continuation of a design series on flying wings and is the second design from the series to be published. The Little Plank was featured in the May 1972 RCM and, judging from the correspondence received, was well accepted both here and abroad. The current design is an attempt to improve performance for thermal soaring while retaining the simplicity and ease of construction inherent with the Plank configuration. A new wing section was developed based on the NACA 6409 and the aspect ratio was increased to ten. Control installation was simplified through the use of elevator and rudder.

Design Summary

Configuration: Flying wing with no sweep and a constant wing section allowing the use of a single rib size.

Fuselage: Minimum cross section with a single internal bulkhead.

Rudder: Flying rudder utilizing an aluminum tube hinge.

Power: .049 to .051 in a power pod, easily removed for slope or tow launch. Prototype used a Cox TD .051.

Controls: Elevator and rudder.

Wing Section: CJ-2, a section developed by the authors for use on flying wings and based on the NACA 6409 used on the Olympic 99 and other R/C gliders.

Wing: Two piece with integral or plug in tips. Basic span of 100 inches may be extended with alternate tips.

Equipment: The prototype utilized a Kraft two channel and Soaring Products thermal sensor.

Construction: Balsa with spruce spars.

Finish: Solarfilm and MonoKote on wings, Hobbypoxy finishing resin and acrylic lacquer on the fuselage.

Weight: 36-46 ounces, using a Kraft two channel and Soaring Products thermal sensor.

Performance: An unusual and versatile sailplane with a large range of flight speeds.

STANDARD PLANK
Designed By: Chuck Clemans & Dave Jones

TYPE AIRCRAFT
Thermal Soaring, Tailless
WINGSPAN
100 Inches
WING CHORD
11.25" (Average)
TOTAL WING AREA
1090 Square Inches
WING LOCATION
Top of Fuselage
AIRFOIL
Reflexed NACA 6409 (CJ-2)
WING PLANFORM
Swept T.E.
DIHEDRAL, EACH TIP
6 Degrees
O.A. FUSELAGE LENGTH
20¾ Inches
RADIO COMPARTMENT AREA
(L) 9" (W) 2" (H) 2½"
FLYING RUDDER HEIGHT
11¾ Inches
FLYING RUDDER WIDTH
4½ Inches (Average)
REC. ENGINE SIZE
.049-.09 Power Pod or Nose Mounted
LANDING GEAR
Skid
REC. NO. OF CHANNELS
Two
CONTROL FUNCTIONS
Elevons & Rudder
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa and Ply
Wing ..... Balsa, Ply and Spruce
Empennage ..... Balsa, Ply and Spruce
Weight Ready-To-Fly ..... 36-46 Ounces
Wing Loading ..... 4.75-6.07 Oz./Sq. Ft.

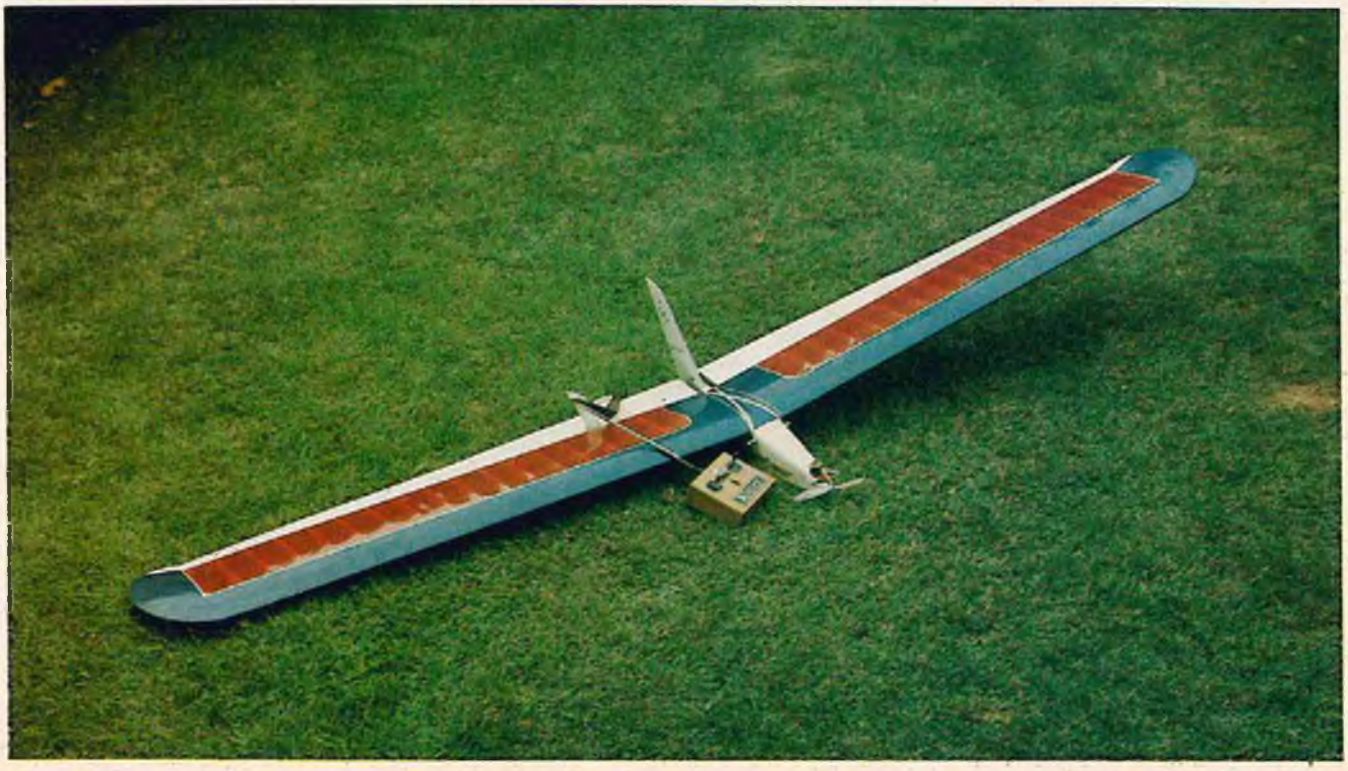
Historical

The lineage of this model dates back to the late 1940's when we built our first Plank. A typical model of that time is shown on page 26 of the 1950 Aeromodeller Annual. The data by T. van Teunenbroeic of Holland, in addition to the model two views, included ordinates for the airfoil. After a hitch in the Air Force and college, more Plank models were built. All exhibited similar flight characteristics which led us to believe better performance necessitated an improved wing section.

Little Plank (RCM, May 1972) had a modified wing section based on earlier models. However, the changes were toward stability and construction simplicity, not performance improvements. Although the Little Plank has its place, we felt we wanted a plane oriented more toward the thermal side of the sport. With this in mind, configuration changes aimed toward higher performance were considered. The final changes were these; increase in aspect ratio and area; rudder/elevator control; and a new wing section.

The first modifications, area and aspect ratio increase, produce a higher performance wing. The control system of rudder and elevator allowed us to use plenty of dihedral (6 degrees) which, in turn, made the plane easier to fly. The big jump in performance, however, came from the new

Photo to the left, and below, show Frank Nauman's Standard Plank. Optional nose mounted engine used on this prototype.



Telephoto lens compresses the distance as the Standard Plank flies over the West High School field in Torrance, California.

wing section. It has more camber and less reflex than any section we have used in the past.

Aerodynamics Of Flying Wings

The fear many modelers have of tailless airplanes is based on the unknown. The basic forces on a tailless are the same as on a conventional or canard configuration. These are lift, drag, weight and pitching moment. Lift, drag, and weight are probably familiar terms but pitching moment may not be. Pitching moment is a force produced by the wing as it is moved through the air. This force tends to pull the leading edge of the wing down. In order to prevent that from happening a trimming device is needed.

On a conventional configuration the trimming device is the horizontal tail. On a tailless it is the sweep and/or the wing section. On the Plank it is the wing section which is self-trimming. In other words, the wing section does two jobs, lifting and trimming. A wide variety of sections are capable of doing the job. Although none can, at this time, compete as a lift producing device with the conventional configuration, other advantages are inherent. Low drag, high maneuverability, wide speed capability and structural simplicity are some of them.

If you now have the urge to try something on your own, a set of six wing section ordinates are available. Also available is a newsletter Tailless Topics[2]. It is intended to put experimenters and flyers in touch to further the advancement of tailless airplanes.

CJ-2 Development

The NACA 6409 has long been a favorite of modelers, and even in these days of the Eppler series, finds success on models such as the Airtronics' Olympic 99. We were curious to see if a reflexed version of the 6409 would, if stable enough for flying wing applications, retain good soaring capability.

How does one reflex an airfoil? Fortunately, the work of Jim Marske, a designer of man-carrying flying wing sailplanes, suggests a method for accomplishing this[3]. According to Marske, the stability of an airfoil is determined by the point at which the mean camber line intersects the chord line. The further forward this point of intersection, the more stable the airfoil. An intersection at about 85% of the chord line back from the leading edge will produce an airfoil with more or less neutral pitch stability.

To produce the CJ-2, the mean camber line of the NACA 6409 was first plotted and then redrawn so that the intersection with the chord line occurred at 75%. This was deemed to be as close to neutrally stable as we wanted without an autopilot. From 75% to 100% the mean camber line is gently returned to the chord line. Using the new mean camber line as a reference, the NACA 6409 thickness distribution about the original mean camber line was plotted. The result, a reflexed NACA 6409 (CJ-2), with many of the characteristics of the original airfoil plus the added self-trimming capability required for flying wing applications.

FLYING

Test flying the Standard Plank will present few problems if the following points are kept in mind:

(A)Begin tests with the Center of Gravity and elevator settings as shown on the plans.

(B)It is impossible to have too much rudder throw.

(C)While too much up will rarely cause a problem, a little down can be quite dramatic.

Hand gliding is definitely advised. Begin with full up trim and adjust for a relatively fast glide. Fine tune the glide after the proper elevator/CG relationship has been established. The idea here is to move the CG as far to the rear as possible, thus reducing

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WING MAIN PANELS

W1 LEADING EDGE - 1/4 SQ. BALSA
W2 LEADING EDGE SKIN - 1/16 SHEET BALSA
W3 MAIN SPAR CAP - 1/8 x 1/4 SPRUCE
W4 MAIN SPAR WEB - 1/32 PLYWOOD
W5 REAR SPAR - 1/8 x 1/4 SPRUCE
W6 TRAILING EDGE - 1/4 x 2 - 1/4 BALSA
W7 ELEVATOR - 1/4 x 3 - 1/2 BALSA
W8 GUSSET - 1/16 PLYWOOD (20 REQ.)
W9 ELEVATOR INSERT - 1/4 PLYWOOD
W10 PANEL JOINER - 5/32 DIA. WIRE 6° DIHEDRAL (2 REQ.)
W11 JOINER SEAT - 5/32 I.D. ALUM. TUBE (4 REQ.)
W12 RIB - 1/16 SHEET BALSA (30 REQ.)
W13 RIB CAP - 1/16 x 1/4 BALSA
W14 JOINER RIB - 1/16 PLYWOOD (6 REQ.)
W15 ROOT RIB - 1/4 BALSA (2 REQ.)
W16 ROOT RIB FACE - 1/32 PLYWOOD (2 REQ.)
W17 TIP RIB - 1/4 BALSA (2 REQ.)

WING MAIN PANELS

W18 TIP RIB FACE - 1/32 PLYWOOD (2 REQ.)
W19 TIP JOINER SEAT - 1/4 I.D. ALUM. TUBE, EPOXY FILLET
W20 TIP WEB - 1/16 HARD BALSA VERTICAL GRAIN
W21 ELEVATOR HORN (2 REQ.)
W22 ROOT SKIN - 1/16 SHEET BALSA, TOP & BOTTOM

REMOVEABLE WING TIP

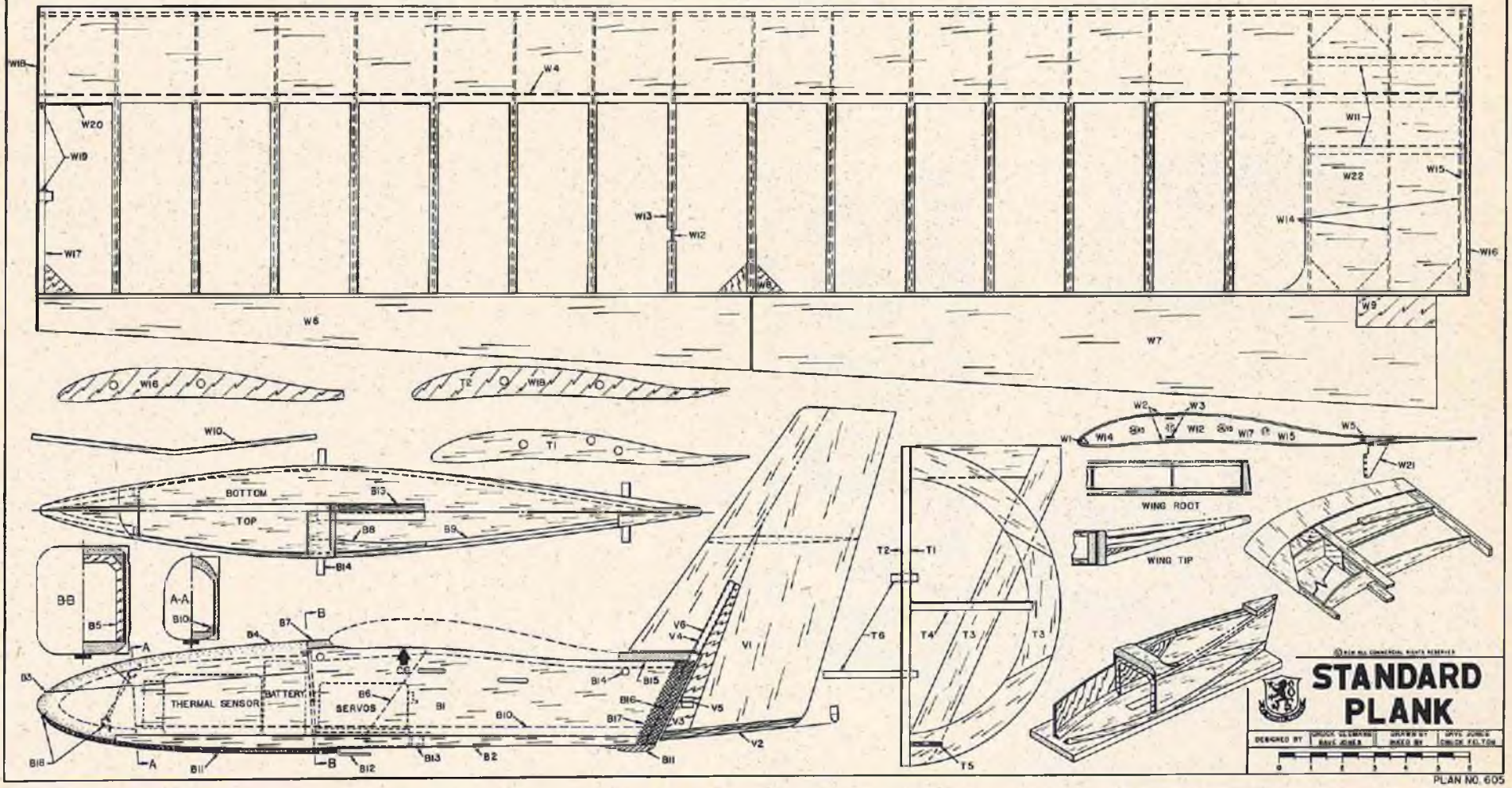
T1 ROOT RIB - 1/4 BALSA (2 REQ.)
T2 ROOT RIB FACE - 1/32 PLYWOOD (2 REQ.)
T3 TIP OUTLINE - 1/4 SHEET BALSA
T4 TIP SPAR - 1/4 O.D. ALUM. TUBE, EPOXY FILLET
T5 DIHEDRAL BRACE - 1/8 PLYWOOD 15° DIHEDRAL (2 REQ.)
T6 TIP JOINER - 1/4 O.D. ALUM. TUBE, EPOXY FILLET

VERTICAL TAIL

V1 MAIN BODY - 1/4 SHEET BALSA
V2 ROOT RIB - 1/4 SQ. SPRUCE
V3 INSERT - 1/4 PLYWOOD
V4 HINGE - 1/4 O.D. ALUM. TUBE
V5 HORN (1 REQ.)
V6 BEARING - 7/32 O.D. ALUM. TUBE

BODY

B1 SIDE - 1/8 SHEET BALSA
B2 BOTTOM - 3/8 SHEET BALSA
B3 LOWER NOSE - PINE OR HARD BALSA
B4 HATCH/UPPER NOSE - BALSA
B5 FRAME - 3/32 PLYWOOD
B6 FORWARD DOUBLER - 1/32 PLYWOOD
B7 FORWARD WING STOP - 1/4 SHEET BALSA
B8 FORWARD WING REST - 3/8 TRIANGULAR BALSA
B9 AFT WING REST - 1/8 SHEET BALSA
B10 LOWER LONGERON - 1/4 TRIANGULAR BALSA
B11 SKID - SERVO TAPE AND STYRENE, REAR SKID - SPRUCE
B12 TOW HOOK - 1/16 DIA. WIRE
B13 TOW HOOK BLOCK - 1/2 x 3/8 MAPLE
B14 WING HOLD DOWN - 1/4 O.D. ALUM. TUBE
B15 UPPER TAIL - 1/4 SHEET BALSA
B16 HINGE - 1/4 O.D. ALUM. TUBE
B17 HINGE FAIRING - FG CLOTH AND EPOXY
B18 MISCELLANEOUS



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STANDARD PLANK

DESIGNED BY DRUCK ULLMANN BRUCE JONES
DRAWN BY MIKED BY DRUCK ULLMANN CHUCK FELTON

PLAN NO. 605

The author, watching the store at the 1975 Toledo Conference.

HIGH PERFORMANCE HYDROS

Setting up the Drive Line and Running Gear

BY GLENN CUPIT

Editors Preface: This is the first in a series of 'how-to' articles for high performance power boats. Subsequent installments will include all phases of installing radio equipment, antenna routing, propeller selection, and other articles of interest to high performance boat enthusiasts. The author of these series of articles owns and operates Performance Hobby Supplies, P.O. Box 73030, Metairie, Louisiana 70033, a company dealing exclusively in competition RC boat items. In addition, Glen is a top power boat competitor and treats each of these indidvidual subjects with an understanding that comes from years of technical expertise and knowledge of racing competition. Both R/C Modeler Magazine and the author welcome your comments, suggestions, and inquiries concerning this series of articles. . . Don Dewey

This first article is concerned with setting up the general drive line and running gear on your Hydro but covers only articulated drive shafts. (One or more underwater U-Joints.) We feel this is **generally** the best set-up. However, there are certain applications where solid shaft (propeller to engine U-Joint), or flexible shafts, may have certain advantages. These will be discussed in a separate article.

Please study the illustrations accompanying this article carefully. Figure 1 shows a conventional strut Monoplane arrangement. All underwater struts shown are parallel since we feel this is the most successful set-up for all monoplanes. It is most difficult to turn a fast Mono with an angled shaft. Trimming is accomplished by shimming the strut at the front or rear — trim tabs not being required. (A small torque tab on the starboard side may be helpful.)

To lower the bow at speed, increase the strut angle (move the propeller away from the bottom). Conversely, to raise the bow at speed, it is necessary to decrease the strut angle (move the propeller towards the bottom).

For a super-clean bottom, cut a hole through the boat exactly the size of the strut. Epoxy and reinforce a plywood piece inside the hull and mount the strut to the plywood. (Tap the strut and screw from the inside). Temporarily fill around the strut with modeling clay. After running your boat, and shimming the strut as required, remove the clay and fill around the strut with epoxy. Octura extruded struts may not require fairing-in with epoxy since they are extruded and of even thickness. Octura struts may also be mounted inside the hull by slitting the bottom and transom as shown in Figure 1A and sealing with silicone or epoxy.

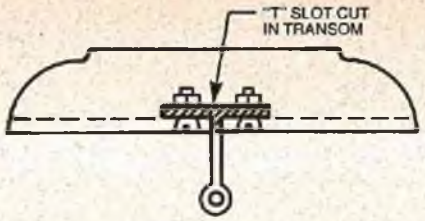

FIGURE 1-A
STRUT MOUNTED INSIDE HULL

Figure 2 shows a transom mounted V.O.A. (Variable Outdrive Assembly) by Marine Specialties. This is a good set-up for .19 to .40 Mono's and Hydro's. The strut depth and angle may be changed easily and the rudder is also included in the assembly. In addition, no hole is required in the bottom of the hull.

Figure 3 shows a typical D-V drive line set-up for racing. In this illustration we show Octura's "Strudder" as it offers considerable advantages. As an example, no hole is required through the hull into the radio compartment since sealing such a hole with an adjustable strut on a D-V is a definite problem. The effective length of the boat is increased by the propeller located to the rear of the transom. This helps rough water running while the strut depth and angle is easily adjusted. You can deepen the strut to eliminate cavitation. When the outer circumference of the propeller is about even with the keel, you have an adjustment that is usually about right. Trimming can be done by changing the strut angle and rudder pivot angle. To lower the bow at speed, increase the strut angle (lower the propeller). To raise the bow at speed, decrease the strut angle (raise the propeller). To raise the bow in turns, move the bottom of the rudder forward. To lower the bow in turns, move the bottom of the rudder rearward.

Again referring to Figure 3, mount the radio, fuel tank, etc., to the port side of the keel and as low as possible. This will help offset torque which helps to roll the boat to starboard. Also, mount the engine as far rearward as practicable and keep the Center of Gravity as far back as possible. Mount the fuel tank as close to, and forward of the engine.

The stuffing box should be faired in with epoxy under the keel. This fairing should have a slightly larger outside diameter than the male U-Joint to prevent water from being forced up through the stuffing box. Referring to Figure 3A, make "A" larger

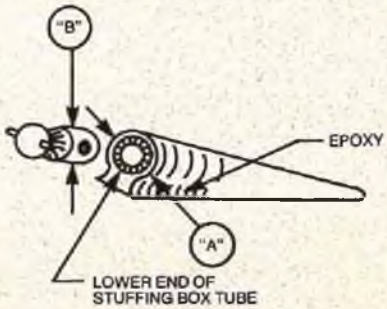

FIGURE 3-A

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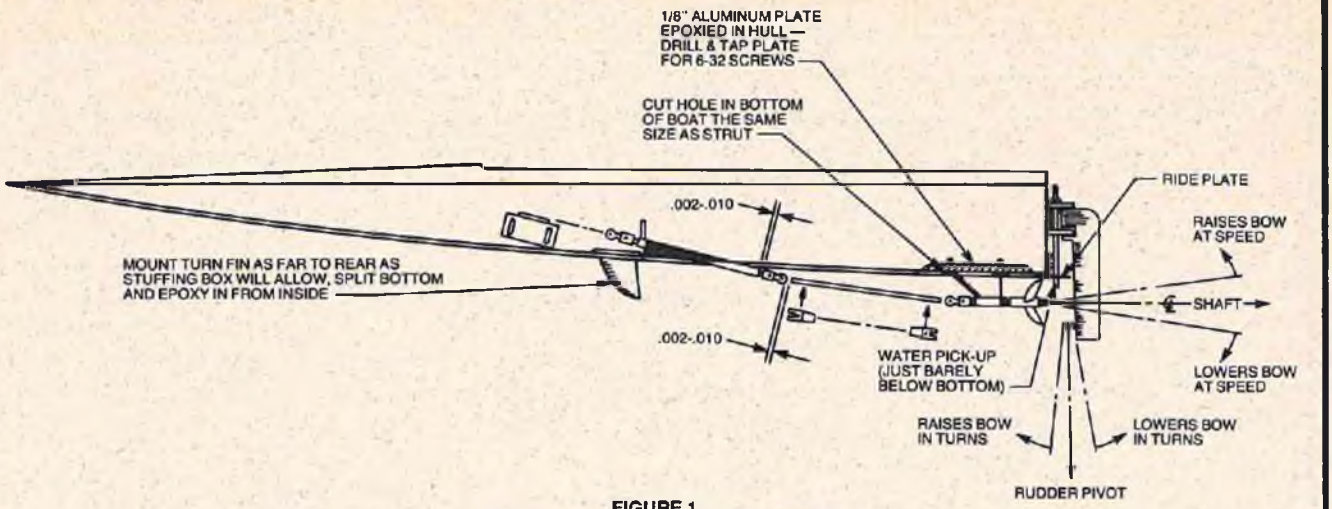

FIGURE 1
STRUT MOUNTED FLUSH WITH BOTTOM

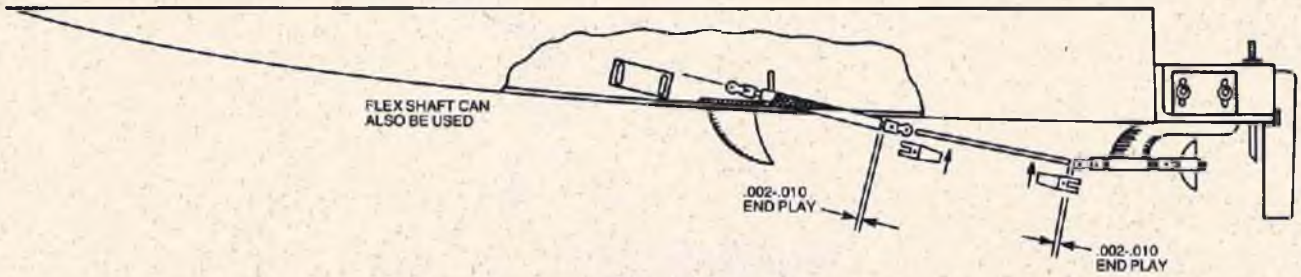

FIGURE 2
MARINE SPECIALTIES V.O.A. (VARIABLE OUTDRIVE ASSY.) MONO OR HYDRO SET UP

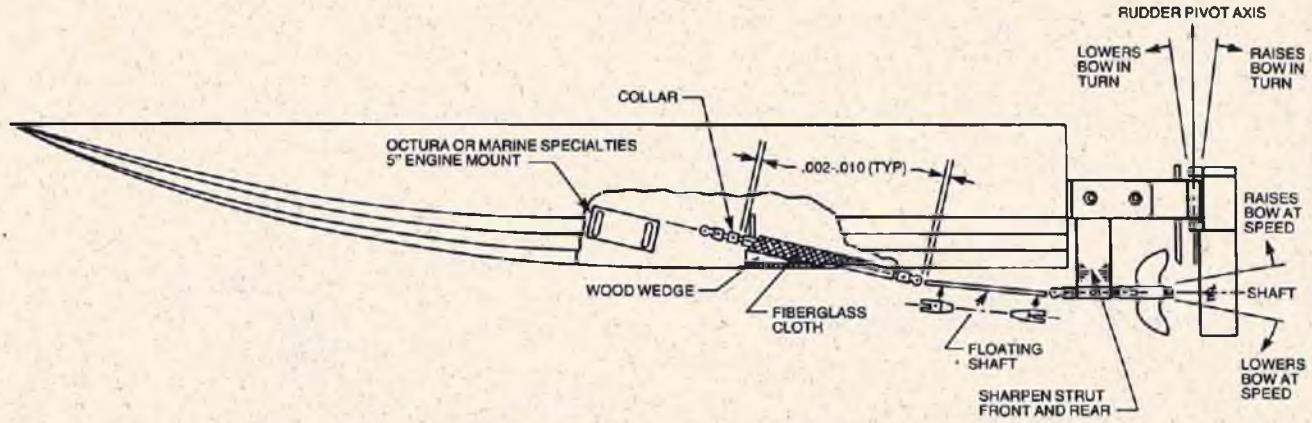

FIGURE 3
TYPICAL D-V DRIVE LINE SET UP FOR RACING

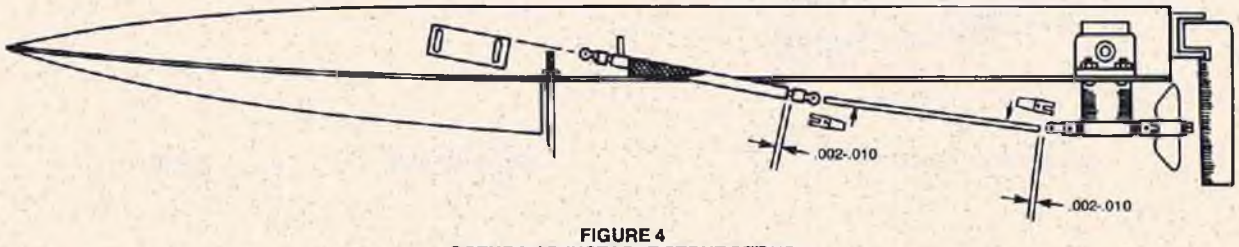

FIGURE 4
OCTURA ADJUSTABLE STRUT SET UP

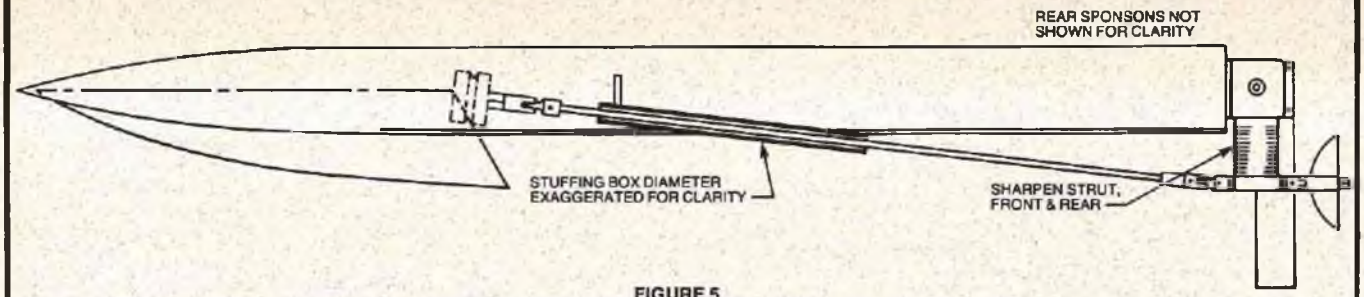

FIGURE 5
SINGLE U-JOINT (NO BEARING IN STUFFING BOX)

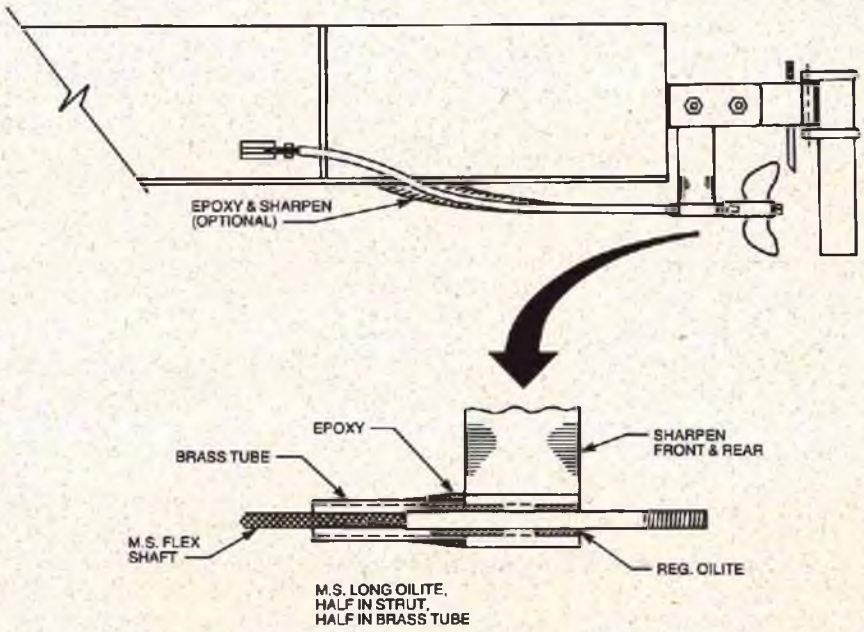

FIGURE 6
MARINE SPECIALTIES FLEX SET UP (STRUDDER OR STRUT) (BORED FOR OILITES)

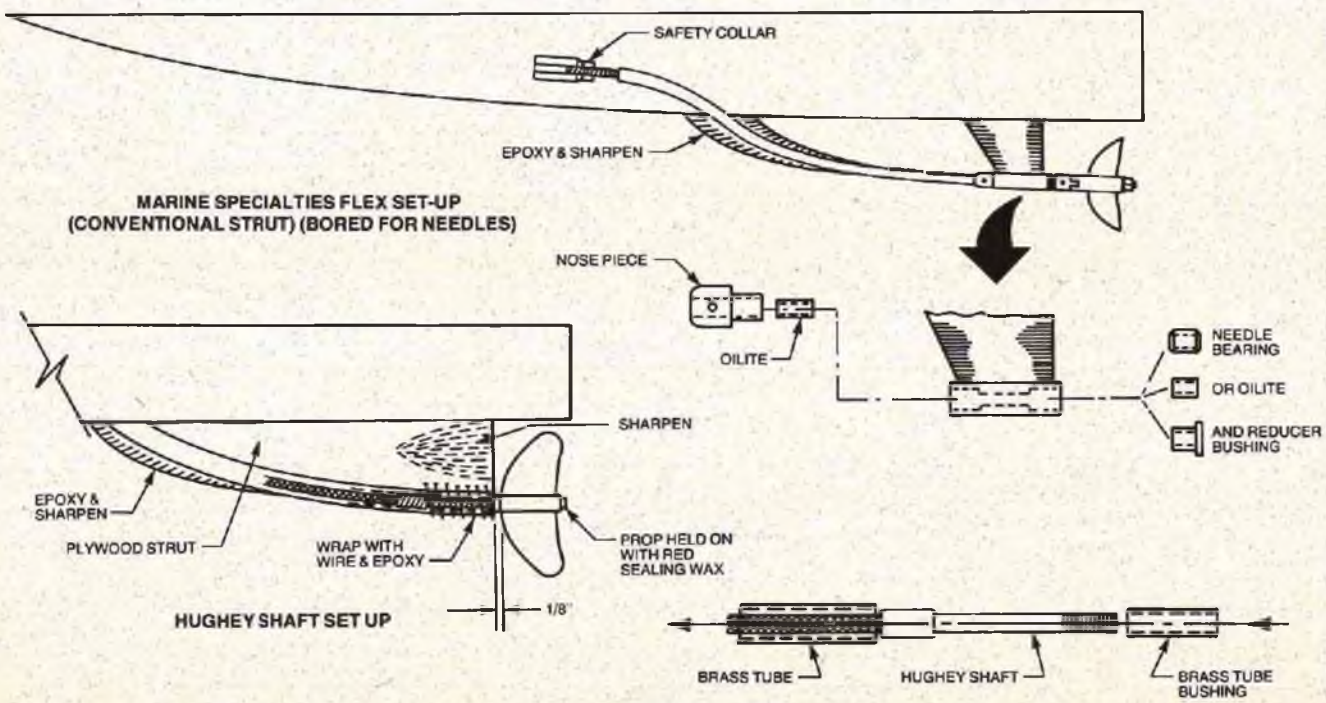

FIGURE 7

Converting Your Du-Bro Hughes 300 To A New SHARK

BY ALONZO RICHARDSON

Having started with the Hughes 300 to see what helicopter flying was all about and having experienced the usual problems of trying to keep it together, it was not surprising that a few months later I wrote the "How To Improve Your Hughes 300" article.

After a year of flying it and having given it the best of maintenance it still clearly showed a year's hard use. In trying to go through Grade 2 of the National Radio Control Helicopter Association checks, I felt I was being held back because I could not control the tail with the confidence the many hours of practice should have generated. The wood parts were oil soaked and the plastic canopy was full of cracks. Obtaining a set of drawings and parts list of the Shark, a close check indicated the conversion probably could be made at a fraction of the cost of a new helicopter. On one of my trips to the Chicago area, Dave Gray advised me that several others had made the same conversion with little trouble.

A parts list and a check were sent to Du-Bro and soon the parts were in my shop and the conversion underway. For the most part, I had little trouble. There are only a few changes required such as drilling a few holes. Four or five nights work and the job is finished.

Before going into what must be changed, let me state why I wanted the change and what I feel I obtained from these changes.

1. New fuselage.
2. No more wood.
3. Better rotational stability.
4. Less weight and more lift.
5. Easier model to keep clean.

The new all-metal frame and new plastic canopy or body are much better. The additional fin area, plus the weight in the nose of the plastic canopy, add yaw stability. I believe this comes from a greater polar inertia, plus the fact that the larger fin does act as a dampener when hovering and as a regular tail fin when flying. Reduction in the total weight means more reserve power to be used to stop the descent when coming down for a landing. With the fuels that we have had in recent months my year-old engine was just not enough in the Hughes but is much better in the Shark.

As for keeping it clean the plastic body does wipe off with less trouble but if someone could find a way to stop the blow back from the carburetor they would be doing us two favors: The cleaning problem would be less and the fuel use should be reduced.

To be on the safe side, I made the first several flights with a training bar tied across the skids. Unless you are an expert (I have seen only one) I would recommend the same precaution for you. Once I am sure all things are working and trimmed for the conditions of the day, I remove the training bar.

There were some changes made to the 300 before the Shark was introduced and I would recommend these no matter what your future plans are for your ship. These are as follows:

(1) The bevel gear drive from main rotor shaft to tail drive shaft is now a pair of steel gears replacing the old brass ones.

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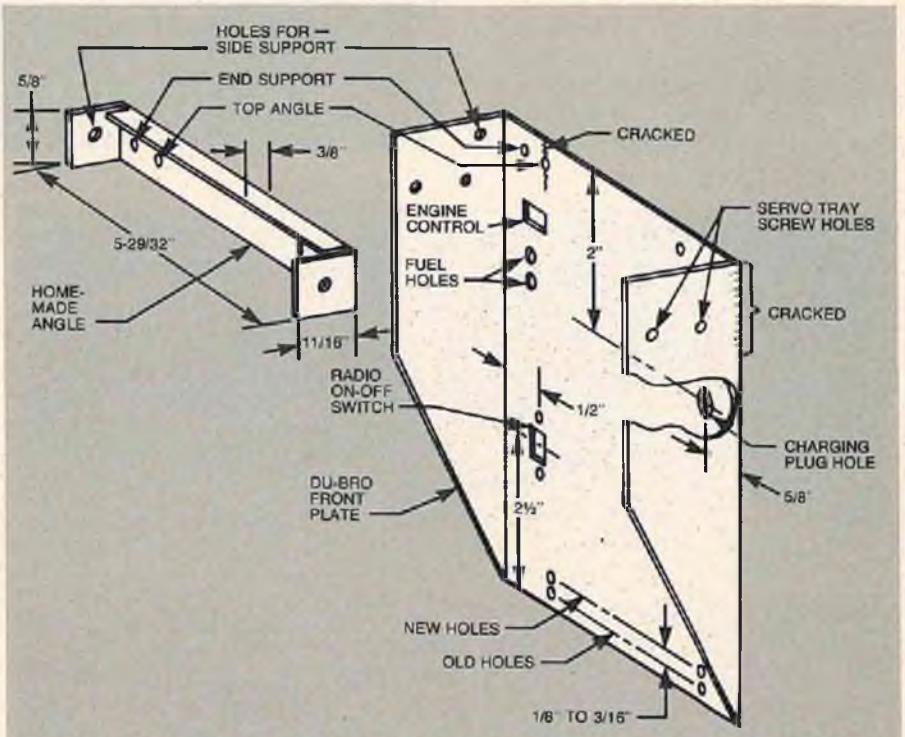
PARTS LIST

Bag No.	Part No.	Description	Quant.
SH-2	205	6-32 Spade Bolt	3
	208	4-40 3/4 Bolts	8
	209	#4 Lock Washer	8
	210	4-40 Nuts	8
	215	Spring	1
	216	#6 Lock Washer	3
SH-3		Complete Bag of Misc. Nuts, Bolts, Screws, etc.	1 bag
SH-5	242	Flybar Control Arm	1
	245	Kwik Link Swivel	1
	246	10-32 Set Screw	1
SH-10	282	4-40 1/4" Bolts	2
SH-14	297	Center Bearing Eyelets	4
	298	Center Bearing, Teflon	2
SH-15	304	Steel Eyelets	7
	305	Scissors Head	2
	306	Scissors Base	2
	308	Stand Off	4
	310	1/2" Brass Spacer	2
	312	Scissors Mt. Block	1
	313	Scissors Mt. Collar	1
SH-16	Comp Bag	Plastic Body Parts	1 bag
SH-17	349	Fin Mount	1
	323	Top Plate	1
	324	Front Plate	1
	325	Bottom Plate	1
	326	Top Angle Bracket	1
	327	Bot. Angle Bracket	1
	328	Lg. 1/4" Boom Brace	2
	329	Med. 1/4" Boom Brace	2
	330	Sh. 1/4" Boom Brace	2
	331	Cross Brace	1
	337	Skids	2
	338	L.G. Struts	2
	339	Fin	1

1 Shark Instruction Manual and Skelches



SKETCH NO. 1

Alonzo Richardson with his original Du-Bro Hughes 300.

(2) The small gear in the above set was mounted on a shaft that had a reduced diameter for the gear to fit onto. The new shaft is of constant diameter with a small recess for the set screw to seat into. Using Loctite, the new shaft, and the new gear, you will have no more trouble keeping the gear on the shaft. The new shaft is stronger and will stand more punishment before it will bend.

(3) The original tail rotor gear box was not ball bearing. The new one is, which means less power wasted. One word of caution, it must be lubricated often. I failed to do so and one of the bearings got so hot it melted the nylon case.

(4) The new gear box is driven through what I call a pin-and-slot type coupling. The assembly of the tail drive shaft and boom is therefore different. Should you order the new tail gear box you should tell Du-Bro you are making the change so the other parts required will be supplied at the same time.

The author with the final conversion of the Hughes 300 to a Shark, as detailed in this article.

The converted chopper flying at the author's flying site near Burlingame, California.

The above changes are worthwhile even if you stay with the 300. Now for the 300 to Shark conversion.

Start by removing everything on the main rotor shaft. Remove the tail boom assembly, radio, servos, tray, battery, fuel tank and tank bracket. In short, strip it down to the bare engine and main rotor shaft. If you will wash up everything now it will make handling both new and old parts much easier. A helicopter gets oil in every place you can see and to a much greater degree than a plane.

The assembly starts by mounting the top plate, bottom plate, top angle, bottom angle, and then the front plate. Here is where I ran into my first problem. The later engines have a deeper fly wheel or fan housing so that the distance from the top of the engine to the bottom is greater on the new ones than on the old ones like mine. The front plate must have new holes drilled 1/8" to 3/16" above the ones that are there

Close-up of converted Hughes with Shark modifications – body removed.

for screws to match the holes in the bottom angle. Refer to Sketch 1 for details. Your engine may be one of the newer ones so try the fit before making the new holes. If the holes have to be moved you will also have to notch the bottom angle to clear the nuts on the large "J" bolts at the bottom of the front plate. Leave the top and bottom plate screws a little loose until the front plate is in place to prevent twisting the front plate.

Now that we have a fit for the front plate, you should cut such other holes as required for the receiver on-off switch, the battery charging plug, and any other thing like a fuel level indicator light or what-not. You should add all the bellcranks and stand-offs to the top plate then assemble front, top, and bottom plates as described above.

Adding the landing gear and skids gives a stand to hold the ship through the rest of the assembly. I used screws and nuts with the nuts soldered when securing the skids to the struts. Sheet metal screws were provided but a few hours flying and I was running out of sheet metal screws. Be sure to use the spade bolts when mounting the rear strut to the bottom plate because the tail boom braces mount onto the spade part of the same bolts.

Either now, or after you have added the servo tray and servos, you should consider a modification I found necessary to prevent cracks from developing in the front plate. Look at Sketch 1 and you will see cracks developed in the left top corner and through the right top screw hole for the angle bracket. I believe this is caused by the load from the weight in the nose of the plastic canopy putting a strain on the top of the front plate which is only supported by the screws into the top angle. As you can see from Sketch 1, I fashioned an angle brace to add stiffness to the top of the front plate as well as some strength to the sides of the front plate. Use some scrap 1/16" to 3/32" thick sheet aluminum that is hard, but not so much so that it cannot be bent as required without breaking. The top leg of the new angle must be flush with the top of the front plate or else the servo pushrods will drag on it. The inside angle formed is, therefore, less than 90 degrees.

At this point, I wanted to see what the tail boom would look like so its assembly came next. You will have a hole to drill for securing the front end of the fin. Be careful not to damage the brass drive shaft inside and use a sheet metal screw short enough not to touch the drive shaft.

The 300 tail drive shaft had one nylon bushing supporting it about half way down

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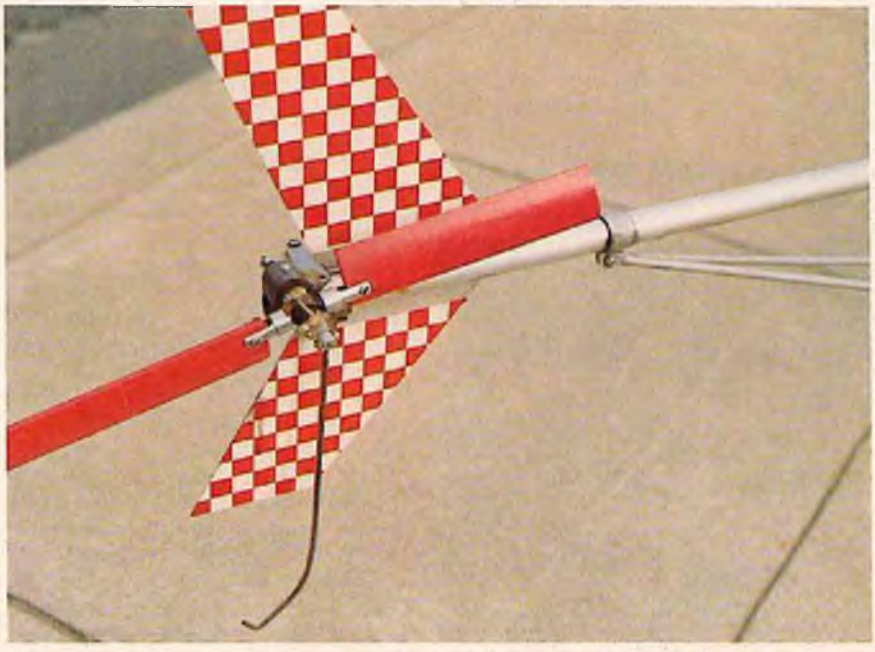

Tail rotor gear box and and pitch mechanism on converted Hughes.

SUNDAY FLIER

BY KEN WILLARD

Dick Aubert's Little Shaver proves that Half-A Racers are all engine!

● A couple of months ago, in the May issue, I talked about the results of some flight tests with various items. Well sir, that issue got so darn full that some things just had to be postponed until later. And because I got a bit carried away and wrote a longer column than usual, some of it had to be postponed.

Hey! Why pick on me? Especially when the bit that was postponed was an informal product report on the GB Mallard that Gary Korpi helped write.

Now Gary weighs in at a solid figure about fifty pounds heavier than me. Rounder, too! You can just about see the picture as I ease up to him and say, "Your report was left out."

As the face reddened, the nostrils flared, the knuckles got white, and the terrifying bulk - - er, hulk - - ah (gulp) broad shoulders, came menacingly forward, I quickly added, "But it will come out it a future issue!"

With that, I managed to placate him long enough to get to a phone and let Dauntless Don know that one of his staff was in dire jeopardy. Besides, it's a good report. So here it is:

When Ken asked me if I would like to build the Gee Bee Mallard, I greedily said yes, knowing that this was my chance to own a seaplane. My time was limited, what with another project – flying an R/C job to take air pollution samples for the State Department of Transportation – but a few prodding phone calls from Poolside (Ken's home) convinced me it was time to finish the project.

The Gee Bee Mallard is a seaplane built around the new Gee Bee float, which, by the way, is a vast improvement over the earlier grey models.

At first I had my doubts about the attachment method to join the fuselage and the float hull (contact cement and leather strips) but these doubts proved groundless as it is quite strong and watertight.

The fuselage is a little cramped for equipment installation and you need one of the newer smaller radio and servo combos to fit. The radio we used was a new 1974 Proline 7 channel, using only three servos.

I built the model exactly according to the instructions, with two exceptions. First I fiberglassed the wing center section and second put a Fox .36 in it instead of a .19-.29 as recommended. A Fox closed-end muffler was also used.

Coverite, with four coats of clear and then sprayed with K & B Superpoxy white gave the Mallard a good base finish. Trim was with MonoKote Trim Strips.

For the first tests we went out in the middle of the channel (we were up in the Delta of the Sacramento River), started up the engine, checked the controls, and taxied around for a bit. It taxiis very well, so I gave it power and started the take-off run. A quick check, after a water loop, shows all okay, so I try again. Another water loop. Same thing next try.

Seems like it's stalling on take-off, so I put in about six to eight turns of down elevator trim. Now it takes off. Seems that due to the .36 for power a lot of down trim is required. Possibly if I had used a .19 or .29 the trim would have been pretty close. But, as an old pylon flyer I just can't seem to have enough power in a model. After all, what are throttles for anyway?

The Mallard handles well on the water. The tip floats and their flat bottoms really do skip off the water with no tendency to dig in or drag a wing tip.

I still prefer ailerons, but when properly trimmed the Mallard handles all but the most windy days.

Landings are a joy, but care must be taken to be very close to stall speed on touch down, as a nice bounce off the water will result if the speed is a little faster than stall.

All in all, the Mallard is a good handling seaplane. If, like me, you use a larger engine, I would recommend at least three degrees more downthrust on the engine or, possibly, one degree positive on the stab. For all around sport flying, the Mallard is a good performer, and its unique appearance, with the "inverted Dixie Cup wing floats" always attracts a lot of attention. I've had a lot of fun with it, and so will you.

Dick and the Little Shaver in a more normal pose.

Gary's experiences with the Mallard were subsequently confirmed by me, personally. We went out to a local reservoir and I put in some flights.

My impression? It's a good three channel sport job. Handles well on the water — the tip floats give it a lot of lateral stability. They also have a fair amount of drag until they break clear, and so you have to take-off directly into the wind if it has any force, since otherwise the side load of the wind will keep one float on the water and you have a decided problem in breaking free. But right into the wind it goes up easily.

Air handling is about the same as any good all around sport job with rudder and elevator. Ours was maybe a trifle hot, since it came out a bit heavier than the specs call for, but not at all hard to handle once you got

used to it. I enjoyed flying it just like Gary did.

And the Mallard is still doing a great job of sport flying.

●

In the March 1975 issue of RCM, I asked for help on temperature effects on nickel cadmiums, specifically low temperatures. Here's a letter I received in response.

Dear Ken:

In answer to your request for assistance concerning temperature affects on nickel cadmium batteries (re: letter from Andrew Macdonald, RCM March '75), I certainly am not an expert on nickel cadmiums, but through my job, have gained considerable knowledge in working with equipment utilizing nickel cadmiums in different climatic conditions.

To be as brief as possible, refrigerating primary batteries (e.g., zinc, alkaline, mercury, or any other non-rechargeable battery) is an accepted practice and does preserve (extend if you will) the life of a primary battery.

This practice, however, does not apply to secondary (rechargeable) batteries, such as nickel cadmiums. Nickel cadmiums lose their capacity to hold a charge when the ambient temperature drops to zero degrees fahrenheit and lower. At zero degrees the capacity of nickel cadmiums decreases to approximately 70%. This figure applies to a non-vented 500 mil pack as commonly used for R/C. As temperature drops further, capacity decreases until near zero capacity is reached at approximately 70°F.

If nickel cadmiums are charged fully at room temperature and then stored at below zero temperatures, they will retain their charge when returned to room temperature. I use the term "room temperature" loosely to mean any temperature above 32°F.

In conclusion, there are other factors involved with the behavior of nickel cadmiums at temperature extremes, but they are beyond the scope of this letter.

Sincerely,
Alfred J. Trapanese

By the time this column appears, the information will be of academic value to most of you, but save it until next winter. And Andy Macdonald, up there in the really cold country, may find use for the data even earlier. Just don't try to fly when the temperature is −70°F, Andy.

●

Had a couple of inquiries lately about fuel feed to engines. In the case of one, regarding flooding and leaning out with a .60, I referred the modeler to Clarence Lee, but first I told him he might try a system that I've used with .10's and .15's with success, and also on occasion with an .049.

One of the letters on the smaller engine, a Max .10, dealt with the problem of running it as a pusher on the Puddlejumper. It seems that after the engine was leaned out to run two cycle it would go into four cycle as the

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The Mallard on Grass – lines are unique. "Dixie Cup" floats are different, to say the least. BELOW, the Mallard in the pool.

BELOW: Gary Korpi with Pylon Racer. As he says, he "likes power."

TOLEDO '75

● Bigger and better than ever — the 21st Annual Toledo Radio Control Exposition, sponsored by the Weak Signals Radio Control Club was held in a new location this year. The Toledo Sports Arena provided at least 50% additional space over the previous site and it was packed full of exhibits and people.

The Weak Signals Radio Control Club members, quided by co-directors Don Belote and Bob Hisey, can be proud of a most successful and well organized show for 1975.

More than 250 booths were occupied by manufacturers and organizations displaying every conceivable product related to radio controlled modeling. Most prominent were accessories and gadgets. A small sampling would include a tiny electric air compressor for charging pneumatic retractable landing gears, a rate-of-climb sensor for the sailplane enthusiasts, a beveling jig for making true wing panel joints, engine driven fuel pumps and matching large bore carburetors for constant fuel flow, plus electronic devices of several types for charging and checking battery conditions. There is no way to list them all but they are described in the advertisements in this magazine.

Aircraft identified as trainers were all over the place. You can find a trainer of any size with any degree of pre-fabrication, and in any performance range. Construction materials range from conventional balsa through all sorts of plastics, plywood, and paper.

Stand-Off Scale came on strong and there is now a wide variety of kits available that are designed to fly well and to look good. Competition for this market has brought about some very high quality kits.

The number of radio manufacturers continues to increase. There are radios to fit everyone's desires from the small pulse sets and tiny proportionals on up through the expensive prestige systems. Whether the manufacturers call it a new radio or an improved set, radios have to be the best value available to the modeler. Performance and reliability continue to improve while holding the line on prices.

RC engines shown this year, particularly in the .40 to .61 sizes, have made remarkable improvements over previous models. Power has increased through refinements in carburetion, porting and balance, while improving sound suppression capabilities. It was difficult to pass an engine booth without wanting a new engine!

Kits, components, and accessories were shown for all types of boats. Model boating is one of the fastest growing phases of our sport and, like model aircraft, there is a boating activity for every taste. The marine

The Greatest R/C Show On Earth is truly an understatement when applied to the 1975 edition of the Annual Toledo R/C Exposition. Hosted by the Weak Signals Club of Toledo, Ohio, over 250 manufacturers and organizations displayed their 1975 line of products for a crowd of more than 20,000 RC sportsmen and their families. In the following pages, RCM will take you on a photographic tour of some of this years exhibits at the Toledo Sports Arena.

Photos and text by Dick Tichenor.

equipment displayed was both beautiful and of the highest quality. Also for the boating enthusiasts were several impressive new marine engines that were introduced at Toledo.

An extremely popular event of the Exposition is the Trading Post, this is one giant modeler's swap meet. Every imaginable item associated with modeling is offered for sale or trade by individual modelers. Several hundred completed and partially built aircraft exchanged hands. One table gave a choice of 15 HP drone engines or .020 model engines. The Trading Post attracted so many people that it took a couple of hours just to move through to see what was there.

Two tables 8 feet wide and 160 feet long held well over 500 models competing for sterling silver trophies in 17 categories plus the coveted Best of Show award. Undoubtedly such a huge collection of excellent craftsmanship cannot be found anywhere else in the world. Each trophy was presented with a bonus kiss from the lovely 1975 Queen of the show, Miss Ann McFarlan.

The Best of Show award went to Buford Gross of Peru, Indiana, for his amazing model of the 1908 Wright Brothers Flier which also won 1st place in non-military scale. Mr. Gross' craft had a wing span of 93 inches, weighs 14 pounds and has twin pusher props geared down with chain drives to a Fox .60 RC engine. This extremely accurate reproduction even employed a wing warping arrangement for roll control.

A special commendation was presented to Bob Hisey on behalf of the Weak Signals RC Club by Johnny Clemens, President of the Academy of Model Aeronautics. Mr. Clemens also presented a special plaque and individual awards to Col. Al Betkey's Flying Air Circus. This group has become widely known for the many charity benefit air shows it has given — they are a sharp group of accomplished modelers that perform in smart matching uniforms and put on an outstanding RC show.

Estimates of paid attendance to the show exceeded 20,000. Throughout the show, door prizes were awarded and, after the trophy presentations, came the raffle winners. We couldn't even venture a guess as to how many thousands of dollars of merchandise was given away but there were plenty of radio sets, engines, kits, accessories and supplies generously donated by the model industry.

Plans are already underway for the 1976 show. To our readers that attended this Expo, you already know that this was the Greatest RC Show on Earth; to those that did not attend, try to make it in 1976 and see what you have been missing.

●

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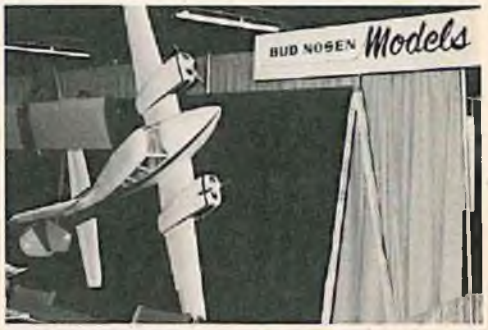
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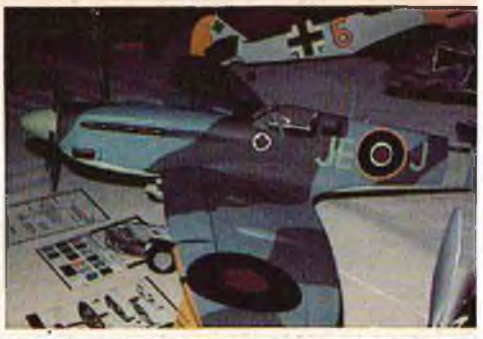

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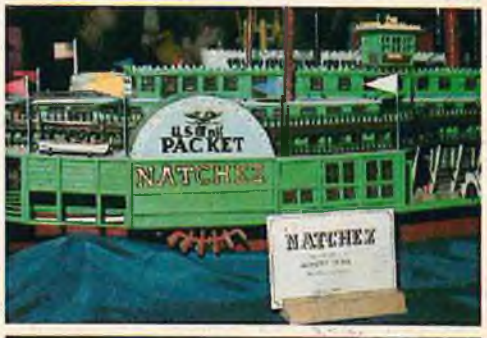
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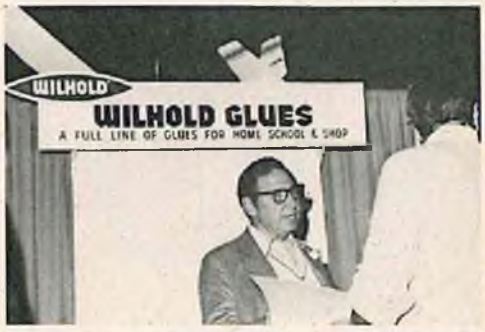
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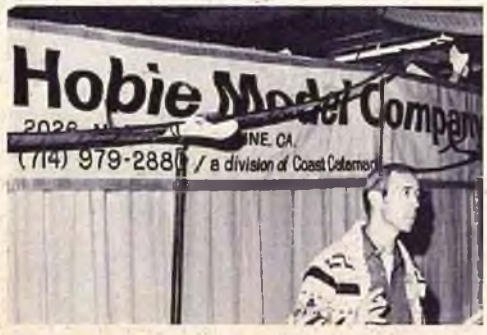
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BY JOE BRIDI **Text By Ben Strasser**

CONCLUSION

● In Part I of this construction article we included a list of materials you will need and went through the process of building a custom kit. Now it's time to get out the pins, clamps, and glue to make something worthwhile out of those pieces.

The building sequence begins with the fuselage. Because of the flat top block, the fuselage is built in typical Bridi fashion, upside down. Next, the stab, elevator, fin, and rudder are built. To add strength to the symmetrical airfoil stab, angle braces are used between the ribs. Then the wing panels are assembled and the wing halves are joined. Follow the construction sequence outline and you'll get the wing dowels in so your wing is properly located. Then finish the plane, put in the equipment, and you're ready to fly.

Since the way the plane flys is affected by the way the wing, stab, fin, and sub fin are installed, please follow the alignment procedure carefully. In addition, the hinge gaps should be kept as narrow as possible — or seal the hinge gap with a strip of Solarfilm. To make sure you get parts like the wing leading and trailing edge, the stab, the elevator, and such sanded straight, we recommend preparing a 12 to 18 inch sanding block. A piece of 1/2 x 2 aluminum channel stock with sand paper glued to the flat face works very well because it's straight, light, and easy to handle. So the building sequence will be easy to follow, the first time a part is used the name is given in italics. The marker ☆ is used to indicate that we've said all we're going to say about installing a particular piece and it's time to get out the glue.

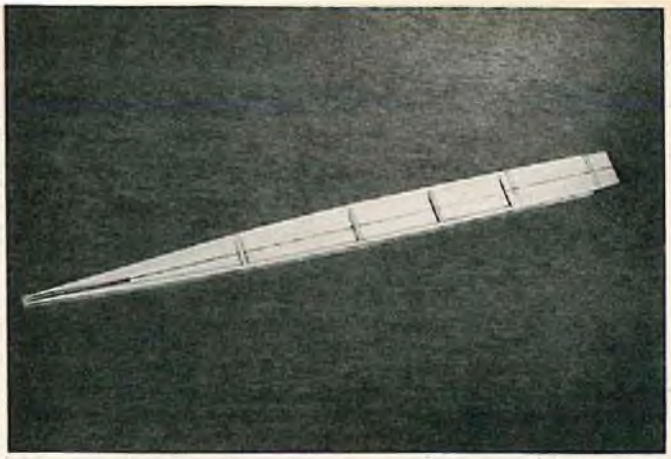
THE FUSELAGE

To get started, draw a center line down the length of the top block, from top to bottom on bulkheads 1, 2, and 3, and down the fuel compartment top block.☆ Draw a line across the top block at the location of the back of the back of the fuel compartment top block, at the location of the cross brace in the center of the servo compartment, at the location of bulkhead 3, and behind bulkhead 3 at the location of the cross brace.☆ Draw a line across the fuel compartment top block at the location of bulkheads 1 and 2.☆ Working on the inside of the right and left fuselage sides, draw lines to mark the location of bulkheads 1, 2, and 3, and the vertical support braces.☆ Draw a straight line on the outside of the fuselage sides just above the wing saddle. Each line should run from about 1" in front of the wing saddle to 1" behind it and located about 1½" from the straight edge of the top block. This line will be used to check the wing incidence angle.☆

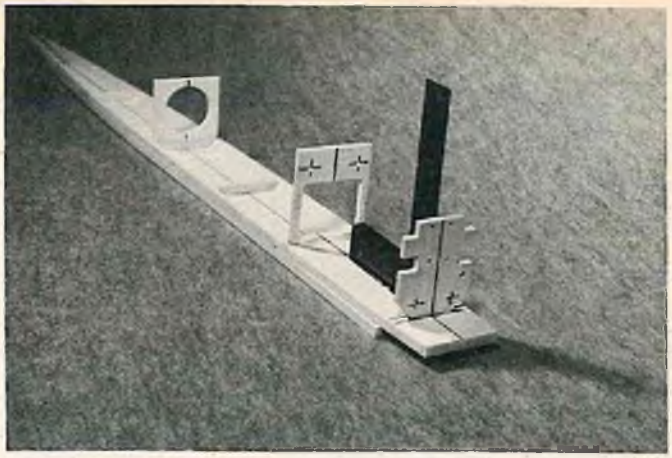
With the top edge of bulkhead 1 "up", mark and drill the holes for the nose gear bearing or retract gear, and for the throttle linkage and fuel lines.☆ Pin the 3/8" *top block* down on a flat building board with the center line side up.☆ Next, the *fuel compartment top block* is to be glued in place. If you are to use retracts, the fuel compartment top block should be cut out to make room for the fuel tank. Use the top view of the motor mount rails in the fuel compartment as a guide to mark the cut-out. You'll note that bulkhead 2 is already cut out for this purpose. The side view of the plans indicates the forward limit of the cut-out. Be certain not to make the fuel tank cut-out too far forward or else you may sand through the top block as the nose of the fuselage is shaped later.☆

After the fuel compartment top block is glued in place, a piece of 3/8" scrap may be used under the front end to support it while you're working.☆ Add the *top stringers* to the top block. Note that the stringers shown on the plans are triangular stock with one edge of the stock cut down to make a flat edge to mate with the fuselage side. Because of the difficulty in preparing this type of stringer, we have used 3/5" x 5/8" stock for the stringers. They should be installed with the 5/8" side onto the top block, butted up to the back of the fuel compartment top block, even with the edges of the top block, and run to the trailing edge. The width of each top stringer will have to be shaved in the area of the fin slot.☆ Relieve the inboard corners of the stringers in the area of the servo compartment to make room for the servos.☆ Before the glue has set-up, add the 1/4" x 3/8" *cross brace* in the center of the servo compartment, at the location of bulkhead 3, and behind bulkhead 3. The cross braces should be glued in place with the 1/4" side down. The top block stringers may be moved in or out slightly to insure a good glue bond to the cross braces.☆ Glue *bulkheads 1, 2, and 3* in place, upside down.☆

Glue the 1/32" ply *servo compartment doubler* in place on each *fuselage side*.☆



The fuselage top block showing the stringers, cross braces, and fuel compartment top block glued in place. Note the top block centerline.



The bulkheads glued in place on the top block. Note that the end of bulkhead #1 with the angle cuts is oriented toward the fuel compartment top block.

Add a piece of 1/4'' *triangular stock* along the bottom of each fuse side from the back of bulkhead 3 to the fuse trailing edge. Shape the 1/4'' triangular stock as necessary at the back of the fuselage sides so they can be glued together at the trailing edge.☆ Glue the 1/4'' x 1/4'' *vertical support brace* in place on the fuse side so the angled end mates with the 1/4 tri stock.☆

When the glue has dried, glue the fuse sides in place from bulkhead 2 to the trailing edge. Clamp the sides to bulkhead 2, making sure they are at 90° to the top block.☆ Add a piece of 1/4'' *tri stock* along the back of both sides of bulkhead 2.☆ Glue the *bottom block cross brace* in place between the fuse sides. Remove any pins from the inside of the back of the fuselage and add the 1/4'' rear fuse *bottom block.*☆

Glue a 9½'' long piece of 3/4'' *triangular stock* onto each side of the fuel compartment top block so it runs from the front of bulkhead 2 into the engine compartment. If you've cut out the fuel compartment top block for the fuel tank, the inside edges of the tri stock will also have to be relieved.☆

Put glue on the side of each of the pieces of 3/4'' tri stock that is to mate with the fuse sides. Before you clamp the fuse sides in place though, apply glue to the hardwood *motor mounts* and slide the motor mount rails in place. Next, pin and clamp the fuse sides in place along the tri stock and to bulkhead 1. Clamp the fuse sides together in the front so they are 2⅜'' across, from side to side.

Prepare a 5/8'' x 3⅛'' motor mount locator template out of some scrap balsa. This template is used to align the rear of the motor mount rails when they are glued in place to make sure they are level and to build in the correct amount of down thrust into them.☆ Pin the template in place to the fuse sides so it is across the front of bulkhead 2 and rests on top of the tri stock on each fuse side.☆ Clamp the motor mount rails in place to the fuse sides so the rear of each rail rests on top of the template. Remove the template and let the glue dry. At this point the fuselage should be removed from the building board.☆

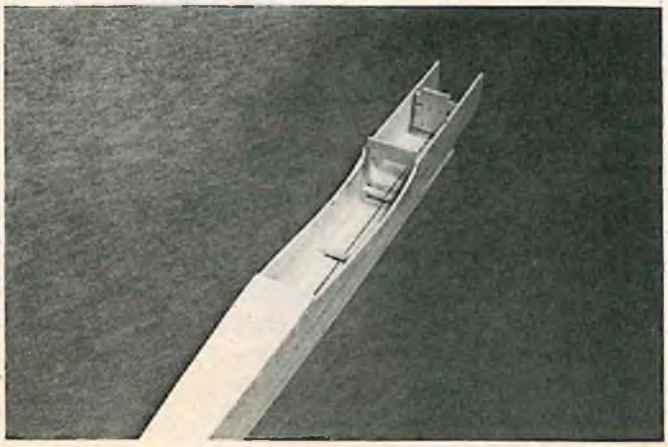
Add 1/4'' *triangle stock* along the top and bottom of the motor mount rails in the area of the fuel tank compartment.☆ Shape the sides of the *upper spinner ring filler block* to fit the angle of the fuselage sides.☆ Glue the block in place. Cut both the top forward end of the fuel compartment top block and upper spinner ring filler block as necessary for your engine.☆ Mark and drill the motor mount screw holes in the rails and install the blind nuts. When mounted, the engine thrust washer should extend 1/8'' in front of the fuse sides.☆

Fit the *fuel compartment side blocks* by cutting the bottom of each one to make a straight line from bulkhead 1 to bulkhead 2. Relieve the inside corner of each side block as necessary for clearance for the wing hold-down dowels.☆ Glue the side blocks in place so they fit in the notch in bulkhead 1 and overlap the side of bulkhead 2. If you're using fixed gear, you may want to install the tubing for your nosegear linkage at this time because it will be more difficult to get to after the bottom block is in place.☆ Install the *nosegear bearing*.☆ Cut out a hole in the front of the *fuel compartment bottom block* for the nosegear strut and spring — or relieve the center of the block as necessary for your retract gear. Glue the bottom block in place.☆

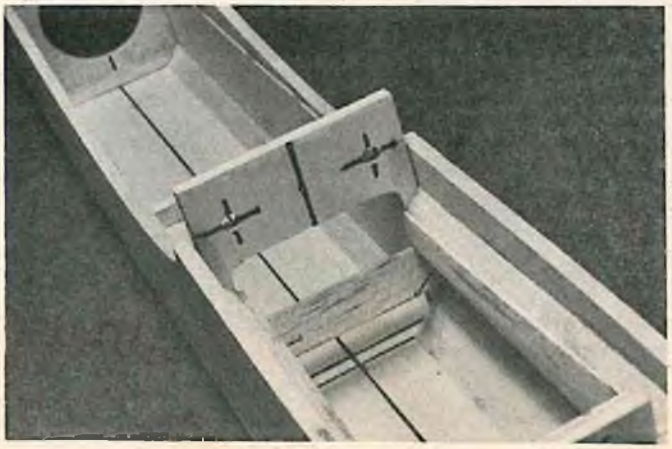
Mark and drill the engine mounting screw clearance holes in the balsa *motor mount supports*. Put a small piece of masking tape on the bottom of the blind nuts in the motor

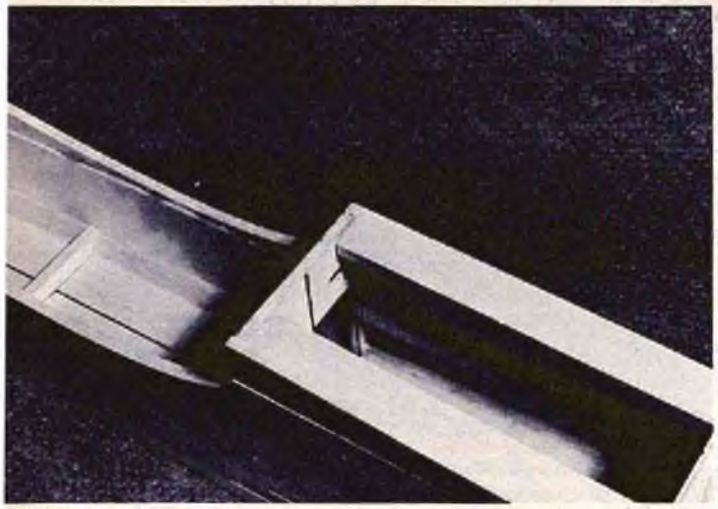
text to page 101

The fuselage sides glued in place from bulkhead #2 to the tail, with the fuse rear bottom block added. The sides are not yet glued in place forward of bulkhead #2.

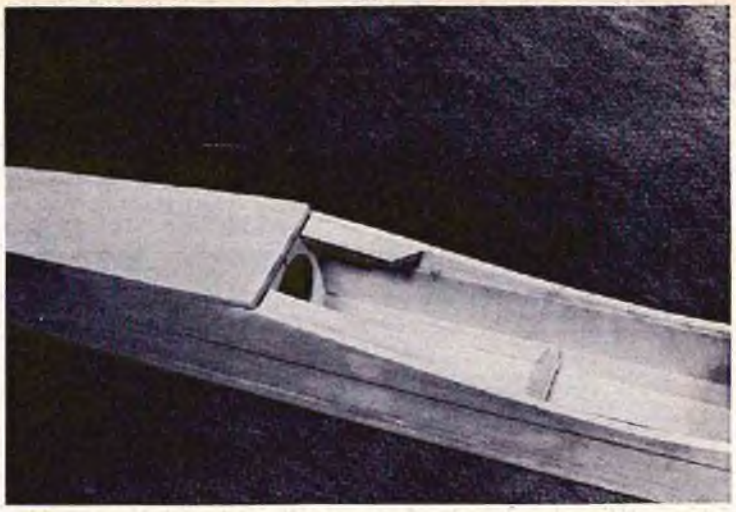


Using the scrap balsa motor mount locator template pinned in place across the front of bulkhead #2 to align the rear of the motor mount rails.

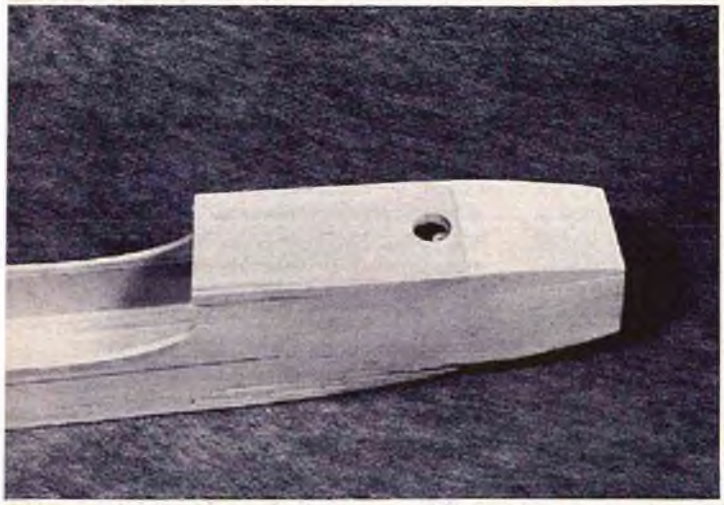




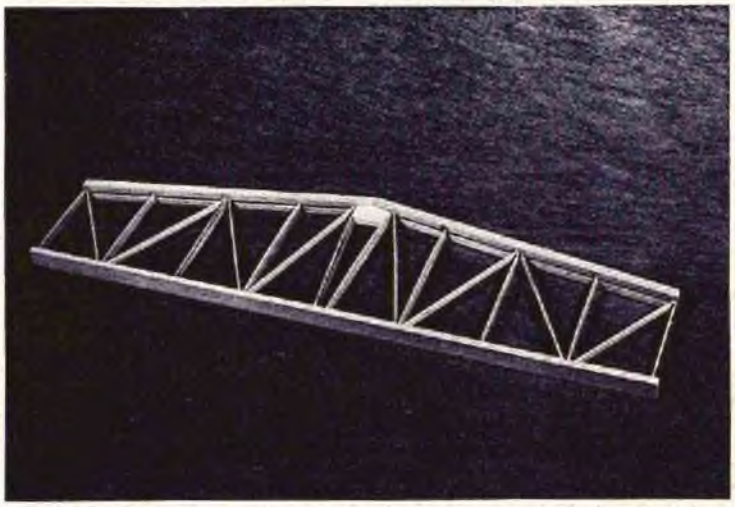
The fuel compartment side blocks glued in place so they overlap the sides of bulkhead #2 and fit in the notches cut out of bulkhead #1. The rear corners of the side blocks have been relieved for clearance of the wing hold-down dowels.



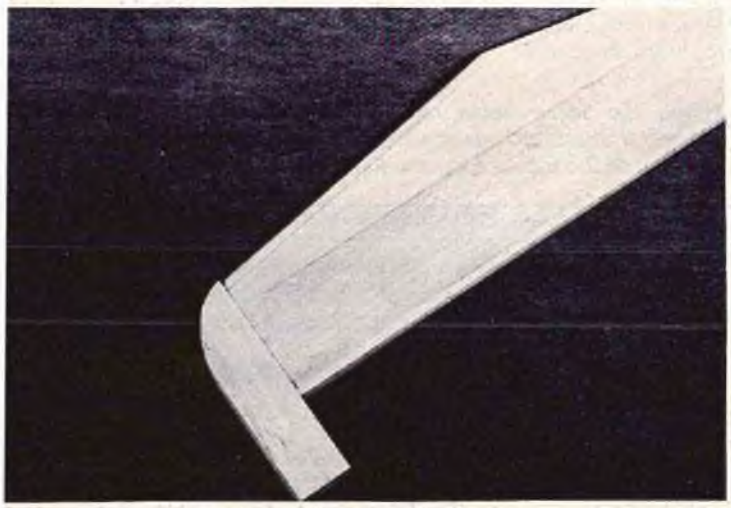
The 1/4 ply fuselage wing hold-down plates glued in place. Pieces of 1/4 triangle stock have not yet been installed.



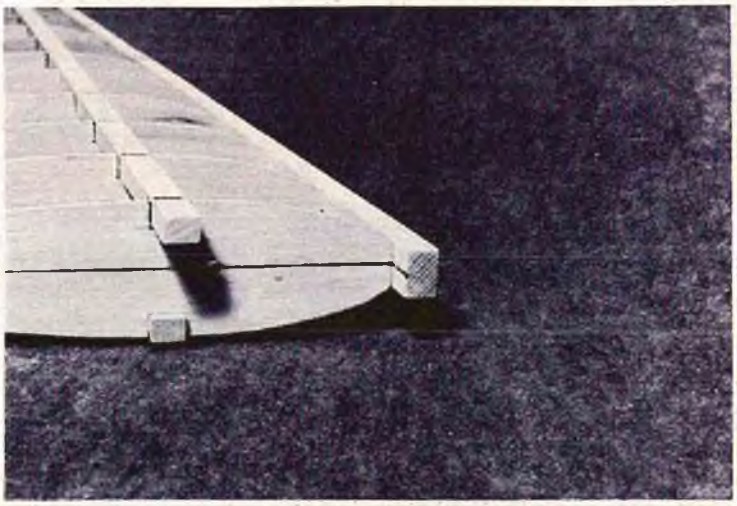
The bottom of the fuselage showing the chin block and fuel tank compartment bottom block.



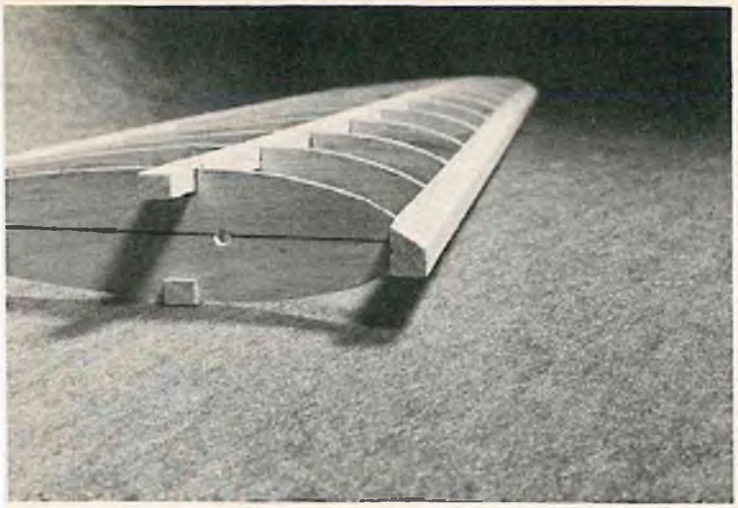
The stab ribs and cross braces glued in place to the leading and trailing edge blocks.



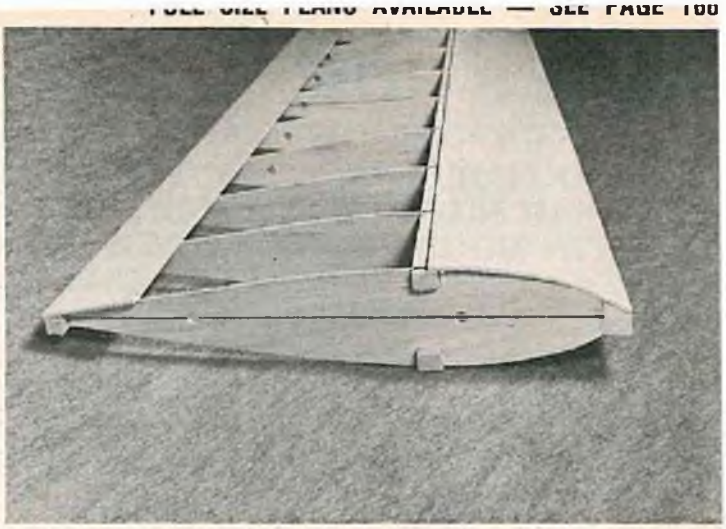
The stab is sheeted, the leading edge partially shaped, and, the tip blocks are installed.



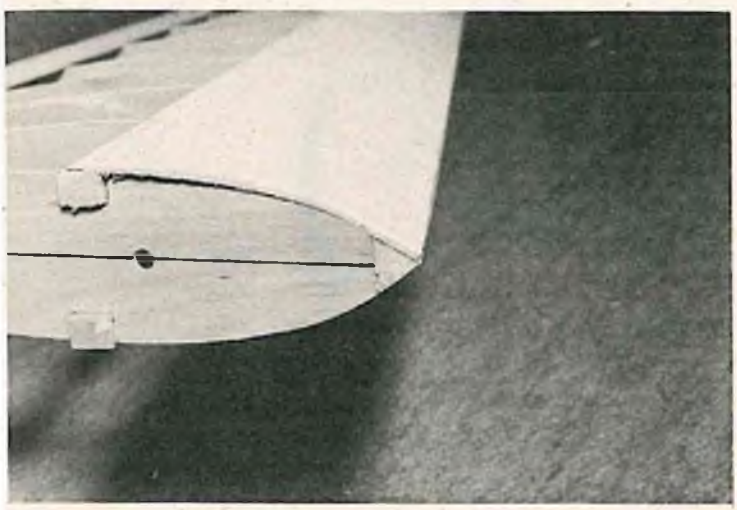
The wing leading edge installed. Note the center line on rib #1 and the back of the leading edge.



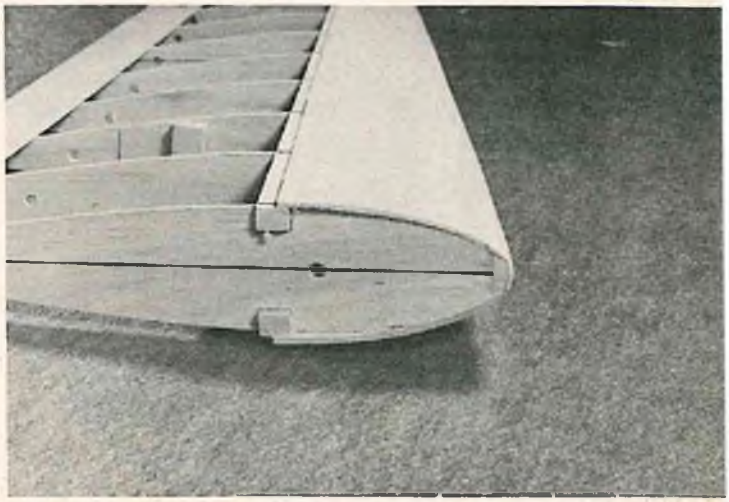
The top of the leading edge shaped to the rib contour.



The T.E. and top L.E. sheeting installed.

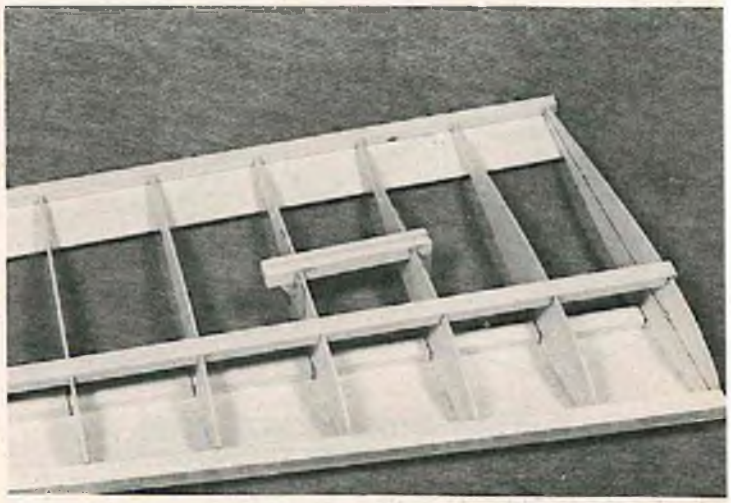


The bottom L.E. shaped to the rib contour.



The bottom L.E. sheeting installed and L.E. sanded to shape.

The main gear support with the torsion block installed.



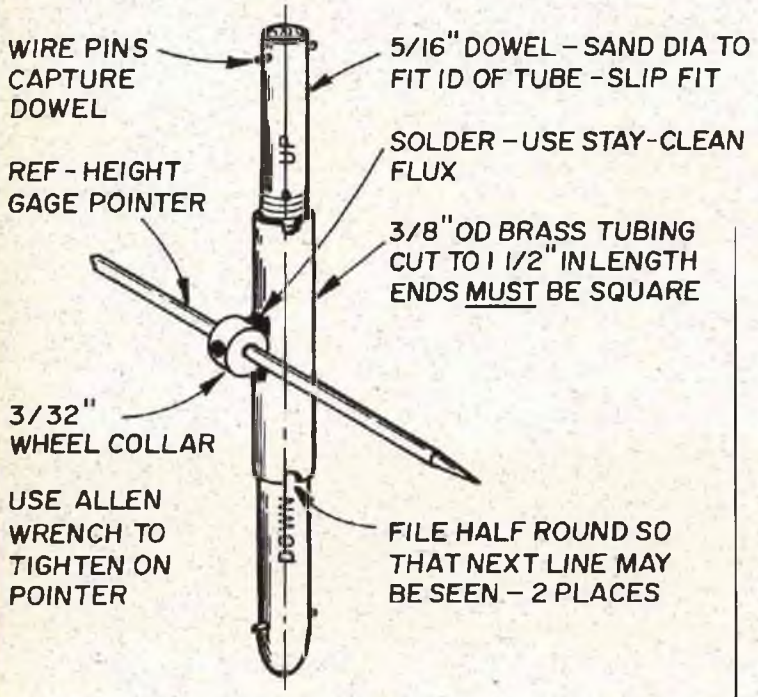
The main gear support/torsion block assembly installed on the bottom side of the wing. Note both the gusset at the outboard end of the main gear support and the ply brace glued to the rib.

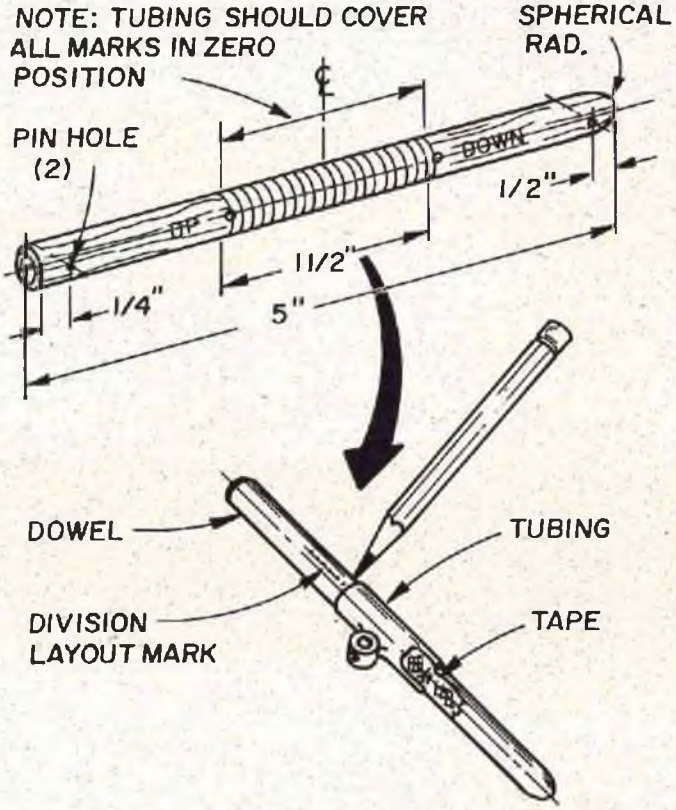
HERE'S HOW

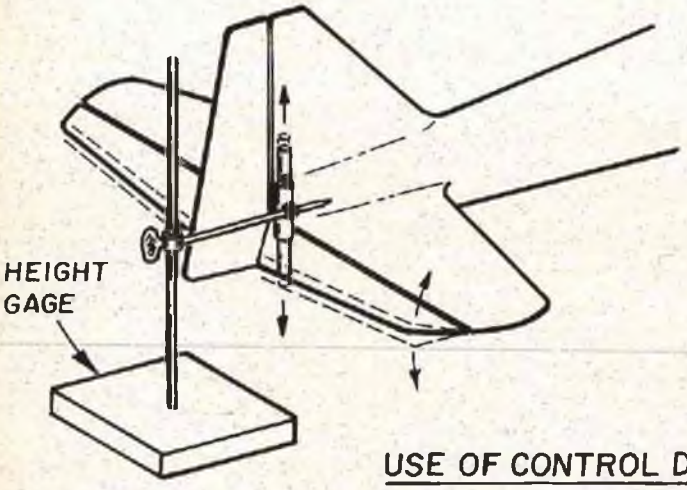
BY JERRY SMITH

EVER TRY TO MEASURE CONTROL SURFACE DEFLECTION WITH A SCALE OR POSSIBLY A YARDSTICK? NOT TOO GREAT, HUH? MOST PLANS GIVE CONTROL TRAVEL AS A GUIDE TO HELP YOU ON YOUR INITIAL TEST FLIGHTS. EXPERIENCED FLYERS CAN "BALL PARK" CONTROL TRAVEL AND GET BY WITH IT HOWEVER, THE LESS EXPERIENCED NEED A BETTER HANDLE.

FEATURED THIS MONTH IS AN ULTRA SIMPLE CONTROL TRAVEL MEASURING INDICATOR, DESIGNED AS AN ACCESSORY TO THE HEIGHT GAGE PRESENTED IN LAST MONTHS HERE'S HOW. THE EXPLANATION AND SKETCHES BELOW, WITH THE NECESSARY EFFORT ON YOUR PART, WILL ALLOW YOU TO PRODUCE THIS FINE MEASURING INDICATOR. BUILD WITH CARE AND IT WILL REWARD YOU WITH ACCURATE INFORMATION. AND, I MIGHT ADD, WILL PROVE A VALUABLE ADDITION TO YOUR WORKSHOP! SO — HERE'S HOW!







SUGGESTED METHOD OF MARKING DOWEL

CAREFULLY LAYOUT 1/16" DIVISIONS ON DOWEL. SLIDE DOWEL INTO TUBE. LINE UP EDGE OF TUBE WITH DIVISION LAYOUT MARK ON DOWEL. TAPE DOWEL TO TUBE AS SHOWN. USE EDGE OF TUBE AS A GUIDE FOR SCRIBE OR PEN. USE THIS METHOD TO CONSTRUCT EACH LINE. START AT THE TOP AND WORK TOWARDS THE BOTTOM. A CLEAR DOPE FINISH AND WAX JOB COMPLETES THE DOWEL INDICATOR.

USE OF CONTROL DEFLECTION INDICATOR

TO MEASURE ELEVATOR DEFLECTION, LEVEL STAB WITH A FLAT SURFACE AND SET ELEVATOR FOR NEUTRAL TRIM. ADJUST HEIGHT GAGE TO ZERO OUT DEFLECTION INDICATOR. MOVE ELEVATOR TO FULL UP AND READ TOP SIDE OF GAGE FOR DISTANCE IN 1/16'S. MOVE ELEVATOR TO FULL DOWN AND READ BOTTOM SIDE OF INDICATOR FOR DISTANCE TRAVELED. YOU CAN ALSO CHECK HOW YOUR SERVO CENTERS BY GOING TO FULL UP — THEN NEUTRAL. NOTE INDICATOR. NOW FULL DOWN — THEN TO NEUTRAL. AGAIN NOTE INDICATOR. IT SHOULD END UP IN THE SAME PLACE. AILERON TRAVEL CAN BE CHECKED IN THE SAME MANNER AS DESCRIBED FOR THE ELEVATOR. TO CHECK RUDDER TRAVEL, LAY FUSELAGE ON ITS SIDE AND LEVEL VERTICAL FIN WITH FLAT SURFACE.

NRCHA

BY DON DEWEY (N1A)

Starting off this months column we'd like to point out that the NRCHA Model Helicopter Nationals will be held on July 26 and 27 at Greenville Municipal Airport, Greenville, Pennsylvania. This event, sponsored by the National Radio Control Helicopter Association and hosted by the MERCO MACS, is the largest R/C helicopter contest held in the United States and is the official National event for the NRCHA. We want **you** to be there! There is a category for both Novice and Expert and the events and their description have been mailed to every NRCHA member. However, this event is open to any helicopter enthusiast even if he is not a member of the NRCHA. Bill Curtis, the Contest Director, will require a non-NRCHA member to demonstrate his ability to handle a helicopter safely prior to the contest. Pre-registration is required and an appropriate form can be found in the NRCHA Nationals advertisement in another section of this issue of RCM. Both AMA and FCC licenses are required. For complete information and details, contact William H. Curtis RD. #2, Greenville, Pennsylvania 16125.

We hope that you will be attending this meet — the years largest and most significant R/C helicopter event. RCM will be presenting a full photo coverage of the NRCHA Nat's in a forthcoming issue.

☒ ☒

And now, here is a word or three from Dave Keats:

Why the fascination for helicopters?

Radio control has been around for almost 40 years, during which time we've had high-wingers, low-wingers, biplanes, deltas, Snoopy's Doghouse, Seagulls, and even a Flying Lawn Mower. Despite their various shapes, they all had one thing in common – A WING! Helicopters, on the other hand, don't look like they would ever get off the ground, much less fly (not to mention what the would-be-heliophite say about them)! I believe that fixed wings have become so imbred in our way of thinking that, like a kid with a new toy, the helicopter offers a whole new concept in our conquest of air.

This, along with the rotating rotor blades, whirring gears, and mechanics, leaves all of us heliophites in awe.

A specialized group "The League of Silent Flight" has enjoyed a phenomenal growth rate since its inception. But, in only one year, our own "NRCHA" has almost equalled their membership, and we have had commercial machines available only for three years or so! I personally am proud to be a member of such a select group. How about you?

Drag racing and pylon racing with helicopters? You say, "Can't be done!" Too dangerous – read on.

Last summer, the "Michigan Whirlibirds" ran their first contest. The beginning of the contest used the format worked out by the "W.O.R.K.S." Club for the "Wright Brothers Memorial Contest" at Dayton, Ohio, a more or less precision event. The second half of our contest featured a pylon race and an impromptu drag race. The pylon race was run as follows: A 2 pylon course was set-up with pylons 200' apart. Two machines were started and lifted off into a hover, on the drop of a flag (the only dangerous part of the race as the starter was in the line of fire) one machine bored off to be followed one second later by the second machine. The first machine over the finish line three laps later was declared the winner and was awarded points.

After several rounds, the points of each flyer were tabulated and places were awarded. While there was apprehension prior to the racing, all pilots involved enjoyed it and were chomping at the bit for more.

As this was a testing round type of contest, we decided to find out whose chopper was fastest and from that evolved an impromptu drag race, what else!

The "Drag Race" was set-up as follows:

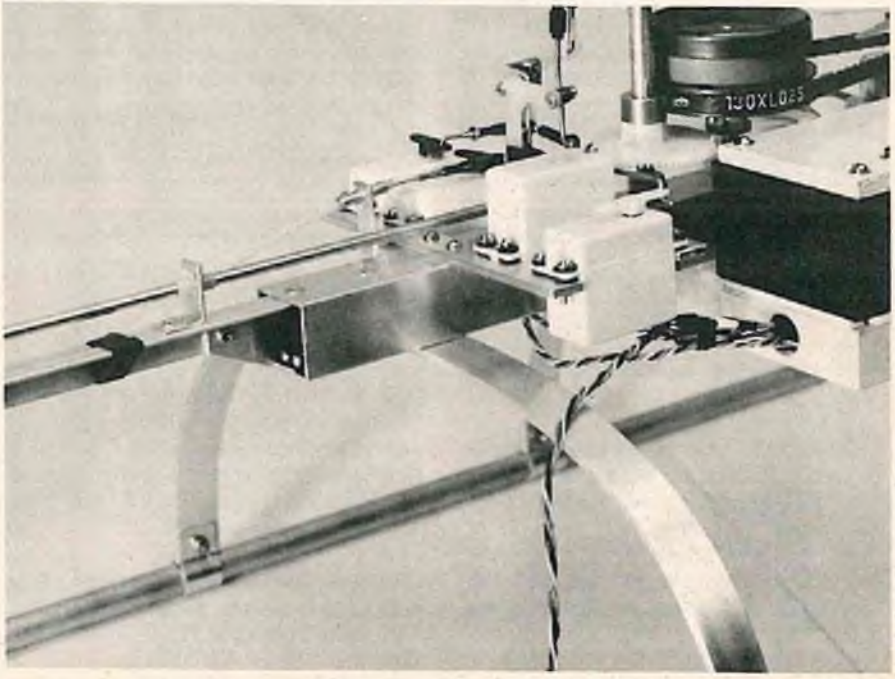
A pre-determined length course was set-up (approximately 250') and two timers stationed at the finish line.

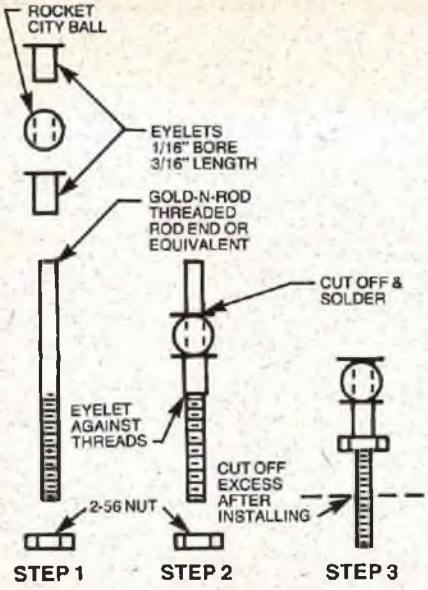
The machines were not allowed to lift off, as in the pylon race, but only to rev up short of lift-off power; at the drop of a flag, both machines lifted off and accelerated down the course. The stop watches were started at the drop of the flag and stopped as the timers' individual machine crossed the finish line. If you were really good, your skids touched the pavement three or four times down the course! As our degree of skill improves, I belive we will see more of this type of competition (the spectators also enjoyed it more than the hovering type of competition).

An update for the Polecat is due and as, undoubtedly, many will be flying "Polecats" in competition this summer, it is important that they be set-up as follows:

The pitch on the main rotor should be set so that in your particular locale in a **no-wind** *condition, the main rotor hover rpm should be between 1,100 and 1,200 rpm. I do this by holding on to the front leg and set the throttle so that, when I release the leg, the machine holds altitude, then I tach the rotor rpm. For a hover type contest*

John Walker's Polecat modifications. See text for details.





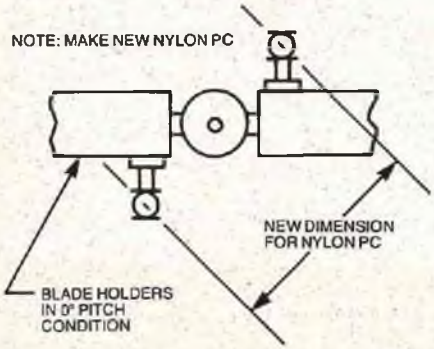


FIGURE 1: BROAD BAND TAIL ROTOR COLLECTIVE PITCH FOR "POLECAT."

(or for learning), the swash-plate travel measured at the outside ends of the swash-plate input pins (where the "Missing Link" balls are attached) should be set 1/4" to 5/16" full travel, i.e., full up through full down – full right through full left. For acrobatics, 3/8" to 1/2" travel is required or whatever you have the guts to try! The C.G. is in error on the plans and should be on the front of the main rotor shaft! Fig. 1 shows my modified tail-rotor collective pitch set-up and, if used, gives a wider band of tail rotor sensitivity to select from. Be careful with it – that in the full de-pitched condition, the missing links don't run into the T.R. box cross Pc. 4-40 bolt heads. I recommend the 3 bladed training prop always be used in lieu of the depicted metal cooling fan on the plans. Normal hover mode will be slightly nose up, and I've never encountered any problems in forward flight.

☒ ☒

Since Dave was on the subject of Polecats (what else?), John R. Walker of Bel Air, Maryland, wrote that he had just completed his Polecat helicopter built from RCM plans. However, John mentions that, while building the machine, he had difficulty locating the 1/2" square tubing for the tail boom. As a matter of fact, he couldn't buy the quantity needed for 3 or 4 choppers.

Jerry Holcomb (N18D), flies his original design .19 powered chopper, shown at right and above, and described in this months column.

Instead, Walker found some 1/2 angle that weighed the same as the tubing specified and used it. He brazed it in the fuselage section with a length of the 1" square and "L" shape and riveted it into place as shown in the photograph. John at first thought he would have to give the Polecat project up because of the above problem, but the substitution of the angle stock has proved to be sufficiently solid. This may be of benefit to others who have had difficulty locating the specified tubing for the tail boom.

☒ ☒

Jerry Holcomb (N18D) of Vancouver, Washington, submitted the photograph of his latest original design single rotor helicopter. Specifications include a main rotor diameter of 41"; 12:1 overall reduction (engine to main rotor); 6:1 main rotor to tail rotor diameter; K & B .19 with Kavan carburetor; Kraft Series 70 with KPS-10 servos; 6 oz. fuel tank; 5 lbs. all-up weight. The rotor head is a free-flapping original design using nylon bearings while the body consists of a 1/32" plywood fuselage with aluminum boom and skids and the usual combination spruce-balsa rotor blades.

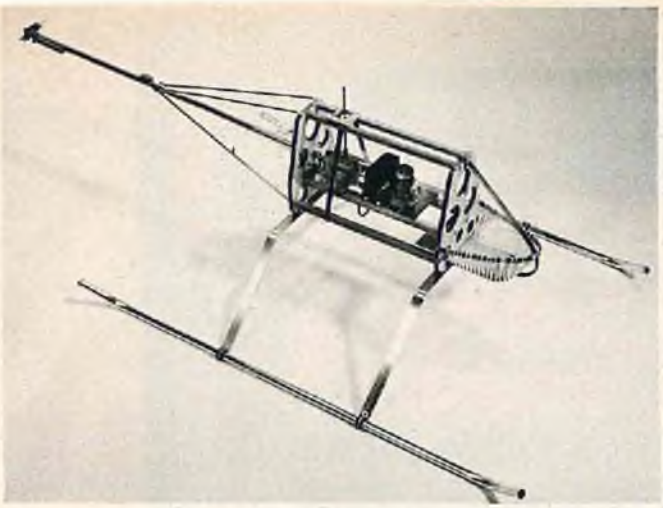
So far Jerry has had over 20 full tanks of fuel of air time with this new machine with no damage or failures.

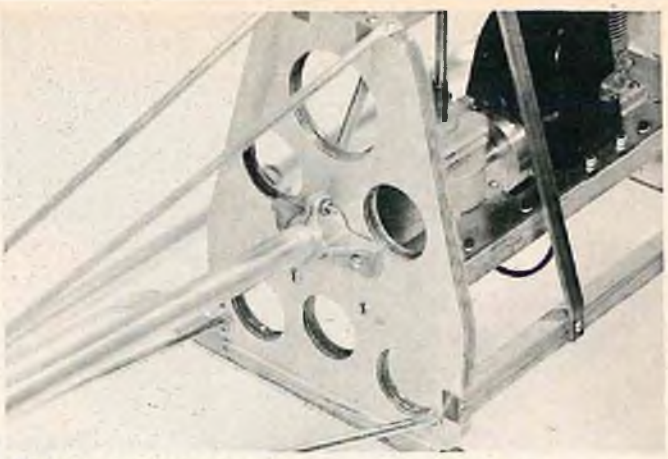
☒ ☒

Included with this months column are some photographs of a semi-completed D & B Models Helicopter Training Fuselage utilizing the Schluter drive train from an Enstrom helicopter kit. The D & B Helicopter Training Fuselage is designed to offer maximum protection of your drive train components and consists of a high quality aircraft plywood and tubular aluminum fuselage that is rugged, long lasting, and can take the punishment that comes with learning to fly a radio controlled helicopter. Since we previously did a

complete review of one of the D & B fuselages, utilizing the Kavan Jet Ranger drive train, we aren't going into further details now except to point out that we did show this training fuselage in the semi-completed stage in order to illustrate the installation of the Schluter mechanism, minus radio, in order that you might see how it was installed. The bellcranks connecting the pushrods to the swash-plate, normally mounted on a plywood bulkhead in the Enstrom fuselage, are mounted on the vertical aluminum straps that are located on the training fuselage on each side of the

The new HB .25 engine designed for the Graupner Bell 47G helicopter.





D & B training fuselage with Schluter mechanics.

main transmission gear box.

☒ ☒

While we are on the subject of RCM projects, we have quite a few helicopter projects underway which will be presented complete with close up step-by-step photographs in order to aid you in building the various commercially available helicopters. Bernie Murphy is working on the Graupner 212 and the Boelkow BO-105, while I have been working on the .19 powered Micro-Mold Lark, Kalt-MRC Hughes 500 with both standard and collective pitch head, the Kalt "Flying Box," the MRC-Kalt Bell 212, the Schluter Gazelle, and our recently completed Schluter Enstrom. In addition, we have a new Fairchild-Hiller underway which I am sure you will enjoy. All in all, it has been keeping us pretty busy building and taking photographs, and we hope that the articles will be of benefit to you. In addition, RCM will be the first to show you the step-by-step construction of the new Du-Bro Tri-Star with its standard Scorpion fuselage and its optional Hughes 500 and/or Enstrom shell.

There are quite a few new innovations evidenced in these new kits, from the ingenious Delta hinged tail and pre-finished head and blades of the Kalt machines, to the utter simplicity and ruggedness of the Du-Bro Tri-Star, and the ingenious engineering incorporated into the little Micro-Mold Lark designed for .19 to .25 engines. In addition, we will soon be working on the Schluter Heli-Baby and the Graupner Bell LG 47. While we enjoy working with each and every one of these machines, and would like to present them to you as quickly as possible, stopping at each major construction step and taking a studio photograph of that step so that you can see the close-up details of it, is quite time consuming. I hope that you will bear with us until we have the opportunity to present each and every one of them to you without incurring the wrath of the non-helicopter types!

☒ ☒

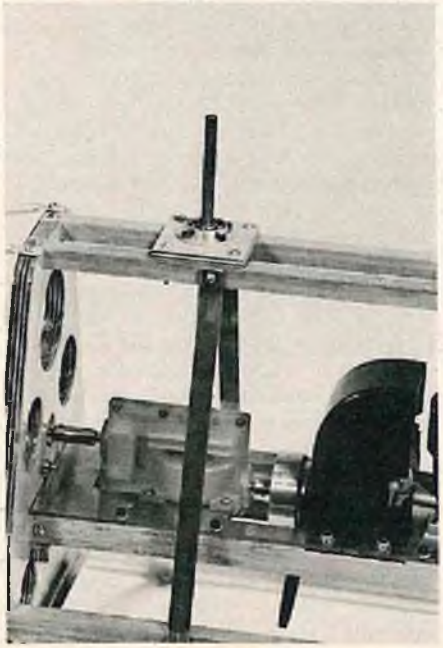
Johannes Graupner, in unveiling the Graupner Bell 47G R/C helicopter for the American helicopter enthusiast at the 21st Toledo Radio Control Exposition, announced a new concept in R/C helicopter merchandising. They appointed Model Helicopters, 14695 Candeda Place, Tustin, California 91680, their Graupner Helicopter Service and Parts Center for the United States. This firm has established an enviable reputation for fast and expeditious service for parts needed for the Graupner Bell 212 Twin Jet R/C helicopter and for the HB Stamo .61 R/C engine that powers this model helicopter.

When the Bell 47G helicopter kits reach the market in July or August of this year, this firm will already have a back-up supply of spare parts for the Bell 47G and HB .25 R/C engine in case they are needed. Johannes Graupner also mentions that the Warranty Card enclosed with each Bell 47G helicopter kit is pre-addressed and should be mailed immediately to Model Helicopters.

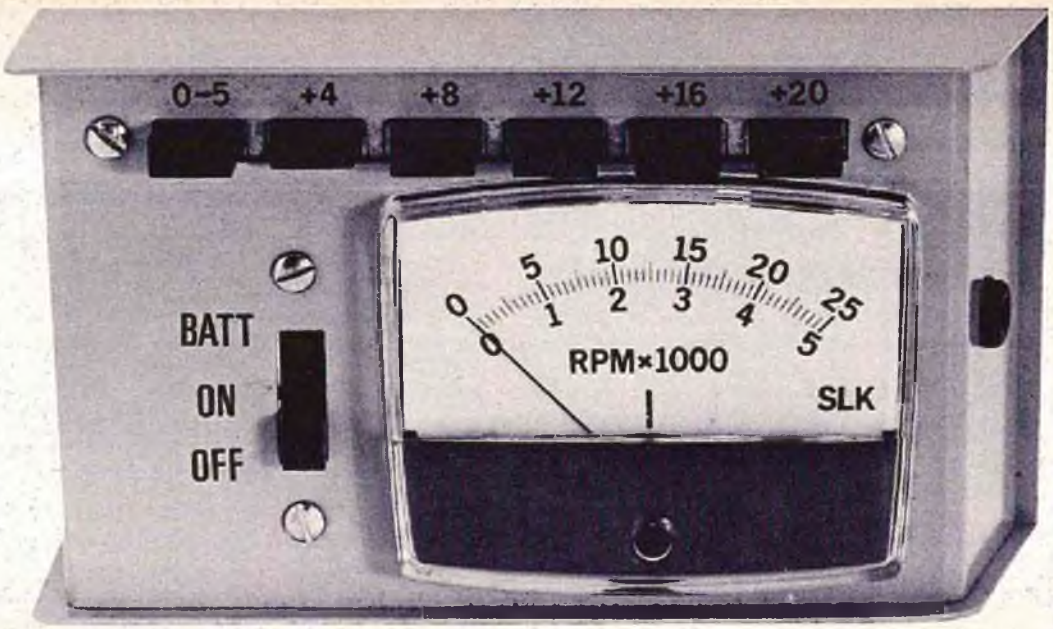
This firm also offers technical assistance

to page 98

Close-up of Schluter mechanics in D & B fuselage.



The Graupner Bell 47G, shown at the 1975 Toledo Conference. This new helicopter will be available in July or August of this year.



ProTach

One of the most versatile and precise tachometers ever designed, the ProTach can be built by anyone with a minimum of electronic kit building experience. Jim Oddino, RCM's Electronic Editor and well-known Pattern flyer, thoroughly tested the ProTach and rated it excellent in design and construction, as well from a fliers standpoint for ease of operation. It also has an even greater accuracy than is claimed for it by the author.

BY SID KAUFFMAN

● Precise measurement of engine performance can be an enormous benefit to almost all types of flying, sport as well as competition. This article will show you how to build what I feel is the best tachometer available for measuring the performance of our engines. The ProTach was designed to meet three goals:

(1) Easy to use with superior accuracy and readability over the full range of engine RPM and light conditions.

(2) Ease of construction, with calibration that can be performed without special equipment.

(3) Moderate cost.

All of these goals have been met.

Table 1 indicates some of the capabilities of this tachometer. ProTach performs as its name implies — it is capable of accurate readings over a wider temperature range than most of us ever work in, and over an extreme range of ambient light conditions. It has seven pushbutton ranges. With all buttons out, it reads 0-25K RPM (K = 1000). This scale is used to get a rough estimate of where an engine is running, which is the extent of the capability of many tachs. Pushing one of the buttons selects an expanded scale, which allows a very precise reading. Notice that these scales overlap. This eliminates the problem of having to switch back and forth between scales due to slight RPM changes near the end of a scale. In addition, the meter indicates battery condition when the ON-OFF switch is moved to a third position (BATT). Half-scale is 12 volts (replace battery) and full scale is 18 volts. The accuracy of the tach does not change down to about 10 volts. At least 20 hours can be expected from the two 49¢ batteries. This is at least a full season of normal use — assuming you remember to turn the tach off when you are finished using it!

ProTach Specifications

Ranges (pushbutton selection):
1. 0-25K RPM 2%
2. 0-5K RPM 1%
3. 4-9K RPM 1%
4. 8-13K RPM 1%
5. 12-17K RPM 1%
6. 16-21K RPM 1%
7. 20-25K RPM 1%

Other Features:
Built-in battery check, built-in "stand," easy construction, calibration without special equipment.

Stability:
Less than 1% change in reading for any combination of voltage and temperature, 12-22 volts and 0°C. to 50°C.

Operating Temperature Range:
0°F. to 150°F.

Battery Voltage:
18 volts nominal.

Battery Type:
Two 9-volt transistor radio batteries.

Current Drain:
12 ma. (at least 20 hours use).

Case Size:
1⅝" x 3⅛" x 5⅝"

TABLE 1

Five prototypes have been built and evaluated in the past three years with much appreciated help from avid modelers Jerry Parker and Ron Earp. During this time, the electronics haven't been changed substantially, but the physical design has been continually refined. You will notice that the ProTach has been designed for one-hand pushbutton operation. The switches and meter are oriented for an operator position along side the plane. The sloping case front allows hands-off operation without the need for a cumbersome stand. Despite the circuit complexity and large meter, the tach is physically quite small and easy to handle.

Construction is made a lot simpler through the use of two printed circuit boards. One of these boards fastens to the pushbutton switch, eliminating much tedious wiring. ProTach is built as sub-assemblies which are connected together with a minimal amount of interwiring. It can be wired, assembled, and

calibrated in less than three hours.

Table 2 lists all parts necessary for construction. As an additional help, Royal Electronics has agreed to stock all parts, and will provide a complete parts kit for only $50.00. Construction requires only a slight amount of kit building experience, but assembled tachs are also available for the electronic klutz.

Semi-Technical
Circuit Description

Figure 5 shows the innards of ProTach. Q1 is a phototransistor whose output is a current proportional to the light level. Phototransistors have better frequency response than the more conventional photocells, and the built-in lens eliminates the need for a separate bulky lens or shielding tube.

R1, R2, and D1 form a signal compressor which provides an output voltage approximately proportional to the percentage change in ambient light due to the rotating prop. This means that the output is not a function of the ambient light level, allowing the tach to function over a very large range of light levels, and making it less susceptible to reflections.

A1-A5 are integrated circuit operational amplifiers. A1, A2, R4, R6, R7, R8, R9, C1, C3, C4, and C5 form a bandpass amplifier. This multiplies the signal about 5000 times while filtering out undesirable harmonics and other unwanted signals such as background movement.

A3, R10, R11, R12, R13, and C6 form a Schmitt trigger which "squares up" the signal from the prop. Hysteresis is incorporated to minimize reflection pickup. The output of A3 is used to trigger a monostable multivibrator via R14, C7, R15, and Q2.

Q3, Q4, Q5, R16, R17, R18, R19, R20, R21, and C8 form a monostable multivibrator. Its output is a pulse that goes from ground to −V when the output of A3 switches positive (decreasing light input). This pulse is a fixed width (time) determined by C8 and R17. The capacitor selected compensates the circuit over a wide temperature range, and the whole circuit operates from a regulated voltage, making the output immune to battery voltage changes. R21 is a multi-turn potentiometer used to calibrate the unit.

A4, R22, R23, R24, and C9 invert the signal and filter it to provide a positive output voltage which is proportional to engine RPM.

A5 is a current subtractor that supplies a current to the meter equal to the current flowing through R29 (proportional to RPM) minus an offset current determined by S1. Resistors R31-R35 each subtract a current equal to 4K RPM when connected through the switch to −V. In the 0-5 position, the current through the meter represents the RPM signal. In the 4-9 position, R31 subtracts 4K RPM. Each higher scale places an equal resistor in parallel, subtracting an additional 4K RPM. The current through these resistors is determined by the regulated supply voltage, −V, which is

PARTS LIST

Resistors

All resistors 1/4-watt 10% tolerance carbon composition except as noted.

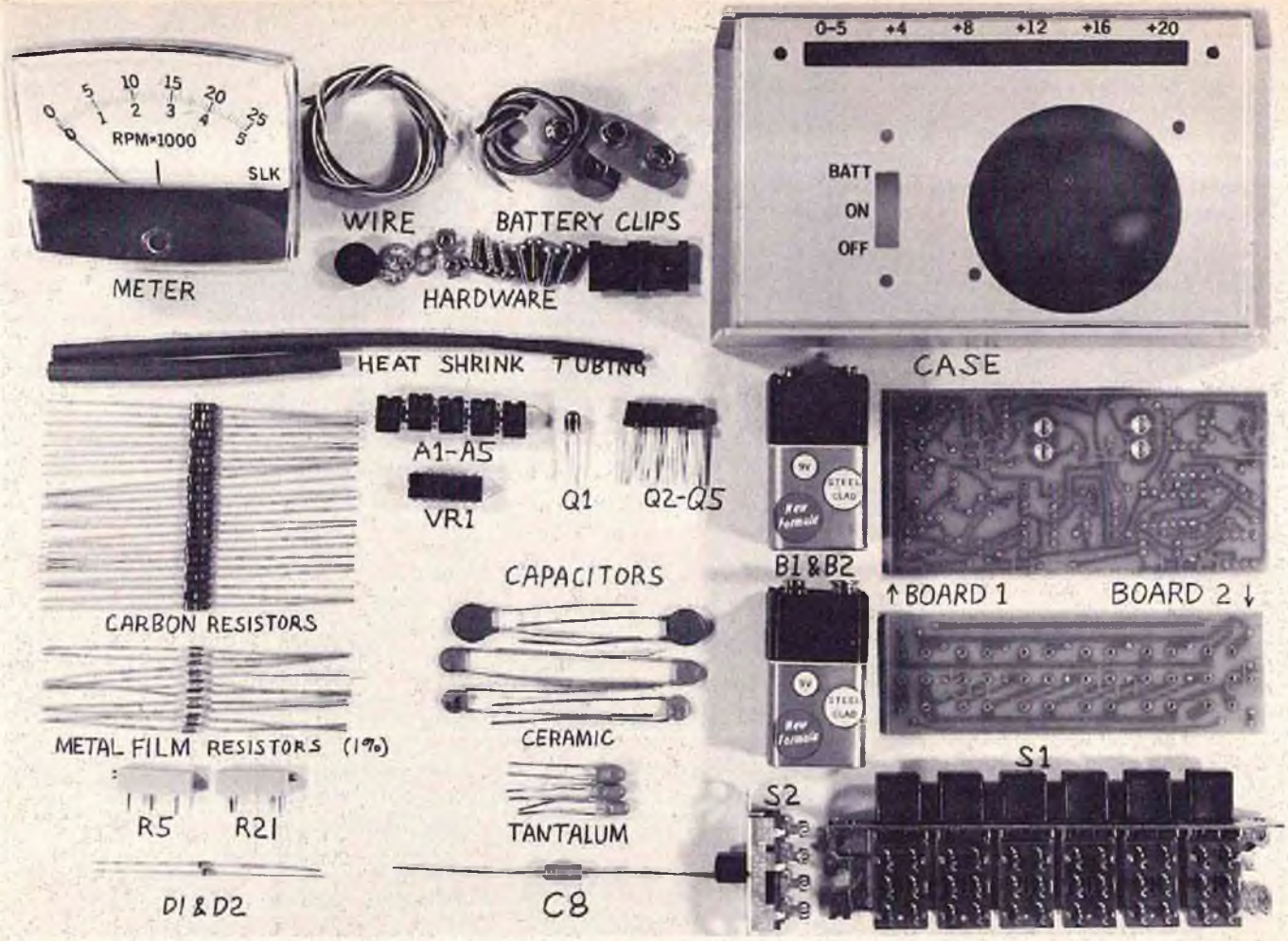
R1, R8, R26	470
R2, R16, R19, R25	10K
R3	240K 5%
R4, R11, R23	4.7K
R6, R13	220K
R7, R9, R10, R14, R15, R18, R20	47K
R12	470K
R27, R28	68K
R17, R31, R32, R33, R34, R35	150K 1% 1/8-watt metal film, type RN55 or equivalent.
R22, R24, R29	10K 1% 1/8-watt metal film, type RN55 or equivalent.
R30	40.2K 1% 1/8-watt metal film, type RN55 or equivalent.
R5, R21	10K multiturn cermet potentiometer, Bourns 3006P or equivalent.
	Capacitors
C1	1 microfarad tantalum, Sprague 196D105X9035 or equivalent.
C9, C10	4.7 microfarad tantalum, Sprague 196D475X9035 or equivalent.
C2, C7	100 picofarad disc ceramic.
C3, C5	1000 picofarad disc ceramic.
C4, C6	0.1 microfarad disc ceramic.
C8	.0068 microfarad polyester film, Sprague 192P6829R8.
	Solid State Devices
Q1	phototransistor, Clairex CLT2130 or equivalent.
Q2-Q5	transistors, G.E. 2N3393 or equivalent.
A1-A5	operational amplifiers, Motorola MC1741CP1 or equivalent.
VR1	voltage regulator, Motorola MC1723CL or equivalent.
D1, D2	diodes, 1N4148 or equivalent.
	Hardware
*S1	Switchcraft 650611K-206 pushbutton switch with 6 interlocking buttons & PC terminals.
S2	slide switch, DPTT lock/momentary, Switchcraft 46313TDR.
*M1	0-50 microampere meter, Micronta 22-051 (Radio Shack) with modified face.
*case	1/16" aluminum.
wire	26-gauge, 19-strand: 10" black, 12" red, 10" orange, 16" yellow.
HST	heat-shrink tubing: 6" of 1/16", 3" of 3/16".
B1, B2	9-volt transistor radio batteries, Eveready 216 or equivalent.
2	connectors for above batteries.
2	4-40 x 3/8 plated brass binding head machine screws.
2	6-32 x 3/8 plated brass binding head machine screws.
2	#4 lockwashers.
2	#8 internal lockwashers.
2	#4 nuts.
*2	4-millimeter nuts.
*2	#6 J-type speed nuts, Tinnerman C13211-017.
3	#4 3/8" self-tapping or sheet metal screws.
1	3/16" grommet for 5/16" hole in 1/16" material.

* See construction hints section for details.

Complete Kit: Available from Royal Electronics, Box 22424, Denver, Colorado 80222. $50.00.

Assembled Unit: Available from author through SLK Electronics, 2906 Charolais Drive, Greensboro, N.C. 27406. $65.00 includes two-year warranty.

TABLE 2



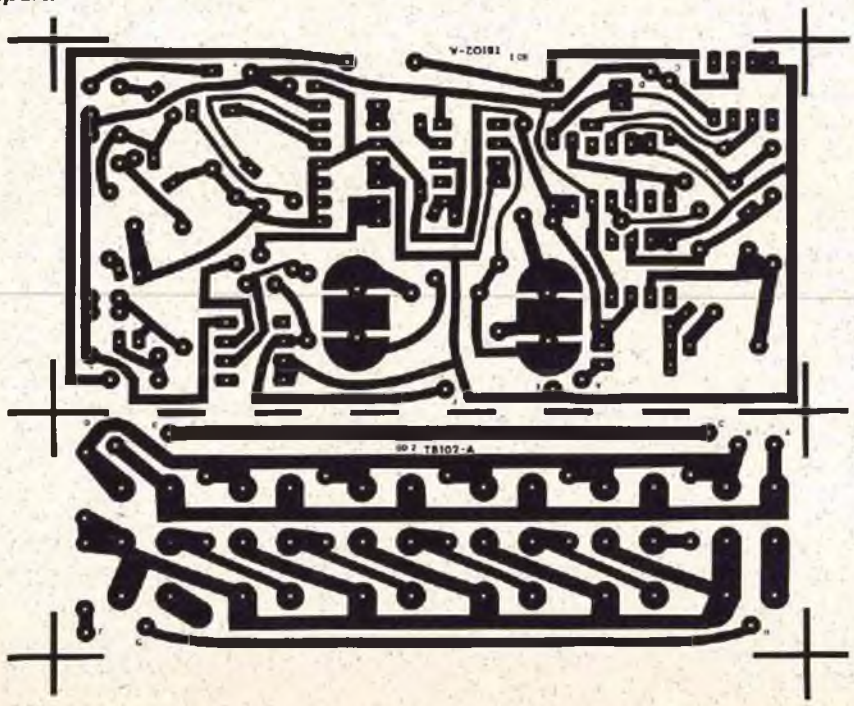
All parts for the ProTach laid out, ready for assembly. Components can be purchased locally, or a complete parts package is available from Royal Electronics.

adjusted by potentiometer R5 to calibrate the meter offset. D2, R26, R27, and R28 protect the meter from overloads. S3 reverses the current through the meter for calibration. S3 is actually implemented on the PC board by mounting the meter through different holes. This allows the current through R31 to be read on the meter and the regulator adjusted for a reading of 4K RPM.

With all buttons out, R30 is placed in series with R29 and this divides the current to the meter by five, providing the 0-25K RPM scale. When S2 is switched to the BATT position (spring return), R3 is connected to +V and to the input of A5. The RPM and offset signals are disconnected. R3 is chosen so that full scale on the meter occurs when the battery is at 18 volts. A half-scale reading represents about 12 volts and is the recommended replacement voltage.

VR1 is an integrated circuit voltage regulator which supplies a constant voltage, controlled by R5, to all critical circuits. This also supplies the positive and negative voltages necessary to power the operational amplifiers.

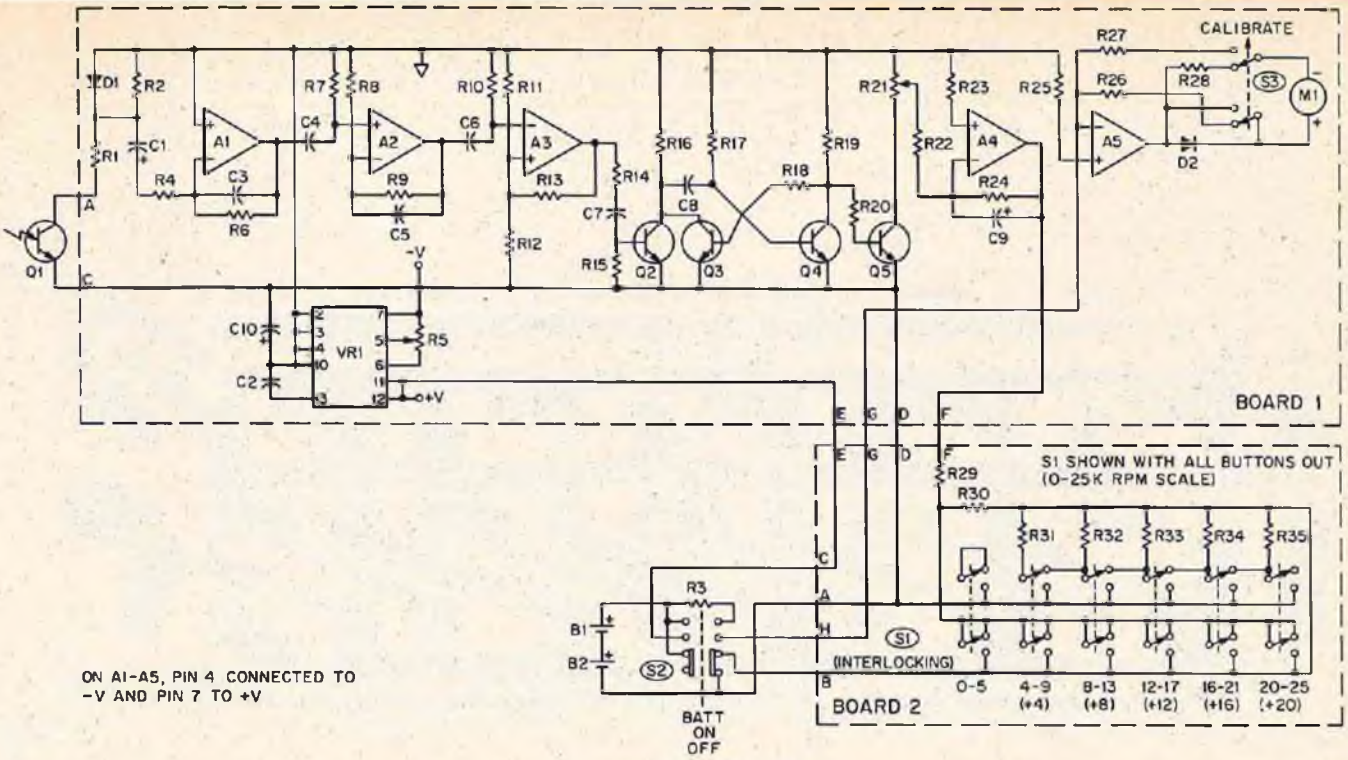
Actual size PC board. Both boards, as shown, are printed as one unit, then cut apart.



Construction Hints

The following hints are provided for those who don't use the kit parts, but would rather "scratch-build:"

Figure 6 shows a suggested case layout. A "minibox" type of case could also be used, as long as the inside dimensions are made large enough. If you are not interested in the hands-off feature, the sloping front could be eliminated, making construction a little simpler. On my prototypes, I made the top first, cutting and smoothing all holes before bending. Be sure to double check all

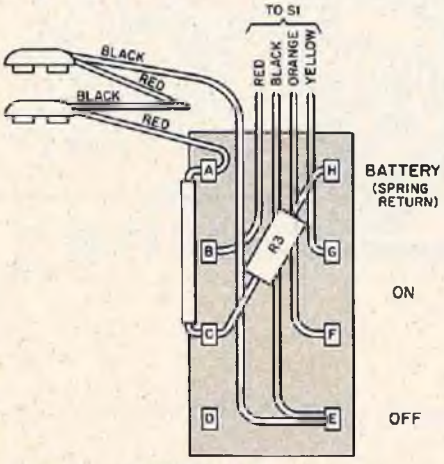


PROTACH

FIGURE 5

dimensions. I found that a better case bottom could be made using the case top as a guide. When bending it, it is better to goof too tight rather than too loose, then the top can be filed to fit. It is also a good idea to cut the bottom oversize, and then trim it to match the case top after bending. I finished my prototypes using epoxy appliance enamel. Check that all parts fit before finishing.

If you don't get a parts kit, you can still get a professsional looking meter face with a little care. Unsnap the meter cover, remove the two screws holding the face plate, and carefully remove it. All of the lettering can be removed with cotton swabs dipped in dope thinner. Be careful not to touch the scale itself. After this has dried, you can label the scale using dry transfer lettering.



ASSEMBLY OF S2

FIGURE 2

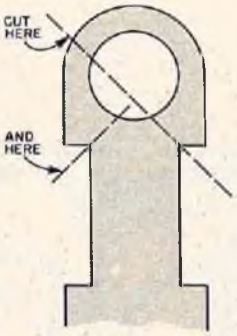


FIGURE 7

Then put everything carefully back together, and that's it. The meter in the photos was lettered in this way. You could substitute another brand of meter, but the PC board layout must be modified if the rear terminals differ. The 4mm. nuts can be found at a hardware store and are used to properly space the PC board.

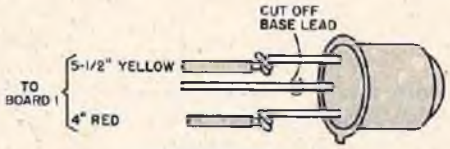
The printed circuit board layout shown allows both boards to be printed at once, and then cut on the dotted line. Drill all holes with a #60 drill. Then enlarge the 36 holes for the S1 terminals in board 2 with a #51 drill. The four holes in S3 on board 1 for the meter should be enlarged with a #17 drill. If your boards have not been solder-plated, clean the copper thoroughly with steel wool before beginning to solder.

The push button switch specified in the parts list is not a normal stock item because it has special PC terminals. If you can't get this version, get the standard version (same number shown in Table 2) and cut off the terminals as shown in Figure 7. File the rough edges smooth. This procedure only takes about ten minutes. This switch is designed to accept the Tinnerman nuts specified in the parts list, but these also may be hard to find. You can use regular 6-32 nuts instead, but it takes a little patience due to the compact packaging.

It is a good idea to have all the parts ready and neatly arranged before beginning the step-by-step assembly instructions. This allows you to keep your mind on what you are doing, and minimizes mistakes. Use a small soldering iron of less than 50 watts with a 1/8" tip.

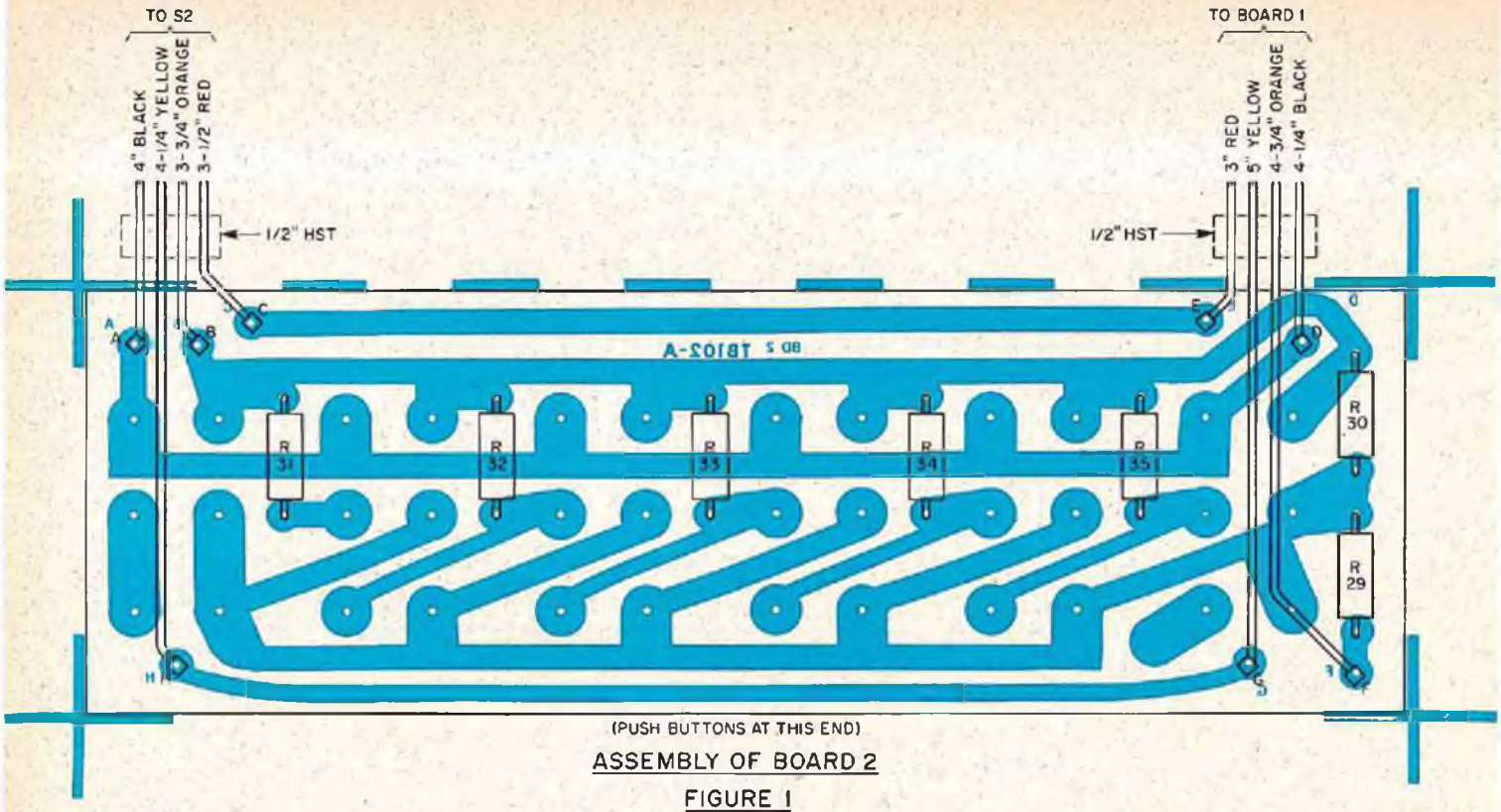
TACHOMETER CONSTRUCTION

The following instructions are intended to guide you in an organized construction sequence. Most instructions involve installation of parts on a printed circuit board. Install each part when called for, bending and clipping off excessive lead length. After all parts in an instruction have been installed, solder all unsoldered leads with a small iron, checking for solder bridges. Heat Shrink Tubing (HST) can be shrunk carefully with a match, but a heat gun does a better job.



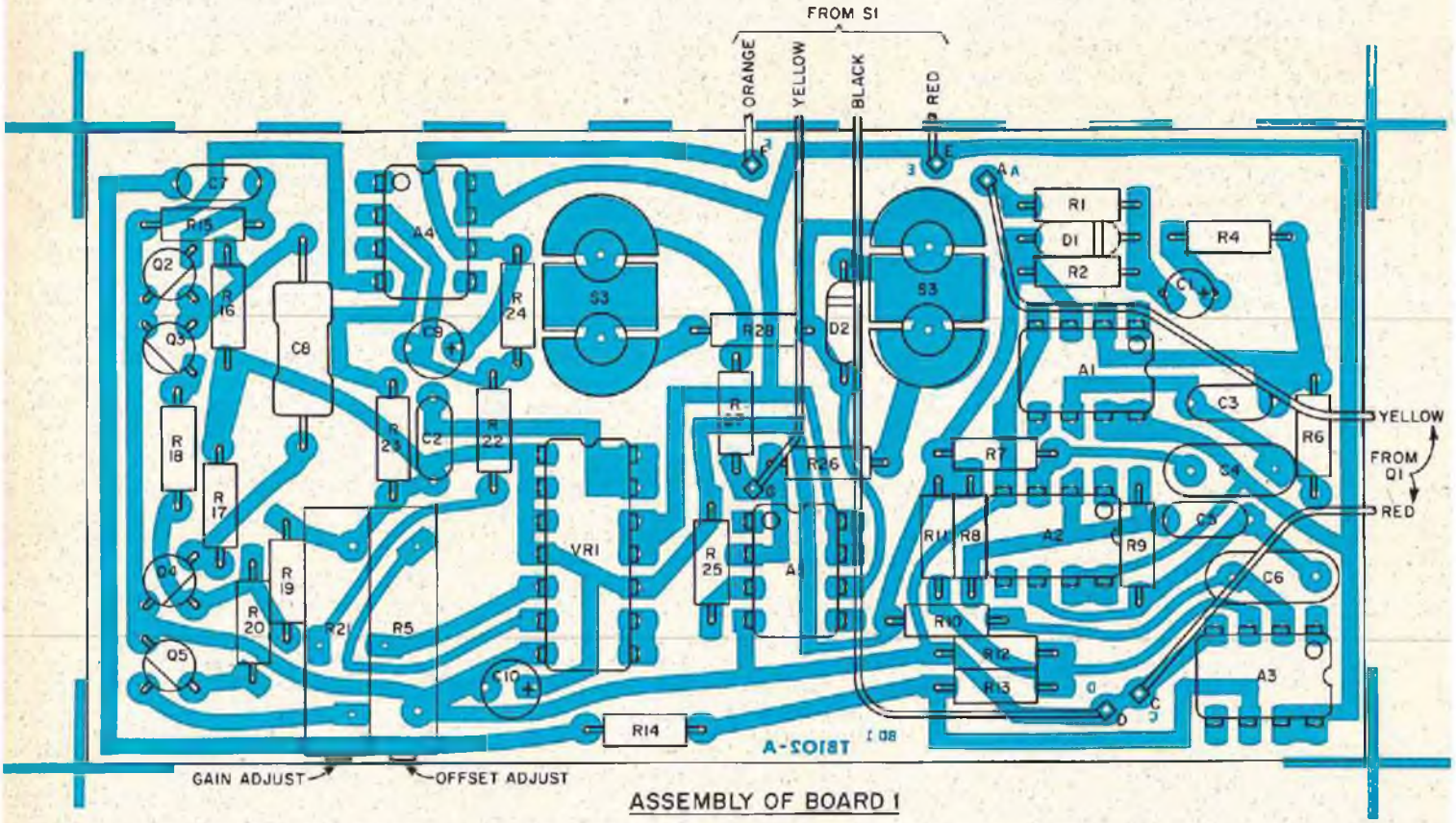
PREPARATION OF Q1

FIGURE 3



ASSEMBLY OF BOARD 2

FIGURE 1



ASSEMBLY OF BOARD 1

FIGURE 4

The two overlay illustrations above illustrate the wiring of the two printed circuit boards used in the ProTach, once they have been cut apart as described in the text.

Lead Preparation

Prepare the following leads by cutting to length, stripping 3/16" from each end, and tinning the leads.

BLACK
( ) 4"
( ) 4¼"

RED
( ) 3½"
( ) 4"
( ) 3"

ORANGE
( ) 3¾"
( ) 4¾"

YELLOW
( ) 5½"
( ) 5"
( ) 4¼"

Board 2 Assembly

Board 2 is the smaller of the two boards. Refer to Figure 1 in the following steps.

( ) Install R29 (10K 1%), R30 (40.2K 1%), and R31 (150K 1%).
( ) Install R32, R33, R34, and R35 (all 150K 1%).
( ) Install 4" black lead at A.
( ) Install 3¾" orange lead at B.
( ) Install 3½" red lead at C.
( ) Install 4¼" yellow lead at H.
( ) Slide 1/2" large HST over these wires as far as it will go and shrink.
( ) Install 4¼" black lead at D.
( ) Install 3" red lead at E.
( ) Install 4¾" orange lead at F.
( ) Install 5" yellow lead at G.
( ) Slide 1/2" large HST over these wires as far as it will go and shrink.
( ) Mount board on push button switch S1 and solder all switch terminals.

Assembly of S2

Refer to Figure 2 for the following steps.

( ) Clip one lead of R3 (red-yellow-yellow) to 5/16, slide long end into C, and short end back into H, using pliers. Solder C and H.
( ) Slip 3/8" large HST over leads from S1 (A, B, C, H).
( ) Clip black lead of one battery clip to 4" and red lead to 2¾". Strip 1/4" off ends.
( ) Clip black lead of other battery clip to 2¾" and red lead to 3¼". Strip 1/4" off ends.
( ) Twist ends of short black and short red leads together and solder. Tin remaining two leads.
( ) Slip battery clip leads through HST on S1 leads from S1 end.
( ) Solder yellow wire to G, orange wire to F, and red wire from S1 to B. Insert black wire from S1 at E.
( ) Insert long black battery lead at E. Solder E.
( ) Insert red battery wire at A.
( ) Clip protruding R3 lead to 3/4", slip 1/2" small HST over lead, and insert lead at A. Solder A.
( ) Slide large HST so that it covers exposed connected ends of battery clips, and shrink.

Preparation of Phototransistor Q1

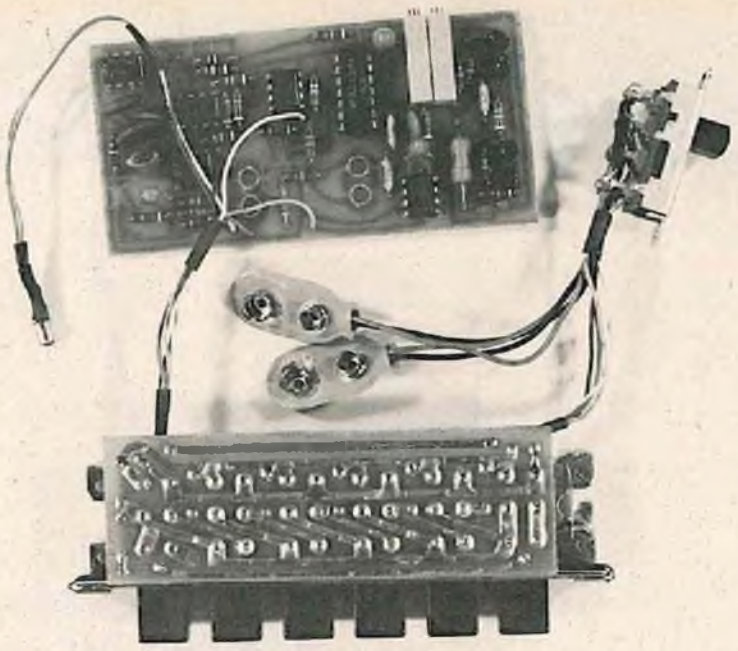
Refer to Figure 3 for the following steps.

( ) Clip middle lead of Q1 (transistor with lens) as close to case as possible.
( ) Bend 1/8" hook in the ends of the two remaining leads of Q1.
( ) Bend hook in one end of 4" red lead, attach to Q1 lead closest to tab (emitter), bend hooks shut, and solder.
( ) Bend hook in one end of 5½" yellow lead, attach to remaining Q1 lead (collector), bend hooks shut, and solder.
( ) Slip a 3/4" piece of small HST over each Q1 lead and shrink, taking care not to heat Q1.
( ) Slip a 1/2" piece of large HST over both leads as far as it will go, and shrink, taking care not to heat Q1.

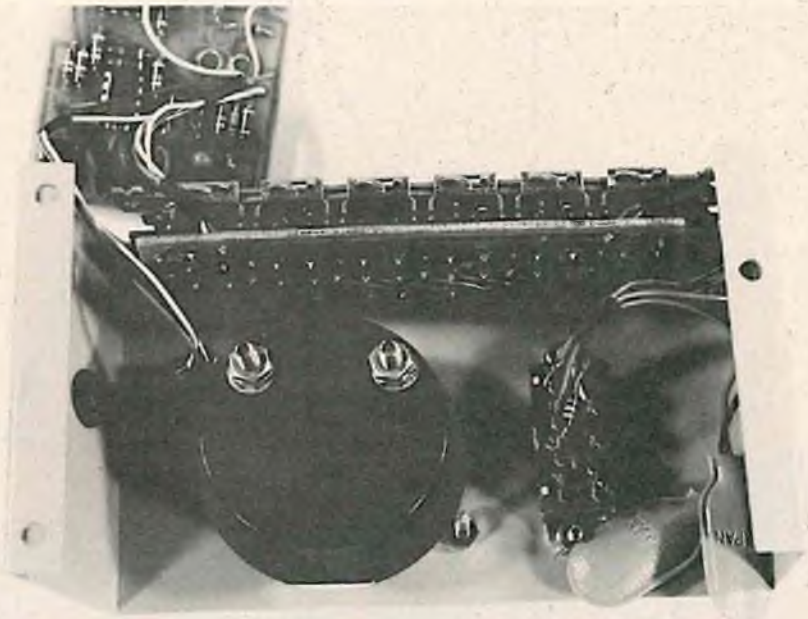
Assembly of Board 1

Refer to Figure 4 for the following steps.

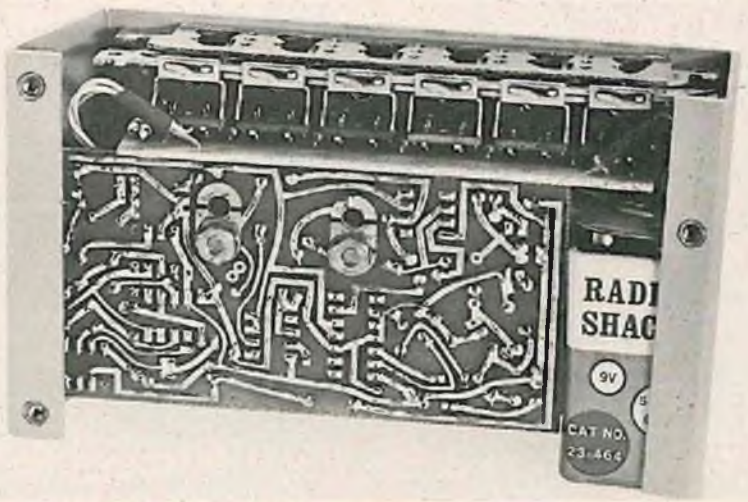
( ) Install R1 (yellow, purple, brown), D1 (1N4148), R2 (brown, black, orange), and C1 (1 Mf.), checking orientation of D1 and C1.
( ) Install R4 (yellow, purple, red), and C3 (.001 disc).
( ) Install A1 (741 integrated ckt.)
( ) Install R6 (red, red, yellow), and C4 (0.1 disc).
( ) Install C5 (.001 disc), C6 (0.1 disc), and R9 (yellow, purple, orange).
( ) Install A2 (741 I.C.).
( ) Install A3 (741 I.C.).
( ) Install R7 (yellow, purple, orange), R8 (yellow,



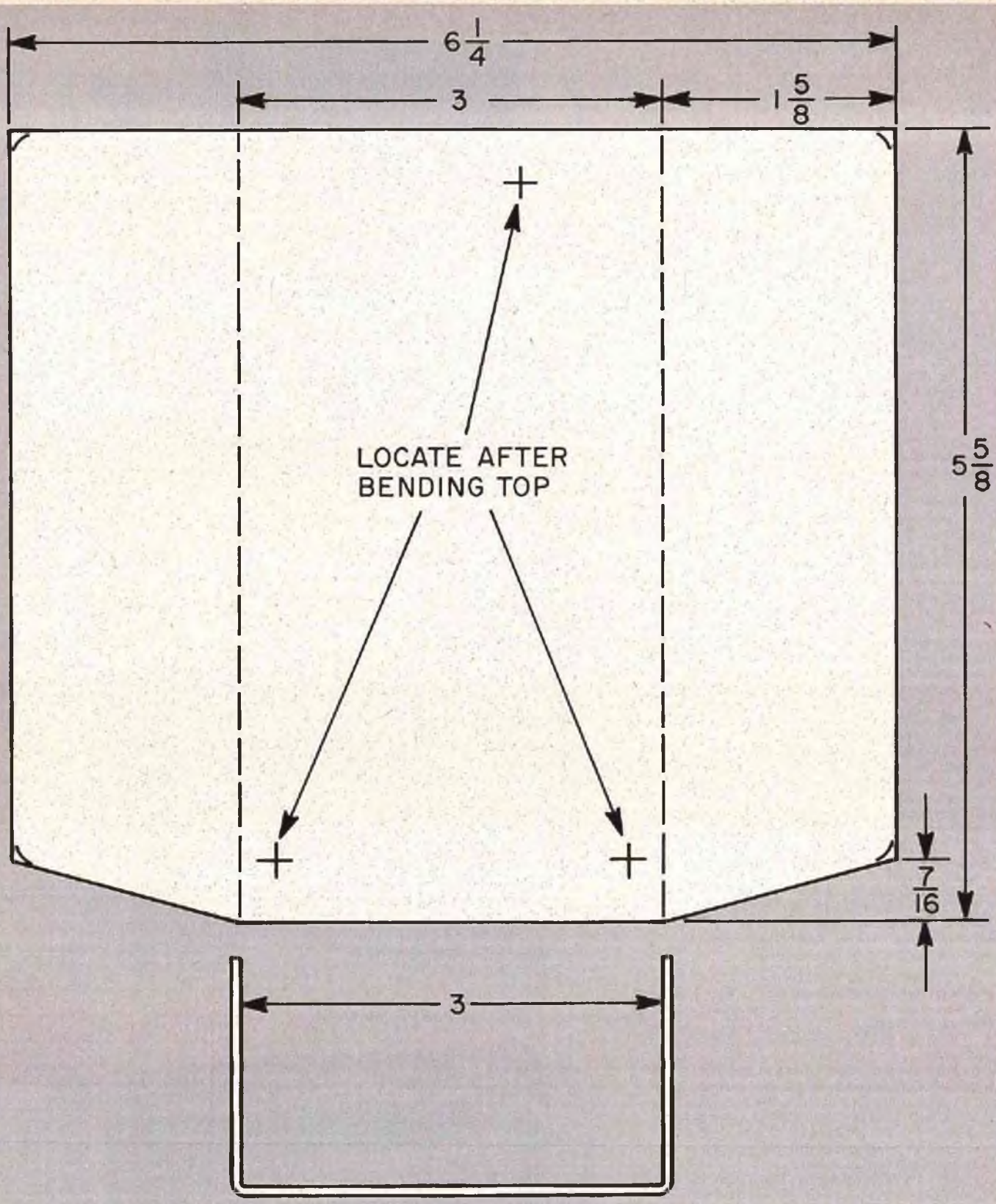
The two PC boards removed from case.



Main components installed in case front.



Assembled ProTach with back cover removed.



purple, brown), and R11 (yellow, purple, red).

( ) Install R10 (yellow, purple, orange), R12 (yellow, purple, yellow), and R13 (red, red, yellow).

( ) Install A5 (741 I.C.).

( ) Install R25 (brown, black, orange), R26 (yellow, purple, brown), R27 (blue, gray, orange), and R14 (yellow, purple, orange).

( ) Install R28 (blue, gray, orange), C10 (4.7 Mf.), and D2, checking orientation of C10 and D2.

( ) Install VR1 (723 I.C.).

( ) Install R21 (adjustment potentiometer), and R5 (adj. pot.).

( ) Install A4 (741 I.C.).

( ) Install R23 (yellow, purple, red), R24 (10K 1%), and C2 (100 disc).

( ) Install C9 (4.7 Mf.), checking orientation and R22 (10K 1%).

( ) Install R20 (yellow, purple, orange).

( ) Install R19 (brown, black, orange), Q4 and Q5 (2N3393), and R17 (150K 1%).

( ) Install Q2 and Q3 (2N3393), and R18 (yellow, purple, orange).

( ) Install R15 (yellow, purple, orange), R16 (brown, black, orange), and C7 (100 disc).

( ) Install C8 (.0068 tubular).

Final Wiring

Refer to Figure 4 for the following steps.

( ) Slip a 1/2" piece of small HST over Q1 leads.

( ) Install red lead from Q1 to point C.

( ) Install yellow lead from Q1 to point A.

( ) Slide HST as close to the board as it will go, and shrink.

( ) Slip a 1/2" piece of large HST over S1 leads.

( ) Install red lead from S1 to point E.

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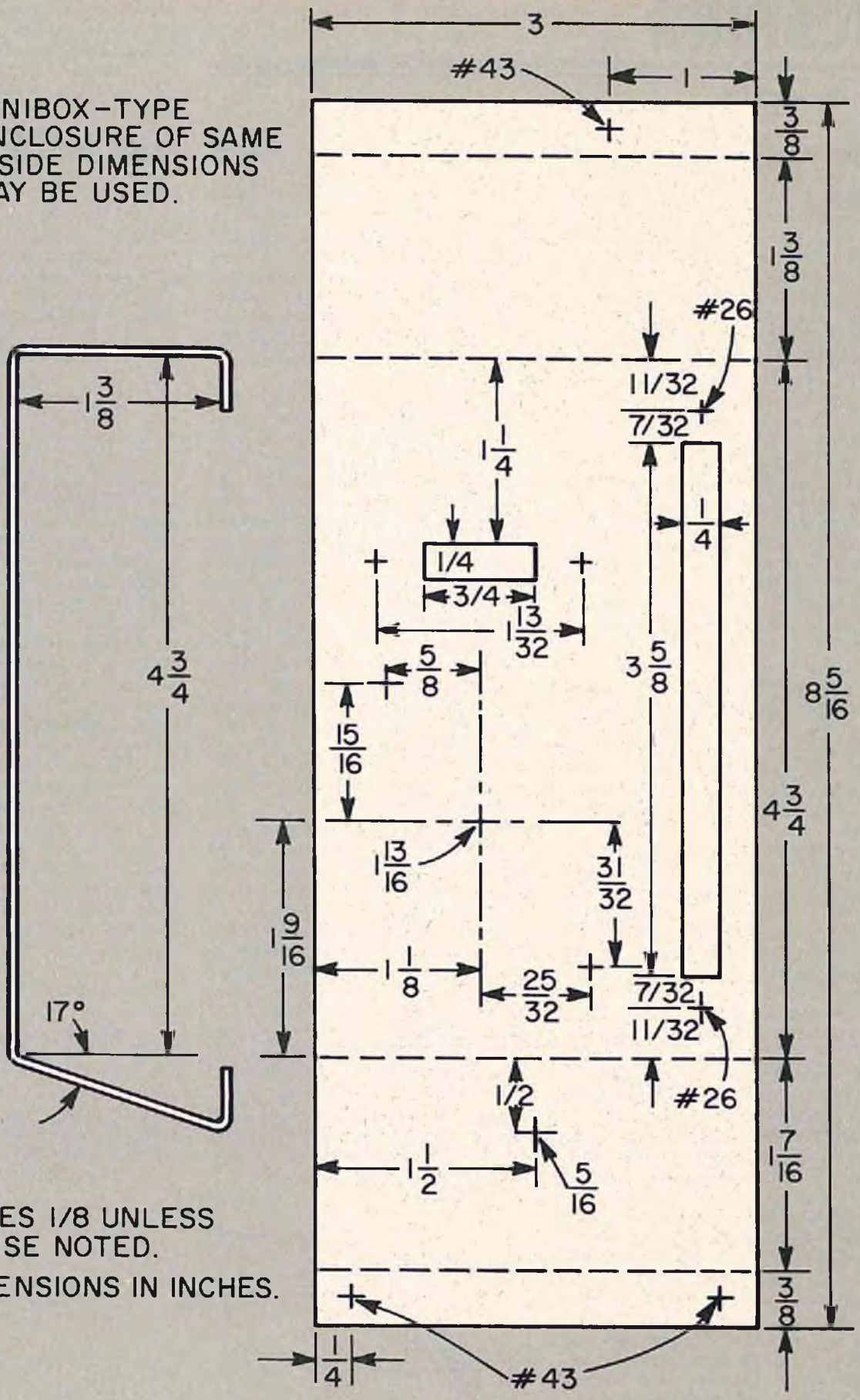
NOTE: MINIBOX-TYPE ENCLOSURE OF SAME INSIDE DIMENSIONS MAY BE USED.



ALL HOLES 1/8 UNLESS OTHERWISE NOTED.

ALL DIMENSIONS IN INCHES.

FIGURE 6

SOARING

BY JIM SIMPSON

The 100" wingspan, standard class, R/C sailplane has been the object of a rules debate. To resolve this problem, the National Soaring Society conducted a poll of its membership. Results of the poll indicate that, of the three options, the membership favors two:

(1) AMA Rules Proposal RC-76-9 — Basic sailplane (commonly known as standard class) controls limited to rudder and elevator.

(2) AMA Rule Proposal RC-76-19 — Classify sailplanes by size and function. Three classes are created. The contest organizer may select any of the three classes or any combination of the two.

There was a difference of nine votes between the above proposals. Because of the close vote, the Board of Directors of the National Soaring Society has adopted RC-76-19 for use during 1975. All R/C soaring contest announcements should include information concerning the class or classes of sailplanes to be flown at the event.

●

All of the "exotic" aspects of unlimited class R/C Sailplane flying have been adequately covered in previous issues of RCM with the notable exception of flying itself. This is (of course) the side I think I know best. After all I've learned to fly four times since 1953! Some guys never learn once.

But, before we begin, let me explain. The first time I learned, was with escapements and relays. The next time was with "reeds." (If you don't remember these things don't worry because you really don't need to know.) The third time was with the proportional equipment not unlike that we use today. Now, I am learning to fly a fourth time. I would have assured you that I was a bonafide expert after each of the first two cases. The third time I wasn't so sure and now, with sailplanes, I am learning just how much I don't know! So through this column let us learn together.

Good R/C sailplane flying starts before the actual launch. This phase of the effort can be called flight preparation. To omit a lot of mind boggling details, let's say this phase includes; sound structure, no warps, proper balance, reliable equipment and a knowledge of how the whole assembly has been flying lately. If all these things are not known, your next flight will be a test hop and should be planned accordingly.

Assuming sound structure, no warps, and reliable equipment there are still two variables that we can "play with." Take the first — **balance.** We change this to match the weather and the event. For example, if it is windy, or the event is 2 or 3 minute precision-duration, we might prefer more nose weight. Conversely, if it is dead calm and long duration flights are our goal, we might prefer less nose weight (which must be adjustable). The second variable is knowing **how it flew last** and, therefore, is related to the first consideration. For our purpose here let's assume that we **do** know how it has been flying and wish to make no changes. (This naturally assumes that your trims are all set correctly, and even that the expansion coefficents of your pushrods and fuselage match!)

The prime objective of each launch is to grab for all the altitude you can get, because altitude equals time and, when the most time wins — the most altitude on launch was important. There are four Standard Class sailplanes which we can discuss for comparison. The Olympic and Windrifter can easily be trimmed such that there is not another blessed thing you can do to improve the launch or altitude except get off (with a releasable towhook) at the absolute top. The other two (Windfree and Hobie Hawk) can be "played" into a more optimum launch with judicious application of the elevator control to balance attitude and speed through the launch phase. This is mostly because the first two planes are "at home" on calm days flying around slowly on the very edge of a stall. The latter two planes can be flown in a variety of wind conditions and often do better when "up on the step and moving out"! Thus, they resemble the "exotics" somewhat and this can be attributed to their airfoils, planform wing loading, etc. Do you see a glimmer of the different philosophies of flight here?

Let's go on to the exotics and their launch regimen. The two outstanding examples of trimmed for optimum launch (hands off) would likely be the Grand Esprit and Legion Air but, in reality, all the "exotics" I've flown to date will achieve much better launches if you **fly** them all the way up. Consider the "T" tail models such as the Phoebus, Boss "T", Kestrel, Bjorn, Glasflugel 604, Diamant, LS-1 and Cobra to name a few. Depending on the location of the center of gravity (CG) and the towhook; combined with elevator effectiveness, it becomes possible to "fly" the horizontal stab down into the wing wash (which gives about the same result as if the tail fell off). The redeeming grace of these T-tail jobs also happens just before the stab gets too low, and that is usually seen in oscillations about the pitch axis (nose bobbing up and down). In any case the point here is, that for optimum **launch,** you must **fly** the craft at optimum **attitude** to achieve the maximum altitude.

The next general observation which applies to all the exotic jobs is related to wing loadings, thickness, leading edge radii, attitude and speed. Really, it's just a nasty stall and is to be avoided at all costs. Methods include good pilot technique, leading and/or trailing edge flaps, moveable ballast, variable camber airfoils and so forth. Most effective is naturally pilot technique and that's all we really want to talk about now. To better understand what we are subject to, let's refer to the following sideview of typical launches. (Fig. 1).

Looking first at the optimum launch we see it has four active phases. From launch point A to line B we call **initial acceleration** and the optimum here is to aim the sailplanes nose precisely along the optimum climb attitude then crouch down and really heave it along that line. From line B to line C the craft is in **stable climb** (not accelerating) and is really building altitude. At line C the only thing that you can be certain of is that the towline is either going to get shorter or break. The smart pilot will begin **transitional acceleration** here by relaxing some up elevator and slowly allow the sailplane to rotate into almost level flight attitude where, as it accelerates, lift is being generated and more altitude is achieved. At line D release usually occurs and, with it, you may see two separate results. If you accelerated to above optimum flight speed in the last phase your craft will "zoom" up a few more feet. If you were right on, your craft will coast up more. In either case the removal of towline weight also contributes in altitude increase.

The "hands off" launch has the same phases — they're just automatic and usually not as productive. The poor **1** launch is the result of stall from either (1) tow hook too far aft, (2) too much elevator, (3) or, too tail heavy. The poor **2** launch is probably a result of no initial acceleration which was caused by either not enough beans in the heave, or not enough launch speed.

Next month more on flying! □

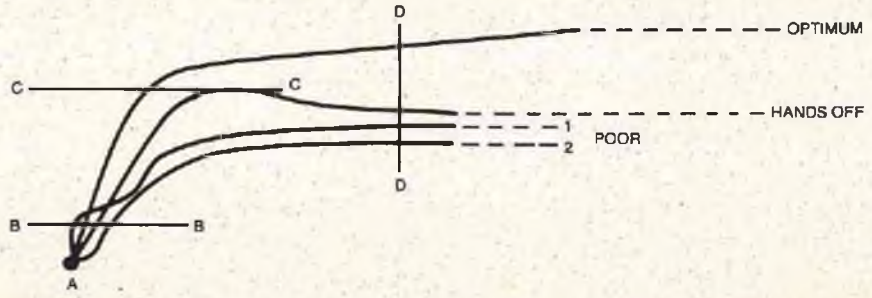


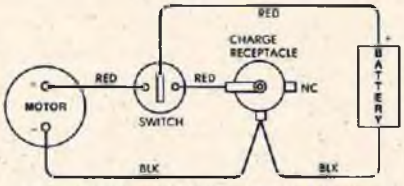
FIGURE 1: SIDEVIEW OF TYPICAL SAILPLANE LAUNCHES

QUIET REVOLUTION

BY ROLAND BOUCHER

Throttle Your Motor

This month we will discuss motor speed controls or throttles. While a throttle is not necessary for electric flight it is an absolute **must** for R/C cars and boats. Many kinds of speed controls or throttles have been used by electric fliers. The simplest is the servo operated toggle switch. It provides two speeds (on and off) and can be used to taxi, (by blipping the throttle stick) to shut down the motor in thermal flight, and most important of all, to shut down the motor for landing while having enough charge in the batteries to go around again if necessary.



WIRING DIAGRAM FOR 2 SPEED THROTTLE (ON-OFF)

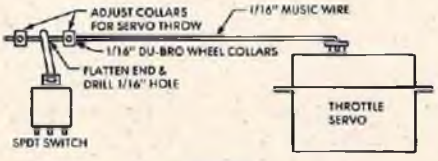


FIGURE A

SIMPLE TOGGLE SWITCH PROVIDES ON-OFF CONTROL WHEN OPERATED BY THROTTLE SERVO.

The next step is to switch in a resistor to provide a realistic taxi. This method of speed control works well and produces a definite wind-up of the motors not unlike a prop jet coming up to speed.

Next in the evolution of throttle devices is to add a second resistor to provide a "medium" speed. The resistors are selected by means of three micro switches operated by a cam. This has been used in electric R/C cars. For the purist who doesn't like the fixed switch points, a variable resistor can be used. Both variable and switched resistors have been used by boat enthusiasts for years.

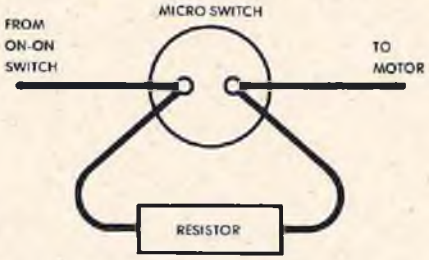


FIGURE B

SINGLE POWER RESISTOR AND MICRO SWITCH ADDS ADDITIONAL "TAXI" SPEED. EXTRA SWITCHES AND RESISTORS CAN BE ADDED TO PROVIDE ADDITIONAL SPEEDS.

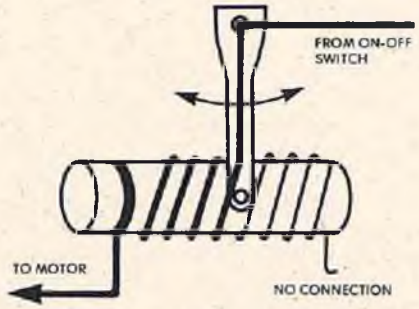


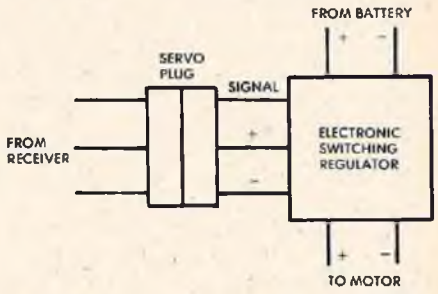
FIGURE C

FOR THE "PURIST" WHO DEMANDS COMPLETE VARIABLE SPEED, THE RHEOSTAT IS AN INEXPENSIVE SOLUTION.

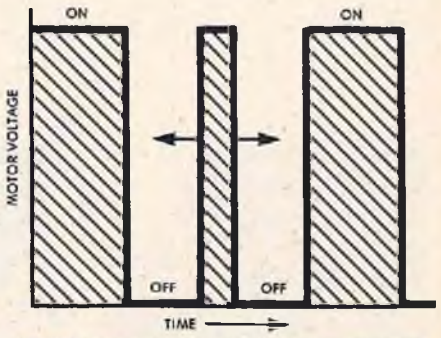
The next step in sophistication is to use a transistor as the variable resistor or voltage regulator. This works well but requires that the transistor be attached to a heat sink to get rid of the waste heat (transistors can't operate at temperatures normally reached by power resistors).

The next step in the evolution of the speed control is to switch the transistor on and off rapidly; controlling motor speed by the percentage of time the device is on. Since no heat is generated in the "throttle device," it is widely considered more efficient than the simple rheostat. This is not true. The rheostat drops the battery voltage to slow down the motor. The electronic throttle changes the percentage of time the battery voltage is applied to the motor to slow it down. At any power level both draw the same average current from the battery and give the same increase in duration when throttled back. The difference is that when the electronic throttle applies full battery voltage to a motor operating at less than full speed, higher peak currents flow through the motor than when the throttle is wide open. These short bursts of current cause the motor to heat up. The result is to produce exactly the same efficiency as the "old fashioned" variable resistor. The difference is where the heat is generated (motor or resistor). In either case, the efficiency is much higher than you might first expect. The propeller is nearly a constant speed device. Throttling back to 1/2 power on the ground results in only a 20% speed reduction. In the air this reduction is even less, due to "windmilling." Since the efficiency of the throttle is determined by the percentage of battery voltage it absorbs, throttling back to 50% power even on the ground will result in an 80% efficient use of battery energy and yield a 50% increase in duration. Remember the losses in the "switching regulator" (electronic throttle) are in the **motor** so be careful to provide plenty of motor cooling air when using this device in a car or boat, where larger motor speed ranges (heating) can be expected.

The efficiency of the switching regulator can be improved by making use of a property of the motor armature called inductance. This is a characteristic of all coils of wire (especially if they are wound on an iron core) to hold back the attempt to change the current in the coil by producing an opposite voltage of their own. This effect is small in a motor and it takes less than 1/1000 of a second for current to build up to full amperage after the voltage is applied. Electronic circuits can be made quite fast however, and if the switching regulator is operated at high enough speed the motor



THROTTLE IS INSERTED IN POWER LEADS TO MOTOR. BOTH POSITIVE AND NEGATIVE LEADS ARE USED

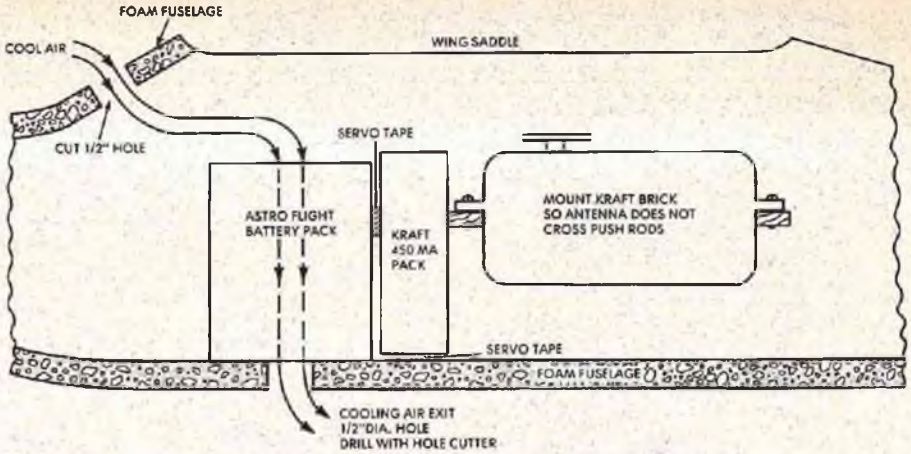


THROTTLE CONTROLS PERCENTAGE TIME VOLTAGE IS APPLIED TO MOTOR

FIGURE D

THE ELECTRONIC SOLID CONTROL (THROTTLE) ADJUSTS THE PERCENTAGE OF TIME MOTOR VOLTAGE IS PRESENT FROM 100% OFF TO 100% ON.

Electronic speed control manufactured by Benson Hobby Products. Unit provides full stop to full speed operation – plugs into throttle servo connector.



Electric power installation in Goldberg Ranger 42.

current will smooth out and efficiency approaching 100% may be achieved. To illustrate this point suppose we throttle back to 1/2 power with a resistor or slow speed switch. Battery current will drop to 2/3 instead of the 1/2 value of a perfect throttle, with a high speed switch the current value might be 5/8 of the full current values.

Now that we have discussed the theory, let's consider some practical applications. If you are a sport flier who's mission is to taxi, take-off, fly, and land when you want to, the servo operated toggle switch will work just fine. If you prefer a scale-like start-up and slow taxi to the runway, install a two position switch and select the power resistor that gives you the taxi speed you want. If you want variable power, install some sort of servo operated rheostat or purchase an electronic speed control. If the purpose of the speed control is to lengthen the duration of flight under continuous power then you can expect to be able to double flight time with a rheostat or slow speed switching throttle. The best commercial throttle available (Benson SC-1H) might give three times normal duration. If duration **only** is your game, select your prop for best **climb**, use a toggle to turn your motor on only for climbing, and spend most of your time gliding. Helmut Walter of West Germany, recently claimed an unofficial world record for electric duration by flying a cabin type plane powered by an Astro 25 for 53 minutes using this technique.

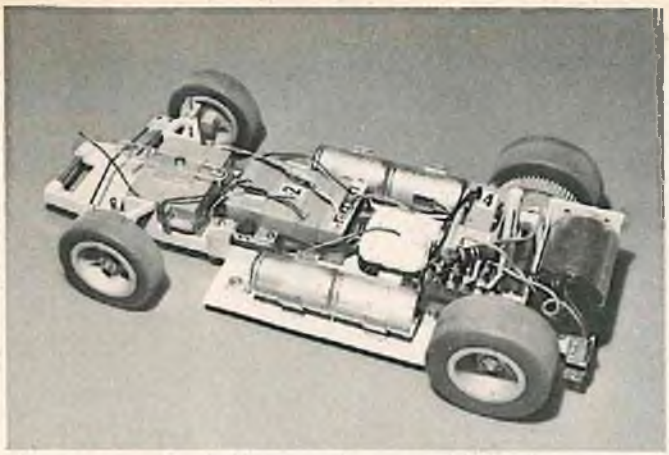
Benson Hobby Products Speed Control

Benson Hobby Products, 6240 Placita Pomona, Tuscon, Arizona manufactures a speed control which is capable of operating any electric power system on the market. I have tested this product and confirm Mr. Benson's claim of an efficient lightweight throttle capable of operating any of the Astro Flight Power Units. The unit provides full stop to full speed proportional control and can be used in boats, cars, and planes. Three models are available, all operating directly from the pulse output of standard digital R/C receivers, and completely replacing the throttle servo. The least expensive model SC-1, operates at the pulse rate of the R/C transmitter, and costs $29.95. This same basic unit, incorporating additional circuits, to raise the switching rate and improve motor efficiency is available as the SC-1H, priced at $34.95. Also available is a deluxe unit incorporating both the high speed switching and a voltage regulator which allows owners of 3 wire radios to dispense with radio batteries completely. This is a real asset, especially with small R/C planes. I recommend any of these units for use with the Astro motors. If you intend to operate a boat or car, be sure to order the high efficiency version.

The Goldberg Ranger 42

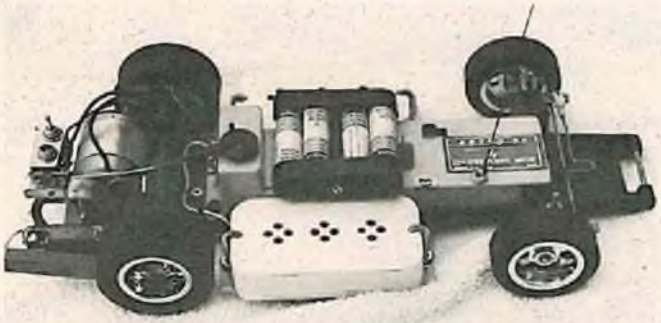
The Goldberg Ranger 42 is back in production and flies beautifully with the Astro 05. The best part is that the 05 fits it perfectly and the kit goes together in a few hours. I built up one of the new kits, sanding it smooth with #200 paper and applying Solarfilm right over the foam. Two changes were made to the kit. The first was to drill a 1/2" hole through the bottom of the fuselage and through the windshield to provide battery cooling air. This was accomplished in seconds with an X-Acto hole cutter mounted in an electric drill. The second modification was to replace the foam elevator with a piece of 1 inch trailing edge stock. My radio was a Kraft Brick mounted antenna end aft to keep from crossing the pushrods. For a radio battery, I used one of Astro Flight's 250ma packs from an Astro 020 Free Flight System. The little ship is nothing short of amazing. On the first flight I did three consecutive rolls, three loops, and was delighted with the ships performance. Landing was a cinch on the tricycle landing gear. By the third flight I was ready to wring it out. I took off, flew the "A" pattern, then threw in a couple of extra shots of three consecutive rolls, did a few extra loops then put in full back trim and climbed until the power ran out. I did a

Goldberg Ranger 42 with electric power. Foam ship completely covered with Solarfilm.

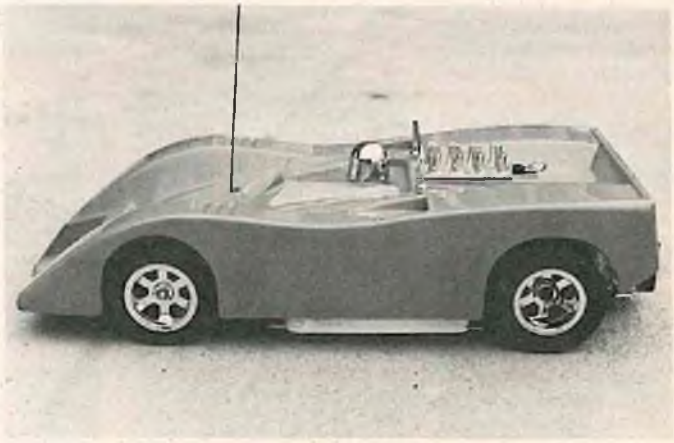


Jerobee converted to electric power for indoor racing by Roy Moody appears to use cam actuated micro switches for speed control.

Components used by Larry Goddard to convert Jerobee to electric power for outdoor racing. From left, transmitter, rapid charger, 8 cell battery pack disassembled, 4 ohm slot car controller, switch, charge receptacle, Astro 05 motor, Jerobee car.



Car with chassis complete. Motor and speed controller replace glow engine batteries mount on each side of chassis on 0.063 aluminum pan.



Electric Jerobee, by Larry Goddard, ready to race.

couple of rolls during the glide down and touched down 8 minutes after I took off. Not bad for a ready made foam kit and a $35.00 electric power plant. My hats off to you, Carl Goldberg — your Ranger 42 is a very positive contribution to electric flight.

Electric Indoor Jerobee Racing

Roy Moody of Flossmoor, Illinois sent in a photo of a 1/12 scale Jerobee, which is converted to electric power especially for indoor use. Unlike the outdoor conversion this car uses only 4 1 AH cells and charges at 6 volts. Popular motors are Black and Decker, or Sears Grass Shear motors, and the Astro 05 (when ordering from Astro Flight specify Astro 05 Auto Indoor, price $19.95 postpaid). Mr. Moody reports that the little cars have a running time of 20 to 30 minutes on a charge, and hit scale speeds of 150 mph on indoor tracks. For you lazy folks, these Jerobee cars with Astro 05 and 4 cell battery installed and ready to race are available from Workrite Hobby Shop, 7009 Beaty Ave., Fort Wayne, Indiana 46809. Write them for prices and options.

Electric Outdoor Jerobee Conversion

The following letter from Larry Goddard of Pacific Palisades, California, explains the conversion of a Jerobee car for outdoor electric racing.

Dear Roland,

I enjoyed your first column and thought you might like to know how easy it is to convert a gas powered Jerobee car to electric. I own a couple of 1/8 scale gas cars and a 60 powered deep V but have thought for a long time that an electric car would be a lot of fun. I am a general building contractor, but with money as tight as it is, there is not much construction going on these days. I wanted to build an electric car that I could run in front of my house without having the neighbors call the cops! I went to a couple of local dealers who run cars and they said it wouldn't work. "Electrics are no good," they said. One guy told me it would last only 30 seconds. Then one dealer told me to contact Astro Flight. He said maybe they had something I could use. I called and asked if they had an electric motor for a Jerobee. They suggested the Astro 05 Marine Unit would have about the same power as a Cox engine.

I ordered an Astro 05 Marine Unit and Rapid Charger. I picked up a Jerobee at the local shopping center and worked out the installation using a 4 ohm slot car controller for speed control. The photos

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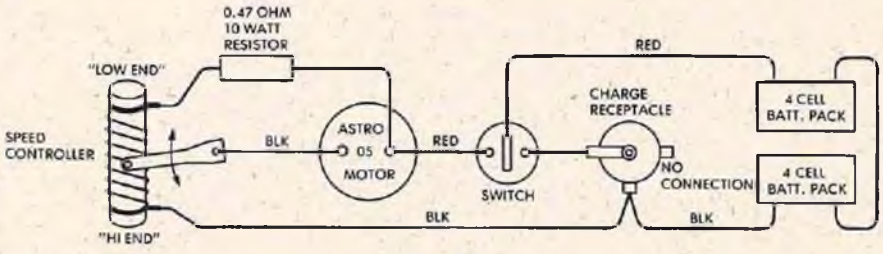
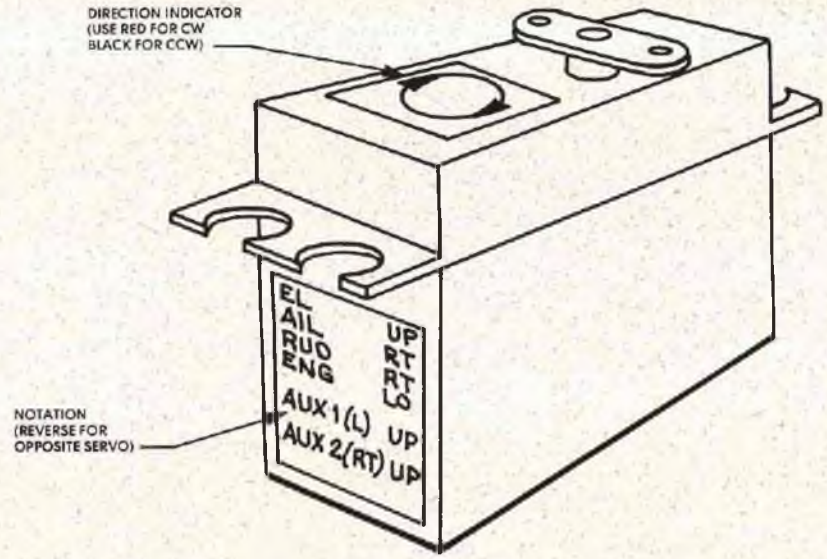


FIGURE E

WIRING DIAGRAM FOR LARRY GODDARD'S OUTDOOR ELECTRIC JEROBEE

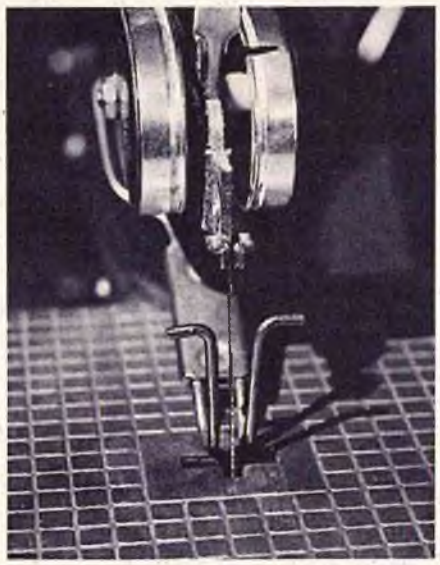
FOR WHAT IT'S WORTH

After years of struggling with temporarily hooking servos up to his receiver to test which direction of throw he was dealing with, Jim Anderson of Hamilton, Bermuda, finally stuck the following information, applied with tape, on each servo. Now his servo installation goes in with no problem whatsoever.

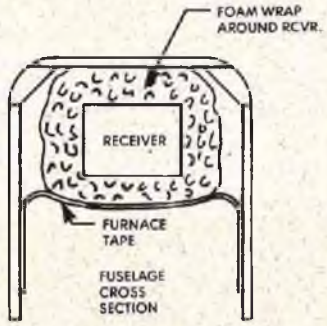


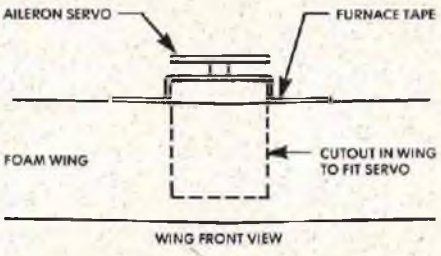
James Hedges of Charlotte, North Carolina, like most modelers, doesn't strictly adhere to finding his tools in a hobby shop. In fact, some of his most frequently used tools have been borrowed from his wife, a painting class, a surgeon, and fly tyers. From his wife, Jim has used crocheting hooks of various sizes which are great for retrieving wires and fuel line, etc., from internal crevices into which his fingers won't fit. They are also inexpensive and are available in both metal and plastic. Jim has also found artist's palette knives to be of great benefit, especially for mixing epoxies and resins and they may be cleaned with any of the standard solvents without damage. Palette knives may be found in any artist supply house and many paint stores and come in a variety of sizes and shapes including shapes like miniature trowels. Jim personally prefers using a medium flat knife for mixing and applying large amounts of epoxy although the blade was originally a little stiffer than he preferred. The latter can be remedied by applying a little emery cloth and a large dab of elbow grease. Another extremely useful tool is what surgeons call Kelly clamps or forceps — these are like miniature pliers which will sercurely hold extremely small items (even a single hair), and they also have the advantage of being lockable to securely hold a small wire without being held by hand. They are also extremely useful for shutting off a fuel line or refueling to prevent flooding the engine, much as a surgeon uses them to shut off a blood vessel during surgery. Much like the Kelly clamps are the fly tyers hackle pliers for holding easily broken items. When the pliers are released, they close and firmly hold what you wish held. But the most useful tool Jim possesses is a fly tyers bodkin. This is a small tool shaped much like a miniature awl or ice pick which Jim uses for mixing very small batches of epoxy, for laying thin beads of glue, for starting holes for small screws, for aligning holes for small sheet metal screws and small bolts, and for pulling fuel lines through small holes — and that is only the beginning of an almost endless list of tasks the bodkins can be used for. Keep your eye open in even the most unlikely places for tools that can be used in the R/C shop.

Joe Robinson of Saline, Michigan has heard friends say that they do not use the material hold-down spring and finger protector on their Dremel saw because it is too clumsy to use. About two years ago, Joe bent the wire ends over approximately 1/4" on his saw for use as a means of lifting the spring as shown in the photograph. This idea, which we could call "human engineering," works quite well, and adds even more versatility to one of the most valuable tools the R/C craftsman can own.



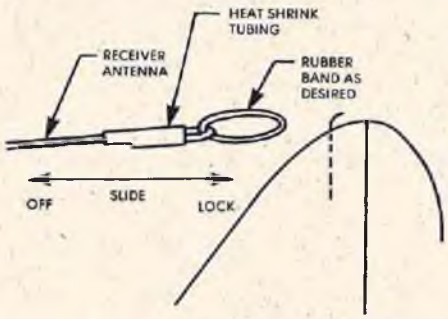
If you're looking for a way to secure your receiver in your model without tying it down to something solid, try this suggestion from Bryce Peterson of So. Charleston, West Virginia. After wrapping your receiver with foam, secure it with furnace tape using the fuselage sides to bond the tape. This heavy duty cloth-based tape is designed to cover cracks and holes in sheet metal and will bond to a clean surface strong enough to even secure your aileron servo in your wing. The tape is available at all hardware stores.



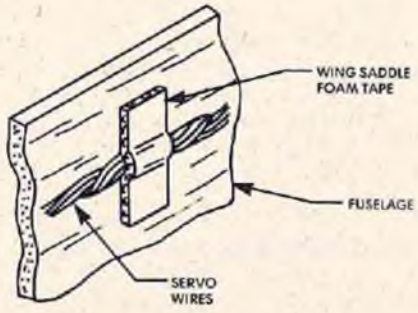


Most of the kits on today's market use grooved hardwood blocks as the mounts for the landing gear. The "gear leg" is held in place by metal straps and retained by short wood or machine screws. A neater method of installation is as follows: After finishing the airplane, install the "gear leg" in the slotted recess. Usually, the gear will be about 1/16th of an inch below the mounting block. Now mask off the slotted opening with masking tape, and fill in the recess with a bead of G.E. Silicone Rubber. Don't worry about any excess rubber at this time but try to keep as much of it within the mask outline as you can. When the rubber cures, take a new double edge razor blade and, starting at one end, lay the razor blade on the wing surface and bow the razor blade between thumb and forefinger. Then, using a see-saw cutting motion, slice off the

excess rubber. Remove the masking tape, and what rubber remains will hold the gear in place, while still providing the necessary shock absorbing qualities. Now if your wing was MonoKoted, you can iron a strip over this installation for an almost invisible finish. After the rubber has cured, the whole process takes less time than messing around with eight short screws and metal plates that have to be drilled. It will also keep you from "dinging" the wing which you usually do with the older and more conventional method. This idea was suggested by Craig Williams writing in the Shawnee Mission Radio Control Club newsletter.

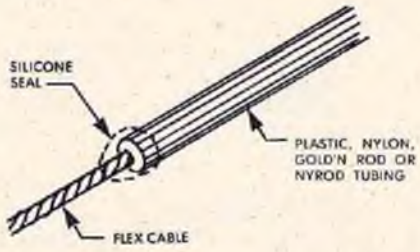


Gerald Reinhard of Brillion, Wisconsin, submitted a foolproof method for securing an antenna without tying knots in the wire. It is simply a piece of heat shrink tubing shrunk to a sliding fit over the folded end. To avoid accidental over-shrink, the slide should be made on a piece of scrap wire and then installed on the antenna. This method works well and Gerald has used it for the past six years. It also looks neat, removes easily, and "gives" readily when the antenna is laid on the fuselage stand or snagged by anything.

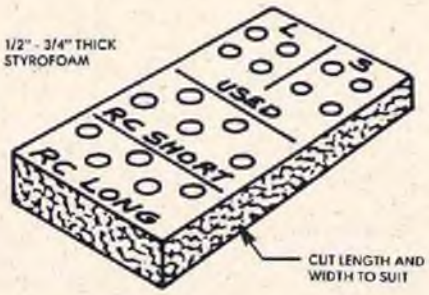


H.S. Davenport of Warner Robins, Georgia, writes that he uses small pieces of foam tape for wing saddles to secure his radio wiring to the inside surfaces of his aircraft. This keeps the wiring out of the way and helps prevent broken wires caused by vibration.

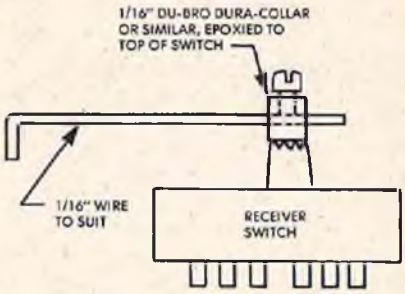
Major M.T. Letaw, USAF Ret. of Fairborn, Ohio, submitted the following idea as a fuel seal for a throttle control cable. It works equally well with two pieces of plastic, nylon, Gold'N Rod or NyRod tubing or with a piece of stiffer music wire. Major Letaw prefers using cable due to its flexing under otherwise servo-jamming pressure; also, cable linkage tolerates less than perfect alignment, both behind and ahead of the firewall, better than other materials. To install this seal you proceed to mount the tube and cable in the conventional manner. Then, simply oil the cable and slap on a gob of Silicone rubber over the end of the tube. The oiling of the cable, or other inside component, prevents the silicone adhering after it cures. This will prevent fuel from "creeping" down the outer tube and into the throttle servo. To install the seal on a linkage already gooped up with exhaust, it's simple to clean the outside of the tubing with thinner or spray relay cleaner and then apply the silicone.



For holding your glow plugs, Dick Nellis of Jackson, New Jersey, suggests using 1/2" to 3/4" thick styrofoam from shipping or packing cartons. Make the holes with a 1/8" to 3/16" soldering pencil. You can cut the foam to fit any compartment or drawer with a blade type saw soldering tip. Dick uses a felt tip marker for labeling and for lines.



The next suggestion comes D.G. Warren of Northern Ireland who mentions that, when covering foam cores with certain types of veneer, cracking can occur when trying to get the veneer around the leading edge. If the veneer is dampened this can sometimes cause the wood to swell up in an uneven manner making it extremely difficult to apply it to the foam core. Warren found that, if strips of cellophane tape are placed over the front of the veneer where the curve will take place, and if this is done while the veneer is laid over a broom handle or dowel to impart some curvature, then, when it is attached to the foam core things are a lot easier and no splits take place. The cellophane tape can be removed after covering the core but some care is needed not to lift the surface of the veneer.



Lance R. Harmon, APO New York, submitted the following sketch of an external switch mechanism which has the advantage of being able to be used in a smaller area with no need to have brackets to align with the switch. Also, the bond will "give" during a mishap, thus saving the switch for future use.

If you would like a nice looking and easily applied coaming for around the open cockpit of your next plane try this idea from Jim Schneider of Lancaster, California. Jim had tried fuel tubing and rubber tubing around the cockpit of his last Aeromaster and found that nothing would glue it in place and paint wouldn't adhere to it. Since that time, Jim has used braided electrical loom that can be obtained at any electronic or radio supply house. The braided tubing comes in almost any diameter. Simply rub a coat of model airplane cement on the braid to prevent it from coming apart when you split it lengthwise. You'll find that the split loom will conform to any curvature around a cockpit and, best of all, it is compatible to any glue and all paints. It also gives an excellent textured appearance for scale effect.

Marc F. Brown from San Mateo, California, writes that, in building an airplane directly on the plans you need something between the plans and the wood to prevent sticking and tearing of the plans. Having used Saran Wrap, but having found that it didn't work well due to the fact that it would stick to itself, tear fairly easily, and leave a "film residue" on the wood, Marc discovered a substitute. This item is clear 4 mil polyethylene film. If you have a friend who is a gardener or contractor you can ask him for any extra scraps, but it is available by the roll at Sears as well as most hardware and nursery stores. At Sears you can get a roll of 250 square feet for only .02¢ a square foot. □

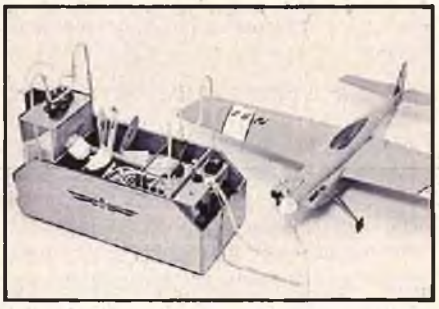
All items appearing in Showcase '75 are press releases supplied by the manufacturer of the product and/or their advertising agency unless otherwise specified. The appearance of an item in Showcase '75 does not necessarily constitute an endorsement of that product by R/C Modeler Magazine.

STANLEY POCKET KNIFE

A new sharper, safer pocket knife with a stainless steel blade has been announced by Stanley Tools. No ordinary pocket knife, it's sharper because it's made of the finest cutlery stainless steel. It's safer because a safety lock holds the fold-out blade firmly while in use. A pull of the plastic lock releases the blade for folding it back into the case.

A cross between a pocket knife and a utility knife, it features the best elements of utility and pocket with a price that is more in line with the utility. It's designed for the do it yourselfer, the tradesman, the outdoor man, craftsmen and homeowner — for whittling, carving and cutting — just about anything. Around the home it's handy for cutting paper, string, wood and plastics for any light to medium duty cutting job. Hunter and fisherman alike go for it because it won't rust whether it's used for cutting fish line or cleaning game. The stainless blade stays sharp in all kinds of weather. Zinc casting case and plastic lock also keep it dry and sharp.

And you can change the blade in seconds. Just remove the large screw from the body of the knife and swing knife apart. Place new blade under plastic retainer, and put the screw back in. Storage is provided in the handle for an extra blade. Two types of blades are available — sheepfoot and utility. Suggested list price is $2.75. Write: The Stanley Works, Dept. PID, 195 Lake Street, New Britain, Connecticut 06050.



FLITE PAL

Aerotrend Products announces their new "Flite Pal" field box which is an up-dated version of the former DAE product. This multi purpose carry-all has removable plane holders, rubber feet, and extremely rugged grooved construction of 3/8" thick plywood. The design also provides for instant mounting of the DAE Power Panel. A 12 volt motorcycle type battery will fit under the Power Panel and can be charged through the panel starter sockets without removal. With ideal dimensions of 19L x 9W x 7H, it has room for all field equipment. The "Flite Pal" will handle all the sport flyer's needs and is just right for the contest flight line. Availability is through dealers or direct at $16.95 for complete kit or $26.95 for fully assembled unit with clear fuel proof finish. DAE Power Panels (stocked by Aerotrend) are $19.95 for the standard model or $24.95 for the "dual range" type. The "dual range" has a high-low switch to light all 1.2 to 2 volt plugs. Available from Aerotrend Products, 32 Diana Lane, Beacon Falls, Connecticut 06403.

RCS SERVO CONTROLLERS

RCS Engineering Co., announces "the plane savers," otherwise known as servo controllers. Three different units are available. Unit #1 automatically positions the throttle servo — or spoiler servo — to a pre-set position if your receiver fails, if the transmitter fails or, if there is interference. If normal operation of the radio is regained, the servo returns to normal operation. Unit #2 automatically positions the servo if the batteries wear down — while you still have about five minutes of flying left; enough time to get down safely. It will also position the servo if there is a receiver or transmitter failure. Unit #3 is a combination of units #1 and #2. The units weigh 1/2 oz. each and are 1.25" x 1.1" x 55" in size. Their current drain is approximately 10ma and operate over a temperature range of 0°-150°F. To be inserted into the system the throttle or spoiler servo plugs into the unit which, in turn, plugs into the receiver. The plane savers are compatible with Kraft radios, 1968-1975. Specify year when ordering. Available with instructions to set the failure mode servo position from your local hobby shop or directly from RCS Engineering Co., 11015 Fenway St., Sun Valley, California 91352, (213) 768-1519. Unit #1 and #2 sell for $34.95; Unit #3 sells for $39.95. When ordering directly from RCS please add $1.50 for postage and handling.

WINDRIFTER SAILPLANE

Although on the market only since October, Windrifter has racked up for itself a most impressive list of accomplishments. Among these, Windrifter was flown by Rick Pearson, helping him to achieve the 1974 Southern California Soaring Clubs (SC^2) championship. At two separate December contests in Southern California, Windrifter took three out of the four top places. Yet, in spite of this impressive contest record, because of its excellent stability and forgivingness, along with its ease of construction, Windrifter is gaining tremendous popularity as a sailplane well suited for the beginner to R/C soaring. Windrifter's wide speed range results in a versatile sailplane with good penetration, yet extreme precision landing capability. Although its wing span is only 99.8 inches, it has a wing area of 915 square inches. The wing loading is approximately 6 oz./sq. foot.

Windrifter is priced at only $37.95, and is available at most model dealers throughout the United States, and in many foreign countries. Prepaid direct orders to the factory are air shipped, postpaid. Another fine product from: Craft-Air, 5651 Kelvin Avenue, Woodland Hills, California 91364. (213) 340-2114.

SCUFF GUARD

If it gets scuffed or scratched, it needs Scuff Guard from Allied Hobbies, 8655-2 Belford Avenue, Los Angeles, California 90045. Scuffing and scratches are impossible with this space-age Scuff Guard tape. It is a must for protection for damage prone areas of model airplanes, boats, and cars. It provides protection for wing tips and other easily damaged areas, thus eliminating tedious repairs. This material is long lasting, fuel proof, water proof, and is transparent — nearly invisible after application. It is easy to use, just remove the protective backing and it adheres immediately. Scuff Guard cures with age, becoming a permanent bond. It can be used on any curved or flat surfaces. Each .98¢ package has a 1" x 12" strip and is available at your local dealer.

FIBERGLASS RICKEY RAT

D & S Models, 4080 Orange Ave., San Diego, California 92105 have come out with their Formula I and Quarter Midget racers — the Rickey Rat in fiberglass. This is an aircraft with which all pylon racers are familiar with because of its contest wins and performance history. This fiberglass Rickey Rat is so aerodynamically slick, it will in plain words, run rings around any racer in the air today. The complete Formula I kit is priced at $89.95 plus postage, while the Quarter Midget complete kit is $55.00 plus postage.

RICHARDSON, TEXAS

★ R/C CHARLIE CAME DOWN WITH THE CHICKEN POX YESTERDAY.
★ HE STAYED HOME TODAY — HEADACHE.
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QUIET REVOLUTION

from page 83/81

show how the car goes together. For added strength, and to provide a place to mount the batteries, I installed an 0.063 inch aluminum pan under the car. The car goes great and runs about 14 minutes on a charge. Top speed is between 20 and 30 mph depending on the gears used. The local kids get as much of a charge out of it as I do. They like it when I chase cars down the street out in front of my house. I built the car last summer and it is still going strong. The best part is that I don't have to spend half an hour cleaning it up after running it, like the glow fuel cars.

Good luck with the Quiet Revolution and how about an article on cars now and then?

Thanks for your letter and great photos, Larry. It looks like you have just written our first article on R/C cars!

J.R. Foster of Enfield, England, flies a 12 foot span Wildflecken Motor Sailer with Astro 25 power. Close-up shows Astro 25 in nose. Battery under wing.

Southern California Scene

FF Scale has really gone electric with dozens of ships flying in the Los Angeles area. The author has had good results with the Curtis Robin, kitted by Fliteline Models while Tony and Addie Mae Naccarato favor the Comet Taylor Craft and Aeronca Chief.

Electrics In England

J.R. Foster of Enfield Middlesex, England sent in several photos of his Astro 25 powered "Wild Fleken." This 12 foot span thermal soarer was built from a "radio sailplane" kit and weighs 3 pounds without electric power. Mr. Foster reports that his best flight was 31 minutes and that his average flight time is 15 minutes.

Electrics In New Zealand

Doug Marsh of Palmerston, New Zealand sent in photos of his Astro Fly which, unfortunately, were Polaroid prints and could not be reproduced. The low wing aerobatic ship has 600 square

to page 94

GRYPHON - $45.00

Aerobatic Slope soaring R/C Glider. Easy to Build. Fun to Fly. Tested, Approved & Recommended by RCM. GRYPHON 1st place winner in the 1971 Northern Calif. Sprint Races; 1971 MARKS Pylon Races; 1971 Northrop Wing Contest.

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887 Sq. In.
SPAN: 67"
WEIGHT:
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ENGINE SIZE:
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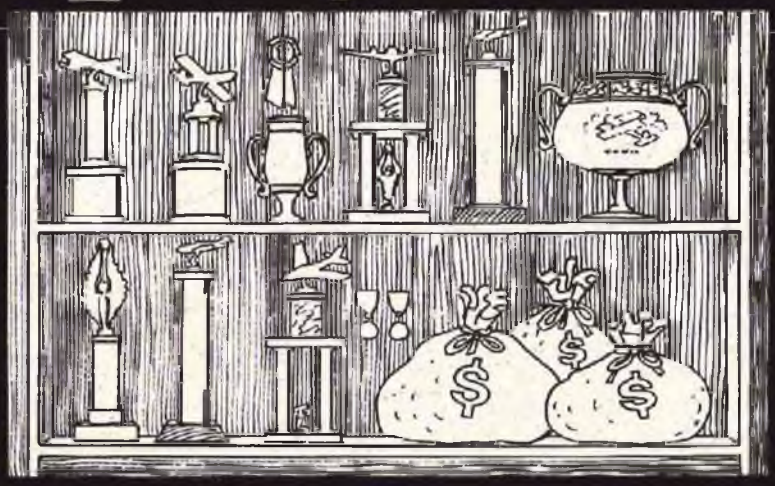

Your experience in RC Modeling can begin to pay off in another way. . . .

INCREASED INCOME. Hobby World would like to establish some sales representatives in areas not served by RC oriented shops.

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from page 10

considered clean.

After ultra-sonic cleaning it is important that the parts be dried and the steel and iron parts oiled.

Reassembly of your engine after ultra-sonic cleaning is the same as with any conventional cleaning method. Use plenty of light machine oil such as Hoppe's gun oil during reassembly. Although 3-in-1 is okay to shoot in the exhaust and down the intake after a flying session, or when putting an engine away for a while, it is pretty light to use when reassembling an engine when it will be the only lubricant in the engine.

Dear Mr. Lee:

In the "R/C Engine – Volume II" about the care of small engines, you say to use Hoppe's #9 gun cleaner. I went to a gun store to get some of this gun cleaner. The man pointed me to a Hoppe's #9 stand. There were all kinds of cleaners, solvents, etc. Can you tell me what size it comes in, the color of the box; and is it in a plastic or glass bottle? I want to get the right kind before I use it in my small engines. What color is the cleaner, etc.? You say not to use plastic props, yet the .01 to .051 are plastic props at high rpm. I've never seen anything about the Taipan true pitch glass filled props. Are these also in the same class as the other nylon props – that is, **do not use** *as they will pull apart in cold or high rpm? How long can you keep glow fuel in quart cans that are full and never been opened up? Will fuel with castor oil or synthetic last longer? If you do use them, how long will they last if you keep the can closed and by pressing to get out the air?*

I would be most grateful for any answer you can give me.

Thank you,
Frank Sapienza
Daly City, California

Many fellows have made the same mistake that you did, Frank, which is quite understandable. Even though the article on 1/2A engines appears in Volume II of the "R/C Engine," I was not the author. The article was written by Larry Renger. Due to the fine quality of the article it was included in the "R/C Engine" book. However, there was one portion of the article with which I am not in agreement — the use of Hoppe's #9 gun cleaner. Hoppe's #9 gun cleaner was intended for cleaning powder and lead residue from the bore of guns. It was never intended to be used in the combustion chamber and burned. Hoppe's #9 gun cleaner is composed mainly of Nitro Benzene, a very toxic chemical. Now, Nitro Benzene has often been used in model fuels — mostly fuels intended for racing purposes. High percentages of nitro methane do not want to mix with castor oil and the addition of a small percentage of Nitro Benzene would act as a mixer. Nitro Benzene is the old shoe polish smell that many of you have probably noticed at some time or another. When mixed in fuel the total percentage going through the engine is quite low. Even so, this is a dangerous chemical to fool around with. It is absorbed by the skin directly into your system, is accumulative in the system, and can cause serious physical problems, such as kidney and other organ failure. To pour it in concentrated form through your engine is an unnecessary health risk. There is no way you can do this without inhaling the fumes which is asking for trouble. So forget the Hoppe's #9 unless you have a gun you want to clean.

Your nylon props in smaller sizes do not have the danger factor that the larger sizes do — i.e., those used on the .60's. However, even the small ones let go from time to time, but so do wooden ones. The glass filled props are naturally considerably stronger but, at the same time, are more rigid or stiff. So, if you bounce your model off of the runway a few times and the prop takes the impact, bending in the process, it is easily fatigued — more so than straight nylon which can

to page 150

Beat the price CRUNCH Buy a "DRONE"

TWO YEARS OF ENGINEERING AND TEST FLYING BEHIND THIS ONE.

IT REALLY FLIES GREAT

3 & 4 CHANNEL R/C

- *No carving.*
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- *Put it together in a weekend.*
- *Build as a tail dragger or with nose gear.*

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3½ TO 4½ LBS. FLYING WEIGHT
.29 TO .50 ENGINES

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THIS COMPLETE KIT INCLUDES ALL THE FOLLOWING ITEMS:

- GIANT PLANS THAT MAKE SENSE, WITH STEP BY STEP INSTRUCTIONS THAT DON'T FRUSTRATE YOU.
- MACHINE CUT BALSA PARTS FOR FUSELAGE & TAIL.
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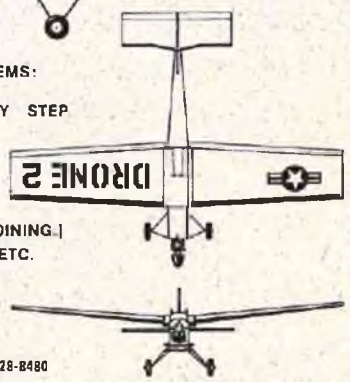
- HIGH IMPACT LEXAN SPINNER.
- FOAM WING CORES (WITH COVERINGS & GLASS FOR JOINING.)
- HARDWARE PACKAGE - FITTINGS, HORNS, PUSHRODS, ETC.
- COLORFUL DECAL SHEET - LOTS OF INSIGNIAS.
- FORMED MAIN LANDING GEAR.
- MACHINE CUT PLYWOOD PARTS.



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WING

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SEND 45¢ FOR WING PRODUCTS CATALOG.

QUIET REVOLUTION

from page 91/81

inches of wing and weighs 5¼ pounds with a four channel Royal Classic Radio.

Electrics In Hawaii

Henry Pasquet sent in a photo of his Astrobat powered by an Astro 15, it weighs 47 ozs. with four channel Cannon Radio and Benson Throttle. Mr. Pasquet, who is a well known pattern flier on the island, reports that his newest design is his best electric so far — and it flies the complete "C" pattern with ease. □

ACE PLUG-IN RADIO

from page 38

grease anymore).

The answer came one night during an evening of transcendental meditation in front of the Telly. One of the innumerable commercials depicted a harrowing modern Tragedy — the family TV set had busted. Luckily, a handsome and friendly TV repair man happened to be passing by, and he swiftly replaced the defective circuit boards to restore both the TV and happiness to all concerned.

This circuit board idea was just what I needed. Mount all my radio bits on a board, then simply plug this into whichever model was serviceable. The sketches show one of the configurations I've used.

As the sketch shows, the radio pieces are all hung from a central base plate. The receiver is sandwiched between foam rubber and strapped in place with rubber bands. The battery slips inside the battery holder, and the actuator is then bolted into place. The fuselage housing is made from scrap pieces of trailing edge section cemented to the fuselage sides. The radio board can then be slid in and out as required. □

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ASPECT RATIO	20
WING LOADING	7.5 oz/sq. ft.

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C.I.F. SQUARE SOAR OLYMPIC QUESTOR

AERO-STAR AQUILA HI-START & ACCESS

PRO-TACH

from page 78/72

( ) Install black lead to point D.
( ) Install orange lead to point F.
( ) Install yellow lead to point G.
( ) Slide HST as close to Board 1 as it will go, and shrink.

Tachometer Assembly

Refer to photos for help in the following steps.
( ) Mount M1 with lockwashers and nuts provided.
( ) Mount S1 with 6-32 x 3/8" screws and Tinnerman nuts.
( ) Mount S2 with 4-40 x 3/8" screws, lockwashers, and nuts.
( ) Install grommet in Q1 mounting hole.
( ) Install Q1 into grommet until Q1 case ridge is evenly against grommet.
( ) Install two 4mm. nuts on each terminal of M1.
( ) Mount Board 1 in normal position (closest to S1) with #8 lockwashers and 4mm. nuts, taking care not to get any wires caught.

Checkout

( ) Turn R5 with small screwdriver counterclockwise until hard to turn.
( ) Turn R21 clockwise until hard to turn.
( ) Turn S2 off, and set S1 to all buttons out (0-25K RPM).
( ) Install B1 and B2.
( ) Turn tach on and point to an incandescent lamp. Meter should read somewhere around 5-10K RPM. Depress S1 buttons until a scale is found that gives an on-scale indication. Other higher scales should read off-scale to the left, and lower scales off-scale to the right. You might get an on-scale reading on two adjacent scales, but the readings should be different.
( ) Push S2 to battery check position. Meter should indicate around full scale if the batteries are fresh. Turn off tach.
( ) If all has gone well, proceed with calibration. If not, check over all your work and all solder connections.

Calibration

This tachometer was designed to be accurately calibrated without special equipment. However, note that tach accuracy will only be as good as your eyeball. Make all adjustments with tachometer on level surface, sighting vertically down on meter needle.
( ) Remount Board 1 in calibrate position (meter holes closest to edge of board.)
( ) Turn on tach with S1 set for 0-5K RPM. Cover Q1 and adjust meter screw for exactly zero RPM.
( ) Set S1 for +4 (4-9K), and adjust R5 for exactly a 4K meter reading with Q1 covered.
( ) Repeat above two steps and get everything tweaked up just right.
( ) Turn off tach and remount Board 1 in the normal position.
( ) Set S1 to 0-5K, turn tach on, and adjust meter screw for zero RPM with Q1 covered.
( ) Uncover Q1 and aim at incadescent light source to obtain reading. Adjust R21 for a reading of exactly 3600 RPM.
( ) Carefully redo above two steps to make sure you have it just right.
( ) That's it. Don't forget to turn off tach. Install bottom cover with self-tapping screws.

Using The Tach

Positioning the tach is not critical but the best signal can be found around the outside of the prop path. Don't point the tach at the spinner! Don't forget that three-bladed prop readings need to be multiplied by two-thirds. Don't stick the tach in the prop or drop it on the runway. This kind of special handling will give you many years of benefit from your ProTach. □

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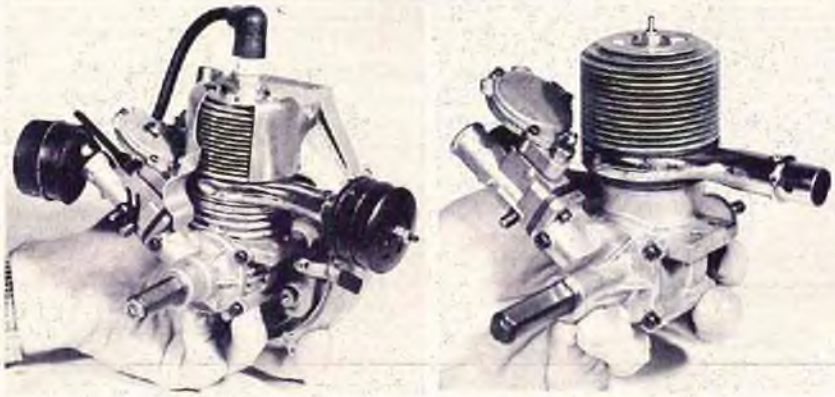

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NRCHA

from page 71/69

for both the Bell 212 Twin Jet and the Bell 47G helicopters. They have recently installed a new electronic phone answering machine that records orders and messages 24 hours a day, seven days a week, while shipment of orders are made within 8 hours, providing that the Post Office or United Parcel Service is open. They will provide parts for both R/C helicopters to the retail dealer and to the individual modeler.

In addition, Model Helicopters carries in stock all three Schluter helicopters, the Bell Huey Cobra, the Enstrom, and the Guzell as well as spare parts for all machines. In addition, Model Helicopters also has the Micro-Mold .19 powered Lark in stock at the present time. This firm also stocks the Boelkow BO-105, the HB-61 (German-Veco), the HB 61 Stamo and the HB 25 HC engines.

to page 101

NRCHA

from page 98/69

Dale Willoughby of Model Helicopters, also points out that they have a complete line of metric screws, nuts, and bolts in the hard-to-find sizes normally used on model helicopters. And, if you are looking for floats for use with your helicopter for water or for training purposes, Model Helicopter has their #776 floats which are 100% thicker overall and priced at $16.00 as well as their standard model #775 heavy duty floats which are 100% thicker on the bottom only, also priced at $16.00. Both sets of floats feature reinforced loops for the landing struts.

☒ ☒

And that's it for this month. □

DIRTY BIRDY

from page 65/64

mount rails to keep out unwanted glue, and glue the motor mount supports in place.☆ Add a piece of 3/4" *tri stock* down the sides of the motor mount supports. The tri stock should be installed so one flat side will mate with the chin block to be glued in place next.☆

Relieve the top back edge of the *chin block* so it will clear the bottom nosegear mounting screws and nuts, and glue the chin block in place.☆ Add the two 1/4" ply *fuselage wing hold-down plates* inside the fuselage.☆ Glue 1/4" *tri stock* to the bottom of the sides and back of the fuselage wing hold-down plates☆

To mount the ply spinner ring in place for a perfect fit, use your ply spinner ring as a template and prepare a shim out of a piece of scrap 1/16" balsa. Tack glue the balsa shim to the back of the aluminum spinner plate.☆

Mount the engine temporarily in place. Put the ply spinner ring onto the engine thrust washer so it rests against the fuse. Then put the spinner plate — with shim — in place. If the spinner plate won't seat, sand the appropriate area of the front of the fuse as necessary.☆ With the prop bolted in place, hold the ply spinner ring forward to the balsa shim on the back of the spinner plate. Don't worry about small gaps between the spinner ring and the fuse. Large gaps can be shimmed. Get some epoxy between the ply spinner ring and the front of the fuselage and hold the ply spinner ring up to the balsa shim while the epoxy sets up.☆

Remove the prop and engine from the fuse. Remove the 1/16" balsa shim from the spinner plate.☆ Use epoxy and micro balloons to fill any gaps between the ply spinner ring and the front of the fuselage☆

At this point the fuselage should be complete except that it has not been shaped and the ply wing fillet base pieces, fin, sub fin, and stab are not yet installed.

THE STAB, ELEVATOR, FIN AND RUDDER

Sand the inboard end of each of the *leading edge blocks* as necessary so they will fit together at the proper angle. The groove serves to center the stab ribs and to assure a strong rib to leading and trailing edge glue joint.☆ Glue the two leading edge blocks together and pin them in place on your building board.☆

Use the root and center ribs to space the *trailing edge block* and pin it in place.☆ Sand the *center rib filler block* to the rib contour. Glue it and the *center* and *root ribs* in place.☆ Glue in the remaining ribs.☆ Cut and install the *angle braces* using the 3/32" x 1/4" balsa stock.☆

When the glue has dried and while the stab is still pinned down on your building board, apply the 1/16" *top sheeting* so it butts up to the leading and trailing edge. Be certain that when installed, the sheeting is seated on each rib and butts up to the leading and trailing edge.☆ Remove the stab from the building board after the glue has set-up and install the *bottom sheeting*.☆ Cut the leading edge to shape and finish sand it with your 12-18 inch sanding block. See the plans.☆ To shape the trailing edge, tack glue the elevators to the stab T.E., then sand the stab T.E. down to size.☆ Add

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the stab *tip blocks* and sand them to a sharp edge as shown on the plans.☆

Break the tack-glued *elevator halves* free from the stab and sand them to shape. The T.E. of the elevators should be left 1/8" thick rather than sanded to a sharp edge. Do not install the elevators onto the stab yet. They are to be hinged after the stab is installed on the fuselage.☆

Glue the two rear *fin pieces* together. The forward fin piece should not be glued in place until after the other fin pieces are glued to the fuselage.☆ Glue the *rudder pieces* together and add the plywood *rudder horn insert*. If you want to make the rudder horn insert flush with the surface of the rudder, you can either laminate several pieces of ply together or add a piece of scrap balsa to one side.☆ Sand the sides of the fin and rudder smooth.☆ Round the fin tip and taper the rudder T.E. down to 1/8". Do not hinge the rudder until the fin has been installed onto the fuse.☆

At this point you should have the stab, elevators, a forward fin piece, the fin, and the rudder ready to install.

THE WING PANELS

Lay both pieces of leading edge stock on your workbench with the 3/4" side down. Draw a center line down the length of the top side.☆ Also draw a center line down ribs 1, 6, and 11, from the leading to the trailing edge.☆ Finally, relieve the appropriate ribs for your landing gear. If you're using fixed gear, the bottom of ribs 3 and 4 should be notched for the hardwood main gear support. The support should be mounted so it will be just flush with the balsa center section sheeting. If you're using retract gear, the ribs should be relieved for the 1/4" plywood retract gear mounting plate just deep enough so the mounting flange on the retract gear is flush with the balsa center section sheeting. Also relieve the ribs for the retract gas tubes, wires, or linkage.☆

When you build the wing panels, rib 1 is to be glued only to the leading and trailing edge pieces. It should not be glued to the spars and leading and trailing edge sheeting. That will allow you to adjust the angle of the root rib on each panel so they will mate squarely when the wing panels are joined. With the angle of the root rib properly adjusted, each one is glued to the spars and sheeting. Then the wing panels are joined.

Building The Wing Panels
On A RCM Wing Jig

To build the wing panels on a wing jig, use the sequence outlined for building one wing on a building board which follows. However, to make sure the ribs are properly spaced, mark the location of the ribs on the spars and trailing edge stock. Begin by putting the ribs onto the jig, then pin and glue the bottom spar in place.

Building The Wing Panels
On A Building Board

Before you get started, save yourself some grief by checking out your building board with a straight edge or carpenter's level to make sure you have a flat surface. To make the work easier, set up your wing so the leading edge is toward the front of your workbench.

Since the wing is built top side up, begin by pinning the 3/8" x 1/2" *bottom spar* down.☆ Pin rib 1 in place on the spar but do not glue it.☆ Pin and glue the other *ribs* in place on the bottom spar. The ribs relieved for the landing gear should have the notched side down.☆ Add the *trailing edge*, making sure that the ribs are at 90° to the trailing edge stock. Note that 5/16" x 1/4" stock is called for on the plans, but 1/4" x 1/4" is more readily available and works just as well.☆ Sand the trailing edge to the rib contour with the king sized sanding block.☆ Add the 3/32" x 2" top *trailing edge sheeting*, but don't glue it to rib 1.☆ Block up the trailing edge of the wing as necessary so the center lines on ribs 1, 6, and 11 are parallel to your building board.☆ Glue the *top spar* in place to ribs 2-11 and pin it to rib 1.☆ Add the *leading edge* so the center line aligns with the center line on ribs 1, 6, and 11. Center the other ribs on the leading edge.☆

Use your X-Acto knife to roughly shape the top of the leading edge stock to the rib contour. Then sand it smooth to the rib contour with the big

to page 105

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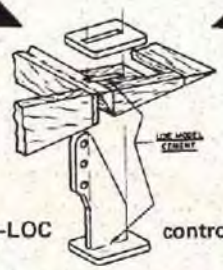

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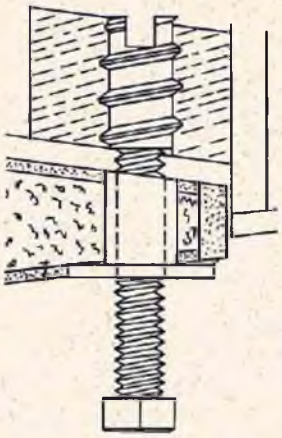

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DIRTY BIRDY

from page 102/64

sanding block. The front of the leading edge should not be rounded until the top and bottom sheeting have been installed.☆ Add the 3/32" x 4" *leading edge sheeting* so it goes to the center of the spar and overlaps the leading edge. Do not glue the leading edge sheeting to rib 1. The outside of the sheeting may be dampened with a sponge so it will bend to the rib contour easily.☆ Trim the leading edge sheet flush with the front of the leading edge.☆ Add the 3/32" x 4" *center section sheeting pieces*, but don't glue them to rib 1.☆ Glue the 3/32" x 3/8" *capstrips* in place.☆

Remove the wing from the building board. Shape the bottom of the leading and trailing edge to the rib contour.☆ Add the bottom *trailing edge sheeting*.☆

Build the second wing panel in the same way. Be sure to set up the other wing panel carefully so you won't end up with two right or left wings.

FINISHING THE WING

Now it's time to glue rib 1 of both wing panels in place. To find the proper angle, turn the wing panels upside down and move them together. With the spar at the tip rib down on the building board, block the center of each wing panel up 3/8 of an inch. Adjust the angle of rib 1 on each wing panel so these ribs will mate squarely when the wing panels are joined. Glue rib 1 on each wing panel in place to the spars and the sheeting.☆ Trim the leading edge, spars, trailing edge, etc., flush with rib 1.☆ Glue the wing panels together using 5 minute epoxy. As you do so the center section should be blocked up 3/8".☆

Glue the *aileron torque rods* in place into the groove in the *center section trailing edge pieces*.☆ Put some Vaseline around both ends of each torque rod sleeve to make certain epoxy glue

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SPAN ..... 134.5 in.
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won't get inside, and glue the center section trailing edge pieces in place. Add the 1/16" ply *hold-down plate* on the bottom of the wing with 5 minute epoxy. See the plans.☆

As preparation for the installation of the wing hold down dowels, draw a line on the bottom back of bulkhead 2 to indicate the location of the center of the wing dowel holes.

Time to align the wing to the fuselage. Lay the fuse upside down on your workbench and tape the back end down so it won't move. Put the wing in place in the wing saddle. Center the wing on the fuselage by measuring the distance from each tip rib to the fuselage side.☆ To assure the wing is straight, measure the distance from each wing tip to a point on the center of the trailing edge of the fuselage. Obviously, both distances must be the same. Mark the location of the fuselage on the leading and trailing edge of the wing. Also draw a line down the wing cord on the fuselage side of the wing along both sides of the fuselage — to mark the location of the outside of the fuselage sides. This line will be used to locate the ply wing fillet base pieces. Also mark the location of the holes to be drilled in the wing for the rear hold-down bolts. Drill a pilot hole through the wing hold-down plate into the 1/4" ply plates in the fuselage to mark the location of the holes.☆ Remove the wing from the fuse. If the holes are properly located on the fuselage hold-down plates, drill out the clearance holes in the wing for the 6/32 hold-down screws. Also drill the holes in the plates for the blind nuts and install the blind nuts on the bottom side of the fuselage wing hold-down plates.☆

Next the alignment of the wing saddle is to be checked. First the wing fillet base pieces should be taped in place on the wing. Working on the wing, draw a line down the wing cord 3/16" inboard of each of the lines you drew earlier. Tape each *1/32" wing fillet base piece* to the wing so it butts up to this inboard line. Be certain that the tape will be clear of the wing saddle. Put the wing in place on the fuselage to check the alignment of the fillet base pieces.☆ If they are okay, run a strip of masking tape down the wing so it butts up to the straight-edge of the ply fillet base pieces to prevent glue from seeping out from the saddle and gluing the wing in place. Now you're ready to get to the final alignment of the saddle.☆

With the fuselage still taped down on your workbench, bolt the wing in place. To assure the wing is level, measure the distance from each wing tip to the workbench. To check the wing incidence, work on one side of the wing at the fuselage. Measure the distance from the center of the leading edge to the line you drew earlier on the fuse side. Also measure the distance from the center of the trailing edge to the other end of the same line. Because the wing incidence is slightly positive, the distance should be 1/32" more at the trailing edge.☆ Double check yourself by repeating this process on the other side of the fuse.☆ Remove the wing and sand or shim the saddle as necessary to assure that the wing is level

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DIRTY BIRDY

from page 106/64

and is at the proper incidence. Put the wing back in place and check it again. Don't worry about trying to get an exact wing-to-saddle fit since the ply fillet base will give you a perfect fit when you're done.☆

When the saddle is okay, put a thin coat of 5 minute epoxy on it. Bolt the wing in place and push down firmly on the front center of the wing to assure the forward end of the fillet base pieces will seat properly to the wing saddle.☆ While the wing is still in place on the fuselage, use the marks on the back of bulkhead 2 to mark the location of the holes for the wing hold-down dowels on the wing leading edge.☆ After the epoxy on the fillet base pieces has set-up, remove the tape from them and remove the wing from the fuse. The fuselage may be removed from the workbench.☆

Any gaps between the wing fillet base pieces and the saddle may be filled with epoxy.☆ Add pieces of *1/4" triangular stock* to the fillet base pieces along the fuselage sides.☆ Use 5 minute epoxy to glue the back ends of the fillet base pieces to the fuse sides.☆ Add *1/4" triangle stock* to this area as well.☆

Drill the two 1/4" holes through the leading edge for the hold-down dowels.☆ Now you're ready to glue the dowels in place. Bolt the wing in place onto the fuse. Put the ply *dowel support pieces* onto the *wing hold-down dowels*. Slide one end of the dowels through the holes in the wing leading edge and into the holes in bulkhead 2. Add some 5 minute epoxy to the back of the ply dowel support pieces and, while holding the wing firmly in the wing saddle, slide the dowel support pieces to the rear so they'll glue to the front of the top and bottom spar.☆ Glue the dowels to the ply support pieces and to the wing leading edge.☆ Add a *false rib* to both sides of each dowel.☆ Remove the wing from the fuselage.☆

Glue the *bottom leading edge sheeting* in place as you did the top leading edge, and trim it flush with the leading edge.☆ If you are using fixed gear, glue the *torsion block* to the bottom side of the *main gear support*. The grooved side of the torsion block should be oriented toward the outboard end of the main gear support.☆ Glue one 1/16" ply *main gear brace* on the inboard side of rib 3 and the other on the outboard side of rib 4.☆ Glue the main gear support/torsion block assembly in place so the torsion block is glued to the main gear brace on rib 3.☆ Add the *triangular hardwood gusset* at the outboard end of each main gear support. (If you're using retract gear, glue the *retract gear mounting plate* in place.☆ Add the 1/16" ply *retract gear mounting plate braces.)*☆

Add the *bottom center section sheeting* and *capstrips*.☆ Use your king sized sanding block to round the leading edge. For the desired flight characteristics the leading edge should be blunt rather than sharp. See the plans.☆ Trim the leading edge, top and bottom sheeting and the trailing edge sheeting flush with the tip rib.☆ Add the *tip blocks* and sand them to a sharp edge along the tip as shown.☆

Use 4 to 6 oz. glass cloth at least 5 inches wide with resin to reinforce the wing center section.☆ Sand the *ailerons* to shape. A slightly rounded T.E. about 1/8" is recommended.☆ Install the ailerons using at least 4 hinges for each one. The outboard hinge should be within 1/2" of the end of each aileron.☆

Put the wing in place on the fuse and glue the *wing fairing front*, *sides*, and *bottom* in place using 5 minute epoxy.☆ Holding the wing upside down at the center section, do a tip to tip balance. Add weight to either wing tip as necessary.☆

The aileron servo well may now be cut into the top side of the wing.☆ Add the 1/2" x 1/2" hardwood servo mounting rails into the servo cavity.☆

FINISHING THE FUSE

Time to check the stab saddle and mark the stab for installation. With the fuse upside down on

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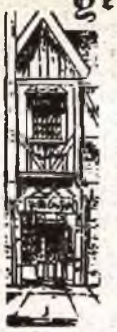

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DIRTY BIRDY

from page 110/64

your workbench, mount the wing in place. Put the *stab* in place to check the alignment. The L.E. of the stab cut-out in the fuse may have to be enlarged a little to get the stab in place.☆ Make sure that (1) the distance from the stab tip to the fuse is the same for both stab sides, (2) the distance from the center of the stab L.E. and T.E. to the workbench is the same for each stab panel (0° incidence) and for both panels, and, (3) the distance from the L.E. of one stab tip to the T.E. of the wing tip rib on the same side of the fuse is the same as for the other stab panel. Mark the location of the fuselage on the leading and trailing edge of the stab so you will be able to locate it properly when you are ready to glue it in place. Sand or shim the stab saddle as necessary.☆

Turn the fuse right-side-up and glue the *fin rear sections piece* in place. The fin T.E. should be aligned with the fuse T.E. and it should be at 90° to the fuse top. Eyeball the fin from the front in relation to the wing to make sure it's okay before the glue sets up.☆ Add the *forward fin piece*.☆ To glue the *sub fin* in place, first pin the rudder to the fin. Then use the rudder to align the T.E. of the sub fin. The L.E. of the sub fin should be centered on the fuse bottom.☆

Remove the wing from the fuse. File and sand the fuselage and wing fairing to shape.☆ Use 3/4 oz. glass cloth and resin on the fuselage, stab, fin, sub fin, rudder, wing fairing, and elevator.☆ Shape the bottom of the balsa *stab top filler block* so it fits to the top half of the stab.☆ Glue the stab in place in the fuselage using 5 minute epoxy, making sure it's properly aligned. Epoxy must be used for this joint because the stab has already been covered with resin and glass.☆ Add the stab filler block by sliding it in place on top of the stab. It should be glued to the top of the stab and the fuselage.☆ Hinge the rudder using at least three hinges. By making a slight "V" notch in the T.E. of the fin and cutting the L.E. of the rudder to a slight "V" shape, the hinge gap may be minimized. The bottom hinge should be into the sub fin.☆

Install the elevator horns onto each elevator half. Each one should be cocked forward at 15°. This will assure that both inside and outside loops take the same amount of control on the elevator stick. Using a horn on each elevator half means that the elevators are independently adjustable; a feature important for fine trimming of the airplane. For additional strength, a piece of 1/16" ply may be countersunk into the elevator halves at the 15° angle in the location of the elevator horns.☆ Prepare the stab T.E. and elevator L.E. as you did the fin and rudder.☆ Install at least three hinges on each elevator half.☆

Finish the area under the canopy as it will be for the finished airplane and install the canopy using Hot Stuff.☆ Use resin and micro balloons to build a fillet around the canopy, along the sides of the bottom wing fairing, along the stab/fuse joints

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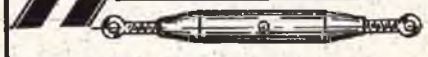

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and along the fin and sub fin/fuse joints.☆ Complete the wing fillet by adding resin and micro balloons to the plywood plate to get the desired shape. See the plans.☆

Cut the pushrod exit holes for the elevator and rudder. See the plans. Note that the rudder pushrod exit hole is actually on the bottom of the fuselage, near the sub fin.☆

The rudder and elevator pushrods may be prepared at this time. Since the split elevator will need two rods and clevises at the rear, double clevis rods will have to be attached to the rear of the elevator pushrod.☆

Install the nosegear steering linkage. The steering arm should be at an angle to bulkhead 1 so it will be free to move back and forth.☆ Install the main landing gear. If retracts are used, the main gear struts should be cut so the plane rests on the ground with a slightly positive incidence. The wheel wells may be cut out. Add hardwood rails above the retracted nose gear to support the fuel tank.☆

LOCATING THE CG

To set up the CG, the plane should be finished. The landing gear, engine, muffler, fuel tank, battery, and receiver should be installed. The pushrods should be in place inside the fuse. Lay the servos on top of the fuselage and move them fore and aft until the desired balance point is found. Then the servos are mounted inside the fuselage at this location.

While the specific location of the CG in a pattern ship is a matter of personal preference, we recommend locating it at a point approximately 6½" in front of the T.E. at the wing tips for your first flights. Above all, the plane must not be tail heavy. The CG may then be checked in flight by putting the plane into a tightly banked turn. If the nose drops, the plane is nose heavy. If the tail drops during the bank, the plane is tail heavy. Shift the battery pack or add weight to the nose as necessary. The CG may also be checked by putting the plane into a spin. If it wants to go into a spiral dive instead, it's nose heavy. The landing is another thing to check. If elevator must be added to keep the plane flared out for the touch down, it may be nose heavy.

FINAL CHECK-OUT

With the plane standing on the ground, measure the distance of each wing tip to the ground. Bend the main gear as necessary so the wing tips are level. Eyeball the plane from the side.☆ It should rest in a slightly nose-up attitude.☆

Check the roll of the plane to make sure it rolls straight.☆ Check the operation of the control surfaces to make sure they operate freely and in the direction they should.☆ With someone holding the plane, check the operation of the surfaces with the engine running wide open — to check for the effects of vibration.☆ And do a distance check with your radio.

Time to go a'flyin'. □

SUNDAY FLIER

from page 51/50

model got up to flying speed, but if you leaned it out enough to prevent this, the engine would starve before you could get it moving forward. Then, you could hold the plane nose up (the tank is in front of the engine) and get it a bit rich, then let go and hope, but that was unreliable. So what to do?

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Of course there is another way; pressurize the tank with a pressure take-off. But I'm not inclined to fuss with all that plumbing, so long as my system works okay for my usual Sunday flying requirements. Maybe it won't work for you. Although manufacturers try to maintain uniformity, my experience is that each engine has its own personality and I have to learn to get along with it. For example, on my Half-A Racer, I have one engine on which I have to use the restrictor type fuel line. The other one screams along with just the usual fuel line set-up. And both of them turn up about the same rpm, once they're adjusted.

And I better get them adjusted, too. The 1975 RCM/Pioneers Half-A Trophy Race will be held at the Pioneer's R/C Airfield in Sunnyvale, California, on Sunday, September 21, 1975. Processing will be from 8:00-8:45 A.M. with racing from approximately 9:00 A.M. to 3:00 P.M. RCM Half-A Rules will be used. Starting positions will be determined by drawing lots and take-offs will be required. A pilot, canopy, cockpit, or cabin, will be required, but full scale similarity will be waived. (See May 1971 issue) for further information, contact Contest Director Dick Aubert (408) 734-4224.

Come on up and join the fun and excitement. I've got a new racer that really seats — when I can get the engine to run right..

Wanna race with me? □

HUGHES 300 CONVERSION

from page 49/47

the length of the boom. The Shark has two and I feel it is worth the trouble to move the first one and add the second. Anything that can be done to prevent whip or vibration should be done so fittings will stay together.

You can now add all the fittings to the main rotor shaft. The old bearing plate is used but you will have to drill two holes 1/2" apart and 5/16" forward of the rear edge for the two 4-40 screws that secure the anti-rotation scissors block. (Part Number 312). The location need not be exact and I believe the above dimensions will get you close enough to the right spot to work. Follow the instructions from Du-Bro in assembling the scissors but look out for the hole in the scissors that is tapped and not drilled to clear the pivot screw.

The old swash plate is used but must be rotated 180 degrees. Don't try to turn it over, just rotate it, and you have all the holes you need in the right place.

The parts list on pg. 47 of this article contains a new flybar control arm. I did not buy the new hex bearing block and, therefore, the arm part of the control arm must be bent so as to be 1/16" to 3/32" further away from the flybar than it is when you get it. Just try it on and you will see quickly what change must be made.

Now a word about main rotor blades. The cone angle or the amount each blade should be above horizontal is not critical but can cause trouble and damage if not enough. Du-Bro suggests fixing it so that when the blade is pushed down over the tail boom it will hit bottom about 3" to 3½" above the boom.

Next, the angle of attack is set at 6 degrees using the Du-Bro gauge. I tried 6½, 5½, 5 and settled on 5½ degrees. Pick your own.

Du-Bro states you can cut up to 2" off the length of each blade to prevent floating. I have had no problems floating but have had trouble with my old engine getting lift. There are said to

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HUGHES 300 CONVERSION

from page 114/47

be rules like "the power required to turn a prop goes up as the cube of the diameter" and that "the lift or pull varies as the square of the rpms." Working around with such rules can give lots of answers on paper but what counts is what you get out at the field. I cut 1" off each blade and got 125 more rpms on the main rotor. I believe I lost no lift, possibly picked up a little, but feel more certain I got quicker response when asking for lift. If you have an old set of blades that need the ends trimmed, try it and use what you find best. The test will cost little and may be rewarding.

I am using an old Heath radio with the large servos on the 27 band which band some claim works better in helicopters. Don't ask me why but having tried 72 first, I lean toward believing it. The large servos require a large tray and that gets in the way of the seam made by the white plastic body and the clear side windows. If you see you are going to have the same trouble, make the servo tray 1/2" shorter side to side, then add a 1/4" spacer between the tray and the front plate sides.

I cut 3/8" wide strips from 1/4" plywood and built up a three layer overlapping servo frame using epoxy glue. This makes strong corner joints that result in a lasting tray.

I could not get all servo pushrods to run parallel to the tail boom. The ones to the bellcranks run at an angle from the servos to the bellcranks. By bending the vertical support for the bellcrank, you can get the arms to line up with the pushrods and the side-to-side movement of the bellcrank is eliminated, which cuts out a lot of play in the linkage. Rock the swash plate and watch the action of the bellcrank and you will see what I am talking about.

I found a 16 ounce tank will fit between the "J" bolts, the sides of the front plate, and between the sides of the plastic body. It's snug but can be done.

When assembling, and then using the plastic body, I believe these tips will help: I cut a 1" and a 1½" diameter circle from the white scrap waste. These were used as doublers around each screw hole used to mount the body to the front plate. It will add strength and prevent cracking. Add a similar doubler at the top just forward of the rotor shaft hole. I made a short metal strap to tie the body together at the top behind the main rotor. By so doing, I can remove the body entirely by removing one of the two sheet metal screws that secure the halves to the small strap. The strap goes inside and cannot be seen.

Two more suggestions are in order. To mount the front clear plastic windshield inside requires removing the material protruding inward around the front opening. I wanted to leave this for strength and stiffness so I mounted the front clear plastic windshield outside the white plastic body.

The second suggestion concerns the rear rolled

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HUGHES 300 CONVERSION

from page 118/47

edge of the white plastic body. After several hours of flying, I found several cracks starting along these edges. Using hot melt glue with care not to get the plastic hot, I glued a piece of NyRod pushrod along the inside of this edge from top to bottom. No more cracks.

I had been reluctant to fly in wind with the 300. Now I welcome a light wind because it helps keep the tail in one place. I passed the three minutes at 50 feet and back into the 6 x 6 foot square part of phase II of the NRCHA Proficiency Program as well as the straight up to 50 feet and back down again part. 100 feet forward and 100 feet backward is no problem. I must admit, I am still thinking about the slow 150 feet diameter circle at 50 feet; it has me waiting for a day when the wind is still. On the Pacific Coast such days are few and I will probably just have to fly it in the wind. With the new machine, I won't sweat it as much. Good luck.

No prices are shown but the cost should be below $150.00 and above $100.00 □

HI-PERFORMANCE HYDROS

from page 44

. . . . than "B". Trim tabs may be used if desired, but **too** much down trim on the tabs slows the boat down and indicates that the strut is not at the proper angle.

The outer circumference of the prop within 1/8" of the keel (above or below) usually works well. Recommended props for a .40 size boat are J.G. I-25X, H-25; Octura 1450, 1445; Hughey M5051. For .60 powered boats the following are recommended: Octura 1455, 1460; J.G. J-30; or Hughey M6051.

The Strudder bracket should be mounted as

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HI-PERFORMANCE HYDROS

from page 120/44

high as possible on the transom and still maintain the proper depth of the propeller. Too low a placement will cause drag from water spray on the bracket and rudder arm.

This basic arrangement is similar for Monos (flat bottom) and Hydros, except that the rudder is offset to the right. The strut may be mounted under the hull on other than Deep-V boats. A flex shaft may be used instead of U-Joints on .40 boats, if desired.

On all these Mono set-ups, two underwater U-Joints are used to assure a free drive line throughout the range of strut adjustments. Even if the strut does not require adjustment, a single underwater U-Joint will often develop a bind after some running, for example, as the boat "takes a set" and changes the original free alignment.

On a Mono, especially Deep-V's, it is necessary that the stuffing box lower end fairing be of a slightly larger diameter than the male U-Joint or washer. If not, water will be pumped up through the stuffing box and out the lube tube into the boat.

The Hydro arrangement is similar to the one used for Monoplanes. However, a single underwater U-Joint may be used as per Figure 5 **only if no bearings** are used in the stuffing box! (Some "set" and a slight adjustment of the strut is possible with no bind occuring.) Tubing of 1/4" to 5/16" **I.D.** should be used for the stuffing box. This is small enough to stabilize the shaft during "whip" and large enough to allow a slight adjustment. This set-up is used in Mike Meelbush's record holding Outrigger kit, the "Wing Ding", by Octura.

On all of the illustrations accompanying this article, Hydro struts are shown essentially

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HI-PERFORMANCE HYDROS

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parallel. Some slight angle is required, however, to prevent the propeller from pushing the stern under the Sponsons at high speeds ("kiting" or "flying"), and then picking up further lift at the bow from air pressure under the nose.

On surfacing propeller Hydros, a flat "pad" under the strut, either epoxied or built-in, creates a small ride surface and seems to decrease propeller "walk." The latter is the tendency of a propeller riding Hydro to force the transom to the left, causing the boat to pull right, which in turn, requires the application of left rudder to correct, effectively slowing the boats speed. This action will be further discussed in another article.

When installing drive lines on any boat, it is always much easier to mount components in this order. First, secure the engine and mount it in the hull. Second, mount the strut assembly. Third, slot the hull and epoxy in the stuffing box, using a shaft with U-Joints to align the stuffing box. Scotch tape is used to hold the stuffing box to the hull (do not pull out of alignment). Tack with 5-minute epoxy and recheck alignment when the epoxy has dried. The shaft should slide into the engine U-Joint very freely. Apply tape to the bottom of the hull and the stuffing box, pour in Hobbypoxy Number 2 glue from the top and allow to harden. Finally, remove the tape, turn over, and coat the outside of the stuffing box lower end and fillet as shown in Figure 3.

A 3/16" collar can be used at the upper end of the shaft between the engine U-Joint and the stuffing box to limit the downward end play in the stuffing box. This is necessary if the upper shaft male U-Joint is not adjacent to the stuffing box upper end. Note on the sketches that end play of strut and stuffing box shafts must be limited **prior** to fitting of the floating shaft. The end play of the floating shaft **must be** between the male U-Joints and the ends of the floating shaft — **not between pins or sockets of the male and female U-Joints!**

On struts with no holes for lubrication, a small countersunk 1/16" hole should be drilled for this purpose. A small needle nose pressure grease gun or a good quality pressure oiler can be used. Lubriplate Number 105, outboard motor gear lube, is an excellent water resistant, light drag grease. It can be thinned with motor oil slightly if desired. A 50-50 mix of STP and motor oil also seems to work satisfactorily. Struts and shafts should be lubed **immediately after** each run.

A 1/8" wide flat must be filed (or hole drilled) on the shaft at the contact point of each set screw. An anti-vibration locking compound such as Loctite Lock N/Seal (Blue), Vibra-Loc, Nut-Loc, etc. **must** be used on **all** threads on drive line. □

STANDARD PLANK

from page 42/40

the amount of up-elevator required for a floating glide. All this, of course, tends to reduce pitch stability. A satisfactory balance will be reached with the CG at 20% to 23% of the basic chord width back from the leading edge. The prototype seems to fly best with a slight lope or instability in straight flight which disappears when turning in a thermal.

When flying on the slope, attempt to stay ahead of the airplane and anticipate turns. If at any time the Standard Plank is not responding fast enough to a turn command, simply increase the flying speed by feeding in a bit of down elevator until it responds. This is good advice for any model, of course, depending on altitude remaining.

Winch tows with the Standard Plank present no special problem. Just keep the switch closed and the Standard Plank will climb like a conventional design. If there is little wind to launch into, expect a stall about two feet after the launch. This initial stall results from the position of the

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STANDARD PLANK

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towhook and the short tail moment which combine to produce an initial pitch-up and resultant stall.

Do not attempt to fly the Standard Plank under power without first achieving a satisfactory glide. If you are not an experienced flyer, find someone to help with those first flights. With the engine mounted in a pod high above the CG, it is easy to develop pitch oscillations under power which will become magnified if the operator gets behind. If this should happen to you, let the elevator return to neutral and put the plane into a climbing turn until you get things sorted out. This method was used to control stalls on rudder-only models and applies here as well. Pitch stability under power is improved by mounting the engine in the nose. This approach precludes removing the engine for slope or tow launch, however.

For those modelers wishing a permanent nose installation of their engine, several small problems must be solved. Our friend, Frank Nauman, has built a 105 inch span Standard Plank with an engine (.09) in the nose. Flight tests have indicated elevator sensitivity during the powered portion of the flight. This can be handled by flying with the elevator trim only, but probably the best solution is to fix the inboard end of the elevators. The fixed portion need only extend outboard of the propeller tip. A skid to protect the propeller can be added. Frank reports that two ounces of fuel is too much and suggests a one ounce tank. The nose must be shortened so the propeller center line is about 9 inches in front of the wing. Frank's trim is 3 degrees down on the engine with enough elevator up trim to hold a constant 15-20 degree climb.

Flying the engine in the nose version of the Standard Plank requires no more than the normal care. Trimming can probably be accomplished in two short flights. You can take advantage of Frank's final trim for a beginning. He states. "I put three degrees of down in the motor and that caused the need of a bit, just a wee bit, of up trim to maintain a 15-20 degree climb." The next flight had three turns of up and a reduced rudder throw to ± 20 degrees. The following flight used a click or two of left rudder trim. Fuel used on these flights was 1/2 ounce of Blue Label. As Frank reports. "It climbed to maybe three hundred (feet) and the fuel ran out, the nose came down to level flight, but it kept right on going up. I had hit smack dab in the center of a thermal. With almost zero wind the drift was so slow it was hardly noticeable, however, that red, white and blue 105 inch wing was sure getting smaller. I eased some down in, as I just chickened out at the distance that thing was, and straight up, (my poor neck) anyway I couldn't tell if it was still going up, or what, so I put in full down trim, thats when I lost it, not the control, but the sight. Course, as

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STANDARD PLANK

from page 128/40

you know, it was diving directly at me, from what my number two grandson (the one with the very good eyes) said, it must have come straight down for better than 800 feet before I had sense enough to put her into neutral. Soon it started to reappear, going like it had a hot tail. I could just see the wings folding, coming apart, uncovering themselves, the elevators flapping off, or whatever, but nothing happened. I made the most beautiful 150 foot loop you ever did see." Eight more flights were made with this trim set-up and Frank thinks it is good.

CONSTRUCTION

The Standard Plank is not intended for the beginner and the plans, together with the parts list, should be complete enough to point the way for the more experienced builder. A few points will be discussed however to avoid possible confusion.

Fuselage: The plans show a split top and bottom view along with a side view of the fuselage. When cutting out the fuselage sides be sure and allow approximately 1/4" for curvature. Take care when assembling the fuselage to ensure that the sides are vertical since any error will be evident when the rudder is mounted. The rudder hinge assembly has proven easy to make and trouble free. 1/4" OD aluminum tubes are inset in the rudder and the aft end of the fuselage respectively. The next smaller size aluminum tube is then inserted through both larger tubes to act as a bearing.

Wing: Before beginning construction, determine whether the wing is to be built in one, two, or four pieces. The prototype was built with removable tips to permit experimentation with different sizes and shapes of tips. If fixed tips are used, the wing construction may be simplified accordingly. Round and swept tips are shown on the plans. Both were used on the prototype with no apparent change in performance. The round shape was preferred from an appearance standpoint, however. If a one piece wing is built, replace the tubes and wires with dihedral keepers. Except for the tip and root plates, the wing ribs are all of a single size and shape. They do differ, however, in the placement of holes and in the material from which they are cut. Study the wing layout and composite drawing of the ribs carefully before committing wood to saw. Notice the small upsweep of the tips. This shape not only increases the effective dihedral but dramatically effects the appearance of the aircraft.

Finish: The prototype was covered with a mixture of Solarfilm and MonoKote. The wing tips and trailing edge were white Solarfilm with open areas transparent yellow. The wing leading edge and center were covered with opaque red Super MonoKote. White and blue stripes were cut from trim MonoKote. Elevator hinges were made from Solarfilm. The fuselage and rudder may be finished in any of several ways depending on your local terrain. The prototype utilized Hobbypoxy Quick-Prep finishing resin and blue acrylic auto lacquer.

CONCLUSION

Test flying the Standard Plank was described earlier in the article so there is little left to say but "Happy Flying." The authors invite your comments or questions. Send SAE c/o this magazine.

1. **"Six Self Trimming Wing Sections", $1.00 Postpaid, Western Plan Service, 5621 Michelle Drive, Torrance, California 90503.**
2. **"Tailless Topics", $.25 and self-addressed, stamped envelope, Western Plan Service, 5621 Michelle Drive, Torrance, California 90503.**
3. **"Experiments In Flying Wing Sailplanes", $2.50 Postpaid, Jim Marske, 130 Crestwood Drive, Michigan City, Indiana 46360.**

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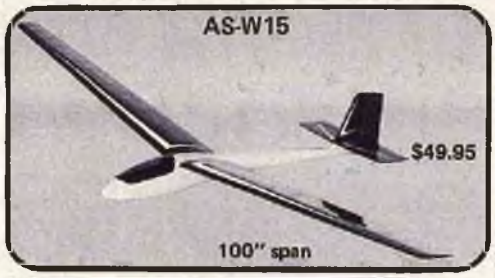

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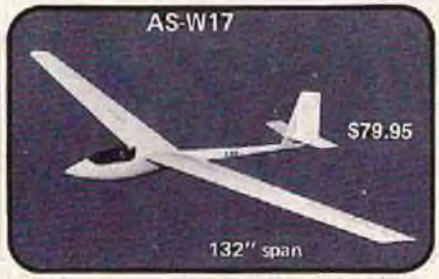

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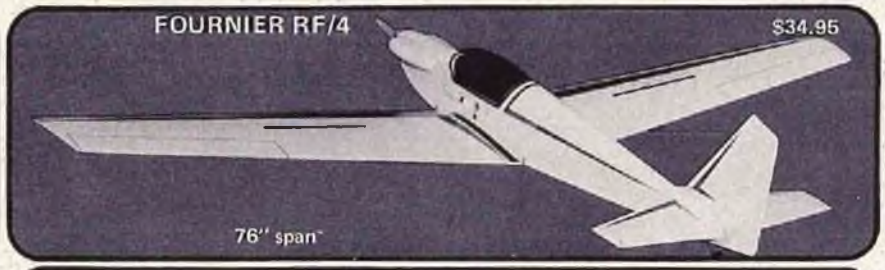

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FLIGHT TRAINING SEMINAR

from page 39

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if you should 'blow it'
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the first to show it.
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is the key –
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Though unlikely it is,
that I should last –
Flying these choppers
is one hell of a blast.
I work for you, Joe
surely I must –
even though - - ashes to ashes
and dust to dust –

□

HALF-A-CHAOS HALF-A-STIK

from page 33/32

(6) Glue on the 3/16" nose bottom and the 3/16" balsa hatch.

(7) Cut out and install the vertical fin, and sand the elevators to shape.

(8) Sand the entire fuselage as smoothly as possible and cover with Solarfilm.

(9) Build the foam wing according to the step-by-step instructions shown on the RCM plans.

(10) Install the engine, radio, and hinge the control surfaces. Be sure to locate the C.G. exactly as shown on the plans. It can be slightly forward of that shown but under no conditions any further back.

HALF-A-STIK

The creation of the Half-A-Stik is the result of at least several minutes of deep thought. Having built several of the current Half-A designs, we wanted an airplane that would meet certain specifications. It must be a simple design, stable for a beginner, manueverable for the more experienced flier; a Sunday flyer; a pylon racer; and, above all, an airplane that Baron Von Thumbs could fly.

The big light flashed on — Ugly Stik! And so, after clearing the table of empty beer cans, glue bottles, balsa shavings, and over-flowing ashtrays, the Half-A-Stik emerged. Like all of its counterparts it fills all the requirements and then

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some. It requires less money, less radio, less engine, less gas, and less space to fly in. At this time in history it all adds up to beating the inflation game and still getting some stick time.

Unlike some of the other Half-A designs this airplane was built with ample room in the fuselage for the gas tank and radio. You can use a Cox .049 Medallion with the tank mount and an Ace pulse system for a minimum investment and enjoy hours of pleasure flying. If you've got the "Bread," or already have the equipment, you can use a "brick" or mini-servos, a Cox TD .049, and put on an airshow that will keep the flying field talking for a few days!

We built two prototypes with the Kraft brick and TD .049 engine. The first one used rudder and elevator, had lightening holes, spring steel landing gear, lightweight Williams Bros. wheels, and flew right off the drawing board at 21½ ounces. The second plane used aileron and elevator, Hallco landing gear, heavier wheels, a brass torque rod to the ailerons, and it flew off the board at 26 ounces. Both aircraft were very stable. The aileron version is capable of consecutive rolls for as long as you care to impress the spectators. The rudder and elevator version will do snaps, rudder rolls, spins, and ROG.

Some options if you are a doodler: cut lightening holes in the wings (but be careful how many G's you pull), scallop the trailing edge and elevator, try tricycle gear, steerable nose wheel, etc., etc. For maximum performance I recommend the Kirn Kraft Cox TD .049 engine, pressure fuel system, Kirn Kraft needle valve, and a balanced 6/3 grey Cox prop. By the way, we used Hot Stuff for all construction except on the foam wing

Half-A-Stik Construction

(1) Transfer all the parts from the full-size RCM plans to your balsa and plywood and then notch 1/8" plywood, as shown on the plans, for the landing gear. If you don't, the landing gear will not fit later.

(2) Lay B-1, B-2, and B-3 down on a flat surface, shimming up under B-2 and B-3 in order to make B-1, B-2, and B-3 even (flush) on the top side. This is important to make the fuselage sides fit properly. (Use a thin piece of cardboard under B-2 and B-3 for this).

(3) Glue B-1, B-2, and B-3 together, then draw a centerline through B-1, B-2 and B-3 and through the center of the horizontal stabilizer. Now line up the stabilizer with the centerline on the fuselage bottom and glue it on. Now glue the stabilizer. Refer to the construction sequence on the plans.

(4) Drill F-2 for the 'J' bolts that hold on the landing gear. Do not bolt the landing gear on yet, it will go in later.

(5) Glue F-2 on to the bottom 6" back from the front of B-1. Glue F-2-A on, 6⅜" back from F-2.

(6) Glue the vertical fin on the horizontal stabilizer, exactly on the centerline, with the rear of the fin flush with the rear of the horizontal stabilizer. Use a couple of blocks to keep the fin

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perfectly straight. (90° to the stabilizer.)

(7) Glue on the sides and install F-1 using 5 minute epoxy. Pull the rear of the sides together and glue to the vertical fin and horizontal stabilizer. Glue in F-3.

(8) Glue down the 3/16" front hatch, only gluing at the front and rear of the hatch. Cut the hatch as it's shown on the plans, then take a 3/8" x 1/8" x 6½" plywood strip and cut the hatch hold-down strips. Glue one of these on the rear of the bottom of the hatch, the other under the hatch nose piece. Use a small screw through the hatch and into this strip to hold the hatch on.

(9) Install the NyRods now. (See the detail on the plans.)

(10) At this point, glue on the cross grain rear sheeting and cut and sand flush with the fuselage sides.

(11) Sand the whole thing to shape until it resembles an airplane.

(12) Install the landing gear and 1/8" plywood tail skid.

(13) Glue in the 1/8" plywood doubler at the rear of the wing saddle.

(14) Hinge the control surfaces, using MonoKote or Solarfilm for hinging, or your favorite method.

(15) Install the 1/8" wing hold-down dowels.

(16) Assemble the wing. (See plans for wing tip details.) **Do not leave off the wing tips.** These are important, as they help prevent tip stall.

(17) Drill the motor mount holes and cut the hatch so it is now removable (Good thinking, eh?).

(18) Fuel proof the tank compartment with resin.

(19) The wing is an Ace constant chord foam wing available from Ace R/C, Box 511, 116 W. 19th, Higginsville, Missouri 64037, your local hobby shop, or a wing kit plus motor mount is available from GMC Models, 28062 Glasser Street, Canyon Country, California 91351, for $4.95 plus 50¢ postage. (Either Half-A-Stik or Chaos — Specify which.)

(20) Epoxy the trailing edge and tips onto the foam wing panels.

(21) Sand the dihedral angle into the foam panels. Use 2" of dihedral if you are not utilizing ailerons. That's **total** dihedral — 1" under each wing tip, or 2" under one tip with the other pinned down flat to your workbench. Use 1/2" under each tip, or 1" total dihedral, if you are using ailerons instead of rudder. Epoxy the two wing panels together, using the dihedral angle you have selected.

(22) Run a 1" wide length of fiberglass strapping tape across the bottom of the wing, from tip to tip.

(23) Finish the model with your favorite far-out covering material.

(24) Attach the motor, install the tank, radio, and balance carefully.

Now you can go out and tear up the sky. Or, if you are like Baron Von Thumbs, go out and tear up the earth.

By the way, if you want an almost perfect 1/2 scale Ugly stick, shorten the nose 2½" and use a Cox Black Widow or Golden Bee with the built-in tank. Still another note: For rudder only use, such as the Ace Commander pulse radios, raise the leading edge of the wing 1/8" (positive incidence), then put two washers behind the top tank mount/motor mount screws to give you approximately 3 to 5 degrees downthrust. Don't forget to glue the elevator on to the stabilizer, making it perfectly flat.

Have a ball! Either the Half-A-Chaos or Half-A-Stik will give you more flying pleasure per hour and dollar invested in construction than you ever imagined possible. And their performance will have every guy at the field waiting for a turn at the stick! As a matter of fact, even Dewey can fly them — even though he kept disappearing into his van after each flight and reappearing wearing a different set of pants.

We never did figure that out — when he's "flying," it's the rest of us who are nervous! □

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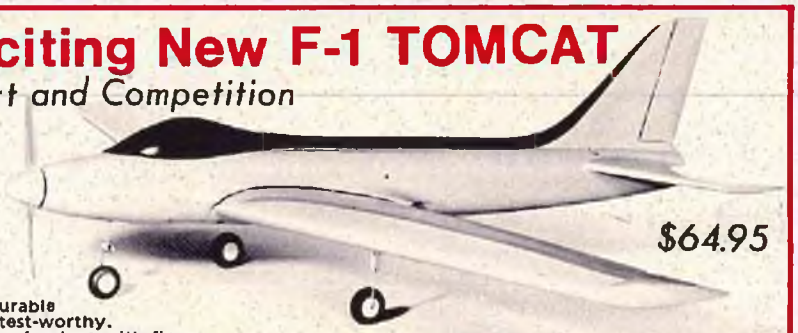

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STYROS XV

from page 30/24

. . . . the cloth around the edge of the stab, fin and wing. Next, cut a piece of cloth large enough to go completely around the fuselage and long enough to extend about 1" beyond the front and rear of the fuselage ends. Cut a slit in the aft center, long enough to go around the vertical fin and lay in place over the fuselage with the fuselage resting on a box to raise it off the table about 6" or more. Make 2 cuts in the cloth along the leading and trailing edge of the wing so the cloth will hang down along the front and rear fuselage sides. Trim the excess cloth around the fillet allowing a 1/2" overlap with the upper wing surface fiberglass. Pull the cloth from the aft fuselage and lay it over the front half and apply glue to the rear half of the fuselage. Carefully lay the cloth back over the glue and smooth out the wrinkles with your finger, moving them to the edge and end. Pick up the front half and lay it back over the just applied rear half and complete, using the same procedure. Overlap the cloth along the bottom of the fuselage about 1/4". Allow to cure, then fiberglass the bottom of the wings. Trim off all excess cloth using an X-Acto knife and sand the edges using 180 grit silicone carbide paper to finish the edge. Brush on a thin coating of Hobbypoxy II glue over the tail surfaces, fuselage, and top surface of the wings, and allow to cure. Brush a coating on the bottom of the wings and allow to cure with the model upside down. When dry, wash the entire model with a mild solution of Ivory liquid before sanding with 100 grit garnet paper. Be careful not to sand into the glass cloth or the balsa wood on the ailerons, elevator and rudder, and hatch.

Glue the 8" canopy on the fuselage at the location indicated on the plan with Hobbypoxy after finishing the area under it with flat black enamel. Tape and sand the canopy outline and the glue edge around the canopy/fuselage joint.

Brush on the last (thin as possible) coat of Hobbypoxy II as thin as possible, using the same procedure as you did the first and allow to cure at least 24 hours at 70° minimum temperature. Sand the entire model smooth using 100 grit garnet paper followed by 280 silicone carbide No-Fil paper.

Finish with brushed or sprayed Hobbypoxy White Trim as indicated with International Orange and apply appropriate decals to fit your color scheme. Install equipment, tank, engine, spinner, landing gear, and wheels. Hook up the linkage as indicated on the plan and stand back and take a good look at a "new generation" model airplane. If the .15 size model is too small for you, scale up the full size plan 25% and go for a .40.

Here are a few last minute hints that will help you through your Styros project. First, when you mix the Hobbypoxy II glue, warm the tubes by

to page 142

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Lay the decal face down with enamel side on a table top. Peel the backing paper away. The plate will have the sticky side up & will adhere to your finger. Holding it flat, apply in position. After application, wipe hard with a soft cloth, then with squeegee, tie down all the edges. After 48 hour set up at room temperature, decal will adhere permanently.

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STYROS XV

from page 138/24

placing them next to a 100 watt bulb or shining a heat lamp on them. Bring the temperature up only enough to allow the glue to flow through well, **do not get it too hot.** If you get it too hot, you will reduce the curing time too much. Mix the glue in small quantities. This makes for a lot more mixing, but it also allows you to brush the glue more easily, while the viscosity is down because of the heating, without the glue starting to set on you. Mix the Hobbypoxy II glue in pot pie tins and brush it on with a stiff bristle flux brush usually obtainable at hobby shops or hardware stores. Finally, when you are sanding, if the glue balls up or sticks in the sandpaper it hasn't cured long enough. Your sanding should leave a heavy white powder. Also, to avoid excessive weight build-up, sand as much of the glue off as possible without sanding into the glass cloth or the balsa parts.

Flying the Styros is a real pleasure. She's got a good speed range, handles well fast or slow. It's active enough to be satisfying, yet docile on landing — and it doesn't look like everyone else's model. It is a real standout in the pit and in the air.

Once you master the foam and fiberglass technique you can apply it to any other model you would care to build from pattern to sport to scale.

Good luck with your Styros. I hope you enjoy yours as much as I have enjoyed the eight that I have built and flown. Plans for the Styros 15 are available from R/C Modeler Magazine Plans Service. If you prefer the larger, .40-powered Styros, the plans are available from the author John D. Woods, 2947 Persimmon Dr., Xenia, Ohio 45385 for $5.00. □

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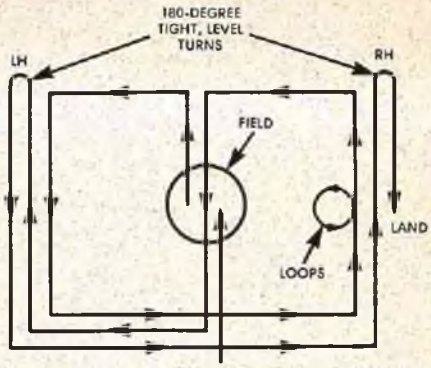
from page 22



INTERMEDIATE CONTROL CIRCUIT

FIGURE 2

(7) Land under power.

The candidate will fly the control pattern shown in Figure 2 in order to demonstrate the foregoing procedures. The candidate will, after becoming airborne, maintain a reasonable altitude and range, while being judged. The candidate will not fly over specatators, parked cars or the pit area, while executing the pattern and procedures. The candidate must complete his pattern and procedures on the first try, during each of his two attempts.

C LEVEL: INTERMEDIATE ADVANCED

The candidate must demonstrate, on two successive attempts, during the examination period his ability to:

(1) Start engine in pit area.

(2) Taxi aircraft to take-off. Head it into the wind. Stop its forward movement in front of the take-off line.

(3) ROG within designated runway.

(4) Execute a 360 degree, right hand pattern. The last leg will be flown over the designated runway on the field.

(5) Execute the following maneuvers immediately after completion of item #4 and in the order shown: Two consecutive, horizontal rolls; square loop; inside eight; flat eight; straight and level inverted flight, including a 180 degree turn and reverse direction.

The candidate must complete his pattern and procedures on the first try, during each of his two attempts.

D LEVEL: SENIOR ADVANCED

The candidate must demonstrate, on two successive attempts, during the examination period his ability to:

(1) Start engine in pit area.

(2) Taxi aircraft to take-off area. Head it into the wind. Stop its forward movement in front of the take-off line.

(3) ROG within the designated runway.

(4) Fly straight and level upon reaching a satisfactory altitude after take-off.

(5) Execute a tight, 180 degree, level, right or left hand turn and reverse direction over the runway.

(6) Execute the following maneuvers, immediately after completion of item #5 and in the order shown: Three consecutive horizontal rolls; outside loop; double Immelmann; Cuban Eight; horizontal eight; straight and level inverted flight, including a 360 degree turn.

So, if you are tired of punching holes in the sky every time you go out to the flying field, start rallying for a Flying Proficiency Program in your club. You'll be pleasantly surprised with the new and interesting dimensions such a program adds to an already absorbing hobby and sport.

And, by the way, the next time you are at the flying field, give our A and B Level control circuits a whirl. You might find that you are a better flier than you think, or as good as you always thought. However, don't be discouraged if you blow them. Others, mightier than thee, have been stonewalled by such seemingly simple patterns.

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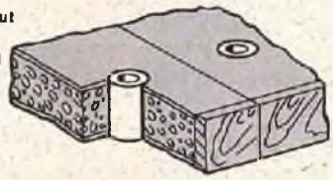

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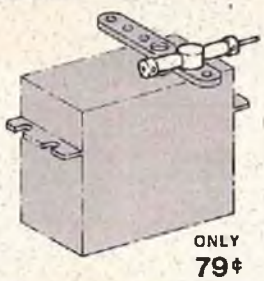

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from page 12

..... *how to determine wing area and wing loading and to know when the flying weight of my model is acceptable and a few tips on cutting down on extra weight.*"

Sincerely yours,
Wesley Busch

To start with Wesley, forget the Corsair. It isn't going to fly. It is designed to be a control line aircraft, and is not going to fly as an R/C ship. Some outstanding stunt type of ukie aircraft have been converted to R/C, but not a scale, or semi-scale U-Control airplane. Take my advice, and at least a hundred thousand others who join with me, to tell you to **forget this aircraft for R/C**. Purchase a small trainer type, or a glider kit, for your first effort in R/C and don't waste your time and money on a project that will not work.

Now, to your question about wing area and weight. We generally think of the relationship in model weight to wing area as so many ounces per square foot of wing area. It is strange, since we tend to weigh in pounds and measure the wing in inches but that's the way it is. Let's take an example to see just what we have.

I have an Ugly Stick that has a wing span of 60" and a wing chord of 12½", and it weighs six pounds and four ounces. Using these figures, the wing area is 60 x 12.5, or 750 square inches. To convert this to square feet you divide by 144 square inches and you have the answer of 5.21 square feet.

Next, we convert the weight of the aircraft from pounds to ounces. It weighs 6 pounds and four ounces, so we have a total weight of 100 ounces. (16 ounces to the pound, remember.) Now, then, we want to find the relationship of ounces per square foot, so we set up the equation of ounces (100) to square feet (5.21) and we have: 100/5.21 = 19.19 ounces per square foot. This is known as the wing loading.

Okay, so what good does knowing what the wing loading of the aircraft do for you? Well, certain types of aircraft fly best with certain types of wing loading. A thermal soaring glider, for example, is pretty happy with a 7 to 10 ounce wing loading. Slope soarers may like a 12 to 20 ounce loading, depending upon the normal wind velocity. Trainer type aircraft seem more at home with a wing loading from 18 ounces to 24 ounces, and pattern aircraft like the 20 to 30 ounce range, mainly because they are flying with gobs of power and must be ready to fly no matter what the wind conditions may be. You can see that, if you exceed any of these limits by a great deal, you will have much more difficult flying to cope with.

to page 150

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CUNNINGHAM ON R/C

from page 146/12

Generally, the higher the wing loading on the aircraft the much more powerful the engine should be.

A really good example of this is found in Formula I racing aircraft. The wing area minimum is 450 square inches, and the weight minimum is 5 pounds. This gives us a wing loading of 25.6 ounces per square foot, and the Formula I racers are beautiful flying aircraft, but **not always**. Early in the game the general rule was an aircraft that weighed in at about 6.5 pounds, and were powered with engines that were about one half, or possibly less than the available power today. The 6.5 pound aircraft sported a wing loading of 33.3 ounces per square foot and were really marginal fliers. Once they got into the air it was okay, but, getting off of the ground was a real chore, and lots of models snap rolled on take-off and bit the dust. With today's engines those aircraft would have been much better fliers. So, the basic reasoning holds — the higher the wing loading, the more power that you need.

But, getting back to Wesley's Corsair, I would expect that the wing loading just might be in the 40 to 50 ounce range when completed, and thus this aircraft just doesn't have a chance to get into flying condition, even though he does possess a very powerful .09.

Another thing that does have an effect on the flyability of the aircraft is the wing airfoil. A lifting wing section, such as the Clark Y airfoil, will be able to fly at a higher wing loading than will a symmetrical airfoil section. This is the reason that full scale aircraft that are used to lift large loads relative to the wing area use lifting wing airfoils, and then use all types of flaps or leading edge slots to increase the lift of that aircraft on take-off and landing. Our models are similar to full scale aircraft in that they need to be designed with certain load lifting abilities in mind.

Until next month, good flying. □

ENGINE CLINIC

from page 92/10

be more easily bent. Although the model press has not made any mention of it, there have been several serious accidents involving plastic props followed by lawsuits. One fellow active in pylon racing here in Southern California had to have quite a few stitches taken right across his nose. A little bit either way would have been an eye! 1/2A's are about the only size engine I would use fiber filled or nylon props on.

The length of time model fuel will remain okay while stored is determined by the storage conditions. Fuel stored in a constant temperature will last longer than fuel stored where it can warm up during the day and get cold at night. Synthetic based fuels will last longer than castor based. Castor oil will go rancid after a period of time. I guess you have all smelled an old mayonnaise or vegetable oil bottle! Most fuels, if kept tightly capped, can be stored for at least a year, after that deterioration can take place. A lot depends on how fresh the fuel was when you purchased it. Fuel can set in jobbers warehouses, on the dealers shelves, etc., and be many months old when purchased. Generally, if you look in the fuel and it is still nice and clear, (disregarding any coloring added by the manufacturer) it is okay to use. If, in the case of castor oil based fuel, it looks like it is full of soda cracker crumbs, it is probably bad. Some of this crumbling is normal in cold weather, especially if the fuel is allowed to set in the sun and get hot then, in turn, cooled. If rewarming of the fuel causes the crumbs to go away everything is okay. But if they stay no matter what, the fuel is bad. This is one problem we do not have with synthetic oil based fuels so their storage life is much longer. However, deterioration still takes place and the fuel loses its potency, becomes hard to start, will not idle, etc.

to page 152

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ENGINE CLINIC

from page 150/10

Mr. Lee:

First of all, let me compliment you on the fine column you are running every month in RCM, a column which I think is most helpful to us RC fliers. I hope you will continue with it for a long time.

I have some questions I hope you will be so kind to answer.

Is it really necessary to balance propellers on the two stroke reciprocating engines we use? I know the bad effect a grossly out-of-balance prop will have, but since our engines vibrate (except for the two and more cylinder engines) no matter what, what is the use of meticously static balancing the propellers? When you compare 2 props, one roughly balanced and the other balanced 100%, I do not think you'll notice a difference in vibration or smoother running of the engine.

I once read that it is not necessary to balance propellers at all, as long as you position the heavy blade on the same side as the crankweb counterbalance in order to improve the balance of the proplengine combination. This bit of information came from the maker of Rev-Up props. I, myself, am a bit sceptical on this point, as I feel that you cannot balance reciprocating forces by adding rotary forces (unbalanced).

I'd like your comments on this matter.

Sincerely,
A.F. Bruens
Ede, Holland

You had better believe it is necessary to balance your propeller. An out-of-balance propeller (or spinner) can create havoc with your servos, receiver, etc. Many cases of "I haven't got it" are due to nothing more than vibration getting to a servo motor, causing the brushes to bounce, in turn causing the servos to stop functioning. You get back on the ground and everything works great. The aileron servo, in particular, is susceptible to this type of vibration usually being more rigidly mounted in the flat position rather than upright as with the other servos.

If you made tests with balanced and unbalanced props and did not notice a difference it must be due to a badly vibrating engine.

The old bit about hanging the heavy blade of an out-of-balance prop on the same side as the counterbalance will work sometimes if the particular engine does have a bad crankshaft imbalance. However, what about the engines that do have the proper counterbalance? You are just creating a worse situation now. In years past, many of your engines were shy in the counterbalance department. The older model Mercos were a good example here. However, this is not true of your present engines. Most manufacturers, in an effort to stay competitive, are doing everything they can to make their engine the 'best.' It is impossible to competely counterbalance a two cycle single cylinder engine but most manufacturers are coming as close as is possible by cutting down on piston weight, rod weight, etc., which, in turn, helps smooth an engine.

Dear Mr. Lee:

I recently purchased a Cessna "Skymaster" kit and am anxiously looking forward to assembling it during the coming winter evenings.

I have not yet decided on engines for this model and would like to get your help on this point. Although the plans show two .35's, several of my fellow R/C "experts" tell me that I shouldn't consider anything less than .60's. At present, I have on hand a .35, a .45, and a .60 but don't have two of the same size and am wondering if it is really necessary to have a matched pair of engines. Would it make sense, for example, to use the .60 for tractor and the .45 for pusher? Or vice versa?

I have a feeling that the plane would be underpowered with two .35's, but it also seems to me that two .60's would be overdoing things a bit.

1975
S.O.A.R. NATIONALS

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For some reason I am partial to the .45 engine and have a hunch that two .45's would provide enough power to make the plane a sweet flying machine – somewhat docile perhaps but not a fuel guzzling bomb.

The decision is ultimately mine but your advice and recommendations on engine selection for the Skymaster will be greatly appreciated.

Within the past year or so I recall reading in one of your construction articles that for some unexplained reason on a twin engine plane, two engines of a given displacement will deliver more power than a single engine of the same total displacement (e.g., two .15's will not put out more than one .30). Does this hold true for a plane with the tractor-pusher engine arrangement such as the Skymaster?

Dudley Lewis
Houston, Texas

Two .60's, both operating, would be considerably more power than you would need. Two .45's would seem more like a more logical choice. There is no reason why you couldn't use a .45 for the tractor and .35 for the pusher for that matter. The only thing is if you should lose the tractor engine in flight, the .35 would be marginal as far as flying the airplane. Even so, once airborne you could probably maintain level flight.

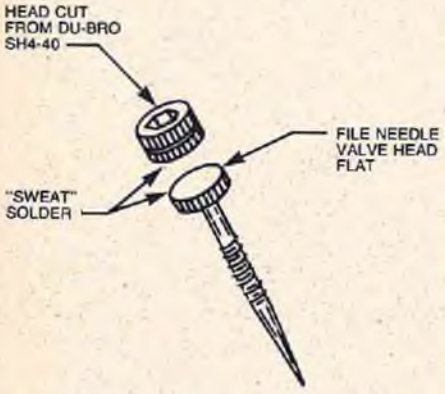
Generally speaking, two engines of a given displacement will develop more power than a single engine of the total equivalent displacement simply due to propeller efficiency. Two smaller props will do more work than one slightly larger one. I have had little experience with the Cessna Skymaster so am not sure if this will be true in this case or not due to the rear prop running in the wash of the front prop. Some efficiency undoubtedly will be lost here.

Dear Mr. Lee:

I like my fingers, I've grown attached to them and I don't like to stick them in a spinning nylon blade. It hurts and the sight of blood makes me faint (if it's mine).

So, to keep my thumbs, knuckles, and fingers out of spinning props, I soldered the head of a Du-Bro 4-40 socket head mount bolt on the head of my needle valves. Now my sweet wife pats me on the head, saying "Nice boy," as I adjust the mixture of the running engine with a six inch socket driver.

Frank L. Hughes
Kansas City, Missouri



Many times we will have a tendency to overlook easy solutions to simple problems. Frank Hughes has sent in a handy hint that may seem pretty elementary to some of the old pros but I'll bet is something many of you have never given a thought to; that being an easy way to adjust the needle valve without getting your fingers in the prop or even reaching it if inaccesible in certain installations — scale models, etc. Many times long extensions will be soldered to the end of a needle valve and the resultant increase in wear. This is particularly true with the short unsupported type needles as used on the Perry carburetors. The use of a ball end socket driver would be more flexible. □

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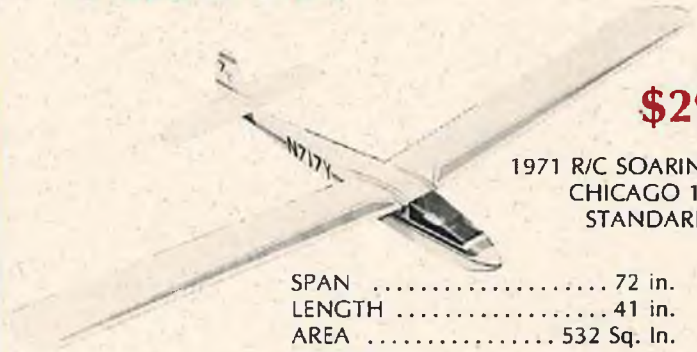

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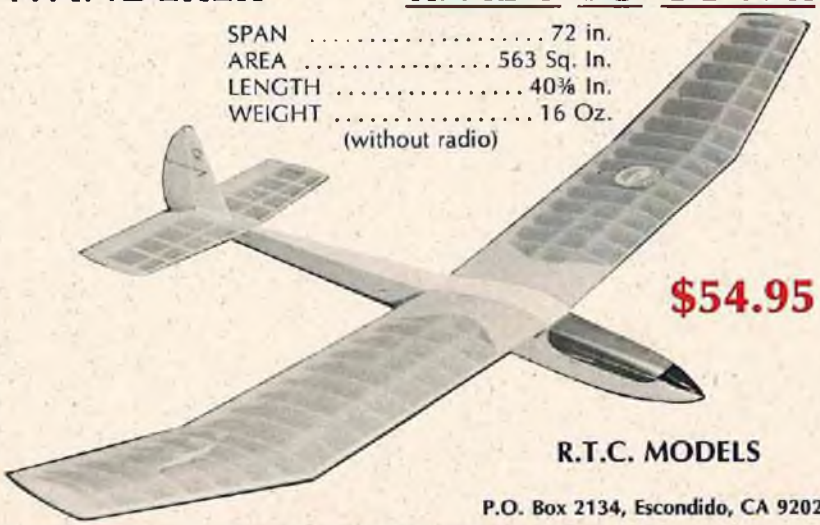

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from page 6

In summation, I think the purpose of this column should be to keep up with current ideas and equipment and to further the knowledge of the modeler who has been at it a few years and would like to improve himself. There are many books and columns on getting started in RC and there are a greater number of books on basic electronics, so we don't plan to cover that territory here.

While I'm on my soap box preaching, let's attack another letter. Notice I said letter, **not** writer. Bob Aberle sent us a letter and a copy of the Long Island Radio Control Society Newsletter. The whole thing is a little too long to publish but the gist of it is, Bob thinks the test equipment boom is a step in the wrong direction. He ended his letter with the following: "When you approach test equipment in future columns, keep the inexperienced in mind. Make it brief and simple. If it can't be described that way, then don't attempt to even publish it."

He ended the newsletter article with: "Remember our hobby is supposed to really be a sport of flying RC models. Keep that in mind as a prime goal and confine your bench testing to an absolute minimum. Enjoy!"

Well, this time I don't agree with you, Bob. I'm sure you've read technical journals such as those put out by Bell Labs and RCA. They're not brief and simple. When I started in RC, the magazine articles seemed almost as complex. As I learned more and more, I'd go back and read the articles that had seemed too far out. Soon I was looking for information that wasn't published anywhere but was obviously in the heads of the guys who designed the equipment. Eventually I learned enough that I was actually able to contribute a little (I hope). My theory is the more people we get **thinking**, the better our equipment will be. Hopefully guys like yourself will read this column and come up with better ideas, circuits, etc. I'm really surprised at your attitude towards testing. I have seen the relationship between those who never seem to crash and how they maintain their equipment, vs. those who crash frequently and have no way of telling that their systems are not working properly. Not testing is like putting your head in the sand. I agree that there will be times when you will probably not fly because you're not sure of something, but that is better than crashing because you didn't **look**. Most of the mail blames batteries for most of the crashes. Well batteries can be tested and those crashes can be prevented. I'd like to see more tests prefected. How about a means of detecting a servo motor problem before it gets you? It would be kind of nice, right?

to page 156

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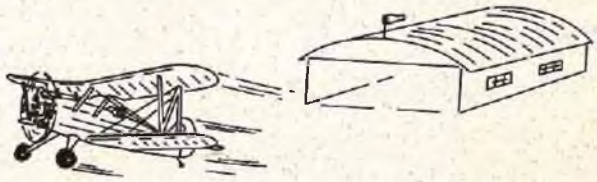

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RADIO SPECTRUM

from page 154/6

Enjoyment is proportional to the ratio of flights to crashes, and crashes can be minimized by performing good periodic tests. So test, fly and enjoy!

The next letter tells it better than I can. I shortened it a little bit because I don't think most people have to worry about germanium transistors in their servos anymore:

Dear Jim,

My experience in RC is somewhat similar to yours – about 20 years – with 35 years in modeling and your comments on reliability struck a familiar chord. The equipment available today is so much superior to things such as the Babcock "Magic Carpet" receivers that there is no real comparison. The state of the art is such that I personally feel that the usual equipment failures can be narrowed down to a few items.

In the last few years I would estimate that 95% of my radio problems have been traced to battery problems in the receiver. An instrument such as the Flite Life can provide some very interesting (even startling) information. There is very little sense in risking a $250.00 plus aircraft on a doubtful $3.00 cell. My own version of a battery tester was made by rewinding a 100 ohm DPDT relay to approximately 40 ohms and connecting it so that it dropped at somewhere near 4.0 volts to disconnect the battery pack and an electric clock. These values are not critical; the real purpose is to have a method to check the battery pack periodically and note any drastic changes. My equipment is a bit outdated by present standards (all my servos are the 4 lead type) and a dead cell in the pack can be disastrous. Since using a battery tester I have not had a single in-flight battery failure. I would fervently recommend any person who is seriously involved in RC to acquire something to check his batteries.

The next biggest cause of concern has been the servo motors. When a servo travels slowly in one or both directions I have found that the internal resistance has changed substantially and a replacement of the motor has cured the condition. Occasionally the motor can be removed, cleaned, run for some time in each direction, and be brought to original condition but this has worked in only a few cases. Again, the cost of a new servo motor is not that much as compared to the costs of a new plane and the rebuild of a crashed (crushed?) radio.

John Arbogast
Hamilton, Ohio

Well said, John. That relay idea is a good one. If one of you guys out there has nothing to do, pick an inexpensive relay and tell us how to rewind it. If you could get it to drop out at 4.4 volts with a 20 ohm coil you wouldn't need a separate load resistor. Connect your charger to the normally open contact on the relay and the unit will charge your battery automatically after discharging it. When you get some bridge type servos, John, you'll find it hard to detect slow motors. I know people who have flown for weeks on three cells. So once again you guys, let's invent a test for servo motors.

Dear Jim,

What is the best way to install a radio in an airplane? How should the servos be mounted, what wires should not cross, how and where should the receiver and battery be located? What happens if the things you recommend are not followed?

If you are having trouble with a radio, send it back to the factory for repair, and upon receiving the radio, find it is still not working properly, what can you do to convince the factory of this?

Dennis C. Weaver
Collegeville, Pennsylvania

My experience has shown that the installation isn't too critical although I have seen differences in ground range, particularly in small airplanes

to page 158

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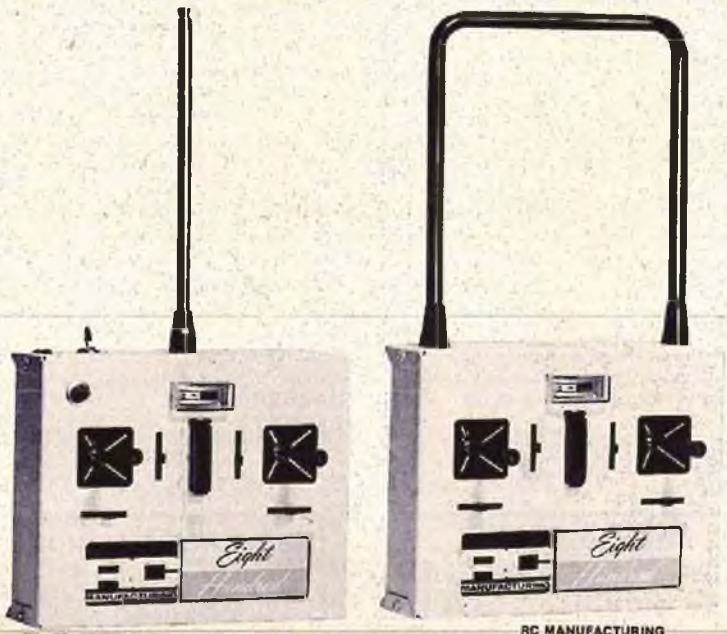

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RADIO SPECTRUM

from page 156/6

with everything tightly packed. First I'll tell you some of the things I've done and gotten away with. Lately I've been running my antenna through a teflon tube inside the fuselage, adjacent to the servo cables, up into the top of the fin. I put my receiver and battery pack in the same compartment right behind the leading edge of the wing. I have had the battery behind the servos (for CG purposes) with a relatively long power cable. I've seen installations in a RPV project with 12 foot extension cables with no problems. I've never been worried too much about metal-to-metal contact in my linkages, and I've even used aluminum arrow shafts for pushrods. One of the things that degraded the range the most was running electric brakes off the airborne battery pack, using the L.G. strut for a return.

All of these things are to be avoided if you are having trouble. Try to get the antenna away from power and servo leads as fast as you can. Try to get it as far from the ground as you can if you're having trouble on the ground during long roll outs. Keep power leads short. Keep the receiver away from the servos. The most important thing is to try to isolate your radio from vibration. Don't pack the receiver too tight. Use servo trays and don't bottom out the grommets.

I had a foreign built engine a few years ago that was doing a good job for me, until it cracked its own crankcase due to vibration. I sent it back to the importer about six weeks before the Nats, figuring I had plenty of time. I bought a second engine so I could continue to practice but it wasn't as good as the first. I had to go with it at the Nats because the good one didn't get back in time. I had no contact to call to check progress and ended up very disappointed. I've flown American made engines ever since. Getting good service is one of the most important things to consider when you buy an engine, radio, or anything else that you can't afford to throw away. It is very important to have some individual you can call, by name, who knows something about the product (the more the better) and, hopefully, something about your particular problem. The main thing is to establish good communications. Nothing makes the service department more unhappy than receiving a package with a note, "It crashed again. Fix it." The more you can tell them the lower the repair bill. Try to isolate the problem yourself if you can, so you can tell them where to look. Tell them all you can about the circumstances that might have caused the problem. Also, don't overlook some of the things other than the radio that could be causing the problem. I recommend that everyone try to keep an old test bed around that you know flys, without pushrods binding, loose servo mounts, and all the other things that can look like radio troubles. Keep a couple of known good servos on elevator and aileron. When you get a new radio, or get the old one from the factory, fly it a dozen times in the test bed before you put it in your new pride and joy. Then if you have trouble, communicate, but don't antagonize. All manufacturers really would like to solve your problems in the shortest time and at the minimum cost.

★ ★ ★

We've been beating batteries to death in this column so let's try to get something going on servos. There are a jillion servo configurations available these days and a modeler has a tough decision when he orders his new set. He can buy big ones, small ones and some that are 1mm smaller than the small ones. The size he can usually decide for himself, depending on the type of plane he's putting them in. Some of the other considerations are not as straightforward.

One very controversial decision is linear vs. rotary. I've always preferred the linear for precise pattern flying but have gotten arguments from such notables as Jim Whitley and Norm Page. Jim pointed out that the control surface angle really is linear with respect to the control stick angle if you use a rotary servo, because the horn on the control surface that converts the pushrod motion back to rotary motion compensates for the rotary to

push-pull conversion of the servo. However, I maintain, what you really want is a non-linear relationship. You want your controls to be less sensitive around neutral and still give you a fast rate when you are hard over. This relationship is shown in Fig. 2.

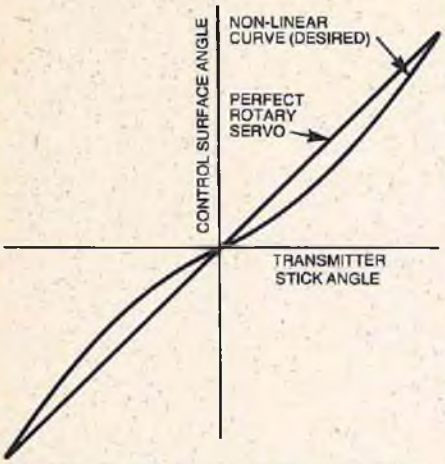

FIGURE 2: CONTROL SURFACE ANGLE VS. CONTROL STICK ANGLE

The so-called linear rack servo gives you this relationship if the rack travel is truly linear with respect to control stick angle. This effect may not really be significant, but I've tried both kinds of servos on the same plane and convinced myself the rack servos were smoother around neutral.

Norm Page's argument was that there was more slop in the rack servo because the feedback pot wiper is not connected directly to the output mechanism but is separated by the slop of at least one set of gears.

I agree: in fact it would be tighter yet if you put the feedback wiper on the control surface itself and eliminated the slop in the pushrod. The problem is vibration of the pushrod which is transmitted directly to the wiper, which eventually wears out the pot element around neutral. I've been using E.K.'s dual rack servo mechanics for the last seven years and have had no significant feedback pot problems. I know Norm can't say that. Another thing I feel gives the E.K. mechanics superior performance is the fact that the wiper travels almost 180° instead of the usual 90°. This minimizes any irregularities in the pot element, so, even if you do wear a spot, it will have 1/2 the effect. The problem with the E.K. mechanics has been material fatigue which results in cracking of the cases. This problem should be eliminated now that they've gone to nylon cases.

We'll continue our discussion of servos next month. If you've got any questions or would like to add something, (or argue), drop us a line! □

FROM THE SHOP

from page 2

..... of the manufacturers booths and products, so we've had to pick a random selection and try to give you an impression of this magnificent exposition. The only thing we can say is that we hope you will attend the next Toledo Conference in person — it is an experience you'll never forget. And, while we are on the subject, our congratulations to the Weak Signals Club for producing this magnificent and best of all trade shows.

•

Speaking of clubs, R/C Modeler Magazine has instituted a new program which we hope will encourage and aid club growth and activities. Each month, RCM will select one club which will be the recipient of a $100.00 cash award which is sent to the club president for use by that club in any way they see fit. Our congratulations to the first two clubs selected for this award - - - the

to page 163

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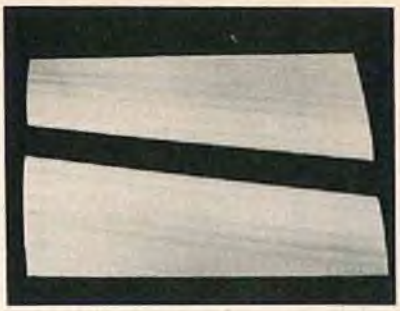

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FROM THE SHOP

from page 159/2

first being the Utah State Aeromodelers and the second being the Capital Area Radio Drone Squadron, Inc., of Lansing, Michigan. Both of these organizations have an outstanding record of contributions to the sport and hobby of model aviation.

Watch your mailbox — your club could be next.

•

Ron Kopp, the Contest Committee Chairman for the Milwaukee Flying Electrons, has notified us that Old Milwaukee Beer, which is a division of the Schlitz Brewing Company, is going to co-sponsor the Sud City Soar-In.

This sailplane contest held in conjunction with the Schlitz Brewing Company going national with their Old Milwaukee Beer. Also, since Schlitz is no longer sponsoring the Circus Parade in Milwaukee, a lot of the promotional efforts formerly expended on that parade will be given to this sailplane contest. This will include a major poster campaign in taverns and stores throughout the midwest. The Milwaukee Flying Electrons will be performing demonstrations at large Schlitz events throughout the summer. Response to word-of-mouth announcement of the forthcoming soaring contest has been overwhelming throughout the country.

This is the first time in many, many years that a nationally known manufacturer outside of our industry has sponsored a contest in our sport. The Soar-In will be at Aero Park Airport, Menomonee Falls, Wisconsin, on August 2nd and 3rd. A nearby Howard Johnson's motor hotel has been set aside as a headquarters and a hospitality room will be in operation on Saturday night. This is an event to which you will want to bring the entire family. Our thanks to the Schlitz Brewing Company for their outstanding participation and national promotion of this event, and we urge each and every soaring enthusiast to attend this major soaring competition. For further information, contact Ron Kopp, 8010 West Waterford Avenue, Milwaukee, Wisconsin 53220. Ron may be reached by phone between 9:00 A.M. and 5:00 P.M. (Milwaukee time) at (414) 462-9200 or in the evening (414) 321-3465.

If you are a sailplane enthusiast - - - don't miss this one!

•

The intent of Omaha's National R/C Multiwing Championship is to recapture the romance, excitement, yet easy pace of the early days of aviation — the nostalgia of the biplane era. In their efforts, the Omaha Fliers will furnish a competition format that is appealing to not only the serious competitor, but also the sport flier. In 1975 they will offer five events: three Pattern events, Sport Scale and High Noon Barnstorming

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— the latter being a novelty event. All will be limited to aircraft with more than one wing. Official or provisional AMA regulations will apply, if applicable, and not noted as revised in the Contest Flier which is available on request.

The Pattern Events include the Omaha Freestyle Aerobatics for Novice; Omaha Freestyle Aerobatics Advanced; and the NSPA Advanced. All contestants will have the option of entering either the OFA Advanced or the NSPA Advanced event. Fliers who have not placed third or higher in an AMA sanctioned pattern competition within the past three years will have the additional choice of entering the OFA Novice event.

Aircraft must employ more than one wing, have a fixed gear, be scale-like in appearance, and have no wing with less than 40% of the area of any other wing. No scale bonus points will be offered.

Briefly, the Omaha Freestyle flight pattern is much looser, less demanding, and perhaps less exact in the NSPA flight pattern. It consists of twelve school maneuvers (normal AMA Class A Pattern) plus a program of five pre-selected maneuvers of the pilots choice. The Omaha group feels that the NSPA flight pattern will be preferred by many of the more seasoned contest fliers. They also feel that the relative newcomers and less competitive individuals will continue to prefer the Omaha Freestyle pattern.

The Sport Scale Event requires no explanation and AMA rules will apply, except that all aircraft must employ more than one wing.

Introduced for the first time last year, the High Noon Barnstorming Event is designed for the spectator and the "Show-Off" flier. This lunch break event takes in just about everyone. No entry fee is charged and a single five minute time period is allowed each participant. A random selected panel of six judges will independently grade each exhibition on a one-to-ten basis. The points awarded will be based on each judges overall impression of each show. There will be no judging guidelines furnished. Anything goes — Parachute Drops, Smoke Screen, Staged Dog Flights, Jettison Wings, Low Level Aerobatics, the spectacular and the unusual. If a routine is impressive and does not endanger the life or limb of the audience or the flier, it's probably a good one.

Add to the previous event descriptions a good dose of excellent Nebraska weather, lots of flying from one of the most attractive flying sites in the nation, and the normal Saturday night Omaha Luau and party, and that's the program for the National R/C Multiwing Championships for 1975. By the way, the photograph of the lovely young lady and the modified Andrews Aeromaster is of Ms. Caroll Scott, the 1975 National Multiwing Championships Queen. Ms. Scott is a weather forecaster and reporter for KMTB, Channel 3 in Omaha, Nebraska. The photo is by Larry Quigley.

If you would like further information on this event, write or call Olie Olson, 6111 Maple St., Omaha, Nebraska 68104. Or, if you prefer, you can call Olie during the day at (402) 551-4662 or (402) 393-7591 in the evening.

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The First Annual High Plains Radio Control Championships will be held on July 4-6, 1975, at the Hobbs Industrial Air Park, five miles northwest of Hobbs, New Mexico on State Highway 18. Hosted by the High Plains Radio Control Association, which is an association made up of R/C clubs from Amarillo, Plainview and Lubbock, Texas, and Clovis, Roswell and Hobbs, New Mexico, with all clubs participating in the organization and administration of the competition. The flying site is located in the Hobbs Industrial Air Park which was previously used as a B-17 base, and provides what is recognized as one of the finest flying sites in the Southwest. There are plenty of runways and tie-down areas for any full-scale aircraft wishing to fly in. The City of Hobbs will provide space and hook-ups for recreational vehicles and campers at the Air Park. This contest will utilize two circles with two flight lines at each circle, thereby guaranteeing everyone plenty of flights

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Events include aerobatic competition for the novice flier as well as the advanced fliers with trophies and merchandise awards in all categories. Events include Class A Novice, which is a shortened A pattern restricted to fliers who have never placed in any R/C competition. In addition, there will be Standard Class A, Class B, Class C Biplane, Class D Novice, Class D Expert, and Sport Scale.

AMA and FCC licenses are required and AMA rules will apply at the High Plains Radio Control Championships. Mufflers are required on all aircraft. For further information contact J.R. Cox, 1917 N. McKinley St., Hobbs, New Mexico 88240, or telephone him at (505) 393-8063.

The High Plains Radio Control Championships will be one of the major contests of the year wherein clubs from Texas and New Mexico have been able to unite in one concentrated effort to promote the major event on the High Plains of West Texas and New Mexico each year. We hope that you will plan to attend.

•

Here are a couple of hints and kinks you may find useful. The first is from Dr. John R. Mountjoy of Winston-Salem, North Carolina, who built Dr. Tennyson's "Whimpy" which was featured in the January 1975 issue of RCM. John says the flying characteristics of this old timer-like aircraft are fantastic and, in addition to being an excellent sport flier, also makes an excellent trainer. He found that it needed 4 ounces of weight in the nose and, with an Enya .19, a 9/4 prop proved to be more efficient than the larger prop recommended in the article.

By the way, since most of us do use DJ's or Bridi Enterprises trim tape in both the trim sheets and striping tape sizes, here's a way to make sure the material adheres permanently and one wherein you can avoid adhesive seepage after the plane has been coated with exhaust residue a few times. After your aircraft has been painted or covered with one of the plastic film coverings, clean the aircraft with Ditzler 440 paint prep wax and grease remover. Simply wipe this material on and then wipe off. It is available at all Ditzler automotive paint dealers for $2.25 a quart. After the aircraft has been wiped down with this material, and is dry, apply the striping tape or wide trim sheets and allow to cure three hours per side in the sun. You'll find that this material will become a permanent part of your finishing job and that there will be no more adhesive residue along the edges after you have flown the plane a few times.

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Finally, this month, just about everyone, in the back of their mind, has always had the idea that R/C models were the most dangerous form of modeling — right? I mean, we'd never admit it to anyone outside of the hobby, but it has generally been taken to be true.

Lee Taylor of Roseville, California, now has absolute evidence that that presumption is absolutely false. In fact, would you believe that rubber band models are the most dangerous?

Yep, tis true, and an accident happened to one of the local modelers in Lee's area that proved the fact. While this individual will be referred to as 'Joe Modeler' for obvious reasons, that flier was out at the local playground recently with the desire to fly his Wakefield model. He had prepared the many stranded rubber band motor for winding in the normal manner — stretched it several times its normal length, as usual — and proceeded to wind it up. He packed in all the turns he could - - - with multiple layers of tightly wound knots of rubber — when the rear motor hold-down inside his fuselage broke loose. Whereupon, said motor proceeded to snap back out of the fuselage, wad up into a twisting, snarling ball, hit Joe in his chest, flipped inside his loosely buttoned shirt, and proceeded to tangle itself up in his chest hairs!

And, nobody — but nobody, ever had that disastrous an accident with an R/C model.

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That's it for this month — watch out for low flying birds when painting your next aircraft! □

POXY POINTERS

Here I am again,

Last month I left you with a pot full of paint and a dust-free model. If you've waited a full month you now have a dusty model and a pot full of cured metallic epoxy paint. You're probably hungry, too. Well, have a sandwich, mix up some more paint, clean the model again, and this time I promise we'll get it on.

But first I'd like to repeat a suggestion I made a few months ago about testing your spray technique on an old tin can before you attack the model. **This is especially important when shooting metallic paints. Metallics have a way of accentuating any surface imperfections, and require a good application technique.** So I strongly advise you to make sure everything is just right before you point your spraygun at the model.

What kind of spray equipment should you use? Anything that works. I used an inexpensive Badger plastic siphon-type gun that sells in hobby shops for under ten dollars. My compressor is an ancient piston type, also from a hobby shop. The air hose comes directly from the top of the cylinder, with no tank or pressure regulator or anything. It's primitive, but it works. On the other hand, I know guys who use artist's airbrushes hooked up to compressed air or CO-2 tanks with fancy pressure regulators. **Use whatever you like.**

Be sure the paint is thoroughly mixed before filling your spraygun bottle. Add about 40% thinner to start with, then test your spray. The amount of thinner used will determine the quality of the metallic effect you get. In our experiments, we achieved what to us was the best result when we used 40-50% thinner. What you use will depend on your spray equipment, your technique, and the metallic effect you want. And speaking of technique, you might try this: Spray a light mist coat first, wait a minute or so, then follow with a heavier wet coat. Remember, messing up a few tin cans is a lot better than messing up your model. So keep testing until you get precisely the result you want. Only then are you ready.

Another important thing to do when spraying metallic paints is to keep the paint moving. Don't allow the paint in the spraygun bottle to settle out. If you do you'll find yourself spattering silver specks in your paint job. Swish the paint around between passes. Keep it moving. If it sits for a while, stir it.

You'll find that if you've never had trouble spraying Hobbypoxy standard colors, you won't have any trouble with metallics. Just keep the paint mixed, and be careful with your technique.

Metallic colors might require a bit more care, but the results sure are worth it!

Yours for magnificent metallics,

John E. Poxy

John E. Poxy

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