radio control
RC MODELER
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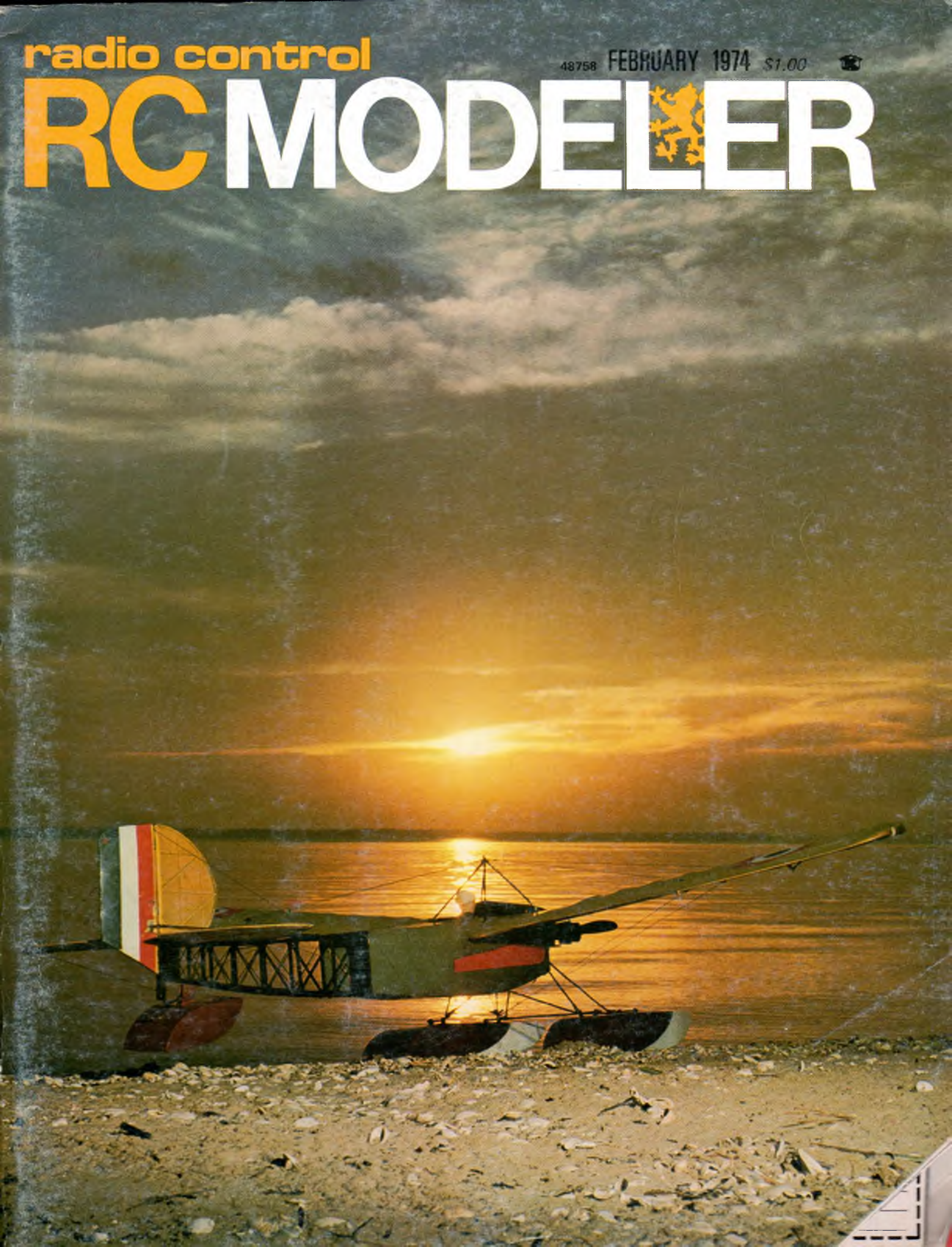

RCMODELER

FEATURES

PRODUCT TESTS

DEPARTMENTS

VOLUME II 1974 NUMBER 2

FEBRUARY

THIS MONTHS COVER
is a magnificent Ektachrome transparency of a Proctor Antic on floats. Photographed in North Carolina by Ted Baxter.

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FROM THE SHOP

DON DEWEY

Our nation is currently facing a crisis period virtually unequaled in its history. The combination of a severe energy and resources shortage and the self-serving interest of large corporations whose business it is to make a profit from those resources, has created severe shortages that affect not only our basic daily needs, but have reached down to our hobby industry as well.

For example, the price of balsa wood recently increased another 15% and is in quite short supply. Many manufacturers are unable to obtain balsa, while others are able to purchase only a fraction of the amount required for their kit production. At the same time, one of our severest shortages is in the field of paper, due to the fact that the lumber industry is selling a large portion of their total production overseas due to the premium price being paid for the export of this material. This paper shortage, of course, has affected all newspapers and periodicals and has prevented us from increasing either our total number of pages or our circulation. As a magazine publisher, we have been allotted the same amount of paper we used last year and we are unable to increase the consumption at all. Many publications in other interest areas have been unable to renew their contracts with their printers when those contracts are due to be renewed due to this paper crisis. This same shortage is creating havoc with the kit manufacturers due to their inability to obtain an adequate, if any, amount of paper boxes in which to package their product.

The crude oil shortage is severely hampering our industry due to the fact that virtually all of the plastics we use are petroleum based items. Thus, the plastic suppliers are, for the most part, selling only to the larger buyers in other industries while turning down smaller accounts and even refusing to discuss any sales at all with new purchasers of raw plastics. Methanol, the basic ingredient of model engine fuels, is also a petroleum product and is becoming harder and harder to obtain. All of the fuel manufacturers are experiencing difficulty in obtaining methanol, and when they do, the price is several times what it was just a few months ago. And, each of these areas with its own inherent shortages, are affecting other products that we use and have taken for granted in our industry. As an example, the booming digital calculator field is eating up the majority of diodes and chips used in the production of digital proportional radio systems, and a great many of these parts are becoming increasingly difficult to obtain. One diode manufacturer has already stated that they will accept no further orders until 1975. This, in turn, is placing a severe hardship on our radio manufacturers.

So, just as the energy crisis will affect each and every one of us in our daily lives, it will also adversely affect our hobby and sport. We will have shortages of paper, balsa wood, all plastic items, fuel ingredients, electronic parts, and the like. We have taken all of these things for granted for so long, that it is hard to imagine that these shortages really exist. And, whether they are completely due to our gluttony of resources or whether they were, in part, created by the industries controlling those products, the fact remains that the shortages are here, and here now. The purpose of this is not to inject a feeling of gloom or despair into our hobby – the same feeling we get from reading the newspaper every day and listening to the news each night – but to point out that the members of our industry are facing crucial shortages and experiencing spiraling prices for the raw materials necessary to make the products you and I enjoy. So, if you find the product that you want to purchase is back ordered, and your hobby shop can't obtain it for you, please be patient. And, when you do find a product on the hobby shop shelf and the price has gone up 20% or 30%, don't be surprised. It's a fact of life that these shortages and increasing prices are here now and we're going to have to live with them for some time to come. Let's make the best of it and be patient with each and every member of the industry who is doing his best to serve you by bringing you the products you want at a reasonable price concurrent with the problems and increasing costs those manufacturers are experiencing.

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While on the subject of increasing costs, we have been notified that all magazines will sustain a 22% increase in postage costs once again. While this cost will be absorbed by RCM, it is rather infuriating that our postage costs have increased 50% in the past 18 months, while the service has deteriorated at an even more rapid rate! And, if you'd like to check out that service, or lack of it, this issue of RCM, which you are now reading, was mailed to each and every subscriber on the 28th day of December 1973. The bulk orders going to hobby shops were mailed two days later. Take a look at the date you received your copy of RCM, as a subscriber, and see just how long it took for the U.S. Postal Service to get this copy from Los Angeles to your home. And, don't be surprised if the hobby shop copies, which were mailed at a later date, arrived several days before your individual mail copy - - - the post office works these magazines as they see fit, and they'd rather get the bundles out first since they take up more space! As we have done over the past few years, we continuously file complaints with the post office but to no avail.

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NSRCA

Ed's Note: The newly formulated National Society of Radio Controlled Aerobatics as outlined in this article by Rhett Miller, a professional Engineer from Tallahassee, Florida, is sorely needed and membership in this organization is encouraged by R/C Modeler Magazine. The NSRCA has the full support and cooperation of this publication. For a membership application, see page 74 in this issue.
---- Don Dewey

● Approximately a year ago, a bona-fide movement was started to form an organization primarily composed of "RC Pattern flyers." A number of well-known flyers were contacted in this initial effort and almost to a person, expressed not only favorable interest in such an organization, but felt that it was needed and could serve a very worthwhile purpose; not only to the flyers but as an advisory group to AMA as well.

An organizational meeting, such as could be put together under the circumstances, was held at this years Nat's with persons of all age groups attending from virtually all areas of the U.S. Those present agreed unanimously that such an organization was definitely needed and asked me to more or less assume the responsibility of getting it "off the ground and running." The success of this endeavor will be directly proportional to the interest, help, and efforts on the part of the R.C. Pattern enthusiasts themselves. It is my personal opinion that an association of this nature can fill the void that now exists among Pattern flyers by giving us a forum from which to discuss various ideas, pattern and rules changes, and most definitely provide a good vehicle with which to assist and advise our AMA leadership.

From the very outset let us state that, at no time in the past nor, at any time in the future, will our organization be used to supplant, replace, or operate outside the framework of AMA. Our organizational structure will be patterned after the other groups such as NMPRA, League of Silent Flight, etc., and will be geared to promoting pattern flying within, not without, AMA.

Since there has not been an "official" meeting of our proposed group and consequently no "official" name given to the organization, I am taking the liberty of naming it as follows: **National Society of Radio Controlled Aerobatics** and will use this name and the initials (NSRCA) until such time as the future membership elects to change it.

The questions most frequently asked when someone is approached about joining any club, group, or society is "what do they do," "what does membership offer me," "what does membership require of me," and last but not least, "what does it cost." I hope the following will answer those questions about NSRCA to everyone's satisfaction:

(1) What does NSRCA do?

Since we are in the formative stages I will only expound on what we propose to do realizing, of course, that growth in NSRCA, as well as the hobby, will open many new avenues. The primary purpose will be to promote and improve pattern aerobatics and thus encourage interest in the area of competition. This is a lofty aim, but is well within reach.

Through the medium of a monthly newsletter we can exchange ideas, air proposals, gripes, congratulations, etc., which heretofore has not been available. Our newsletter would not, of course, replace the Competition Newsletter; bear in mind we will only be concerned with RC aerobatics. How many of you would like to see contest results distributed promptly in order to be aware of "who is doing what." This will also be feasible through the proposed newsletter.

Through "working committees" composed of actual pattern flyers, we will offer valuable assistance to AMA in the area of rules changes, pattern changes, and, hopefully, make available to local C.D.'s visual aids and other materials to help train judges and run a better pattern contest. These are but a few of the things that can be done and many of you will add other worthwhile endeavors that NSRCA can address in the future.

(2) What does membership offer you?

Membership in NSRCA will provide the opportunity to associate officially with a group of individuals whose interest in the hobby primarily parallels that of your own. Heretofore there has been no well defined avenue or ready forum from which the pattern flyer could be heard or have his ideas explored.

Contest Board members have, amazingly, commented to me that seldom do they hear from many persons concerning matters affecting RC pattern. NSRCA can fill this void and become a sounding board in the

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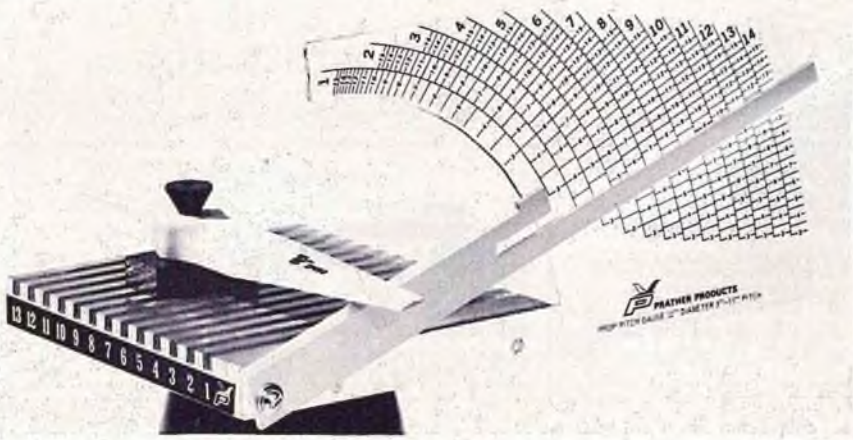
engine clinic

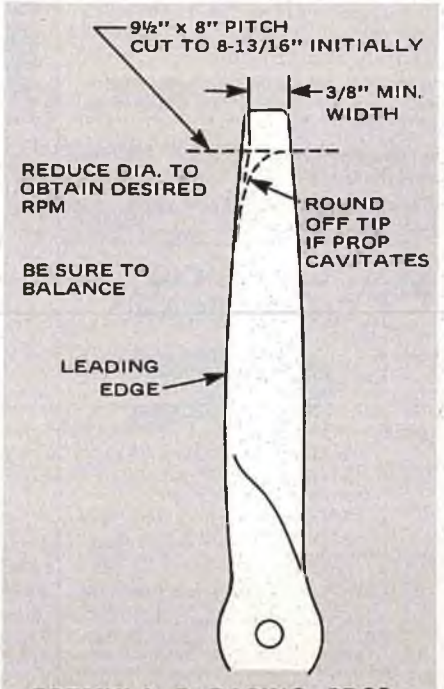
By Clarence Lee



● This past month I received one of the new Prather propeller pitch gauges in the mail for evaluation. An accurate pitch gauge is something every Pylon flier should have and something the competition stunt fliers could put to good use as well. A good pitch gauge is an item that has long been needed for those interested in obtaining maximum performance from their engines and propellers. Although there have been other pitch gauges on the market over the years, they either have never been readily available or had shortcomings. Most were blocks of steel or aluminum that utilized templates thus requiring a set of 8" pitch templates, 9" pitch, etc. These were fine if you were carving a prop, but if you just wanted to check the pitch of an existing prop that fell between your set of templates you had to do a little "guesstimating." The Prather gauge has a movable bar that lets you measure the angle of the blade exactly and find out if the propeller is 7¼ pitch at one point on the blade and 7½ at another. Actually, this type of pitch gauge was first marketed by Franz Kavan in Germany. Most of you are familiar with the Kavan carburetors and line of accessories. However, the Kavan pitch gauge was difficult to obtain and few modelers even knew of its existence. To my knowledge custom engine builder George Aldrich was the only source of the Kavan pitch gauge. Prather Model Products has now made this type of accessory readily available through any hobby shop in the country or by direct mail.

A pitch gauge is nothing more than a means of measuring the angle of the propeller blade at any given point. The angle of the blade determines the pitch of the propeller. An 8" pitch propeller simply means that, in one revolution of the blade, it would theoretically move forward 8 inches, if it were 100% efficient and there was no slippage. The Prather pitch gauge measures the angle of the propeller blade and has this directly transposed into pitch on the scale.

Now many of you are probably saying to yourselves, "what the heck do I need a pitch gauge for? My plane flies great with an 11/8 and this is already marked on the propeller to begin with." While it is true that this item will be of most interest and use to the pylon fliers, those interested in maximum performance from their engines can put it to good use as well.



FORMULA I RACING PROP

First off, just because your propeller may have 8 pitch stamped on the blade does not necessarily mean that it is 8 pitch. Some manufacturer's propellers are more accurate than others. If you were to take six identical propellers of the same make and run them on your engine, you might be surprised to find that only three turned close to the same rpm, and the other three either considerably higher or lower - - - the spread between the highest and lowest turning propellers being 500 rpm and in extreme cases 1000 rpm. Many times fliers will have been using the same propeller for many months and then finally break it. It is replaced with an identical propeller but the engine is now down 500 rpm. Due to the fact that the engine used to turn 12,000 with an 11/8 and now only turns 11,500, the engine must be over the hill. Not necessarily – try another prop as this could well be the cause of the rpm drop. What causes the variance in rpm between propellers of identical size and make? You guessed it – differences in pitch between the individual propellers. Check a few propellers out and you will find the tips of one may have less pitch than another, etc. This, in turn, accounts for the difference in rpm readings.

This is naturally not of as much importance to the stunt fliers as it is to the pylon racers. The pylon fliers, in particular, should not be without a pitch gauge. You cannot just take a 9" or 9½" – 8 propeller, chop off the tips, stick it on the airplane and expect to go. And, yet, this is what many

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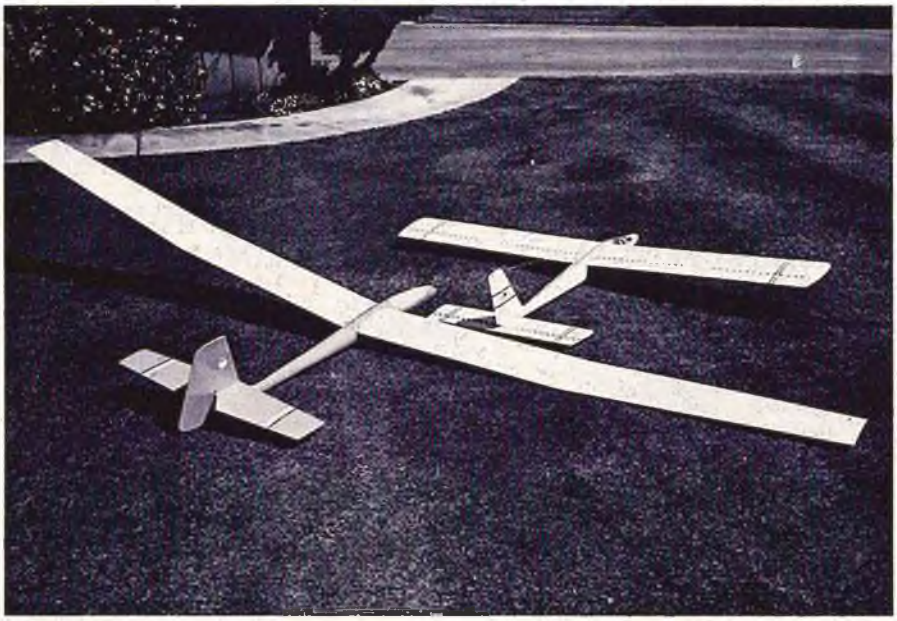
SUNDAY FLIER

KEN WILLARD



The difference between a thermal soarer and a slope racing R/C sailplane. The 'Topsailer,' a thermal design in the foreground. Author's 'Led Sled' racer is smaller, heavier, and 2½ to 3 times faster.

● Throughout this great land of ours there are literally thousands of hills where the prevailing wind blows against them all day long, and the updraft that results gives fantastic lift which the slope soaring enthusiasts enjoy all year 'round.

Until you schedule a contest there.

Last month I told you a bit about the planned RCM Slope Soaring Trophy Races, scheduled for the 6th and 7th of October on a hill in San Luis Obispo, which I named Madonna Hill after the owner, who was kind enough to let us use it after the state had refused permission to use our former site at Sunset Beach. And we really appreciated the chance, too. 1973 was – and is – fast drawing to a close. But, like I said, for the first time in history, a front of weather stalled in the area, and the wind blew in the wrong direction on Saturday, then the rain came on Sunday.

It couldn't happen again – not on Madonna Hill. So the races were rescheduled for three weeks later.

And it didn't. But the Santa Ana winds did. And the wind came from the wrong direction in the morning, and when they shifted later in the day, the velocity was just barely enough to keep the thermal jobs up. So we raced anyway. It was our last chance. And enough of the guys had come with thermal jobs that they could at least finish the course. That is, in some cases, if they headed out over the valley and picked up a thermal which would help them through the course. Honest!

One race was won with an average speed of ten miles an hour! Yet, strangely enough, there were periods when the "lead sleds" could fly, and during one of those periods, Jerry Arana was able to clock the fastest time, and his Boss T averaged slightly over 30 miles per hour. Not anything like the fifty-five mph which we could hit at Sunset Beach, but at least respectable. And then Jerry couldn't finish a couple of races due to lack of lift, so when it was all over Jerry Wolfram came out on top by completing all four races, winning two and placing second in two for the high point score. So Jerry Wolfram has the RCM Trophy for 1973.

And 1974 will be another story. We'll find another slope where the wind blows. Next Spring, not next Fall. So if you have any suggestions, send them to me. All will receive serious consideration.

Be sure, though, that the site really is consistent. Beware of sites where the wind can blow the wrong way, because it will. And then we'll be faced with the wait from the morning wind to the prevailing afternoon wind, and that's pretty frustrating. What happens is that the wind is coming in from the wrong direction, and the local weather experts will say, "It'll shift soon." Then it does, and you get all ready, and it shifts back again. Now that's what some of us oldtimers have come to know as a "bullshift." You can't rely on it. So look ahead to 1974, and tell me about the good sites. The best ones are undoubtedly those by the sea, where the onshore breezes can be relied upon to develop during the day. Perhaps the next best are sites located in a canyon where the wind blows through every afternoon.

Just don't pick a "bullshift" hill.

* * * *

How do you go about designing a slope racer? That's a good question, and from what you will see at any slope racing event, there are a lot of different theories: high wings, mid wings, low wings, flying wings, swept wings, straight wings, and tapered wings. Then there are the airfoils – symmetrical, semi-symmetrical, flat bottomed, undercambered – even reflex. And the tail surfaces – conventional stab, fin, rudder and elevator, T-tail, V-tail, or no tail in the case of the flying wing. Long noses, short noses; long tail moments and short ones. Control modes vary from conventional to coupled ailerons and rudder, rudder and elevator, aileron and elevator. I will say I've never seen one with spoilers for roll control, and that's natural enough, since spoilers add drag. But some jobs do have spoilers just for landing, and they work very well.

So what's best? Who knows? At one time or another, nearly every one of the above combinations has won a race or two. Over the long haul though, up to the present time, two designs have had exceptional success; one is Bob Andris' Peregrine (and all the variations) and the other is the Jalapeno (including Jerry Arana's modified version).

On the longer courses where straightaway speed becomes dominant, the big KA-6 all fiberglass job designed by Jerry Nelson, and now made by Jerry Wolfram and Tom Christian, is hard to beat, but its turning ability does give the pylon polishers a chance to turn inside of it. Also, when the wind is really up, the KA-6 is handicapped because it is so big that it can't be loaded up to its full weight carrying

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CUNNINGHAM ON R/C

BY CHUCK CUNNINGHAM

● Winter is just about the best time for the newcomer to R/C to launch his hobby. Of course, its pretty hard to get your interest built up to a high pitch when the cold winds are blowing and the snow is falling, but when you think about it, winter conditions are just about perfect for building. You don't have many outside attractions to disturb your thoughts, and the lack of grass to mow, leaves to rake, and houses to paint makes for a lot of time to be spent sitting in front of the tube absorbed in other peoples doings. So, get up, get out, and get to building, so that when the good weather comes again, you will be ready.

I have received many letters over the years telling of the trials and tribulations of the fledgling builder/flier getting started for the first time, only to crash his first aircraft, and find that he didn't have time to build another before the bad weather set in. So profit from the problems of others, and plan ahead. If you are a true beginner to this sport, build your first R/C aircraft, and as soon as it is done, begin building the next one. You won't regret it.

As I said earlier in this series, it is a common mistake for the beginner to make his first aircraft the most perfect that he can build. Often he chooses a subject that is too advanced for his building skills, and certainly for his flying ability. For your first few aircraft, keep them simple, and **don't** slather them with lots of dope or paint. If you must add weight to the aircraft that you are building, do it by adding strength in the structure, and extra glue around the nose section, but not in adding an extra pound of paint to the airframe. This is pretty easy to do, so be careful.

Your first aircraft should be one that is expendable. Naturally, you don't want to be seen dragging the sloppiest looking old dog out of your car at the flying field - - - after all, you've got pride! But, that sloppy looking old dog may be a pretty good flier if you took care with the structure, and skimped on the paint. The point is, build it true and strong, but don't try to put a super finish on it - - - save that mirror-like look for the time when you become an expert pilot.

Last month we talked a bit about setting up a minimum workshop, and how to go about constructing your first kit model. This month I would like to take up the ways of finishing your first effort, and some help on installing your radio equipment.

As I indicated earlier, I am against super finishes on early models, so let's make an assumption, or two. First, let's assume that for your first construction project you picked out a Falcon 56, and plan to power it with a Max .19. A great choice, and one that a lot of people have made before you. If you have followed all of the steps in building, then you have reached the point of deciding what material you are going to use to cover the aircraft. You can go several ways. First, you can use silk on the entire aircraft - - - fuselage, wings, etc. If you do, and are a former model builder, then use colored silk and clear dope only, don't use colored dope – it's too heavy. Second, you can use silkspan on the entire aircraft, and double cover the wings and tail sections. Again, use colored silkspan and clear dope, and forget the colors. The first two methods are more for experienced builders. Third, you can cover the wing and tail with any material that you choose, and then paint the finish on the fuselage with epoxy paints. Either Hobbypoxy or K & B Superpoxy paints are great but, again, you should be a somewhat accomplished builder before using these materials. The system that I like the best, and the one that will give the best finish in the least amount of time is to use Solarfilm or some similar iron-on type of plastic material.

Let's make another assumption, and assume that you have decided to give Solarfilm a try. You may buy the expensive equipment needed to get the job done like the experts, or you can use the items that you find around the house, or the time proven (superior) method - - - borrow the equipment from someone else! Most modelers who I know are happy to loan out just about anything that they have. But, if you don't have someone to borrow from then you can get along with a few household items. You can use your wife's iron for sticking down the film to the framework, and her blower-type hair dryer to shrink the film once it has been applied to the framework. If she doesn't have this type of hair dryer, then you can use the iron held about an inch away from the surface as a shrinking machine, or you can use your kitchen range. Turn the burner on medium and move the surface to be shrunk over the hot burner until it shrinks. But, this is getting a bit ahead of the game. First, let's take a crash (bad choice of words, that) course in covering with plastic films.

Make sure that you have sanded the entire structure and that the balsa is smooth, and that there are no little blobs of hardened glue sticking out from the structure. Finish sand with 400 grit sandpaper. You need not get everything super smooth, just get the roughness out of the wood, and the grain laid down. You may notice that if you sand with a vigorous back and forth motion, you can sand forever without getting the blasted thing really smooth. Balsa has a definite grain pattern, and you must sand with the grain, not against it. I don't mean crossgrain, but sand in the direction that the grain flows. If you do this you will find that you can cut your sanding time in half, and you can get a smooth surface rather quickly.

Now, lay out the part that you are going to cover on your roll of plastic film. Cut around the structure with a pair of scissors. Leave an edge of about ½" all around the framework. Let's assume that you are starting by covering the horizontal stab first. Good choice, since it is usually small and easy to handle, and if you screw it up, you can peel off the plastic sheet and start over without much loss.

First, wipe down the stab with a painters tack rag. Next, peel off the clear backing sheet from the plastic covering, and lay the sheet, sticky side down (well, it really isn't sticky, but one side is very smooth) over the frame work of your stab. Lightly pull the sheet into position with your fingers, just being sure that you have it covered with an equal spacing of material all around. Grab your iron, or heat sealing iron, and lightly tack the plastic to the wood. Do this with a swiping motion of the iron, down and away from the edge of the balsa wood. You might experiment first with a piece of scrap balsa and scrap plastic to be sure that you have achieved the correct setting on your iron. If it's too hot you will burn right through the

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BRITTEN NORMAN

BY BUD CHAPPELL

ISLANDER

Britten-Norman Islander BN2-A – what's that? Most people haven't heard of it. Some think the name suggests a seaplane. Some think they know what it is, but mistake it for the Aero-Commander 500. A few sharp aircraft types recognize it.

This situation is quite understandable, since the design hasn't been around very long compared to the more familiar twin types one usually sees as model subjects. The BN-2 series began to be manufactured in 1965-1966 and started showing up all over the world. I personally had never seen a full size Islander and was only vaguely aware that they existed until one day in November 1971.

How many of you modelers out there have been turned on by a centerfold in a magazine – in "Flying" magazine? Well, I was! It was instant mental conversion of that beautiful picture to a gorgeous Stand-Off Scale model. In minutes I knew what I would use for engines, construction – everything. Excitedly I dug into my books, came up with a little publication called "The Observer's Handbook," and found just what I needed to draw plans from - - - silhouetted three-views. A model with approximately 5 feet of span would not be too large and yet big enough to fly well. Since two O.S. 10's (Yes, Mr. Willard, I said 10's) had been pulling my scale 5 pound PBY5 around the previous summer, I decided they would again do the job nicely.

If you are surprised by the last statement, let us have a word here about twin engines. Some phenomena occurs when two small engines are paired up. It is natural to assume that two .10's would provide the power of a .20, but that ain't so! Because of the total propeller blade area, (you engineering types can correct me on this) you have pulling power similar to a .30. I have used this combination on three previous planes, and have experimented with different types, sizes and pitches of props, to get the best performance. Two .10's with Top Flite 7/6 nylon props will pull like a .30 – two .15's with 8/4 or 8/6 give power at the .40 or .45 level. For example, when onlookers examine my PBY5 flying boat and inquire about the size of the engines, their reaction is total surprise, and they remark that they thought they would be .30's, or something like that. When they see what these engines can do in flight they are amazed. So much for the cause of the small engine, and back to the design. As the scale and sizes worked out, 2" wheels all around were just right: 4 ounce tanks would cowl in well; the scale control surfaces would be fine, but for a little insurance, enlarging the stab and elevator seemed prudent. Construction details were weighed and worked out, and building was begun.

Some hints at this point might be helpful. The wing is probably the hardest part of this model to build, but it is not as difficult as it is unusual. The plywood center section spars are laid out first followed by the lower balsa spars and ribs. After the leading edge, upper spars, and sheeting have been put on, the trailing edge with ailerons should be added. MonoKote hinges on the ailerons proved to be excellent, providing an air tight seal over the joint. Add the bellcrank supports, bellcranks and linkage. As the ailerons and linkage are installed and adjusted, be sure to rig the ailerons approximately 1/16" above neutral – an old trick to get more wing tip control at low speeds and minimize snap tendencies. Much credit should also go to the vortex tips that contribute heavily in this area.

The plywood engine mount plates are next. Hardwood blocks are glued in place and drilled to provide engine bearers. Landing gear parts are formed and attached. Fuel tanks should be strapped in, and balsa rails glued alongside the tanks, which form the bases for the carved cowlings. Add the fairing blocks behind the main gear legs, and ahead of the leading edge, and the wing is ready for engines and manifolds, servos, and linkage.

The fuselage should be built in two box-like sections, and joined only after the wing hold-down screws and blocks have been aligned and fastened. This area is critical due to the unusual condition of the wing bolts having to handle not only the wing stresses, but the engines and main landing gear as well. It is essential that extra care be taken in making this area strong and correct, or a hard landing could yield some surprises in the "crack-and-strain" department. The nosegear is 1/8" music wire fitted inside a section of brass tube to which a brass glue plate has been soldered. A drop of solder on the top of the wire prevents the gear from falling out after the unit is slipped into place in the nose block. Epoxy glue is the proper fastener here. The square box directly behind the nose block provides a natural spot for the battery. In a fuselage as wide as this one, keeping this weight exactly centered is a good idea. The box also soaks up and distributes landing shocks very well.

The tail surfaces, with the exception of the stabilizer, are made of 1/4" sheet balsa. Control horns are hidden, the rudder having its own inverted tiller bar as the plans show. The elevator horn is placed inside the tail block which is grooved to permit the travel required and also accomodate the nylon pushrod connector.

The entire model is covered with white Super Mono-Kote. Red, gold, and black accent stripes are used to imitate the color scheme of the original aircraft featured in "Flying" (November 1971) magazine. Windows are black MonoKote. Fortunately, the radio antenna wire is in the scale position. Banner wheels with the new white hubs are perfect for the main gear. Add white spinners, registration numbers, landing light lenses, wing position lights, and your favorite radio rig. Be sure to twist the wing panels as they are MonoKoted to provide washout at the tips. 1½ degrees is about right. This trick makes a flat wing think it has dihedral, and improves handling markedly.

Quite a bit of time was spent trying to devise a method of holding the cowlings in place. Many ideas were considered, and finally I hit on an easy way to do it: Three blades of aluminum, two on one side and one on the other, are forced into slots cut in the rails of balsa on the engine plates. The rails and blades are then drilled, and #2 wood screws are used to pin them in place. Matching slots are cut into the balsa cowls, and the cowls slip onto the secured blades in the rails. The cowls are then also drilled, and screws put in place to hold them on. To remove the cowls, take the screws out of the cowl parts only, and pull them off.

The finished aircraft was ready for test flights in March 1972. A Controlaire 4 channel single stick system was installed. Having had very little experience with ailerons, I decided I would use the lateral function of the stick for rudder, the rotary portion of the knob for ailerons, and for the flight tests, at least, keep the model's controls similar to three channel types with which I was more familiar. Flight testing a new plane is not the time to learn new pilot techniques!

Arriving at the club field, I proceeded to warm up and adjust the engines. Because they are inverted, an upside down starting position of the model is essential, and a padded field box makes the job easy.

After running the engines two or three times to check

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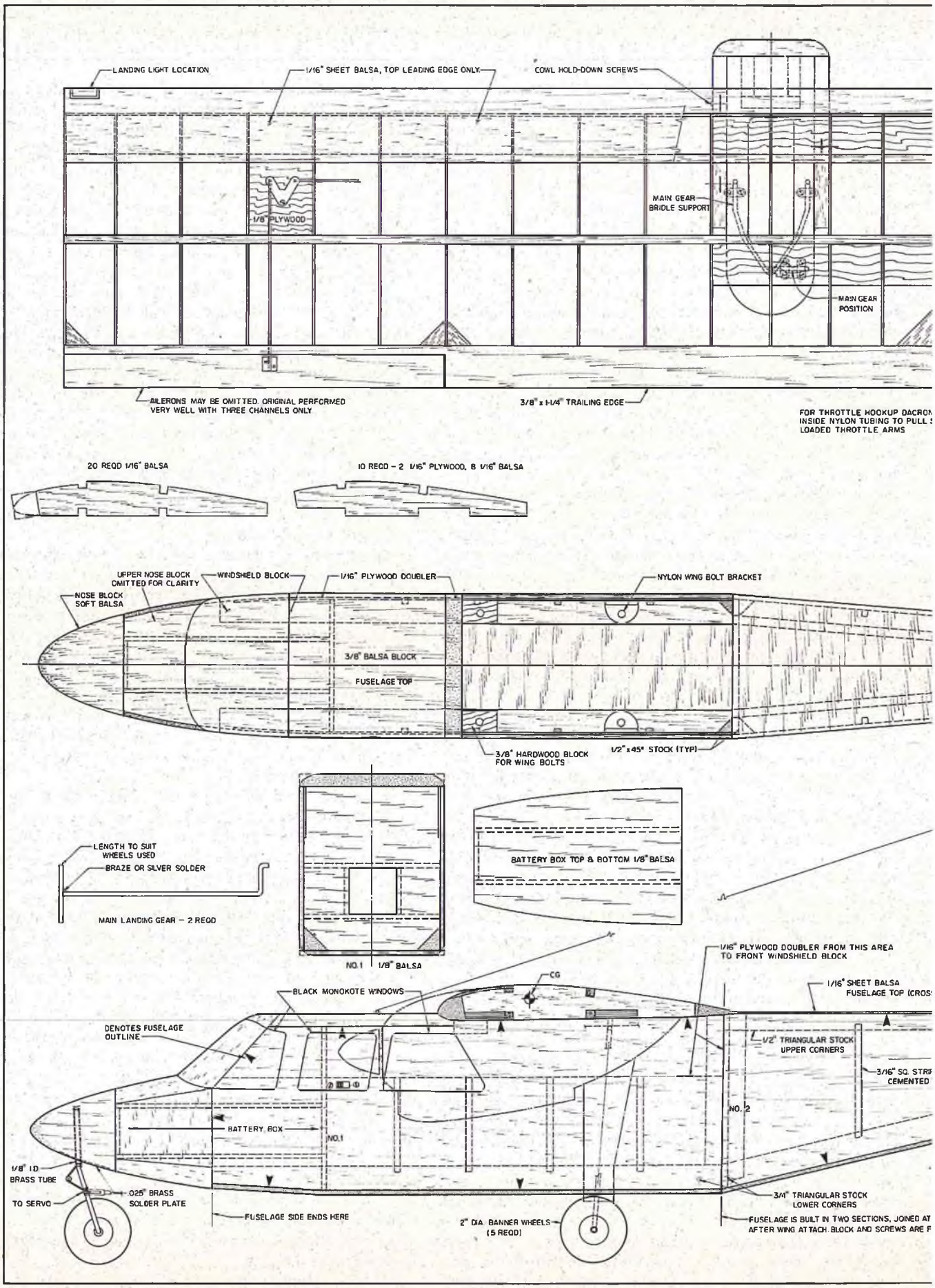
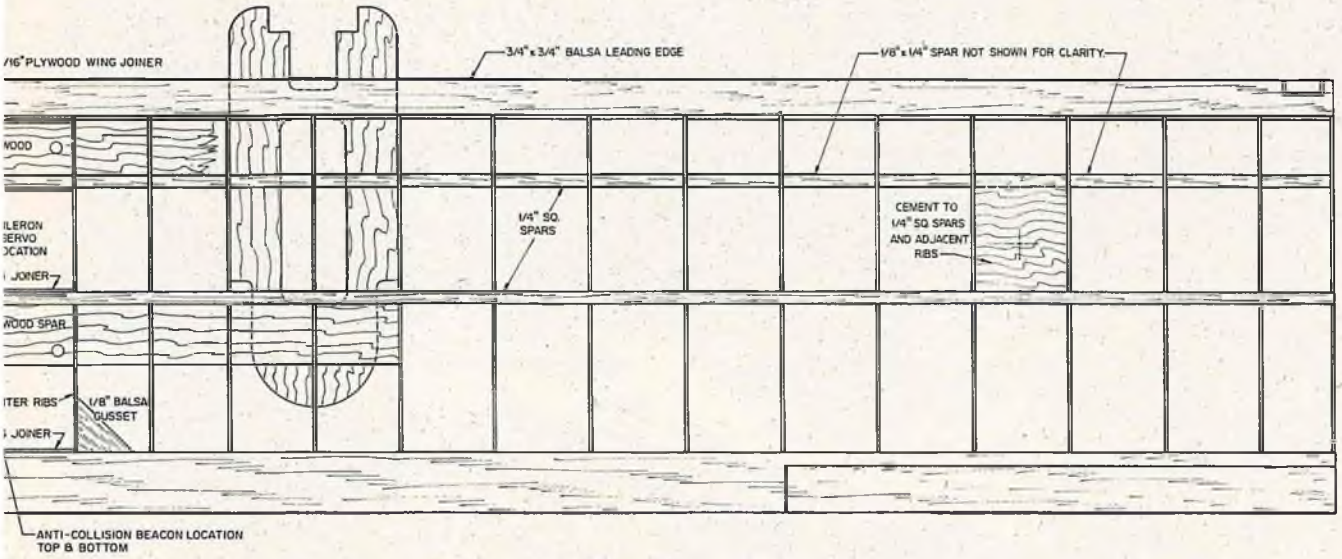
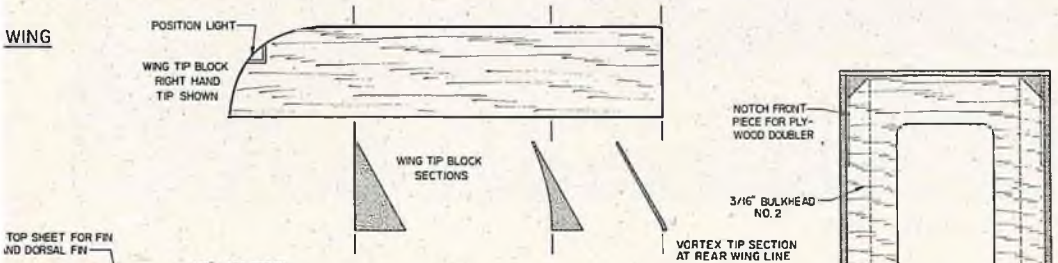
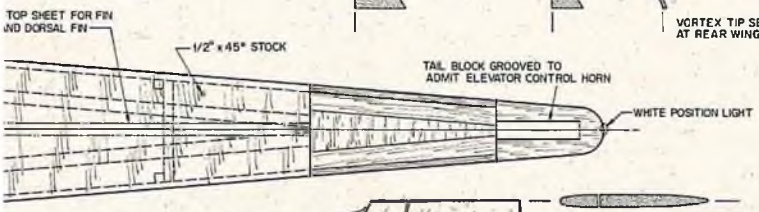

LANDING LIGHT LOCATION
1/16" SHEET BALSA, TOP LEADING EDGE ONLY
COWL HOLD-DOWN SCREWS
1/8" PLYWOOD
MAIN GEAR BRIDLE SUPPORT
MAIN GEAR POSITION
AILERONS MAY BE OMITTED. ORIGINAL PERFORMED VERY WELL WITH THREE CHANNELS ONLY
3/8" x 1-1/4" TRAILING EDGE
FOR THROTTLE HOOKUP DACRON
INSIDE NYLON TUBING TO PULL
LOADED THROTTLE ARMS
20 REQD 1/16" BALSA
10 REQD - 2 1/16" PLYWOOD, 8 1/16" BALSA
UPPER NOSE BLOCK OMITTED FOR CLARITY
WINDSHIELD BLOCK
1/16" PLYWOOD DOUBLER
NYLON WING BOLT BRACKET
NOSE BLOCK SOFT BALSA
3/8" BALSA BLOCK
FUSELAGE TOP
3/8" HARDWOOD BLOCK FOR WING BOLTS
1/2" x 45° STOCK (TYP)
LENGTH TO SUIT WHEELS USED
BRAZE OR SILVER SOLDER
MAIN LANDING GEAR - 2 REQD
NO. 1 1/8" BALSA
BATTERY BOX TOP & BOTTOM 1/8" BALSA
1/16" PLYWOOD DOUBLER FROM THIS AREA TO FRONT WINDSHIELD BLOCK
CG
BLACK MONOKOTE WINDOWS
1/16" SHEET BALSA FUSELAGE TOP (CROS
DENOTES FUSELAGE OUTLINE
1/2" TRIANGULAR STOCK UPPER CORNERS
3/16" SQ. STR CEMENTED
NO. 2
BATTERY BOX
NO. 1
1/8" I.D. BRASS TUBE
TO SERVO
.025" BRASS SOLDER PLATE
FUSELAGE SIDE ENDS HERE
2" DIA. BANNER WHEELS (5 REQD)
3/4" TRIANGULAR STOCK LOWER CORNERS
FUSELAGE IS BUILT IN TWO SECTIONS, JOINED AT
AFTER WING ATTACH. BLOCK AND SCREWS ARE F

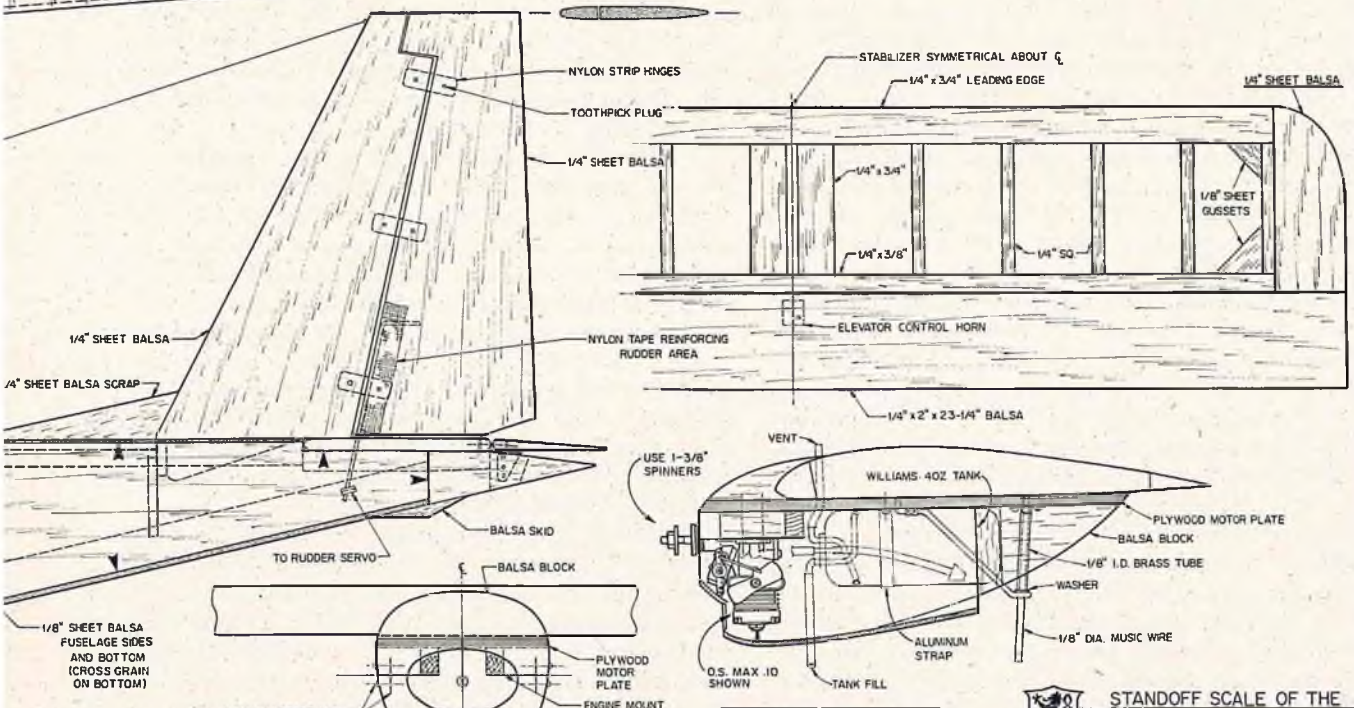
FULL SIZE PLANS AVAILABLE – SEE PAGE 118



WING







WING SPAN—60"
WING AREA—540 SQ. IN.
LENGTH—42"
WEIGHT—4–5 LBS.
ENGINE SIZE—(2) .10 CU. IN.
FOR EXPERIENCED FLYER

STANDOFF SCALE OF THE
BRITTEN-NORMAN
ISLANDER

DESIGNED BY	BUD CHAPPELL	DRAWN BY	HERMAN LUEVANO

0 1 2 3 4 5 6

HL

Normal take-off rotation. Twin .10's more than adequate power.

rpm and fuel feed and with the model held in a nose-high position, taxi tests were begun. Only fair directional control was possible on the grass strip. The nose wheel being a full swivel type did not permit short or accurate turns, and was tricky on the take-off run. Nevertheless, it was now or never!

At full power the model accelerated slowly, bumping over the uneven surface. Quickly the bumps became hops and a little up elevator rotated the plane and then the nose lifted. One last hop on the main gear and it was climbing - - - and flying! Beautifully!

A straight-out climb was maintained until a safe margin of altitude allowed a shallow left bank. Control response seemed solid and accurate, and the climb proceeded to 300 or 400 feet in order to test maximum control maneuvers. Loops were crisp. Steep turns did tend to get steeper, but with no dihedral whatever this may be normal and expected. Slow flight showed the wing and the unusual vortex tips worked – no snap tendencies through the stall; in fact, the stall turned out to be a flat mushy turn to the right.

With my nervous tension ebbing, I flew a couple of passes over the runway at different power settings to get the feel of the approach and to test throttle response. On the next downwind leg, I closed the throttles and turned on base. On final, the model seemed to be picking up speed, and it turned out that if it is not flown to a landing at a shallow rate of descent, it does come in too hot. In fact, I nearly overshot the runway!

As I stopped the engines, I suddenly realized I had not used the ailerons at all! (Who, me nervous?) I promptly refueled the plane and attempted another take-off. The model veered to the right. Another run was tried and halted for the same reason. By holding the rudder and running the engines to full power, a nice take-off was accomplished. The second flight was excellent and the ailerons tested well - - - no trim changes were needed!

The first modification was to the nose wheel. A tiller bar was soldered to the nose wheel fork and connected to the rudder servo with a medium stiff piece of 1/16" wire. A nylon pushrod end was used on the tiller to avoid possible radio noise and to break loose in a hard landing situation instead of transferring the shock to the servo.

Another modification was the addition of an anti-collision beacon system worked up by club member Ken Lund; the two transistorised lights were mounted in the scale positions. They are more of a novelty than anything else – they can only be seen if the model is flying at dusk, at altitudes under 100 feet, or taxiing out for take-off. But a little more realism doesn't hurt, does it?

Having flown this model in excess of 40 flights to date, I think it can open up the twin-engine field to the average builder and flyer. He will be rewarded with success without going through the painful slowly-built scale route that often ends up with a terribly overweight craft that often does not survive flight tests. The Islander is no harder to fly than the average pattern ship, provided careful attention is paid to engine selection and tuning. Try this capable addition to the great aircraft of the world. As a matter of record, the prototype took three second place trophies in scale events at Rhode Island, New York, and Connecticut in 1973. So, give Scale, and the Islander, a try. □

A few cans of Aero Gloss dope, a sheet of cardboard, a tack rag, and some lace - - - all you need to paint like a pro in sixty minutes.

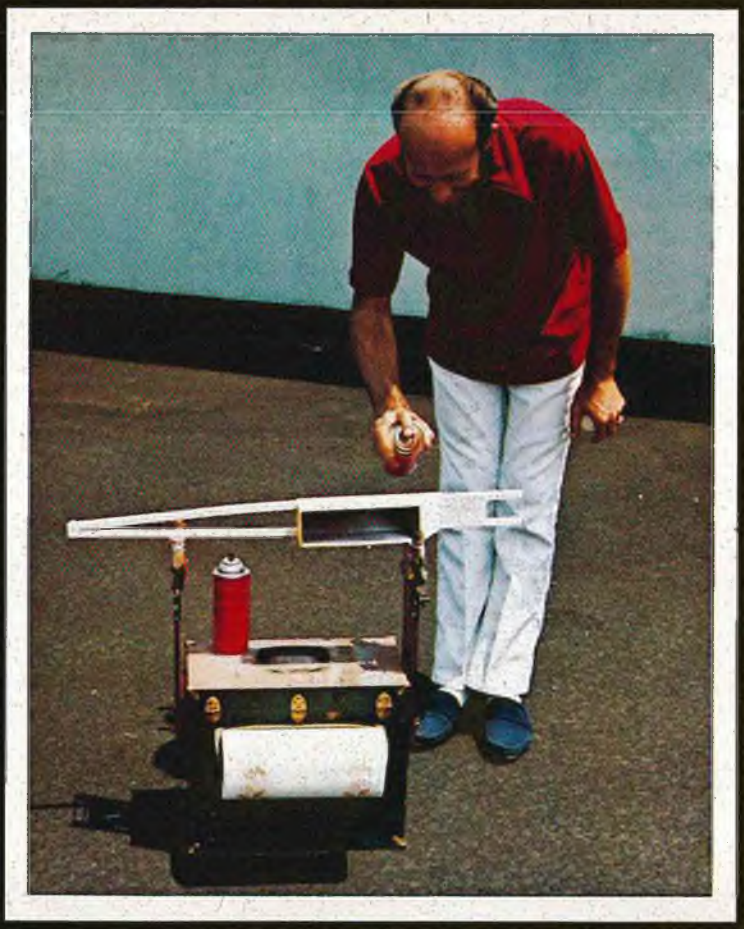
BY GEORGE CHABOT

PHOTOS BY DON DEWEY

PAINT LIKE A PRO

Shoot on 2 or 3 coats of clear; let dry between each coat approximately 15 minues in warm weather.

Sand lightly with #320 sandpaper; this can be done dry. Go over surface with a tack rag.



TOP: Spray the white on for a base color coat, white makes any color, even black, look better; red is redder; yellow is yellower, etc. Let dry about 20 minutes, then sand lightly with the #320 sandpaper used dry. ABOVE: Decide what kind of pattern you want: round, teardrop, lace, etc. Cut the proper shape out of the light cardboard, or if you want lace, select the appropriate pattern.

● Did you ever look at some of the planes at a Pylon race or a Pattern contest and wonder how in the world they ever got such a fabulous finish?

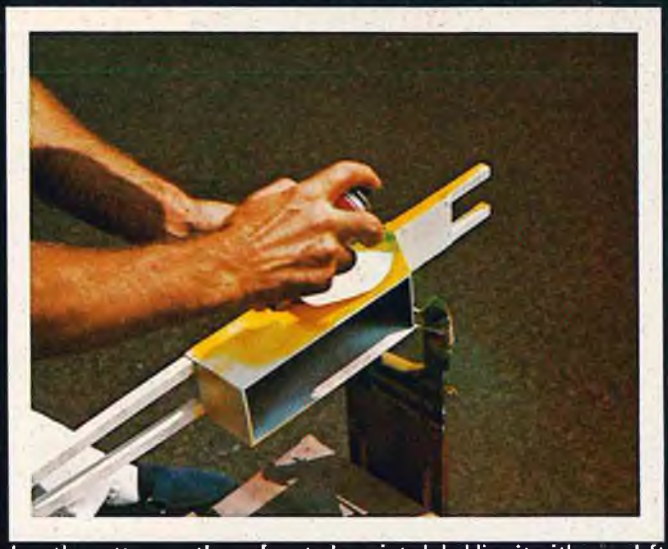
Well, it is no secret, it just takes a lot of hard work and plain old elbow grease, sanding, rubbing and polishing to achieve that kind of paint job. However, don't despair, there is something that can be done quickly, inexpensively, and without an airbrush or fancy spray gun.

If you have ever used a can of spray paint, you can come up with a very eye catching paint job on that new, super special ship of yours that you have just completed. The new airplane is done, finally, after weeks, maybe months, of gluing, sanding, shaping, and nagging from the wife; the dog is not sure he knows you any more and has been snarling at you at dinner time. You are sitting in the shop, the balsa dust has settled, the aircraft is sitting on the bench, stark naked, no paint, MonoKote – no nothin' – just bare, smooth, clean, pure balsa wood. You ask yourself, what color this time? You used pre-World War II yellow and blue navy colors last time; you are tired of red with white trim, besides that the wife asks you why you don't paint one a different color for once? Okay, why not?

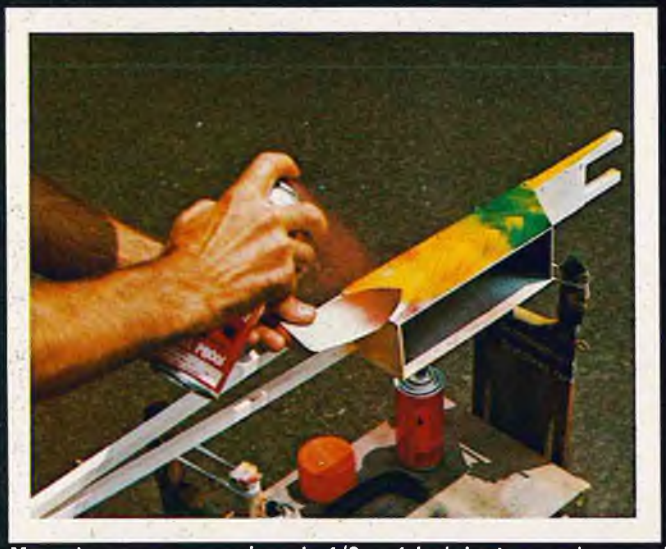
The paint method we will show you in this article is known as "trick-painting" in Bike and Van language, however, the only trick involved that I have found is in trying to keep the paint off of your thumbs. Rather than spend pages on a lot of talk about this type of painting, we will show you how with a series of photos. The materials you will need are several different colors of your favorite spray dope (I use Aero-Gloss), a can of clear and a can of white, some good grade of masking tape, some thin cardboard such as a manila folder to cut the masks from, some 320 grit wet-or-dry sandpaper and, if you want to try the lace bit, go to the fabric shop and get some open weave lace. Also very important, is the tack rag – don't forget this!

Now make sure the fuselage or wing, whichever you are going to paint, has been sanded smooth and sealed with your favorite method of sealing. There has been many excellent articles written on sanding and sealing so I will not go into that. Now, before you put any paint on that new creation of yours, pick out something to practice on. Find a nice flat surface, like the side of your neighbors car, or

Mask off anything you don't want painted on, or are going to paint another color.



Lay the pattern on the surface to be painted, holding it with your left hand, and spray away from you. Use a very light touch on the spray button.



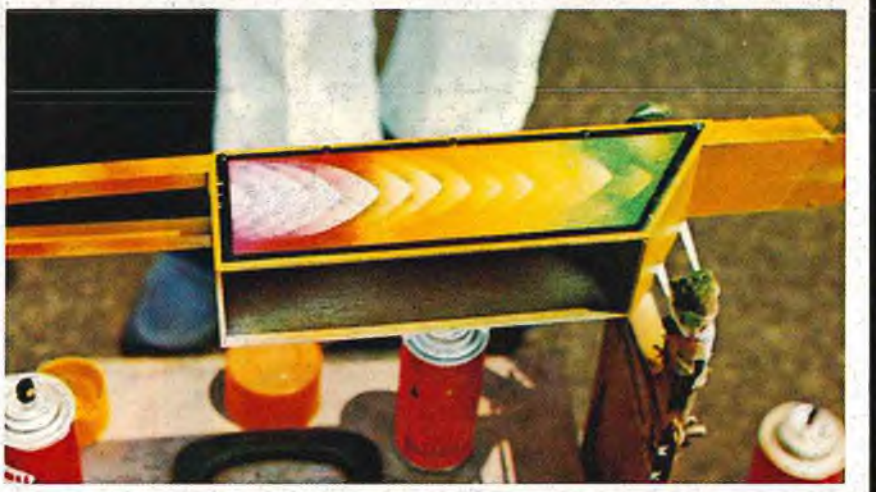
Move the pattern approximately 1/2 to 1 inch back toward you and repeat the spray. Now you can change colors if you wish; for example, if you started with green, change to yellow, then orange, then red, then purple, etc., as far as you wish.

If you want the lace bit, it is even simpler. Lay it on the surface, spray lightly, and presto – instant lace. Pick it up right away or you will have the lace stuck to the plane.

A lace pattern is impressive, and even easier to do. Looks like a custom bike and van finish.

Now if you want a border, you can wait overnight for everything to dry hard or you can do what the author does and use a hand-held mask and spray the edges.

a section of white wallboard, and then practice your spraying techniques. Keep the arc constant – that means that the spray should always be an equal distance from whatever you're painting. Don't be flipping the can back and forth but, rather, move your whole wrist along the surface. You'll also have to experiment with how far away your spray can should be from what you're painting. It'll probably work out somewhere in the neighborhood of 12 to 18 inches. Keep practicing till you think you've got your act together. Then you're ready to work up your own little spray booth. Hot tip - - - a good place to paint is definitely **not** your backyard.



The finished border. Much easier than masking. Clear, sharp lines possible if proper technique is used.

Now spray the whole thing with 3 or 4 coats of clear dope; this is important as it really brings out the colors and gives a high gloss. After a few days you can rub it out if you wish using a fine rubbing compound such as DuPont white or Sig fine compound.

Finish on fuselage can match Solarfilm on wing if proper color combinations are used. Cub Yellow base with Stearman Red overspray used in this photo. Lace pattern does not show at this camera angle due to light reflection.

The wind; your wife's cat wanting to see what you're doing; a leaf falling off the old pepper tree - - - get the point?

Now clean – really clean – a section of your shop. Pick a spot that's near a light socket, or run a light nearby. Put a giant light in it so you can see what you are doing. When you clean, make sure you dust off the rafters and so forth. If you don't, just as soon as you hang the ship up and shoot one side, and then turn it to do the other side, dust will give you an

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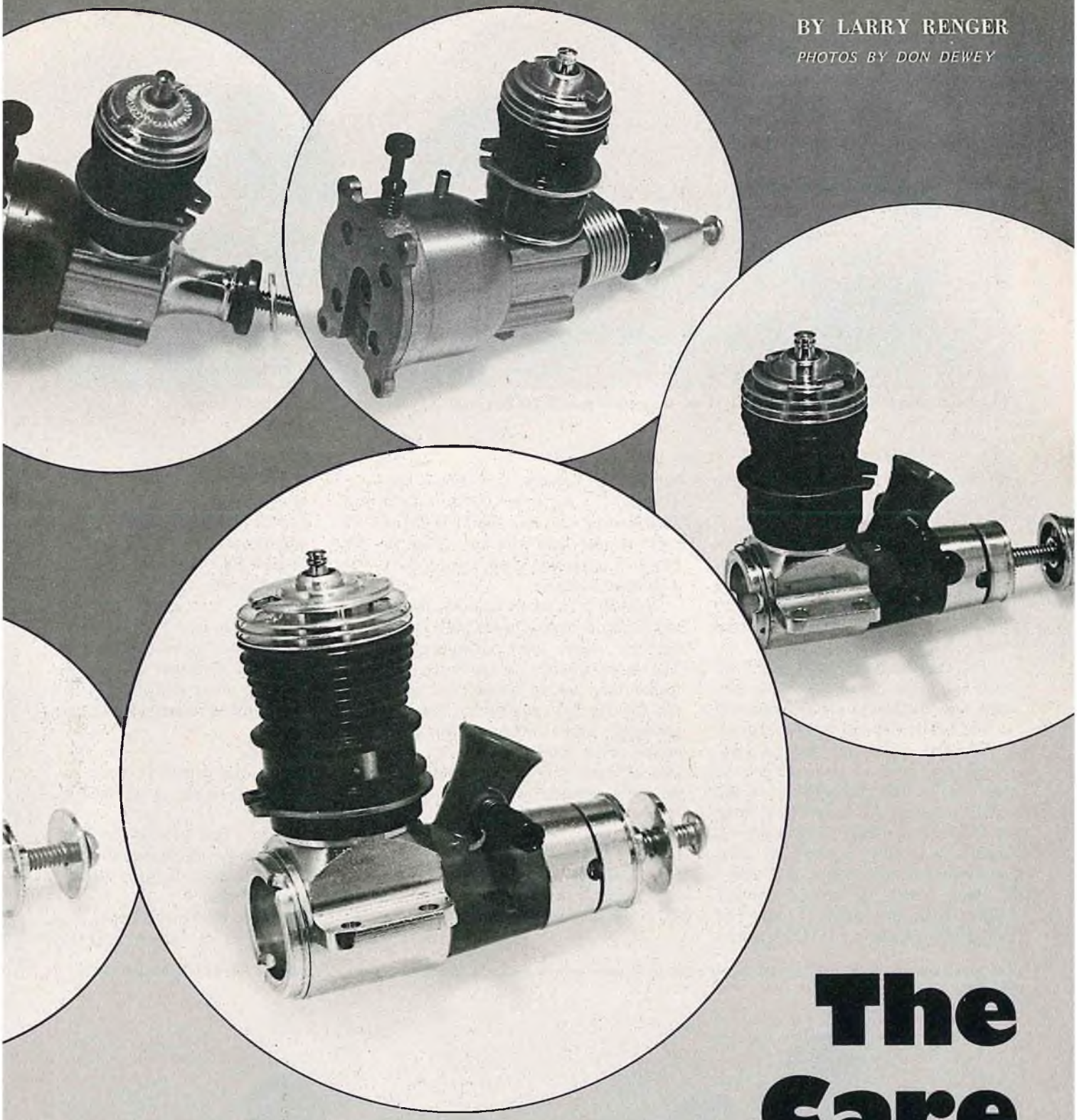
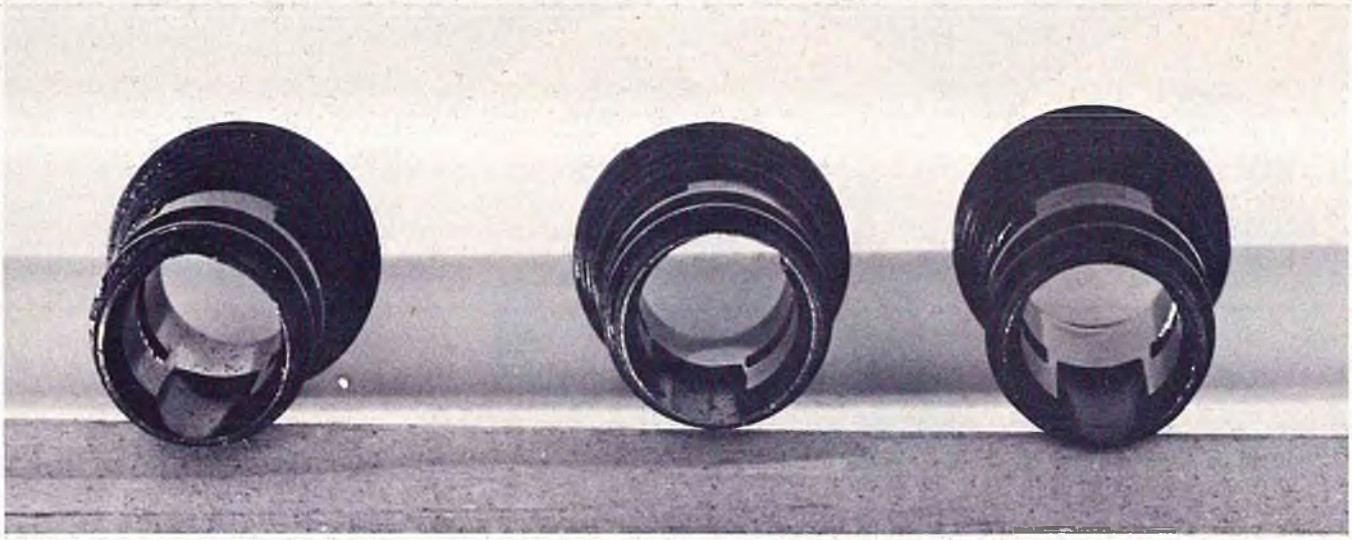
BY LARRY RENGER
PHOTOS BY DON DEWEY



The Care of Small Engines

A large percentage of small engines are mis-treated to rapid oblivion by even the most knowledgable modeler. Properly handled, the .15 and smaller engine is smooth running and reliable, produces incredible power, and will last for years. Here's how . . . . . .



Twin ports allow more gas to flow than the single; the more expensive Tee Dee is cut out even further for peak performance.

● Most of the model engines in the world are .049 size. Take that, you big engine fliers! Really, L.M. Cox Manufacturing Co. has turned out millions of engines, all but a small fraction of which are .049 size. Unfortunately, a large percentage of these engines are mis-treated to rapid oblivion by even the most knowledgeable modeler.

Properly handled, a small (.15 cubic inch and less) engine is smooth running and reliable, produces incredible power for its size and weight, and will last for years. There are, though, a few things you need to know to get the best results. The chief enemies of the small engine are dirt and varnish. None of you would dream of taking a .60 engine you just crashed in dirt, sloshing some fuel over it to "clean" it, then starting it up for another flight. This very thing is done by practically everyone to 1/2A engines supposedly because they don't last, anyway. If you run an .049 in a clean environment on clean fuel, it will last much longer than you are willing to buy fuel; certainly it will run for over a hundred hours.

Varnish is an amber colored coating which forms on the inside walls of the cylinder under some circumstances. The more varnish on the walls, the higher the running temperature gets, and the worse the engine runs. Varnish generally forms when a tight new engine is run too lean; it can accumulate sufficiently in even the very first run to convince you that you have a "bad engine."

The basic areas of small engine handling break down as follows:

1. Starting
2. Break-in
3. Propeller choice
4. Fuel
5. Maintenance
6. Mounting
7. Mufflers and Throttles
8. Modifications
9. Trouble Shooting
10. Miscellaneous

The rest of this article will deal with each of these areas in detail. Once you have a good knowledge of these basics, you will find that you can get reliability you never thought possible out of even the smallest glow engine.

1. STARTING

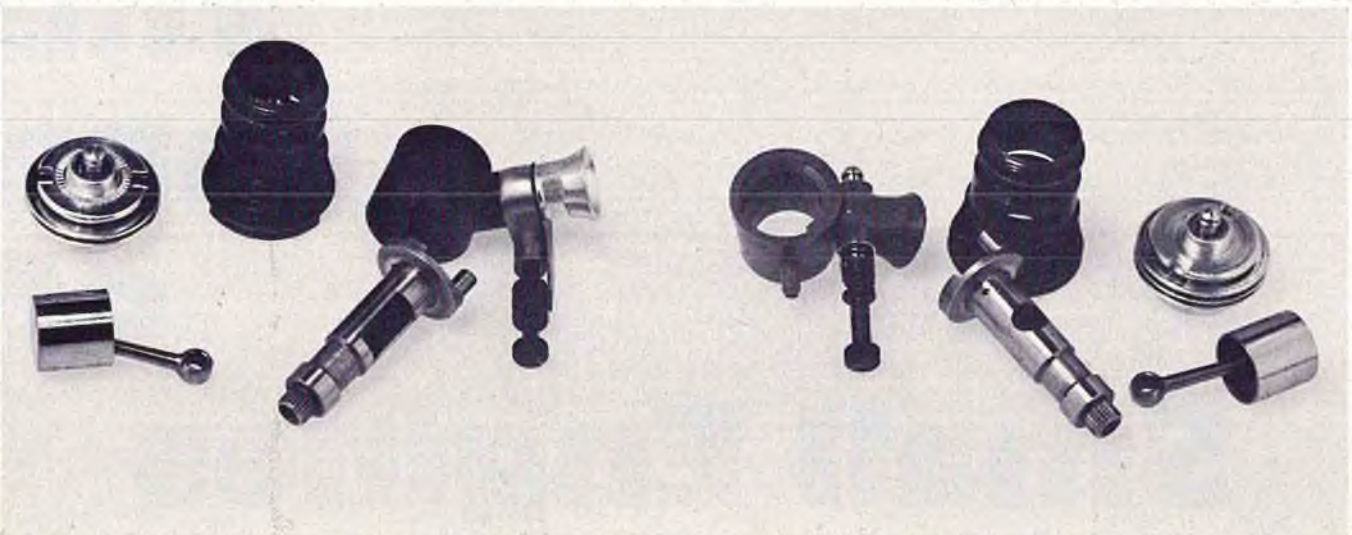
(a) Mount the engine firmly using the appropriate screws as outlined in section 6.

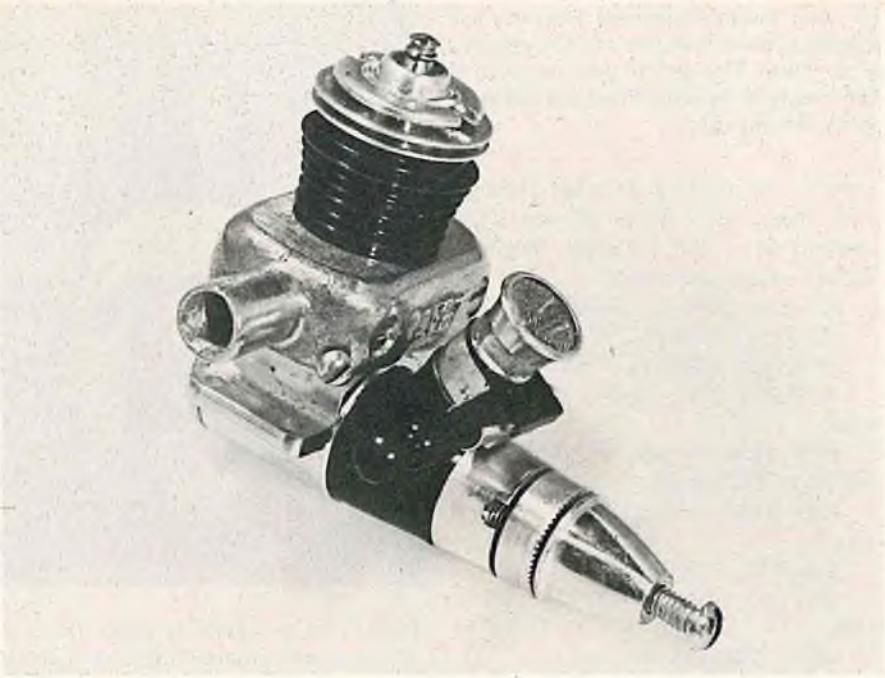
(b) Set up a fuel tank, if required, on a level with the needle assembly.

(c) Mount a break-in prop of the size shown in section 2.

(d) Open the needle valve up to the specified number of turns and fill the

The added complexity of the Tee Dee engine adds up to extra rpm in the air. Costs more to make, though. Tee Dee on left, Medallion on the right.





Add a QZ cylinder and a Tatone muffler for a silent Tee Dee.

tank.

(e) Prime the engine and flip the prop half a dozen times.

(f) Hook the plug to the battery, re-prime, and start flipping.

(g) On small engines, restrain your urge to prime at the venturi, they love port prime. Each time it runs out the prime, shoot it with some more fuel. The engine should fire up rapidly.

(h) See break-in, section 2, for instructions if this is the first run on your engine. Otherwise, disconnect the battery, tune for peak power, then back off a bit on the needle setting. Most tank set-ups lean out through the run, so a slightly rich run at first is good.

(i) In case you do flood the engine, close the needle valve down, blow hard through the ports, and flip the prop until the flooding has been run out. Restart as normal except with a slightly leaner initial setting.

2. BREAK-IN

Not necessary, you say? Bah! This is a misunderstanding dating from the bad old days when you normally disassembled your new big engine, lapped it to fit, then gave it a several hour bench run to get it flyable. About ten hours of air time later, it would be running right. Compared to that, a Babe Bee or Thermal Hopper was ready to go out of the box. In reality, Cox engines have always recommended at least a 1 minute break-in, something they rarely get.

My own procedure is somewhat longer, but amounts to all of about 5 minutes. Big deal! Generally, I would recommend the following props for first runs on these engine sizes: .15 – 8/4 cut to 7½/4 Cox Grey; .09 – 7/3½ cut to 6½/3½ Cox Grey; .049/.051 – 5/3 Cox; .020 Tee Dee and Pee Wee – 4½/2 cut to 4/2 Cox; .010 – Stock Prop.

Use a mild fuel equivalent to Cox Custom Blend down to .049 and Cox Racing on .020 and .010's. I prefer to add about ½ ounce of Hoppe's No. 9 gun cleaner per pint of fuel. This stuff cuts the varnish out of your engine as it forms, so there is less chance of overheating or seizing. I found, while living at high altitude in Colorado, that even an .09 could not be run without gun cleaner for any length of time without heavy varnish formation. Three tanks was about the limit on an .049 before de-varnishing was a necessity.

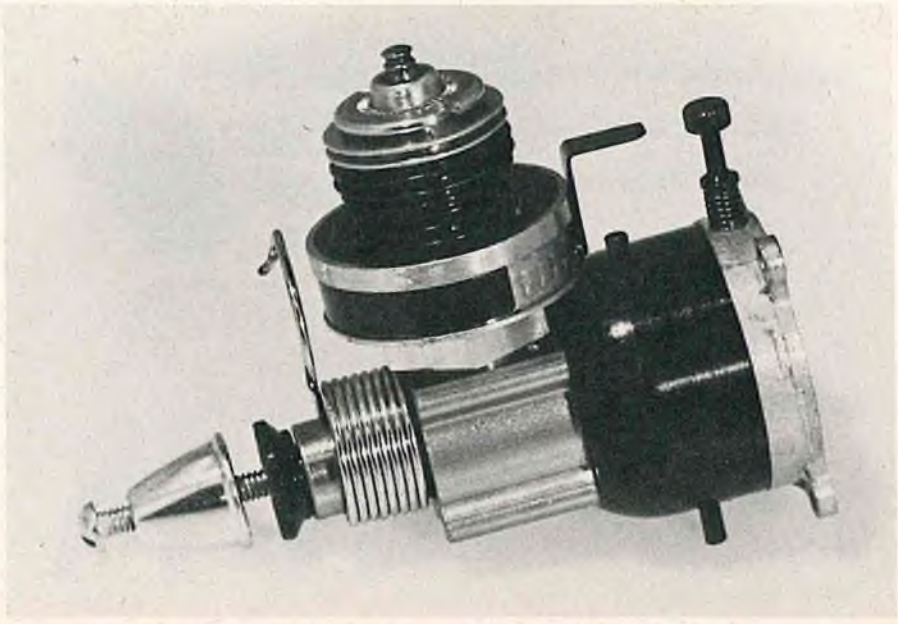
The first run should be kept with the battery on at a very rich four-cycle for about a minute. Then, slowly rev the engine up to a two-cycle peak. Back off immediately to a lean four-cycle for a few seconds to let it cool down. You can now take the battery power off. Continue this up and down cycle for about 5 minutes, increasing the peak time bit by bit. By this time, you should be able to run at peak rpm continuously on your break-in prop without the rpm sagging off. If not, check the engine for varnish or other tightness as described below. Should all be well, give it 5 more minutes run time.

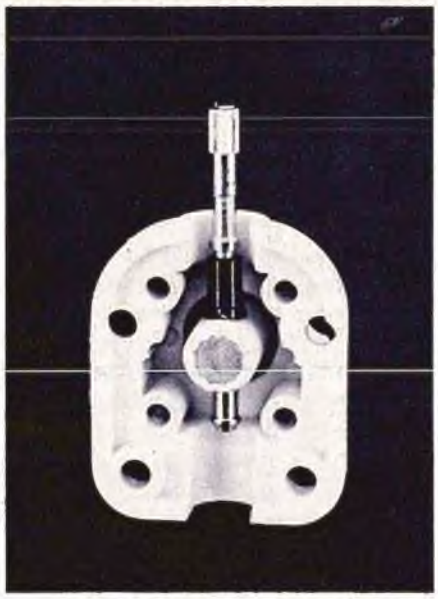
This should be all the careful break-in required for Cox engines. Check the instructions of other brands for the specific requirements. For about the first hour of running, the engine should be run just a bit rich and possibly on a slightly smaller prop than you eventually want to use. Always be alert for signs of the engine "sagging off." If it does, check for varnish formation.

3. PROPELLER CHOICE

Propellers are what make the plane go. Turning a prop is the name of the whole game. Optimum performance results from a complex balance of

Quiet running is a modern necessity. The QZ kit fits all Cox reed valve engines.





For light weight, convenient mounting and easy use of clunk tanks, the #1245 carburetor is the thing. This carb is used on most of Cox's ready to fly ukies. Front and rear views shown, left and right.

prop diameter, pitch, blade area, the engine, airplane, fuel, and weather conditions. In general, the faster the airplane, the higher the prop pitch, the larger the airplane, the larger the required prop diameter. Of course, this means that a big, fast airplane needs a large diameter high pitch prop which could call for a bigger engine. So you must first be sure the aircraft is compatible with the power available from the selected engine. Usually the engine is specified on your model plans. Once that has been settled, the trick is to select a prop which will allow the engine to run within its ideal operating rpm region.

Each engine will run best over a limited rpm range. Outside that region, the needle valve setting becomes critical; overheating or other damage can occur. For those of you with tachometers, the "happy engine" ranges are approximately:

.15 sport, 9000 to 16000 rpm.

.09 T.D., 12000 to 20000 rpm.

.09 Other, 10000 to 17500 rpm.

.049/.051 T.D., 16000 to 23000 rpm.

.049 twin bypass & medallion, 14000 to 18000 rpm.

.049 single bypass, 13000 to 17000 rpm.

.020 T.D., 17500 to 25000 rpm.

.020 Pee Wee, 15000 to 19000 rpm.

.010, 22000 and up rpm.

High rpm props generally go with higher nitro fuels. RPM is much more influenced by prop diameter than pitch, so don't be afriad to trim a slightly oversize prop down to get your rpm to where you want them. For peak performance, stock props should be the exception, not the rule.

Sport flying isn't so critical, so the emphasis should be on easy engine running characteristics. That means milder fuels and smaller props so the engine runs at high rpm with less than the absolute peak power output possible.

4. FUEL

I hate to sound commercial, but I preferred Cox fuels for years before I was employed there. Now that I work for Cox, I can see that this is justified. The materials are quality checked, the cans are checked, the batches mixed and checked, then the final canned fuel is checked. All that, and a built-in filter cap, too! Many other brands of fuel will work well too, but you just have to experiment on your own.

The main thing to remember is to filter your fuel just as it goes into the tank. Don't suck fuel into your filler bulb through a filter, squeeze it back into the tank through the same filter and think you did any good. You can only push fuel through a filter in one direction and expect it to work.

For all but .020, .010 engines and competition use, I run Cox Custom Blend (identical to TRC) fuel. The really small stuff needs the higher Nitro of Cox Racing Fuel (30%). For competition, even higher nitro is in order; the level will depend on the model, engine, use, and weather.

All Cox fuels still use pure castor oil for lubrication with one exception. Just going on sale now is "Glow Power," using a synthetic oil developed especially for L.M. Cox Mfg. This fuel is a sport fuel which provides about 10% more "miles per gallon," and costs less per can, though at the cost of about 250 rpm off the top end of all but the Tee Dee .010, where it adds that many for some reason. Added features of the new fuel are less tendency toward varnish formation, and it does not gum up after sitting in the engine or tank.

5. MAINTENANCE

There are a very few causes of bad

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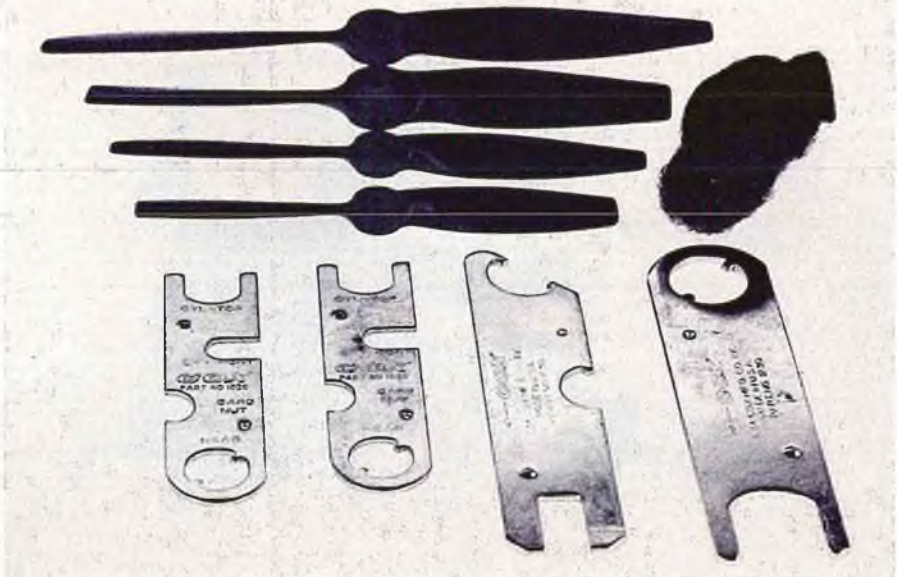
Cut down and balanced props for break-in, the correct wrenches for disassembly, and steel wool for varnish removal make all the difference in Half-A flying.



WWI Western Front

BY KEN WILLARD

The Second Annual WW I Western Front Jamboree at the Hill Country Air Museum in Morgan Hill, California, provided beauty, action, thrills and skill.

AT RIGHT, George Popandrea's beautiful Nieuport. MIDDLE ROW, LEFT: Colonel Bob Thacker's Sopwith Camel, winner of Maneuvers event; RIGHT: Jerry Wolfram's Fokker D-7 won the Mission event. BOTTOM ROW, LEFT: Gene Pond's scale Eindecker; RIGHT: Wally Hurley's Sopwith Triplane.

Floyd Carter's Packard Le Pere. Outstanding scale model of the Jamboree. 78" span (2" = 1'-0"), 10½ pounds, S.T. .71. Flies as good as it looks!

● On September 22 and 23, 1973, the Pioneers R/C Club of Sunnyvale staged the Second Annual World War I Western Front Jamboree at the Hill Country Air Museum in Morgan Hill, California, some thirty miles or so south of San Jose.

Like the first one, this annual event was more fun for both contestants and spectators than most of the fun flies which are staged at various locations. It's entertaining, competitive, nostalgic – even educational, as the ubiquitous Monty Groves delineates historical facts about the full scale versions of some of the aircraft that are on display and flying during the two day event.

It was particularly unfortunate that this year's show came on the same weekend that gas station dealers threatened a widespread "close-down" in protest of the squeeze they were in due to wholesale price increases without relief on the retail price. Many modelers who had indicated they would come were frightened away by the prospect of no gas to get home with. Some showed up on Sunday who didn't come on Saturday, but, subsequently, learned that gas could be had. And, although there were only approximately twenty planes, the show was fast paced, the competition fierce, the exhibitions thrilling, and everyone had a ball. Too bad you couldn't make it – but there'll be another one next year. Plan on it – and get that WW I Scale, or Stand-Off Scale job ready for the competition - - - bomb drop, aerial combat, balloon bust, maneuvers, and the like. You'll be glad you did. I certainly was this year; entered my new little "Fokker Heinschmitt" WW I type bipe, and managed to get a trophy in the aerial combat event. More fun!

For the record, the event winners were Floyd Carter in AMA scale with his great Packard Le Pere, Nick Maire in Stand-Off Scale with his Fokker DR-1, Col. Bob Thacker in maneuvers, Jerry Wolfram in the mission (balloon bust and bomb drop) event, and Willard and Druckman in aerial combat. Bob Thacker won the overall championship with his Sopwith Camel.

One of the highlights of the show was Monty Groves and Floyd Carter flying their mighty "Toad" for the crowd. This unbelievable machine, made of scrap wood, fiberboard, old file folders and styrofoam, weighed in at twenty pounds, measured fourteen feet, eight inches in span, eleven feet long, and was powered by two .61's. It carries a camera in the nose which took movies of the crowd. As it went aloft for the last time, I sent my Fokker Heinschmitt (not a Fokker, not a Heinkel, not a Messerschmitt – but a fighter just the same!) up to attack. Monty Groves likened the scene to a king bird molesting a buzzard! The crowd loved it. Afterwards, Monty tried to auction off the monster, with bids to start at two bits. No takers – the logistics of handling it scared everybody. So maybe it will fly again next year.

As always, the quality of the scale models was excellent. No longer is the R/C scale modeler worried about crashing a year's work due to radio failure, so he puts many more hours in to make sure he has a chance to take top honors in static scale. Floyd Carter's Packard Le Pere LUSAC-11 (for Le Pere U.S. Army Combat) was a beautiful example. In cowling the engine, Floyd figured he'd have heating problems, but he wanted a scale cowl. Now how can you make a scale cowl for an air cooled engine that will simulate the cowling for a water

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1ST ROW, LEFT: Some of the entries line up for a portrait. RIGHT: Wally Hurley's great Sopwith triplane flew well, but tended to nose over on landings - - - just like the original! 2ND ROW, LEFT: Floyd Carter and Monty Groves with Irv Perch of the Air Museum. The "Toad," a "giant step backward" in R/C! 3RD ROW, LEFT: Floyd Carter gets the camera carrying Toad off on a reconnaisance flight. RIGHT: An SE-5 following an attempted sharp pullout from a combat loop. 4TH ROW, LEFT: Bob Thacker's Sopwith Camel. RIGHT: Nick Maire's DR-1 about to crash after missing the balloon.

ONE MAN FOAM CUTTER

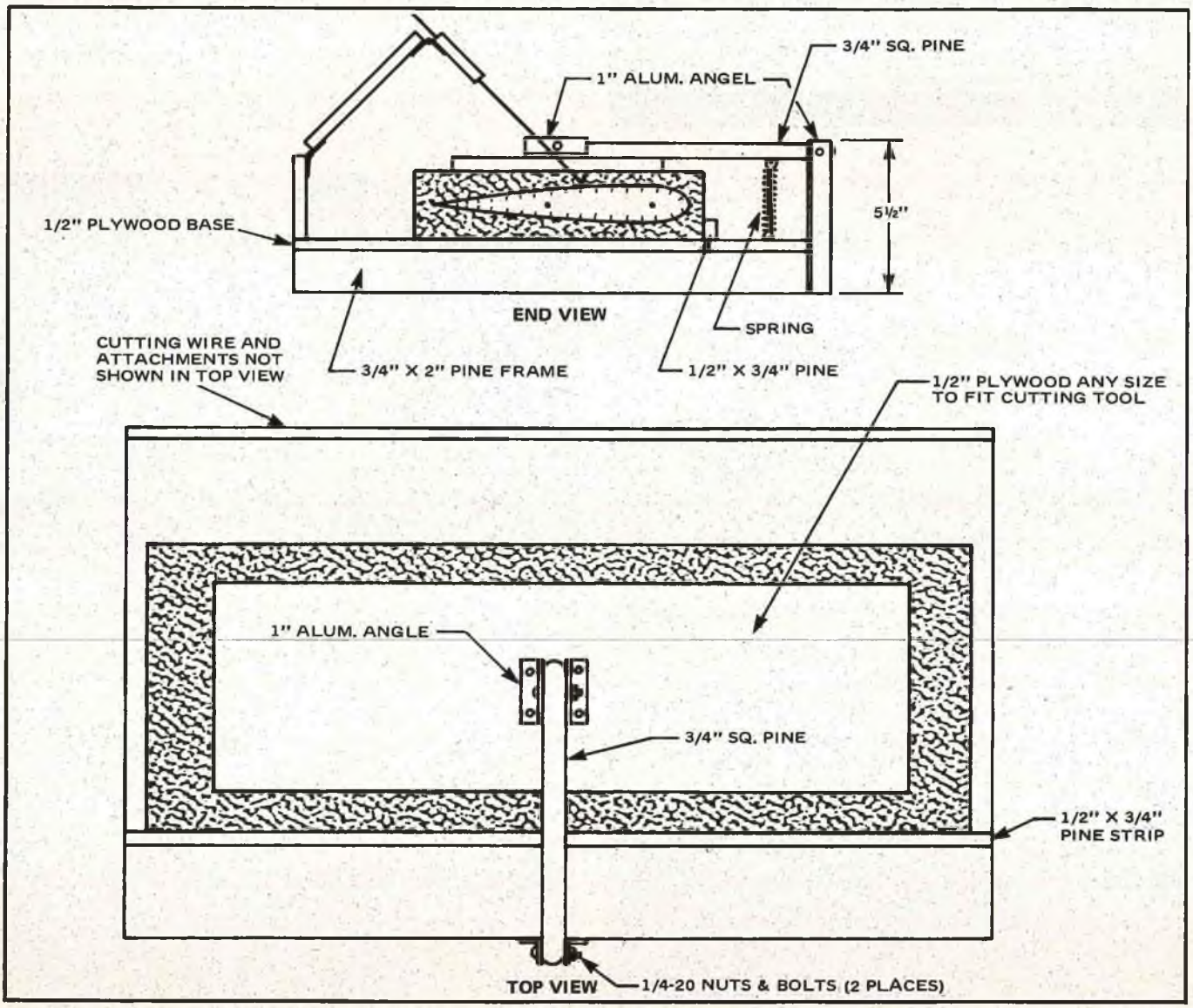
BY BILL BROWN

Burt Van Barheveld's one man foam cutter, which appeared in the For What It's Worth pages of the October 1973 issue of R/C Modeler Magazine, works like a charm - - - however, you still need to hold the foam down and straight to the cutting wire. The sketches accompanying this article show an easy way to do this.

Start by framing the foam cutter with 3/4" x 2" pine. The 1/2" x 3/4" pine is next. Set it parallel with, and inside, the maximum throw of the cutting wire. This is important, so use the cutting wire to establish this block line. The 1/2" plywood pressure board can be any size that is convenient. Contact cement 40 grit cabinet paper to the pressure board and the cutting table.

Now, cutting your foam wings is easy and no longer requires an extra pair of hands. Start with a block of foam that is squared up and pin your templates in place. When you're ready to cut, lift the pressure board, slip the foam in, making sure the leading edge face is against the 1/2" x 3/4" block. You are now square, flat, parallel, and secured in place. A little juice to the cutting wire and you're in business for a set of foam wing cores.

If you're lonely, and miss a cutting partner, then you can always count down the template numbers to yourself!



EXHAUST PRESSURE

..... and how to use it

BY DON DEWEY

● One of the questions that is most frequently asked by RCM readers is how to use exhaust pressure for pressurizing a fuel tank. While we have described this in the past, the question keeps recurring, so the accompanying sketches were drawn to show you exactly how to use exhaust pressure properly.

To begin with, a pressure tap must be made in your muffler. This is quite simple on many mufflers, such as the OS, since a fitting is provided for priming the exhaust port from the outside of the muffler body. This fitting, in many cases, consists of a short length of brass tubing, threaded on one end, which is attached to the muffler by threading the end of the tubing over which an external nut is fitted. By removing the nut and reversing the tubing, you have a ready-made fitting to which can be attached a length of fuel line which can be connected directly to your fuel tank as a pressure line. We recommend installing a fuel line type filter in the pressure line in order to prevent the back flow of any extraneous material from the muffler into the fuel tank where it would be picked up and sucked into the venturi.

The easiest method of setting up a pressurized fuel system is shown in Figure 1 wherein a Tatone Fuel Tank Filler is used on the side of the fuselage. All that is necessary in order to fill the tank is to lift the cap, exposing the fill line, and remove the pressure line from the filler so that the line from the filler to the tank can act as an overflow line during the fueling process. The line from the venturi to the tank is conventional. We strongly recommend using latex fuel line since the silicone fuel line tears quite easily and the black tubing rots and cracks quickly in areas of medium to high pollution. You will be quite surprised at the difference pressurization can make in the running of your engine.

Figure 2 shows another use for exhaust pressure, and that is to provide a heavy smoke trail, or "skywriting." This is quite effective in visually displaying your maneuvers in the sky as well as a real crowd pleaser at local air shows. It is quite easy to accomplish by simply using exhaust pressure to force feed number two diesel fuel into your muffler where it is ignited and provides a highly visible smoke trail. Again, provide a pressure tap at the muffler and run a pressure line to a separate 2 ounce fuel tank. Be sure to include a filter in the pressure line to prevent back-flow of grit and dirt. This pressure creates enough force so that the diesel fuel can be taken up by a feed line into your

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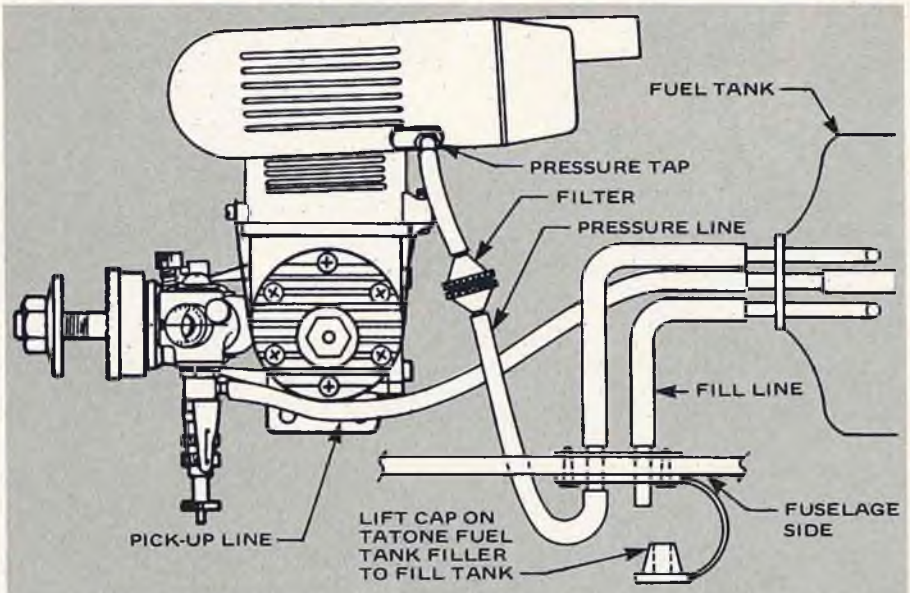


Figure 1. Exhaust pressure used to provide fuel pressurization to the engine.

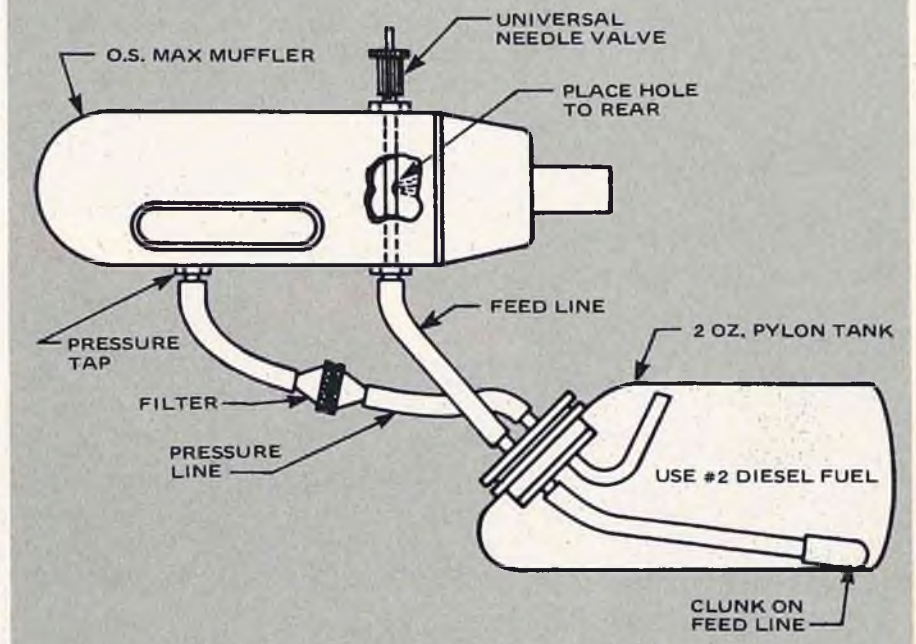
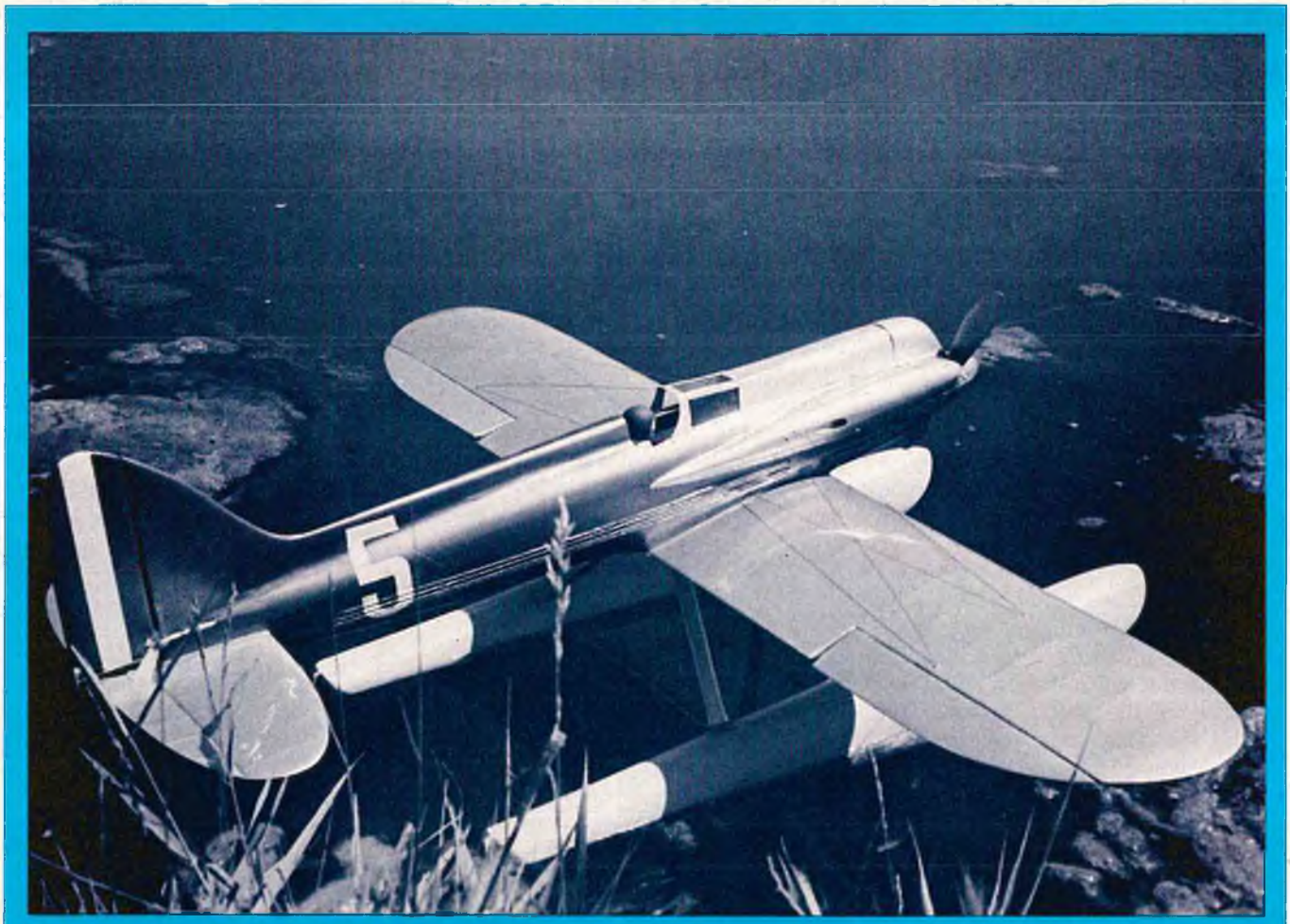


Figure 2. Exhaust pressure used to provide heavy exhaust trail. Engine to fuel tank hook-up standard.


5

SUPERMARINE S-5

A Classic Racing Plane For .15-.25 Power.

BY G.A. FLANDRO

Possibly one of the most beautiful aircraft ever designed, the 1927 Supermarine S.5 racing seaplane led the successful British attack in the famous Schneider Trophy Competition. The S.5 was one of a series of racing seaplanes designed by R.J. Mitchell, and was the forerunner of the immortal Battle-of-Britain Spitfire.

. . . . Don Dewey

I trace my life-long involvement in airplanes to a Saturday afternoon towards the end of World War II when, as a youngster, I saw a motion picture entitled "Spitfire" (original British title was "First of the Many"), which depicted the life and times of the famous designer R.J. Mitchell. I was fascinated by newsreel shots used in the picture of the silvery seaplane racers as they competed for the coveted Schneider Cup. Mitchell's career was devoted to the design of the fabulous line of Supermarine racing seaplanes, and his efforts led to the three successive wins which won the Schneider cup permanently for England in 1931.

His design innovations were definitely decades ahead of the times, and the graceful beauty of the 1925-1931 Supermarine racers has, in my eyes, never been equalled. These were very specialized vehicles, designed to take-off only from water, fly a seven lap 190 mile course at high speed, and alight again on the water.

During the 1920's and 30's these were the world's fastest aircraft; the Supermarine S.5 captured the record in 1927 at 282 mph using the Napier Lion engine. This was bettered by an improved version, the S.6, using the new Rolls-Royce 12-cylinder "R" engine, forerunner of the famous Merlin. The S.6 and S.6B raised the world speed record to 358 and finally to 408 mph using a special "sprint" version of the Rolls-Royce R. One can clearly see, in these aircraft, the rapid evolution of high-speed aerodynamics, and the story of their tremendous impact on the design of the fighter aircraft later used in World War II has been often repeated. In the semi-elliptical wing planform and beautifully faired fuselages of the Schneider trophy racers there is a definite link to the redoubtable Spitfire of Battle-of-Britain fame.

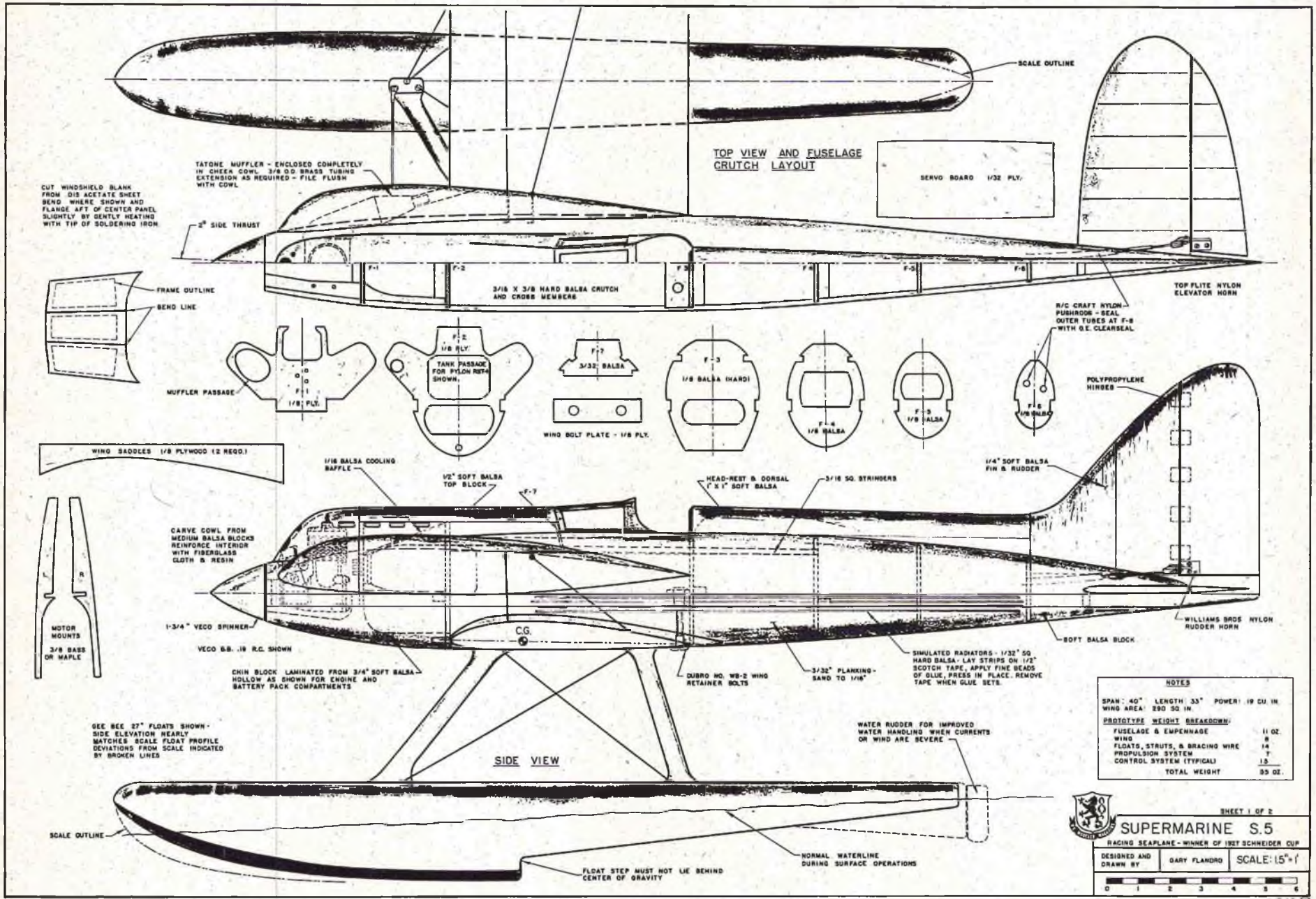
The devlopment of lightweight micro-miniature proportional radio control equipment has produced a tremendous revolution in R/C model design. It is no longer necessary to build huge ships modeled on the 2" or 2½" = 1' scale to achieve the desired combination of scale detail and acceptable flying qualities. The 1" to 1½" = 1" formula using engines in the very successful and well developed range from .15 to .19 cubic inches is now entirely practical. The many advantages of smaller models are so obvious they hardly need mentioning; lower material bills, faster building time (less area to sand, etc.), much lower fuel consumption, easier transportation of models, and on-and-on, ad infinitum.

There has been much talk lately of cutting down racing speeds for safety and for encouraging the less-skilled flyer to participate. What better way to accomplish this than by using the smaller engines permitted by reduced control system size and weight? The astute reader will by now have discerned what all this is leading up to – a cautious suggestion that there ought to be some study of a modeler's version of the Schneider Trophy Seaplane Race using small radio controlled airplanes patterned after the Curtis, Supermarine, Gloster, and Macchi racers of the pre-war years. Here is both a virtually untouched reservoir of appealing designs for the scale builder and the possibility of a racing event which would be tremendously appealing to the onlooker and truly challenging to the contestant and model designer. There is just nothing prettier than a scale-type R.O.W. This type of racing may also lead to solutions for some of the safety problems. What better way to ensure spectator safety than by flying the models over the water? It might also be noted that crashes in water are usually less severe, and damage is often slight if care is taken to protect the radio gear from water damage.

Before I get carried away too far, I should state that this article was not intended to push any new racing events, but rather to indicate that there are some modeling areas which remain virtually untouched and are worthy of some development work. This article describes an initial exploration into some of the possibilities just described, making full use of the availability of advanced radio equipment, materials, and design techniques.

I chose the Supermarine S.5 from among many other worthy Schneider designs for practical as well as esthetic reasons. First of all, the advantages of an upright engine installation are well-known, and this can be accomplished in the model S.5 without deviating from the scale outline. An interesting feature, which emerged in the design process, was the possibility of completely submerging (don't use that word too often around a seaplane jockey) a muffler system in one of the cheek cowls. If your flying lake is close to a populous area, this could be an important consideration – much has been written concerning the dwindling supply of flying sites due to uncontrolled engine noise. Another obvious advantage of the muffler installation is the channeling of exhaust gases completely away from the airplane. My S.5 is completely untroubled by the usual gummy castor oil smear – this is important when you are trying to maintain a fragile set of scale details and decals. The major design constraint for the model was that it be the absolute minimum in size required for efficient operation with a hot .19 RC engine. The scale which appeared to best meet these requirements was the 1.5" = 1' conversion. This results in a model which can be built from standard material lengths without any splicing required, and allows use of easily available scale accessories. The model is so compact that it can be easily transported to the flying site without dismantling. This is a significant advantage where it is necessary to protect the inner workings from moisture. The system can be

FULL SIZE PLANS AVAILABLE – SEE PAGE 118



NOTES

SPAN: 40" LENGTH: 33" POWER: .19 CU. IN.
WING AREA: 280 SQ. IN.

PROTOTYPE WEIGHT BREAKDOWN:

FUSELAGE & EMPENNAGE	11 OZ.
WING	8
FLOATS, STRUTS, & BRACING WIRE	14
PROPULSION SYSTEM	7
CONTROL SYSTEM (TYPICAL)	13
TOTAL WEIGHT	53 OZ.

SHEET 1 OF 2

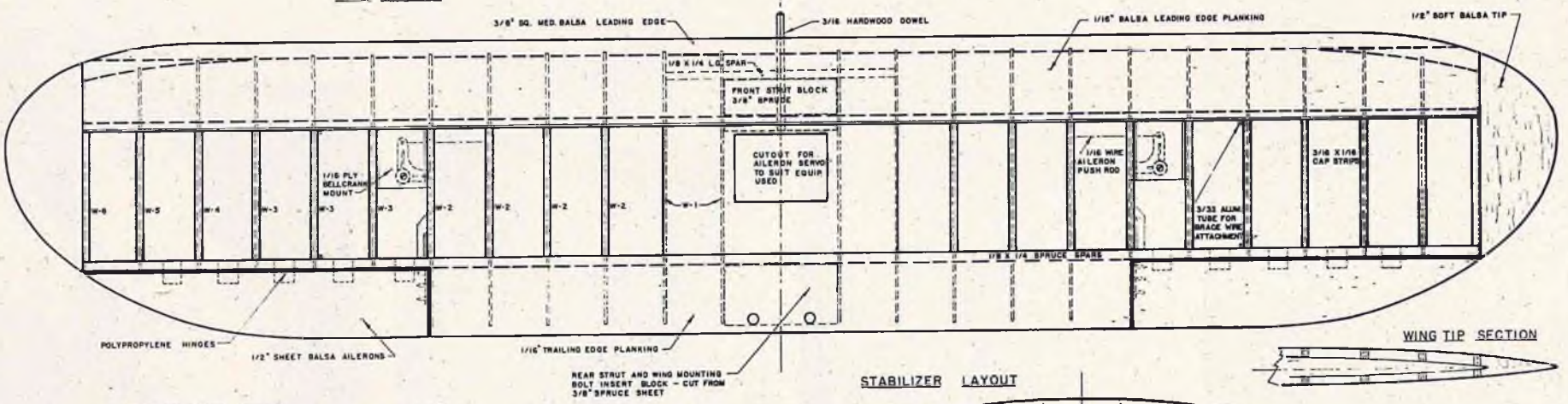
SUPERMARINE S.5

RACING SEAPLANE - WINNER OF 1927 SCHNEIDER CUP

DESIGNED AND DRAWN BY: GARY FLANDRO | SCALE: 1.5" = 1'

0 1 2 3 4 5 6

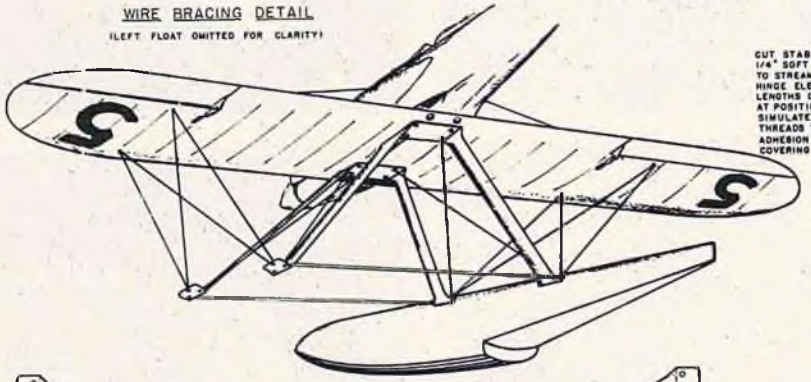
WING LAYOUT



WING TIP SECTION

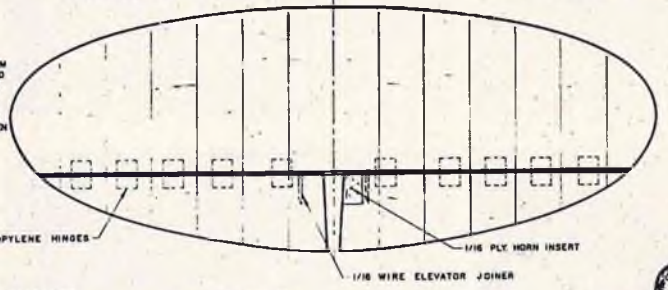
WIRE BRACING DETAIL

(LEFT FLOAT OMITTED FOR CLARITY)

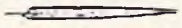


STABILIZER LAYOUT

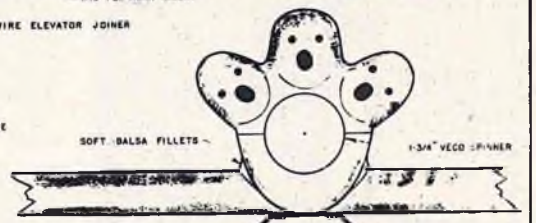
CUT STABILIZER PARTS FROM 1/4" SOFT BALSA SHEET. SAND TO STREAMLINE SECTION AND HINGE ELEVATORS. GLUE LENGTHS OF NO. 50 THREAD AT POSITIONS INDICATED TO SIMULATE RIBS. WAX BETWEEN THREADS TO PREVENT ADHESION OF MONOKOTE COVERING MATERIAL



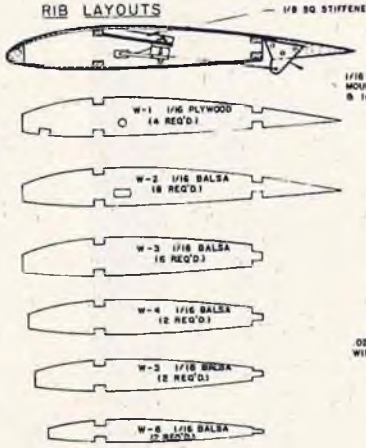
STAB. TIP SECTION

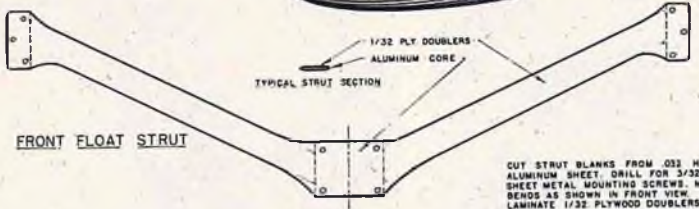


FRONT VIEW



RIB LAYOUTS

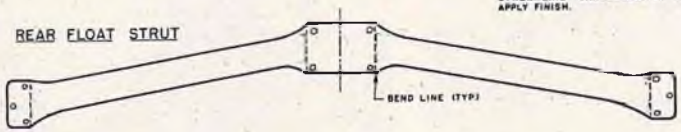


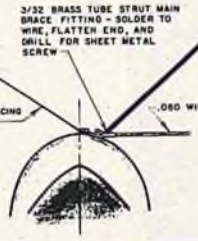


FRONT FLOAT STRUT

CUT STRUT BLANKS FROM .032 HARD ALUMINUM SHEET. DRILL FOR 3/32 DIA. SHEET METAL MOUNTING SCREWS. MAKE BENDS AS SHOWN IN FRONT VIEW. LAMINATE 1/32 PLYWOOD DOUBLERS TO EACH SIDE OF ALUMINUM CORE USING EPOXY GLUE. CLAMP BETWEEN WOOD BLOCKS UNTIL CURED. SAND TO A STREAMLINE CROSS-SECTION AND APPLY FINISH.

REAR FLOAT STRUT





SHEET 2 OF 2

SUPERMARINE S.5

1927 SCHNEIDER SEAPLANE RACE WINNER

DESIGNED AND DRAWN BY	GARY FLANDRO	SCALE: 1.5" = 1'

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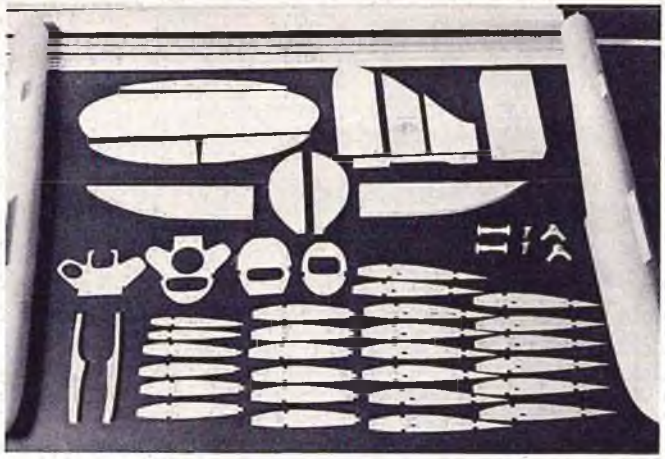

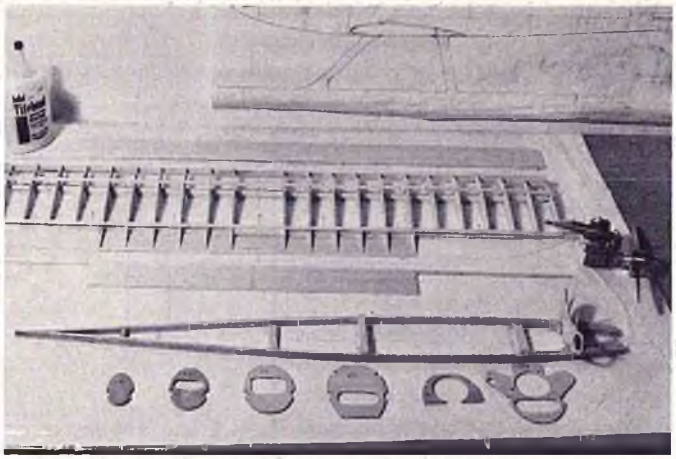

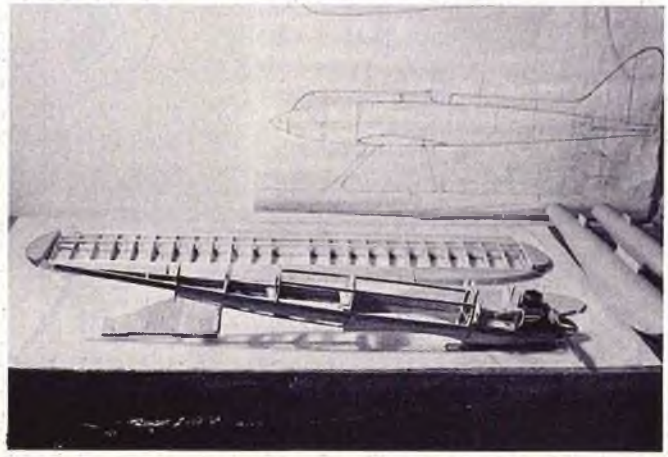

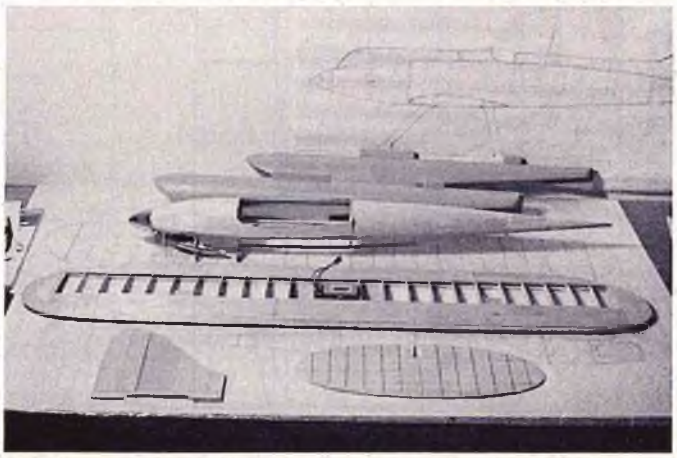

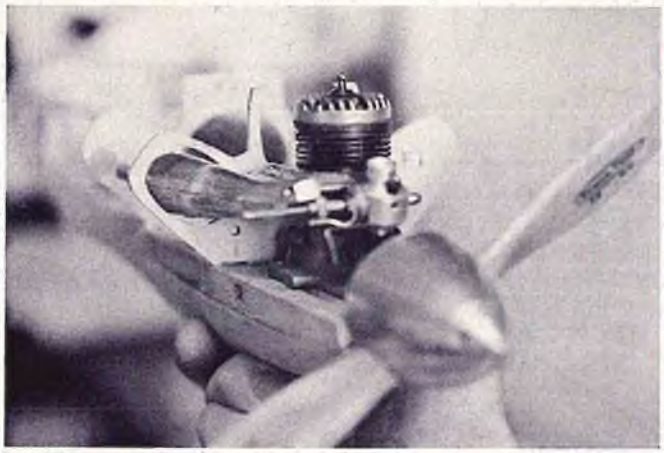

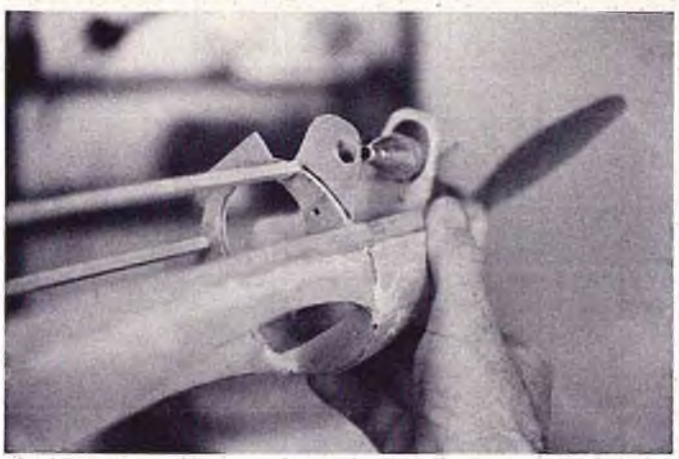

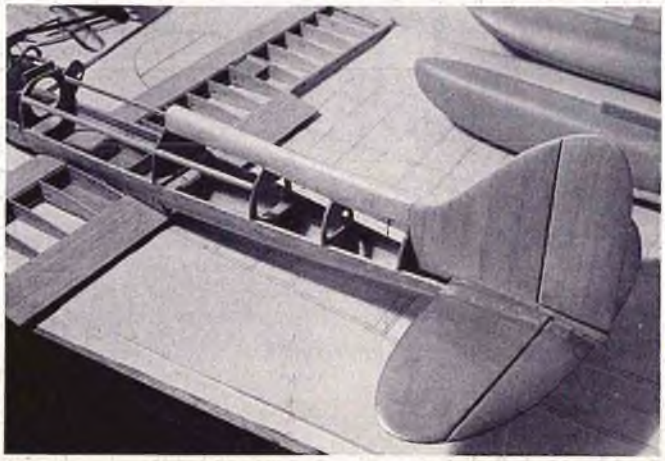

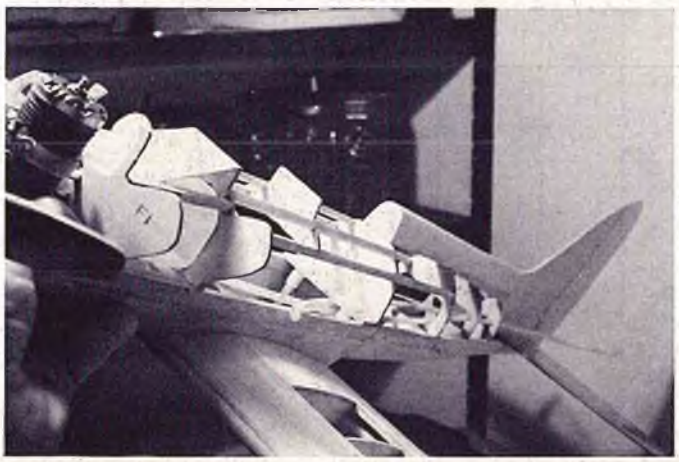

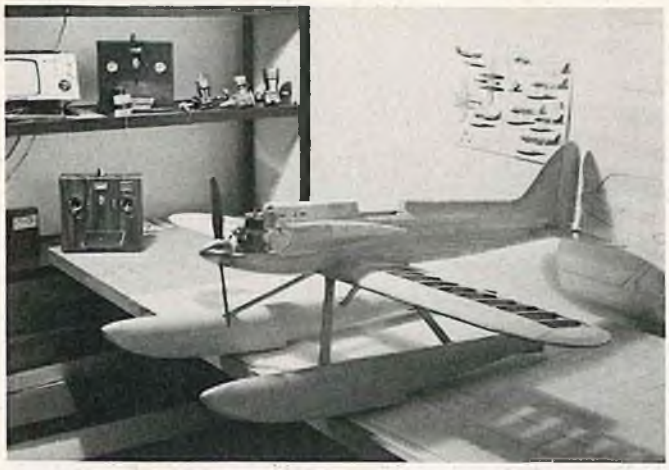

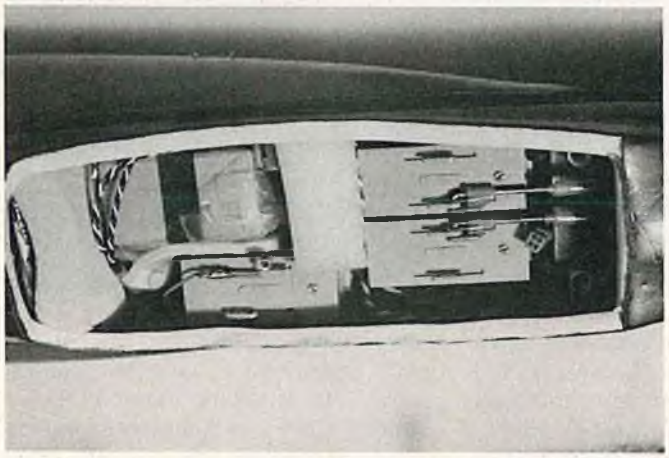

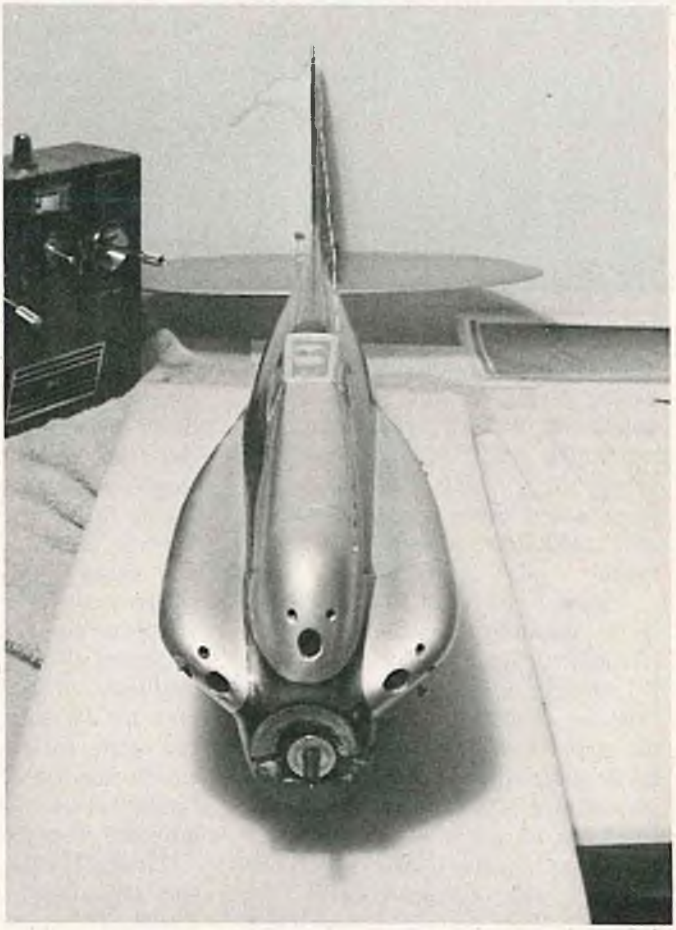

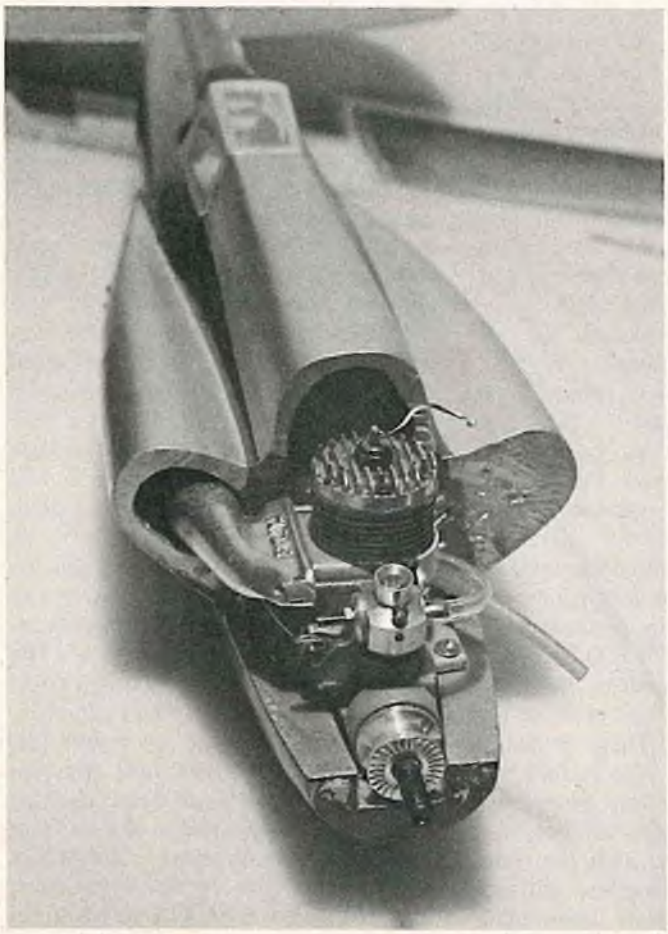

completely checked out, the wings installed, and moisture seals checked before leaving the shop for the flying pond. The model fits handily in most car trunks, and even in the back seat of the trusty V-dub. Needless to say, there is not room enough in such a small model for old-style radio equipment.

I guess I picked up the "small-bug" from absorbing so much of R.J. Mitchell's design philophy – the actual S.5 fuselage probably has the smallest fuselage cross-section ever achieved; the pilot actually sat on the floor with his shoulders pressed against the cockpit coaming. The model was carefully layed out to accept any of the newer miniature proportional rigs. The original was equipped with the XL-Series Micro Avionics system. Only minor detail changes in servo mounting will be required to use the Kraft (with small servos) or Orbit equipment. Unless you have a "flat-pack" airborne battery pack, you will have to use a different fuel tank arrangement to make room.

Still another advantage of the 1.5" = 1' scale is that commercial floats can be used with only slight deviation from scale. The original was equipped with Gee-Bee Line 27" vacuum formed floats for the initial testing and development flying. The scale purist will want to build scale floats, and this can be easily done using one of the standard pontoon layouts. The simplest method is to cut a vertical keel from sheet balsa, add formers to right and left, and then plank with sheet and strip material – this will produce a float system weighing several ounces less than the plastic floats. If you are handicapped by lack of suitable flying sites, or if you desire to fly in a scale contest where no water is available, removable wheels or even a take-off dolly may be employed. The main wheels should be just ahead of the float step, and must protrude far enough that the airplane can rotate for take-off. Steerable tailwheels may be attached to the water rudder pivots for (excuse the expression) ground handling.

I'll skip the time-worn cliches about who should and should not build this model. This project is obviously an initial thrust in a new direction – there are still many unknowns – but the results to date are extremely promising. The prototype was my first experience in seaplane design and practice. I had nightmares about the oft-mentioned problems of R.O.W. operation, and could visualize my radio equipment lying in the mud at the bottom of the lake. These problems proved not to be all that formidable. No exotic encapsulation procedures were found necessary. In fact, the wing joint was sealed with the time-honored foam tape method without admitting a drop of H_2O. Telescoping NyRod pushrods solved the leak problem at the pushrod holes. The battery pack and receiver were safeguarded simply by wrapping them in polyethlene plastic, and the entire equipment installation was covered by a sheet of the same material tucked in around the edges like a blanket. Not a drop of water has been found inside the plane even after some vigorous test flying sessions. No exterior finish problems have been encountered, although a lighter-than-average dope finish was employed.

The initial flight attempts were made off a large reservoir amply stocked with fish, fishermen, and waterskiers. The water surface was rather rough due to both the speed boats and a moderate wind. The model was started and set in the water. Full throttle was signalled and off she went directly into the wind. The model tracked nicely, but turns were sluggish due to the weathervane effect in the strong wind. The model was planing on the steps almost immediately and was about to take-off when interrupted by waves from a passing boat. The folly of trying to fly from rough water had become apparent. The main problem here seems to be the power loss due to spray splashed into the propeller disc by the float tips as they hit wavelets. The solution to the problem is fly from smooth water – the glassier the better. Small ripples won't hurt, but strong currents and wakes from

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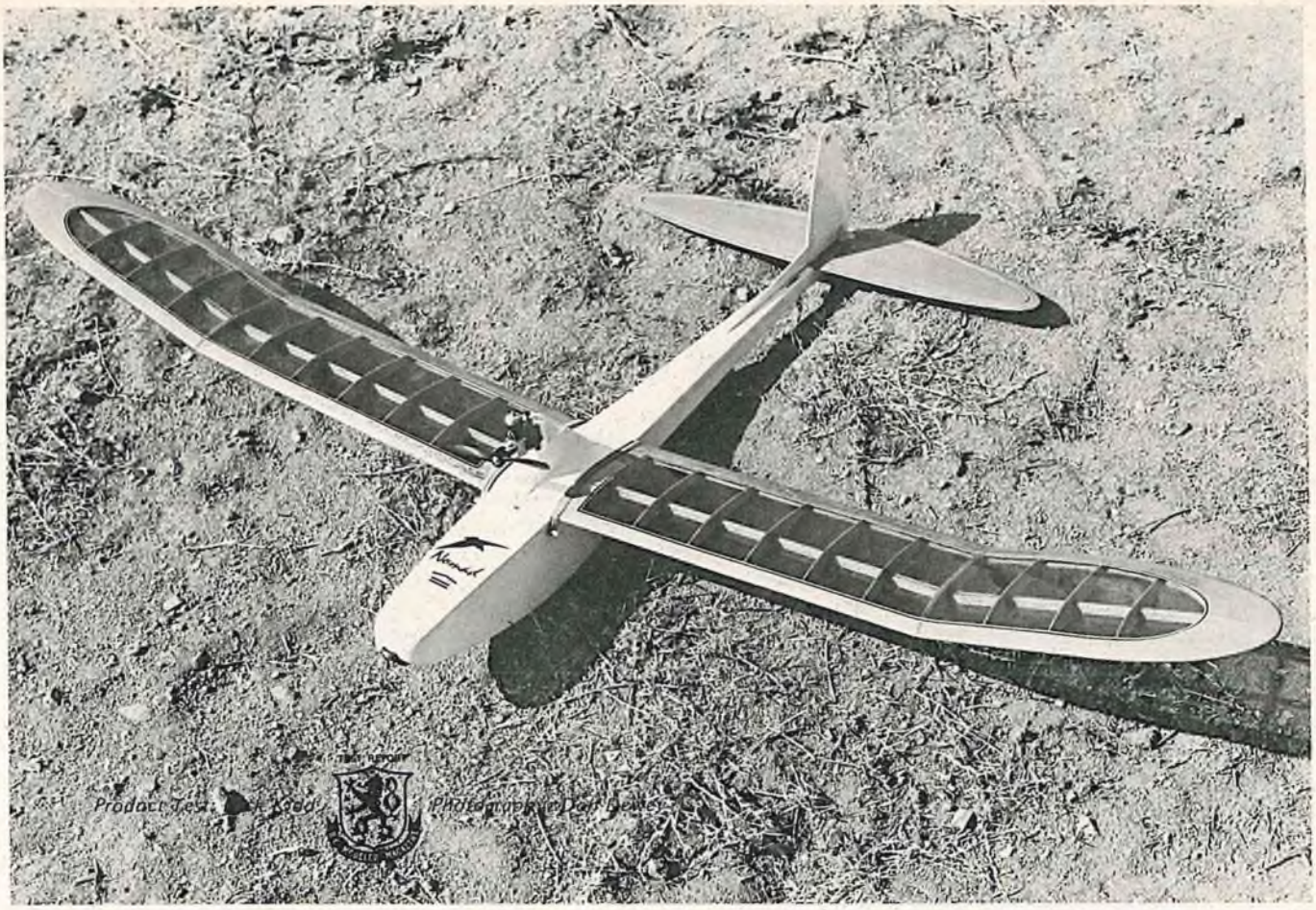

The Nomad has been around for a decade and a half - - - many of us learned to fly on this venerable old design by Ted Strader, now an all-new kit from House of Balsa. Opaque white and transparent blue Solarfilm with DJ's Multi-Stripe.

HOUSE OF BALSA'S NOMAD

● House of Balsa, 2814 East 56th Way, Long Beach, California 90805, has come through with, in our opinion, a real winner. As they state in their advertisement, "A Radio Control Change of Pace!"

And that's exactly what their new R/C sensation, the Nomad, designed by Ted Strader many years ago, turned out to be. I'm sure the name will bring back memories for many. It is the new improved Nomad and has the same flying characteristics as before. Those of us who have built, flown, and even lost our Nomads of several years ago, will remember only too well.

The Nomad is a little single

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RCM's Technical Art Editor, Dick Kidd, with test prototype of House of Balsa's Nomad.

The Nomad, off on another flight. You can almost lose it on a 2½ minute engine run.

RCM-WORLD

SIX CHANNEL DIGITAL PROPORTIONAL SYSTEM

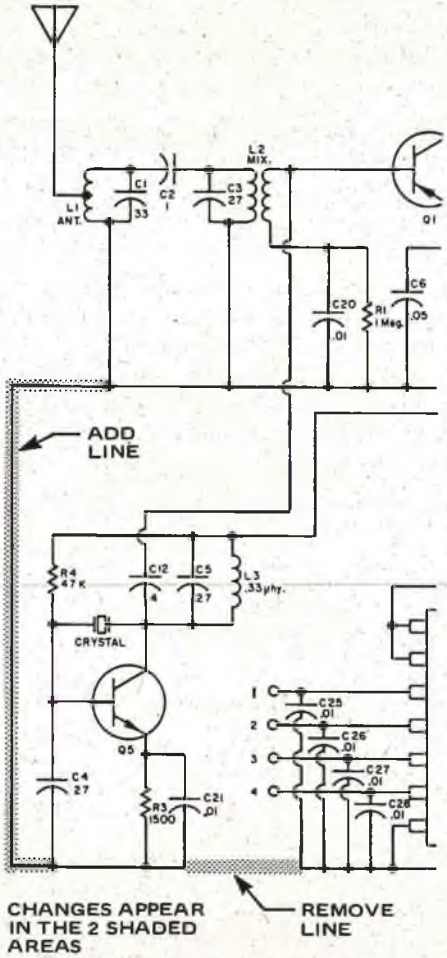
PART V: SWITCH HARNESS, BATTERY PACK AND CHARGER

BY JOHN MALONEY

This month we cover the switch harness, airborne battery pack, and the dual charger for both the airborne pack and the transmitter. At World Engines we have produced quite a number of different nickel cadmium battery chargers. Our experience with the latter goes back to the early 1960's when we were just getting strong in the reed radio equipment business. We have always manufactured a battery charger with an isolation transformer and you will notice that the battery charger covered in this article still incorporates this feature. You will also notice that this charger incorporates a scheme so that it can be assembled for operation on either 110 volts or 220 volts (not both at the same time) line voltage. We are incorporating another nice feature into this charger and that is the use of light-emitting diodes for indicating light sources rather than the conventional light bulb. These space age light-emitting diodes have a much greater dependability expectation than do the incandescent light bulb indicators.

In our switch harness we use connectors where the wire is soldered to the connector terminal rather than using a connector that requires a wire to be staked mechanically to the terminal. We feel that this is a much superior electrical connection than the staked type. It is true that this type of connection to the terminal takes longer to accomplish than the mechanical staking job and also it is necessary for us to use heat shrink tubing to protect this joint or solder connection. The heat shrink tubing also gives a certain amount of mechanical protection from bending the wire right at the connector terminal. We might add a word of caution, and this applies to anyone flying a model airplane anywhere, and that is to treat the wiring in your system with the utmost respect. Do not tug and yank at wires in this system which would put undue strain on these soldered connections. Be careful when you are plugging in your connectors. If your eyes are beginning to fail as are the writer's, put your glasses on before you plug in your connector. Also, make sure you are not trying to put the plugs in backwards.

Now we would like to say a few words about the nickel cadmium batteries that we are supplying with this system and, for that matter, all nickel cadmium batteries. First of all, this World Engines system is a relatively low current drain system. Even with AA pen cells, we are getting up to 20



REVISION ON 6 CHANNEL RECEIVER-DECODER SCHEMATIC

pattern flights on an airborne pack with one good overnight charge. We may at a future time even drop down to a little smaller battery in the interest of weight saving because we do not feel most people want to put in 20 flights on a Sunday afternoon. We are going to assemble the battery pack here at World Engines. These flight pack batteries will have been cycled through one charge and one discharge at World Engines before we ship them out. We have never manufactured a system with a fast charge program for these batteries. The battery manufacturers that we have worked with and talked to are generally in agreement that a longer, slower charging cycle is better for the batteries. We are for improvement in this area because, frankly, it is our opinion that the nickel cadmium batteries are the weakest link in any R/C system today. Other things that wear out in a system are the potentiometers, the motor commutators, and the mechanical bearings in the system. While on the subject of safety, we might also caution you to keep your eye on all switches in your system and if you notice any failure to "make" in a switch, the switch should be replaced.

Now for a word about vibration. Vibration in an airplane model is, to say the least, hard on a radio control system. It is hard on the batteries, it is hard on all the solder joints, it is hard on the switch, and it is actually hard on some of the parts on the receiver and decoder deck. We suggest that one thing you should look for in a model airplane engine is an engine that is not known to be a vibrator. Some engines vibrate so bad that it can be seen on a test bench and this vibration is generally something that has to do with the design of the engine rather than something that happens in a random fashion from one engine to the next in a production run. Also, unbalanced pro-

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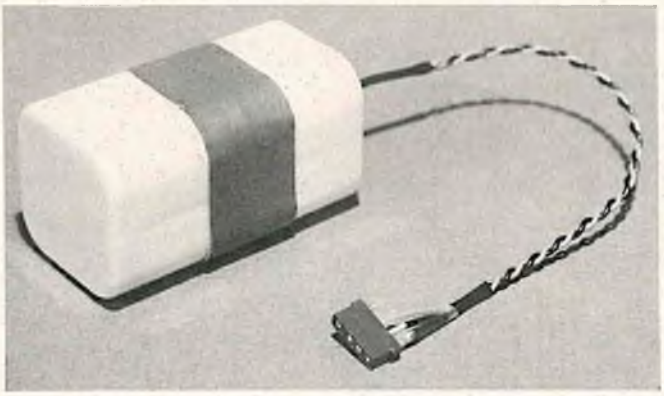


Flight Battery Pack. This unit is supplied factory assembled, tested, and ready to use. See the introduction to this article for recommendations concerning its installation.

SOLDERING COMPONENTS INTO THE BATTERY CHARGER BOARD

The Battery Charger board measures approximately 1-5/8" x 2-7/8" and has six large holes of 1/4" diameter. Place this board on the table, foil side down, so that the row of four large holes is at the rear.

When installing a component, follow the seven-step procedure explained in the general instructions.* This procedure involves identification, mounting, soldering and finishing for each component.

Figure C-1 shows the locations of the components on this board. Install the transformer first. Then install the four resistors and the two small diodes, D1 and D2, on the component side of the board. Do not install the light-emitting diodes, D3 and D4, at this time. These diodes will be positioned and installed in the final assembly.

*The general instructions will be found in the second article of this series which appears in the November 1973 issue of this magazine.

SPECIFIC MOUNTING INSTRUCTIONS

TRANSFORMER

SYMBOL	DESCRIPTION AND MARKING
T1	Power Transformer (CT-564A)

WIRING FOR 110 VOLT OPERATION

Insert the two red leads into the large hole located in the front and left of center. The two green leads go into the large hole located in the front and right of center. Insert the black-red and red-yellow leads into the large hole located in the rear and left of center (when viewed from the rear). The black and black-yellow leads go into the large hole located in the rear and right of center (when viewed from the rear).

Fasten the transformer to the board using #4-40 x 1/4" binder-head machine screws, 5/16" hexagonal brass standoffs and #3 flat washers. Place the washers between the transformer lugs and the board.

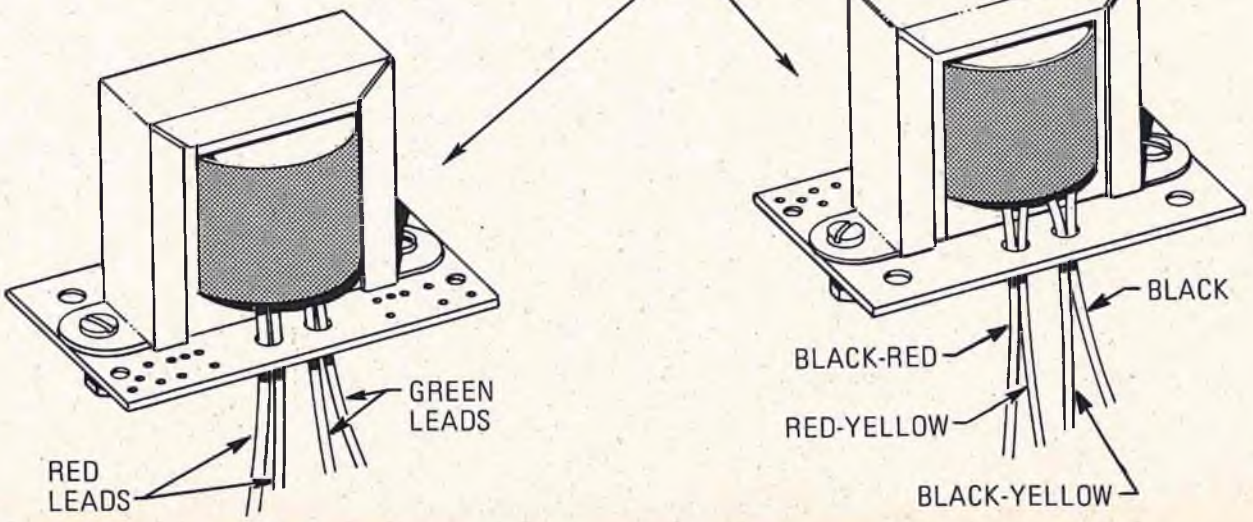
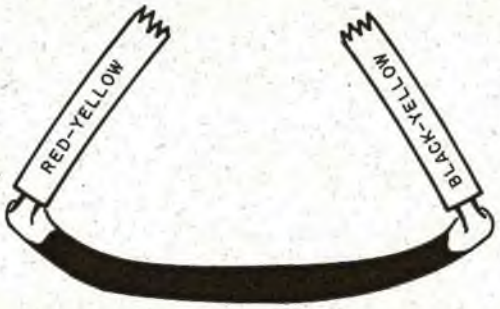


Figure C-2 shows the routing of the leads from the foil side of the board. Cut the leads to the necessary length. Strip 1/8" of insulation from the ends and tin the exposed metal. Form a nodule of solder on the copper foil where each lead is to be soldered. Heat until the solder has melted over the wire; then remove the soldering iron. Hold the wire steady so that the end cannot move around while the melted solder is solidifying. If it should move, remelt the solder and let it solidify again.

WIRING FOR 220 VOLT OPERATION

The only required change in the wiring involves the repositioning of the black-yellow and the red-yellow transformer leads. Connect these leads to opposite ends of the boat-shaped copper foil land in the center of the board. All other wiring remains the same.



RESISTORS (1/2 watt)

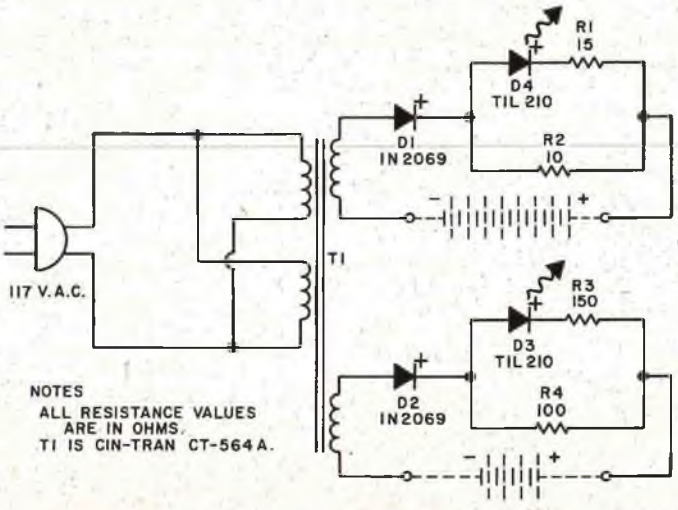
SYMBOL	DESCRIPTION AND MARKING
R1	15 ohms (brown, green, black)
R2	10 ohms (brown, black, black)
R3	150 ohms (brown, green, brown)
R4	100 ohms (brown, black, brown)

Make a smooth bend of about 160° in one lead. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the resistor is drawn, and push the resistor down against the board.

DIODES

SYMBOL	DESCRIPTION AND MARKING
D1, D2	IN2069 diode (white stripe on one end of case)
D3, D4	TIL210 light-emitting diode (junction encased in translucent red epoxy case)

Make a smooth bend of about 160° in the lead coming out of the end marked with a white stripe. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the diode is drawn, and push the diode down against the board.



BATTERY CHARGER–SCHEMATIC

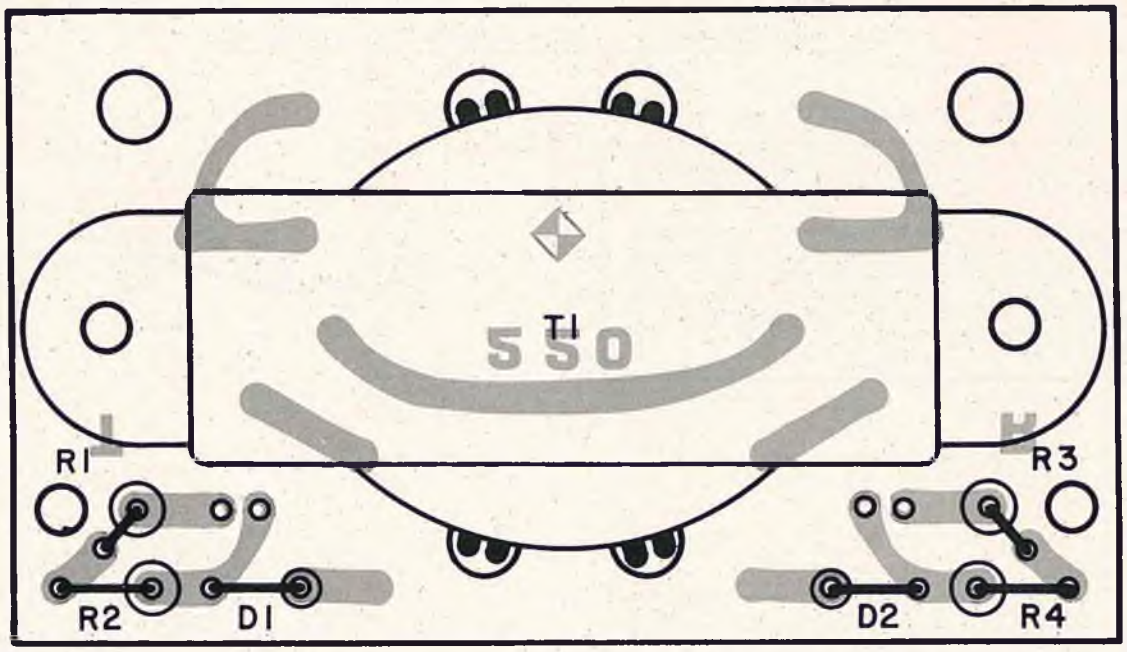


FIGURE C-1
CHARGER PRINTED CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)

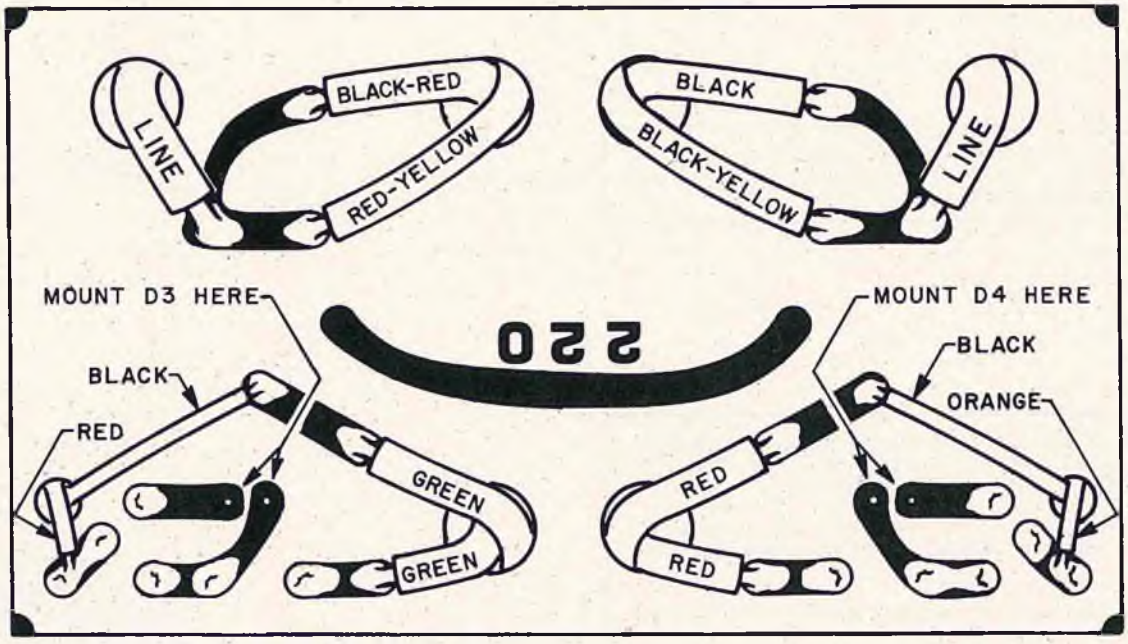


FIGURE C-2
CHARGER PRINTED CIRCUIT BOARD
(VIEWED FROM FOIL SIDE)

BATTERY CHARGER – FINAL WIRING AND ASSEMBLY

PART A. PREPARING THE TRANSMITTER AND RECEIVER CORDS

[ ] Step A-1. Select 36" lengths of orange wire and black wire and strip 1/16" of insulation from one end of each.

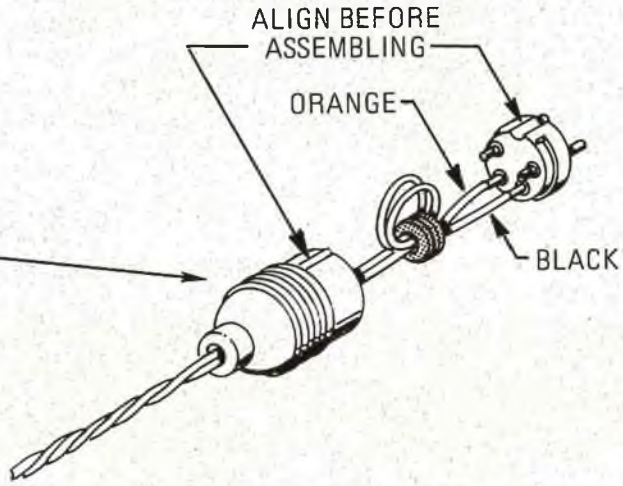
[ ] Step A-2. Tin each exposed metal end. Remove tip of the soldering iron as soon as the solder has flowed onto the wire. Continued heating will cause the insulation to melt back exposing bare wire and making likely an accidental short circuit. THIS WARNING APPLIES WHENEVER A WIRE IS TINNED OR JOINED TO A POINT BY SOLDERING.

[ ] Step A-3. Solder the black wire into terminal #2 of the Rye plug.

[ ] Step A-4. Solder the orange wire into terminal #3 of the Rye plug.

[ ] Step A-5. Slip an 1/8" inside diameter rubber grommet over the free ends of both wires and run it up to within 1¼" from the plug. Tie the wires in an overhand knot around the grommet to provide strain relief.

[ ] Step A-6. Slip the plug jacket onto the wires, align the ridge on the jacket with the notch in the plug, and press the jacket onto the plug.



[ ] Step A-7. Select 36" lengths of red wire and black wire and strip 1/16" of insulation from one end of each. Carefully tin the exposed metal as explained in Step A-2 above.

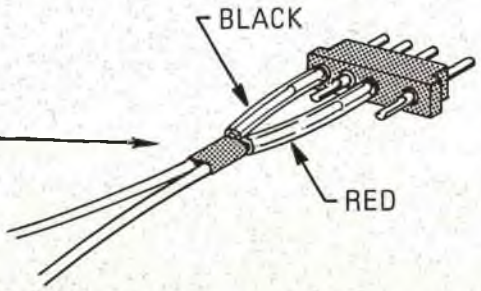
[ ] Step A-8. Prepare a flat male connector for soldering to the wire ends by melting a bit of solder into the hollow of each terminal to which a wire is to be connected.

[ ] Step A-9. Solder the black wire into terminal #1 (farthest from the isolated terminal) of the flat male connector.

[ ] Step A-10. Solder the red wire into terminal #3 (closest to the isolated terminal).

[ ] Step A-11. Slip a 1/2" length of clear plastic heat shrink tubing over the free end of each wire and run it up over the soldered connections for insulation. Shrink in place over a small flame (as from a match). Hold the tubing 1" above the tip of the flame.

[ ] Step A-12. Slip a ¼" cuff of black plastic heat shrink tubing over both wires and shrink it in place just behind the clear plastic sleeves.



PART B. CONNECTING THE EXTERNAL WIRING TO THE BOARD

[ ] Step B-1. Slip a 1/8" inside diameter rubber grommet over the free ends of each cord just prepared.

[ ] Step B-2. Run the orange-black transmitter cord up through the large hole at the left rear of the board and back down through the smaller 1/8" diameter hole near the left front.

[ ] Step B-3. Strip 1/16" of insulation from the ends of each wire and carefully tin the ends.

[ ] Step B-4. Form a nodule of solder on the copper foil where the black wire is to be joined. Solder the wires to the copper foil as indicated in Figure C-2. Use the technique for surface-soldering explained in the specific mounting instructions for mounting the transformer.

[ ] Step B-5. Run the red-black receiver cord up through the large hole at the right rear of the board and back down through the smaller 1/8" diameter hole near the right front.

[ ] Step B-6. Strip 1/16" of insulation from the ends of each wire and carefully tin the ends.

[ ] Step B-7. Solder the wires to the copper foil as indicated in Figure C-2.

[ ] Step B-8. Slip a 3/16" inside diameter rubber grommet over the free end of the line cord.

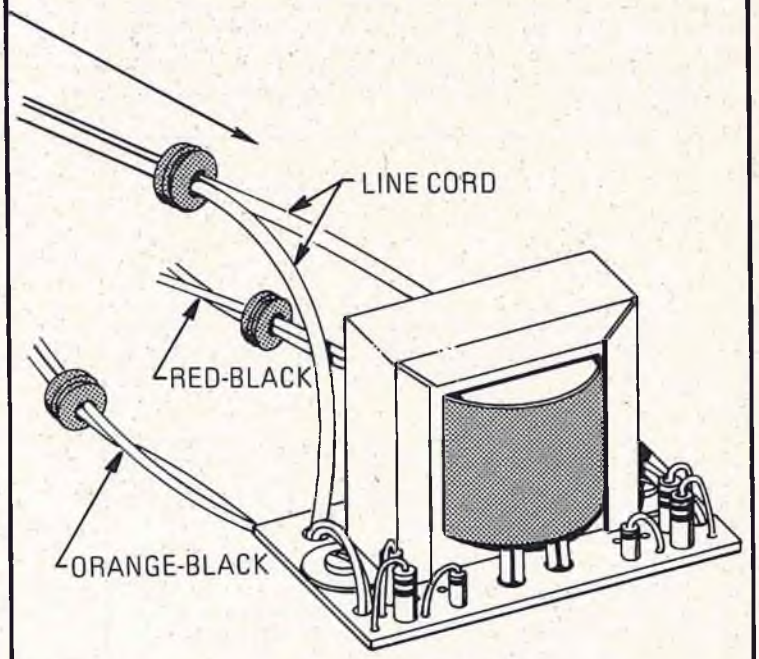
[ ] Step B-9. Smooth and straighten the copper strands and tin the ends.

[ ] Step B-10. Clip the tinned ends so that they extend 1/8" beyond the insulation.

[ ] Step B-11. Unzip the cord from the ends to form two 3" leads.

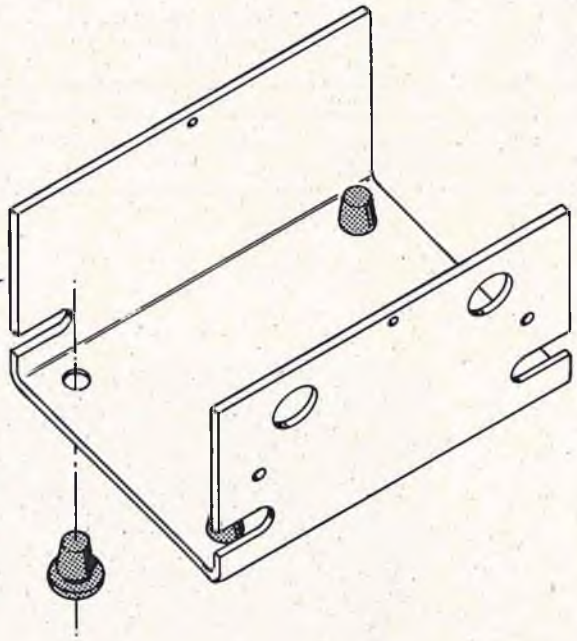
[ ] Step B-12. Run one lead down through the large hole at the left rear of the board, and the other lead down through the large hole at the right rear.

[ ] Step B-13. Turn the board over and solder the wires to the copper foil as indicated on Figure C-2.

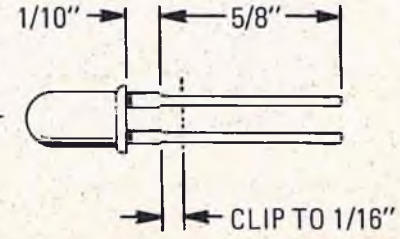


PART C. ASSEMBLING THE BATTERY CHARGER

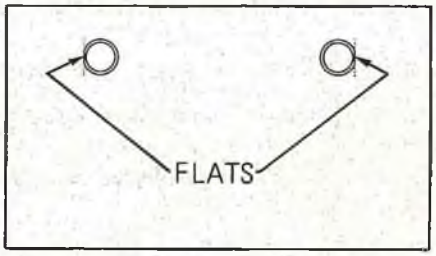
[ ] Step C-1. Insert the rubber feet into the four holes in the bottom of the case.



[ ] Step C-2. Select the two light-emitting diodes D3 and D4. Clip off both leads 1/16" beyond the point where they become narrow.



[ ] Step C-3. These diodes are to be mounted to the copper foil side of the board. Turn the circuit board assembly over so that it rests on the transformer top. Insert the diodes into the proper holes (see Figure C-2) so that the flats on the cases point towards the edges of the board. Make sure the diodes rest square and are not tilted over; then solder the leads in place.



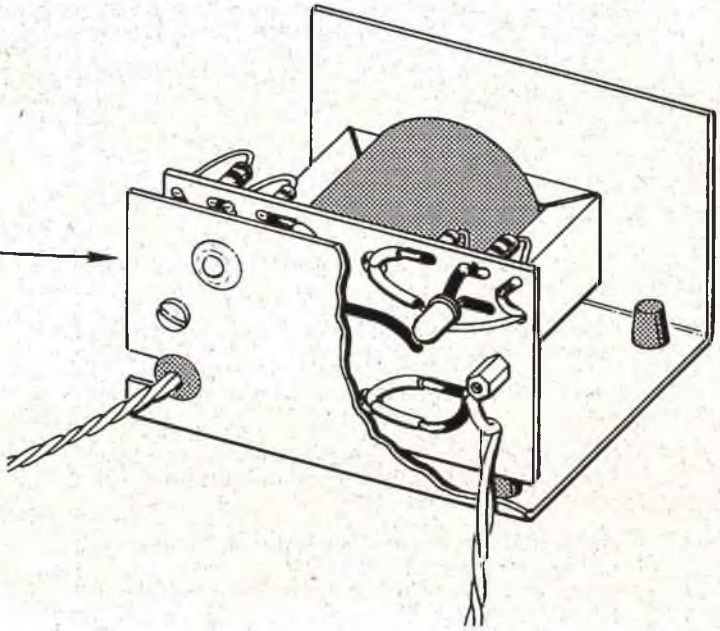
[ ] Step C-4. Work two 3/16" inside diameter rubber grommets into place in the two large holes in the front panel of the case.

[ ] Step C-5. With the case resting on its feet, lay the wired assembly in the case so that the front of the board is up and the standoffs line up with the holes in the front panel. The light-emitting diodes should now be aligned with the holes in the rubber grommets.

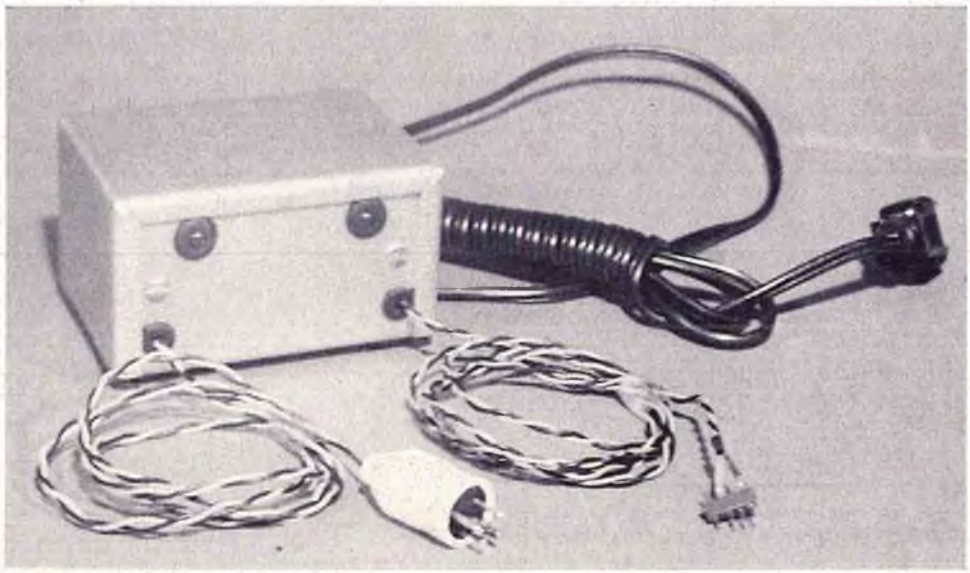
[ ] Step C-6. Move the circuit board towards the front panel, working the light-emitting diodes into the holes in the grommets. Screw two #4-40 x 1/4" binder-head machine screws into the brass standoffs through the holes in the front panel to fasten the assembly to the case.

[ ] Step C-7. Work the grommets girding the three external cords into their slots in the charger case. The line cord should go through the slot in the rear panel.

[ ] Step C-8. Twist the orange-black wires together to form a twined transmitter cord. Similarly, twine the receiver cord.



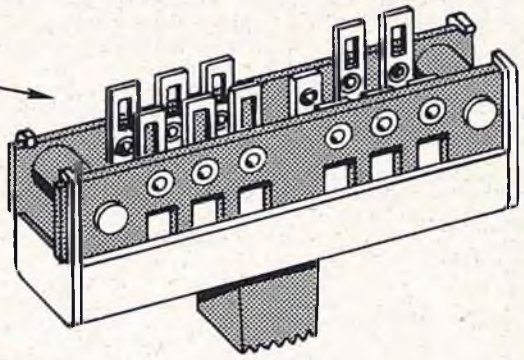
[ ] Step C-9. Put the top of the case on and fasten it with two #2 x 3/16" sheet metal screws.



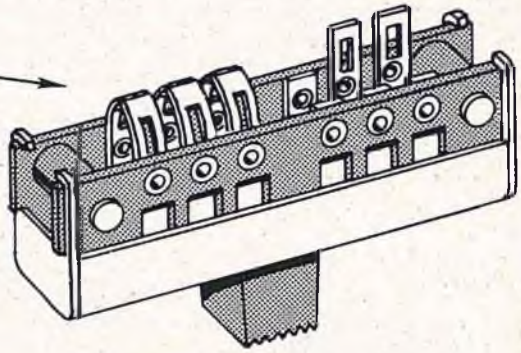
Completed Battery Charger

WIRING AND ASSEMBLY OF SWITCH HARNESS

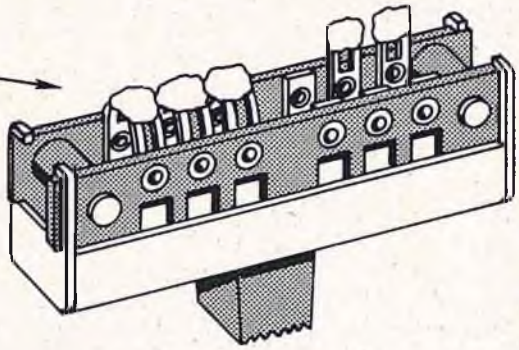
[ ] Step 1. Clip off even with insulator strip the four terminals shown.



[ ] Step 2. Bend the terminals on the unclipped end towards one another so that they make contact.



[ ] Step 3. Solder together the three pairs of terminals that were bent in Step 2. Also, tin the remaining two terminals.



[ ] Step 4. Select three red wires and three black wires of 6" length. Strip 1/16" of insulation from one end of each wire and carefully tin the exposed metal. (See Step A-2 in the wiring instructions for the Battery Charger.)

[ ] Step 5. Solder the wires prepared in Step 4 to the switch as shown in Figure H-1. Route the wires as shown.

[ ] Step 6. Slip two ¼" cuffs of black heat shrink tubing over each red-and-black pair. Be sure to pair off the wires correctly as shown in Figure H-1.

[ ] Step 7. Clip the wires in each pair to equal length. Then strip 1/16" of insulation from the ends and carefully tin the exposed metal.

[ ] Step 8. Slip a ½" sleeve of clear plastic heat shrink tubing over each wire in one of the pairs.

[ ] Step 9. Select the proper flat connector to be attached to this pair (See Figure H-1). Solder the black wire to terminal #1 (farthest from the isolated terminal). Solder the red wire to terminal #3 (closest to the isolated terminal).

[ ] Step 10. Run the clear plastic heat shrink sleeves over the soldered terminals for insulation and shrink them in place over a small flame.

[ ] Step 11. Run one of the ¼" black cuffs up to just behind the clear sleeve and shrink it in place.

[ ] Step 12. Shrink the other black cuff in place at the switch.

[ ] Step 13. Repeat Steps 8 through 12 inclusive for each of the other two pairs of wires.

[ ] Step 14. Twist each pair of connector leads together to form three twined cables. Pull the cables out parallel to the long axis of the switch.

[ ] Step 15. Install the black plastic switch cover. See photograph of assembled switch. Bind the cover to the switch with the two ¼" wide strips of adhesive backed tape supplied.

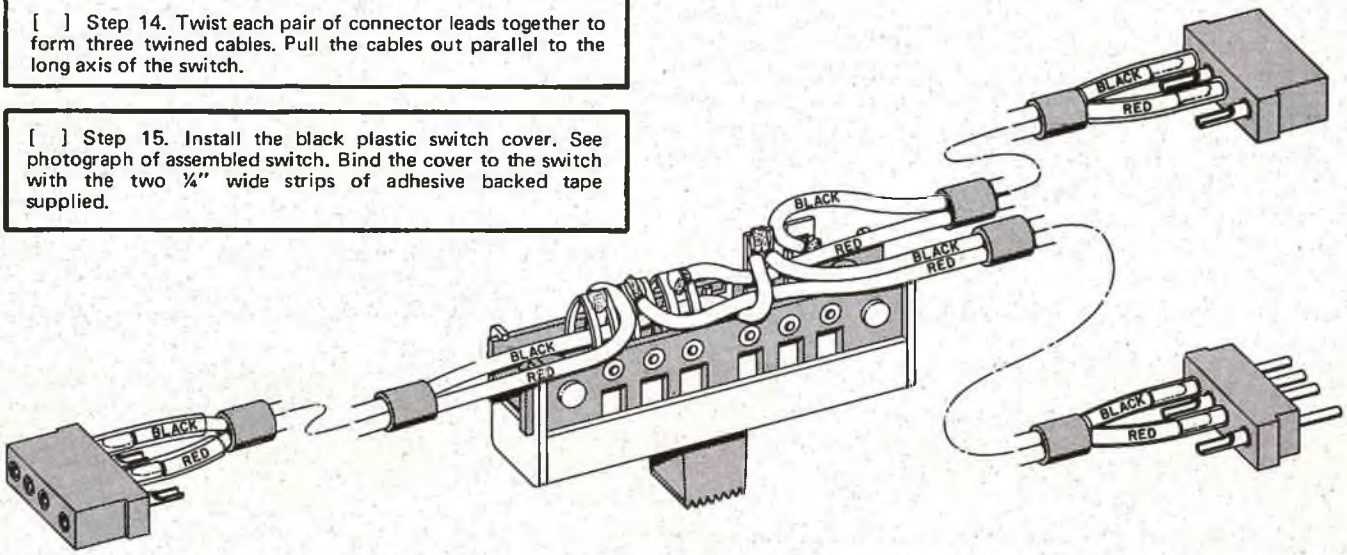
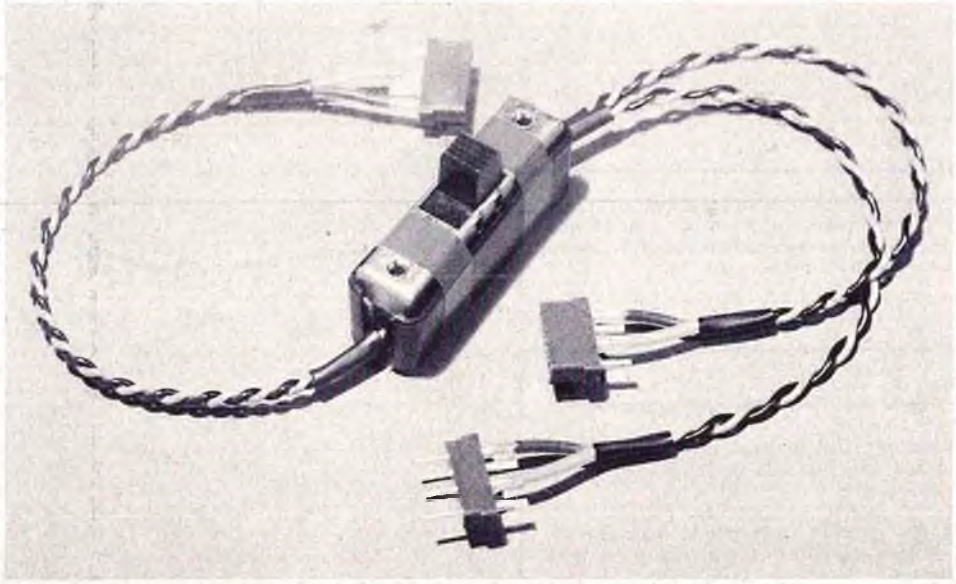


FIGURE H-1
SWITCH HARNESS



Completed Switch Harness

THE TRUTH ABOUT ADHESIVES

TEXT AND PHOTOS BY DON DEWEY

● What's the absolute strongest glue that we can use in the construction of our balsa and plywood RC aircraft?

If you said epoxy, you're absolutely - - - wrong!

A few years ago the construction of almost any model aircraft was limited primarily to the use of the so called "model airplane cements," which were aromatic glues usually consisting of a nitro-cellulose base. While satisfactory for smaller aircraft, they proved to be inadequate for the job of building the larger RC aircraft that had to withstand severe G-loads during flight. Since the hey day of these model airplane cements, RC'ers have been using a random conglomeration of adhesives such as 5 minute epoxies, 30 minute epoxies, overnight cure epoxies, solvent based and latex based contact cements, acetone based cements, plastic and steel filled epoxies, white glues, aliphatic resins, and polyester resins. And, unfortunately, the choice of a particular adhesive is not usually based on the best material for a particular job, but rather on, "what everybody else is using" or, simply, what we assume to be the strongest material.

It is fairly common knowledge that all white glues are pretty much the same, can be thinned with water without affecting the bond strength, and that epoxy glues are absolutely the best for high strength areas such as joining a firewall to the fuselage sides. Right?

Wrong again. To begin with, let's take a look at some of these adhesives and determine where and how they should be used. First of all, if you've ever had your stabilizer pop off on a rougher-than-normal landing, you probably noticed that the hardened glue was still firmly attached to the stabilizer and, on the bottom of the hardened glue, was a thin "skin" of balsa. In other words, the balsa gave way and not the glue joint. What this means is that the adhesive used was stronger than the materials which it had bonded together, And, the basic rule to follow when selecting an adhesive is that it be as strong or stronger than the surfaces to be joined, and that it have adequate bonding qualities for the particular type of material to be joined.

Read the above paragraph once again. To be sure, epoxy has the highest test reading (strength) only because it is designed primarily to adhere metal to metal. Epoxy glue is quite brittle compared to other forms of adhesives designed for use on wood and has very little shock or vibration resistance. It fractures under vibration since it has no ability to absorb shock. In fact, if you read the labels on most commercial epoxies, you will see that

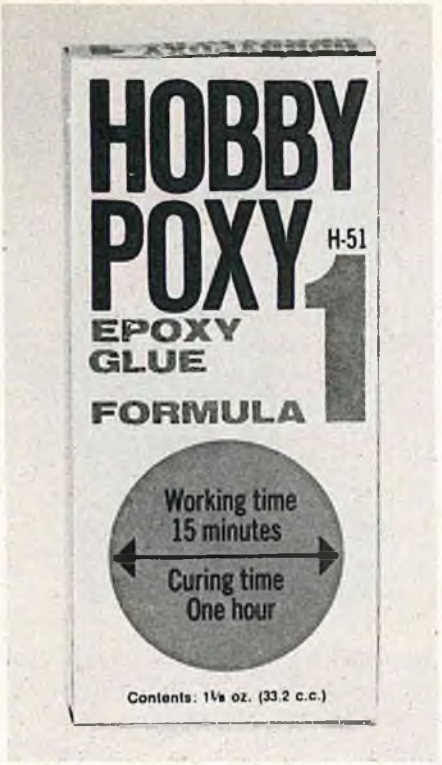
it is designed for bonding metals, glass, ceramics, rigid plastics, marble, concrete, porcelain and most all other **non-porous** materials in any combination. The key here is the two words "non-porous" – and wood is certainly a porous material.

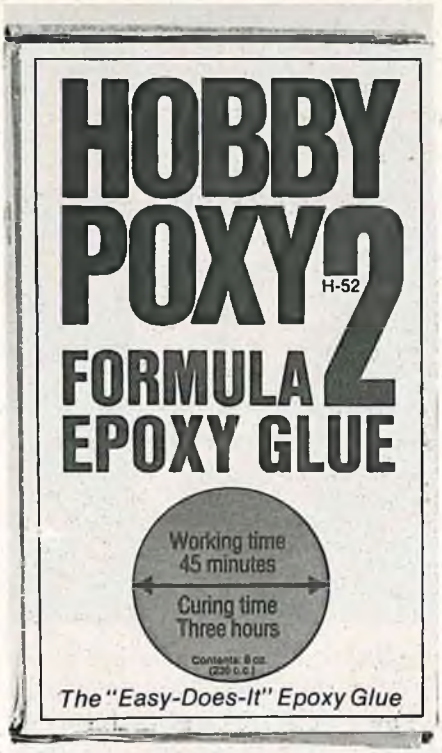
Epoxies consist of two parts – a base and a catalyst which causes a chemical reaction between the two parts starting the curing process. One of the characteristics of epoxy is that there is virtually no shrinkage of the adhesive, itself, since it does not cure by evaporation. The "grab" time of epoxies can be varied by the manufacturer from a couple of minutes to several hours with the cure time from 30 minutes to overnight. The flexibility of epoxy glue can also be varied by the manufacturer, to some degree, by the addition of celastic as a filler. And, as the cure time of epoxy is shortened, the strength goes down proportionately. But, all in all, epoxy is still a brittle joint that is designed for joining two non-porous surfaces such as metal or ceramics. Used as specified, it goes without saying that epoxy is truly a fantastic space age material. But, for joining wood surfaces it is far less than the optimum.

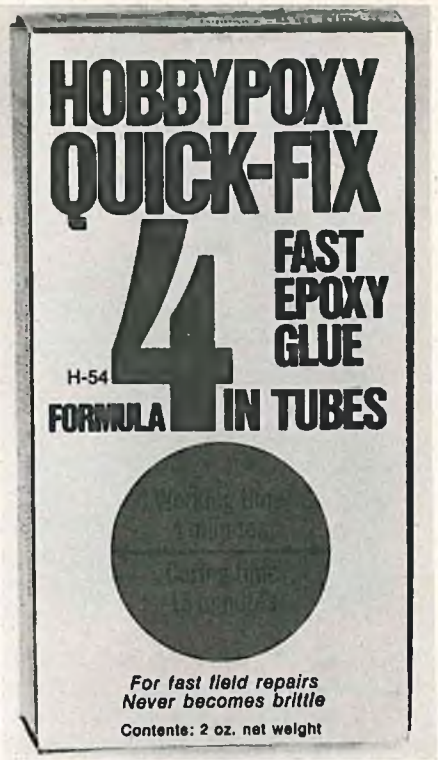
White glues have been around for many years and are widely used in the construction trade due to the fact that they are many times stronger than any type of wood to be glued together, provide a fast grab and cure time, and provides the best penetration of any adhesive known for use on wood surfaces. But, all white glues are **not** alike and **any** white glue has certain disadvantages when used for our applications.

To begin with, many white glues currently on the market contain fillers such as talcum, clay, and wheat flours. These fillers keep the white glue from being waterproof, and, in fact, allow moisture to soften and weaken the glue joint as well as retarding drying time. It is also a method of cutting down manufacturing expense on white glue and is very similar to the ancient practice of watering down whiskey in order to make a higher profit!

The finest white glue that we have used is Wilhold Glu-Bird which is one of the most widely used adhesives in the lumber and building material industry. This white glue is formulated with high solid copolymer polyvinyl acetate resins. Unlike other white glues, it is not compounded with adulterants or fillers, but contains liquid orthonol, and exclusive ingredients which increases glue penetration into the surfaces being bonded. And, in all cases, the bond is far stronger than the wood itself. Glu-Bird White Glue has a 50% faster grab even without clamps. Tests made with hard



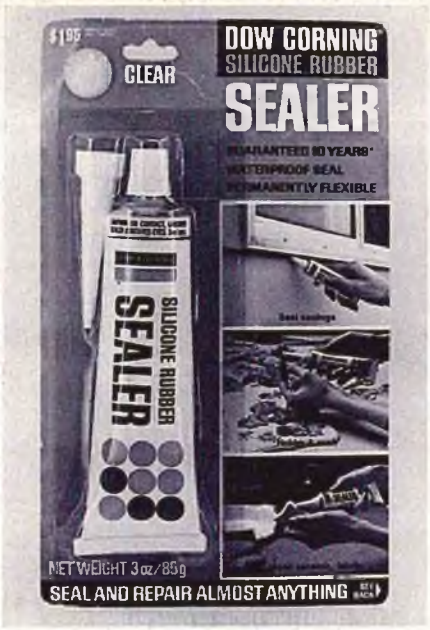




maple prove that strong bonds are effected in as little as 5 minutes with clamps necessary only to align the bonding surfaces and not to hold the joint. It is a hard setting white glue yet shock resistant. Its pure resin base provides high water resistance and it is unaffected by extremes of humidity, dryness, or temperatures. It has one-third greater coverage than other white glues we have tried due to its low viscosity without adulterants. It spreads easily at temperatures between 50 degrees to 110 degrees F. with its optimum application temperature at 70 degrees. As the solvents in Wilhold White Glue dries, the bonding surfaces are strongly bonded together, the drying time depending upon the materials being glued. For example, porous surfaces allow solvents to dry quickly such as balsa, pine, or other soft woods whereas hard dense surfaces such as china, glass, or plastics require a longer drying time. Although it is called a white glue since its base color is white, Wilhold White Glue dries perfectly clear. If the material is applied below the recommended bonding temperature, the glue will remain white indicating a weakened joint. This material has 55% solids, ±2% and the dried film is hard and, in color, is translucent to transparent. Its actual test strength is 3,850 pounds per square inch on an unclamped joint – infinitely stronger than the materials which we would be joining!

However, white glue has certain disadvantages for our applications. While it is certainly stronger than the surfaces to be joined, it does have a tendency to "swell" the joint, and will severely warp sheet wood if it is used as a laminating adhesive. And, contrary to what has recently appeared in the model press, white glue should never be diluted with water prior to using it as a bonding agent. While water will mix readily with white glue, these glues are carefully formulated and the addition of water will destroy this formulation and seriously affect the bonding characteristics and capabilities of the adhesive.

By far the finest "all-purpose" adhesive for use in general RC construction when using balsa and plywood, is Wilhold Industrial Grade Aliphatic Resin. While more expensive than white glue, it is a Mil Spec material that has extremely high bond strength, fast tack, and excellent penetration. It also has little or no tendency to swell a joint or warp balsa or plywood surfaces. It is completely



non-toxic, has no odor, and is non-flammable. It has a high molecular weight to protect and provide resistance to both shock and vibration. It forms a tough and invisible glue line that has excellent sanding ability. In addition, it forms a dry film that is completely insensitive to lacquers and paints. It can be applied at temperatures between 40 degrees to 110 degrees F. with an ideal application temperature of both glue and materials at 70 degrees F. It has a "grab" time of 5 minutes in open areas and 15 to 20 minutes in closed areas. Under normal conditions 10 to 25 minutes clamping is sufficient while overnight drying is recommended for optimum results.

Wilhold Aliphatic Resin is cream colored in its container and dries translucent and almost invisible. It develops it maximum strength in 8 to 10 hours but grabs in less than 10 minutes. As an example, we glued together a set of spruce wing spars and their corresponding spruce doublers for an Ugly Stik wing and tried to pull them apart in 10 minutes. The wood doublers broke rather than parting from the spars to which they had been joined. This material has a strength factor in excess of 3600 pounds per square inch and contains 44% solids ±2%. This material is a polyvinyl acetate with aliphatic resin overlays and is superior to white glue in that it can be applied at lower temperatures and can withstand higher temperatures, once dried. It has proven to have excellent shock and vibration absorbtion qualities and never forms a "brittle" joint.

In our tests, here at RCM, during the past 6 months, we have used a case of white glue, another case of aliphatic resin, and the equivalent to a case of various types of epoxies. We have asked other modelers to use these materials and report their findings to us. In each and every case, they selected Wilhold Aliphatic Resin as the most outstanding adhesive they had used for general building applications. One of the biggest deterrents to the proper use of an aliphatic resin or white glue is applying **too much** glue to the joint. Ideally, butt ends of wood should be double-glued and than a second **thin** application of glue applied. In fact, the thinner the spread, the faster the set and the stronger the eventual bond. And, for most applications, the aliphatic resin, or white glue, should be applied with a small brush, to insure an evenly distributed and minimum spread. We can actually say that, to date, we have not had an aliphatic resin glue joint come loose from shock or vibration. An excellent test for this material is to apply it to the end of a rib which is to be butt glued to a piece of trailing edge stock. In virtually all cases, the rib will easily break loose from the trailing edge. When a rib has been double-glued with aliphatic resin, it provides an extremely strong bond even in a weak area such as a joint formed with a piece of trailing edge stock where the rib is not notched into the tapered trailing edge.

While Wilhold Industrial Grade Aliphatic Resin Glue is somewhat difficult to locate, we predict that it will eventually become a standard item in hobby shops throughout the country, due to its phenomenal qualities for use in model aircraft construction. If you are unable to locate this material in your area, we suggest you write to Wilhold Glues Inc., 8707 Millergrove Drive, Santa Fe Springs, California 90670, or 2943 West Carroll Avenue, Chicago, Illinois 60612.

Contact cement has been widely used by RC'ers for laminating doublers to fuselage sides and, in fact, many modelers use this adhesive for joining wing sheeting to wing ribs and spars. Contact cement is available with a neoprene base and a blend of toluene, MEK, and petroleum distillates; with neoprene base and a 1,1,1, Trichlorethane solvent; or with a water soluble synthetic rubber latex base. The latter material is usually billed as "home safe" since it is non-flammable, water soluble, and has no toxic fumes. However, it is totally unacceptable for use in laminating fuselage sides and doublers since it has a tremendous tendency to "curl" or warp. In fact, in one of our tests, we laminated a 1/32" plywood doubler to a 1/8" balsa fuselage side, and the entire lamination tried to roll itself up into a tube!

Due to the recent health hazard alarm over the use of certain spray contact cements, commonly used by RC'ers for joining balsa or cardboard wing skins to foam wing cores, many of these products have been pulled off the market. One spray contact cement that apparently meets governmental standards is Kwik Stick Glue which has been formulated exclusively for applying balsa or other covering materials on to foam wings. This material is available from G.M.C. Model Products, 28062 Glasser Street, Canyon

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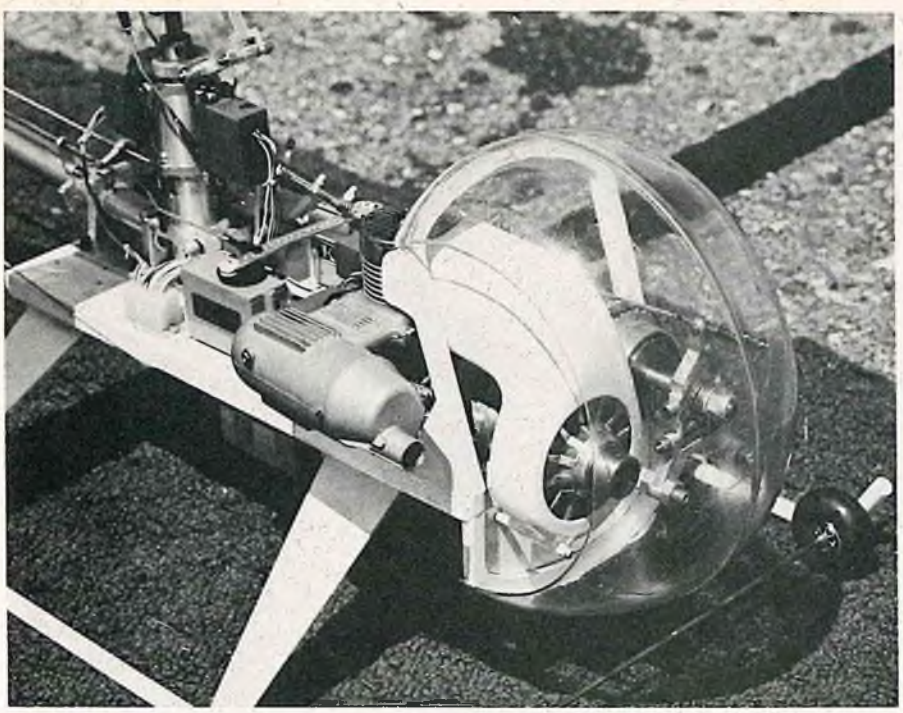
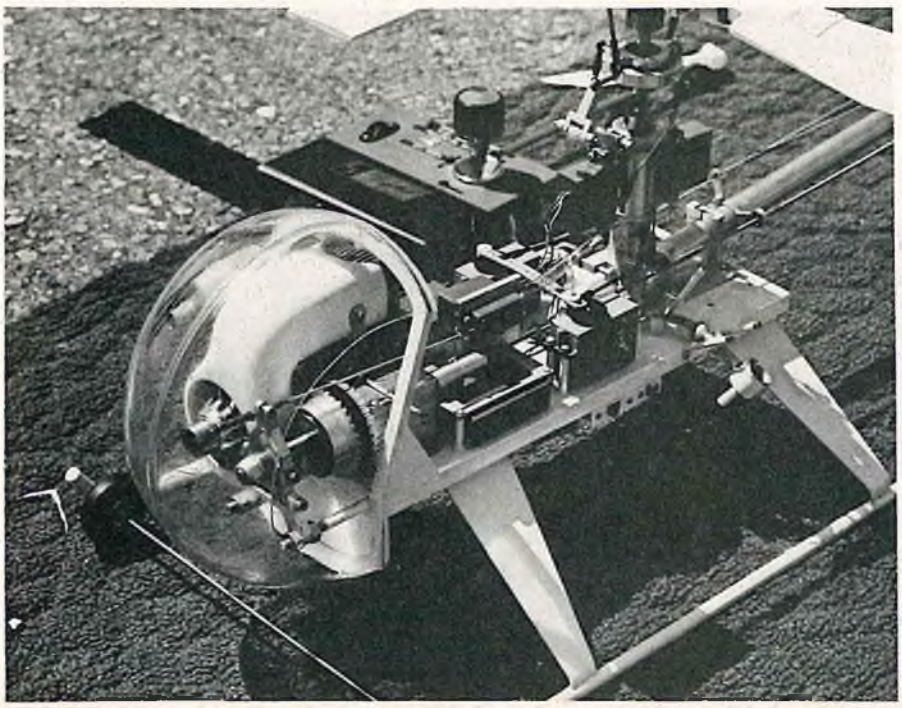


HOVER

BY DON DEWEY

● As you can quickly determine from the title, this column is intended for the helicopter enthusiast or for those RC'ers who think that they might like to get started in rotorcraft.

In kicking off this more-or-less monthly column, let's start with one basic premise - - - you who are reading this material are beginners, just as is the author. For, in fact, there are no experts in the field of rotorcraft today. This is an all new facet of radio control, and throughout the world there are only a handful of truly proficient flyers. One of these is Dave Gray of Du-Bro Products and, as Dave is quick to state, he considers himself a beginner. If you have ever seen Dave fly and perform with his Du-Bro Hughes 300, doing such maneuvers as stall-turns and even a complete loop, you would be amazed at the degree of his proficiency. But, even though Dave is a pioneer in the field or rotorcraft, he still considers himself an apprentice. This is one part of our sport that is so unique – so different – that everyone starts off at the same point. It doesn't matter if you are a raw beginner, a good sport pilot, or the best competition pattern or pylon flier in your club – you're still going to be a complete beginner with a helicopter. You're going to experience the same frustrations, disappointments, challenges, and exhilarations, regardless of your level of proficiency with fixed wing aircraft.



What is it like to fly an RC helicopter? The only way it can be explained is to describe it as a 14 pound object, which you are attempting to balance on top of a rolling ball. The controls are never idle – you're using all four controls simultaneously. The left hand stick is operating throttle and tail rotor, while the right hand stick is operating the roll-mode and the pitch-mode (fore and aft). And, for every action on a helicopter there is a reaction. The helicopter is **capable** of flying and flying quite well – it's a matter of training your reflexes to the point where **you** can fly it. For example, our own personal choice in helicopters, the Hughes 300 by Du-Bro Products, flies in the 80 mile per hour range in all-out level flight. It is capable of most anything a full size helicopter can do, but in order to be able to accomplish these maneuvers, you must first learn to hover. And how fast you learn to hover depends upon your willingness to persevere through the initial stages. You're going to have to teach yourself to fly and you're going to have to do it on a daily regimen. When you can hover your helicopter over a single spot for a full tank of gas - - - approximately ten or twelve minutes - - - you're ready to learn to fly. But to get to that point is going to require a great deal of perseverance. In other words, you **can** learn to fly an RC helicopter **if you really want to.** If you just **think** that you'd like to fly an RC helicopter, you probably **won't.** What this learning process requires is an hour a day, each and every day, for approximately ten gallons of fuel. This is just a rule of thumb time frame, based on the experiences of those who

have learned to fly. Some can do it in a slightly shorter period of time while others require more practice. But, if you start with a proven machine, put in the practice each and every day, you can do it.

Another factor about helicopters is that they are expensive. For example, the Hughes 300 is priced at $350.00. But, this includes and O & R engine that has been completely reworked by Du-Bro Products to the specifications for their helicopter. And, when you stop to think about it, a beginner who starts with a full house competition-multi, may go through a lot more than $350.00 in aircraft if he's learning to fly by himself as you will be with your rotorcraft. And, ten gallons of fuel isn't an excessive price to pay when compared to the learning stage with that full house multi and a newcomer at the sticks. What is apparent, is that you are learning to fly in a shorter time period, with far more concentrated effort than the random one hour per weekend flight pattern of most beginners with fixed wing aircraft. It is imperative that you space your training sessions far more closely than just "every Saturday" when learning to fly an RC helicopter.

During these early stages, you are going to become frustrated and discouraged. When that helicopter leaves the ground for the first time and skitters in every direction at once and all you seem to be able to do is change that direction with no apparent degree of control, it will become discouraging. But, as you trim out the machine and as you keep trying, you will gradually be able to bring it off the ground clean and hold it in a given position. The first time you do this – albeit only for six or seven seconds – you have made the first step forward. From that point on it's only a matter of practice to learn to hover that machine two or three feet off the ground for a full tank of gas. And, when you have mastered that, you are ready to begin learning to fly. And, as I mentioned earlier, if you have ever seen one of the proficient fliers flying RC model helicopters you'll be "hooked" on this new frontier in RC.

So, if you really want to fly an RC helicopter – you can. Make the decision now, let's get started, and we'll take you through the various learning stages as we go along in this column.

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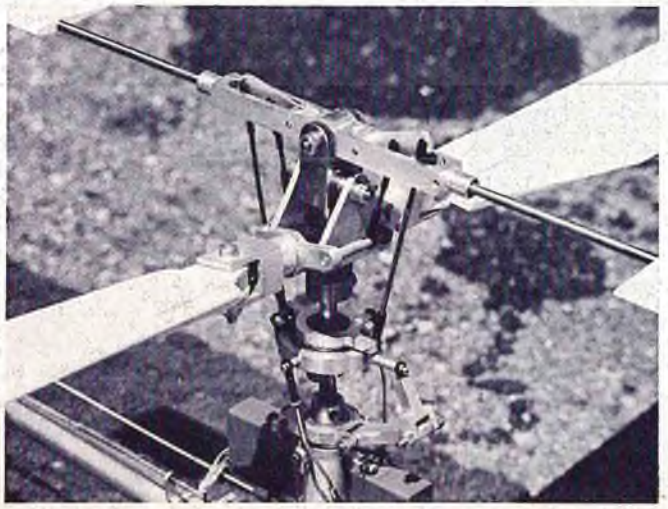

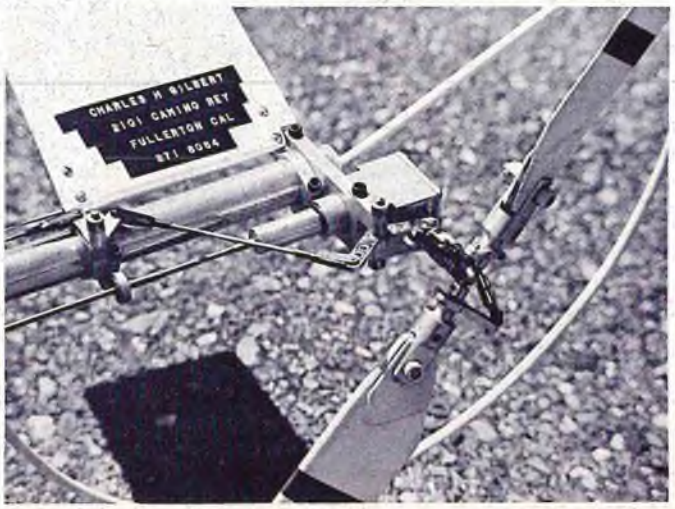

Built from magazine plans, OV-10A Bronco by Joe Hancock takes off on maiden flight in unfinished state.

SCALE IN HAND

BY DAVE PLATT

Last month in our opening segment of our new series on Stand-Off Scale models, we covered the background of the event and studied the approach of getting into this class by buying a kit.

We want to turn now to the question of building a model from plans purchased from a magazine. As we said last time, each way has its advantages and its disadvantages. Essentially, the only real problem with magazine plans (compared to pure scratch-building) is that, as with kits, one is somewhat confined in one's choice of subject to what is available or to what can be achieved by a "mod-job" to an existing design. However, to offset this, we have a number of persuasive benefits.

One is, that by buying a plan the choice of building materials is left to the builder: he may elect to use hard, heavy wood for a tough model, or lighter wood for a more lively version.

A second benefit concerns the repairability of the model. Kit plans, for good reasons, do not contain drawings of each separate piece of the model, whereas magazine plans do, as they must. If an "accident" occurs to the model and a major repair is indicated, a detailed set of plans becomes a valuable asset.

However, we saved the most powerful benefit till last. Those of you who have been reading this column for even only a short time will have become aware that this writer is a "variety" nut. This, of course, is personal opinion and open to argument, but to our mind, the best meetings we've attended were the ones where the greatest number of **different** subjects appeared. While it is true that each modeler may have a favorite type, or period, of subject (as, for instance, our preoccupation with Luftwaffe types), we still enjoy the other fellow's interest when it varies from our own.

To put all this in a nutshell, we like the offbeat airplanes, the good, bad, and the uglies, the forgotten types, the ones that sort out the men from the boys at the field (the men being the ones who don't have to ask what it is!)

Now, it is one of the rather unfortunate rules of commercialism that only the well-known subjects will sell in sufficient numbers to ensure the survival of the manufacturer. For example, the *Macchi 202 Folgore* may be one of the most beautiful, interesting and all-around fighters that we could build, but in kit form a real dog would outsell it, if the latter was a more widely known ship. It's obvious that this somewhat sad "home-truth" has a very cramping effect on the kit manufacturers, but no such restrictions apply to magazine editors. Thus, you will find a far greater variety of subjects in the plans lists; better yet, you'll find more "connoisseur-flavored" aircraft there. The example we gave, the *Folgore,* is not available as a kit and may never be, but you can find one in the plans catalogue (RCM Plan #221 by Dennis Bryant).

So, while relying on published plans may carry a choice-penalty compared to a scratch project, it still beats kit buying 10 to 1 in this respect.

Before leaving the option of building from plans, we'd like to touch on a

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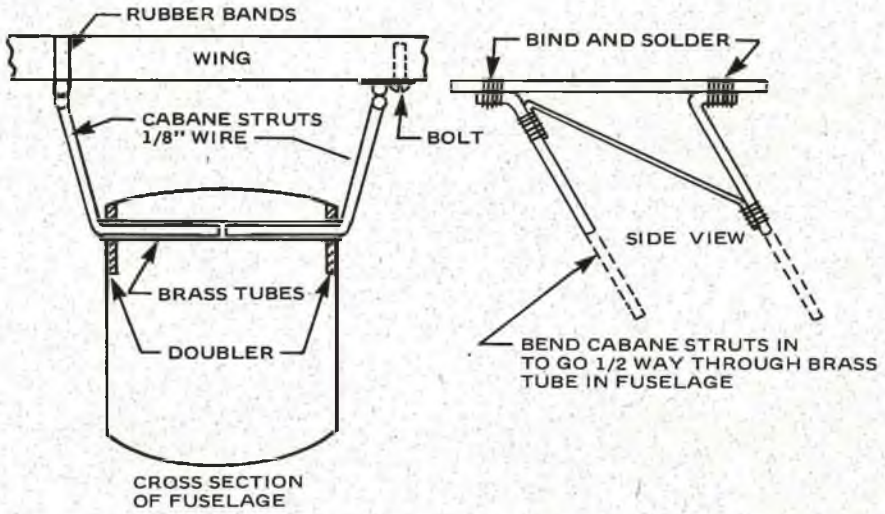
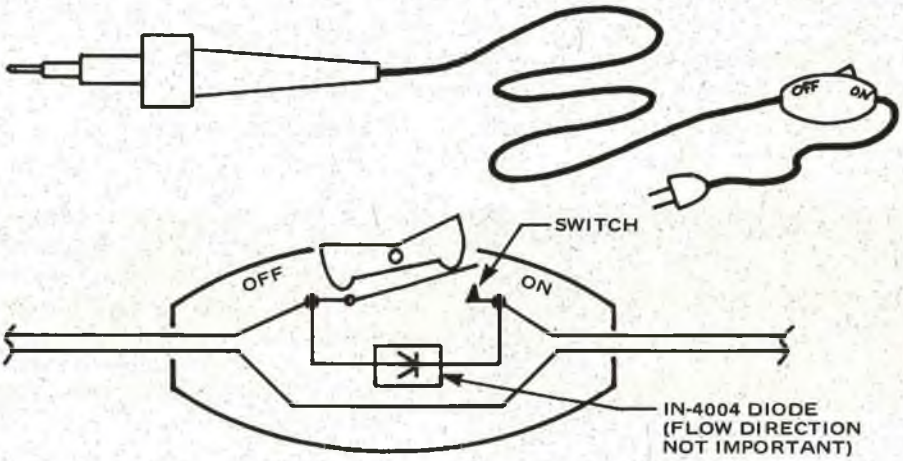
FOR WHAT IT'S WORTH

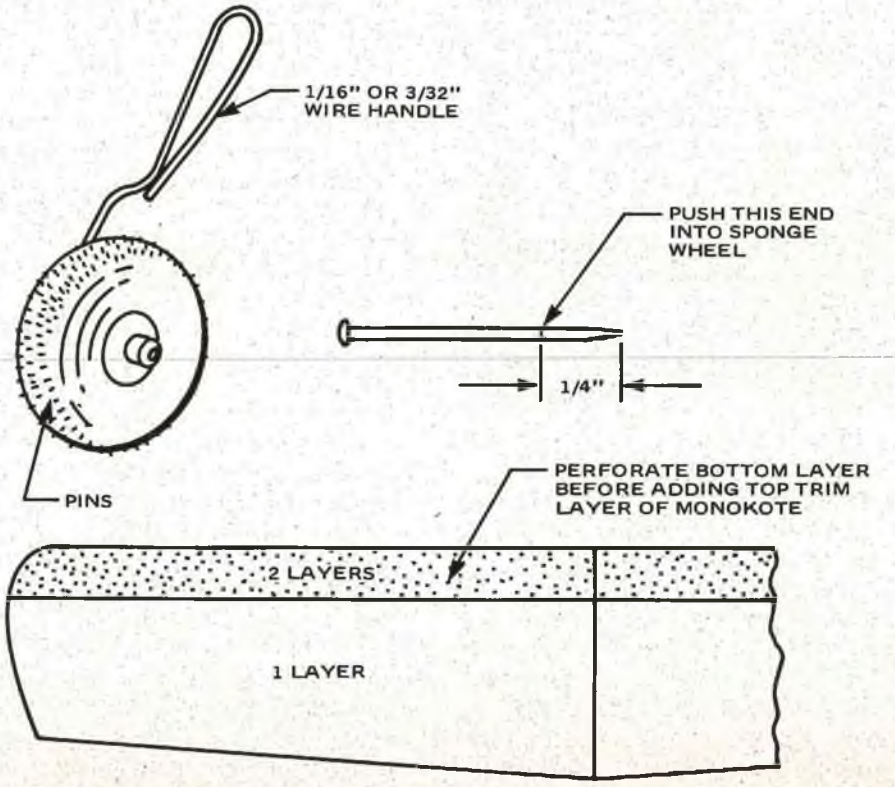
Don't install wire cabane struts permanently in your new biplane. Instead, permanently install two 5/32" brass tubes through the fuselage (use doublers). The cabane struts should be built in two sections so one can be installed into the brass tubes from the left and the other from the right side of the fuselage. The struts can be easily removed for painting, cleaning, etc. They cannot come out, however, when bolted or rubber banded onto the wing. This idea was submitted by E.J. Fischer of Indianapolis, Indiana.



Those of you who use a soldering iron may find this idea from the Indian City R.C. Club newsletter helpful. To prolong the tip life on a soldering iron during extensive heating periods, when occasional soldering is performed, an "idle-heat" switch can be easily installed in the cord. Use an in-line switch and a diode as shown in the diagram. Install the parts so that the ON position feeds full current to the iron. In the OFF position the diode blocks out one half of the AC current and the iron will "idle" at approximately one half of its normal heat. The tip will last much longer and stay cleaner. When the iron is needed, switch it to ON and it will heat up much quicker than if it had been turned off completely. Any one of the following diodes can be used: IN4004; IN4005; IN4006; IN4007. The diode may be installed in either direction. The iron can be used as a dual heat iron, i.e. a 50 watt iron can be used as a 25 watt iron, etc.



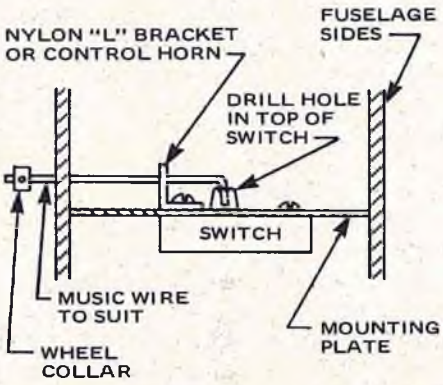
Often, when putting MonoKote on top of MonoKote, such as when you are adding trim, it becomes very difficult to keep from getting bubbles in the top layer of the plastic covering material. To eliminate this problem, John Evert of Rosemont, Minnesota, took a small sponge rubber wheel about 1" in diameter, clipped about ¼" off the pointed end of straight pins and pushed the blunt end of these ¼" pins into the sponge wheel. Push enough pins into the wheel so that they are about 1/8" to 3/16" apart and so the points stick out about 1/16 of an inch. Mount the wire on a wire handle and roll it over the MonoKote in the area you are going to cover with a second layer of the material. This perforates the bottom layer of



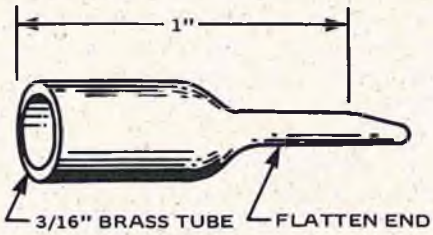
FOR WHAT IT'S WORTH

MonoKote and allows the trapped air to escape, thus eliminating the bubbles.

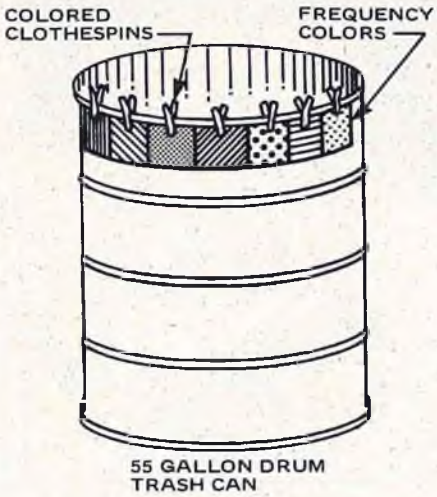
Lester Beason of Roswell, New Mexico, suggests an exterior actuator for your slide switch. It is very simple and only one internal support is needed since the fuselage side provides the second support. In a crash the music wire pivots in the seat or bracket and will come out of the switch without damaging the bakelite parts.



Darrel C. Stebbins of Spokane, Washington, suggests a method for getting glue into the slits you have cut in your control surfaces for installing hinges. Simply use a one inch length of 3/16" brass tubing, squeezing the end in a vice until it is flat. Next, file the end until it is smooth and to reduce the overall thickness. Fit the round end over your glue tube nozzle, insert the flat end into the slit and squeeze glue into the slit until it bubbles up at the ends of the slit. For white glue or aliphatic resins, drop the tip into water to clean or just leave it in the water until it is used again.



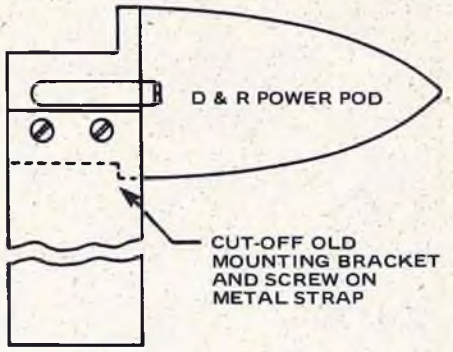
Does the frequency board at your club end up missing, knocked over, or just plain stolen? The problem was solved by the Mountaineers of Charleston, West Virginia, by painting the frequency colors on the rim of a 55 gallon trash can. The clothes pins fit the rim nice and snug and are stored in a plastic bag under the drum at night. The can also serves to keep the pit area clean. This idea submitted by Bryce Petersen of Charleston, West Virginia.

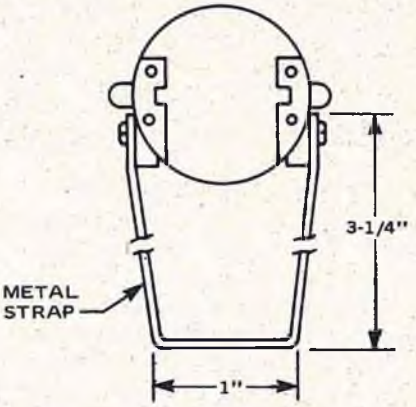


Robert L. Govro of Albany, Oregon, like many modelers, uses the silicone sealer-Saran Wrap method of molding a wing or hatch seat for his models. An excellent way to trim the excess silicone once it has cured is to use one of those small V-shaped fingernail cuticle trimmers. They are available at most any drug store for about $1.00 and beat a new hobby knife blade by at least 100%!

Rather than buy a special hot knife for your all-foam aircraft or foam core wings, try this suggestion from Gray Ruff of Phoenix, Arizona. If you have a soldering pencil with a screw-in point and an X-Acto knife, unscrew the head of the X-Acto knife and try it on the soldering pencil. This works with a Weller SP-23 pencil and an X-Acto with a 5/8" diameter handle. Use the blade you were about to throw away since a keen edge isn't needed for foam when using heat.

Bart Kleinlein of Salt Lake City, Utah, mentions that, in their valley, many sailplane pilots use the D & R Power Pod to get their planes in the air. In a crash the legs usually break, and if you keep buying new ones you will soon go broke. These fliers found that epoxy doesn't hold the plastic so they came up with a cure. You obtain a 7½" x 1" x 1/16" piece of metal and bend it to the shape shown and secure with your choice of screws and nuts.





For protecting airborne systems, Randall L. Courts of Fremont, California, uses a product called Aircap. It is currently used by many electronic component manufacturers for packing their products. In addition, it is used in many candy boxes. It looks like a "bubble pack" and consists of two plastic sheets laminated together with air pockets spaced at regular intervals. The size of the air pockets range from ¼" to 1" depending on the size desired. This material is extremely lightweight, firm, non-compressible, and provides equal protection when wrapped around corners and edges of components. It also does not deteriorate with age as does foam rubber.

From the Palm Beach Aeronauts "News" comes an idea for using Plumbers No. 2 cement for plastic PVC pipe which is available in most all hardware stores. This is an excellent and extremely strong cement for use when assembling plastic parts in many of todays models, especially the ARF types. The small can with an applicator costs about 95 cents. The plastic parts should be given a light sanding prior to being joined with glue. Properly joined the parts are almost impossible to separate.

for $12.00. A scale canopy is also available at $3.50. A complete package consisting of the plans, cowl, and canopy is available for $22.00. The Hellcat, designed by Brian Taylor, was First Place Winner in Class II at the 1973 British Scale Nationals.

B & F ENTERPRISE CATALOG

B & F Enterprises' new catalog features a $6.00 Geiger counter, a $1.50 reading pacer, fiber optics for $1.00 a yard, Light-Emitting Diode indicators at 10 for $3.50, an all-new digital wrist watch for $149.50, and a $332,280 RCA Model 501 computer for only $4000! Almost all is high-grade military or industrial surplus, made for performance, not for a price. A goldmine for the non-technical individual as well as the engineer, science student or hobbyist, the B & F catalog offers its reader several unique opportunities. He can own a fully checked-out system such as the Friden Flexowriter. He can assemble a complete system such as a Hi-Fi or a burglar alarm. He can obtain the components to break into such exotic technologies as digital computing or opto-electronics. And, he can re-stock his "junkbox" with electronic components and hardware. All this at bargain basement prices. Also offered in the B & F Catalog is the Aries electronic kit line: a 12-volt digital quartz-crystal chronometer for car or boat, a 12-volt fluorescent lamp for trailer or boat, and a beautiful 6-digit household clock for under $50.00! Many more, all in kit form. Naturally satisfaction is guaranteed on any item that B & F sells. From B & F Enterprises, 119 Foster Street, Peabody, Mass.

BoLECTRA

Sore fingers and broken starter cords are gone forever with Bolinks BoLectra - - - the first electric starter designed especially for 1/12 scale cars such as the Jerobee, Riggen, Mach-12. The BoLectra comes with a 15 foot cord and plug-in adapter for your car cigarette lighter and is priced at $14.95. This unit is also available with clips for a standard battery at the same price. Clips are also available separately at $1.49. Also available from Bolink are durable receiver antenna support tubes, starter cords, starter springs, and starter buttons for Cox and Jerobee .049's. Complete replacement parts for Jerobee cars and .049 Cox motors are also available. For direct mail order service or for catalog, write Bolink Industries, Box 80653, Atlanta, Georgia 30341.

HOT STUFF

Hot Stuff is a clear, non-toxic, one part adhesive with the viscosity of water. It will bond both porous and non-porous material (wood to wood and metal to metal). Hot Stuff replaced 1600 pounds of rivets formerly designed into the 747. Hot Stuff is great for very fast field repairs. For example, just hold a broken spar or sheeting tightly together and apply a very small drop of Hot Stuff which will penetrate the wood. The absence of air will cause the Hot Stuff to go off immediately. Fill a crack with balsa sawdust and one drop of Hot Stuff. One word of caution, however, if you get any on your fingers don't touch a thing or you will be stuck! Price is $8.00 per ounce plus .50 cents First Class Postage from Bill Hunter, Satellite City, 9486 Sandusky Avenue, Arleta, California 91331.

SUPER CUDA

This is a hot new contest airplane from the West Coast. Fourteen Super Cudas were entered at the Phoenix contest with seven out of twelve finalists taking home trophies. The Super Cuda features a high quality fiberglass fuselage ready for painting. The standard kit has a foam wing and all balsa included at $69.95. The deluxe kit has a balsa covered wing with tips installed and sanded at $94.95. The Super Cuda has been flown by the RCM staff and we can recommend it as a top competition machine.

STALLION .35 R/C

K & B Manufacturing, division of Aurora Products Corp., 12152 Woodruff Avenue, Los Angeles, California 90241, has announced that the Standard Stallion .35 that has been popular for over ten years is now available as a .35 R/C engine for only $19.95 retail. It is the ideal powerplant for beginners in R/C flying. The Stallion .35 R/C offers all the power, performance and dependability of the Standard Stallion .35 but incorporates an exhaust baffle linked to the carburetor for the smooth idle and control required for R/C flying. K & B quality throughout, the low priced Stallion .35 R/C is now available at local hobby dealers. □

SCALE IN HAND

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problem which we frequently encounter in our correspondence from our readers. This concerns the matter of converting a U/C scale plan to RC. We have seldom, if ever, been able to recommend this. While exceptions might be found, a U/C scale design is usually too small and too ruggedly (and thus heavily) built for a truly successful RC conversion. It is very easy to add beef to a model, but hard to take it away. Furthermore, virtually all U/C scale models are built in one piece and have not needed to provide space for the RC gear. By the time you're though changing things, you've put in more work than you'd have had to design the whole thing from scratch. All in all, this kind of conversion is best forgotten. Now the reverse – RC to C/L, that's another matter entirely – but not for this column.

So, we come last to the Ultimate Alternative – a pure own-design model; a scratch-built project, where all you start with is a blank sheet of paper and the "hots" for one very particular piece of flying machinery . . . .

What is the truth about scratch-building? Is it, as some say, an excercise in Pure Scientific Thought; the practical result of years of study in aerodynamic theory? Or is it, as others (usually the fellows who can do it) claim, a very easy job that anyone can do?

Truth - - - it is neither of these.

What it IS, might be compared with playing a musical instrument; simple enough when you know how, when you've studied the basics to get you off-and-running, and when you've had your disappointments in the institution known as the School of Hard Knocks.

Another truth - - - wishing will **not** make it so. Preparatory reading, conversations, questions and answers - - - all of these are important, but you can end up as the club's resident armchair expert, unless you **do it.**

Sounds like a lot of work? Some blows to the ego, too? Yes, it will be. But, in the end, this is the way to increase our ability and knowledge and, inevitably, our pleasure in the hobby. In these times of almost-ready-to-use items, the fun to be had from creating something tends to be pushed into the background and this is a pity. But enough of the philosophizing - - - the fact still remains that armed with the basic ability to design a model, the whole history of aviation is opened up and the choice of a new model becomes truly a choice.

In this series in the coming months we are going to explain how decisions are reached as to the size of the model, what functions can be used, how ribs are drawn out for any shape of wing, how formers are drawn, how incidence angles, tail areas and Center of Gravity are determined, and how structures are designed that will be easy to make and be of the correct strength.

In order to get underway, we're going to need some drawing materials, so to round out this month's episode, we'll make a few suggestions on what you might look for:

A scratch-pad for figuring and sketching. Paper can be used for drawing your plan on too, but we use Mylar, which is dimensionally stable (on paper, a 36" long line today can be 3/16" off in 3 months time). Mylar also is stronger and drawings can be cleaned more easily. The brand we use is K & E "Herculene" .002" thick, matt both sides. We'd suggest the 24" wide roll as being of adequate size for non-commercial plans.

Mylar is fairly expensive, so you may wish to stay with paper. If so, we'd recommend an 80# weight tracing vellum such as "Clearprint."

Pencils, of course. Get a couple of inexpensive draftsman's mechanical pencils and some leads in the 3H to 7H range. You'll need a "pointer" (to put a point on the leads), get a small hand-held job.

Cleaning powder, such as "Pounce" or "Dandy Rub." This stuff consists of finely-ground rubber eraser; you sprinkle some on the paper or Mylar prior to drawing. The rubbing of your instruments and hands, etc., on the surface while drawing keeps things free of dirty marks.

An eraser. For Mylar get a Mars Plastic eraser; for paper a regular eraser will do.

A long metal straight-edge, also a good accurate ruler with 1/32" and 1/50" graduations. A Dietzgen 1390 PW will do nicely.

A set of medium-size French curves (down, Don, down!) plus, most necessary of all, a couple of "yacht" or "Ship's" curves. These will be used for drawing ribs, etc., and should be 15" to 20" long. An adjustable curve is handy but not vital.

You'll need a few additional drawing tools like a compass, divider, triangles of 60-30 and 45-45 types, a protractor and sundries such as thumb-tacks, etc., for which definite brands are not important. Just get decent quality tools of good versatil-

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ity - - - for example, get large rather than small tools which would be limited in scope.

All told, you'll spend perhaps $40.00 or so if you go with the Mylar, somewhat less with the paper. Join us next time and we'll see what we can do with all this paraphenalia. □

HOVER

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Next month, we'll cover a few hints and kinks in building that may save you repair time later on.

***

This month's lead photographs were taken by Dick Tichenor and evidence remarkable craftsmanship in an original designed and scratch-built helicopter by Charles Gilbert of Fullerton, California. This rotorcraft flies as good as it looks and, as you can tell from the photographs, that craftsmanship does look good. Charles is a helicopter pilot in the U.S. Coast Guard Reserve at Los Angeles. All of the machine work for his whirlybird was done in his home workshop. If you take a good close look at the photograph, you'll pick up several hints and kinks that you may file away for future reference for your own original machine.

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★★★

While on the subject of new helicopters, we've had the pleasure of working with a prototype of Du-Bro's new all metal machine, which will be demonstrated publicly for the first time at the forthcoming Toledo Conference. This is a 'bolt-together,' all metal job, where the only wood is in the servo mounts and the training gear. You can put this one into the ground, then repair it and have it back in the air again in a matter of minutes. It is truly an ideal machine from a training standpoint due to its durability and repairability, and is also an excellent performer in the hands of a competent pilot. Watch for it - - - this one should be available before summer - - - -

★★★

We'd like to see photographs of your helicopter, whether scratch-built or built from a kit, along with a few notes on how you're progressing with your own flying. We'd also like to have any hints and kinks in the building and flying of RC helicopters and we'll give a year's subscription, or an Anthology Library Series Book (publisher's option) for each one printed in this column. Drop us a note and let us know what you'd like to see in this column and what you're doing in the field of RC rotorcraft. □

ADHESIVES

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Country, California 91350, and is priced $2.95 per spray can. For permanent bonds, coat both surfaces evenly and allow 30 seconds drying time before assembly. The bond should be made while the adhesive is wet and aggressively tacky. For non-permanent bonds and for easily removable applications, apply a light coat to one surface and allow to dry at least five minutes before mounting. Surfaces can then be separated when desired. For our own usage, we have joined balsa wing skins to both hot wired and molded form wing cores and have had no problem with separation due to humidity changes and the like. This material is extremely convenient to use due to the fact that the items to be joined do not require a long setting time before assembly as was a common practice with some of the older contact spray adhesives. We've also found this material to be strong enough to join foam wing ribs to aluminum skins in an all-aluminum aircraft with which we have been experimenting. Thus, it has an extremely high bond strength and is an excellent material for this type of application.

The virgin neoprene contact cements have a high solid content and provide a very flexible bond but with a glue line that is almost impossible to sand. These contact cements are approximately 20% solid neoprene and are designed for laminating decorative plastic laminates such as wood veneers to wood, particle board, composition board, dry wall, plaster, cork, rubber, iron, steel, aluminum, etc. In normal applications, the contact cement is applied evenly to both surfaces to be laminated, allowed to dry from 15 to 30 minutes, and then positioned together and bonded with pressure. With all contact cements, the greater the pressure the better the bond. However, the bond strength of most contact cements is in the range of 400 to 500

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pounds per square inch. Contrast this to the 3600 pounds per square inch strength factor of aliphatic resin or white glue and you may think twice about this method of adhering your leading and trailing edge sheeting to your next wing! In addition, these contact cements (with the exception of latex based materials) are extremely toxic since they contain butanone, toluol, and hexanet. Under no circumstances should these materials be used without adequate ventilation.

As previously mentioned, epoxy glues are a two part mixture which cure by a catalytic action and are primarily designed for use when maximum strength is desired and where the joints are not subjected to high shock or vibration since epoxy joints are rock hard and non-flexible. The best epoxy glues that we have used to date, due to their particular formulation, are Hobbypoxy Formula I which has a working time of 15 minutes and a curing time of 1 hour; Hobbypoxy Formula 2 which has a working time of 45 minutes and a curing time of 3 hours; Hobbypoxy Formula 4 which is excellent for on the spot field repairs; Devcon 5-Minute Epoxy, and Wilhold 5-Minute Epoxy glue which has a working time of 5 minutes and a curing time of 2 hours. The Hobbypoxy formulations are more flexible while the Wilhold 5-Minute and regular epoxy glue dry crystal clear and transparent. One thing to remember when working with

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fast drying or so called "five minute" epoxy glues is that they do not have full strength in a "few" minutes but, rather, maximum strength is obtained in 1 or more hours. They do offer the advantage of a fast initial grab to hold surfaces in alignment but should not be used for general RC construction.

Devcon Plastic Steel is a specialized type of steel-filled epoxy resin which contains approximately 80% steel and 20% epoxy resins. Primarily used by industry for repairing broken machinery, filling holes in casting, making metal forming dyes, and for many other applications, it is ideal for our usage in joining metal-to-metal parts and for such "spot" usages as gluing a piece of metal tubing to piano wire, or the retaining washer to the back of a Du-Bro E-Z Connector. When using Devcon Plastic Steel, allow to harden for 2 hours. This material should not be used if the materials to be joined or the room temperature is below 60 degrees F.

Another type of epoxy that has made its way into the market is Kwik Set Epoxy which is available in two four ounce bottles. This is a filled epoxy which, when mixed, will stiffen in five minutes and set firmly in fifteen minutes without the "running" normally associated with most epoxy glues. We have found this to be an excellent epoxy for use in firewalls, and other areas requiring a strong adhesive fillet that doesn't run all over the interior of the airplane. This ma-

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terial is available in the RC industry from Gas Model Products, 110 Valley View, Southgate, Kentucky 41071.

Another adhesive that has found its way into usage by RC'ers are the Silicone Rubber Sealers such as that manufactured by Dow Corning. This is a permanently flexible adhesive that is used by RC'ers to form wing saddle seatings, to adhere NyRod and Gold'N Rod to fuselage sides, to secure cockpit coamings, wherever a permanently flexible "rubbery" joint is desired. This adhesive is available in clear, white, black, and silver, under various trade names. Our choice is the Dow Corning brand.

While we do not use any of the so called "model airplane cements" here at RCM, we do use Dupont Duco Cement, a familiar sight in most hardware stores. In areas not requiring the high strength of a aliphatic resin, and where weight is important, such as on smaller models, this material is excellent. As an example, we use it for joining wing skins to wing spars, ribs, and leading and trailing edges since it provides a strong joint that sands even more cleanly than the aliphatic or white glues. Again, this type of cement cures by evaporation and where you have a "closed" joint, such as in a D-tube wing structure, the wing should be allowed to dry overnight for a permanent bond.

Another type of adhesive that recently made its way into the commercial market are those containing cyanoacrilate ester. This material, while quite expensive at $7.95 an ounce, has a tensile strength of 4200 pounds per square inch. It is a material that should be used with caution since one drop will bond your fingers together in a matter of seconds to a point where they must be cut apart with a razor blade! This material is used extremely sparingly and a one ounce bottle is virtually the equivalent of at least two sets of epoxy. In our tests of this material, we have found that a single drop of Super Glue will bond two pieces of plywood together

to a point where the plywood will actually tear if the surfaces are pulled apart after drying for approximately ten minutes. This material is ideal as a special purpose adhesive for firmly securing canopies to bare wood, paint, Solarfilm, or other plastic covering material; for installing pushrod exit guides, or joining virtually any plastic to any other plastic, even the so-called "un-gluable" materials. The only material that would be difficult to join with Super glue is Teflon. This material is distributed in the RC industry by Model Specialties, 9117 La Barranca N.E., Albuquerque, New Mexico 87111, and is available direct only. When using a cyanoacrilate ester, it is recommended that the glue be kept in the refrigerator when not in use in order to prolong shelf-life. In fact, if the material is not going to be used for some length of time, it can actually be kept in your freezer without any damage. However, Super Glue should be brought up to room temperature before using in order that it may achieve maximum strength. This is a good rule to remember with any adhesive - - - both the adhesive and the material to be joined should always be at room temperature before gluing in order to obtain maximum adhesion.

If you are thoroughly confused by now let's summarize what we have been discussing in this article. First of all, we need glue joints that are stronger than the materials to be joined; one that is flexible enough to withstand shock and vibration; that is water resistant; fuel proof; easily sandable; and one that will accept the types of finishing materials currently in use by RC'ers. Here at RCM, we use Wilhold Aliphatic Resin as our prime adhesive for all general construction. Apply it sparingly using a thin even coating and pre-glue butt ends of materials where they are to be joined. For maximum strength, make sure that the materials to be joined are not cold and at least 60 degrees F. when the adhesive is applied. Epoxy is used for certain specialized bonding requirements where vibration and shock are not a problem. An example of the latter would be a plywood landing gear doubler glued to a fuselage bottom wherein the landing gear bolts pass

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ENGINE CLINIC

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RC'ers are doing. Then, when their engine only turns 16,000 rpm on the ground and some of the big boys engines are turning 18,000 rpm or better, it is a foregone conclusion that the big boys have special engines! The guys who are turning the fast speeds and low times are paying attention to all the minor details, and one of these is the propeller. With times in the low 1:20's now a good propeller is most essential. And, as most of the top pilots know, you can carve three identical propellers and yet one will pull better and be faster than the others. There is a lot of unhappiness when a good propeller gets broken. Especially if it is one with which you have turned your fastest time.

So, now that you are convinced that you need a pitch gauge, how do you put the darn thing to use? The first thing to do when checking any propeller whether it is intended for a pylon racer or stunt ship is check the propeller hub for squareness. Many of your propellers actually have wedge shaped hubs. This means that if you have an 8" pitch propeller with a crooked hub, when the propeller is installed on the engine one blade may, in effect, be 8½" pitch and the other only 7½", - - - the blade running at the higher pitch having a tendency to hold the rpm of the engine down. So, the first thing to do is check the hub for squareness. To do this you check the pitch of the propeller at the tips and at a station or two inward. Both tips should be the same. If one is different than the other, sand or file the back of the hub until they are the same. Actually, I like to use a pair of vernier calipers to check the hub and do so in four directions - - - both sides and up and down as well. The up and down measurement determines if the propeller tips follow the same path. Look at your propeller while it is turning on the engine some time and see if you can detect one or two tips. If you see two, the propeller is not tracking. The up and down tracking cannot be done on a pitch gauge.

Having the hub trued, you now want to check out the blades for accurate pitch. The majority of you use the Top Flite pylon propellers. Those of you who have never used a pitch gauge before are going to be

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through both the bottom of the fuselage and the plywood doubler holding it securely in place. Five minute epoxy is used in areas where a fast "grab" time is required and where shock and vibration loads are at a minimum. We often use contact cement for laminating doublers to fuselage sides but never for joining wing skins to wing ribs. Where the latter might be satisfactory for use on sailplanes, we would not recommend this application on powered aircraft.

Don't be mis-led by wild claims for different types of adhesives. Remember that each is a specialized material designed to do a certain industrial job or home repairs. None of them were specifically designed for our usage, and our past few months of tests were designed to find out the best adhesive for our particular applications. This we feel we have accomplished, at least to our own satisfaction, and for those who participated in this usage test procedure. Remember (1) use the smallest amount of glue necessary to do the job properly; (2) use the proper adhesive to obtain a flexible joint that has penetrated the surfaces of the wood; (3) apply the adhesive at normal room temperature. You will find that by properly using this basic information on adhesives you will build stronger, more durable aircraft capable of sustaining higher levels of vibration and degree of shock while saving a considerable amount of money on adhesives over the next building season. □

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pellers add to the vibration in a system. Generally, an airplane made of balsa wood covered with silk seems to dissipate the vibration from the engine better than airplane models made of ABS plastic and we would place the fiberglass fuselage someplace in-between the ABS fuselage and the balsa wood fuselage. We highly recommend wrapping the battery pack in foam rubber and placing it in a compartment of the airplane that is snug but not a real tight fit. We also recommend the same treatment for the receiver. It is our opinion that the battery pack is probably the most sensitive to vibration of anything in the system and yet many times it gets the least protection from vibration, so give this some consideration in your installation. □

HOUSE OF BALSA'S NOMAD

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channel, rudder only, or free flight powered glider. It could easily have elevator added with the small proportional systems available today. We used the Cannon 2 channel Tini-Block, using only the receiver-servo unit for rudder control. There would be no problem adding the other servo to the elevator. The Nomad sports a 48" wing span with a total wing area of 230 square inches. The fuselage length is 28" and the total weight is 11 oz. The plans call for an engine displacement of .010-.020 – we used a TeeDee .020 and a PeeWee .020 engine – both manufactured by the L.M. Cox Company and both of which were more than adequate for this powered

sailplane.

The plans and instructions are done quite well including 4 sheets, 2 of which are working plans and 2 which contain complete written instructions. These sheets show step-by-step how to construct the Nomad and, along with each step is a corresponding photo. It seems to us that this is a sailplane for everyone to build for that "change of pace" between the big ones. It is certainly restful to fly and there are several thousand RC'ers around today who learned to fly on the original Nomad which was presented years ago as a construction article in Flying Models Magazine. And, for the rest of you - - - how long has it been since many of you have flown rudder only? It's a ball!

The House of Balsa kit is of excellent quality both in material and in information on how to build this particular kit. The only change we made was to add about 30% to the rudder area. We didn't add to the complete vertical fin but just cut a new rudder-fin and moved the hinge line ½" forward. The plans show the Ace single channel Baby Twin pulse proportional actuator and, since we were using the Cannon servo block, we felt it was necessary to increase the rudder area. Besides, we like 'em to turn right now!

Our little beauty was covered with white Solarfilm on the fuselage and transparent blue Solarfilm on the wings and stab. And all of the "big guns" with the roaring .60's laughed when we brought it out to the field, but had to try it before we left! For the price of $11.95 the Nomad is an exceptionally high quality kit produced by a manufacturer who obviously puts quality first. In addition, it was not only an excellent "first aircraft" for the newcomer to R/C, but a beautiful "after work-before dinner" powered sailplane that can be flown from virtually any vacant lot. ☐

SUPERMARINE S-5

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boats will keep you on the surface – the S.5 makes a beautiful airboat under those conditions. With proper water conditions, take-offs are truly breathtaking. The model tracks straight and true, and a little up elevator is all that is needed once she's up on the step. Altitude is gained rapidly despite the minimal wing area, and the airplane, once airborne, handles much like a Goodyear racer. I would describe it as a "groovy" flier, and it makes beautiful pylon turns – just what we need for our model Schneider Cup event.

Although the wing has no dihedral, the model is very stable – this probably results from the lowering of the C.G. due to the float system hanging below the wing. Aileron control was just about right as designed – we need a little more lateral control power due again to the floats and their contribution to the roll moment of inertia. Elevator action was smooth with the pushrod set in the outer hole of a standard long control horn. The only trim required during the initial test hop was a bit of right aileron to compensate for motor torque – I had optimistically installed the engine initially without offset. (The plans show the correct thrust line.)

The model lands much like a Goodyear racer. The glide path is fairly steep, but a lot of ground (excuse me, water) can be covered in the landing approach, so this requires some prac-

tice. The stability induced by the low C.G. due to the undercarriage is a big help during landing. There are no serious handling problems in the nearly stalled condition because of this. The model merely mushes, but it can make a big splash if you don't maintain flying speed required for a smooth flare-out onto the water.

All of this requires practice and the pilot must adapt to the peculiarities of any new model – especially one which embodies many new design innovations. The S.5 is really a beauty in the air – the muffler emits a very realistic approximation to the Napier Lion engine, and the pylon turns must be seen to be appreciated. The floats don't seem to have much effect on speed. We should have known that – floats didn't slow up the full-size Schneider racers very much! The model is fast enough and responsive enough to give even a seasoned Goodyear addict a thrill. The model had not been timed at the time of this writing, but I would conservatively estimate the average speeds attained somewhere between 60 and 80 mph – just about right for a safe yet exciting racing event. If all of the above has wetted (pun intended) your appetite, then you may want to study the construction details to determine the special problems which must be met in building a scale, racing-type seaplane model.

CONSTRUCTION NOTES

I beleive you'll find the plans for the S.5 will answer most of your questions on building procedures. The design features follow present state-of-the-art fairly closely. There are a few unconventional twists which I'll try to point out in the following notes. Incidentally, if you intend to build the model as a competition scale ship, I suggest you acquire Profile Publications No. 39, "The Supermarine S.4 – S.6B" which contains a wealth of information on the S.5 – but, alas, no wing or stab profiles. I obtained these from the three-view drawings in the Harleyford edition, "Spitfire – The Story of a Famous Fighter." I found the historical notes describing the evolution of the Supermarine Schneider racers into the Spitfire really fascinating, and highly recommend the book.

It is best to begin construction with the fuselage crutch. The wing layout can be completed while this dries. Notice that only standard 36" material lengths are required. Pin the motor

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SUPERMARINE S-5

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mounts to the plan, noting that right and left are different to give the required right thrust. Taper the ends of the two 3/8" x 3/16" crutch longerons as indicated in the top view. Glue these together at the tail, and pin to the plan progressively as you install the 3/8" x 3/16" cross members – be careful to note the vertical locations of the cross members as shown in the side view. Finally, bend the longerons around the motor mounts and secure them at the forward end with a small C-clamp while the glue sets up. Former F-1 can be glued in at this time since it does not extend below the crutch. Incidentally, it seems to be perfectly safe to use Titebond or Wilhold type glues for the bulk of the structural work if your finish is applied with sufficient care so that water cannot contact the joint. Use epoxy glue at the motor mounts and other critical joints.

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SUPERMARINE S-5

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While the crutch is drying, cut out the wing ribs and start the wing construction. This goes very rapidly, since the wing has no dihedral and standard length materials can be used without splices. First, pin a ¼" sq. scrap balsa riser over the front spar position on the wing drawing. Pin the bottom front 1/8" x 1/4" spruce spar to the riser strip out to the last W-3 ribs in the right and left tips. Block the ends of the spar up 7/16" from the building surface. Pin down the 1/16" x 2" balsa trailing edge bottom planking after tapering a strip about 1/4" wide at the rear edge to a knife edge to accept the top planking. Taper the ends of the two rear spars (1/8" x 1/4" spruce) between W-4 and tip (3 inches on each end) from 1/8" to 1/32" thickness at the tips. Keeping the tapered portion facing toward the inside of the structure, glue one of the rear spars to the forward edge of the bottom rear planking. Pin out to the last W-3 rib on each tip and block up the tips ¼" from the plan. Now install all of the ribs and follow with the top spars. Notch the 3/8" square leading edge and make the two leading edge tip pieces from scrap 3/8" sheet. Glue the entire assembly to the leading edges of the ribs. Now add the front and rear mounting blocks for the float struts and wing attachment bolts. These are cut from 3/8" spruce sheet and are shaped to fit between the ribs and between the top and bottom planking. Add the top rear balsa planking. The basic wing structure is now complete and should be allowed to dry while you continue with the fuselage. The construction photos show all of the operations. Refer to these if you need to check any of the steps.

After cutting all formers, remove the crutch from the plan and glue them in place being careful to maintain vertical alignment. Do not drill the hole in F-2 for the wing dowel until the wing – fuselage mating is undertaken. Add the 3/16" square stringers and former F-7. Cut the wing saddles from 1/8" plywood and glue in place. These must curve slightly, and this can be facilitated by moistening the surfaces. Fit the motor and drill the mounting holes. Test fit your muffler system – if you don't trust the power output of your .19, it may

be necessary to dispense with the muffler. The baffles may be ground out of the Tatone "peace pipe" muffler if you desire only to use it as a manifold to channel exhaust gases away from the plane. You may have to file the muffler passage in F-1 to fit your engine-muffler combination. It is best not to cut the hole for the 3/8" O.D. brass exhaust pipe extension until you know exactly how your engine will set. The tank holes in F-1 and F-2 are for a 4 ounce Sullivan RST-4. Change these as required to fit your tank. The RST-4 was used in the original, since it takes up less radio compartment space than the longer cylindrical tanks. Install the chin blocks and the soft balsa filler block at the aft end of the fuselage and plank the lower half of the fuselage with 3/32" balsa strips. Glue the 1" x 1" balsa head-rest to the tops of F-3 and F-4 after tapering to 1/4" width at the aft end. Note the triangular 3/32" sheet fillers between the dorsal and the tops of the last two formers.

Glue the 1/16" balsa cooling baffle between F-1 and F-2. Cut the stabilizer and rudder parts from 1/4" medium balsa sheet. The stabilizer ribs may be simulated as indicated on the plan. Super MonoKote covering material really works in this application, and I think you will be very pleased with the scale appearance. The edge of the MonoKote should be trimmed to lap about 1/64" over the joint with the fuselage crutch. This will anchor the covering to eliminate the possibility of water soaking into the unpainted balsa under the MonoKote. Mount the stabilizer to the crutch using epoxy glue – check the alignment carefully using the trammeling method. Hinge the fin and rudder and epoxy to the fuselage and, again, watch the alignment carefully.

Remove the wing structure from the plan, and taper the leading edge strip to receive the front planking. Install the tips and aileron system. Install the 3/32" aluminum tubing for the bracing wire. These should be just flush with the 1/16" x 3/16" balsa capstrips, and they should be anchored with epoxy glue so they can't break loose – the wire rigging is functional on this model. Cut the ailerons from 1/2" soft balsa sheet. When planed to final shape these will be just as light as the built-up variety. You will notice that the ailerons are about two sections longer than scale. I feared that scale ailerons would be inadequate due to the large roll moment of inertia resulting from the placement and mass of the undercarriage – in fact, aileron control was inadequate on the real S.5, and Mitchell corrected this fault with much larger ailerons on the S.6 and S.6B. Match the ailerons to the wing contours and install the control horns, but don't attach them permanently to the wing until after covering. This is a bit unconventional and requires some explanation – it is necessary to seal the wing completely against water seepage, and this can be done handily using Super MonoKote. The aluminum

MonoKote is just the right color and texture to represent the natural aluminum scale wing and stabilizer surfaces. (You may also use the time-honored silk-and-dope method if you prefer.) Make slots between the upper rear 1/16" planking and the spar for mylar hinges before covering. You will notice that there is an open space in the wing structure between the ribs in the aileron cutouts – this area is sealed by wrapping the bottom MonoKote sheet over this opening and sealing all edges. The top covering laps over this to make a waterproof seam. Cover the ailerons with MonoKote; locate the previously made slots for hinges, and install the hinges with epoxy. The hinge strips must be perforated before assembly to ensure a reliable bond. Make pin holes through the top and bottom covering into the 3/32" bracing anchor tubes for later installtion of the wire bracing.

Now match the wing to the fuselage and locate the proper position in F-2 for the wing retainer dowel. Set the wing into position and trammel carefully to get perfect alignment. Now drill through the wing bolt holes into the 1/8" ply nut plate already installed in the fuselage across the top of the crutch longerons and against former F-3. Install Du-Bro WB-2 wing bolts. The fuselage construction is completed by installing Nylon (NyRod or R/C Craft telescoping pushrods) elevator and rudder pushrods. The outer tubes are sealed into bulkhead F-6 with G.E. Clearseal, or contact cement, to eliminate any possibility of moisture seeping into the fuselage through the pushrod exit holes in the outer skin.

Plank the upper half of the fuselage with 3/32" strips. Chamfer the strips where they mate with the rudder and dorsal fin. The cheek cowls are formed by planking between F-1 and F-2 and soft block continuation to the rear. Check your muffler clearance as you proceed. Add the 1/2" top cowl block and seal the engine cooling compartment behind the motor cylinder with dope and Clearseal so that any water ingested with the cooling air will not enter the fuselage interior. The scale exhaust holes for the vertical cylinder bank are used to vent the cooling compartment. Notice these are on the left side only. They seem to provide an adequate flow of cooling air, and no overheating problems have been experienced with this arrangement. The engine cowling may be carved from balsa blocks or you may make a fiberglass version if you feel ambitious. If you use the hollowed block method, be sure to reinforce the inside with a layer of light fiberglass cloth and resin. The cowl is held in place by two 1" bolts threaded into hardwood blocks glued into the corners formed by the intersection of the motor mounts with bulkhead F-1. The wing fillets are carved from balsa strips glued to the fuselage, or you may prefer to use Sig Epoxylite or similar light molding compounds.

Carefully sand the fuselage to final contour. Go easy on the planking – you need to sand off only about 1/32" of balsa to reach the finished contour. Be especially careful near the bulkheads, since there is a tendency to sand through rapidly at these points. If you desire, you may cover the fuselage with silk or silkspan prior to application of the finish undercoats. Before applying the final coat of paint, the fuselage scale radiator tubing must be installed. These are not applied until after the bulk of the paint is applied to prevent dope build-up around the simulated cooling tubes. The best way to install the radiators is to lay out a

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SUPERMARINE S-5

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strip of scotch tape (½" width) sticky side up over the plan view of the radiators. Carefully stick the 1/32" square balsa strips to the tape at the proper positions. (1/32" balsa strips of adequate length will be found at the model railroad counter of your hobby shop.) Next, carefully apply a fine bead of glue to each strip and then lay the whole ball of wax into position on the side of the fuselage. Before the glue sets completely, pull off the tape and remove any excess glue using a small balsa scrap for a scraper. Be sure that the last coats of dope are well plasticized to eliminate splitting of the finish at the high-stress points created by the small radius of curvature of the thin balsa strips. Refer to Profile No. 39 for scale color and trim details. I found Aerogloss Metallic Blue dope to be just about the right color for the fuselage and fin. The engine fairings and struts are finished in aluminum. The red and white trim on the rudder really sets the whole thing off to advantage.

The float struts are cut from .032" aluminum sheet, drilled for the sheet metal mounting screws and then bent as indicated in the front view. To achieve scale strut contour and to provide necessary resiliency, 1/32" ply doublers are epoxied to each side of the aluminum core. The floats are attached to the mounting pads on the struts using ¼" pan head sheet metal screws. Don't tighten these completely until the wire rigging is in place. Be sure to position the floats with precision. They must be parallel to the fuselage centerline. The float step must be right on the C.G. to provide adequate longitudinal control for take-off rotation. It may be necessary, in some cases, to adjust the float position fore and aft and also to adjust the model angle of attack relative to the floats to secure good take-off characteristics. This is one area of seaplane modeling which needs more research. Instructions provided with the Gee Bee floats represent a good starting point. You will notice that the struts seem awfully flexible. They were designed to be as light as possible, and require wire bracing as did the struts on the full sized airplane to adequately support the pontoons. The float main cross braces are made from .060" wire as shown in the drawings. A drop of epoxy glue on the mounting screws before final tightening will ensure a reliable installation. Wing bracing wires are from lengths of .025" wire. Here we had to depart from scale a little. However, only the purist should be bothered by this slight scale deviation.

Rig the underside of the wing first. Take a length of wire and measure off enough to go from the wing attach tubing to the front strut attach point, add about an inch extra, and make a 180 degree bend. Make this just sharp enough that the loop can be inserted into the 3/32" aluminum tubing in the wing. The loop protrudes slightly through the upper skin to provide an attachment point for the removable wing-to-fuselage bracing. The two wires now protruding from the wing bottom are bent toward the float attach points. Make "U" shaped hooks in the ends to slip over the as yet untightened sheet metal screws at the float. Do not pull the wire too tight, and be sure to keep close watch on the float alignment as the rigging proceeds. The plans and Profile No. 39 will answer any questions on the

bracing geometry. When rigging is completed you will note the floats are solidly aligned to the fuselage despite the lightweight struts. The top wing brace wires are removable to allow wing detachment. Measure the wires and make small open loops at one end. Pass these through the attach loops already formed by the bottom brace wires, and close the loops by squeezing with needle nose pliers. You may use small springs at the fuselage end to secure the bracing wire to wire attach loops on the cheek cowls as shown on the plans.

The radio equipment is mounted on a 1/32" ply sheet which is glued and sealed against the 3/16" square fuselage stringers. The Micro Avionics servo mounting clips really facilitate installation. Glue in spruce cross members for mounting Orbit, Kraft, or other servos of this type. The receiver switch is operated by a short piece of 1/16" wire which protrudes through a small hole in the fuselage side. After installation, a glob of Clearseal on the inside wall surrounding the wire where it passes through the wall effectively seals the hole yet allows the wire to slip in and out to operate the switch. I like this better than the unsightly baby bottle nipples or rubber balloon external switch seals used on many model seaplanes.

Cockpit details are (unfortunately) up to you. I installed 3/16" Tatone instruments, but had to guess at the layout. A Williams Bros. 1.5" = 1' standard pilot head can be painted up to look just like one of the famous Supermarine racing pilots. The receiver antenna wire passes up through a small hole into the cockpit and remains there coiled out of sight until the model is flown – Schneider racers carried no radio equipment, of course.

Most of the important pointers on flying the model have already been covered. If you have been careful and built the model without excess weight you should experience little difficulty with flying. Considerable research remains to be done on improving take-off and landing performance. I believe that the surface has just been scratched when it comes to model seaplane float design. I am sure you will be pleased with the handling characteristics of the model both in the air and on the water. I think there is great potential in a Schneider Cup model racing event. This will promote some interesting developments along new and really appealing lines as already suggested. If you are inspired to design your own Schneider racer, you will find no end of interesting prototypes. For example, if you don't go in for wire bracing, then build the Supermarine S.4 which was one of the first completely cantilever airplane designs (had flutter problems, though).

If you are a biplane enthusiast, or a flying boat buff, then go back into the earlier days of Schneider racing. There are many gorgeous biplane designs. For example, the 1925 race was won by Jimmy Doolittle flying the beautiful R3C Curtiss biplane.

I may build this one next. □

EXHAUST PRESSURE

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muffler to a Universal Needle Valve, the latter being available at most hobby shops. Before the first flight, adjust the needle valve to provide the proper flow of heavy smoke.

Give fuel pressurization or "sky-writing" a try - - - a few minutes time and a little experimentation will provide you with excellent results. □

WW I WESTERN FRONT

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cooled engine? Answer - - - put a heat sink on the cylinder head and go ahead and cowl it.

Wally Hurley's Sopwith triplane presented a problem of balance due to the short nose. Wally solved it by putting plumbers lead strip around the inside of the cowl until he got the desired C.G.

The accompanying pictures of the Western Front WW I Jamboree tell the story far better than any word description can. Beauty, action, thrills and skill all combined to make it a great event even though the entries were low due to the gas scare.

Too bad you didn't make it – but plan on it for sure next year. See you there; we'll fly up a storm! □

CARE OF SMALL ENGINES

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performance from small engines. The most insidious problem is varnish. The signs are inability to hold the peak rpm, low power output, and seizing up. You can check for varnish by removing the plug and seeing if the piston is "sticky" at the top of the bore.

Varnish is easily removed by running the engine on fuel doped with 1 ounce of gun cleaner, per pint, for a few tanks. At home, you can scour out the cylinder with 000 steel wool, then clean, oil, and re-install it. Fortunately, the better broken-in an engine, the less varnish will form.

If you continue to have a varnish formation problem, you may be running too lean or with inadequate cooling.

Glow plugs represent a second area of problems. They come loose, burn out, or even just "go bad."

Due to the differential expansion of the aluminum head and steel cylinder, the glow plugs tend to loosen up occasionally. Erratic running, low power, and hard starting are the results of loose heads. On rare occasions, the same signs can indicate a bad seal within the plug, too.

Consider what happens within a

running engine; it is surprising that plugs last at all. Modern glow heads have a filament of a diameter, number, and size of coils and material carefully selected and tested to give a combination of good starting, performance, and durability. On the other hand, they take very high pressure, 250 shocks per second and up as the mixture detonates, crash impact, and other indignities. Any junk carried in the fuel or pulled into the intake gets fired directly into the plug by the bypass ports. Every once and awhile, the poor thing is bound to give up the ghost.

Sometimes you will find a plug which seems to work, but the engine runs badly. One cause is element collapse, which can be due to some shock, thermal warping, or "crud bombardment." I have also seen plugs which had no obvious flaw which, when replaced, proved to be the source of bad runs. Try a fresh plug if all else fails.

The next source of problems would have to be leaks. Several areas here are important. Check that all gaskets are in good condition and the engine is screwed together firmly.

Dirt under the reed valve can give you frustration in that type of engine. The fuel lines are clear, it will run out port prime, but not run. The characteristic to look for is excessive freedom of the prop to bounce back and forth against compression. This shows there is no crankcase pressure being formed. You must disassemble the engine and very carefully remove and clean the reed and seating area. Replace the reed **with the same side out as before.** Sometimes the reed can work harden and distort from long use; then replacement is the only cure.

Shaft induction engines in the Tee Dee and Medallion series won't have any reed problems, but the backplate can come loose and leak in a similar manner.

Most Cox engines use a swaged ball and socket joint for the top end of the connecting rod. With wear, this will loosen up in time. This normally is no great problem, but for .049/.051 engines subjected to extra high rpm use you can re-tighten the connecting rod socket with a cleaver tool sold by Kirn Kraft (P.O. Box 224, Anaheim,

California 92805). Similar tools could be made for the other engine sizes. Once the crankshaft is fully run in, the connecting rod is subject to less stress and no further tightening seems necessary.

The most crucial area of engine maintenance is cleanliness. At this year's Nat's, I helped a certain well-known modeler struggle with a "bad" Tee Dee .051. While running, the signs pointed toward varnish, but when stopped, the engine was perfectly free. We started checking the fuel system and found some yellow goop plugging up the fuel orifices in the venturi. When cleaned up it ran fine – for about a quarter of a tank. Same thing! After a couple of repeats, he admitted to not having flushed out his tank after soldering new vents in. A couple of flushes with thinner, yet another venturi cleaning, and he was off and running great.

Dirt will wear out your engine, it will give you erratic needle settings and can cause your flying to be anything but pleasant. Keep a clean rag wrapped over your engine when not in use (not a plastic bag; it can hold moisture in and cause rust). Filter your fuel just as you fill the tank and, if possible, as it flows from tank to engine. Check your engines for gummed castor oil or dirt within the needle valve assembly or fuel orifice(s) in the venturi. Clean these carefully every once and awhile.

6. MOUNTING

This is very similar to big engines. The engine should be solidly mounted to the model and the tank either extremely firmly mounted also, or isolated by foam. I have found #2 x 3/8" sheet metal screws in 1/8" plywood adequate for the Babe Bee, Golden Bee, Pee Wee, and even the Black Widow engine. #3 x 48" bolts and blind nuts are a safer bet with the Medallion and Tee Dee .049. The larger engines move up to #4 bolts, while the Tee Dee .020 and .010 each need a couple of #2's. You might get away with #2 screws on the .010.

When using screws, I squeeze G.E. Silicone seal all over the threads before screwing them into the pilot holes. This keeps oil from seeping down into the wood firewall.

7. MUFFLERS & THROTTLES

Cox has the QZ muffler kit available for the reed valve .049 series. This consists of a piston, a matching cylinder with modified exhaust ports,

and an adjustable muffler assembly.

The raised lower edge of the exhaust ports eliminates the sub-piston induction normal in Cox engine design. When used with a muffler, exhaust blow back would really cut power.

The QZ can be installed on a Tee Dee or Medallion, but some shims are required to make it fit. In the case of the Tee Dee, a noticeable amount of power is lost compared to stock, though it is still a high performance engine.

Throttles are available for all sizes down to .020. Although not able to throttle way down like a .60, you can drop the rpm far enough to land your R/C model.

The extra exhaust restriction of both mufflers and throttles tends to aggravate varnish accumulation.

Tatone also makes a nice muffler, but you should use the cylinder from a QZ kit to get optimum performance.

8. MODIFICATION

Actually this is a real black art with any engine. In the cold light of a tachometer, most hop-up modifications result in an rpm loss. If hop-up you must, there is little really to be done. Free up the engine **if** and where required, based on your own experience. If you run some sort of pressure system, the venturi can be drilled out on the Tee Dee engines to the diameter specified on the instruction sheets. Anything beyond this is purely up to the individual and quite unnecessary for any R/C purpose I can think of.

With Cox engines, most useful modifications come from part interchange to build up an engine to suit your own devious purposes. For example, I have an engine with a QZ piston and cylinder, Tatone muffler, Medallion crank, and Tee Dee carburetor. It is very smooth and quiet, pulls fuel well while still having adequate power.

You have to figure out what you want and assemble it. Just remember to match fresh pistons and cylinders; used ones will often work, but rarely as well.

9. TROUBLE SHOOTING

(a) No fire at all –

1. Dead battery.
2. Shot glow plug.
3. Insufficent port prime.
4. Extreme flooding – close the needle valve, blow hard through the ports, and flip the prop until the prime is run out.

(b) Engine kicks back – mild flooding – close the needle a turn and start without priming.

(c) Engine just pops or oscillates without kicking all the way over insufficient prime or loose plug.

(d) Engine runs rough, hard to start, low power – loose plug, possible loose backplate.

(e) Engine tends to run lean, erratic needle setting, sudden stops:

1. clogged needle jet or other obstruction in the fuel system.
2. can also be varnish.
3. can be fuel foaming in the tank or air leaks in the fuel system.

(f) Low top end, can't hold a peak rpm setting – either varnish has formed, which may be easily removed, or the engine could be set up too tight. Remove the glow head and backplate (or tank) and turn over the engine to check how smooth and free it is, If you find it is binding, tear it down further to determine if it is the fault of the crank or piston/cylinder. If the crank is binding, replace **both** the case and shaft.

(g) Engine runs backwards – this is typical of reed valve engines. Tune the engine up, stop it with a rag on the spinner. Use the spring starter to kick it over smartly in the proper direction.

10. MISCELLANEOUS

(a) Balance your props. At 15000 rpm and up, the vibration can easily cause fuel foaming and erratic running.

(b) Prop modifications – trim the tips, thin the blade width, or shape, but leave the root section **alone!** Shed blades aren't funny! It does help to sandpaper the molding flash off leading and trailing edges.

(c) Sometimes the needle valve on a Tee Dee can bleed a little air into the fuel system. The solution is easy; a bit of silicone fuel tubing over the needle threads seals it up.

(d) For racing purposes on the Tee Dee .049, Kirn Kraft makes a new needle valve assembly with 128 threads/inch. This unit allows more accurate settings than the stock item.

(e) The .051 Tee Dee engine has been carefully tuned to have **exactly** the same power as the .049. There is no point to using the .051 except for getting your model legally out of class 1/2A into a free flight.

(f) In most circumstances, I have found that the 1702 "hot head" gives lower rpm and difficult needle settings on all but the QZ, throttled, and Tee Dee engines. The higher operating temperature of these engines allows it to work properly.

(g) Many of Cox's ready-to-fly models now use the #1245 carburetor body. This is a combination reed valve – venturi – needle valve assembly which also acts as a radial mounting plate. The needle is the 128 thread/inch unit and has a friction rather than spring or ratchet retainer so there is no backlash. The carburetor body is available separately. It is compatible with any of the current reed valve motors. One other feature is the light weight of this item.

(h) The cylinders on Cox engines are coded by a small number stamped just below the exhaust port. No. 1, Twin bypass standard; No. 2, Single bypass standard; No. 3, Twin bypass with throttle sleeve; No. 4, Tee Dee .049, No. 5, Tee Dee .051; No. 6, QZ twin bypass; No. 7, Single bypass with throttle sleeve; No. 8, Single bypass with throttle sleeve for cars.

(i) The Babe Bee and other integral tank engines are assembled with the fuel pick-up tube running to the right side. For R/C use you must move the fuel hose to the bottom of the tank.

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To sum it all up, if you take the time to learn to handle your small engines properly, you will reap hours of enjoyment at immensely less cost than with the more typical gas hungry monster model. Now, go clean the varnish out of the cylinder. ☐

PAINT LIKE A PRO

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instant sand-grain effect and that is not the effect we are striving for.

Now, you have had some practice, the shop is clean, the kids are at grandma's for the day, the wife has gone to the hair dresser with that $20.00 you had saved, so let's paint. Starting with photo No. 1, the whole process should be self-explanatory, so good luck.

When you go to the flying field with this, it will get some interesting comments, but all of them are usually very favorable. When you're asked how to do it, just tell them to buy RCM and they can do it, too! ☐

CUNNINGHAM ON R/C

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plastic, and if it's too cool you will not cause the adhesive to flow and bond to the wood. After you have tacked one tip, smooth the plastic with your fingers and tack the other tip. Then work along the leading and trailing edges, just about four or five inches at a time until you have tacked the plastic to the balsa all of the way around. Next, seal the plastic to all of the edges with the iron, working all around the framework. Wrap the plastic around the leading and trailing edges and seal it all of the way. Don't worry about wrinkles at this stage. Then, take a new, sharp razor blade or X-Acto knife and trim off all of the excess material. Seal down any edges that may be sticking up.

Cut out a piece of plastic for the other side and follow the same instructions for the other side. It is usually a good idea to cover the bottom of the stab or wing first, and then cover the top. When you trim around the edges and you have a little extra here or there it won't be noticeable if it is on the bottom.

Once you have the top plastic sheet sealed to the edges of the framework, hold up your masterpiece and take a good look at it. Sloppy looking bunch of junk, isn't it? When the plastic films first made their way into modeling as a covering material, one great wag - - - I think it was old Fearless Leader - - - commented that the finished covering job made a great garbage bag in which to carry home the sticks after a crash! The plastic stays together and the balsa turns to splinters! Once you're tired of looking at the sloppy mess, and have made all of the muttered comments about the mass of wrinkles, get out your heat gun, hair dryer, or kitchen range and set about shrinking the plastic. The main rule to follow is not to try to shrink it too fast and to always shrink both sides, one right after the other, to prevent warping. If you are using the kitchen range, turn the burner on to medium heat and let it warm up. Then hold the covered framework about six inches above the burner and move it back and forth over the rising current of hot air. You can also do the same thing with your

oven. Set the temperature at about three hundred, and when it comes up to heat, open the door and stick the framework inside. Hold it, Clyde, don't set it on the rack and bake it. No matter what source of hot air that you use, be sure not to get the covering too hot so that it will melt. As the plastic comes up to temperature you will see it change color slightly, and then begin to shrink. Once the shrinking has begun, keep at it until all of the wrinkles have vanished. Then, take another look at your masterpiece – beautiful, isn't it. Really, a great boon to the beginning builder and flier, a beautiful finish with almost no work.

When you cover fully sheeted surfaces remember to rub the plastic material into the sheeted surface with a pad of Kleenex while the covering is still hot – this will seal the plastic to the balsa wood. You can use an iron to do this, but you will have a slightly scratched and marred surface.

When covering the wings, always be careful to cut right and left hand panels if the wings are tapered. It's awfully easy to waste a piece of covering material if you don't plan ahead to be sure that you are cutting it correctly.

Once your pride and joy has been covered it's time to give some thought to installing your radio into it. Most kits give pretty good instructions about the location of the radio in the fuselage, but not many go into the detail necessary to achieve a good installation with a minimum of work and problems. Your task has been made somewhat easier by the almost universal use of servo boards that have been designed for almost every type of radio. If you do not have a servo board, by all means, make this a quick purchase. These boards will make your installation job much easier as well as give very good protection to the radio and servos in case of a crash. Plus - - - another very important plus - - - they give the necessary assistance to protect the radio and the servos from that biggest problem of all, vibration. If you are building a glider then you can thumb your nose at vibration, but with an engine and propeller up front, vibration is a problem. Going back to the assumption bit, let's assume that you do have a servo board for your radio and that you have mounted the radio and servos upon it. Be sure that all of the rubber grommets are in place and that they have been correctly installed, and that you have not twisted the mounting screws too tightly. The vibration absorption quality of the rubber grommets is useless if you have compressed them tightly. The servos should just float on the board. When you are sure that everything has been installed on the board correctly, set about the business of installing the servo board in the aircraft. Use ¼" square pieces of spruce glued along each side of the fuselage as the primary rails. Then, use cross pieces made from 1/8" plywood as the servo supports. Locate these cross braces in the fuselage, and slip the servo board in place. If everything fits, glue the cross pieces to the ¼" spruce rails with epoxy glue. When dry, fasten the servo board to the cross rails with grommets and wood screws, per the instructions accompanying your particular brand of servo board.

Next, build your pushrods. You can use rods made from 3/8" square balsa, ¼" square spruce, ¼" wood dowels, fiberglass arrow shafts, commercial pushrods, plastic tube pushrods, or what have you. The easiest to use, if you install them while you are building the fuselage, are the tube-within-

a-tube plastic pushrods. The cheapest to build are made from ¼" wood dowels sold at hardware stores. If you are using this type, then purchase rods and clevises from the model store, drill a 1/16" hole through the wood dowel about 3" from the end, bend a 90 degree bend on the blank end of the wire, slip it into the hole, and then use electricians black vinyl tape to wrap the wire to the dowel. Of course, you need to figure out the lengths that you are going to need first. You are also going to have to mount the horns on the control surfaces in order to get these lengths correct before you cut the pushrods to length. Always try to make your pushrods with a minimum of bends. A straight line pushrod is the best. If you make a 90 degree bend in the long portion of the wire, you will find out that your pushrods will be too flexible. This can lead to early disaster when flying your model, as the air pressure of the fast flying aircraft will tend to streamline the control surfaces and, if you have a flexible pushrod, the air pressure will win out over your servo muscle and, suddenly - - - no more model.

The easiest way to hook up the throttle servo to the throttle arm is to use a piece of nylon tube from the firewall to the servo. Slip a piece of wire through this, solder on a 2-56 bolt with the head cut off to the end near the throttle. Screw a nylon clevis onto this thread. Attach the clevis to the throttle arm. At the end next to the servo make an S-bend in the wire and slip this into the servo arm. Again, make sure that you have the lengths correct, and that you have hooked up the controls so that high throttle position is also the correct servo position. By using the nylon tube you have made the routing of this pushrod easy, and you have allowed it to slip past the fuel tank and battery quite easily. And, you have also created a pretty neat little passage way for fuel to run back down this nylon tube and into your aircraft! To combat this, slip a small piece of sponge rubber over the wire at the point where it enters the tube, just behind the engine. This will absorb the fuel before it gets a chance to wander down the wire. If you do a lot of flying, change this bit of foam frequently.

This has been a pretty quick look at the installation of your radio, but next month we will explore some of the other in's and out's of getting your radio into a working condition in your airplane and then go on to the care and feeding of your radio systems best friend – and yours – the transmitter and receiver batteries.

Until then, have a great time in your workshop. □

SUNDAY FLIER

from page 12

capacity and still stay within the eleven pound limit set by the FAI.

One thing you can depend on; the larger models – up to the FAI limits – will outperform the smaller ones. Since the FAI weight limit is eleven pounds, and the wing loading limit is one and one half pounds per square foot of projected planform of the wing and horizontal tail (or butterfly tail if used) then the projected planform has to be held at seven and one third square feet if you want to be able to load up to the maximum wing loading. Since that includes the tail area, if you assume one square foot for the tail that leaves you with six and

one third square feet for the wing – or 912 square inches – to be distributed in accordance with your choice. And that's where the differences begin to show up as the designers pick various planforms.

It so happens that 912 square inches lends itself to a good tapered wing configuration with an average chord of eight and one half inches and a span of just under nine feet, giving an aspect ratio of 12.6. Makes up into a good looking wing planform if you make the root chord about ten inches and the tip at six.

Why taper the wing? Theoretically, it will give you a lift distribution closer to the ideal of the elliptical wing, with a resultant lower induced drag. Offsetting this is the fact that it is harder to build, and with the higher aspect ratios the roll rate is slower. Another factor is the bending load in the center section; if you load up the plane to the full eleven pounds, then, when you pull a tight pylon turn, you can be imposing a four, even five G load, and that's the same as supporting the wing midway out from the center and loading about fifty pounds on it. I've seen heavily loaded slope racers fold their wings under the stress of a tight turn. But this can also be avoided with proper stress design.

Personally, I've been experimenting with a straight wing. Sure, it's a compromise, but after three mid-airs I've decided the degradation in performance is outweighed by the ease of building and repair. And, using the wide flaperons which I described several issues back, the wing will stay up in light air as well as strong winds. I certainly wish I had had my new wing ready for the RCM Trophy Races. Maybe I would have finished a couple that I just couldn't quite keep the Led Sled up in as the wind dropped.

Next, what about airfoils? I have read where it doesn't pay to use a semi-symmetrical or symmetrical airfoil – that a flat bottomed one, or even undercambered such as the Eppler 387, is just as fast. Maybe so, on the straightaway, but for racing the course, where there are ten pylon turns involved, I'll take the semi-symmetrical every time. Both the flat bottomed airfoil and the undercambered have a tendency to lose more speed in a tight turn, and even if you make a moderate turn with a slight dive to keep up the speed, they tend to balloon when you roll out. That's okay for fellows like Rick Walters, whose reflexes are fast enough to correct the tendency before it even shows up, but for me, I like to rack around the turn and when the plane rolls level, it doesn't tend to zoom into a climb. And that's the way the semi-symmetrical airfoil operates. A section with the maximum curvature of the mean camber at about forty-five percent back from the leading edge, and a maximum thickness of around ten percent at the same point is highly favored by many racers, including me. The NACA 2410 section fits this specification fairly well; it also has a fairly sharp leading edge, with a small radius of curvature that gives good high speed characteristics without tending to stall out in a tight turn. The section which is used on the Peregrine falls in the same category.

How about tail configuration? The butterfly tail is highly touted because of its low drag, and when the wind is blowing well it's pretty hard to beat. However, in light air I've noticed that racers with butterfly tails tend to wallow, and the turns are sometimes unpredictable. The T-tail also provides

low drag, and theoretically can be smaller, but is very susceptible to damage on landing. So, again, for all around practicality without too much penalty in performance, I, personally, use a standard horizontal stab – easy to install, repair, and stands up well in hard landings.

As for the vertical tail surfaces, most racers have gone to the fixed fin with no rudder, relying on the ailerons for making the turns. At one time I had both rudder and ailerons, figuring that I could vary the turns according to the conditions – flat in light air, steep in strong wind. What actually happened was that in the excitement of a race I couldn't coordinate properly, and the turns were lousy. So, next I tried coupled ailerons and rudder, and that, in my opinion, is the way to go – even though I don't! It takes a lot of test flying to match the throw of the rudder to that of the ailerons, and even then you have to make certain assumptions regarding the wind. If you guess right, the turns are great, but if not, then you have to make a field adjustment, and that's pretty tricky. So, like so many others, I've resorted to straight aileron control and, again, for overall consistency, it's worked out best. In that regard, it is almost mandatory that you have differential travel – at least twice as much up aileron as down, otherwise the drag of the down aileron will tend to counteract the turning.

How long should the nose moment be – and the tail moment? Well, let's look at the Jalapeno. Its moments are roughly equal to those of a good contest power job. With the weight in the nose needed to offset the tail weight (since you don't have a motor up front), the longer the nose moment the smoother it seems to make the turns. At least up to a point. Also, the longer the nose the less counter balancing weight you will need up there. As a general rule, if you have a nose that sticks out in front of the leading edge of the wing about one and one quarter times the wing chord, you'll be in the ball park.

Tail moments of two and one half to three times the wing chord, measured from the center of pressure of the wing to the C.P. of the tail (in level flight) seem to work best. Shorter moments make the racers very critical in longitudinal trim and control; longer moments make it hard to get tight turns.

One thing for sure: Don't try to use wings joined at the center with wire dihedral braces. There just isn't any wire strong enough and, in tight turns, the wings will flap upward and throw your racer all over the place. Solid center sections are a must, and test the center section to at least four times the maximum weight you expect to fly it; support the wing at approximately the center of lift – half the span for a straight wing – and weigh it down at the center – forty-five pounds if you plan to fly at an all up weight of eleven. So it breaks – better it should break in the shop than on the slope! Beef it up and try again. Yes, there's a factor of safety in this method, but it's worth it. Weight is not as critical in racing as in thermals.

Speaking of weight, where should it be added as the wind comes up and the lift increases? Some fellows add weight in the nose, others add it at the C.G. and some do a bit of both. Any discussion of this tends to wind up something like the discussion of downwind turns; it can get heated as the proponents expound their views. Again, the way it comes out to me is that you should balance your plane with the C.G. where you believe it flies best considering all aspects of the course, then, once it is balanced, add all weight so that it centers at the C.G. Thus, you increase the sinking speed to balance out the increased lift of the wind against the hill, but keep the same drag and turning characteristics. Normally, if you do this, you can figure that at twice the bare weight, your racer will increase its speed slightly less than one and one half – about 1.4 times. That's because speed goes up as the square root of the added weight. Why not the same rate? Because you are not only hitting more air particles when you go faster, you're hitting them harder. It's a double whammy.

What is a good racing kit that you can build? There isn't any. The Jalapeno is out of production, and it was a good one to start with. But there really isn't enough volume demand to make it economical for a manufacturer to put out a racer. So, you have the choice of designing one, or you can get a set of Peregrine plans, and build it. You won't go wrong. It's hard to beat. Meanwhile, some new designs are coming out in 1974, so get something together.

This sport is bound to increase in popularity as it becomes better known, just as Quarter Midget and Half-A racing is on the upswing. Especially the latter. And since many of you

have asked me about another small power job, maybe the Half-A racer will be it. I had one years ago; single channel, with an escapement set to yield right, left rudder, and down elevator. Yes, down elevator, for high speed on the straightaway. Pretty sporty.

Which would you rather see – a design for a slope racing glider, or a Half-A power job?

Let me know. I've got one of each in mind. □

ENGINE CLINIC

from page 84

surprised to find that your propellers are of somewhat less pitch than that stamped on the blade. A 9" diameter 8" pitch actually varying between 7¼" and 7¾", depending on the station where you check the pitch and the individual propeller. The propellers also vary between production runs. Those you purchased last season can be different than those you purchased more recently. So, with the aid of the pitch gauge you want to bring the propeller to a true 8" pitch or whatever pitch you intend. Why the necessity for the propeller to be true pitch? Simply because if one part of the blade is 8 pitch and another only 7, when maximum rpm and speed is reached in the air the 7 pitch will actually be holding the 8 pitch back as far as speed is concerned. In other words, one part of the blade will be trying to go faster than the other. So you want as much of the blade to be as true in pitch as possible. This is rather difficult close to the hub due to the thickness of the propeller. You would need a block of wood considerably thicker than most propellers are carved from in order to get the hub true in pitch. However, come as close as you can – with an 8" pitch prop you should be able to get the hub close to 7½" pitch. It is most important when truing the propeller pitch to keep the back of the blade flat and smooth - - - no low and high spots, roughness, etc.

After the back of the blade has been made to true pitch you want to be sure the top or front of the blade maintains a true airfoil shape. Your propeller is nothing more than an airfoil so it must have an airfoil shape, the same as your wing. Be sure to maintain the high point about 1/3 back from the leading edge. I have

seen many reworked props where no attention was paid to the airfoil at all with the thickest part of the blade being towards the trailing edge. This should **never** be. Also, pay attention to the leading and trailing edges. You want the trailing edge sharp. The leading edge should also be sharp but not quite as much so as the trailing edge. Make it sharp and then hit it lightly with sandpaper to take the knife edge off. The preceeding pertains to racing propellers only. Propellers intended for use in stunt and sport should have a larger leading edge radius if, for no other reason, than to be less dangerous to the fingers when hand starting. Most pylon fliers use an electric starter or the "spinner flip."

While on the topic of pylon racing propellers, many of you are new at this rework game and are in the dark as to what is the best diameter to use, how wide the tip should be, etc. There are many theories and ideas about how propellers should be carved and shaped. Much will depend on your particular airplane, engine, and amount of nitro used in your fuel. A clean airplane will let the engine unload more in the air so a little more propeller can be used to begin with. If your airplane is a clunker and will not let the engine unload you are better off with a little less prop. There is a lot of trial and error involved finding the correct propeller for your particular airplane/engine/fuel combination. I, personally, like to start with the 9½" diameter, 8 or 8½" pitch Top Flite pylon prop. This is initially cut to 8-13/16" diameter. The tips are then narrowed to 3/8" by trimming off the leading edge in a gradual taper starting about the middle or high point of the leading edge. By trimming the leading edge there will be less tendency for the propeller to cavitate which is, more accurately, tip flutter, than by trimming the material from the trailing edge. Trimming the leading edge causes the prop, while under load on the ground, to actually flex and decrease pitch slightly. Trimming the trailing edge does just the opposite causing the prop to increase pitch on the ground and have more of a tendency to flutter.

Next, try the propeller on the engine. I like to prop the engine for 17,800 or better on the ground. If your engine turns the prop 17,800 to 18,000 you are in business. If it will not, reduce the diameter 1/16" and check again. Be sure to keep the 3/8" wide tip. Reduce the diameter to

obtain the desired rpm. Do not narrow the blade. You shouldn't have to go below 8-5/8" diameter to get the desired rpm. If, on the other hand, the propeller turns well over 18,000 then increase the diameter. If you have trouble with the propeller cavitating, try radiusing the leading edge of the tip. Rather than a square tip it is a gradual arc. You do not want the prop to cavitate – if it does, throw it away. A cavitating propeller will hold the rpm down and make setting of the needle valve more difficult. Once the tips start cavitating, or fluttering, the engine rpm will not increase. This is the reason many fellows cannot get a prop to turn over 16,500 or 17,000.

The above mentioned prop is only one theory, but one that has been proven to work. Other fliers like wider blades and smaller diameters. Look around at a contest and see what the RC'ers turning the low times are using. The chances are pretty good that you will see several different types of propeller styles. However, one thing they will all have in common – the pitch of the propeller has been accurately set.

So to sum it up, the Prather propeller pitch gauge is a very useful and well made item for which there is a definite need. No one serious about being competitive in pylon racing should be without one. □

NSRCA

from page 6

future for issues involving RC pattern activities. Polling our membership for the benefit of the Contest Board can become a reality. It's up to you!

NSRCA registration numbers will be assigned on a first come basis and, hopefully, you will use them on your pattern planes as a proud addition to your AMA No.

(3) What does membership require of you?

This question can best be answered by you. As in any organization, we will have persons who are vitally interested and will pitch-in to serve on committees, etc. Others, due to various reasons, will lend their support, but will actively participate to a lesser degree. Either way we need the support and help of every person interested in pattern flying in the U.S.A.

(4) What does it cost?

The best has been saved for last. Very little!! Annual dues are initially

being set at $4.00 per year to cover postage, printing, etc. Hopefully, it will prove to be one of the soundest investments you have made in the hobby.

For organizational purposes the U.S. has been divided into areas as you can see on the attached map. The following persons have agreed to serve as District Coordinators and have promised us their wholehearted active support:

Northwest: Ralph Brooke, 3431 S. 194th, Seattle, Washington 98188.

Southwest: Joe Bridi, 23625 Pineforest Lane, Harbor City, California 90710.

North Central: Don Lowe, 3491 Clar-Von Dr., Dayton, Ohio 45430.

South Central: Don Downing, Euless, Texas.

Northeast: Ed Keck, 484 Pellett Road, Webster, New York 14580.

Southeast: Ron Chidgey, 2613 Pompano Drive, Pensacola, Florida 32504. □

FROM THE SHOP

from page 2

So, this is another fact of life that we have to live with and over which we have no control. We hope that you understand that our dates of mailing are fixed and all we can do is deliver them to the post office and let them take it from there. It's just irritating as hell to continually pay more and more for service that gets worse and worse.

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A couple of issues ago we printed a letter of complaint about AMA's current insurance program. Since that time, the AMA has responded to our reader's letter in their monthly mailing and we'd like to present an additional letter from Mr. Leland Taylor, an old friend of this columnist, who lives in Roseville, California.

Dear Don:

I have been mulling over the letter from Mr. Laich which you printed in the November issue concerning his troubles in securing an insurance claim under the AMA insurance. It was a sad story, and one that is often repeated when dealing with insurance.

However, I feel that the story is going to do some unjustified damage to the AMA's image. (One that isn't too bright right now, anyway!)

I would like to voice my opinion on the insurance, since I also have had a similar rather expensive claim filed. Also, as in Mr. Laich's case, no homeowner's insurance was involved. The one major difference was that I was at fault, and damage was property, not personal injury.

What happened was that a heavy fiberglass glider of mine dived out of control into the roof of a parked car, caving in the top,

and tearing the vinyl top. Damage was $410.00.

Three weeks after the accident, the owner of the car had a check for $410.00, no fuss, no bother, and the agent was very courteous.

Now, I'd like to bring out a few points that need expressing. First off, AMA members must realize that the AMA insurance is a SUPPLEMENTARY insurance, which, simply stated, means that it will pay off only that amount which is NOT covered by any other liability insurance that a person may have. (e.g., your homeowners personal liability policy, which will generally cover you against this type of claim.) A PRIMARY LIABILITY policy, which would pay off regardless of the other insurance you may have, would cost the AMA ten times as much, and would be a duplication of any insurance that you already have.

Because of the supplementary nature of the insurance, the biggest battle is determining just WHO, meaning which company, is going to pay off. Anyone who has had any dealings with insurance knows how long this can take.

Second, and what is most important in Mr. Laich's case, you must remember that when the insurance company contacts you, it is an INDIVIDUAL who is talking to you, NOT the company itself!! In Mr. Laich's case, the agent was discourteous, uncaring, and basically dishonest! Yet, even faced with this attitude, Mr. Laich apparently did not get in touch with the superiors, and complain, a very obvious move under the circumstances.

Third, Mr. Laich contacted AMA to try and settle his claim. This was wrong, since AMA is the holder of the insurance policy, not the insurance company itself, which was with whom his problems were. He was literally fighting his battle through a third party, not directly as he should have been doing. He did receive satisfaction through the AMA, which was beyond the effort required of the organization.

In short, I feel that Mr. Laich's complaint was entirely misdirected and basically unjustified. His troubles were with the insurance company AGENT, an individual man whom Mr. Laich did not attempt to circumvent or report for his discourtesy. Mr. Laich accepted the settlement when this INDIVIDUAL threatened him with court action. I can say from personal experience that this is a common bluff of unprincipled claims agents. Once I also accepted this bluff and took an unfair settlement. On two other occasions, older and wiser, I immediately filed suit for full damages AND EXPENSES. Both times, the claim was paid IN FULL before the trial. Basically, Mr. Laich allowed himself to be bluffed out of a fair settlement, a very sad occurance, under the circumstances.

Again, however, I must emphasize that Mr. Laich's complaint should have been directed at the INSURANCE COMPANY, not the AMA! These occurances will continue ad infinitum, as long as people submit insurance claims, and the companies try to get out of paying them, regardless of what company is involved, or the type of claim. And, Hartford Insurance, which is the AMA's company, is one of the most respected of the major companies.

I, personally, believe that the AMA has done a beautiful job of arranging this insurance at such a nominal cost to the members. My experience was very gratifying, and another club member recently had an $800.00 claim handled in the same courteous manner. Other people have had trouble, sure, but the trouble has been with the INSURANCE ADJUSTER, not the AMA.

As a final little note, I would like to bring up an often-ignored fact. The AMA

When Writing To R/C Modeler Magazine Do Not Forget To Use Your Zip Code.

has a safety code that explicitly spells out safe operating practices. If you are a reckless flyer who violates this code, you can forget about having any insurance! If an accident occurs while you are in violation of the Safety Code, it's YOUR NECK, BROTHER, because the insurance DOES NOT APPLY if the company can prove you were in violation.

FLY SAFELY!!

Sincerely,
Leland O. Taylor

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Harry J. Riether, author of the construction article for a Field Strength Meter, which recently appeared in RCM, wrote us with a replacement capacitor for the Hammerlund HF-15 tuning capacitor used in that article. The capacitor that can be used is manufactured by E.F. Johnson and is type number 160-0107-001 and is available from Newark Electronics, 500 North Pulaski Road, Chicago, Illinois 60624. Newark's stock number for this item is 41F202 and it is priced at less than $2.00. Actually, as Harry points out, any variable capacitor between 2 picofarads and 20 picofarads that is one inch or less deep (to fit within the cast) will do the job. Most radio parts stores that handle ham radio supplies can furnish these capacitors. In addition, there was a pricing error in the price list with the Field Strength Meter article and that is the tuning meter, Heathkit part number (27)407-1163, which is priced at $3.60 not $.60 as erroneously printed.

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The 148th Fighter Interceptor Group, Minnesota Air National Guard, Duluth, Minnesota, is celebrating their 25th Anniversary (1948-1973) and have prepared for publication a history book. The contents will include all types of aircraft used, unit missions, equipment and personnel in story and photograph form. It will be printed on glossy paper, contain some color, and have a hard cover. This reference book will be available by the time you receive this magazine and the 148th Fighter Interceptor Group is accepting pre-publication orders at $5.00 each. As an additional bonus this book will contain the story and pictures of an A36 Apache recently restored for presentation to the USAF Museum by members of this unit. Make checks payable to 25th Anniversary, and mail to 25th Anniversary Yearbook, 148th Fighter Interceptor Group, Minnesota Air National Guard, Duluth International Airport, Duluth, Minnesota 55811.

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That's it, for this time. □