radio control

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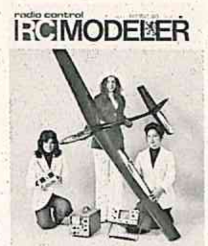

THIS MONTHS COVER

Toni Wurtzler, Mary Jo Atkins, and Jane Knueven, three pretty World Engines technicians who are a part of the program for the series of construction articles for the RCM-World Proportional System which will commence next month. Ektachrome by Austin Bewsey Studio.

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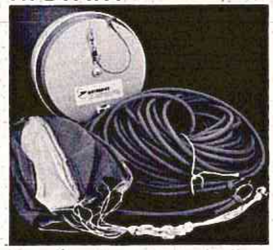
FROM THE SHOP

DON DEWEY

MACH VIII

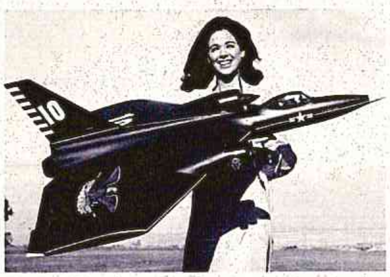
HI-START



KAVAN JET RANGER

FOKKER DVII

VAMPIRE



If you're wondering about this month's cover, wonder no more - - - we're going to tell you! Quite frankly, we're going to tell you because, if we don't, there's a great big Irishman and three pretty girls in Cincinnati, Ohio, who spent a lot of time and money arranging for that particular transparency who would be somewhat unhappy with us, to say the least.

The Irishman in question is an old and good friend of RCM's, John Maloney, President of World Engines, Inc., one of the world's largest manufacturers of proportional control systems and U.S. distributor for many fine products including the world renowned O.S. and Super Tigre engines. The three girls are technicians in the proportional control division of World Engines, Inc., and appear on this month's cover as an introduction to one of the most outstanding series of articles ever to be presented in RCM, commencing next month with our 10th Anniversary issue.

What we have been leading up to is that RCM will be presenting a 12 part series that will comprise one of the most complete step-by-step construction articles for a digital proportional system ever presented. As you may recall RCM pioneered this type of presentation with the Digitrio in 1965. This was followed by the Classic system and we are equally proud to present an update of the state-of-the-art in R/C systems by beginning the series on the RCM-World Proportional System authored by John Maloney.

The October issue will mark the 10th Anniversary of R/C Modeler Magazine and, since we have tried during the past 10 years to pioneer new concepts and new ideas for the sport and hobby of R/C, we feel that you will be as excited as we are by the innovations and performance of this exciting new digital system. Even if you have never "scratch-built" an electronic project in your life, you will find that this system will be presented in such a manner that you will have absolutely no difficulty in assembling it from our instruction series. And, by arrangement with John Maloney, World Engines will soon have parts kits available to correspond with the series of construction articles.

With regards to the girls on the cover, these are three of the technicians in John's Service and Repair Department who will re-do your system if for some reason you goof up during the construction sequences. All I can say to you is, that if you're an RC'er, you'll want to build the RCM-World digital proportional system.

•

While on the subject of electronics, Saverio Gaudiano of Seabrook, Texas, brought to our attention a news release in the May 24, 1973 issue of Electronic Design Magazine concerning the recent development of a nickel cadmium battery which can be recharged in as little as 15 minutes without damaging the battery or shortening its life. Previous to this breakthrough, there have been substantial risks in trying to reduce the normal recharge time of conventional nickel cadmium batteries.

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FIBERGLASS COWLINGS

BY BILL ALDRIDGE

● One of the things I have learned from reading RCM construction articles seems to be that the authors have something of a problem when it comes to constructing engine cowls. Most seem to use rather complicated methods which must make allowances for the thickness of the cowl shell when it comes to making the block nose. Other methods use the engine itself as a spacer with the strong risk of getting dust and bits of wood into the engine no matter how well it may be sealed off. The method outlined in this short article is one that I have used with great success over the years and it is offered in the hope that it may be of some help in solving what seems to be quite a problem for many RCM readers.

I use a number of ½" square lengths of any metal drilled centrally and tapped on each end to a length as outlined in the sketch. I have a number of these to suit each engine and radial mount I normally use. Another point is that it is possible,

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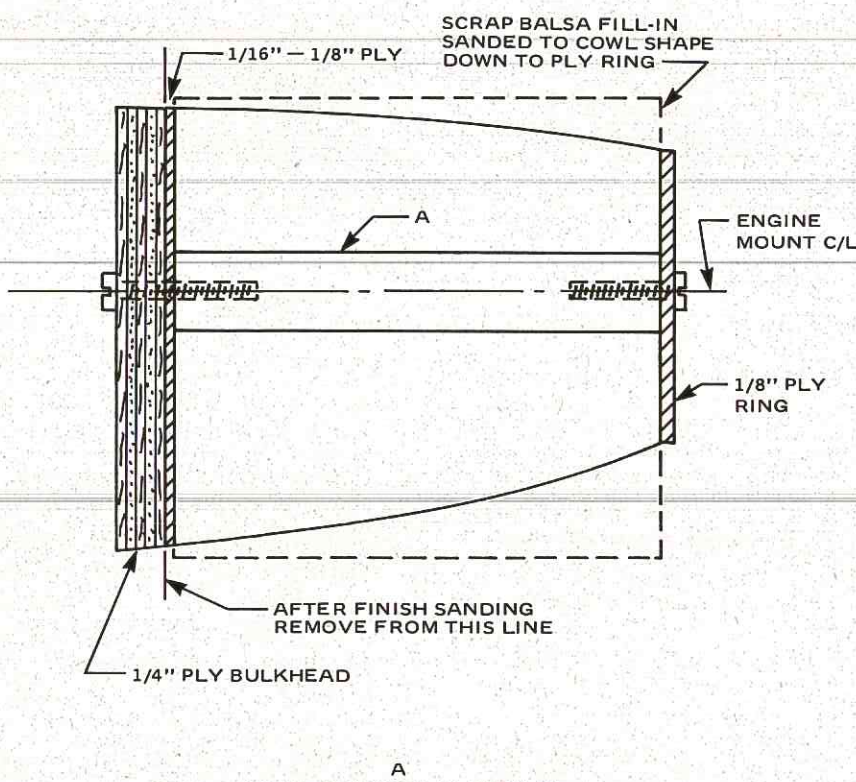
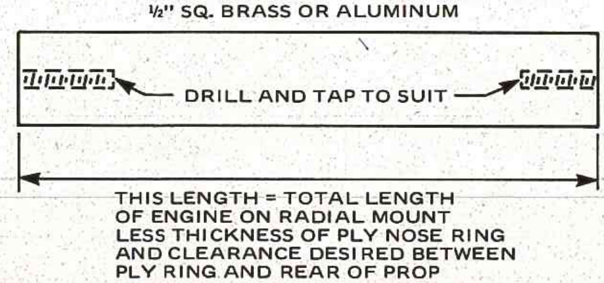
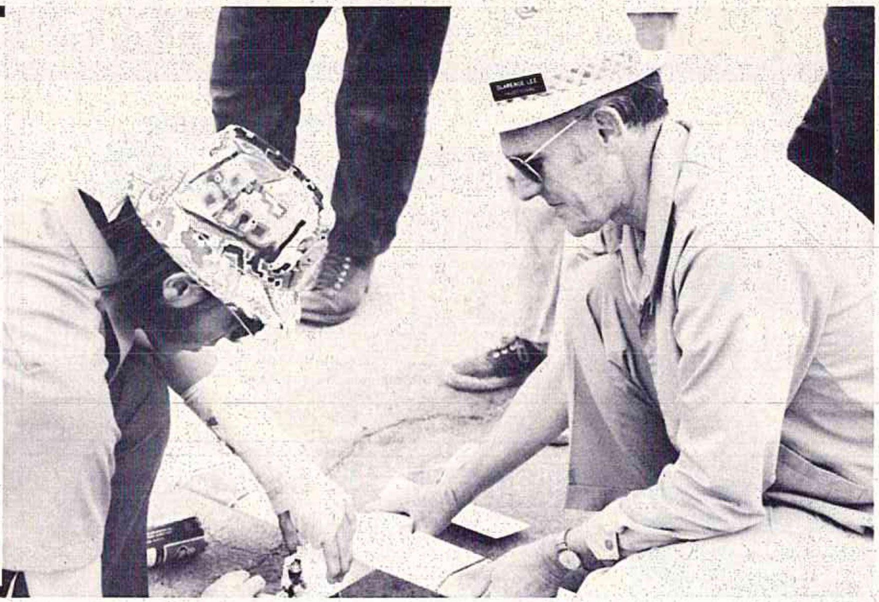


A
½" SQ. BRASS OR ALUMINUM



engine clinic

By Clarence Lee



Dear Mr. Lee:

In the June issue you made mention of two railway tank car explosions involving nitro-methane. Do you have any further information on these explosions? As a boy I recall a tank car explosion here in New York involving chemicals and am wondering if this might possibly be one of the explosions you made reference to.

Keep up the excellent column.

Yours very truly,
George Allison
Niagra Falls, N.Y.

George, the tank car explosion you recall as a boy could well have been one of those involving shipment of Nitro-methane. The first explosion occurred there in Niagra Falls on January 22, 1958. This was followed by another several months later at Mt. Pulaski, Illinois. These two explosions led to the banning of the shipping of Nitro-methane by rail. As I understand it, there were other tank cars containing other chemicals and there was some doubt as to whether the Nitro-methane was the initial cause of the explosions or not. However, when two tank car explosions in a row occurred both involving Nitro-methane, you can well understand the reason for the banning of rail shipment.

Dear Clarence:

Enclosed is a copy of a letter I recently wrote to Du-Bro Products about their new "Muff-L-Aire" and my experiences with it. Their reply is on the back. I wonder if you have had any other letters describing the same type of trouble as I am having?

The engine was broken in with one gallon of Fox "Superfuel" containing an extra 2 oz. of Lubricin N-1. Before putting on the Muff-L-Aire I ran 3 gallons of Cox Blue Can through it, being careful never to run lean and using an 11-8 Top Flite Power Prop. I have pranged the engine into the grass (and the dirt underneath!) on 2 occasions and very diligently stripped it down, scrubbed all the gunk out, and reassembled it. Despite the unforeseen ground contacts, my engine has always run like a gem. However, within 3-4 flights after the muffler went on, my beloved O.S. .60 had had enough.

Question: Is Cox Blue too hot for this engine? Should I be using Lubricin in my fuel? Should I buy another muffler of the flow-through type if I'm after peak power? Any comments you could offer would be greatly appreciated. Everyone else down here is avoiding the Muff-L-Aire like the Plague until I get mine straightened out.

Happy flying!
Nathan M. Mayo
Shaw A.F.B., S.C.

Yours is the first letter I have received regarding any engine damage with the Du-Bro muffler as the suspected cause. I'll have to go along with Du-Bro's answer to you that I do not see how the muffler, if properly assembled, could have been the cause. With the full nine plates assembed, the muffler causes little or no back pressure and little muffling for that matter. I believe those two previous crashes have finally caught up with you and it was just by coincidence that the engine went sour about the same time that you installed the Du-Bro muffler. There was more than likely some dirt left in the engine following one of the crashes, something got bent causing a bind, etc. The only complaints I have received concerning the Du-Bro muffler have been its ability to do a pretty good job of spreading oil all over the airplane.

Cox Blue Can should not be too hot a fuel for your engine. Cox Blue Can contains 15% nitro and your O.S. should handle this fine. Cox has always been one of the better fuels available, however, there have been a couple of times in the past when a new batch would come along that was shy on oil. Possibly you might have a bad can of fuel so best to dispose of it. You shouldn't have to add Lubricin to Cox fuel as it already contains a small percentage. Some years back I was told 2%.

Dear Mr. Lee:

I have been told that a one-blade propeller is better than a two or a three blade propeller. Is this true, and if so why hasn't any company produced this type of propeller? I have tried to make drawings and the prop itself and neither have come out balanced! I was wondering if you could help me with my problem? I just don't seem to be able to come out with a balanced propeller.

Thanks alot for your help.

Yours very truly,
Richard Einstein
Monsey, N.Y.

Whoever told you that a one-blade propeller was better than a two or three bladed one was speaking more from theory than practical application. If this were true you would be seeing more single-blade propellers in operation on, not only models, but full size aircraft as well. The theory behind the single-blade propeller being that for a given amount of horsepower a certain amount of blade area can be used. By using only one blade both the diameter and blade area of this one blade can be increased resulting in a better 'bite' and blade efficiency. The theory being that this one larger blade is more efficient than two smaller ones. However, under actual application it just does not work out this way. Some indoor rubber models have used single-blade propellers with success, but this is about the only instance. Back in the late '40's two fellows, whose names escape me now, used a single blade propeller with U-Control speed models with some degree of success and marketed same through the hobby shops. However, as

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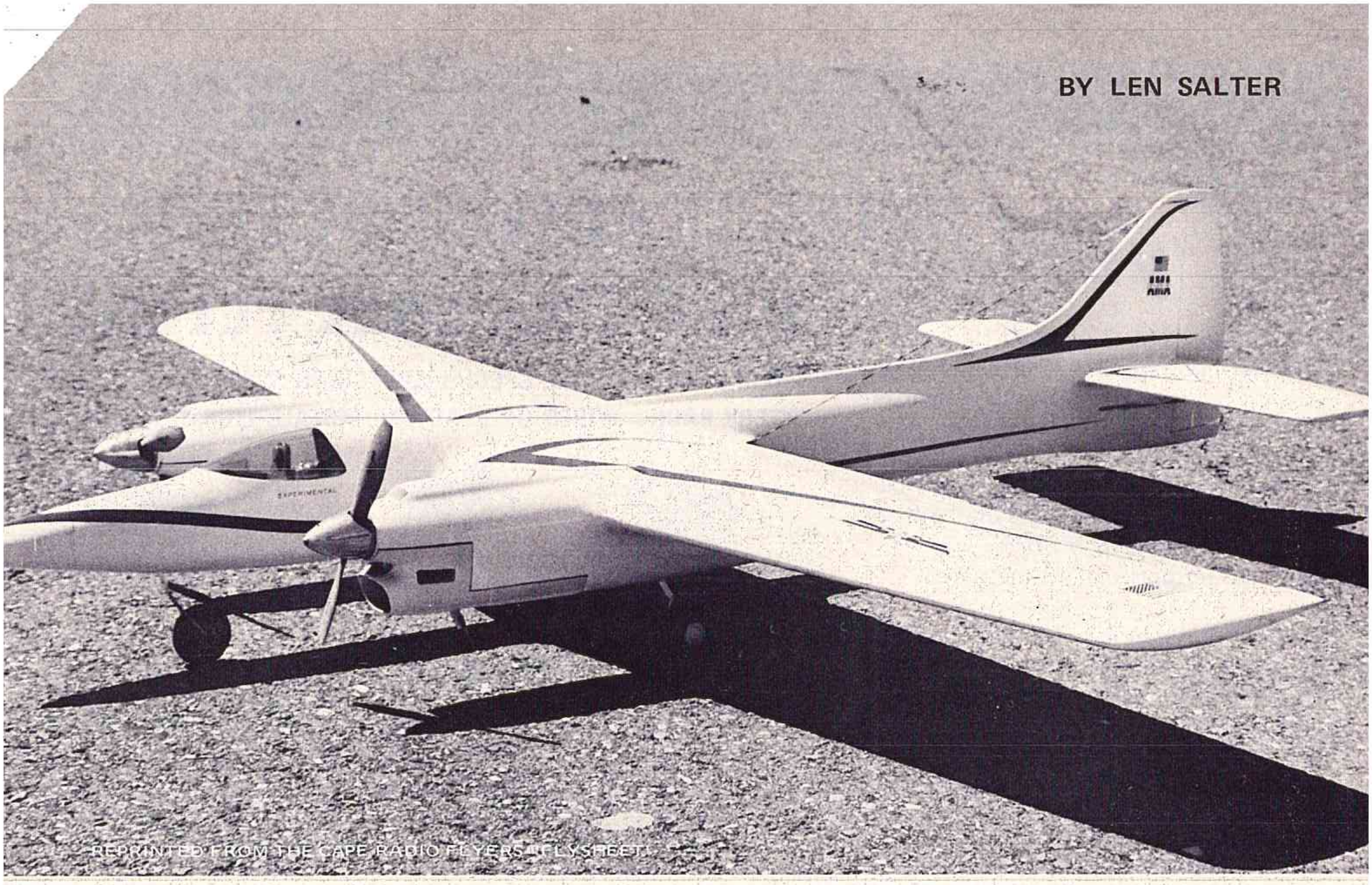
BY LEN SALTER



REPRINTED FROM THE CAPE RADIO FLYERS FLYSHEET

UNDERSTANDING YOUR AIRCRAFT

A little bit of practical knowledge about why your aircraft behaves the way it does will go a long way toward preventing that next crash.

● You all no doubt have varying degrees of knowledge regarding the theory of flight, but there may be things you do not realize, or understand, regarding the behavior of your aircraft, so I have written this article with the object of filling in any gaps in your knowledge in this respect.

A FALLACY

To begin with, I want to disprove a belief held by some fliers that their aircraft behaves differently when they turn from downwind flying to upwind flying, or vice versa. This, as I hope to prove here is an illusion.

First, we must differentiate between the aircraft's movement through the air surrounding it – which I will call its progress, and its movement relative to the ground, which I will call its track. Obviously in conditions of still air, its progress would be identical to its track in regard to direction and speed. If flying directly into wind its track speed will be less than its airspeed, but direction of progress will be the same as the track. If flying in a cross wind there will be an angle between progress and track.

Now, imagine a balloon floating in the wind – there is no progress whatsoever – although it will have track speed and direction. Now, substitute the balloon with your aircraft, which would also make no progress if it were not for the propeller and control surfaces. As far as your aircraft is concerned its progress is **always** the same, wind or no wind. Relative to the air surrounding it, your aircraft is **always** heading into wind regardless of the true wind direction or your aircraft's heading.

Those of you who have flown into clouds in full size aircraft on a straight course, will know that the clouds always come **straight** at you regardless of wind speed or direction. If your aircraft is trimmed to fly straight and level in still air, and you then fly it across wind in a strong breeze, why does it not weathercock? Only because the wind does not affect it in any way, other than its movement relative to the ground – anyone not convinced?

CONTROL SURFACES

These are completely ineffective

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SUNDAY FLIER

KEN WILLARD

Ken Willard flies his 'Sunday Glider' around the pylon while checking out the course on 'Madonna Hill' in San Luis Obispo, site of the 1973 RCM Slope Soaring Trophy Races.

● How times change! Just four years ago, in the December issue of RCM, I wrote a glowing report of the plans which were underway to develop the Sunset Beach State Park slope soaring site into the finest facility of its kind. We were working with the California Department of Parks and Recreation. The initial steps had been taken and a small parking area had been leveled off for modelers. There were additional ideas being explored – pathways for retrieval, a launching area, etc.

Then came the great ecology kick. Natural areas should not be desecrated and disfigured by the installation of facilities for human pursuits other than the viewing and enjoyment of nature's wonders. As this viewpoint grew in intensity, more and more strict limitations were placed on the use of state lands, and without going into detail, the net result has been that no longer can the Annual RCM Slope Soaring Trophy Races be held at what is, undoubtedly, one of the finest sites for that purpose in the entire United States. By order of the State, no group activities are permitted at the site any more, because of the potential ecological damage to the hills and the protective plant coverage, resulting from the trampling by human feet.

Fortunately for the sailplane enthusiasts, however, it is a matter of degree, and the site is still available for modelers to go there on an individual basis and enjoy the recreation of R/C sailplane flying. So, at least all is not lost.

But that still left the problem of finding a site for the 1973 Trophy races. Several sites were considered around the San Francisco area, but none could be found that were quite as good as Sunset Beach. So, the search was extended.

Since a lot of entries came from Southern California, it made sense to try and divvy up the travel, if possible, and that gave me an idea. How about San Luis Obispo? I have spent many pleasant days in Pismo Beach, twelve miles away on the ocean, slope soaring right in front of the Sea Crest Motel where we stay, and it seems there's almost always wind in the afternoon.

So, I drove down to San Luis Obispo, got together with Stan Newton, President of the SLO Flyers, and we went looking for suitable sites. Found one, too – a beauty. It is a hill several hundred feet high and about six hundred feet long – not a cliff, either – but a gentle slope that you can go down and get your plane if it dunks into the hillside below you (and mine did, once).

Small problem. The hill is privately owned. Would the owner be agreeable to having maybe a hundred and fifty people tramping over his grazing land? We figured maybe not if we delayed the event until late in the year, when everything has dried up anyway.

So Stan and the SLO Flyers approached the owner, a successful businessman by the name of Alex Madonna, who built the fabulous Madonna Inn on Highway 101 just outside of San Luis Obispo. To our great delight, he agreed to our use of the hill.

So, the 1973 RCM Slope Racing Trophy Races are now being planned for the weekend of October 6 and 7, in San Luis Obispo. The SLO flyers will be the host club and Leonard Ledson will be the Contest Director. And here's an interesting possibility; if the safety aspects can be satisfactorily worked out, the races will be run on a triangular course instead of the usual figure eight (which some flyers call the demolition derby) that is flown most of the time to avoid turns into the hill. But this hill is so configured that the turn at the far pylon can be made towards the hill. We just have to be sure that crowd control is adequate to keep people off that particular part of the hill. And that can be done. Of course, if the flyer loses his cool and makes his turn into the hill a little too close in, he'll meet up with the side of the hill. But that's a part of racing, isn't it? Just like the auto racer who corners too fast and spins out. The thing I like about it (after two head-on collisions in the normal event) is that maybe I'll be able to finish the race this year.

So tune up your slope racer, and join the fun in San Luis Obispo. Bring the family and let them enjoy the nearby seashore beaches, maybe have one of the fantastic breakfasts that are served at the Madonna Inn.

* * * * *

In the last couple of issues I've been talking about seaplane activities, but now that the thermals and winds are good, sailplanes come to the fore. And that brings up the question, "How are things going with the League of Silent Flight?"

I put the question to Le Gray. "Great," he replied. "We now have gone well past the six hundred mark in qualified Level I or higher members, and applications are still rolling in."

"Since there are no fees, how are the finances?" I asked.

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FOKKER DVII

BY CHUCK CUNNINGHAM

Designed for RCM's World War I Scramble, the quickly-built Fokker is an ideal .15 powered sport aircraft.

The .15 powered Fokker D7 has been expressly designed for the WW I Scramble event presented in the July 1973 issue of R/C Modeler Magazine. It has been designed to look like a D7 and yet is not a scale replica. The original was flown first with a Super Tigre .15 and then later with an O.S. Max .15 with the conclusion that both engines give excellent performance. Obviously, the Super Tigre has more power output but the aircraft flies just as well on the Max .15.

One of the most enjoyable features of the Fokker D7, as far as I am concerned, is that it is one of the best flying, peppiest, all-around most enjoyable little airplanes that I have ever designed or have ever flown. In fact, it literally did fly right off the drawing board. The first flight was made on a weekday evening with no one at the field. When the engine was cranked up, I reached over the top to adjust the needle valve and the first flight, as well as all subsequent flights from that point on, were really a dream. The airplane has been flown in still air and in winds up to 25 mph, the latter leaving white caps gusting on Lake Benbrook adjacent to our flying site here in Fort Worth, Texas. I feel confident that if you build the Fokker D7 for either a WW I Scramble event, or simply for sheer sport flying, you'll have one of the sweetest, nicest flying airplanes that you'll ever have the opportunity to own.

As a small aircraft there is very little material that goes into building the model and very little time consumed in constructing it. In fact, the original was built in three evenings and covered in one additional after dinner session. Everything has been designed in this aircraft to use stock sizes of wood, there is almost no waste, and the entire aircraft, when finished, should weigh between 2¾ and 3 pounds. My original was covered in red MonoKote while Don's prototype in California used yellow and red Solarfilm with black and white trim MonoKote.

When I designed the model I assumed that it would be able to fly with just rudder and elevator without using ailerons so, during the first flight I did not have ailerons on the lower wing. At slow speeds however, the rudder was very effective but as the speed increased, the rudder became less and less effective. In fact, it became almost impossible to make the aircraft turn when it was flat out in a racing mode so I took it back and cut 1" wide strip ailerons on the bottom wing and have flown it this way ever since. This is the way it is shown on the plans presented with this article. You will also note that the wings are fully sheeted and have just a short spar on the center to provide a little extra insurance. My original prototype does not utilize this spar, however, after seeing what this aircraft is capable of doing, and how quickly it can be put into a snap roll and then into a full speed spin, it seemed a little bit wiser to go ahead and add a small spruce spar across the center section of both wings! The Fokker D7 will fly upright, upside down, inside out, and do anything you ask of it. It will go through any AMA maneuver which a little .15 size engine is capable of performing. I suggest that for maximum power output you use a Taipan 8/4 glass filled nylon prop available from Hobby Shack.

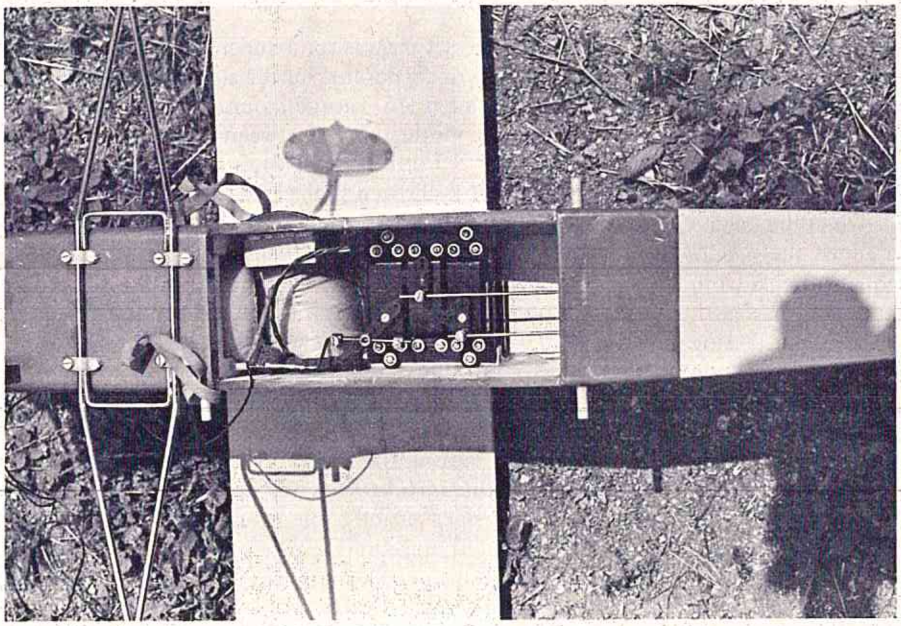
The original set up was for a Super Tigre .15 and, when the Max .15 was incorporated in the nose of the aircraft, I used a long extended .15 Tatone mount plus a ¼" plywood block behind the motor mount between it and the firewall in order to put the .15 out into the breeze. By using all of the extra long mount it allowed the needle valve to stick out past the nose of the aircraft, however, this is not objectionable, and makes it much easier rather than putting in an extension down inside the nose cowling.

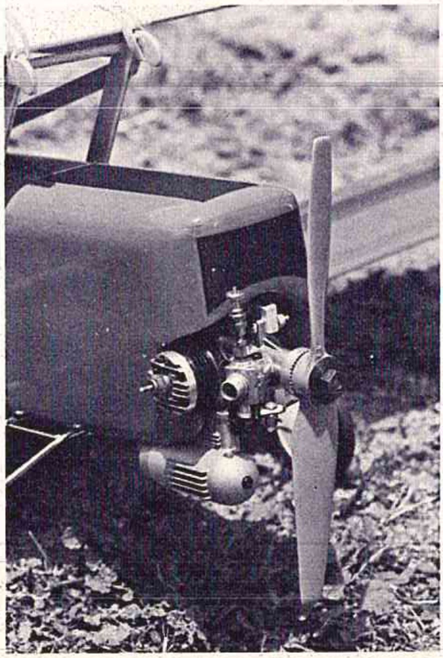
If your interest has been whetted by this description of the Fokker D7, get out your pile of balsa wood, your trusty razor blade, your tube of epoxy glue and let's get to work.

FUSELAGE:

Begin by cutting the sides to the outline as shown on the plans from the 3/16" x 4" x 36" balsa stock. Be sure that you make the sides exactly the same as this will help to insure a straight flying aircraft when you are done. With a soft nylon marking pencil, mark the inside of each fuselage side then, using a small square, mark the lines on the inside of each fuselage side where the formers are to be glued in place. Cut out the formers and mark a center line down the middle of each former. Put a piece of wax paper on the plan and pin the formers upside down over their location on the plans. Simply pin former B and former C in place. Now, using 5 minute epoxy, fit each side against the formers, making sure they're located properly and glue the formers where the lines are marked on the inside of the fuselage sides.

When this is dry, glue in the firewall former A, making sure you put in both the side thrust and down thrust as shown on the plans. Remember you're building the fuselage upside down so that when you're building the side thrust into the firewall, it will be reversed from that direction as shown on the top view of the drawing. When the firewall is dry, bring the tail section together and glue this with epoxy, making sure that everything is lined up. Be certain that the marks on the center line of each former line up exactly with the junction of the two side pieces at the tail since this will insure a perfectly straight fuselage. When all this is dry, remove from your building board, install the extra 3/16" side pieces at the nose, the soft block at the bottom of the nose cowling, and then glue on the ½" soft block to the top of the fuselage.





RCM's prototype of Chuck Cunningham's Fokker DVII. 36" span, O.S. Max .15 power. Capable of most maneuvers, it is an ideal sport aircraft for the sport flier who has passed the intermediate trainer stage. Photos show MRC Masters Series VIII radio installation as well as method of hanging the Max .15 out in the breeze.

Now, sand the fuselage to shape and bevel the aft section of the top block from the cockpit back to the junction of the elevator. The fuselage should bevel to just 3/16 of an inch deep at this section where the elevator rests. Round the nose of the aircraft to give the sounding line as shown on the side view. If you would look at a Profile Publication's picture, or any picture of the Fokker D7, you will see that the nose is rounded, while the sides are flat. When you have everything sanded, cut out your cockpit section and glue a floor in place in the cockpit area. On the original I did not cut out a cockpit, I simply made a circular section of black contact paper and stuck it in place on the fuselage top once the fuselage was covered. Subsequent models that have been constructed have a full cockpit section in them, but I was in a hurry on the prototype and therefore took the simple way out.

While everything is being worked out on the fuselage glue the pieces together to form the rudder, the vertical stabilizer, the horizontal stabilizer and the elevators. These can all be glued and drying while you're putting the fuselage together. Do not attach the elevator or horizontal stabilizer or the vertical stabilizer to the fuselage, until after they have been covered. This is a much easier way to complete your aircraft and facilitate quick construction.

The next thing to build in the fuselage section are the cabane struts. These were all made very simply out of 1/8" plywood as shown on the drawing. Make sure you make one right and one left cabane section. Note that the diagonal piece is glued on the outside as well. When the two cabane struts are completed (and I suggest that you build one on top of the other so they both line up completely) set them up and drill a 3/16" hole for the 3/16" dowel that's shown. This dowel will tie the entire cabane section together. Next, on the fuselage, cut four notches on the top block where the cabane struts will slip through. Then mark a horizontal line on the outside of each vertical cabane to indicate the top of each fuselage side. This then will let you line up the cabane struts so that you have no incidence in the top wing. Slip the cabane down inside the notches cut in the top of the fuselage until the lines cut on the cabane struts are exactly level, then you can glue them inside with epoxy

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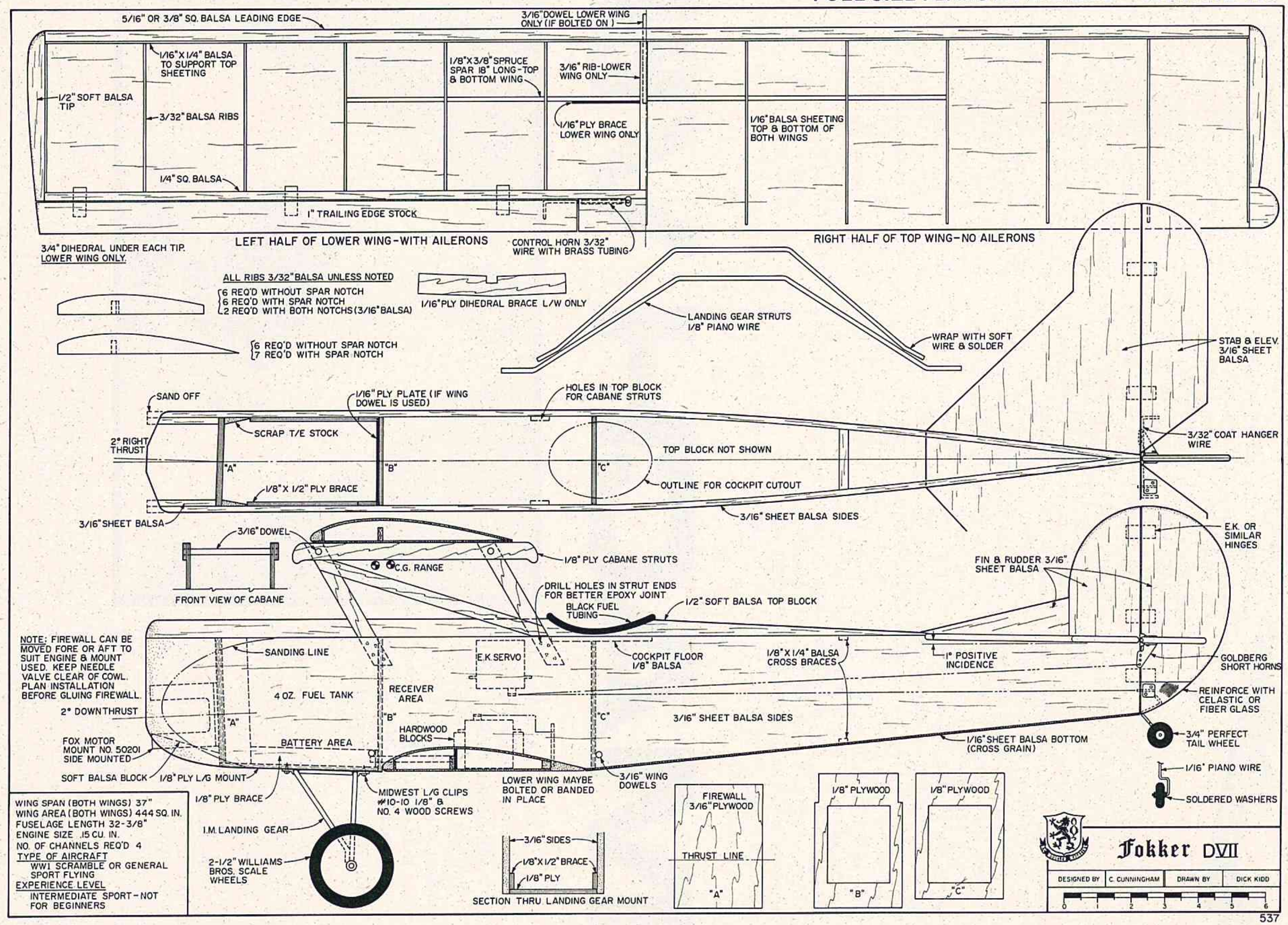
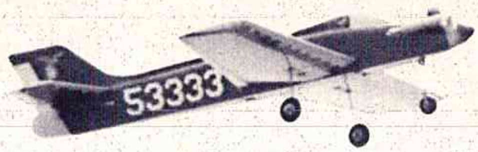
FULL SIZE PLANS AVAILABLE – SEE PAGE 118



MACH VIII

BY JOE UTASI

Twenty-three Mach 8's are currently flying the Midwestern Pattern circuit. This .40 powered competition machine is a very fast and groovy kind of ship. In fact, you'll find that Figure M's and Four Point Rolls aren't hard after all!



At first glance the Mach 8 looks like any other pattern ship, but when you get closer, the size of the airplane has quite an impact. Unlike many other small airplanes, the Mach 8 is a very fast, groovy kind of ship. Several have been built and flown, and all of the pilots agree that it flies as good as, or better, than its big brothers. There are several "theories" about why the Mach 8 flies as well as it does, and this seems to be the one most unanimously agreed upon: Because of its light weight (4 lbs., 4 oz.) and high power (.40) we end up with a very good power/weight ratio. This, coupled with a light wing loading, gives the airplane the ability to "fly" through all of the maneuvers at a fairly constant speed with no zooming or ballooning. This constant momentum makes the ship less susceptible to gusts and cross-winds, and also tends to make the maneuvers look smoother and more graceful.

During the Mach 8's first season of competition, it fared exceedingly well. At the Windy City's Cash Bash the ship bagged a second place, being only 13 points out of first place. Then, at the Wright Brothers Memorial in Dayton, the Mach 8 scored a landslide 1st place victory in Class B. Later, it garnered its third win in a row, a 1st place at Peoria, Illinois. Because of those three wins, the Mach 8 moved up to Class C Novice where it totaled up three first, two seconds, and a third combined in Class B and C Novice Competition.

Unlike many aircraft published in magazines, the Mach 8 is not a "one of a kind" model. At last count there were twenty-three versions either under construction or being flown in Indiana, Ohio, Illinois, and Michigan.

The latest version of the Mach 8 incorporates a fiberglass fuselage. By eliminating the bulk of the balsa in the fuselage, it is possible to install retracts and still have somewhere to put a fuel tank! Needless to say, the installation of retracts and a Super Tigre .46 have enhanced the performance of the aircraft considerably.

For those modelers interested in the fiberglass version, the kit is being offered elsewhere in this issue.

So if you're looking for an economical way to go, but still want to stay competitive, what are you waiting for? The Mach 8 fills the bill, so let the balsa chips fly!

FUSELAGE:

The fuselage takes the most time to build, so I usually get it out of the way early. The first thing to do is select the wood. This is where modelers frequently go wrong. All balsa wood is **not** the same. Spend some time shopping around until you find some hard, lightweight wood with a uniform density when held up to a strong light. This will insure you of a uniform structural strength with no soft spots. After all, you wouldn't want your stabilizer to separate from the fuselage in the air, would you?

Once all the balsa has been selected, cut the sides to the outline shown on the plans, making sure to maintain the wing saddle and stab platform at 0-0. Next, cut doublers from 1/32" plywood and epoxy them to the fuselage sides from the firewall to the trailing edge of the wing saddle. Don't leave these out, as this lamination of balsa-epoxy-plywood furnishes 90% of the body's structural integrity. Next, cut the maple motor beams to the outline shown in the top view on the plans. The reason for this particular shape is that it retains the strength needed to hold the engine, yet allows plenty of room to get an 8-10 ounce fuel tank in the forward compartment. Epoxy the motor mounts in position on the fuselage sides. While this is curing, the triangular stock can be added along the edges of the fuselage sides. Set the sides away to dry and make your F2 and F4 bulkhead outlines on 1/8" ply, and the F1 firewall outline on 3/16" or 1/4" plywood. A jigsaw comes in handy here since it does a nice job in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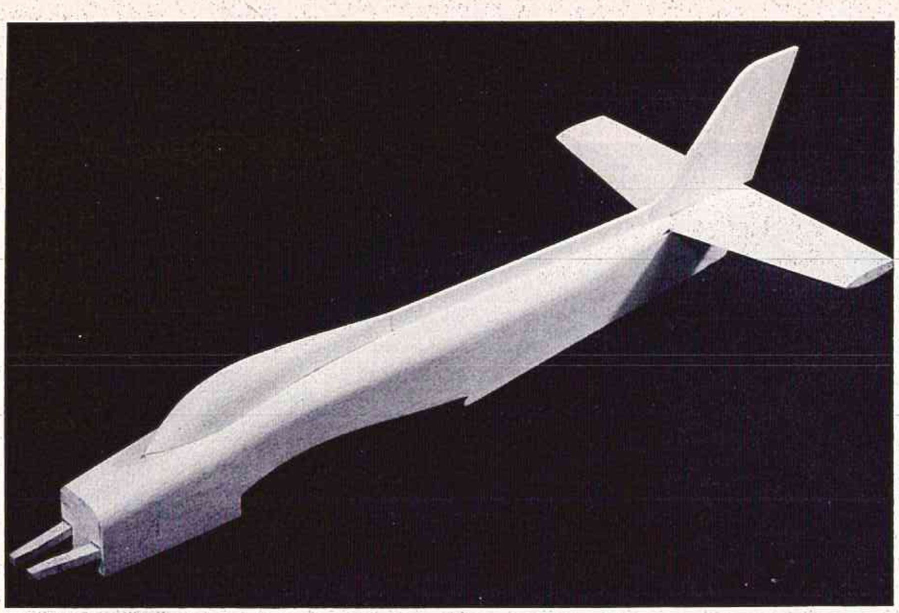
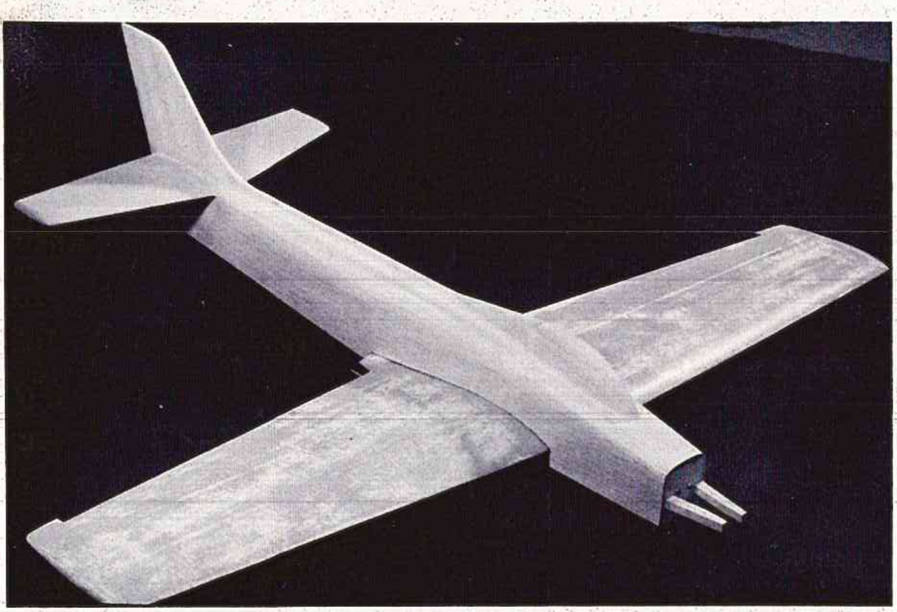
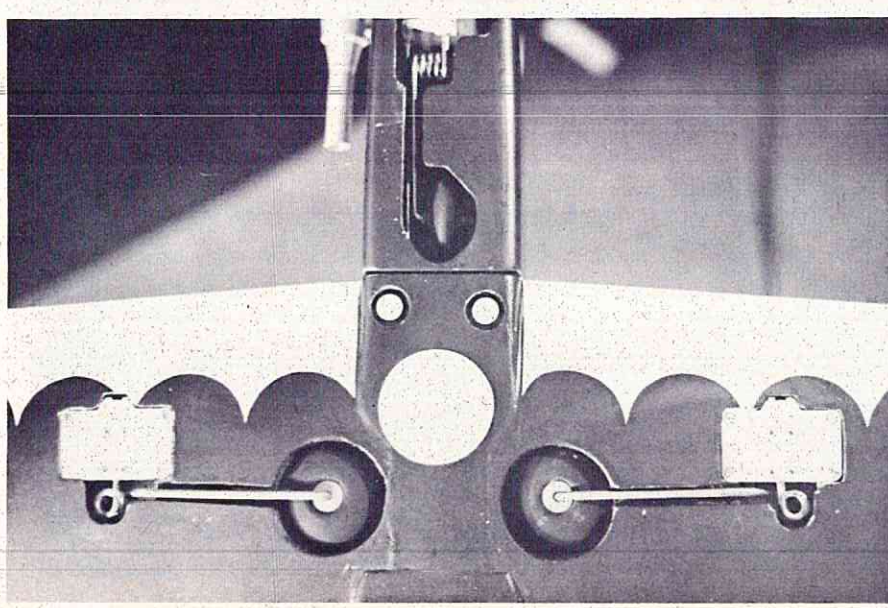


The Mach 8 fuselage and empennage framework.



Here, the sheeted foam wing cores have been primed and sanded.



A retract gear version showing access hatch.

no time flat. When these are cut out, check fit them against the fuselage sides to make sure they fit properly. When you're satisfied that everything does fit, get your jig ready (if you have one) and assemble the sides and bulkheads in place. I use 5 minute epoxy here because I'm impatient. Don't pull the tail section together until you add F3 (hard ¼" balsa). The space between F2 and F3 is for your receiver and varies from make to make, so first check your receiver size and put it where it's comfortable, but don't leave F3 out! This bulkhead retains the fuselage shape over the wing saddle when the tail section is pulled together. After installing F3, pull the tail together, making sure its absolutely true. When that all dries, add the ½" top blocks. At this point, the fuel tank, nosegear bracket, throttle and steering linkages should be added. Then plank the bottom of the fuselage, add the nose blocks and canopy, and carve liberally!

WING AND STAB:

Some of you may have doubts about the "sharp" leading edge that I use on the wing. Well, I've built and flown several now, both sharp and blunt, and I can see no difference at all in the performance of the aircraft. The big advantage to the pointed wing and stab leading edges is that the top and bottom wing coverings can be "lapped" over one another, thereby eliminating the need for any leading edge stock. This speeds the building process considerably and leaves more time for flying.

The wing and stab use foam cores which are then covered with 1/16" balsa sheeting. This results (usually) in a strong warp free wing. To begin with, you must make a set of templates from 1/16" plywood. These templates for the root and tip airfoils should be 1/16" smaller all around than shown on the plans since these include the wing skins. Next, using the top view on the plans, block out the outline for the wing and stab halves on some 2" foam. Fasten the templates to the root and tip with finishing nails, making sure to get the centerlines absolutely level, or else you'll be cutting a permanent warp into your wing!

The wing and stab can be sheeted with 6 sheets of 1/16" x 6" x 36" balsa which brings the cost to about 6 bucks. Cheap, huh? I'm not going to go too deep into how to cover your cores, but there is one point that cannot be stressed enough and that is

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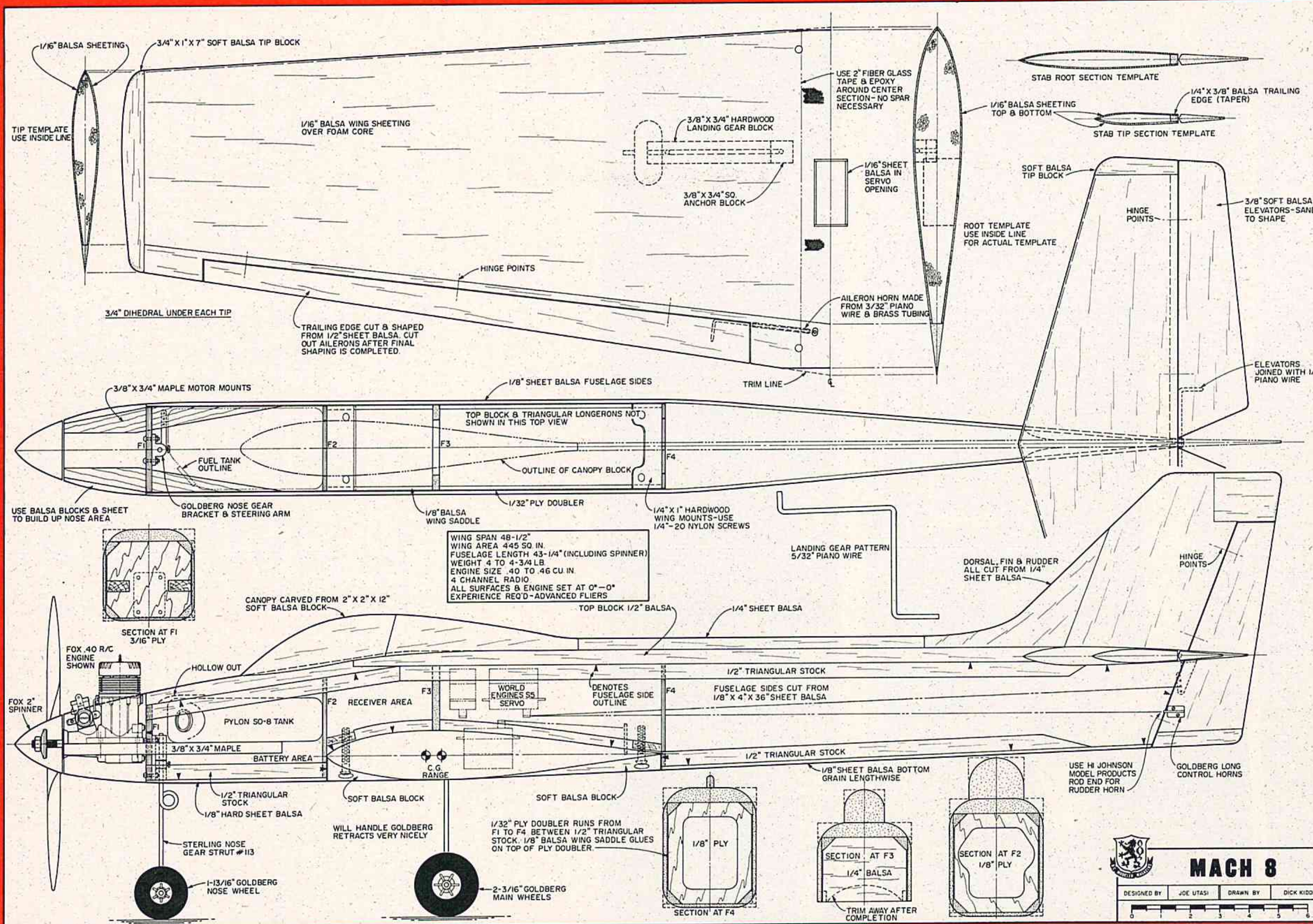
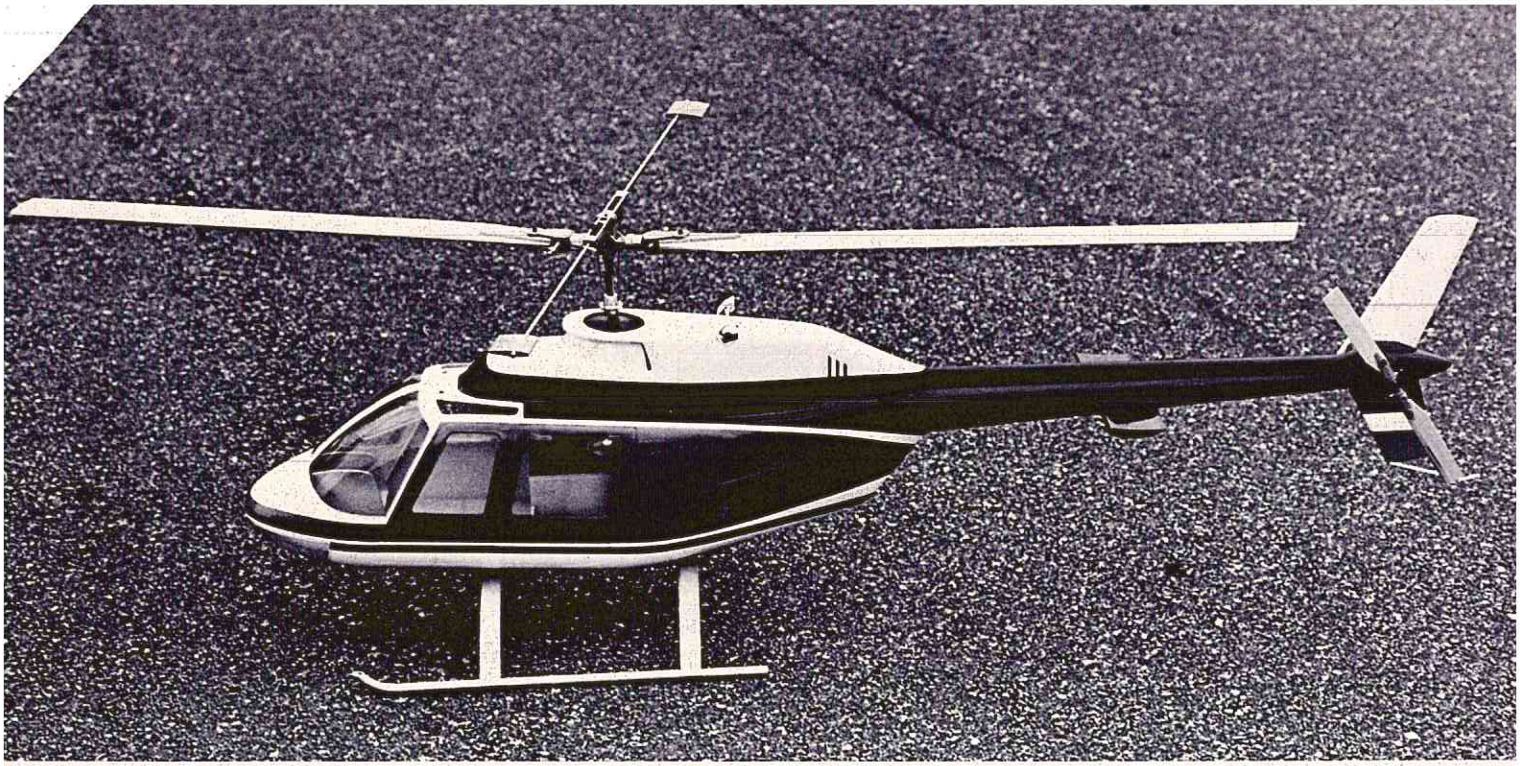
FULL SIZE PLANS AVAILABLE — SEE PAGE 118





RCM BUILDS THE KAVAN JETRANGER

BY BERNIE MURPHY

PART II

With the basic construction having been completed last month, we are now ready to assemble the main rotor head, the tail rotor and install the controls.

The swash plate, which controls the main rotor, has been pre-assembled at the factory. All that is required is to bolt on six brass balls for the control rod ball links. As with all of the "bolt and nut" assemblies, the use of LOP (Loctite) is a **must**. Once the balls are installed, the swash plate is slid onto the main rotor shaft. The swash plate **must slide freely** on the shaft in the area between the bearing bracket and the top of the fuselage hatch. If this fit is too tight, carefully work the shaft down with **fine** emery cloth, until a smooth sliding fit is obtained.

Next up the rotor shaft is the control rod guide. The guide must have four 1.5mm pins epoxied into it. It is a good idea to clean both the holes and the pin ends with thinner before gluing. Additionally, the pin ends should be roughed up with sandpaper in order to provide a better "bite" for the epoxy. The guide is held in position on the shaft by two set screws, but these should not be tightened at this time.

The main rotor head comes partially assembled. The instruction manual describes the procedures for assembling these pre-assembled units. On our Jet Ranger, we debated whether to disassemble and then reassemble or not. Our final decision was to go ahead and disassemble, building the entire rotor head from scratch. We soon found that the blade holders were quite securely mounted to the see-saw, and our **final** decision was to accept the assembled components and begin from there.

The blade see-saw on the Kavan Jet Ranger pivots on a pair of needle bearings. These bearings are glued into the see-saw with Stabilit Express. Extra care should be taken to insure a good bond. The **outside** of the bearings should be roughed up with emery cloth, as should the **inside** of the hole in the see-saw. Both should be cleaned with a good solvent (dope or epoxy thinner). The main rotor hub is inserted into the center hole of the see-saw. The bearing pin is then inserted through the side holes of the see-saw and into the hole in the hub. The bearing pin is adjusted so that it is centered in the hub, then is locked in place with a set screw. A needle bearing is installed onto each end of the bearing pin, and into the holes in the see-saw. The bearings are now epoxied in place being careful to keep the epoxy out of the bearings, and to keep the hub centered in the blade see-saw.

The stabilizer bar see-saw is installed on the main rotor hub in a similar manner, except that small bronze bearings are used instead of the needle bearings.

A brass control link ball is soldered to each of the two pitch control arms, being especially careful not to glob solder onto the outside surface of the ball. The pitch arms are then cemented into the blade holders. Four ball links must be shortened by 2mm. These are then mounted end to end on two threaded rods. The links are then installed between the pitch arm ball and the inner balls on the mixing levers on the stabilizer see-saw.

The stabilizer rods are fitted into the ends of the stabilizer see-saw. The rods are retained by a pair of set screws which are seated into the groove in the end of the rod. A damping paddle is now screwed onto the end of each stabilizer rod. These are locked in place by a 4mm stop nut. The paddles must be aligned so that they are parallel to each other and perpendicular to the main rotor shaft. In addition, they must be adjusted so that the stabilizer see-saw and entire stabilizer bar balances in a horizontal position. This can be accomplished by screwing the paddles onto the rods until balance is achieved, then locking with the stop nuts. Now, the set screws can be loosened, and the rods rotated to obtain alignment. This entire assembly **must** be securely tightened, using LOP liberally.

The main rotor blades each consist of two pieces, a shaped and notched hardwood leading edge, and a shaped and notched trailing edge. These are assembled using Titebond or white glue. Masking tape can be used to hold the two halves while the glue dries. Once dry, the balsa trailing edge is finish sanded to a symmetrical airfoil. A shaped hardwood strip is supplied with the kit, from which the blade reinforcements are to be cut. In our kit, the supplied strip was not quite long enough to make the four reinforcements as shown on the plans. By cutting the strip into four equal lengths, it was usable. This made each reinforcement about 2mm (3/32") shorter than shown, a fact which would not make any difference whatsoever. A fair amount of care is required when laying out the reinforcements, as they must be cut in pairs to fit the rotor blades. Once the reinforcements have been shaped, they are carefully positioned and glued to the blades.

After the blade reinforcements have dried, the blade mounting hole can be drilled, and the slot for the blade tongue can be cut. The blade tongue is epoxied into place with Stabilit Express.

The tail rotor gear box, and the blade holders have been pre-assembled by Kavan. A brass ball must be mounted onto the control bellcrank, and another onto the control bushing. A ball is also bolted onto each of the blade holders. Two ball links, each shortened 2mm, are bolted onto the nylon control plate. Before assembling the tail rotor, it would be wise to check the fit of the gear box into the end of the boom. Ours needed to have the corners filed off in order to prevent distorting the tail boom.

The tail rotor control is assembled by slipping the control bushing onto its long brass inner bushing, followed by a thin spacer washer and then the nylon control plate. The nylon control plate is retained by a fillet of Stabilit Express epoxy. When assembling, be certain that the control ball is on the end of the control bushing nearest the control plate.

The ball links on the control plate are snapped onto the balls on the blade holders. Orientation here is important in order to obtain the correct motion. The pitch control balls must be at the rotor blades leading edge. The control bushing and blade holders are now pushed onto the tail rotor shaft, pinning the blade hub with a 2mm pin. The pin is then locked in place by a set screw into the end of the shaft. The control bushing must slide freely on the tail rotor shaft.

The bellcrank is bolted onto the gear box and a short pushrod with a ball link on each end is fitted between the bellcrank and the control bushing.

The drive shaft between the main rotor transmission and the tail rotor transmission consists of a steel wire which has two flats on each end. One end of this shaft is epoxied into the rear transmission shaft, thus allowing the tail rotor to be installed or removed without the need for access to the shaft, since it is now part of the tail rotor. With the shaft in place, the tail rotor is now installed, passing the drive shaft through the former guides and into the main transmission (the shaft may need shortening at the front). The tail rotor gear box is bolted to the rear former with screws and blind nuts.

The supplied nylon guide for the tail rotor control is fitted through the formers and epoxied in place. A steel control rod is then fitted into the tube. The front end of the control rod has an adjustable ball link which attaches to the control mixing lever. Reinforcing plates are cut and fitted to the pre-shaped tail rotor blades, as was done on the main rotor blades. The tail rotor blades are then painted and installed into their holders. A single screw holds each blade, allowing them to pivot if accidentally struck.

Five servos are required to control the Kavan Jet Ranger. The five servos are operated from four channels, since the throttle servo and the collective pitch servo are both operated from the same control (throttle). An adapter wire must be purchased (or you can make one) to allow connecting the two servos to a single receiver output. Further, the tail rotor control and the main rotor pitch control are mechanically interconnected by a mixing lever.

A complete description of the radio installation would not only be quite wordy, but also possibly confusing. We shall attempt only to note a few points, leaving most of the description to the photos.

The cyclic pitch (left, right, fore and aft) servos and the throttle servo are mounted on a pivoted aluminum plate. This plate should be laid out and cut to fit your particular servos, keeping the center of the output wheel as close as possible to the position shown on the plans. The collective pitch and tail rotor servos are mounted directly to the cabin roof. Kavan has supplied output wheels with the kit. These are intended to be used for set-up. We found that by shimming the output shafts of our Kraft servos with paper strips, the Kavan wheels could be made to fit quite nicely. Final trim and adjustment of the control functions is a trial and error procedure, and simply takes time. We are including photos of the servo tray at various control positions, in hopes that they may help answer some of the questions which are bound to arise.

The Kavan instructions call for placement of the receiver and battery pack in the forward cabin area. To do this will require extension cables to all servos, since they are located farther away than the cable lengths on most sets. If your receiver will tolerate a fair amount of metal to metal noise, and if it is one of the smaller sets, the receiver can be mounted inside of the top hatch just forward of the main rotor shaft. By mounting the receiver here, the entire hatch can be removed with the entire radio system (except battery) intact. This is a big help when making adjustments. In this case, only the battery may need an extension cable.

Once the radio equipment is in place, the control linkages can be made up. The information supplied simplifies this task. We did note, however, that the lengths given for the links between the three cyclic bell-

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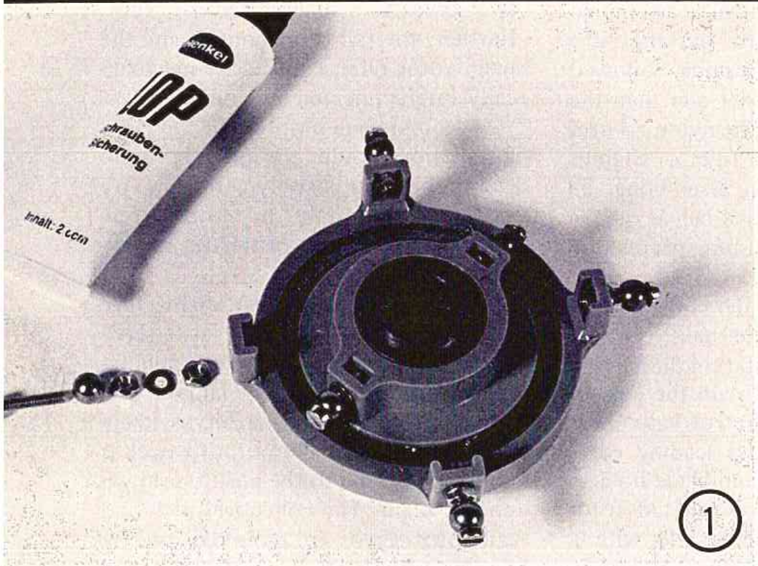
(1) Ball installation on the swash plate. Loctite an absolute must. (2) Guide pins are epoxied into the guide bushing with Stabilit Express. (3) Swash plate, guide bushing and control rods in place on main rotor shaft. (4) Main rotor components as supplied. All parts are assembled using either LOP or Stabilit Express. (5) Rotor hub installed into blade see-saw. Bearings carefully epoxied into place with Stabilit Express. (6) The stabilizer see-saw mounts into the main rotor hub on a pair of bronze bearings. The bearing pin is securely locked by means of a set-screw in the see-saw.



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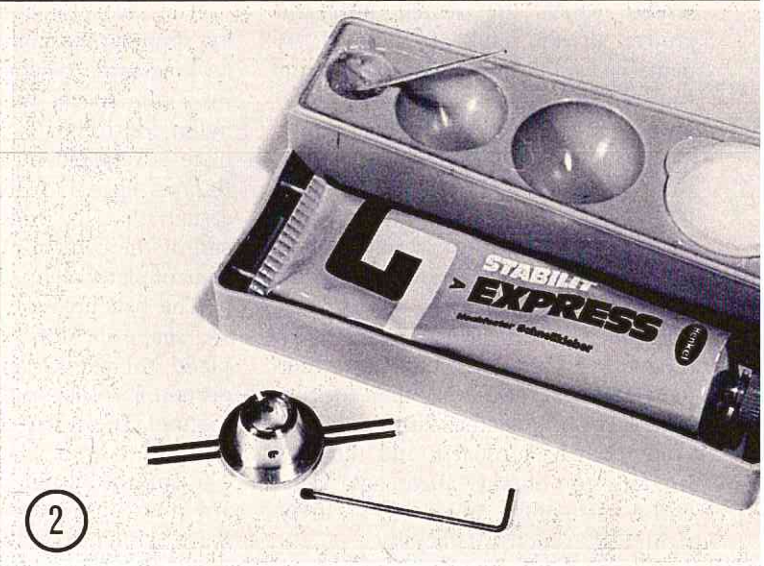

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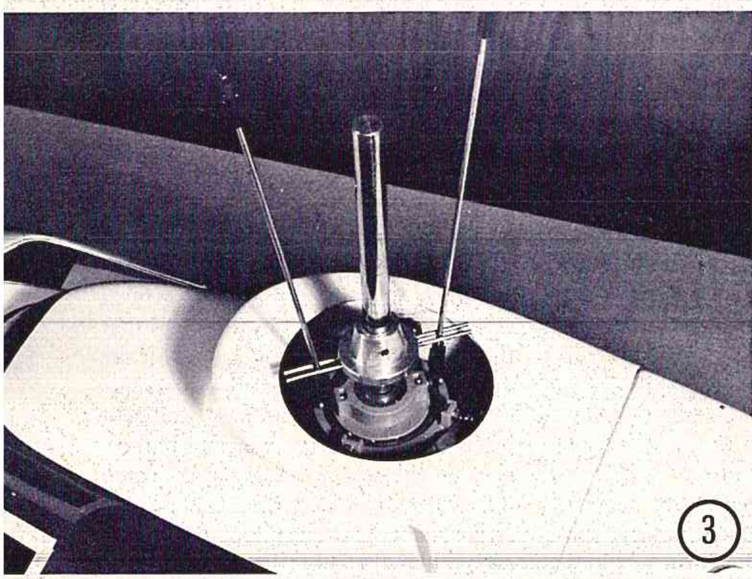

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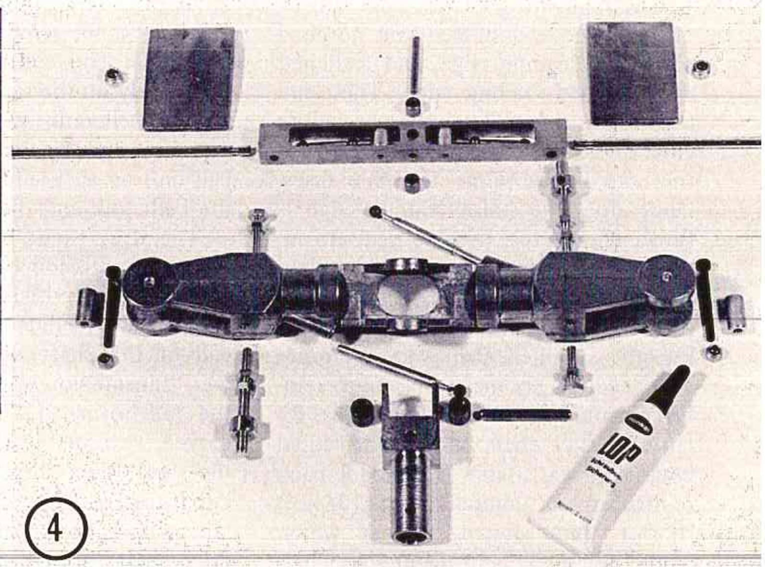

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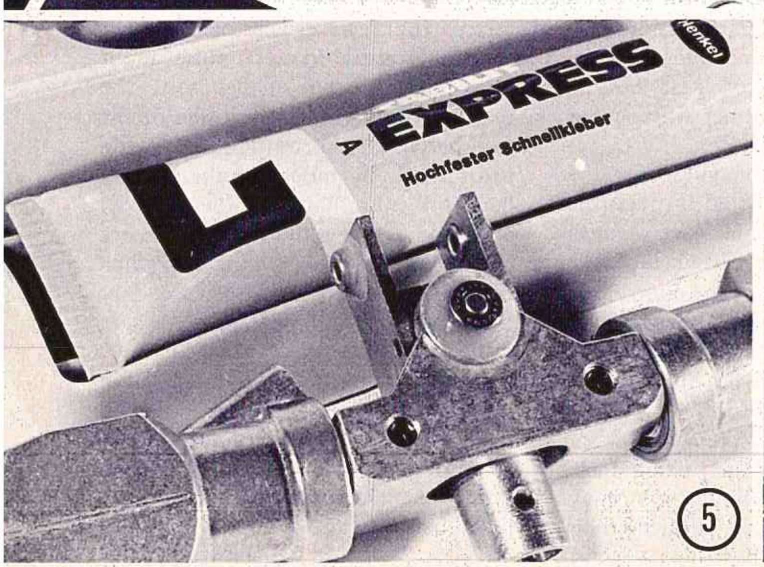

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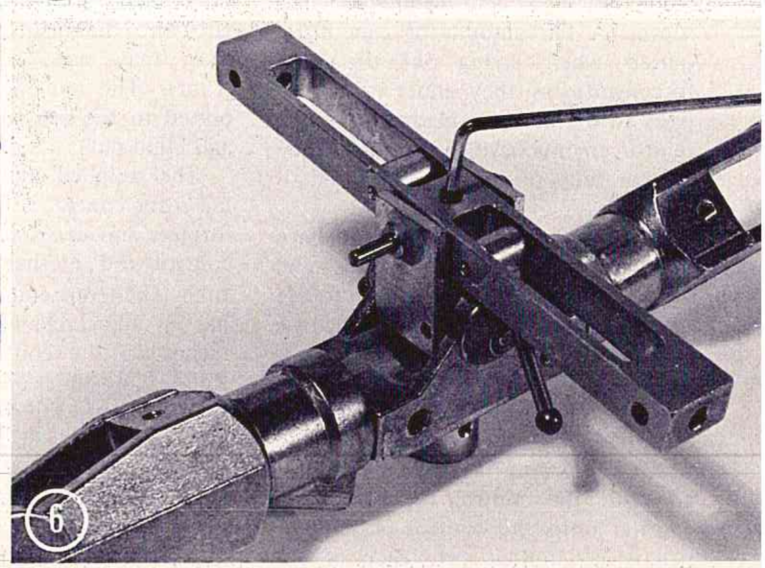

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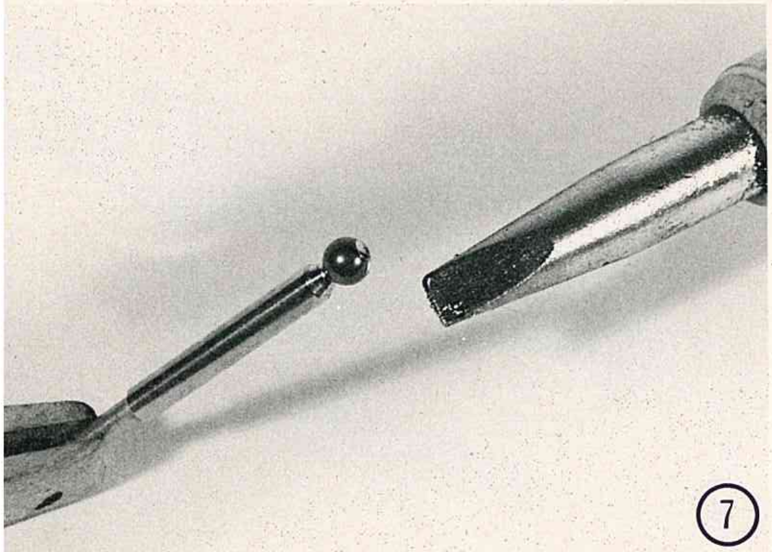
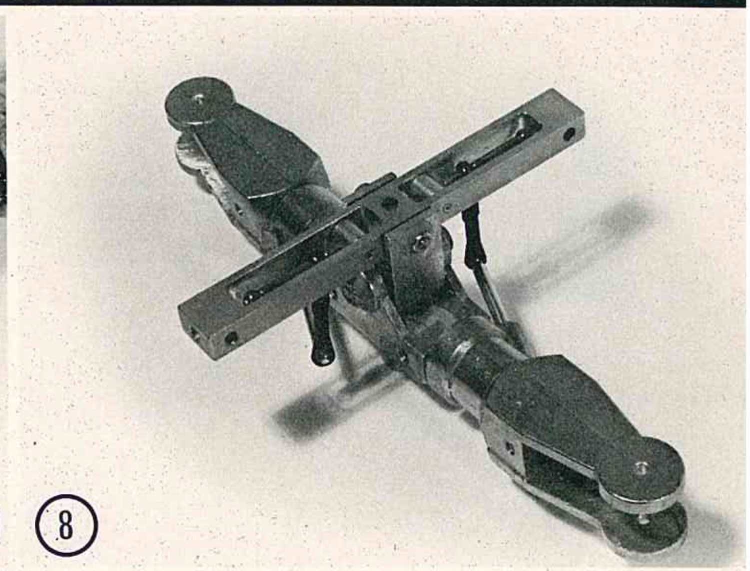
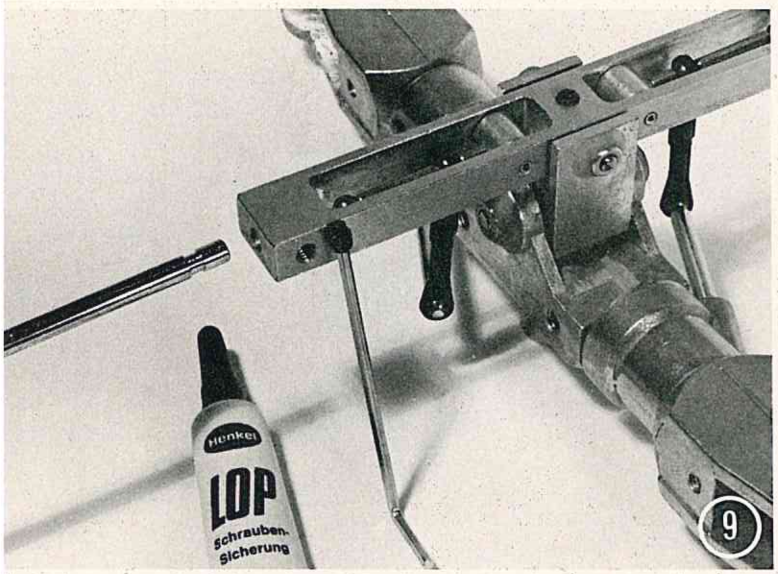
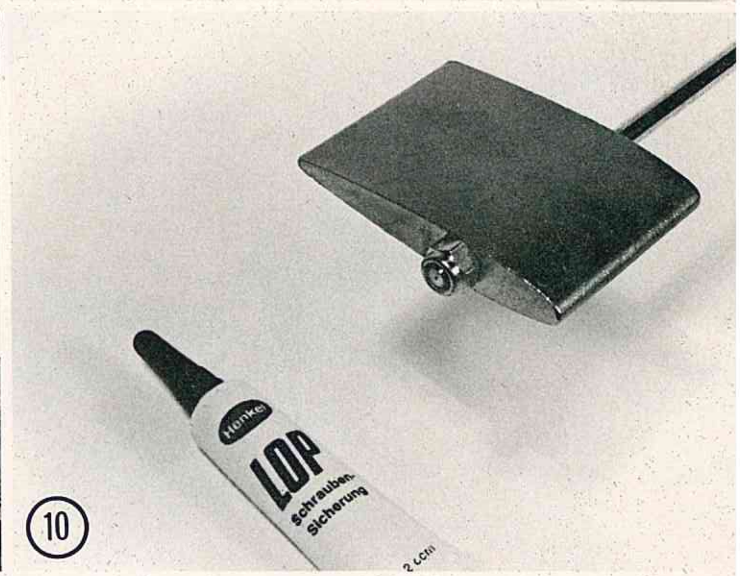
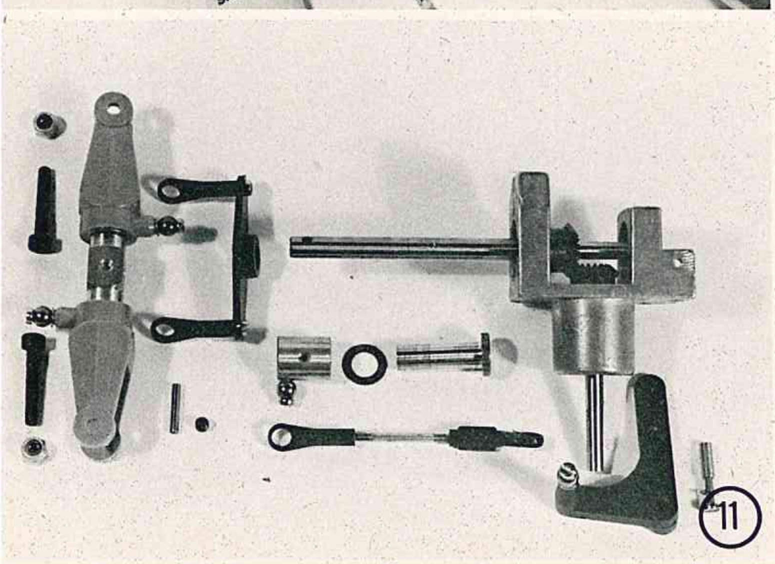
(7) A brass ball must be soldered to each of the pitch arms, being careful not to get solder on the outside surface of the ball. (8) Ball links installed between pitch arms and mixing levers. (9) Stabilizer bar is held securely by a set-screw carefully seated into the groove. Two set-screws are used on each bar. (10) Damping paddle screws onto the stabilizer rods. Stop nut locks the paddle in place. LOP, a must. (11) Tail rotor parts. The gear box and blade holders are factory assembled. (12) The corners of our gearbox casting had to be filed off to allow it to fit properly into the tail boom.

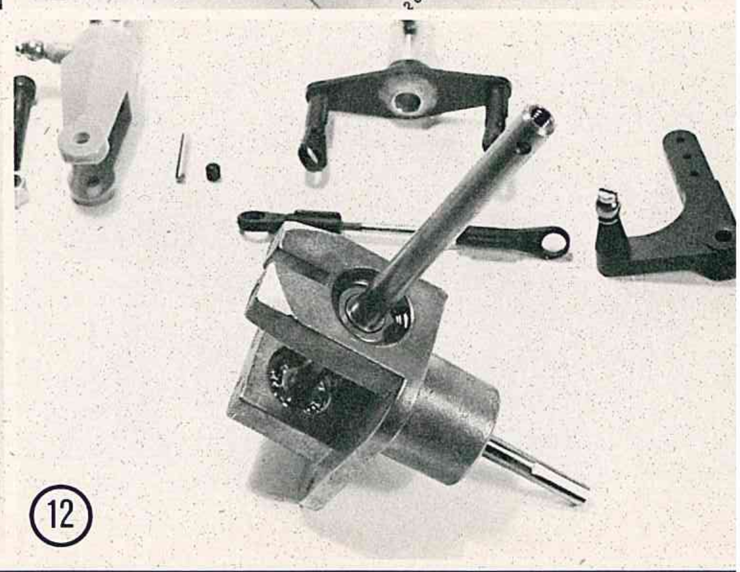




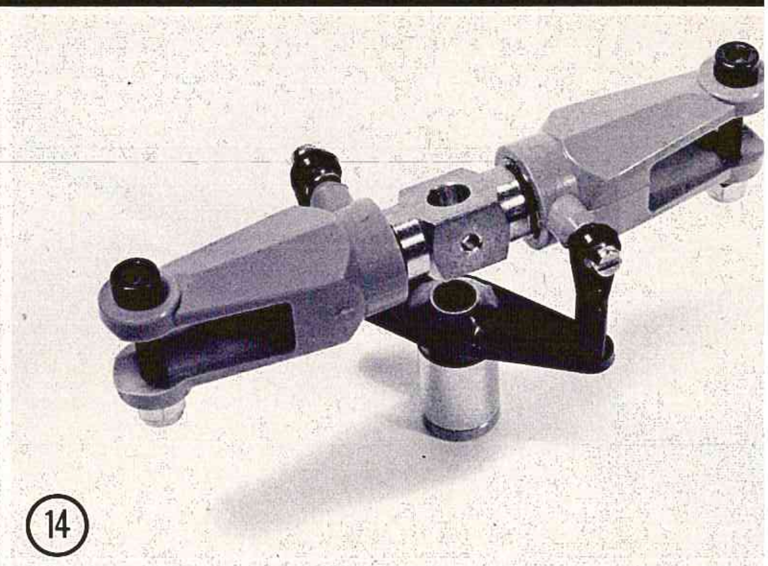


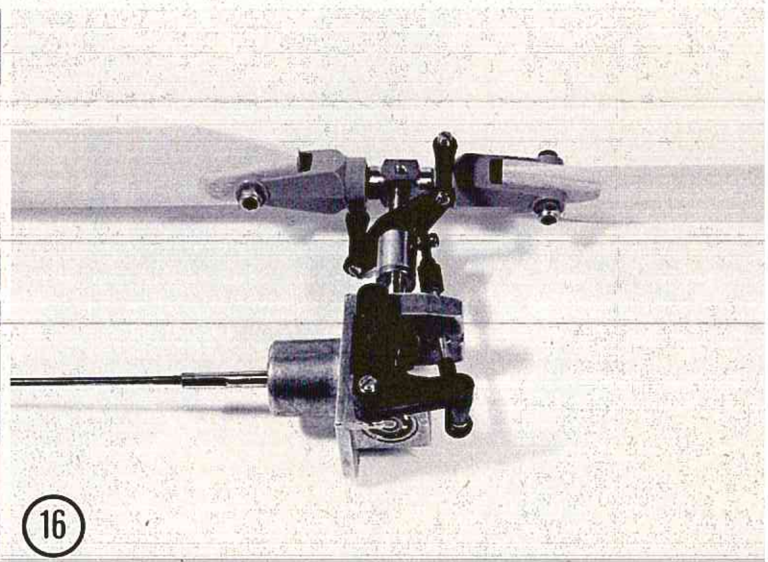


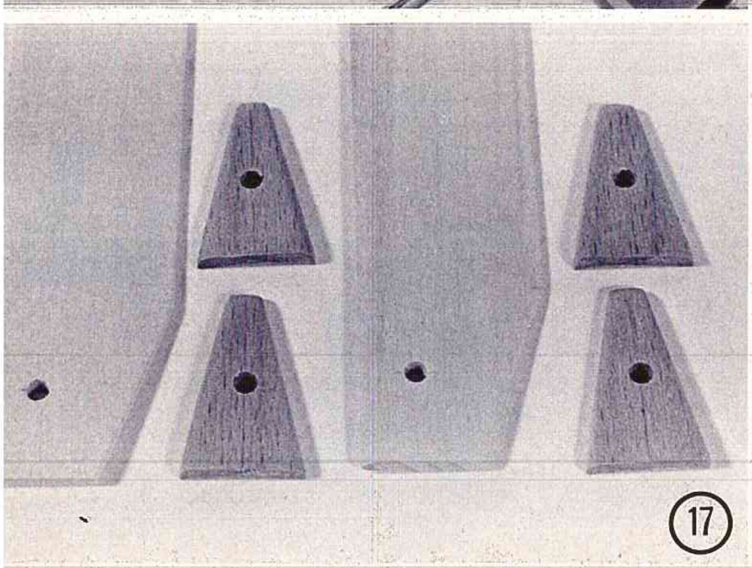


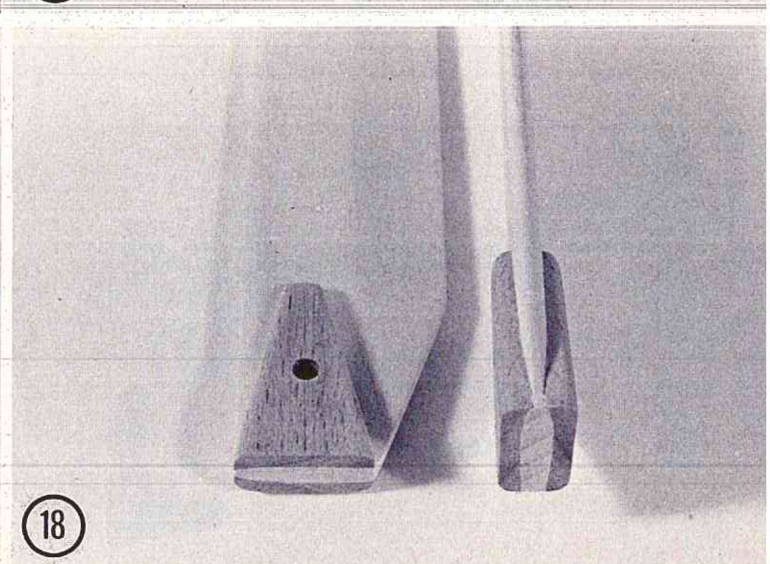


(13) Tail rotor control. Control plate is epoxied in place. Note position of ball. (14) Blade holders and control plate assembled. Note orientation of blade holders with respect to the control plate. (15) Tail rotor hub is pinned to the end of its shaft. Set-screw in the shaft end securely locks the pin in place. (16) Completed tail rotor with blades and drive shaft. (17) Pre-shaped tail rotor blades with fitted reinforcements. (18) Completed tail rotor blades.

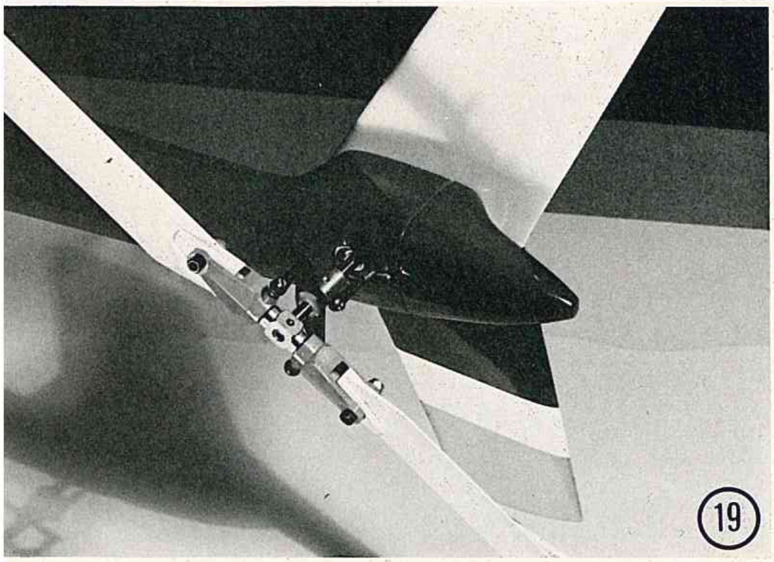








(19) Tail rotor mounts cleanly into tail boom. (20) Completed main rotor blade with shaped strips for other blade. (21) Supplied plate for balancing rotor blades, mounted in vise with top edge level. (22) Rotor blade balanced on edge at 45°. (23) "X" mark after balancing blade. Center of "X" is blade C.G. (24) Blade balancing weights epoxied into underside of blade before covering.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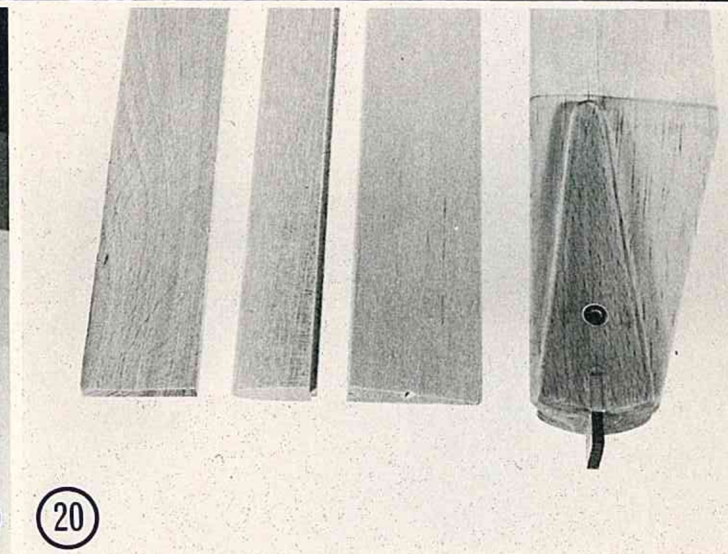
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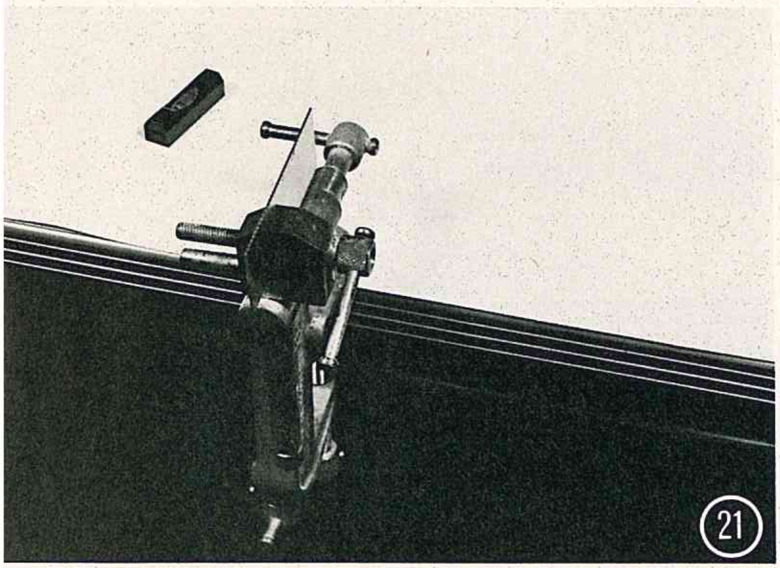
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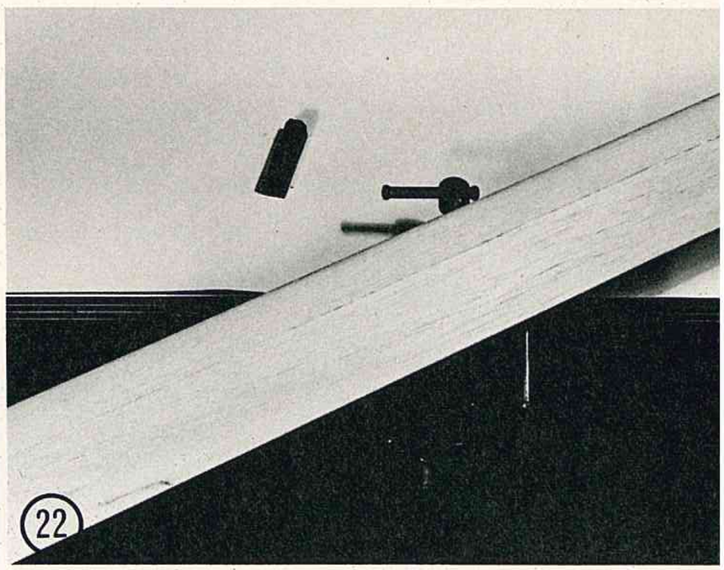
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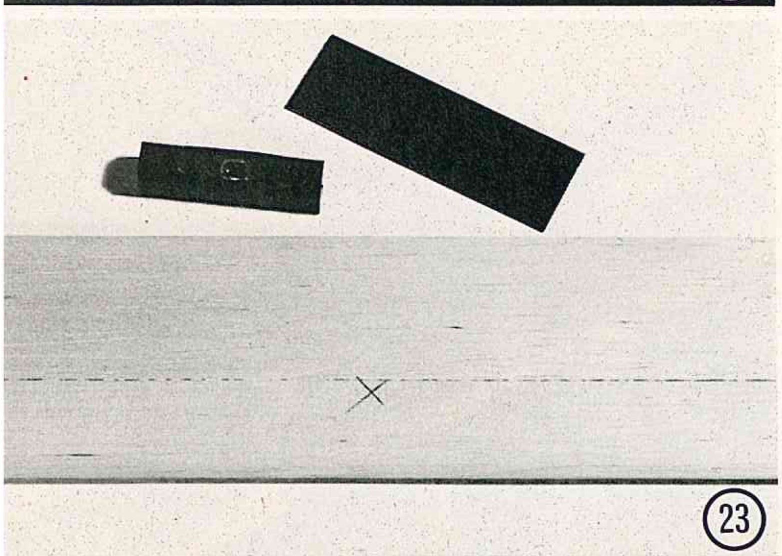
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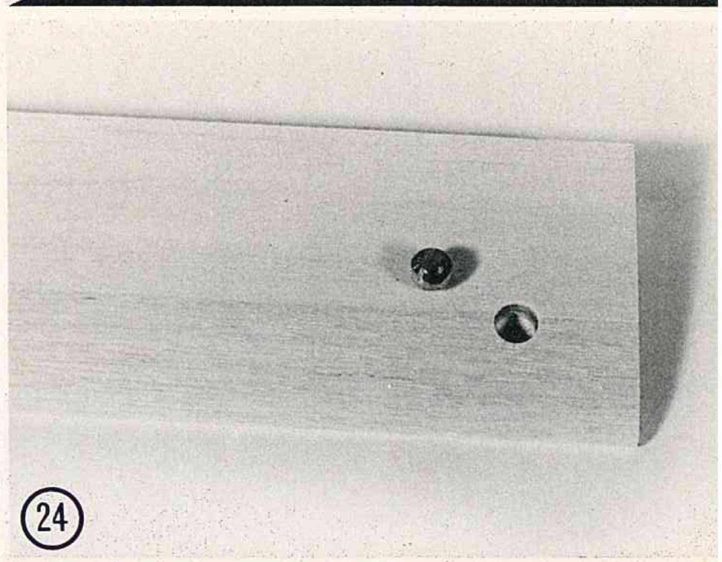
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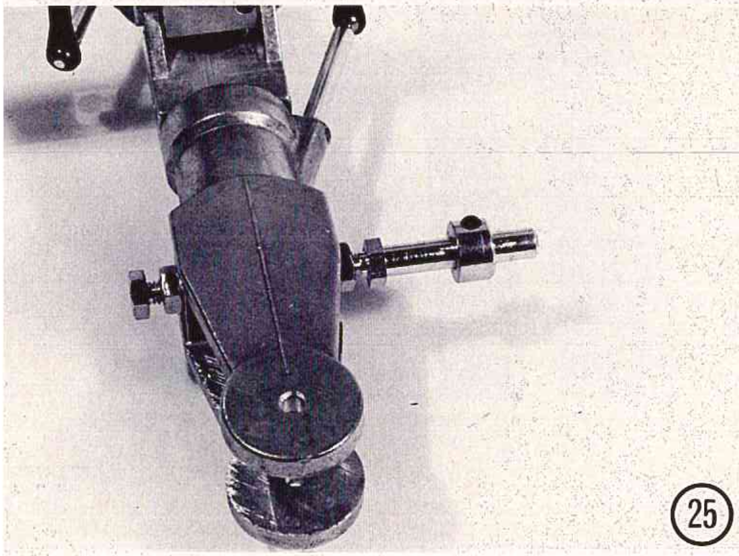
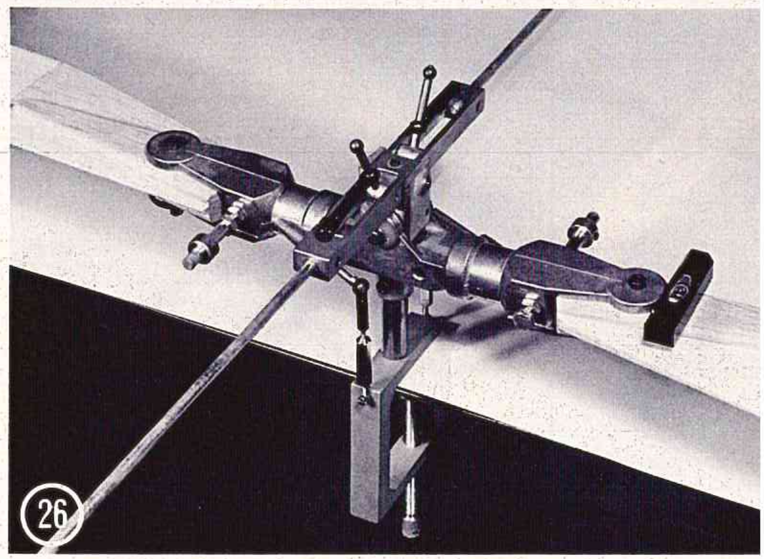
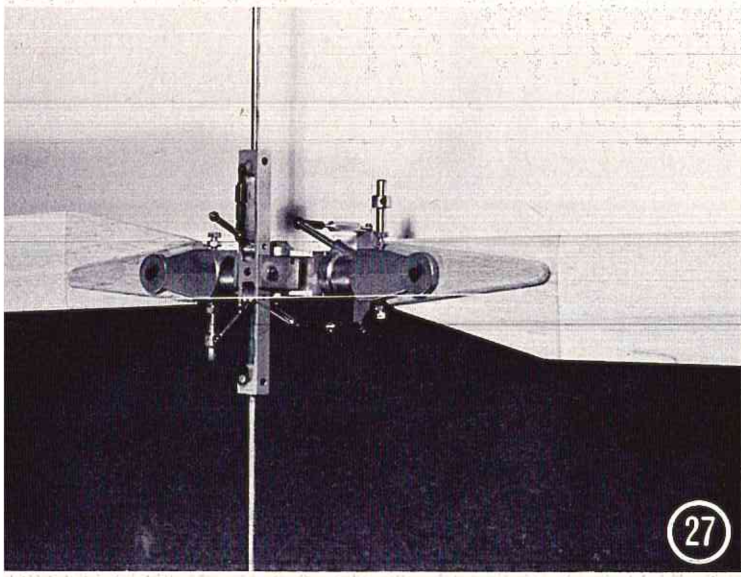
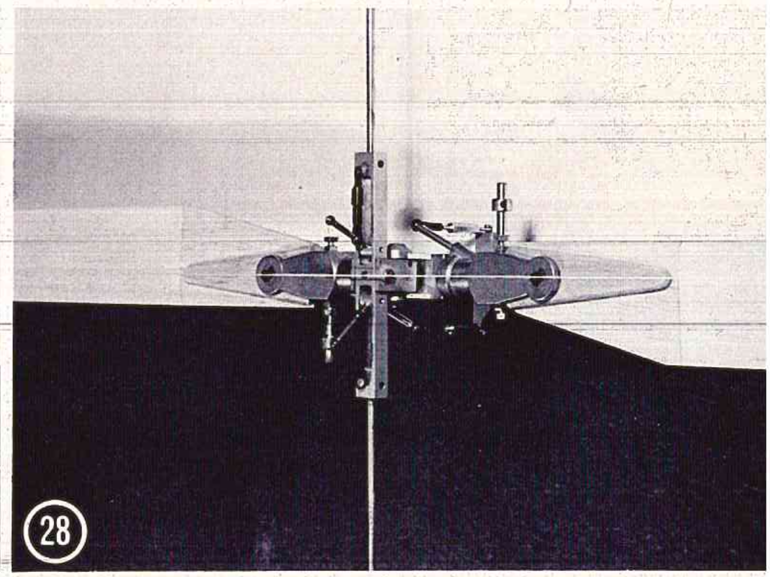
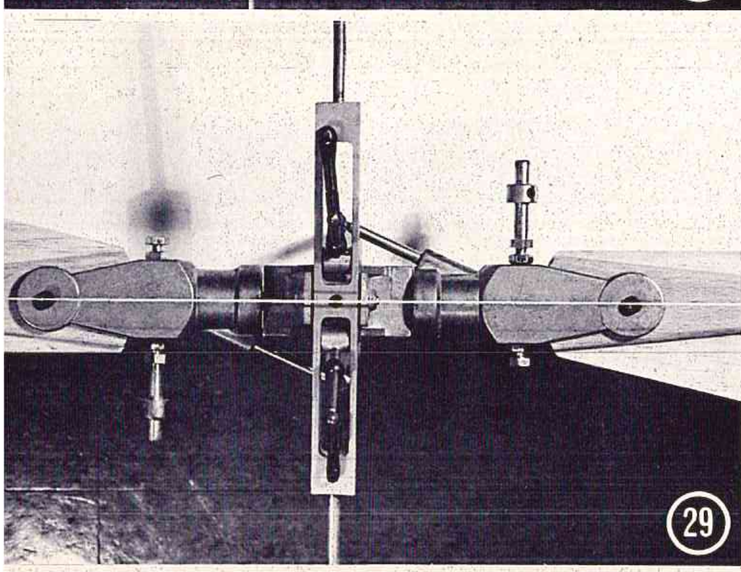
(25) Blade adjustment and balancing screws in blade holder. (26) Rotor head with blades installed is mounted on fixture furnished. Turnbuckles are used to level both blades. (27) Line, positioned 17mm from blade L.E. at tips, is stretched from tip to tip. Improper lead-lag angle causes line to be off-center as it crosses rotor head. (28) When lead-lag angle has been correctly set, by adjusting tongue screws, line passes directly over hub center and blade screw center. (29) Close-up of guide line with blades properly set. Note stud-collar counter balance on L.E. (30) Once lead-lag is set, the turnbuckles are disconnected and blades balanced along their length. Note stud-collar has been moved to T.E. and can be in either position as needed to balance.

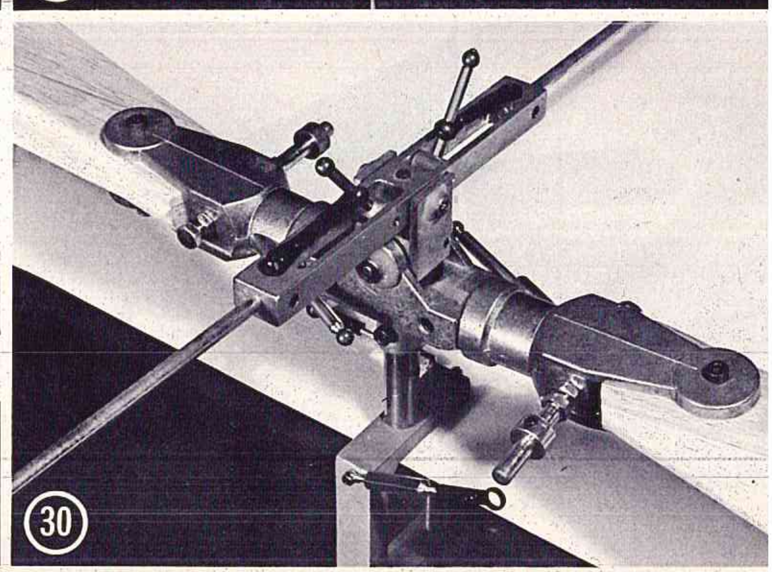




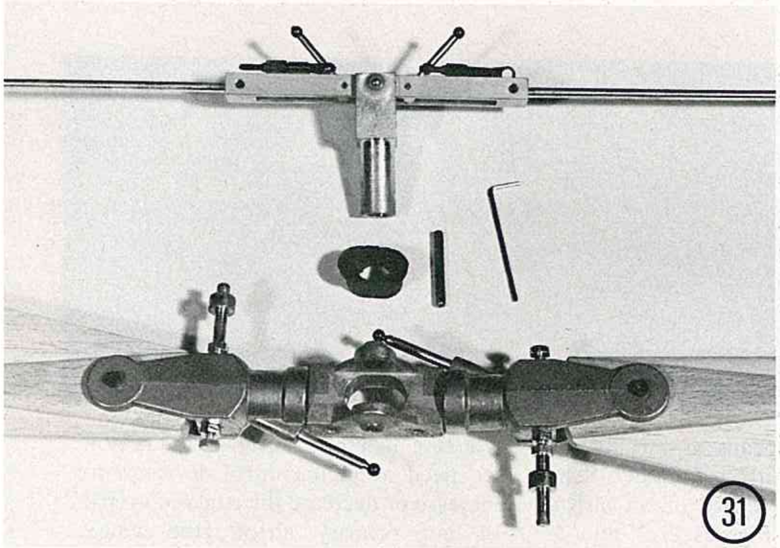








(31) After all balancing is complete, the see-saw pin is removed to allow insertion of rubber snubber. (32) Completed main rotor. (33) Servo tray with layout for Kraft KPS-14 servos with pivot bar and bellcranks. (34) Neutral cyclic and tail rotor servos. Throttle and collective pitch servos at low position. (35) Neutral cyclic and tail rotor servos — throttle and collective pitch servos at center of travel (high trim). (36) Neutral cyclic and tail rotor servos — throttle and collective pitch servos at maximum position.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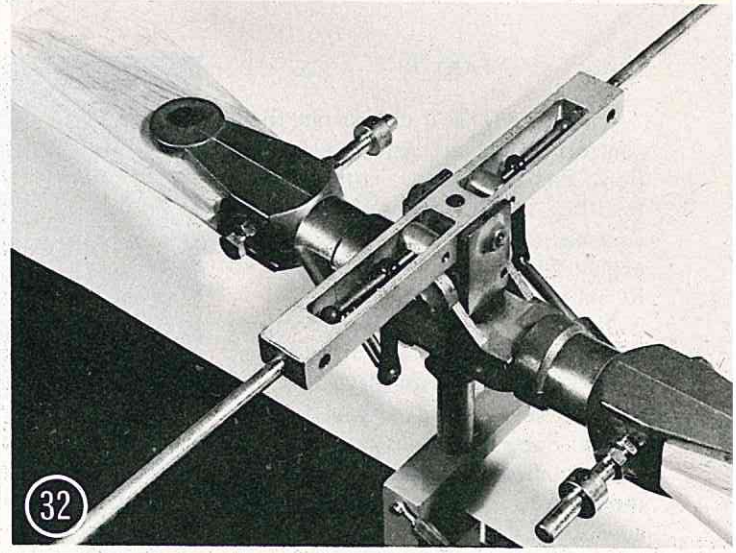
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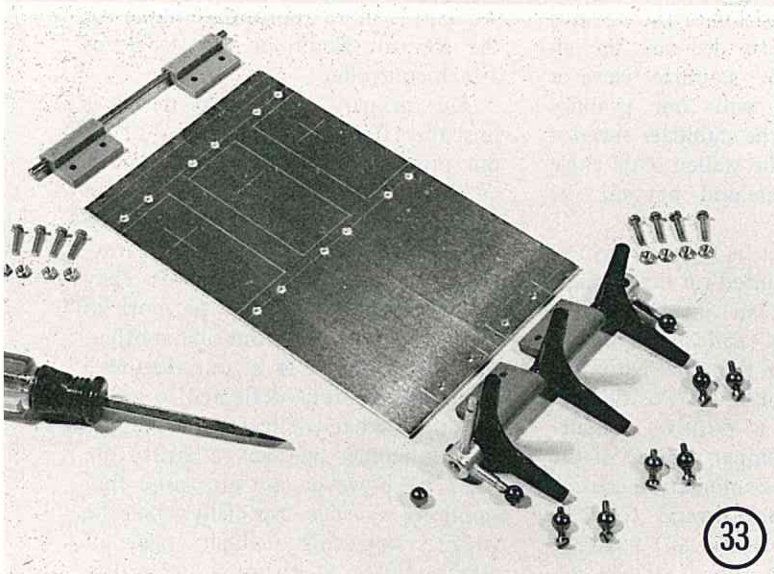
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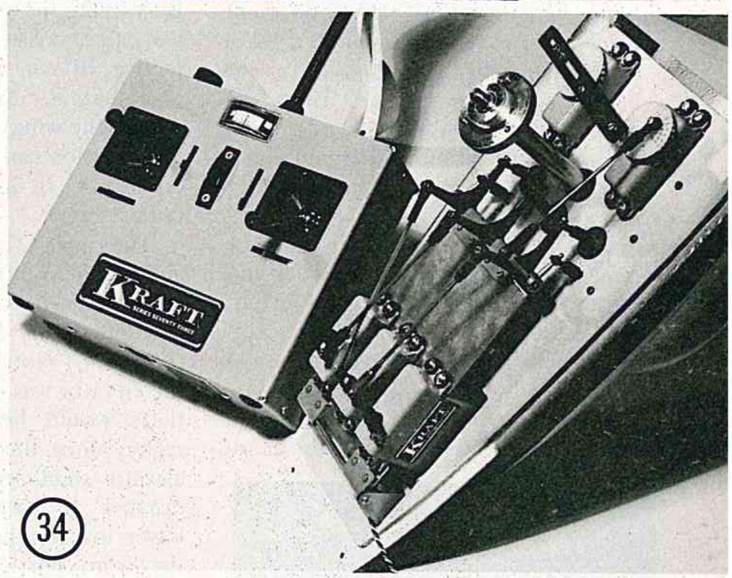

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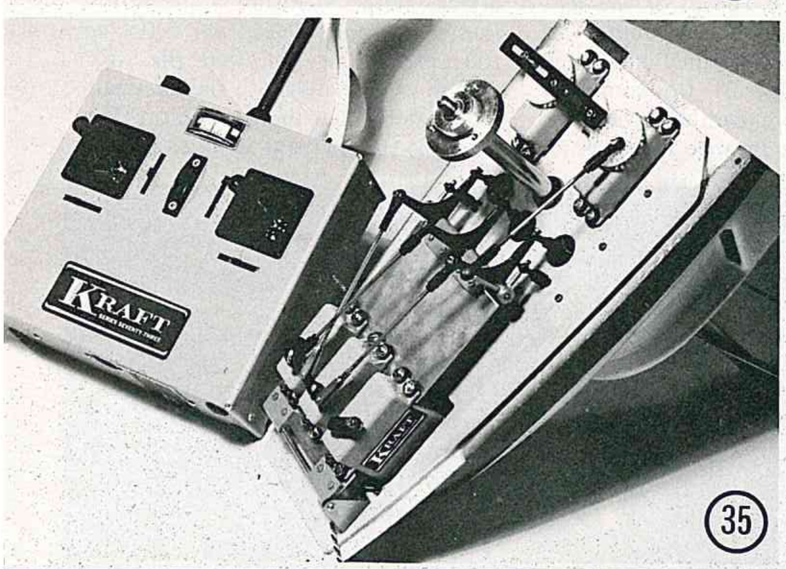

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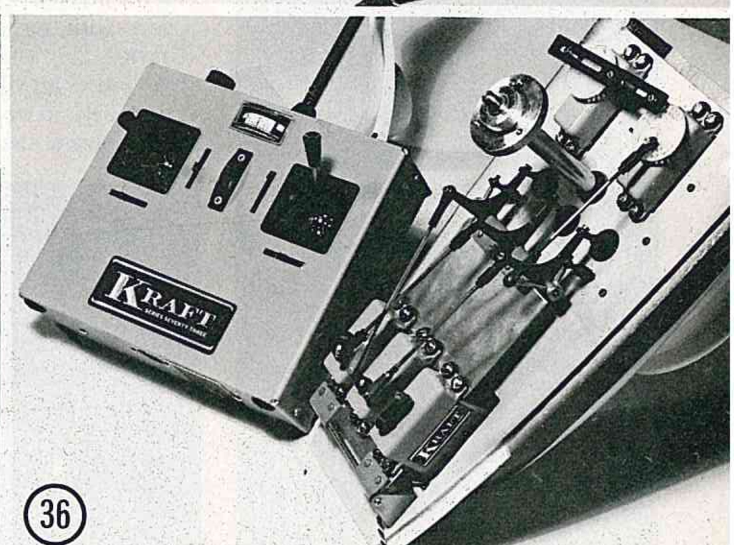

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PRACTICAL AERODYNAMICS

BY MIKE ILYIN

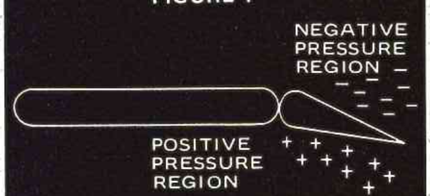
PART III

This month we'll discuss our flight controls. There are many misconceptions concerning the nomenclature, function, and idiosyncrasies of flight controls. This article will attempt to explain flight controls as they apply to RC pilots.

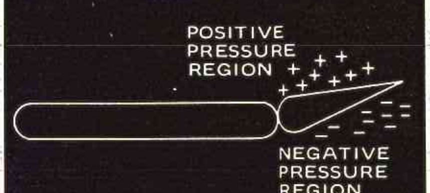
Basically there are only three **primary** flight controls. All airplanes have a pitch control device, a roll control device, and a yaw control device. Some examples are: elevator, pitch control; ailerons, roll control; rudder, yaw control. However, there are other devices that perform the same functions but have different names. For instance, for pitch control we have stabilators or canards; for roll control we have spoilers. There are combination controls such as ruddervators (combination rudder and elevator), elevons (combination elevator and ailerons), and flaperons (combination flaps and ailerons). It must be remembered that no matter what you call any of the **primary** flight controls, they cause either pitch, roll, or yaw.

Let's examine the most common pitch control device, the elevator. Actually when considered in conjunction with the horizontal stabilizer the elevator is merely a means of varying the camber of an airfoil (camber: The convexity of the curve of an airfoil from its chord). Figures 1, 2, and 3. By varying the position of the elevator we can increase or decrease the effective lift of the stabilizer/elevator combination. As with our primary airfoil (the wing) the stabilizer elevator combination can be stalled if its angle of attack is increased beyond the critical angle.

NEUTRAL
FIGURE 1



POSITIVE LIFT
FIGURE 2



NEGATIVE LIFT
FIGURE 3

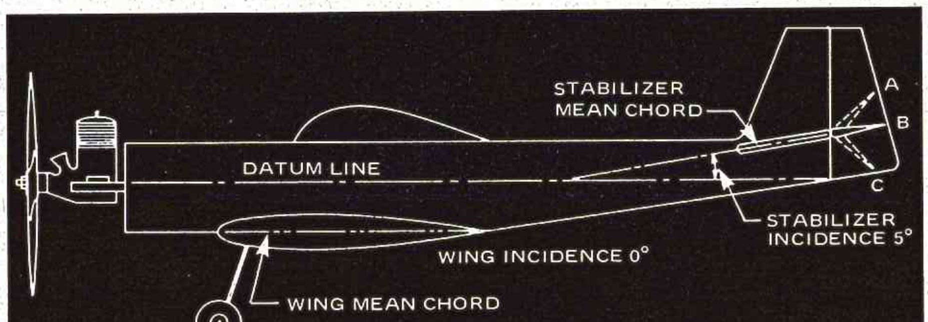


FIGURE 4

The angle that is formed by an airfoil that is mounted on the airplane with respect to an imaginary line (datum line) is called incidence. (Figure 4.) Notice that in Figure 4 if the elevator was raised to "Position A" there would be a positive pressure region along the upper surface of the elevator/stabilizer combination causing negative lift which would tend to lower the rear portion (tail) and raise the front portion (nose) of the airplane with respect to its Center of Gravity. This action is called increasing the **pitch attitude** of the airplane. Conversely if we move the elevator in the opposite direction we will cause a decrease in **pitch attitude.** The reason we need a pitch control device is to increase or decrease the angle of attack of our primary airfoil (the wing). Actually a more appropriate name for the elevator would be the "angle of attack controller."

Our primary roll control device is probably the least understood of all our primary flight controls. The most common roll control device is the aileron. The ailerons are hinged movable surfaces located on the trailing edges of the primary airfoil. They are interconnected so as to move in opposite directions from one another, but they operate as a unit. Figure 5 shows the ailerons deflected to give a left roll. When deflected in the opposite manner we get a right roll. Ailerons, however, are not quite that simple of a device, especially when the wing is operating at high angles of attack. Refer to Figure 6 and notice that, when the ailerons are deflected to cause a left roll, that the right aileron is deflected into the airstream much more than the left aileron. The result is an increase in drag on the

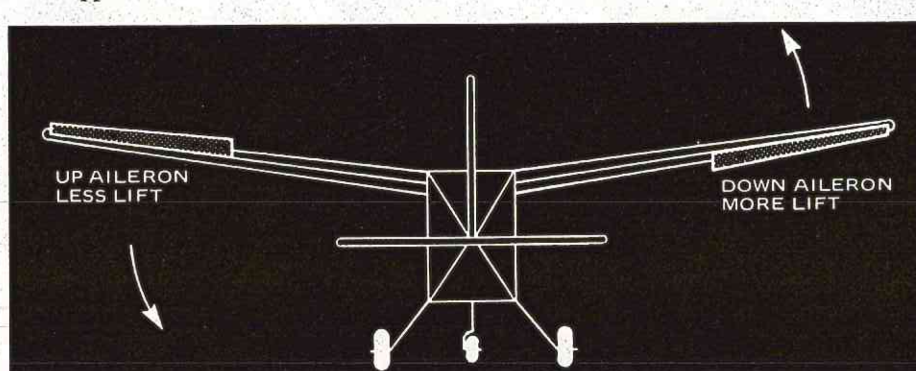


FIGURE 5

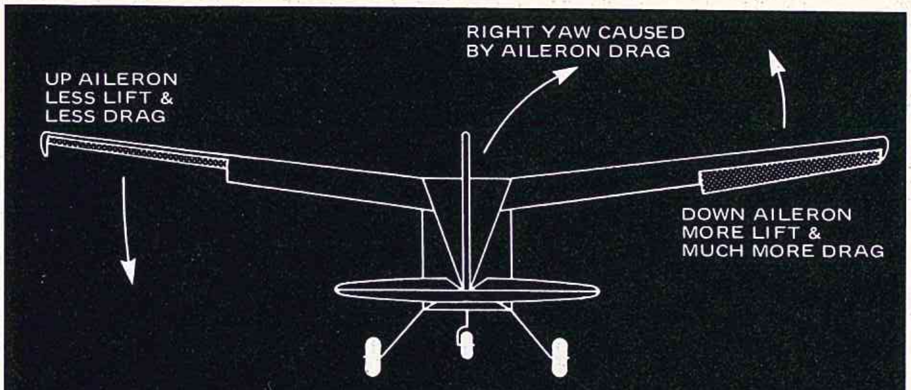


FIGURE 6

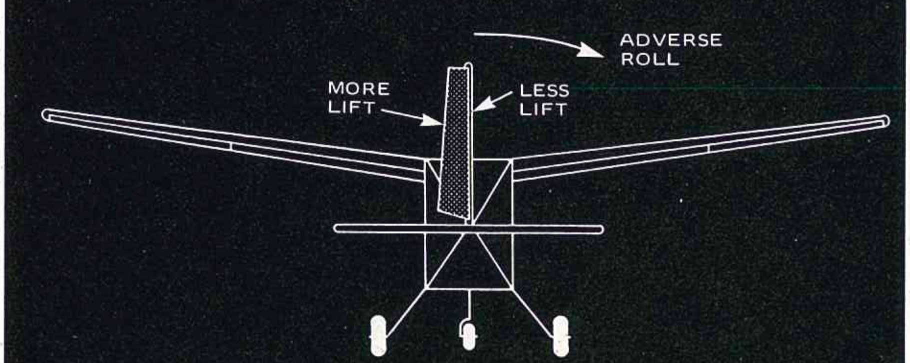


FIGURE 7

right wing causing a yawing movement to the right. The yaw is in the **opposite direction** of the applied aileron and is called adverse yaw. Ordinarily, ailerons have adverse yaw at all angles of attack except 0°. However, at high angles of attack, such as when flying slow or imposing large load factors on the airplane, adverse yaw is more pronounced. This phenomena is responsible for more mishaps with RC airplanes than any other. Usually the problem arises when the model is taking off or landing, but occasionally it happens in a steep turn. What happens is that a turn is commanded by the use of ailerons and, if the model is being flown at or near its stall angle of attack, a snap roll or spin results in the opposite direction of the applied aileron. Usually the model crashes and loud screams emit from the modeler about his "no good radio," because he tried to turn the model one way and it went the other. Adverse yaw can be compensated for by a device, that most modelers don't use during flight, called the rudder. The rudder's primary job, after all, is to develop or control yaw. So, naturally, it can be used to compensate for **adverse yaw.** At low angles of attack adverse yaw is negligible, but remember at high angles of attack adverse yaw can be an extremely important factor in maintaining control (or losing control) of your model. **Use the rudder to compensate for adverse yaw when flying at high angles of attack.** There are some design considerations you might remember when installing your ailerons that can be used to reduce adverse yaw. Use differential ailerons. (The down going aileron moves at a slower rate than the top up coming aileron.) Also Friesetype ailerons can be employed to reduce adverse yaw.

Since we mentioned yaw, let's discuss our primary yaw control device, the rudder. Like all our other flight controls, it is deflected into the airstream to control the airplane about an axis. In this case it is the vertical axis. Normally the rudder's function is to control adverse yaw, but it is also used during special non-coordinated maneuvers such as spins, snap rolls, skips, skids, knife edge flight point rolls, and stall turns. Applying left rudder causes a left yaw and vice versa. The rudder, like the aileron, has an adverse effect known as adverse roll. Adverse roll is more pronounced on tall rudders than short ones. Look at Figure 7 and notice that when deflected to the left, the rudder creates more lift on its left side than on its right side, causing a rolling movement to the right. Reducing this effect can be accomplished by lowering the rudder with respect to the datum line. Most pattern ships have a sub fin and tapered rudder to reduce the adverse roll tendency of the rudder.

Now, all of the single channel guys are ready to write letters about how you can cause roll (or a turn) with rudder only. Let's examine what really happens in a rudder only ship. Refer to Figure 8 and notice that when we cause a left yaw with the rudder the airplane yaws left causing the right wing to move forward and the left wing to move rearward with respect to the relative wing. This increases the airflow (and lift) on the right wing and decreases the airflow (and lift) on the left wing. The net result is a roll to the left. Any airplane can be yawed into a turn **if the rudder is properly located.** However, any one who has flown with ailerons knows that they are much more positive in controlling roll than the rudder.

There is a device which is a roll/yaw control, and it is gaining popularity on many full scale ships. This device is the spoiler. Spoilers operate by destroying (or spoiling) lift on the primary airfoil (wing). They also create more drag on

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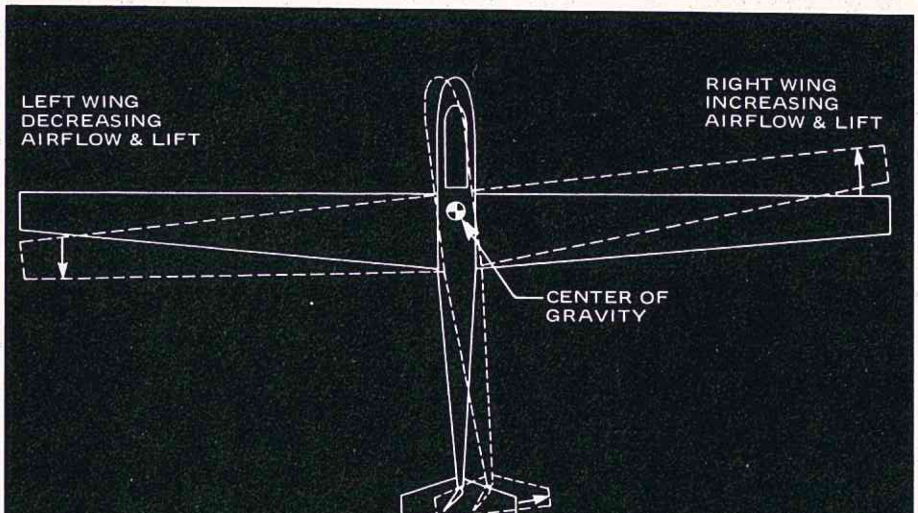
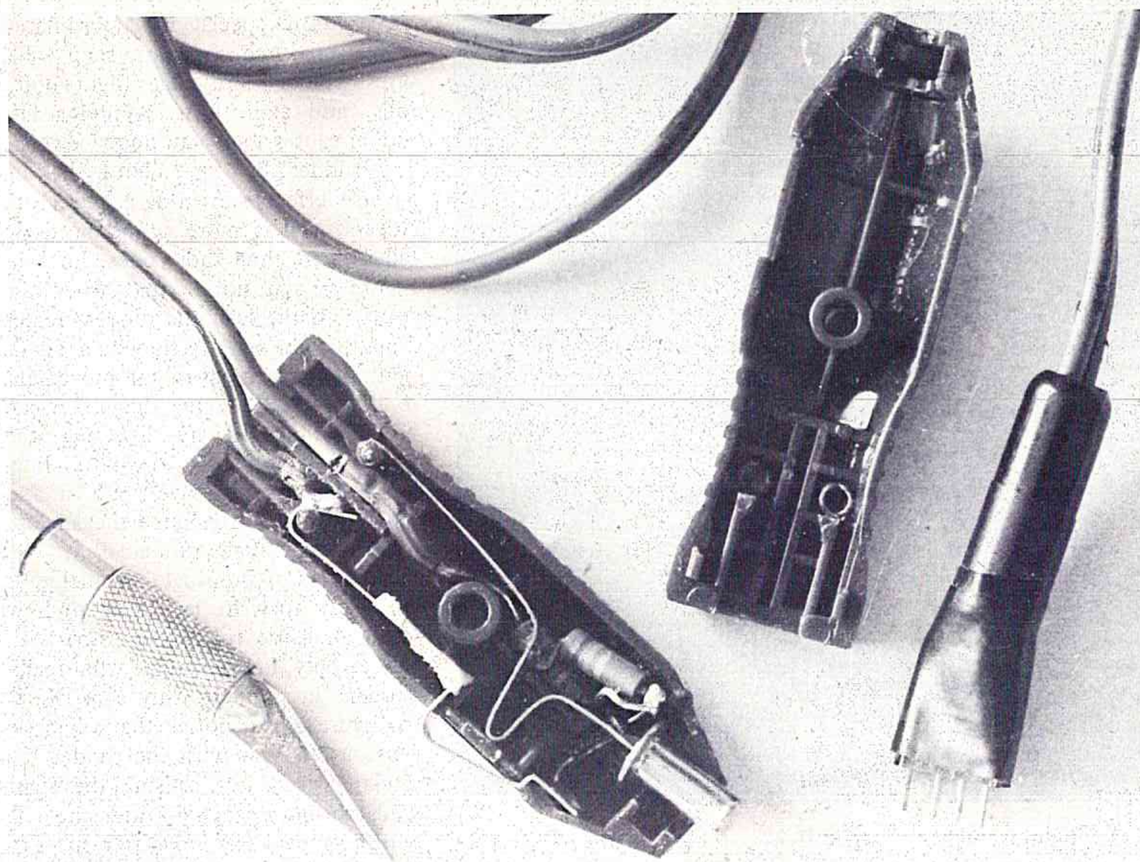


FIGURE 8



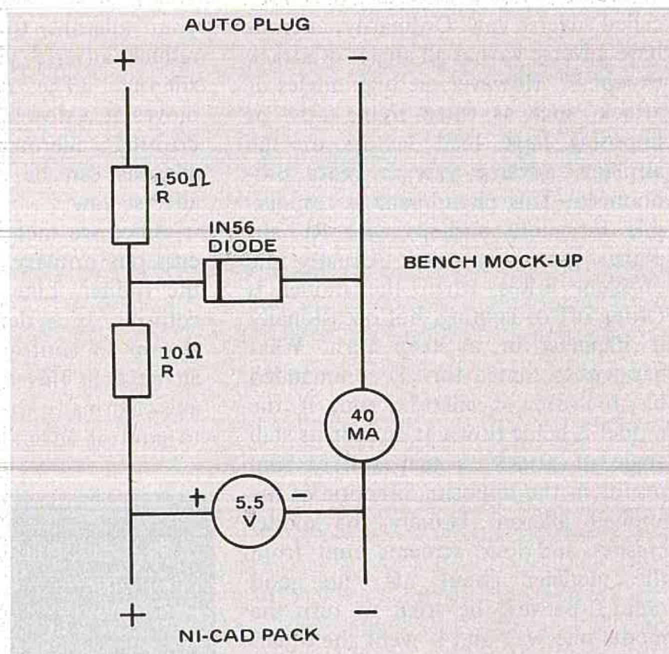
NICAD CHARGER FOR YOUR CAR

BY
MAJOR ED WESTWOOD

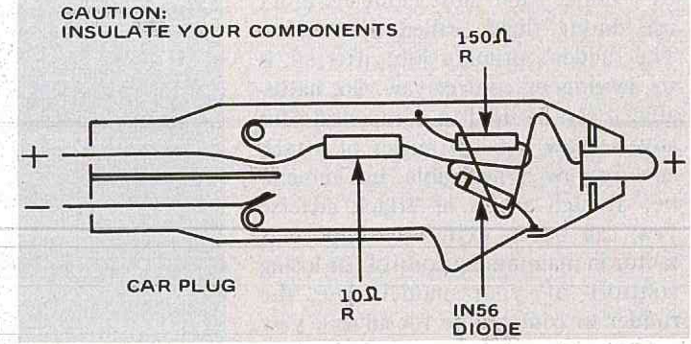
All you have to do is uncoil this little jewel, plug it into the 12 volt cigarette lighter receptacle in your car or camper, then plug in your 4.8 volt flight pack and watch the other guys wait for the smoke!

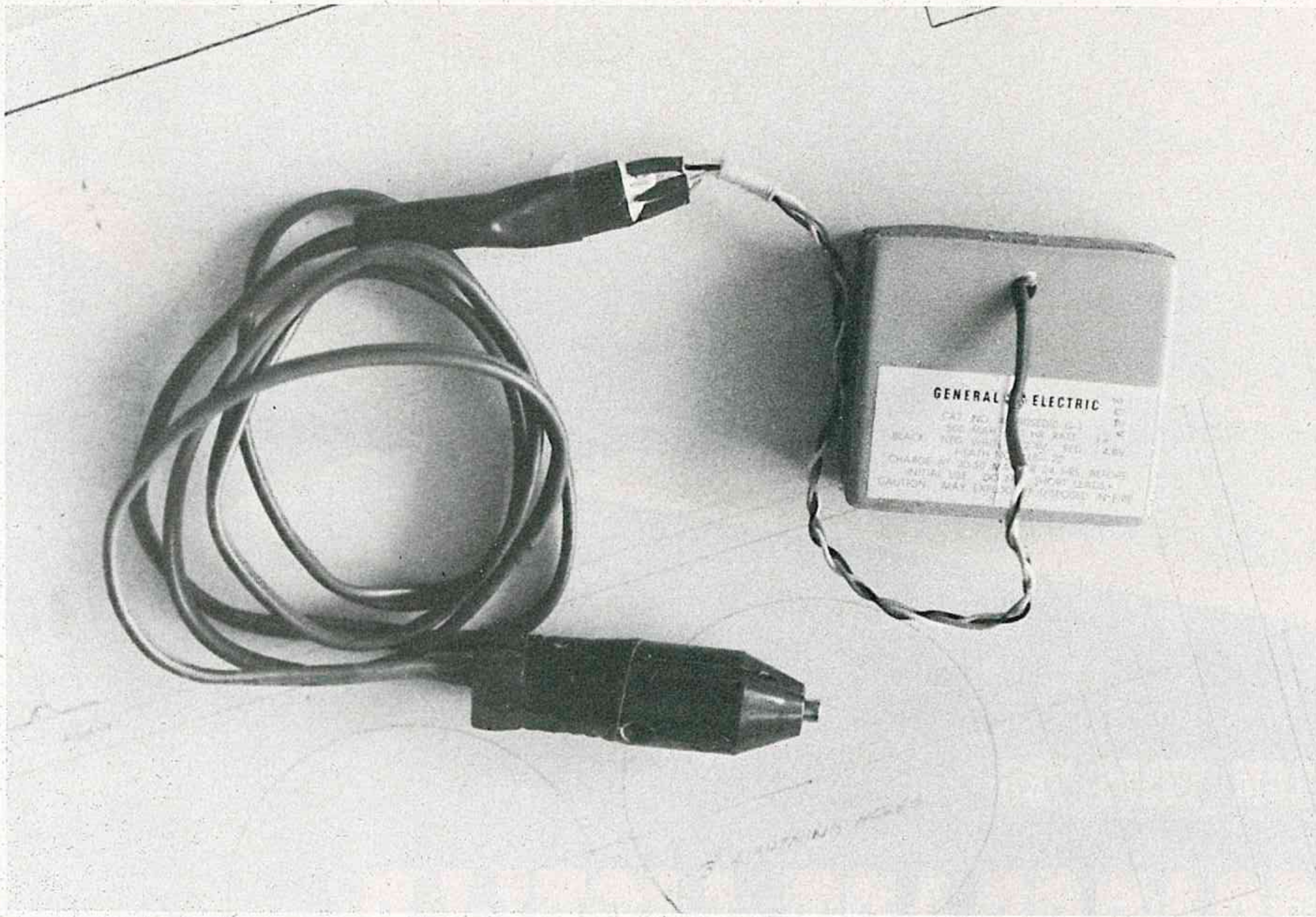
Impossible? Not so - - - as a matter of fact, for about $3.00 in parts you will have another charger that will give you 40 ma at the field or an additional charge capability at home. Here are the parts that are required: 1N56 or 1N751A diode (1) .95; 150 ohm, ½ watt resistor (1) .12; 10 ohm, ½ watt resistor (1) .12; 4 pin plug, Heath part 432-104 (1) .70; Cigarette lighter plug (1) .55; 4' of lamp cord (steal it from the bedroom lamp).

Once you have all the parts layed out on your workbench, mock the system up on the bench according to the circuit diagram with the meters attached. The charge current will be 40 mils and the voltage about 5.5V. Once you are satisfied that the system works as advertised, drill out the grommet in the car plug and open it up. With a little cursing you can solder the units inside the plug and, after making sure they are insulated well, tape it closed. Needless to say, watch your polarity. □

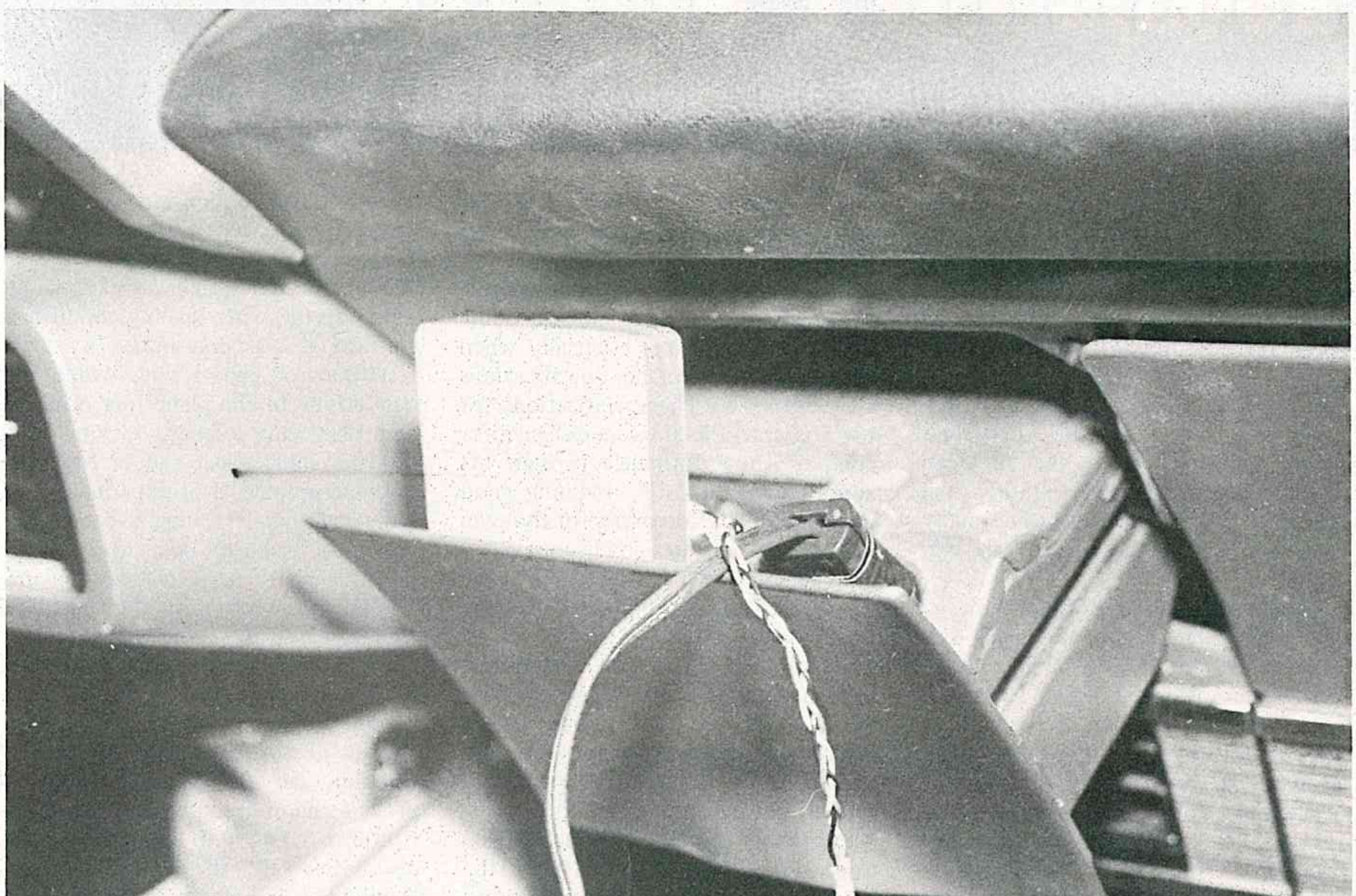


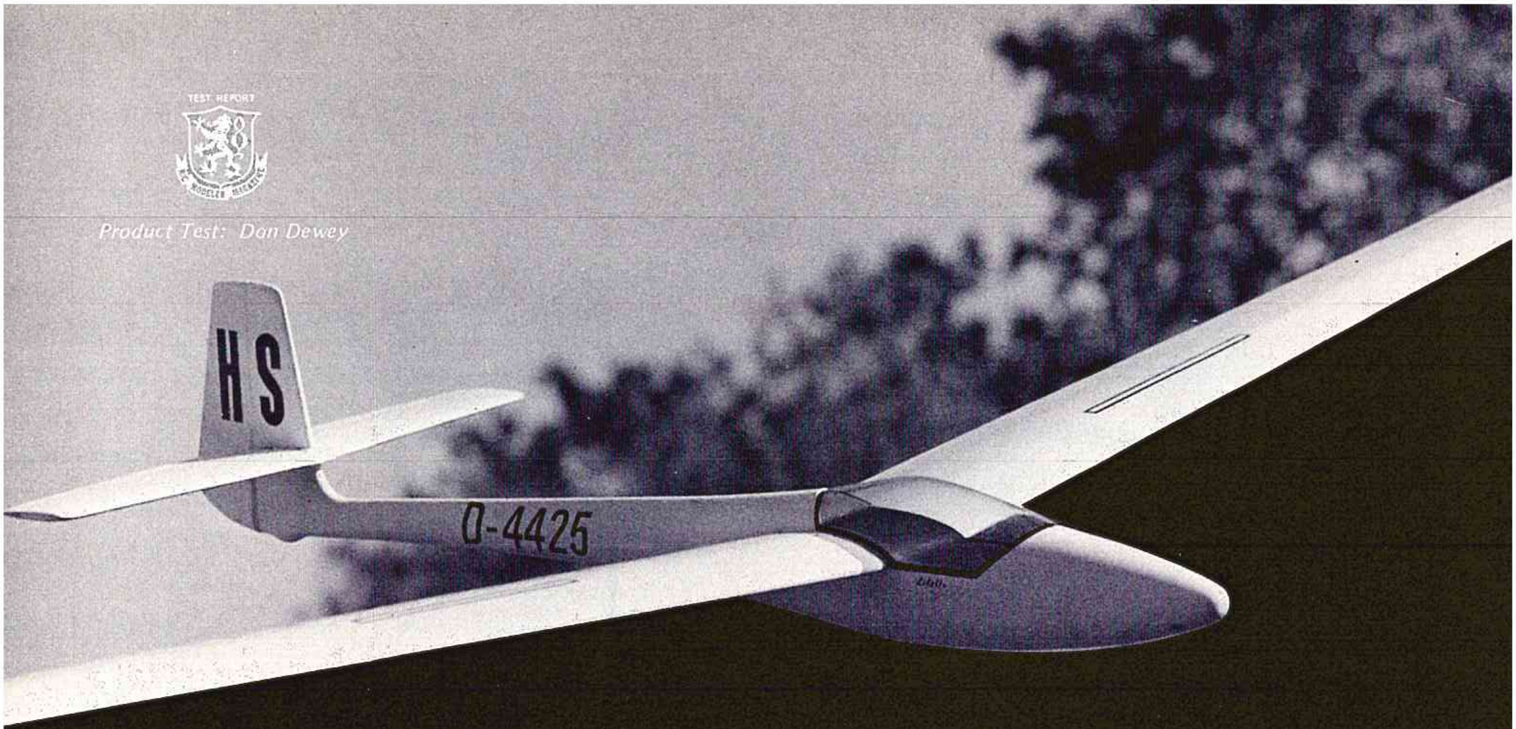
CAUTION:
INSULATE YOUR COMPONENTS





The completed charger shown above. Below, the unit plugged into the car dashboard.





Product Test: Don Dewey

RCM TESTS THE

SOARCRAFT LIBELLE

● The Libelle by Soarcraft, 12446 Palmtag Dr., Saratoga, California 95070, is one of the highest performance scale sailplanes we have flown to date. We say 'scale' because the Soarcraft kit of the Glasflugel Libelle is a 1/6 scale model of the famous full-sized sailplane. We say 'high performance,' because this particular model performs more like an Open Class competition sailplane rather than evidencing the characteristics normally associated with the average scale sailplane.

Hugh Stock, an officer in the League of Silent Flight, and noted R/C sailplane competitor, is the designer of the Soarcraft Libelle which features a wing area of 623 square inches with an aspect ratio of 20:1. The wing tapers from 7" at the root to 4" at the tip of each panel for a total wing span of 111.4". The wing utilizes an undercambered airfoil. The stab area is 12.5% of the total wing area and spans 22½". The overall fuselage length is 40.6" with a total height at the vertical fin of 8.5". Flying weight is 36 ounces.

According to Hugh Stock, designing a model sailplane can present some interesting problems, especially when the desired performance specifications are very strict. The specifications for the Soarcraft Libelle were designed for competitive performance in light lift conditions while still retaining good penetration characteristics for flying in high winds or slope conditions. However, the most demanding specification was to provide a wing length as short as practical.

The success of the Soarcraft Kestrel-19 and its many contest wins during 1972 and 1973 spurred design efforts on insofar as penetration and ability to fly in light lift were concerned; however, many of these characteristics of the Kestrel were realized using 11' plus wingspan. While the longer wingspans are a thing of beauty in the air, the length can become a problem as you prepare for close-to-the-ground maneuvers for spot landing. Considerable flight testing of the Soarcraft Kestrel was carried out with varying wing loading conditions. In fact, it was determined by these tests that too light a wing loading was deleterious to the planes performance and that wing loadings varying from 8½-10½ ounces per square foot was quite acceptable. This experience then indicated that less wing area and subsequently a shorter span may still be used for a high performance sailplane.

The configuration of the Glasflugel Libelle was ideally suited for scaling to the 1/6 scale range so the remaining problems then were with the total model weight in the air. The initial airfoil design was plotted mathematically as closely as possible to provide the desired performance specifications, but with the many uncertainties in the conversion of Reynolds Numbers, etc., this can only

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PLASTICS: SHOW AND TELL

PART EIGHT

BY RAY HANISCO

● You know how, when your favorite cook makes gravy, it is watery until she adds cornstarch or flour. This additive then thickens it into a smooth syrupy texture much unlike its original state. Or, how a mild steel takes on a very different quality when it is alloyed into a tough chisel steel or, perhaps, a hard, but brittle, water hardening tool steel that can be hardened glass hard. Well, if we investigate what occurs during these changes, we would find some are relatively simple, while some are extremely complex.

In this article, we will not cover the changes just mentioned, but we will just skim over the changes relative to the thermoplastics field.

When these are the case, the changes are complex if it involves the alloying of two or more thermoplastics, and relatively simple when the changes involve simply the addition of fillers.

As a case in point, let us look at the type 6 Nylon and see what we can do to change its characteristics, without getting into complex chemical changes.

Type 6 Nylon has a tensile strength of approximately 12,500 p.s.i. This means, it takes that many pounds to have a piece of Nylon 6, measuring one inch by one inch, to fail or break when it is pulled apart.

A common test for resistance to breakage from an impact is one called "Izod Impact Test." It is measured in points of impact resistance. A specimen is clamped into the jaws of a vice, and the extending cantilevered end is exposed to allow a swinging weight to impinge upon it. This tells us the amount of energy in "foot-pounds" required to break it. That's enough of the explanations, before I have some Lab Technician tear me apart for not giving some very technical explanation of the process.

The properties of Nylon 6 are pretty good, until we add something to make it much better. How about if we add glass? What's that? Glass breaks too easily? Got news for you, glass is tough. Especially a glass called 'E' glass. It is a glass that was designed for electrical applications, such as stand-offs used in high voltage applications. It is made into fibers that measure about one quarter of an inch in length, and are .002" to .007" in diameter. The human hair usually measures about that diameter. The glass is of the type called "Borosilicate." It is the same type as used in glass oven dishes, glass percolator bowls, and that kind of stuff. You probably know of it as "Pyrex." It has the ability to withstand "Thermal Shock," and is extremely strong.

Now, let's mix 20% of this glass (by volume) with the Nylon 6 while the nylon is in its molten state, and injection mold it into a part. Look at the change:

Tensile Strength, p.s.i.	Nylon 6	Nylon 6 plus Glass
Izod Impact Strength	12,500	31,000
Heat Deflection Temp. @	1.2	3.0
264 p.s.i.	140° F	280° F.

From the chart, we can see the dramatic increase in strength that has occurred by this simple mixing process.

Nylon has other properties that we can use to great advantage. It has a low coefficient of friction, (it is slippery). That is why it is used for bearings. The bearing applications are only of the low speed type, because of the low softening point of the plastic, but there are many places this type of bearing can be used.

The coefficient of friction can be enhanced by mixing Molybdenum Disulfide (MOLY) with the nylon, in the same basic manner that we mixed the glass. With this mixture, the Moly acts as a solid lubricant, and reduces the coefficient of friction many fold. This type of filling to obtain different characteristics of a basic material is of a simple nature, due to the fact that the thermoplastic is used as a binder to hold a stronger material in place, or a binder for a material of a lower coefficient of friction.

If we desire the engineering properties of Polycarbonates, such as very high impact strength, dimensional stability, good chemical resistance, and will give up a bit on the continuous use temperature, or maybe forget about the self-extinguishing properties, we can save some money in the processing of parts. The way we do this is to alloy the Polycarbonate with Styrene, or Acrylonitrile Butadiene Styrene. This however, is a more complex change than just mixing glass or Moly. A chemical change occurs and alters the material itself.

These mixtures are called "Copolymers."

As an example of other copolymers, we can find no less than six different types of Fluropolymers for various high heat, bearing, or electrical characteristics. We know one of these Fluropolymers under the trade name of "Teflon."

Teflon is used for its ability to withstand high temperature. Therefore, it is used on frying pans and pots. It is so slippery foods do not stick to it and we find this material on some of the soleplates of irons. It prevents the starches used in clothes from sticking and causing a drag while ironing. If you want a happier wife, make her life easier by buying her an iron with a Teflon coated soleplate, or better still, do the ironing for her!

The use of plastics has grown to such an extent, it is expected that, within the next two years, production quantities will surpass that of steel. Let's face it. Plastics are here to stay, and in their place, they can't be beaten.

With copolymerization, alloying, cross-linking, the use of fillers, and the great strides the research chemists are making in thermoplastics, these years may be referred to as the "Plastic Age."

In order to cover the vast number of alloys, and fillers now available, Don Dewey would have to add a supplement to R/C Modeler containing at least 100 pages, and you guys would be sick of reading.

We have now barely grazed the surface of the world of thermoplastics, and we certainly hope that these elementary articles have been of some help to you.

I do believe some of you have learned a bit more about thermoplastics than you knew before, and will not be afraid to tackle a repair job

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RATTLE - PROOF PUSHROD EXITS

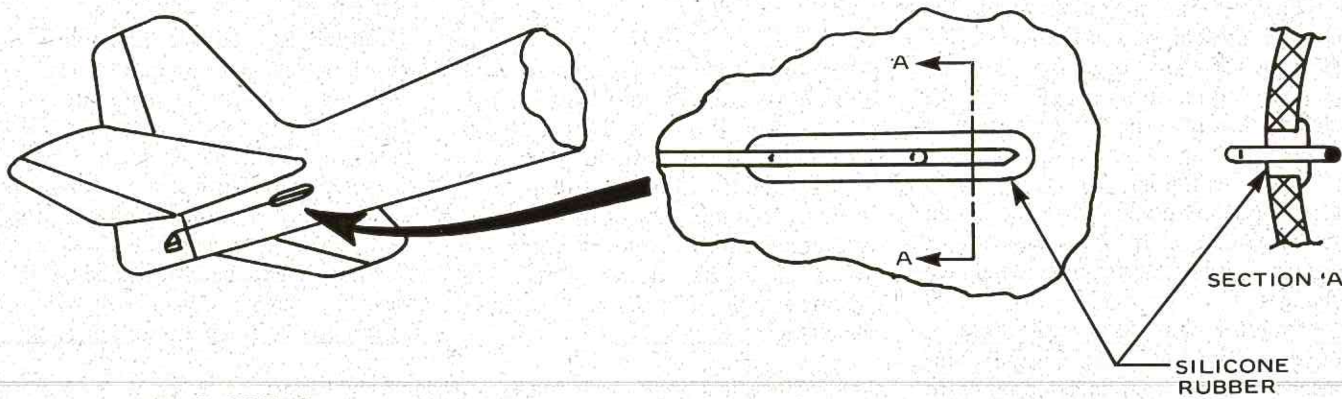
BY BOB MAYHEW

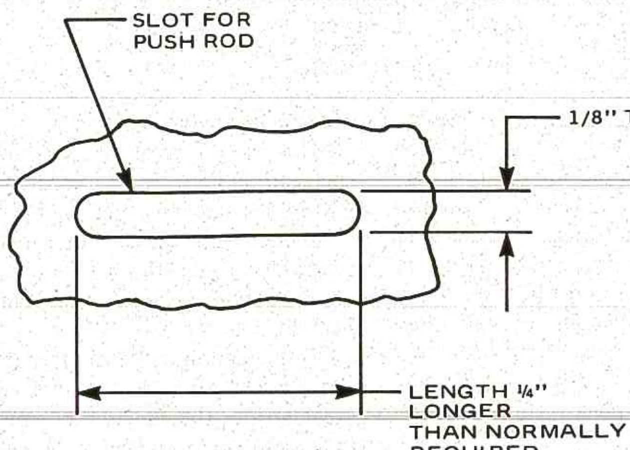
REPRINTED FROM THE INDIAN CITY RC CLUB 'TOM TOM'

The rattle of a pushrod wire at the fuselage outlet hole certainly detracts from the appeal of any radio control model. A proven method to eliminate the rattle is to insulate the hole with silicone rubber. This can be done during the building stage or after the model is completed, as you desire. A good brand to use is Dow Corning Silicone Rubber. The latter comes in clear, white, black, and silver.

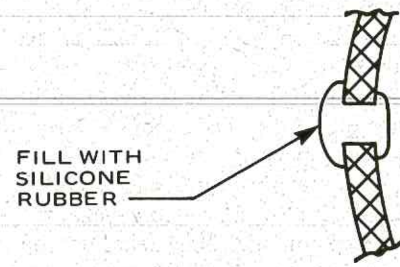
Enlarge the pushrod hole as shown in the sketch. Fill the hole with silicone rubber and let it dry properly. Trim off any rubber which extends above the outside surface of the fuselage. Use a sharp, small blade to cut the opening for the pushrod wire. Install the pushrod and add a drop of oil for smooth operation.

This method will stop the rattle, but the vibration, which caused the rattle, may be the fault of an unbalanced propeller. Always use balanced props on your R/C ships.

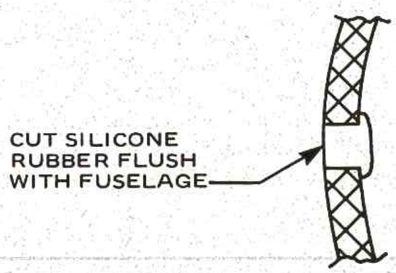




STEP 1



STEP 2



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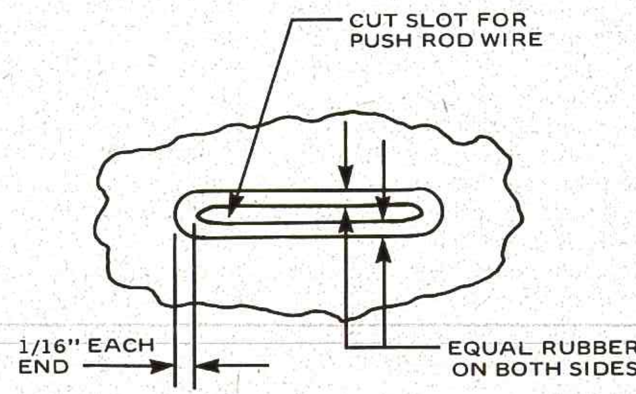

STEP 4

BASIC SAILPLANE DESIGN

BY PRESTON ESTEP JR.

PART VII: HANDLING QUALITIES

Well, gentle reader, if you have stuck with me this long you may not have learned anything, but you have been rewarded by a truly wonderful typographical error. I refer to the July issue, which contained a table captioned, "Airfoil Near C_L Max.," that is, near maximum Coefficient of Lift. At least, that was supposed to be the caption. As you can see by digging into your neatly filed old RCM's, the caption came out "Airfoil Near Climax."

Now I knew that Dewey wanted to be the Standoff-Scale version of Hugh Hefner, but this boggles the mind. Picture, if you will, the aerodynamic conditions which must surround such an event. I tried it on my computer, and short circuited two IC's. I am thinking of scrapping my regular feature and replacing it with juicy items like "Advice to the Lonely Hi-Start." (Answer: Look around for an attractive winch.) – T.E.

We have so far touched on only one of the major determinants of "fly-ability" – the speed range. As we have seen, the term "speed range" is used to mean the ability of a sailplane to maintain a decent L/D ratio when a lot of down trim is cranked in, and also to fly slowly enough to be able to turn in a small thermal. This is brought about not so much by using Eppler airfoils, but by minimizing parasitic drag and keeping aspect ratios moderate (so that the induced drag change with C_L change will be large, thus maintaining a more constant sink rate as down trim is added).

Let's talk about turning radius and thermalling ability, and some implications of launch height, thermal size, etc. First of all, the radius of turn is dependent on angle of bank and speed; it is

$$\gamma = \frac{V^2}{g \text{ turn } \emptyset}$$

where γ is radius of turn in feet, V = forward speed in feet/second, $\emptyset$ is angle of bank, and g = acceleration of gravity, 32 feet/sec.^{2}. Thus a slow-flying ship will turn inside a fast one for a given angle of bank; or the faster ship, to put it another way, must bank more steeply to turn as tightly as the slow one. Now steeper bank means faster sink, for two reasons. First, the lift is not all going straight up, so it is reduced by the vector resultant of the bank angle. Second, if up elevator is used to tighten the turn, the C_L rises, thus increasing induced drag. A plot of rate of sink versus forward speed at various angles of bank is shown in Figure I.

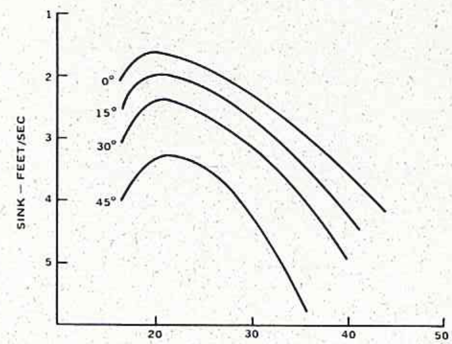

FIGURE I

Now, as you can see, it is a good idea to keep the angle of bank below 30°, and to fly as slowly as possible, when circling in lift. If you circle too tightly, you may stay in the lift, but it won't be strong enough to keep you up. The relationship of angle of bank to turning radius for various speed is in Figure II.

Note that the small, slow-flying planes can stay in a thermal which is only slightly more than half as wide as is required to accomodate a faster-flying, possibly more efficient, machine. Thus, we come to a critical point:

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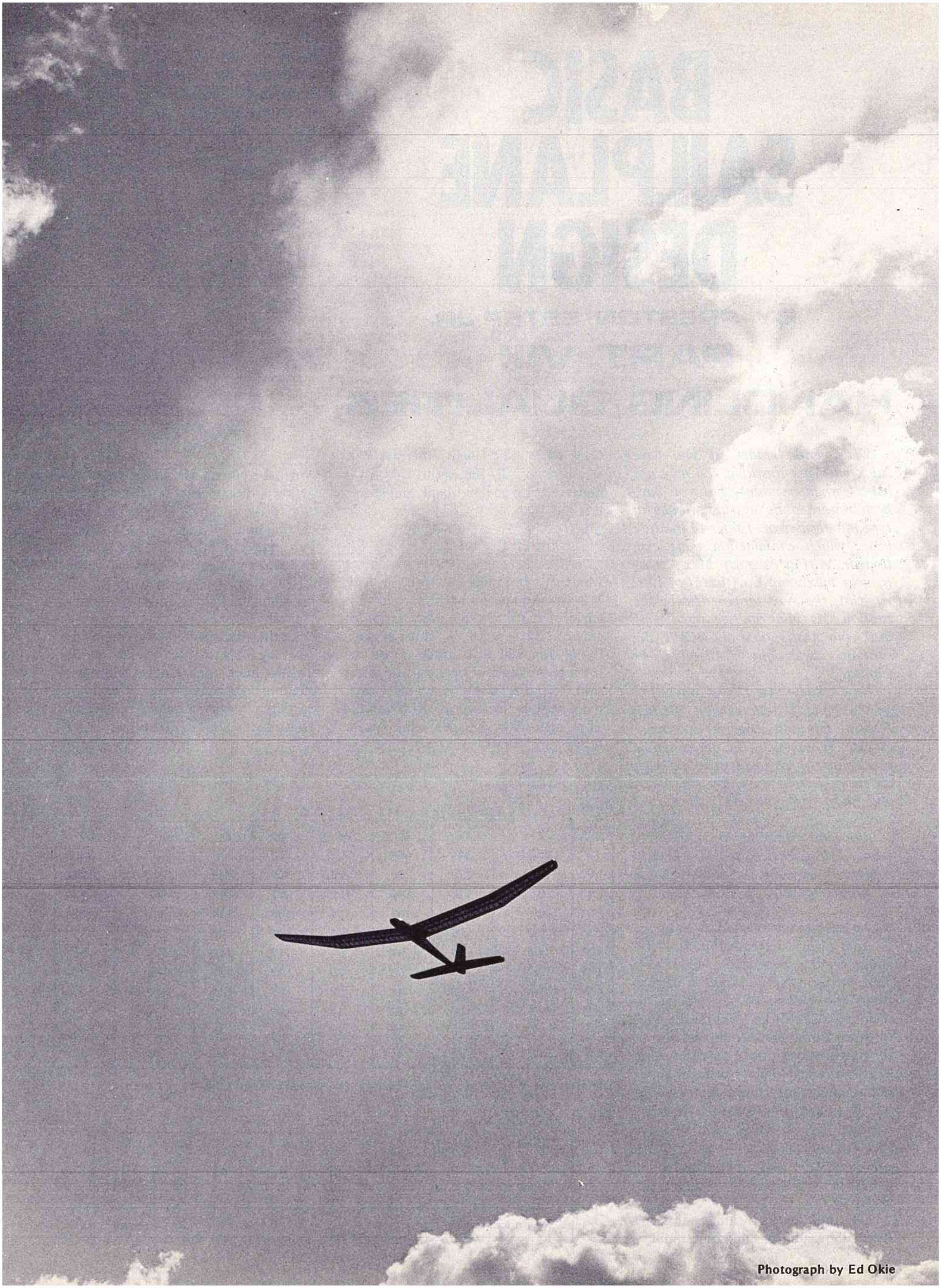
FIGURE II

Angle of Bank	SPEED IN FT./SEC. 20	22	25	28	33	37	45	60
5°	284 ft.	344	444	557	773	972	1438	2556
10°	141	170	220	276	384	483	713	1268
15°	93	112	145	182	252	317	469	834
20°	68	83	107	134	186	234	345	614
25°	53	65	83	104	145	182	270	480
30°	43	52	67	84	117	147	218	387
35°	35	43	55	70	97	121	180	319
40°	30	36	46	58	81	101	150	266
45°	25	30	39	49	68	85	126	223
50°	21	25	33	41	57	71	106	188
55°	17	21	27	34	47	60	88	157

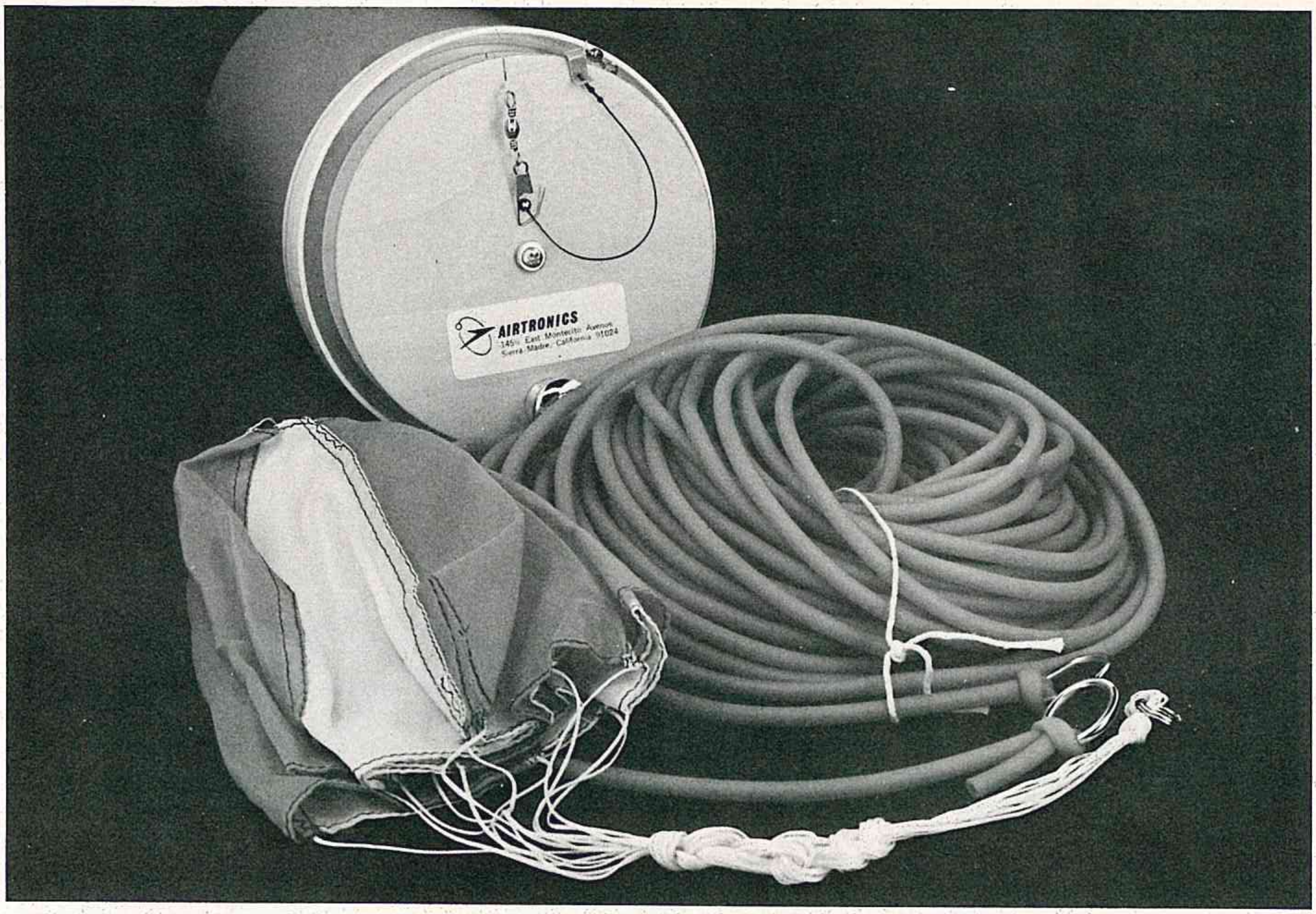
Diameter of circle in ft. vs forward speed in ft./sec. and angle of bank

FIGURE III

Diameter of Turn (ft.)	60	81	84	107	185
Angle of bank (°)	55	40	30	20	10
Speed (ft./sec.)	37	33	28	25	23
Time to make 360° (sec.)	7	8	10	14	28
Height lost in 360° (ft.)	27	24	25	27	40



Photograph by Ed Okie



One of several commercial Hi-Starts currently available. This unit consists of surgical tubing, monofilament line on a storage reel, parachute, and all necessary hardware.

HOW TO SET UP AND USE THE HI START

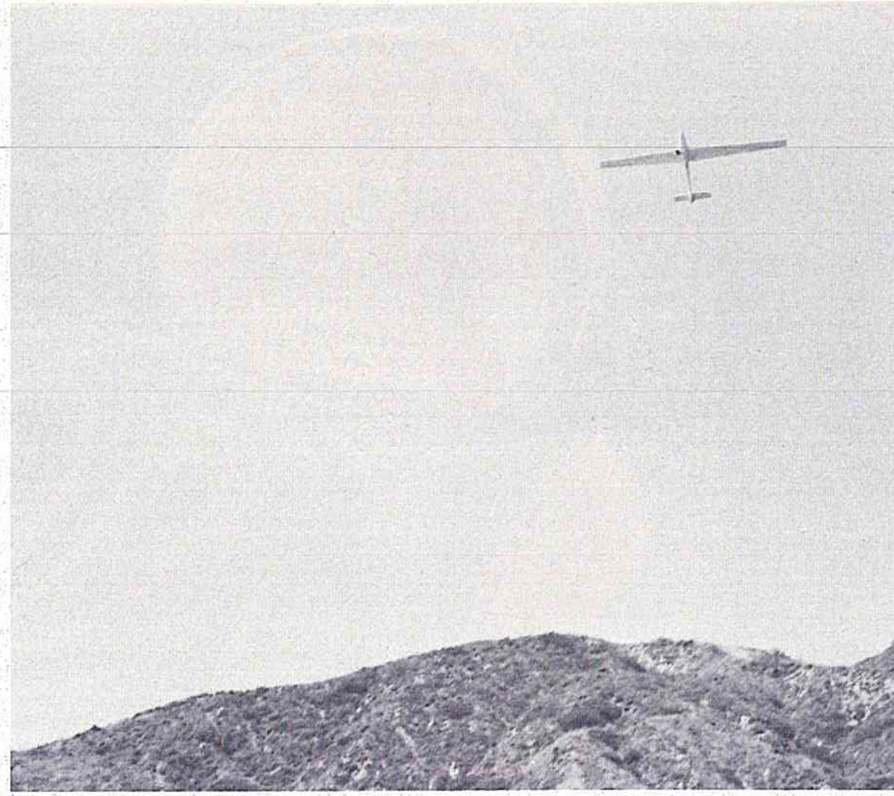
BY LEE RENAUD

THE VERSATILE HI-START IS THE FINEST SAILPLANE LAUNCHING SYSTEM AVAILABLE TO THE SOARING ENTHUSIAST AND IS RAPIDLY REPLACING THE CUMBERSOME AND TROUBLE-PLAGUED ELECTRIC WINCH IN CONTESTS ACROSS THE COUNTRY. HERE'S A COMPREHENSIVE HOW-TO FOR USING YOUR OWN HI-START.

INTRODUCTION

Of the several methods available for launching R/C Sailplanes, none offer the convenience and ease of operation of the Hi-Start. This method can be used by the flier without assistance; is lightweight and readily portable; avoids the noise and mess of power assists; and most important, is suitable for the novice. In addition, it will handle a wide range of model sizes and weights by merely varying the amount of stretch prior to release.

The Hi-Start consists of a length of elastomeric material (rubber) that provides the energy to launch the sailplane; a towline to provide additional altitude; a drag to help release the line at maximum altitude; a stake to secure the end of the elastomer, plus various rings and snaps to tie it all together. In use, the stake is secured firmly to the ground, and the opposite end of the towline is attached to a towhook on the model. The rubber is then stretched by walking away from the stake, then the model is released. The stretched rubber pulls the line and model into the air. It's like flying a kite with a big rubber band replacing the running start used to launch the kite. Properly used, a Hi-Start will launch the model several hundred feet into the air, providing sufficient altitude for good thermal flying. It is worth mentioning that this is not a new idea – Hi-Starts were used to launch free-flight gliders back in the 1930's!



A Soarcraft Libelle goes up on the Hi-Start during an RCM soaring session. The sailplane should start a steep climb almost immediately, and is constant, gaining altitude all the time.

GENERAL

The heart of any Hi-Start is the rubber used to provide launch energy. For R/C sailplanes in the 1 – 5 pound weight range there are three commonly used materials: 1) Strip rubber such as that used to power free-flight rubber models, cut up old inner tubes, etc.; 2) Bungee or shock cord, which has a braided cloth jacket over multiple strands of rubber and is available in many sizes; 3) Surgical tubing which is extruded natural rubber with no jacket. Each has its advantages and disadvantages but for all-around purposes we feel that surgical tubing offers the best choice for most modelers. The most important advantage is that it provides a smooth controlled release of energy which does not strain the wings of the model. The energy release is fairly constant throughout the launch and provides plenty of pull near maximum altitudes. The tubing included with our Hi-Starts is of the highest quality and is one continuous piece so that there are no knots to snag on the ground. Two sizes are available, tailored to different weight sailplanes.

We have found that a parachute provides a good means of drag to help release the model with a plus feature. The chute will carry the line and rubber back downwind, eliminating line snarling and reducing the amount of walking back to retreive the line for the next launch. The chute included is of the highest quality with multiple panels and nylon shroud lines designed for Hi-Start usage.

These and all other elements have been chosen for strength and durability. We have been flying with these Hi-Starts for over two years with literally thousands of launches on a single unit. With minimal care this unit should provide several seasons of flying for the average modeler.

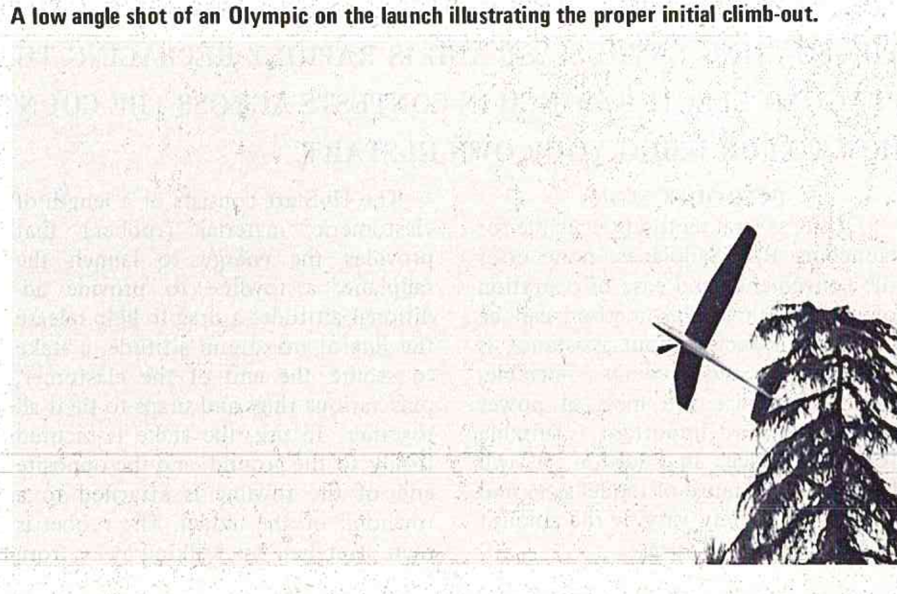
We have proven that 500 feet of altitude is adequate height for good thermal activity. This requires a clear ground space 700-800 feet in length parallel to the prevailing winds at the launch site. This space is available in many large athletic fields and similar locations even in densely populated areas. If necessary, the tubing and line can be shortened to fit more restricted areas, with a corresponding decrease in launch altitude. Try to select a site which is fairly level and free of brush to minimize snagging problems. The side of a secondary road or large parking lot may suffice, if a suitable field is not available – just be careful of traffic when launching and flying, if you use such a site.

WHAT SIZE TUBING?

The Standard Launch Tubing is suitable for most models up to 110 inch span and 3 pound flying weight, in all weather conditions. These include the Airtronics Mini-Olympic, Questor, and Olympic, plus the Mailbu and Monterey, Windward, and Windfree, Dandy and Amigo, and most similar sailplanes. It will launch a Graupner Cirrus if a slight breeze is blowing, but not in dead calm conditions.

The Heavy Duty Tubing is suitable for larger and heavier models up to 5 pounds flying weight. These include the Grand and Super Esprit, Graupner Cumulus, and other similar models. This tubing can also be safely used with smaller models by observing care

A low angle shot of an Olympic on the launch illustrating the proper initial climb-out.



not to stretch back as far while launching.

If you are uncertain which is most suitable, we suggest that you try the Standard size, unless you are experienced in launching via Hi-Start.

SETTING UP

Start settting up at the extreme downwind edge of your flying site. Insert the stake point through one of the large metal rings on the tubing and drive the stake into the ground at least six inches. The upper end of the stake should slant downwind at a 45° angle away from the launch area. Be sure the stake is secure! Tug hard on the tubing and if the stake moves drive it in further, or move to another spot. Walk toward the launch point letting the tubing play out evenly without knots or snarls. When the tubing is fully laid out on the ground, connect the snap on the outer end of the towline reel to the ring on the tubing. Continue walking toward the launch point unreeling the line as you go. Hold the reel in one hand and use the fingers of the other hand to brake the line while unreeling. When you reach the end of the line remove from the reel and attach the free clip to the ring on the bottom end of the parachute. You are now ready to stretch the rubber and launch.

DETERMINING STRETCH

The tubing should be stretched 200 to 250 feet MORE than its relaxed length in most cases, i.e., 300 to 350 total rubber length at launch. This corresponds to 80 to 100 paces for a person of average height and stride. However, several factors should be considered in deciding how much to stretch the rubber. If you are flying a sailplane of 90-100 inch span weighing 2-3 pounds such as an Olympic with Standard size tubing, try your first launch with 200-225 feet of stretch. For smaller sailplanes, such as the Mini-Olympic or Questor, use 175-200 feet and for larger or heavier models use 225-250 feet. These lengths are suitable for winds from calm to 5 mph. For stronger winds reduce the stretch approximately 1% for each additional mph of wind velocity. If launching an Olympic or similar sailplane with Heavy Duty tubing, use 175-200 feet for the first launches. For the Grand Esprit or similar sailplane, use 200-225 feet. Adjust for increase wind velocity as for the Standard tubing.

These distances are guidelines only. The important thing is to stretch the rubber at least enough to provide a firm pull on the model as you hold it before release. Too little stretch can be dangerous as the model can overfly the Hi-Start and release prematurely. This will inevitably cause a severe stall, possibly causing a crash. If you have never used a Hi-Start or winch we strongly urge that you wait for calm weather to try your first launches, as it is a lot easier on the wings if you miscalculate. Once you have gained a little experience you will be able to judge the feel of the pull on the model and adjust accordingly without pacing off the distance for each launch.

If you count paces to measure the length of stretch, don't pace the distance while pulling the line. The pressure will cause your stride to shorten reducing the distance. Pace off the distance first and mark the ground or place the model at this point, then go back and stretch the Hi-Start to the mark.

The energy developed by a Hi-Start is sufficient to cause injury. Do not launch the model toward other fliers or spectators. Do not try to grab the line if it slips away from you or you may be cut or burned. Be sure the stake is firmly anchored before using. Fly safely and avoid accidents.

LAUNCH TECHNIQUE – STAGE I

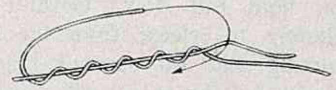
Place the transmitter and model at the launch point and check control operation. Walk back and pick up the towline at the lower parachute ring. Pull line forward and walk back to the model. (The following instructions are for right-handed persons – reverse if you are left-handed.) Grasp top ring in left hand and pick up model with nose facing into the wind with your right hand. Slip ring over towhook holding model firmly. Turn on transmitter and receiver and pick up the transmitter in your left hand and stand up facing the stake, being careful not to lose control of the model. Check controls again, take a deep breath and concentrate.

Hold the model with the wings parallel to the ground, and the nose pointing directly at the stake. Raise the nose so that it points up 30 to 45 degrees above the horizon. Be sure that you have the transmitter in a secure grip and release the model by opening your right hand. Don't throw the model – just let go. Keep your eyes on the model and get your right hand on the stick.

Your first control should be to correct any turning tendency. Don't

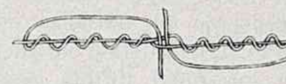
FIGURE 1. Blood Knot

1. Lap the ends of the strands to be joined and twist one around the other, making at least five turns. Count the turns made. Place the end between the strands, following the arrow.

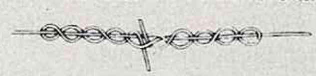


2. Hold the end against the turns already made, between the thumb and forefinger at point marked "X", to keep from unwinding. Now wind the other short end around the other strand for the same number of turns, but in the opposite direction.

3. This shows how the knot would look if held firmly in place. Actually, as soon as released, the turns equalize.



4. And the turns look like this. Now pull on both ends of the monofilaments.



5. As pulling on the ends is continued, the turns gather as above and draw closer together (at this point the short ends may be worked backward, if desired, to avoid cutting off too much of the material).

6. Appearance of the finished knot. All that remains to be done is to cut off the short ends close to the knot.

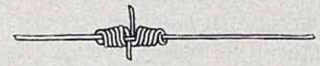
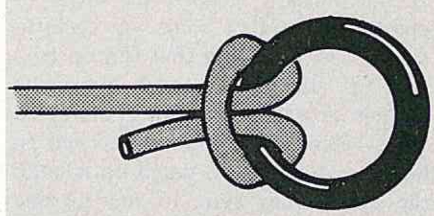
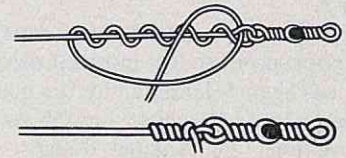


FIGURE 2. Clinch Knot



IMPROVED CLINCH KNOT

To tie this knot, stick the end of the piece of "Stren" through the eye of the hook or swivel and make five or more twists around the standing part of the line. Then thrust the end between the eye and the first loop, and then back through the big loop as shown in the sketch. Hold on to it and pull tight. Be sure to always cut "Stren". Don't ever try to break it with your hands.



worry about altitude, the model will be climbing. Concentrate on keeping the nose straight into the wind and avoiding severe turns. If you get into trouble and can't control the model's path, hold full down elevator immediately to release from the line! Assuming that this doesn't happen, you will find the model still climbing, but flying much slower than when released. When the climb stops the model may fly off the line by itself. If not, tap down elevator momentarily to release. Don't worry about gaining maximum altitude on your first flights – that comes next.

LAUNCH TECHNIQUE – STAGE II

After the first few launches the sweaty palms and rapid heartbeat will diminish. Now you are ready to refine your technique to optimize launch altitude. First, let's define our goal: To gain the maximum altitude possible. Altitude will be increased by any or a combination of the following factors:

1) Applying up trim and/or up elevator during the launch.

2) Moving the towhook position aft.

3) Increasing the angle above the horizon that the nose is pointed at release.

4) Increasing the distance that you stretch the rubber (or using heavier tubing).

We will discuss these factors in greater detail and suggest that you try each in the order presented.

1) If the model seemed sluggish during the first launches, try adding up elevator trim before release. Increase slowly starting with about 1/4 up trim. If this doesn't steepen the angle of climb try holding some up elevator stick. You may find that full up trim and up stick are needed on some models in calm conditions. Increased wind velocity will lessen the need to hold up stick. If too much up is held, the model may start to veer to one side or start to oscillate from side to side. If this happens release the up stick immediately as these oscillations can build up rapidly and make control difficult, if not impossible. Experiment until you find the best trim for your particular model. If the addition of up elevator does not improve the climb then proceed to step 2.

2) The climb is very dependent on towhook position. On most kit designs this has been determined by the manufacturer, and we suggest you follow his instructions. On original designs and some kits no towhook is shown and you will have to experiment to determine the best position.

In general, a forward hook position is the most stable and safest, but will not permit maximum altitude. A rearward position will provide more climb but may result in veering tendencies. The towhook should be placed between the wing leading edge and the Center of Gravity or balance point in almost all cases. Generally, placing the hook halfway between the leading edge and C.G. will provide a safe starting point.

Note also that the hook can be placed further aft in calm conditions than in high winds. The hook position on Airtronics kits has been selected to provide a safe position under all conditions and requires up elevator for maximum climb in calm air. The experienced flier may wish to try a more rearward position for dead calm conditions. Be careful if you optimize the hook position for Hi-Start launches and then fly from an electric winch, as the hook may have to be moved forward to keep the wings intact.

An adjustable hook is very convenient for testing.

3) Holding the nose up will steepen the first portion of the launch, although this will not affect the major portion of the climb. In light air you may be able to hold the nose nearly vertical at release. Be careful to keep the wings lined up and be ready to correct turning tendencies very quickly. We suggest you back off on any up elevator when trying high launch angles.

4) The further the rubber is stretched, the more energy available for climb, as well as more initial speed and stress on the wing. Try stretching the rubber 5 feet further on several successive launches and watch the results. Keep an eye on the wings during the launch so that you don't overdo it. Reading the wings properly is the secret of maximum altitude launches.

Don't stretch the rubber more than 300 feet (800 feet total from stake to release point) as this will over-stress the tubing and cause premature breakage.

Perfect launches are the result of balancing these four factors properly for your model. Remember that each model is different and what's best for one may not work well on another. Keep trying different things until you achieve perfection. When your launches are all according to the following description then you will know that you have mastered the art and technique of Hi-Start launches.

THE PERFECT LAUNCH

The model leaves your hand and starts a steep climb immediately. You have to look almost straight up to follow its path. The climb is constant gaining altitude all the time, with no tendency to sag or mush forward. As you near the release look down the line toward the stake. You should see the tubing standing straight up in the air. At the release point the rubber is actually stretched and the model is reluctant to release, you really have to hold down elevator to get off the line. You're off? Look at the chute zip straight down 50 feet – that's it – now you know what a perfect launch is like.

CARE AND MAINTENANCE

A little care and common sense will greatly increase the life and retain the performance of your Hi-Start. The following steps outline our recommendations and suggestions.

RUBBER: The worst enemy of all natural rubbers is heat. Store the winch in a cool dry place when not in use. Don't leave it in the trunk of a car during the summer months, as the internal temperatures will reach or exceed 125°F, which will drastically reduce the life and power of the tubing. Extreme cold weather will also affect the rubber, and may result in over-stretching the rubber so that it does not return to its natural length. Usually storing the rubber for a few hours at room temperature will restore its resilience, but in severe cases it may have become permanently damaged. Exercise caution when the temperature drops to near freezing.

If you launch in a sandy area or one where particles of dirt and grit are deposited on the tubing you should wash the rubber frequently to remove the dirt. This is most easily done by filling the bathtub with 4-6 inches of water and one-half cup of granulated laundry detergent, or equivalent, and swishing the tubing around in the soapy water for a few minutes. Rinse thoroughly with clear water, blot dry with a towel and hang up to dry on the shower curtain rod or similar. When completely dry, dust with a little talcum or baby powder. This is easily done by sprinkling a tablespoon of talc in a large plastic or paper bag then dropping in the tubing. Hold the neck of the bag closed and shake

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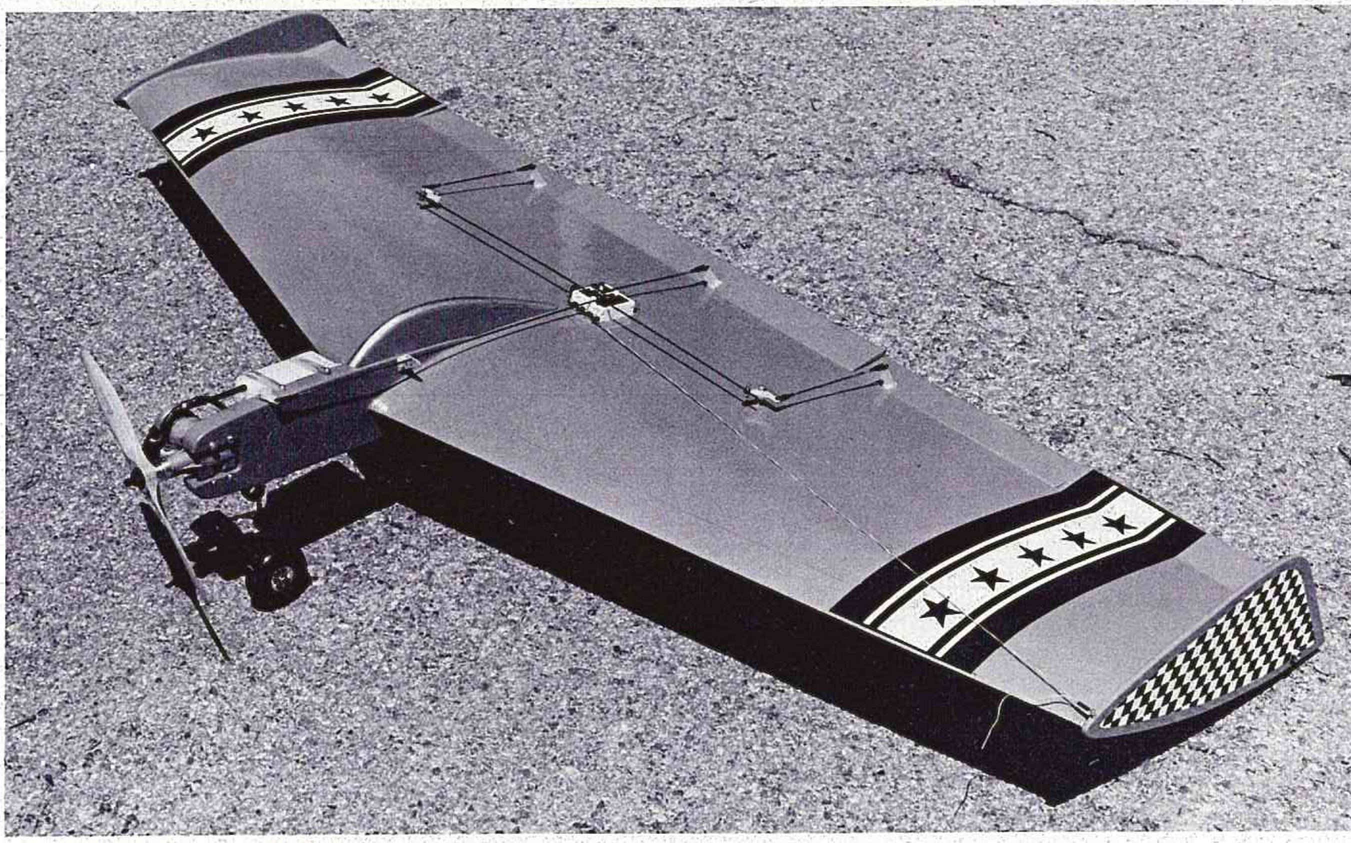

One of two RCM test Wingmasters. This one covered in red Solarfilm with black and white MonoKote trim.

RCM TESTS THE UNIQUE KRAFT WINGMASTER

Product Test: Bill O'Brien

● The Wingmaster is a flying wing design produced in kit form by Kraft Systems, Inc., 450 W. California Ave., Vista, California 92083. The Wingmaster could, in fact, be called a new concept in R/C flying since it can be built in 5 hours and can be flown for less than $200.00 total investment including all R/C equipment. By utilizing low cost materials and techniques in the production of the new Wingmaster, Kraft Systems, Inc., provides a solution to increased modeling costs and complexities. The kit features rapid construction and amazing versatility since the aircraft offers an escape from the tediousness of present model design. Combining the benefits of foam wing cores with the strength and simplicity of cardboard covering material, the Wingmaster accomplishes a low cost and fast building structure. Increased strength and economy was

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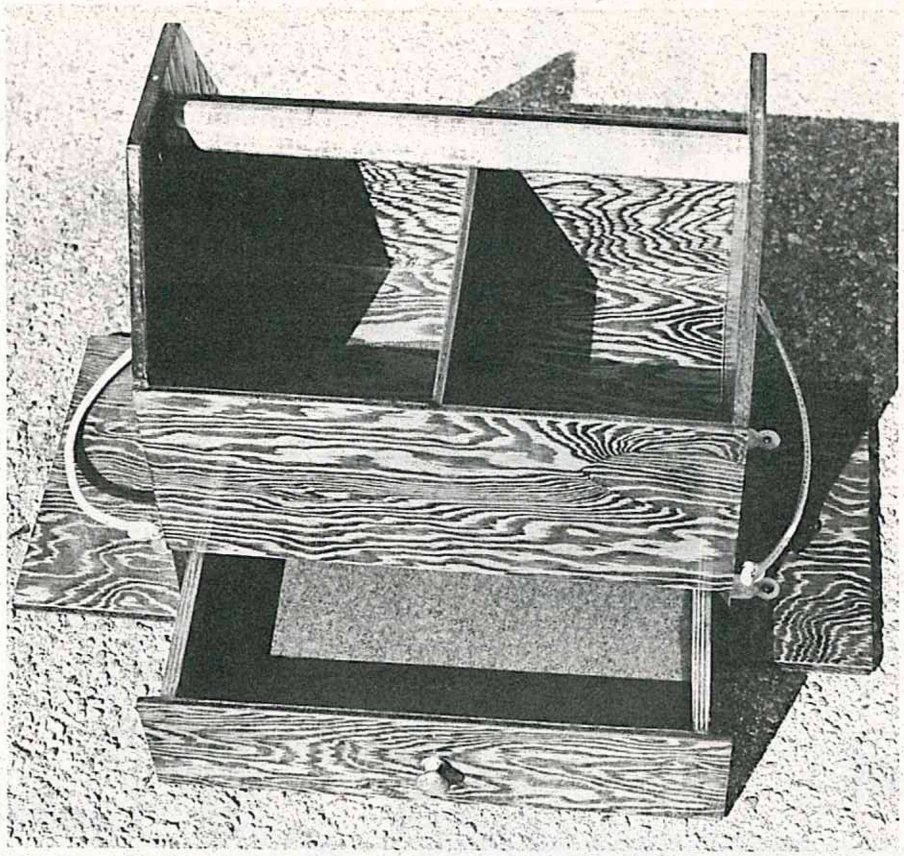
Close-up of K & B .40 and Kraft-Hayes tank mounted on hardwood "fuselage."

TEST REPORT

Product Test: Dick Kidd



The Totem Field Box is a well constructed unit designed to hold the transmitter on one side and your fuel supply or Hi-Start on the other, securely held in place with elastic exerciser cord.

RCM TESTS THE TOTEM FIELD BOX

Priced at $15.95, this well designed and constructed kit field box has to be one of the best buys available today.

The Totem Field Box, manufactured in kit form by Ridgewood Hobby Supply, P.O. Box 2045, Vernon, Connecticut, 06066, is one of the most well engineered and functional field service centers we have tested at RCM.

The Totem features a large partitioned storage compartment for propellers, fuel pumps, electric starters and batteries. For those small items and tools, the Totem contains a large drawer at the base of the unit. Your transmitter and fuel supply, or your sailplane Hi-Start, are carried outboard on the end of the field box, securely held in place with elastic exerciser cord. This eliminates the danger of your transmitter being bounced around inside a compartment or having the contents of your box damaged by a fuel spill or possible fuel leakage.

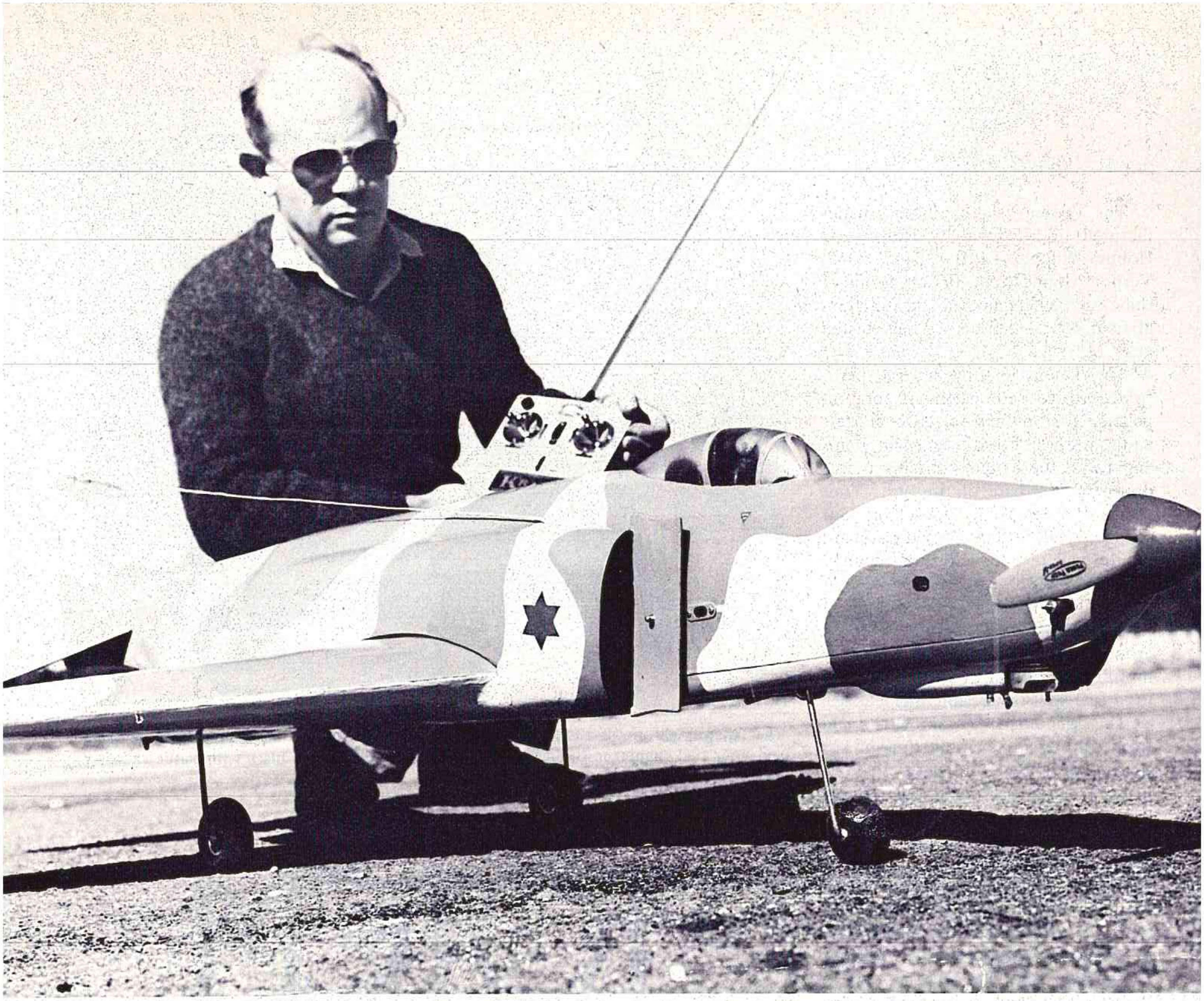
The kit of the Totem R/C Field Box features an assembly time of less than two hours from parts that we found to be completely accurately cut for proper fit, and featuring dadoed joints for added strength. All necessary hardware is included. Following the detailed assembly instructions, assembly is begun by inserting the ends of the partition into the dadoed slots in the box end and fastening with four 1" nails at each end. The rear side is then secured in place followed by the field box bottom. The front side is then added using four 1¼" nails at each end and four 1" nails into the sub-base. The dowel handle is then secured in place using one 1½" finish nail at each end. The drawer sides are nailed to the drawer end using two 1½" nails at each end and aligning the dadoed slots. The drawer bottom is slid into the ladder followed by nailing the drawer front into place using two 1¼" nails at each end.

For a nice smooth finish all nails should be counter-sunk and filled with plastic wood. The surfaces are sandpapered and the corners and edges are smoothed out. A coat of wood filler can be used followed by a sanding with a fine sandpaper. Acrylic enamels such as Sears Enamel or one of the modern aircraft finishes such as K & B Superpoxy or Hobbypoxy can be used for fuel proofing. On the RCM prototype we used several coats of polyurethane varnish for a natural finish.

After the box is dry, the corner braces are added to each end of the field box using 3/8" screws. Then, the drawer pull is attached. The exerciser cord is cut into two pieces of proper length for holding the transmitter and the fuel supply firmly on the Totem. The ends of the exerciser cord are attached to eye hooks using string and epoxy. Our total building time was one and a half hours plus one hour in finishing.

The price of the highly prefabricated Totem Field Box kit is $15.95, plus $1.00 postage east of the Mississippi and $1.50 postage west of the Mississippi. Dealer inquiries are invited.

RCM has Tested and Approves and Recommends the Totem Field Box from Ridgewood Hobby Supply. □



Shlomo Barack and his scratch-built Phantom. Model flew well but was quite heavy at 6 Kg. Webra .61, Kraft radio.

On the occasion of their nation's 25th year of independence, RCM salutes

THE RC MODELER OF ISRAEL

by leon dagon

The state of Israel is currently celebrating its 25th year of independence. In these 25 years we have witnessed, no doubt, a great deal as a young nation. You could almost say, that we have grown up fast.

No less is to be said for R/C Model Airplanes. As a matter of fact, the first R/C ship was seen in the sunny skies of a Tel-Aviv suburb (only sand at the time) way back in 1949, and for a nation of our age, this is a way back . . . .

Actually the Aero Club of Israel (at that time Palestine) was founded in 1937, and is now boasting some 6000 members (don't smile, we only have 2.5 million people in the whole country!) In general we, the Israelies, are very aircraft minded and, in saying this, one can even say that we are early pioneers of the air. Didn't Noah use the "bird" to find land, remember? It's in the book . . . . .

Today we, the R/C fanatics, are quite a group. To be precise, 60 of us who devote all our six days of work, in waiting for the seventh day of rest - - - I mean flying. We do all of our flying on one major airstrip near the outskirts of Tel-Aviv, and on a Saturday morning nearly everyone comes. This creates somewhat of a problem with frequency; but our well organized R/C club committee has adopted quite a system so that the members do not get their "wires" crossed. The system we use goes as follows:

The modeler arriving on the field goes straight to the duty officer, who enters the members name on a list under the appropriate frequency of his equipment. Next, if he, the member, wishes to fly, he receives a colour peg with his frequency written on it. This is the only time when a member is allowed to operate his transmitter. Upon completing his flight, the member returns his peg to the duty officer, and the officer marks the name as "flown" and gives the peg to the next modeler in line.

Our R/C club has three different categories of members and to distinguish the status of each, we have made "wings" which, when placed on the background of one of 3 colours show the classification of the member.

White wings – has received solo check and allowed to fly alone, but no aerobatics.

Green wings – advanced member who has successfully learned the pattern flight, and has passed his test to same.

Red wings – this member is a specialist and has been given the honorary rank by the committee and **he, and only he**, is allowed to teach the new members how to fly and will be responsible for them to qualify for their white wings.

The officer on duty also decides in which direction all take-offs are to take place, and has the power to ground anyone who refuses to obey the club rules and precautions. These are just a few of them:

1. Transmitters off unless peg is on it.
2. No one is allowed to take-off or fly alone unless he holds the minimum rank of white wings.
3. No aerobatics allowed over spectators heads.
4. All take-offs in direction specified by the duty officer.
5. No running-in of engines is allowed on the field close to the flyers.
6. Engine must have muffler.
7. When making test flight on a new model, duty officer is to be notified so that he may clear the field.

And so on . . . .

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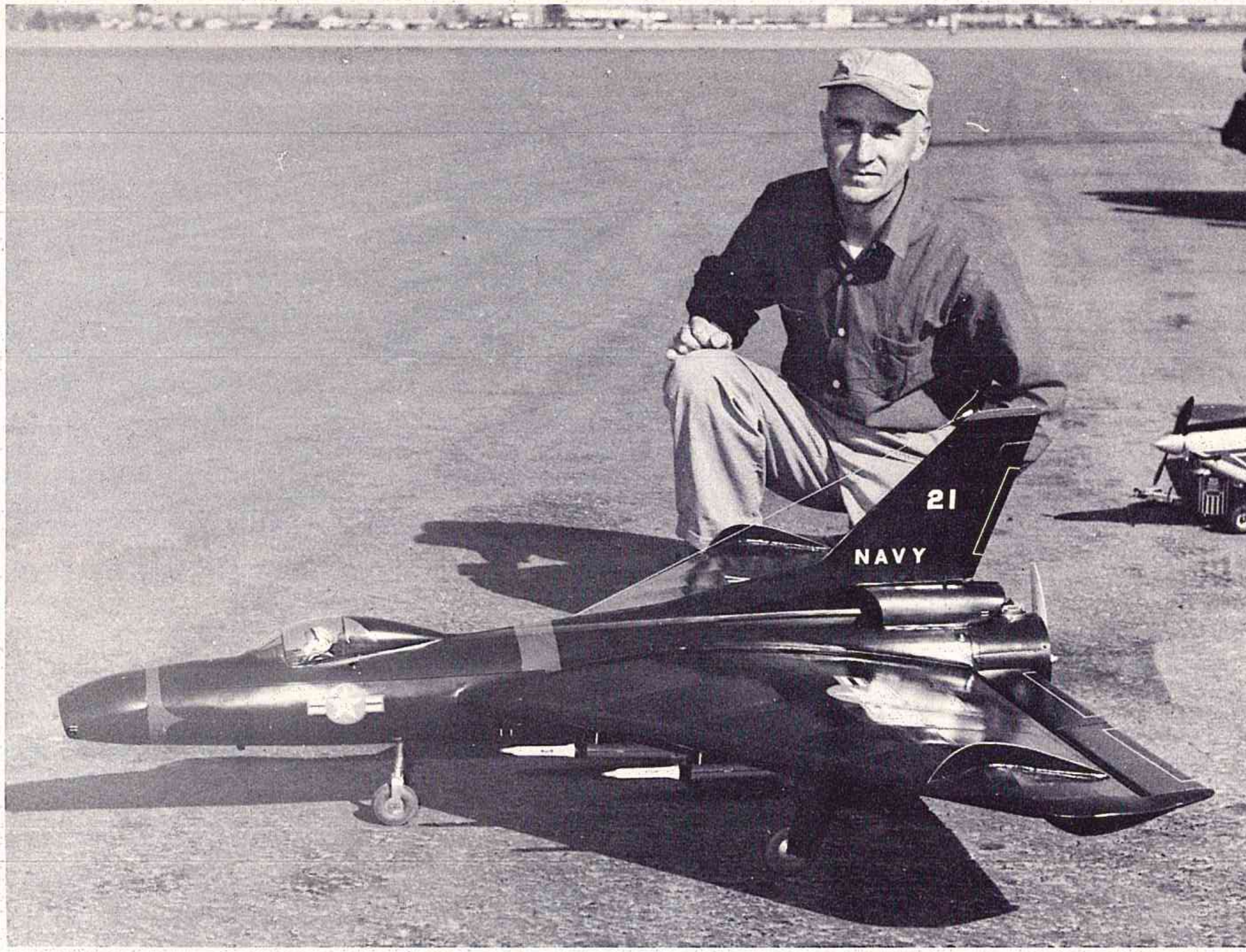
Nisim Eshkenazi with his fantastic Dragon Fly. Webra, Kraft, retracts. Nisim, one of Israel's very best, holder of Kraft Trophy.


Naftaly Horowich, many times Israel Pattern champion. Model is original design called 'Chipopo.'


Nisim Eshkenazi showing the author, Leon Dagon, what it's all about.



Phil Garrard with the original Vampire. Sequence tail numbers started with No. 4.

Phil Garrard. . . A Man And His VAMPIRE

BY DICK TICHENOR

vam-pire (vam′ pīr), n. 3. a beautiful, but unscrupulous woman who seduces men and leads them to their ruin.

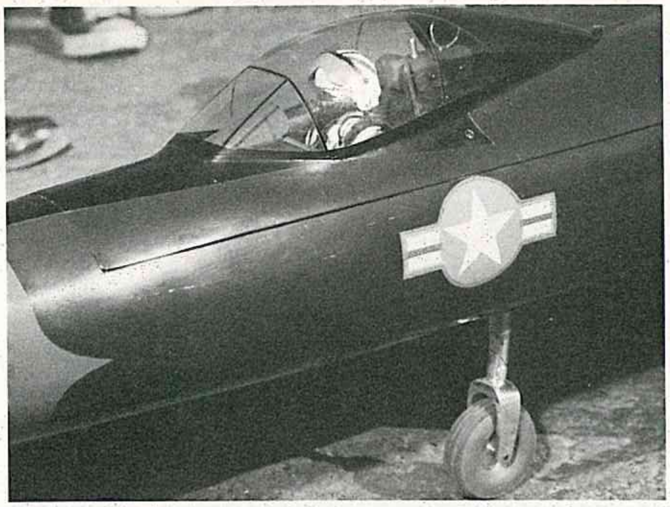
Source: Websters New World Dictionary of the American Language College Edition.

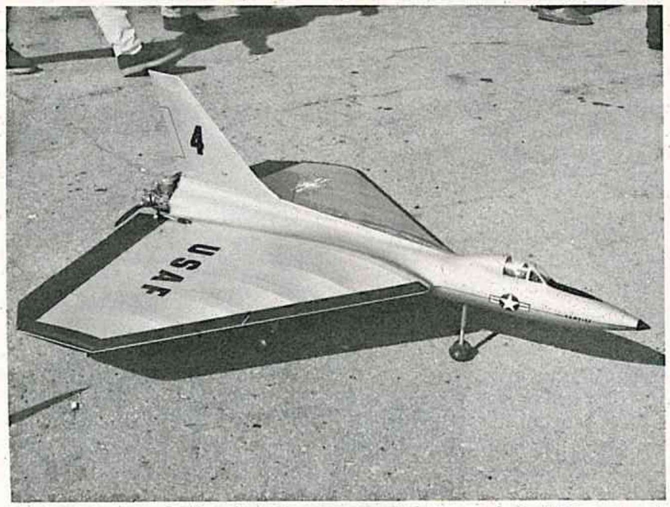
One of the most exciting airplane designs has come from one of the nicest and most talented gentlemen in R/C, Phil Garrard. Phil has been prominent in the model world for quite a few years, his control line models were spectacular; his R/C scale models are outstanding; and he has his sport type R/C jobs for week-end flying.

We each seem to have a particular airplane design that turns us on and Phil "has a thing" about deltas. Some 10 years ago he designed a configuration that has proven quite sound, in fact Vampire #25 of that same basic design is now under construction. Even though the plan form is pretty much the same, each model is unique in several ways. The most obvious difference is the finish and trim, most of the series have a military flavor but he has also included an executive transport version.

The evolution of materials and building techniques that Phil has employed is only one aspect of his creative talent because he normally has worked in those mediums before they came into common usage. His first Vampire, back in 1963, was of conventional balsa wood construction. Then came the horrors of making plugs and molds for fiberglass fuselages. Later came forms and vacuum formed sheet plastic fuselage shells. Wings have run the gamut from built up, silked and/or sheeted through foam cores with either balsa, card stock, or sheet plastic shims.

Landing gears have come in a variety of forms - - - there have been sheet metal struts, machined tubular struts with spring loaded shock absorbers, as well as several retract systems that worked well before





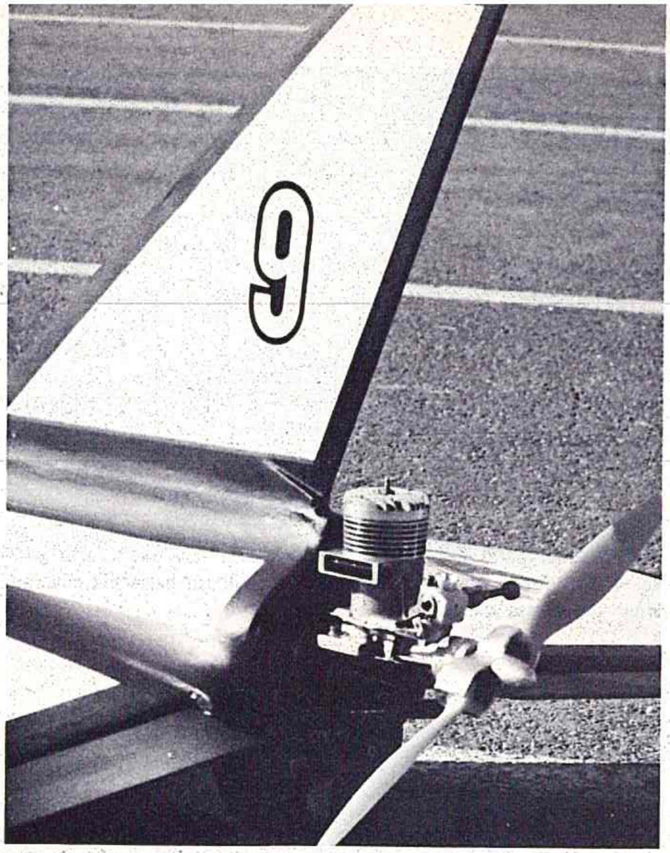
No. 1 had lots of cockpit detail, a trend followed throughout the series.

No. 4 introduced fiberglass fuselage and built up balsa/silk covered wing – dual nose wheels.

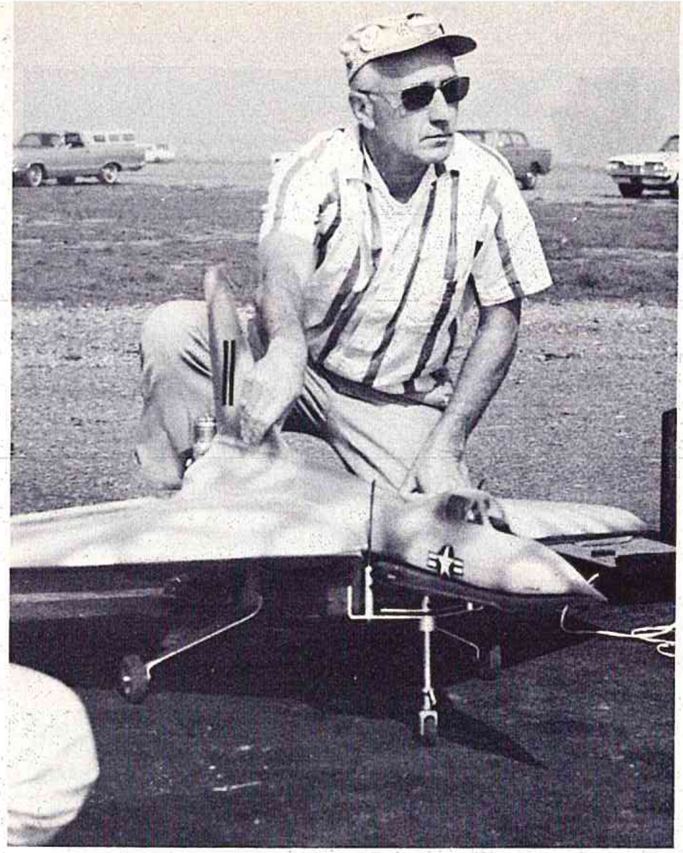
Phil developed retracts shown here on the way up. Sturdy enough for this 12 lb. bird.

Charleen Weirick added to the beauty of No. 6.

ABOVE: Super clean nose lines. RIGHT: No. 7 had Navy Blue Angels paint job. Phil shows Charlie Brown his c/l DC-7.



Phil's ingenious prop adapter used two commercial props to make one large enough for the Vampire.



No. 11 featured retracts that extended only. Dolly (shades of c/l) facilitated take-off.

Much TLC has gone into each of the Z5 Vampires.

Just like going out to do battle!

commercial sets were available. He even had one arrangement that featured a take-off dolly and fold up gear that could be extended for landing.

Power plants have mostly been single engine pushers but, for variety, there have also been twin pusher and twin tractor installations. Most of the popular larger engines have been used but power demands are rough - - - just figure the power required to fly an eleven pound delta with several square feet of wing area at a high angle of attack. It takes a lot of push and some engines just haven't got it. Each engine is run in on a test stand and checked for fuel draw at a wide angle-of-attack range simulating the operating attitudes of the Vampire before he can consider using it.

Finding suitable pusher propellers has been a challenge. One solution has been the use of a clever adapter dreamed up by Phil to use a blade and hub from two commercially available pusher props to make one prop to fit the Vampire. There have also been cases where crankshafts ported for opposite rotation have been available; they allowed the normal tractor props to be used as pushers.

There have been heartbreaks along the way and more than one of these works of art have been lost in the learning process. For instance, you don't know what the control response will really be until you get the bird in the air. You can discover, for example, when you put a delta into a screaming power dive, the nose wants to tuck under more and more as the speed

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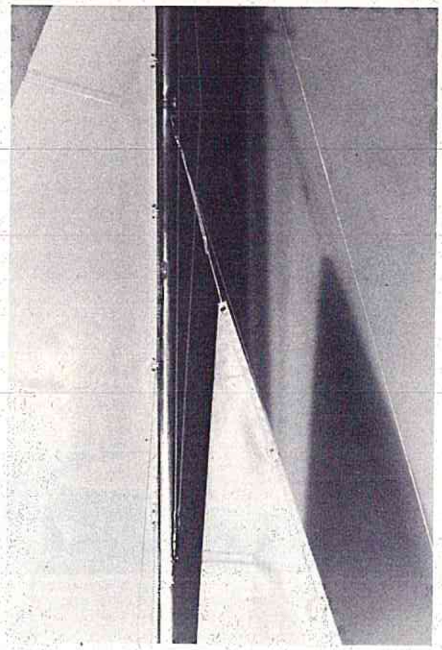
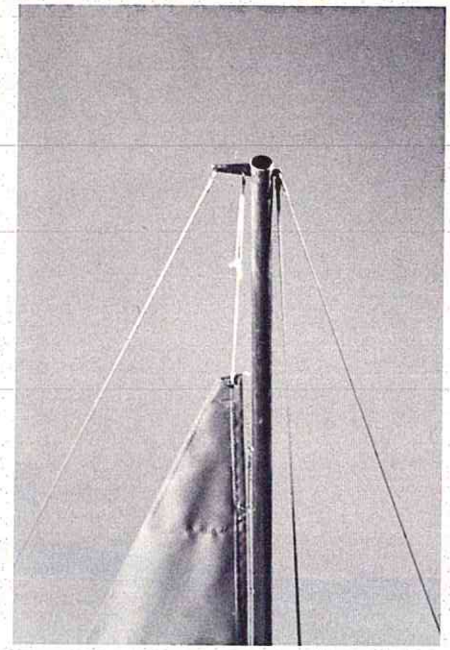
ABOVE: No. 8 was Executive Transport with twin engines. BELOW: No. 10, with Marilyn, was featured on RCM's August 1968 cover.


36/600 rigging details showing triangle and jib stay fittings. The dress hooks on main sail. Numbers are MonoKote.


Rigging details showing top-mast rigging jenny strut and cuff hooks on main and jib.


Mast top details of the 50/800.

SCRATCH BUILDING

MODEL SAIL YACHTS

BY MEIDAD ABIR

PART II

Continuing on with our discussion from last month, drill a hole in the bottom of the hull at the rudder location. The rudder bearing is a length of brass tubing with an I.D. to match the O.D. of the rudder shaft. Drill a hole in the bearing support block and push the tube through. Epoxy the tube and the block making sure the tube protrudes from the bottom (about 1/16" is right). While the epoxy is still workable, insert the rudder into the bearing and make sure it is vertical viewed from the rear and also that the top of the rudder is parallel to the bottom of the hull. Support the assembly while the epoxy is setting to prevent any misalignment.

The equipment floor is now traced on 3/32" plywood and epoxied on top of the two fin support frames. The floor provides a mounting platform for the servos, the sail control unit and the receiver and batteries, as well as keeping the electronics away from any water that might collect at the bottom!

Mark the location of the deck beams and fit and glue the 1/4 square cross members. While the glue is drying, trace and cut the deck beams. Glue the deck beams on top of the cross members and sight the hull from the side – the top of the beam should form a straight line on the 36" boat and a very shallow curve on the 50". Make sure the deck beam tapers to a feather edge at the edge of the hull otherwise the deck will not fit properly!

Glue the mast support in the notches provided in the deck beams, fit and glue the two hatch beams, and also the bow and transom filler pieces. Sand the whole mess and you are ready to glue the deck on – but wait!

Remember Archimedes? While sailing his R/C yacht he discovered what is now referred to as "The First Law of Archimedes." Without getting too technical it is stating (correctly, I might add) that "the amount of water found inside any R/C yacht is directly proportional to the size and number of opening in said yacht deck!

This is why I like to permanently install the rudder, steering arms and push rod and to eliminate an unnecessary opening in the deck!

Mount the rudder and install a steering arm. The rudder should move approximately 40 degrees to each side so choose the hole location to suit. Sometimes it will be required to drill an additional hole.

Form the push rod and temporarily install a servo to check the rudder action and to ensure no binding occurs in the linkages. When you are satisfied, mark the servo location and remove it, tighten the set screw in the steering arm and put on a drop of epoxy – just in case!

If you are building a 36" boat the deck can be in one piece so all you have to do is to trace the outline using the hull as a guide and cut about 1/8" **outside** the line. This material will be trimmed off later. Measure and mark the hatch location and cut – this time **inside** the mark! Trial-fit the deck until you are satisfied that there are no high or low spots and the sheer is a continuous smooth line.

Apply a generous amount of epoxy to all surfaces in contact with the deck, especially the sheer edges. Now, put the deck on making sure it is positioned correctly and clamp in place using short lengths of masking tape all around. Small C-clamps can be used in the hatch area. Make sure no gaps are left around the deck edge.

The same procedure can be used for the 50" boat, however, it is much easier to do the deck in sections. (Figure 3.) Fit the fore deck first, the two sides and, finally, the aft section.

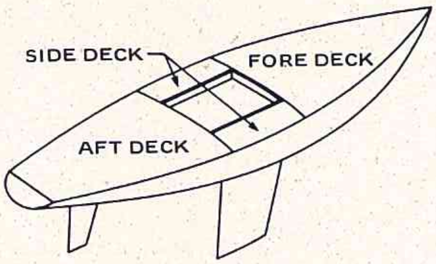


FIGURE 3. 4 PARTS DECK FOR 50/800

Trim all around using a block planer or a sharp X-Acto knife. File and sand the edge to blend into the hull. Trim inside the deck hatch opening and epoxy the hatch coaming strips in place making sure the top surface of the frame around the hatch opening is level.

Cut the hatch cover and epoxy the frame around it checking that a nice tight fit exists between the hatch cover and the coaming. Done correctly, no additional water proofing is required and very little water will find its way into the hull.

Sand the entire deck and apply a couple of coats of clear dope, varnish, or what have you. Some makes of dope tend to peel off in water so varnish is better even though it is more difficult to use, as it dries very slowly. Clear or "white" shellac is also a good material as are all the epoxy based marine finishes. A couple of coats of polyester resin will also do the job but there will be a lot of sanding, so choose your own!

While applying the finish to the deck, coat the fin at the same time so the lead hull bulbs (remember them?) can be permanently attached to the boat.

Lay the boat on its side, locate and drill the mounting holes through the fin; check that the two halves bulbs match and, using long bolts and nuts, fasten the lead to the fin. The holes in the bulbs are counter-bored so the bolt or nuts will not protrude from the surface and can be filled with automotive body putty or polyester filler and

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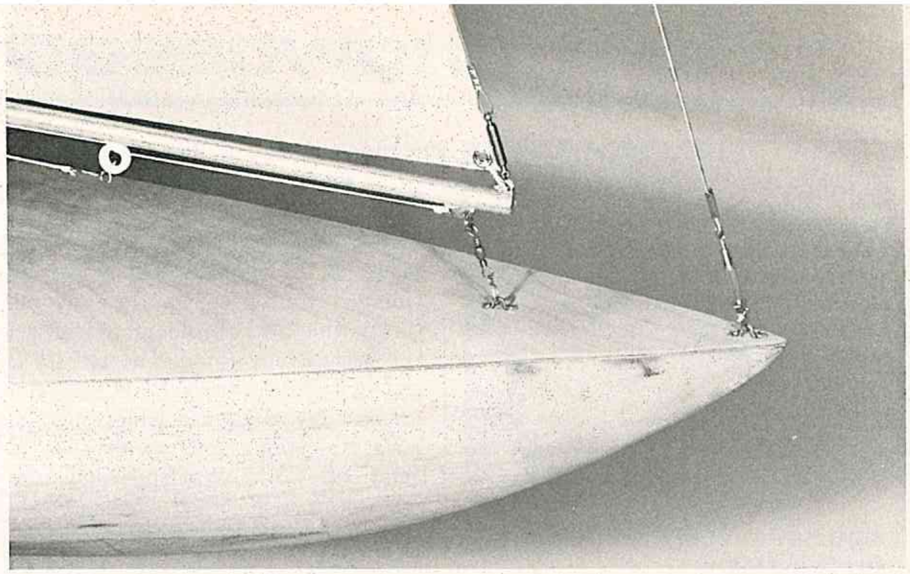
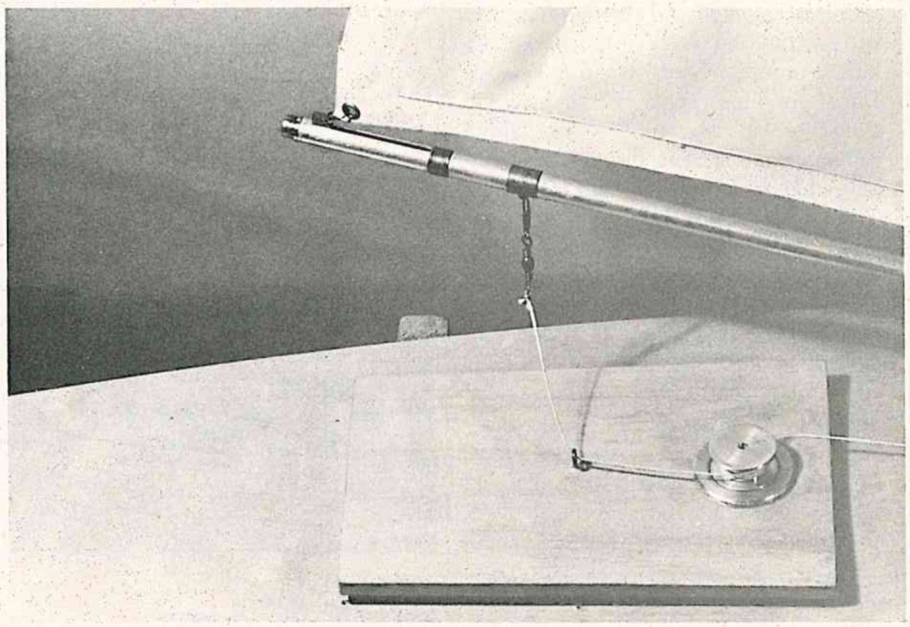
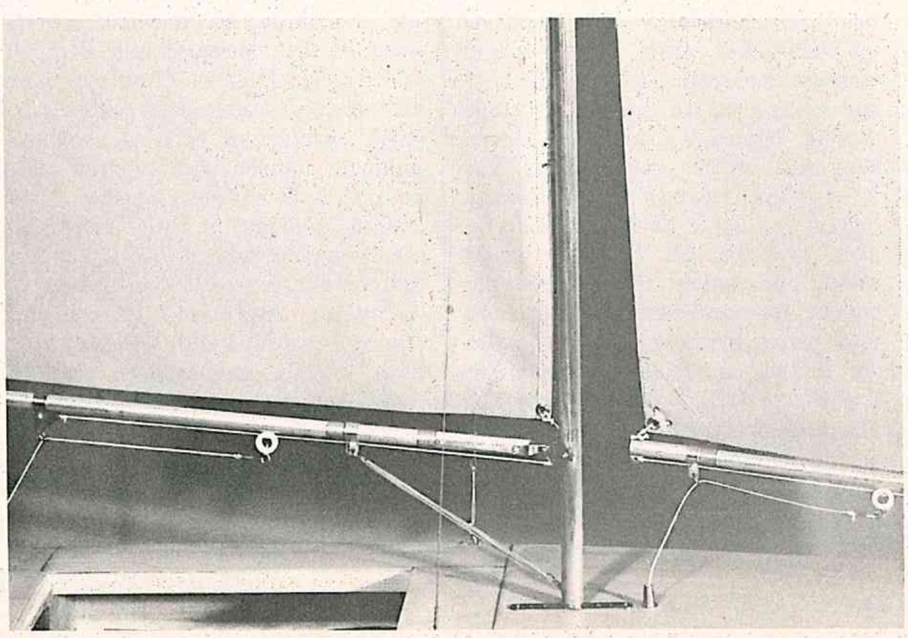


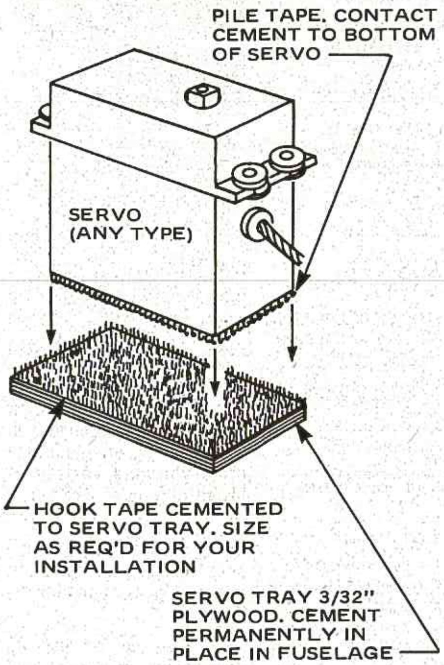
ABOVE: Bow view of 50/800 showing forestay and jib boom attachment. BELOW: Deck view of 36/600 showing sail control drum and sheets mounted on hatch cover.



BELOW: 50/800 rigging details showing mast step gooseneck, kicking strap and main and jib sheets. Hatch is open.

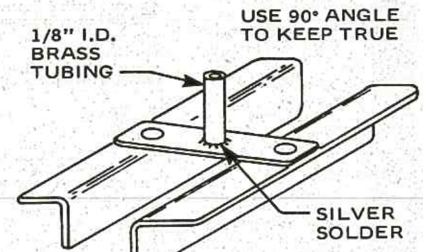


FOR WHAT IT'S WORTH

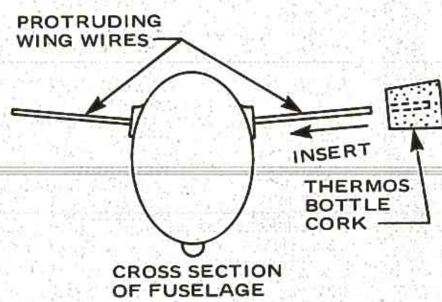


Here is a flight tested modern method of installing servos that offers many advantages according to Alfred C. Falone of Covina, California. It uses hook-and-pile tape of the type found at sewing supply counters under the trade name Velcro. The hook side is fabric that has several hundred nylon fish-hook shaped filaments extending upward to each square inch. The pile side is fabric with nylon fuzz on one side. When the two surfaces are mated, each hook snags a loop of fuzz to form a very strong union. Its shear strength is very high. The advantages of this method of servo mounting are no nut, bolts, or rubber shock grommets to fool with; very effective vibration damping; crash shock resistant; servos can be easily shifted fore and aft for CG weight corrections; servos can be moved from one ship to another in seconds; the servos won't come loose in flight as, unfortunately, sometimes happens with servo mounting tape. To remove your servo, use a rocking-peeling motion. Mark your servo position with a felt pen for proper location when reinstalling.

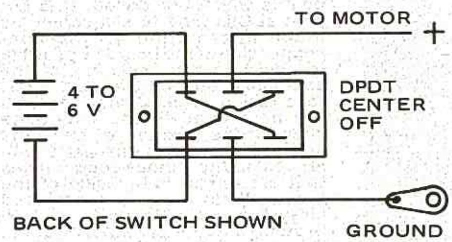
Bill Morrison of Owen Sound, Ontario, Canada, suggests the following additional help for your Robart Hinge drilling guide. Simply take a piece of brass tubing ½" to ¾" long with a 1/8" inside diameter and silver solder it to your guide at 90 degrees. This will prevent your drill from going in at an angle when drilling the hinge holes.



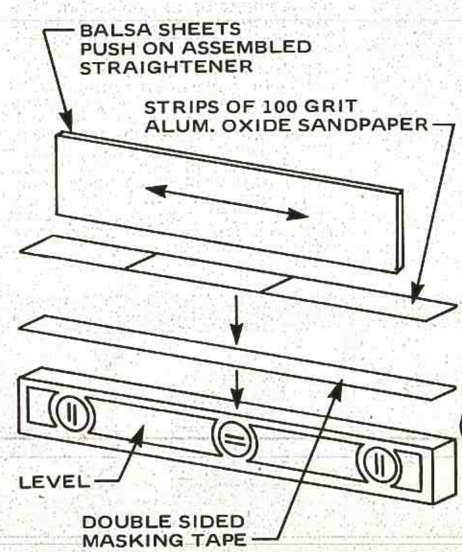
Robert F. Aberle of Hauppauge, New York, writes that a good many of our present R/C sailplane designs employ plug-in wings which require tubing located in the wings that slip over one or two steel wires protruding from the fuselage. On several occasions, while transporting his glider, the protruding wires have accidently punctured other parts of the sailplane. Although it hasn't happened to Bob, there is also the chance that you could poke a person in the eye while holding the fuselage during either the assembly, disassembly, or cleaning process. As a suggestion, Bob recommends buying four Thermos bottle corks and drilling each one partially through. Each is then slipped over one of the protruding wire ends per the attached sketch. The result is peace of mind while traveling with several sailplanes in the trunk.



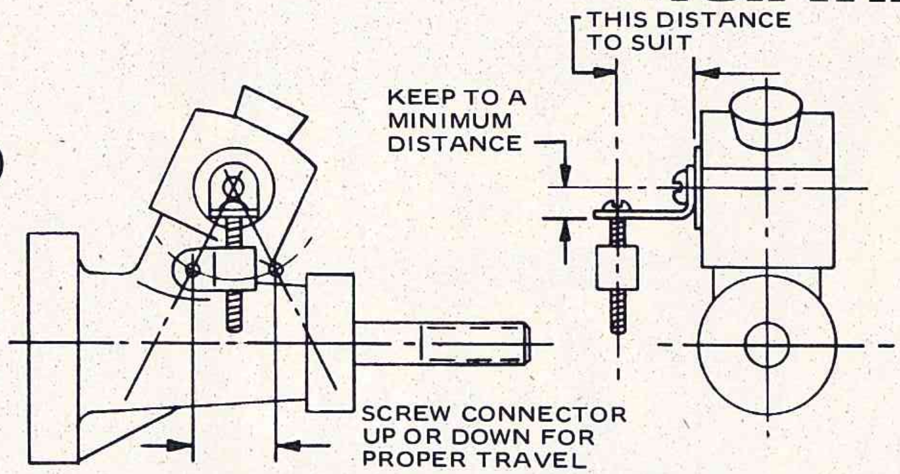
Ray Gareau of Laval, P.Q., Canada, submitted the wiring diagram for reversing a 1965-69 Dodge or Plymouth automobile windshield washer motor when used as a fuel pump. Open the pump cover and remove the resistor bulb which is installed in series with the only wire to the motor. The ground is through the casing. The sketch shows the back of the switch shown using insulated wires for the cross-over connection. The choice of windshield washer is not important as long as one obtains a pump and not a diaphram type. Many discarded pumps have only the resistor bulb burned out as these motors are made for six volt operation, so it only needs to be removed and direct connections made for our usage. Clean the pump with Varsol, or a similar solvent, then with detergent and water and, finally, pump about 4 ounces of fuel before installing on your fuel can.



Since there's always a need to straighten the edge of sheet balsa for butt gluing or general construction, Dean Poeth of State College, Pennsylvania, decided to make use of a 28" long carpenter's level which he had purchased to finish a room in his basement. The level Dean used was 1" wide and 28" long with both top and bottom surfaces machined flat. Dean put a strip of 1" wide two-sided masking tape on one surface and then covered it with 1" strips of 100 grit aluminum oxide sandpaper along its entire length. The sheet balsa is pushed lightly over the length of the level and the edges are sanded straight in only two or three pushes. The level is heavy enough so that it does not need to be fastened to the work bench. The following sketch shows how to assemble the balsa straightener.

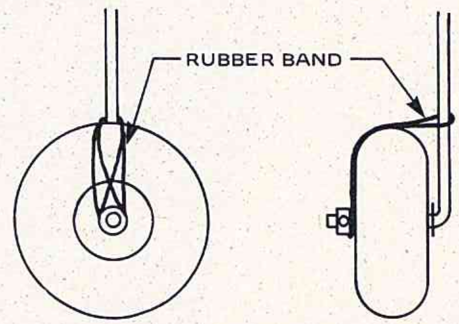


FOR WHAT IT'S WORTH

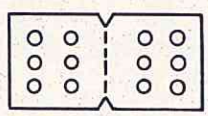


The throttle linkage is usually the most difficult to set up with the proper amount of travel at the carburetor. Linear output servos have only one travel, unless the electronics are adjusted. Radial output servos have different travels but are limited to the hole locations on the arms. Bob Mayhew, while struggling with this problem on his latest model, decided to install a screw on a modified TV lever and, by using a nylon pushrod connector, many hole locations could be selected – limited only by the threads per inch on the screw. Bob made the nylon connectors which are also available from Carl Goldberg Models. Instead of modifying the original TV lever, Bob made one from a piece of .035 thick steel, with one hole for attaching it to the carburetor and a second hole with a 2-56 thread. The screw is a number 2-56 x 3/4" long machine screw. It is screwed tight into the arm. Instead of threading the hole in the arm, the screw could be soldered in place. This idea reprinted from the Indian City Radio Control Club "Tom-Tom."

Stanley J. Tamas of Louisville, Kentucky, writes that, while transporting his planes to the flying field, he was having trouble keeping the planes from rolling around in the back of his station wagon. Stan tried wrapping rags around the wheels but they always seemed to come off. He had thought of building a rack, but this was just something else to be removed when he got home from a days flying session. Then Stan had the idea of using rubber bands, as shown in the sketch, around the wheels and axles. This worked very well for him and works on all types of landing gear.



Graham Bacock of Lexington, Mass., suggests using drafting mylar for hinges as shown in the sketch below. Be sure to drill small holes so that the glue can get a good grip.

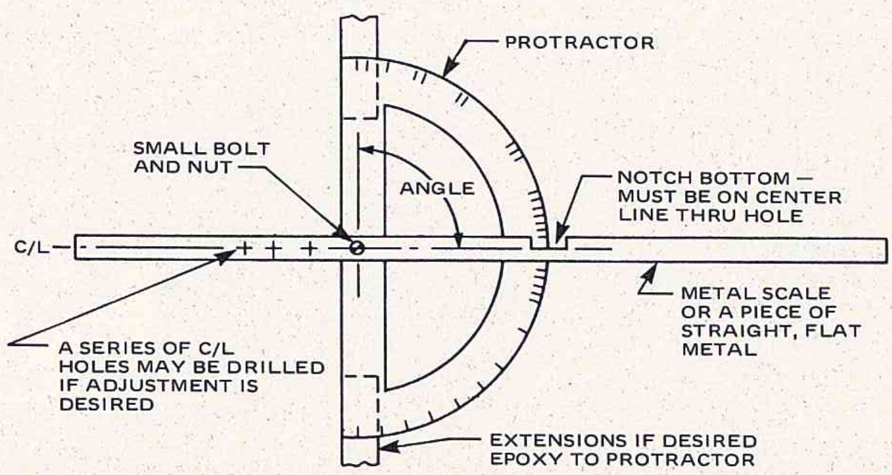


If you have ever needed an angle gauge and could not find one, here's a solution for a fairly good and inexpensive device. Another scale or flat piece of metal could be added to the opposite side for compound angles if so desired. Unless you are a real fanatic for precision, this device by J. Scott, as reprinted by the Eastern Indiana Radio Control Association Newsletter will be more than adequate.

Have you ever found the need for a speed control for your electric drill or Dremel tool? As suggested in the "Glib Glitches," newsletter of the RCFC of British Columbia, go to any good sewing center and pick up a foot pedal control for an electric sewing machine. This should be priced at approximately $8.00. Plug it into a wall outlet and plug your drill into it. Your drill speed can now be controlled from 0 to full rpm. The device will handle normal modeling loads, however, be warned that it will not withstand heavy loads for extended periods.

E.J. Fisher of Indianapolis, Indiana, suggests not installing your wire cabane permanently in your new biplane. Instead, permanently install two 5/32" brass tubes through the fuselage (be sure to use doublers). The cabane struts should be built in two sections so one can be inserted 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.

Tim Tyler of Duck Hill, Mississippi, recommends the use of a 5/16" hollow shaft nut driver as an excellent glow plug wrench. You probably have one in your tool box, so try it - - - you'll like it. □



A MAN & HIS VAMPIRE

from page 54

increases. You learn such things as with the increase in weight and speed you had better put the elevon push-rods and horns on the top side of the control surfaces so that they will be in tension, the air loads are enough to compress the linkages to a point where you can lose control if you mount them on the bottom side!

After all the time and effort of developing these innovations, what does he do with them? He flies them! In fact he is constantly requested to perform demonstration flights at model meets and promotional activities of all sorts, and Phil and the Vampire oblige by putting on an exciting and crowd pleasing show.

Regrettably we must end this story on a sour note - - - if you want to build a Vampire, forget it! First of all, there are no plans since each Vampire is a one-of-a-kind bird. The foam wing core and vertical stabilizer are about the only constants in the later configurations. The myriad of details such as CG location, LG location, control areas and travel that have been developed over the years are stored in Phil's head. Secondly, this is no Sunday flying type machine and Phil is reluctant to expose modelers to some of the miseries he has experienced.

After all, the dictionary did give us the definition of 'Vampire.' □

R/C MODELER OF ISRAEL

from page 51

These rules may seem a little strict to you, but permit me to say that we, the committee, have taken our present circumstances into consideration when they were prepared. The whole idea is to see that everyone has a good time and to protect the property of each member to the fullest extent, as well as the welfare of each spectator and modeler alike against accidents that could happen when we have constantly 5 or more models in the air at a time. I, personally, think that one can never be overcautious at this hobby. Many may not realize this, but when you take a model weighing 3-4 kilos coming at you at 100 kilometers per hour, you have a lethal weapon and, what is intended to be a day of sport

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ENGINE CLINIC

from page 10

time went on the two-bladed props proved to be better.

There is one bad feature of a single blade propeller and the reason you never see one on a full-sized aircraft, and that is the aerodynamic unbalance. With only one prop blade pulling you have a bad gyration of the nose of the airplane. This twisting force would soon separate the engine from the airplane. Even with a two-bladed prop you have a slightly unequal pull during climb-out which is known as 'P' effect and is due to the down coming blade having a higher angle of attack than the up coming blade in relation to the relative wind.

As far as static balance you should have no trouble here if you do want to give a single blade prop a try. You just add a counterweight to the opposite side of the hub, usually in the form of a lead weight. You just add enough lead weight to balance the opposite propeller blade. Be sure you attach it solidly because if the weight should come off it could do serious damage. Frankly, I would advise you to forget the single-blade propeller idea. You can't beat the conventional two bladed props for model use.

Dear Mr. Lee:

I have a problem with an Enya .45 RC. It won't two-cycle without starving out. It has never run right since it was new, even though I've run 8 or 10 gallons of fuel through it. I use a standard K & B 100 fuel or an equivalent home brew. The symptoms appear to be in the fuel mixture.

1) Once I start the engine, I'll lean it out as much as I can, then back it off a few clicks; 2) Go to low speed — OK; 3) Go back to high speed — sag and starves out; 4) Back to low speed quick; 5) Back off a few more clicks; 6) Low speed — OK; 7) High speed — OK, 8,000 rpm and 4 cycle.

If I attempt to fly with a more lean setting it will starve out within 30 seconds after take-off everytime.

Some adjustments I've tried include: 1) Changing needle valves; 2) Changing needle valve setting in carburetor; 3) Changing height of fuel tank; 4) Different glow plugs and prop; 5) Complete disassembly, cleaning and gaskets.

Perhaps a new carburetor will help, but I'm not too optomistic. I'd certainly appreciate your opinion before I give up completely.

Yours Truly,
Michael Auger
Coon Rapids, Minn.

I doubt very much if replacing the carburetor is going to help any, Mike. Providing, of course, that your carburetor is not worn so badly that it is leaking air. I would guess that your problem is caused by the tank either being mounted too low or too far from the engine. You mention using a home brew equivalent to K & B 100. I have heard this statement many times and in many instances the only similarity is that they both contain alcohol, oil, and nitro-methane. Be sure your home brew contains 22% castor oil as lack of lubrication could be the cause of your problem also. A third cause could be using too much propeller on the engine. You should be using a 11-6 prop. I have seen many instances where fliers would over-prop the engine just because they happened to have an 11-7 or 11-8 handy. The final thing that could cause your problem would be a bind or something tight within the engine itself. Was the engine ever involved in a crash? If so, this could also be the cause of your trouble.

Dear Mr. Lee:

Other Wankel owners might benefit by my experience. Hand starting got me nowhere. It sometimes took me a half hour to just start the blame thing. I wrote to the manufacturer and got two extra springs for each tip seal. I installed these (each tip seal now has four springs). I noticed that the propeller drive hub looks a lot like a boat flywheel, so I took out my trusty starting lanyard, primed the engine, took about 4 turns around the drive hub and pulled. Vrooom! It started first time! I also noticed that if I injected plain oil in the intake while the engine was running, the rpm increased considerably. I will now use fuel with at least 30% oil. Let me add that this engine only had about 1/2 to 1 hour running time – brand new. Keep up your Engine Clinic, it is the first thing I read when my magazine is delivered.

Sincerely,
Francis Acampora
Peekskill, N.Y.

Wankels can be pretty balky to hand start although I have seen a few that will hand start readily. However, the majority seem to require a mechanical means of starting – namely an electric starter. Pull starting by a cord might be an easy solution as this is the method fellows use for starting boat engines all the time. However, in the case of an airplane, you are liable to give a hard pull one of these times and watch the engine go flying across the field unless you have a really strong nose on your particular airplane. I would prefer an electric starter, myself.

I don't really recommend adding the extra springs and increasing the pressure on the tip seals By doing this you are also increasing the friction and drag. This is why increasing the oil increased the rpm of the engine. You were reducing the extra drag imposed by the extra tension of the tip seals.

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R/C MODELER OF ISRAEL

from page 68

and fun, could turn into a day of tragedy and mourning. Sure we are strict, but we have all the reason in the world to be. Apart from the reasons previously given, there are those of finance. Our equipment is very expensive; you see our duties are as high as 185%. Just to give you a sample of what I am speaking about, here are some prices:

1 set of Du-Bro wheels, 30.-IL @ $7.00
1 roll MonoKote, 70. – IL = $17.00
1 set wings, 12. – IL = $3.00
1 pushrod & clevis, 10. – IL = $2.50

These are just samples, so how can you live with prices like these? Thus we, by being strict and cautious, save not only lives, but expensive equipment, as well.

Contests are held regularly and started in 1970. Our top men are Naftaly Horowich, Ezra Baban, Nisim Eshkenazi, Shlomo Barack, Peretz Fishbein. I should like to add that we are hoping to send this year's champion to the World Championships, if he makes the required number of points.

The accompanying photos were taken by my son, who is a "shutterbug," we need those too, remember? I shall keep you informed from this part of the world on any new events and would like to take this opportunity to invite all RCM readers who may find their way to Israel to come and fly with us. We will love to have you. Remember that we are known for our good beaches and gorgeous . . . flying weather. □

KRAFT WINGMASTER

from page 48

gained by substituting woods other than balsa wherever possible.

The model, as illustrated in RCM photographs, should not require more than 6 hours to complete and, in fact, our two prototypes each required less than 5 hours. The Wingmaster may also be modified extensively without a noticeable loss of performance. As mentioned in the Kraft catalog, they encourage experienced modelers to "customize" their models by, perhaps, adding a canopy or engine cowl to the basic assembly. Offering the necessary simplicity of construction and proven flight performance for the beginner, and the versatility demanded by the experienced flyer, the Wingmaster is capable of satisfying virtually all modeling desires.

Originally designed to promote radio controlled combat flying, the Wingmaster has also inspired other activities such as class pylon racing, balloon busts, team flying, and other fun-fly events all of which have become more intriguing with these low investment aircraft.

Quite simply, the Wingmaster consists of a foam core flying wing into which cutouts are made for either a two channel "brick" proportional system using the new Kraft elevon linkage, or a conventional 2 or 3 channel proportional system utilizing conventional ailerons, elevator, and throttle control, as desired. The wing is covered with pre-cut cardboard provided in the kit using 3M 77 spray cement. The "fuselage" is a hardwood block that has been pre-cut to proper size for a .40 engine and with the necessary cutout for gluing with epoxy to the cardboard covered foam core. The wing tips are pre-cut from thick plywood to which the main landing gears are mounted utilizing Banner 5/32" axles. The main nose gear is provided in the kit and uses the "fuselage" itself as a bearing. The fuel tank simply mounts on the outside of the "fuselage" slab.

On our original prototype we covered the entire aircraft with Solarfilm although one can of spray paint is all that is necessary since you really couldn't make this aircraft "pretty" if you tried. It is not intended for that purpose and is designed as a high performance fun type model for all around sport flying. It is exactly that, builds rapidly, is quite damage resistant compared to a conventional balsa construction, and flies extremely well through all of the maneuvers. The wing span of the Wingmaster is 56" with an all up weight of 4-6 lbs. Power is from .40 to .60 and it is designed for two or three channel operation. Although not recommended by the manufacturer specifically for use by beginners, it would make an excellent club trainer due to its rugged construction and fast building time and easy "repairability."

The Wingmaster by Kraft Systems, Inc., is priced at $29.95 and has been Tested and is Approved and Recommended by RCM. □

HI-STARTS

from page 46

gently. We recommend that you wash and powder the rubber at least once or twice during the flying season, even it it does not feel gritty or dirty.

When laying out the rubber before flying be sure that you remove any loops or knots before launching. When winding up after flying, wrap around your hand and elbow to maintain smooth, even loops. Twist the hank once and fold back to make a smaller bundle, then drop into the container. Don't squeeze or jam the tubing into the can.

TOWLINE: The line provided with your Hi-Start is 400 feet of 30 pound test nylon monofilament, and should last at least through an entire season's flying. Be careful to avoid knotting the line during use, as the knots will weaken the line and cause premature breakage. Rewind the line evenly after use using care to avoid snarling or throwing loops in the line.

Occasional breaks can be tied together using the Blood Knot shown in Figure 1. If the line breaks frequently then you may wish to replace it. Replace with 40 or 50 pound test monofilament. This will reduce the

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HI-STARTS

from page 78

altitude slightly on smaller models due to increased line drag. Conversely using 10 or 20 pound test line will give greater altitude if you fly small models exclusively. Inspect the line each time you use it and cut out and retie any frayed sections.

GENERAL

Inspect the fittings and rings and all knots occasionally to be sure that they are sound. A drop or two of oil on the reel hub will make line reeling easier. If the line and chute get wet while flying, dry thoroughly before storing in the container.

Replacement surgical tubing and/or launch chutes are available from your local hobby dealer. Other parts and materials can be obtained from a sporting goods or hardware store in many areas, or by writing to Airtronics, P.O. Box 132, Sierra Madre, California 91024.

BASIC SAILPLANE DESIGN

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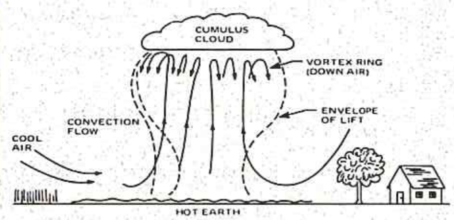
Since thermal size is a function of height above ground, the launch height does much to determine what kind of sailplane will perform best. Consider the Cumulus, for example, an outstanding performer at major contests using 1000' electric-winch towlines. At the altitudes achieved, the lift can be strong and the thermals can be fast, and the plane's superior high-speed performance (mine has 11 oz/sq. ft. loading, flies at a minimum speed of 27 ft./sec.) stabilizes it in winds which might upset a lesser machine's glide path or blow it out of lift. But in short-line, Hi-Start flying, the Cumulus can't stay with a tighter-turning machine which can ride any puff of lift, e.g. the 72" Windward.

To illustrate the problems involved in sticking with a thermal, let's look at the well-known diagram of a typical thermal:



Now the lift will get wider and stronger as you get higher, with very little lift below 150 feet, and a rapid increase at around the 400 foot level. At least that's what the limited data we have seems to say. At the altitude at which full-size sailplanes fly, rates of climb of from 2 to 5 feet per second over and above the sailplane's normal 2 ft./sec. sink rate are common, but not at low altitudes. Anyhow, the lift goes up more or less as shown, and it drifts with the wind. This means that if a thermal is 200 ft. in diameter and is being blown by a 10 mph wind, it will completely pass over a given spot in 13.6 seconds! Thus, it is very important to be willing to drift downwind as you circle. Watch any hawk or industrial smoke plumes for some ideas on how rising-in works. Or, take

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a soap bubble blower to the field with you. I won't dwell on the possible side benefits of having a bubble-blower with you.

One last comment about turning and altitude loss. In the speed events (which I believe are a key element in sailplane contests), the best strategy is to make your turns at an angle of bank of 45°. Even though the increased angle of bank causes you to lose altitude fast, the turn is over with quickly and much less kinetic energy is dissipated (see Figure III). At higher angles the plane stops flying; at lower angles the course is needlessly wide. □

SCRATCH BUILDING MODEL SAIL YACHTS

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filed smooth. Any gaps between the bulb and the fin should be filled too at this time as well as forming a small fillet on top of the bulb.

The lead can now be sanded lightly (don't breath in too deeply!) and should be prime-coated. I use Krylon primer in spray cans which is very easy to apply and will not run.

The deck can be left clear finished or be painted to match the hull color or any other color as is the case with the hull. Gone are the days in which a yacht hull as well as the sails were white. What's wrong with a pink hull and red sails? Become an artist rather than an imitator – be creative!

Rigging the boat is perhaps the most critical step in ensuring good performance. The correct position and angle of mast, the proper setting of the sails are a few of the factors involved. An incorrect mast location could have the effect equivalent to mounting the engine in your plane at 10 degrees up and 10 degrees left! Therefore, rigging details will be given separately for the 36/600 and the 50/800 boats.

36/600 RIGGING

The spars (term used to describe the mast, main boom and jib boom) are made from 3/8" diameter thin wall aluminum tubing. You will need 6' in length. Locating them may be a problem in some areas, however, a quick check in the yellow pages should yield the proper source. Used TV antennas are a good source as well as hardware and surplus stores. When everything else fails, we will show you an alternative method, but remember aluminum is better and much easier to work with!

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Cut the tubing to provide you with the three spars: a 47½" mast, a 14" main boom and a 10½" jib boom. One advantage to using aluminum for a mast this size is the fact that a minimum amount of standing rigging is required – in our case we need only a fore stay and a pair of shrouds.

Starting with the mast, mark the locations of all fittings required. Starting from the top we have a length of 1/8" O.D. tubing which is epoxied into a hole through the mast. Through this tubing we later thread the main halyard, a length of line that keeps the main sail where it belongs!

Use a sharp X-Acto blade and fine sandpaper to remove all the burrs at both ends of the brass tube.

The next fitting is the upper mast band and associated components. Use a .020 brass formed around a 3/8"

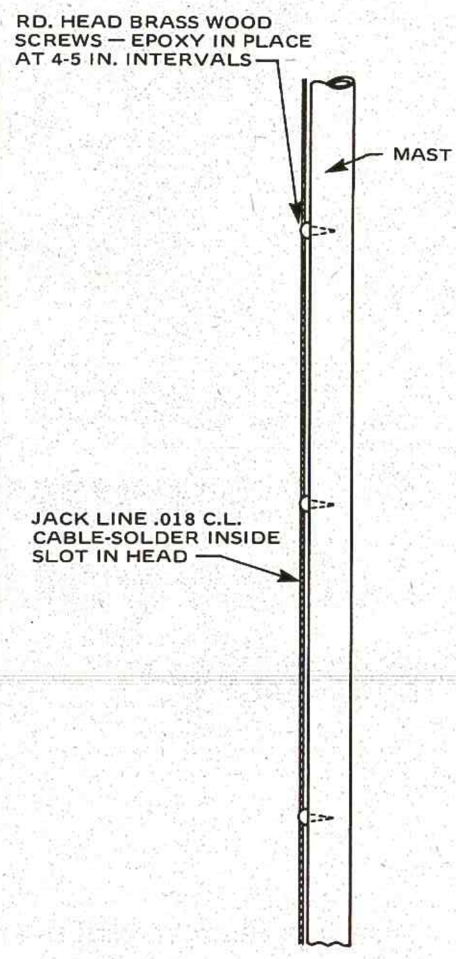

FIGURE 4. JACK LINE INSTALLATION

rod. Cut the triangular piece from .040" brass and drill the pivot hole in both parts. Use a small screw (0-80 or 1-72) and nut to assemble. Slide the assembly into position and epoxy it to the mast. Using a 1/16" drill, drill the holes for the shrouds screw eyes. Clean the surface and solder the eyes to the brass band – do a good job!

The gooseneck is next. I am using commercial units made by A.J. Fisher, Inc., but there is no reason why you could not make it yourself. Disengage the two parts by removing the small ring in the pin. Some re-forming may be necessary to the mast band so it will fit around the mast. Make sure the gooseneck is mounted exactly opposite the upper band triangle, which is the front side of the mast. Epoxy the band and, when the epoxy dries, drill small pilot holes through the mast and use small round head, self-tap screws as reinforcements.

At the heel of the mast, fit a hardwood dowel into which you have pressed a short length of 1/8" diameter brass rod. Drill a 1/16" hole at the location shown and screw in the vang eye. Use epoxy to ensure a durable joint between all the parts.

The jack line is a length of .018" control line cable stretched along the back side of the mast. It is used to prevent the front edge of the sail (the luff) from pulling away from the mast. Small dress hooks on the luff of the sail are hooked to the jack line thus it is important that it will be attached as close as possible to the mast. An almost universal method is to use small brass screws which are threaded into the mast and then to solder the cable in the slots at the screws heads. Small cotter pins can be used instead and these can be epoxied in place, the cable being threaded through. Or, if you are the real lazy type, regular sticky tape can be used at regular intervals or any combination of fastening you can think of! (Figure 4.)

With the mast out of the way, you can start on the main boom. The gooseneck straps are epoxied to the tubing and small screws are used for additional strength. The vang eye and the sheet eye are threaded and epoxied in place. Cut a slot at the rear of the boom and epoxy the pre-drilled outhaul strip. Treat the jib boom in a similar way, making sure all parts are firmly epoxied.

The spars can now be coated with a clear protective coating to prevent oxidation, especially if you plan to sail in salt water. I use Krylon crystal clear acrylic No. 1303, but any other good clear (or colored) spray coat can be used. In the future, I am planning to use some apple candy type finish – just to be different.

If you prefer wood spars or cannot locate aluminum tubing not all is lost! Your nearest lumber yard or hardware store carry molding strips which make excellent spars. Choose a straight grain, flat strips 5/16" or 3/8" thick and 3/4" wide. Again, you will need 6' for your mast and booms.

The mast which is 47½" long can be tapered slightly or can be left straight. Round the corners using coarse sandpaper or a block planer. Varnish or clear dope before proceeding with the fittings. Mark all fittings locations and use small screw eyes, threaded and epoxied into the wood. The heel pin can be made from a brass wood screw, the head being removed after it has been screwed in. For the jack line, use the small round head screws method or tape.

The main and jib boom can be left straight but will look much better if tapered. Use the same size wood (3/8" x 3/4"). Locate a point about 1/3 the length of the boom. From that point taper in both directions. The short side should taper to approximately 1/2", the long end to 3/8". Round all corners as before. Mount the gooseneck to the 1/2" end and install all screw eyes per print. Do the same to the jib boom where the staggered fittings will be at the 1/2" end.

Before erecting the mast, a few simple fittings will have to be made. Chain plates – the metal strips which hook to the shrouds – are cut and mounted at their designed location. Mount them temporarily by the top screw only, do not drill for the bottom one yet. A pad eye for the jib boom should be epoxied to the fore deck and a mast step made per print. The mast step should be fixed by the use of two small wood screws. Do not epoxy it as it might be necessary to move it later on. If your spars are made out of wood, you will also need a small eye mount, as far aft as you can, for the back stay. Use .018" control line cable for your standing rigging. Short length of 1/16" O.D. brass tubing will be used for seizing. (Figure 5.)

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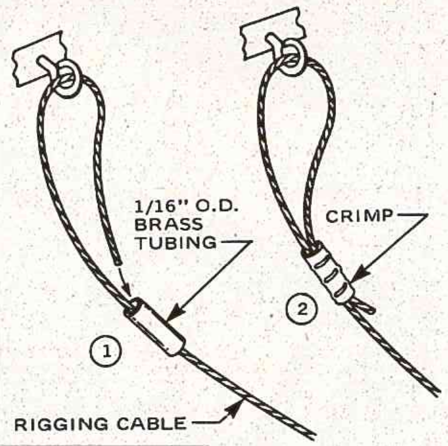

FIGURE 5. SEIZING THE CABLES

Starting from the upper mast band make the two shrouds and a jib stay. The jib stay is attached to the front hole in the triangular plate. Attach a fishing swivel to the bottom of the jib boom and hook it to the pad eye. Holding the mast in a vertical position, thread the jib stay through the foremost fitting in the jib boom. Using your third hand (?) hold the jib boom in a horizontal position and seize the cable in place. The principle is that of a lever arm. The jib stay tries to pull

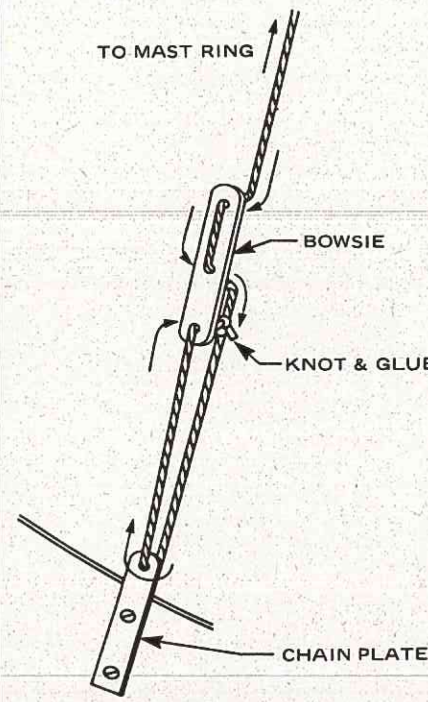

FIGURE 6. RIGGING OF CORD SHROUDS USING A BOWSIE

the front end up, the sail will try to pull the rear end up and, in the meantime, everything is going to be nice and tight. Install the two shrouds turnbuckles to the chain plates and run the threads half the way out. Connect the two shrouds as before and there you have it. The mast, of course, will have a tendency to lean back until the jib is installed. If you wish, you can have an adjustable jib stay as well as a back stay but the system described so far is the most common.

Again, if you cannot find turnbuckles, you can substitute a length of cord and a plastic piece called Bowsie (Figure 6). The installation details are self-explanatory.

50/800 RIGGING

The 50/800 boat with its 6' tall mast requires some extra design considerations. No longer can we expect the mast top to carry the sail load without additional bracing in the shape of a jenny strut and its associated components. If we plan on using a wooden mast spreader bar, an additional set of shrouds will be required, so back to work!

For the 50/800 I have chosen a combination of an aluminum mast and wooden main and jib boom. The booms are constructed in the same manner as described before. The mast is a 72" long, ½" diameter aluminum tube. Following the procedure described before, mark the location of all fittings, starting from the top. The mast top fitting is a piece of .040" brass, cut and drilled per the plan. Cut the short rectangular slot at the front of the mast and the long slot at the rear. Insert the mast head fitting and epoxy in place.

The jenny strut is available commercially from A.J. Fisher or, as before, you can make your own. Locate the position of the mast band and epoxy to the mast, reinforced by two small self-tapping screws. The shroud tangs are made from ¼" brass strip or you can use shoulder cleats, and are fastened to the mast by two 1-72 bolts and nuts. The anchor plate for the top mast rigging is made out of .040" brass and fastened to the mast the same way as the shroud tangs. Before installing it, connect the split rings for the turnbuckles. Further down the mast the gooseneck, the vang eye, and the heel fitting are fitted the same as in the smaller boat. The jack line follows and here you might consider fitting a turnbuckle to it to make sure it is tight.

If you decided to use a wooden mast you will need a set of lower shrouds and a spreader. Its location is half way up the mast and it is a 10" long, 1/8" diameter brass tube. Drill a hole through the mast, fit the spreader through, and solder two small washers on both sides. Apply a small amount of epoxy to the joint. Small cotter pins are now soldered into the ends making sure the opening is vertical.

The deck fittings come next and, again, fit the chain plates temporarily. Install the jib pad eye and make sure it is anchored firmly in place. Mount the mast step and the back stay pad eye.

You are now ready for the top mast rigging. Slide a short length of seizing onto the cable and thread through the hole at the mast head fitting forming a small loop and back into the seizing. The two ends should be long enough to be passed through the jenny strut and reach the turnbuckles attached to the anchor plate. Crimp the seizing using a small pair of pliers; attach the ends to the turnbuckles and tighten. Make sure you don't bend the mast while so doing. The jenny strut and

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SCRATCH BUILDING MODEL SAIL YACHTS

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rigging is designed to take the loads applied by the back stay and the main sail, so final adjustment will have to be carried out after these are installed. The fore stay, which should be adjustable for this model, the shrouds, and the back stay are now connected to the mast. The mast is now stepped and all rigging connected. The mast should be vertical viewing from the front (or rear) and have a slight rake backward.

(to be continued)

PLASTICS: SHOW AND TELL

from page 39

on a thermoplastic A.R.F., or to make some parts for your precious birds out of plastics.

You say, "I want more for my money?" O.K. Next month we will recap this series and provide you with a chart for handy reference.

Until we meet again, E = MC □

SOARCRAFT LIBELLE

from page 38

be a starting point. Several trial wings have been built and attached to the prototype fiberglass fuselages and the design has been refined to a successful completion.

The Soarcraft Libelle kit consists of a beautifully finished fiberglass fuselage, hand selected and matched balsa wood, pre-bent wing rods, all necessary hardware, and complete instructions including many construction photos, full size wing plans and complete templates for the all flying stab, vertical fin, and root rib drilling templates.

The Soarcraft Libelle can virtually be built in one weekend of solid building time. The result is one of the most beautiful scale sailplanes we have had the pleasure of building – and one on which the emphasis is high performance flying characteristics. We predict that you'll be hearing a great deal more about the Soarcraft Libelle in the coming months since it is sure to be a top contender in the contest circuit. In addition, it is an excellent sailplane for the experienced R/C sailplane pilot. Priced at $59.95 direct from Soarcraft, this kit has been thoroughly Tested and is Approved and Recommended by RCM. □

PRACTICAL AERODYNAMICS

from page 35

the respective wing but in a favorable direction. Spoilers are hinged panels on the upper surfaces of the wings interconnected similarly to ailerons; that is, when one is up the other is down (flush with the upper surface of the wing). In the neutral position they are both down. Raising the left spoiler (Figure 10) causes a reduced lift across the left wing, lowering it, and an increased drag causing the airplane to yaw to the left. This yaw is in the direction of the applied spoiler and is called favorable yaw. Spoilers are a very efficient means of roll control; however, they cannot be used in an inverted position.

Next month we'll discuss the secondary flight controls and power plant. Until then – safe flying. □

KAVAN JET RANGER

from page 27

cranks and the swash plate (95mm) seemed to be too long. It is our opinion that these should be 85mm center to center. Further, the link between the swash plate and the stabilizer bar mixing lever (160mm) would appear to require shortening to 150-155mm center to center. These are the ranges where ours ended up, but check before cutting.

A final adjustment and balancing of the main rotor head and blades will about wrap up the Jet Ranger assembly.

Kavan has supplied fixtures and weights for balancing and aligning the main rotor. We begin by balancing the blades. A small metal plate with a serrated edge is provided. This is clamped in a vise, with the serrated edge up and level. Looking down on the blade, set it on the plate so that it angles across the plate at about 45 degrees. Work the blade back and forth along its length until it will balance horizontally. At this point, press the blade onto the plate so that the edge marks a line on the blade. Now rotate the blade 45 degrees in the opposite direction (90 degrees to original position) and again balance and mark. The two marks will form an "X" on the bottom of the blade. The center of the "X" is the blade's C.G. Repeat the procedure for the other blade. The blades should be weighed, and the lighter blade noted. Weight is added to the lighter blade, at either, or both, ends until the C.G. of both blades is at the same location, and the blades are of equal weight. It sounds complicated, but the instructions are clear, and the results are a smooooth running rotor.

After the blades are in balance, they should be covered with the covering supplied (or MonoKote), and installed on the rotor head. The rotor head alignment fixture is attached to the edge of your bench or table, and the rotor head installed. The blades are leveled by means of turnbuckles and a level provided. A small slit is cut into each blade tip, 17mm from the leading edge, and a thread is hooked into one, then stretched across the head and into the tip of the other blade. There are four blade adjustments and balancing screws, two in each blade holder. These are adjusted against the blade tongues until the line runs directly over the center of the rotor hub, and the blade mounting screws, thus assuring a lead-lag angle of 0 degrees. The turnbuckles holding the pitch control arms are now removed, and the collars on the adjustment screws are moved (or removed) until the blades balance along their length. At this point, the main rotor should be in perfect balance, unless thrown off by the blade covering. If there is any unbalance at this point, it can be corrected by adding a small screw into the tip of the light blade.

Kavan suggests the addition of two small plywood plates, one in each blade tip, as an aid in adjusting blade tracking. These plates, which are set edgewise, are coated with different colored chalk, and allowed to tick against a stretched piece of masking tape. Position of the color line traces allows positive track adjustment.

More about this next month, when we will fly the Jet Ranger.

The Kavan Jet Ranger is currently the most sophisticated helicopter kit available. It is scaled at 1" =6.4", with a main rotor span of 63" and a fuselage length of 57". The ship has an all up weight of 10 pounds (Kavan spec.) to about 12 pounds, depending a lot on finish and detailing. The Jet Ranger kit is available. Check your dealer or contact Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817, for the current price.

With every kit there is a post card which must be returned to the manufacturer. The purpose of this card is to keep you informed of any changes and updates affecting your Jet Ranger kit. If you have purchased a kit and have not returned the card, please do so at your earliest convenience. □

MACH VIII

from page 24

to sheet the cores in the blocks they were cut from. If you do it out of the blocks, it's very easy to distort the airfoil shape, and then you've really got problems. After you sheet the cores, glue them together with a good grade of epoxy glue and glass the center section. There's no need for any spars in the wing or stab. In a plane this size, the glass cloth is all that's necessary. Add the wing tips, block in the center section, add your linkages and your wing is finished.

TAIL GROUP:

Fasten the wing to the fuselage using your favorite method. Now, line up your stabilizer so it sets true on the fuselage, making sure the distance from the stab tip to the wing tip is equal on both sides. Now fasten it down with generous amounts of epoxy. Next, the fin is butt glued to the top of the stabilizer and the dorsal fin which runs back from the canopy is added.

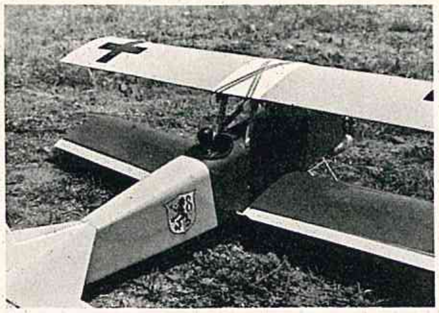
CONTROL SURFACES:

Now that you've built yourself a very light, strong airplane, don't skimp on the control surfaces. They're small, so you can use good hard balsa, especially on the ailerons. By using hard balsa, the flutter which sometimes occurs during high speed runs can be eliminated. Also, don't cheat on the shaping – everything has a purpose, so stick to the size and shapes shown on the plans. A razor plane is an extremely helpful tool to have for this.

FLYING:

Now comes the best part. You've got your ship all finished and your travels set up as follows: Ailerons ¼" each way measured at the root; elevator 3/8" each way; and rudder about 1" each way. On your take-off run give it full throttle and hold about 3 or 4 degrees back stick. When it reaches the right speed, it should lift off gently without the usual sharp "break." Climb out and split-S across the field and check your trims. If you've built it true, it should track straight ahead with no tendency to climb or dive. Turn it around and try some loops – don't forget to ease up on the stick at the tops to keep them round. If your engine is really honking, there should be no significant speed change either entering or recovering from the loops. Get up a good head of steam and try some rolls. If everything's set up right, only a very slight forward pressure will be required in the inverted position. By now you'll have the hang of flying it and the rest should all fall into place. Soon, you'll discover that 4-point rolls and Figure M's aren't that hard after all! Pretty soon, when people rib you about your "little" airplane, you'll be able to point to your trophies and shut them right up!

Good flying . . . □



FOKKER D VII

from page 20

glue. Again, do not install the cabane struts until the fuselage has been entirely covered and is entirely finished.

WINGS:

The wings are very simple to build, and can both be built simultaneously if you have a drawing board or working board that has any size to it at all. Glue all of the sheets of balsa together, two pieces 3" x 1/16" x 36" for the top of each wing and two pieces the same size for the bottom of each wing, making a total of 8 sheets. Cut out all of the ribs required for the top and bottom wings and remember that, on the bottom wings, you are using two 3/16" ribs in the center section. Stack all of the ribs together and sand them so that they are all the same contour section. Cut the notches in the center bay ribs for the single spar to be used in each wing. Now, take two pieces of 3" x 1/16" x 36" material that you have glued together and pin them down flat on the drawing board, forming the bottom of the wing. Make the leading edge piece from a piece of 5/16" or 3/8" square balsa plus a 1/16" x 1/4" balsa glued to the back side of the leading edge. When this is dry, glue it on top of the leading edge and pin in place and, if you are making the lower wing, pin the trailing edge ¼" square piece in place. Next, glue each rib in location, remembering that they are 3" on center. Before you glue the ribs in place, put the 18" long spar in place followed by the ribs. Next, take the top sheeting, glue it, and wrap it over and pin it down well so that when it dries it will be entirely covered.

Next, build the top wing in the same manner except that you do not use the ¼" square trailing edge piece. Let the two pieces of 1/16" sheet come together at the back to make the trailing edge of the wing. When both wings are dry remove them from your building board. Take the top wing and glue the tip blocks to it. Cut the bottom wing using a sharp razor blade, then block up each half ¾" and sand a bevel into the center rib of each wing tip. Next, glue the center section together on the bottom wing, blocking it up ¾" under each wing tip. Use epoxy glue again for this. When this is dry wrap the center section of both the top wing and bottom wing with a 3" wide band of fiberglass or Silastic. This is done more as a protection from rubber bands than as a strength factor, however, in the case of the bottom wing this is the only thing that is needed to hold the two wing sections together. A 1/16" plywood dihedral brace is added to the bottom wing only if you plan to bolt the wing in place and if you plan to drill a hole through there for the wing hold-down dowel. When every thing is dry, sand the wings to shape and set them aside for covering.

TAIL SURFACES:

The tail surfaces are made of 3/16" soft balsa sheet and are very simple to put together. When they are glued and dry, sand them to shape. Use a soft piece of coat hanger wire to make the U shaped connector between the two elevators.

LANDING GEAR:

When I first built the aircraft I used a landing gear made up of 1/8" wire as shown on the plans, however, in browsing through one of the local hobby shops, I came across the very fine landing gear distributed by World Engines, called an I.M. Products landing gear. The original landing gear was replaced by the I.M. landing gear and I think that if you can obtain this commercial unit you will be very happy with it. The tail wheel is not scale, obviously, but makes for much better ground handling as well as the fact that you don't have to listen to the horrible scraping sound of a wild tail gear going across pavement!

COVERING:

The entire aircraft was covered with MonoKote. The vertical tail section was covered in white while the remainder of the aircraft was covered in red. A Sealectric sealing iron was used to seal all the edges and a Polytherm heat gun was used to shrink the MonoKote in place. This makes for a very simple and beautiful covering and is really the quickest way to finish off a small airplane like this.

RADIO GEAR:

The original aircraft used an EK Products Champion radio with small servos since these fit very nicely into the aircraft and leave lots of room inside. Don's prototype used the new MRC propo system. You can use Golden 'N Rod type pushrods or balsa and wire type pushrods at your option. Other items used were EK hinges, Williams Bros. 10½" scale wheels, and a 4 oz. Sullivan tank. There's plenty of room in the nose for this tank as well as plenty of room for the battery. Be sure to balance your aircraft where shown on the drawing. If you need a little additional nose weight you can use soft lead plumbers wool stuffed up ahead of the battery pack. However, if you keep all of your radio equipment fairly well forward you shouldn't have to add any additional weight to the nose.

You may either bolt the wings in place or use rubber bands as I did on the original. I am thinking about going back and modifying the original to take bolted application of the wings, but I haven't done so as yet. The only reason for so doing is it would make a much neater looking airplane.

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FOKKER D VII

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FLYING:

When your aircraft is complete, pick a day when there is not very much wind blowing. Even though I have tested to my own satisfaction that the D7 can handle a very large amount of wind it's much easier on your nerves if you pick a nice calm day in which to make your test flights. Be sure that both wings have no incidence in them since they should be at 0-0. The engine should have at least 2 degrees down and right thrust. The aircraft will track very nicely on its wide landing gear, and has no desire to tip over on its nose nor is it the least bit prone to ground loop. Start your engine and taxi out to the take-off, advance your throttle, and let the aircraft track out across the runway and then slowly lift it into the air. I think you're in for one of the best times that you'll ever have flying a small airplane.

Good luck and good flying. ☐

SUNDAY FLIER

from page 16

"O.K. Naturally, we can always use more, but what with individual contributions which some of the fellows are making when they reach another level, plus the tournament income and income from decal sales, we're at least in the black."

How about club contributions? Le didn't know the answer to that and referred me to Hugh Stock, treasurer. Hugh said that only two clubs were regularly coming through every month in accordance with the idea which I suggested some time ago, namely that at each club meeting the entry fee include fifty cents for the LSF. So, how about it all you sailplane clubs? The LSF is right up front in organizing R/C sailplane standards throughout the world, and also is active in maintaining the right for reasonable use of the air at all altitudes for R/C sailplane enthusiasts. So get your club to support the LSF through regular contributions from your contest entry fees. A little goes a long way, if there are a lot of guys giving a little.

And I've just received word from Le Gray that the 1973 LSF Soaring Tournament site has been selected and approved – and it sounds almost ideal. The location will be the Oxnard Air Force Base, just outside Oxnard, California. For all practical purposes the base is inactive insofar as full-scale aircraft operations are concerned, so the tournament can be conducted using the runways for winch launches and precision landings. Now, I know many of you don't like the idea of scraping up the bottom of your sailplane by skidding along on asphalt, but let me tell you a little secret; you can not only save the bottom of your sailplane, but also get better accuracy in your precision landings, simply by bringing some wing seating tape along and putting a strip on the bottom of your model – use the ½" wide stuff. When you approach the spot, hold off until you're almost there, then apply a very gentle down action. Your plane will touch the asphalt, the wing seating tape will act as a brake, at the same time protecting your fuselage, and you find that you can, with a little practice, vary the braking action by varying the down pressure and improve your landing accuracy. Sure, you'll wear off the tape, but it's easy to replace – and could help you win the Precision Event while protecting your fuselage. Don't let the asphalt runway bother you – use it to your advantage instead!

Two events will be flown, with three flights in each event to count. The Precision Event will be a two minute spot landing. The other event will be a sort of combination Speed and Distance Event, which will require thermal assistance for completion. It will work this way; at the time of release from the winch launch, you will have one minute in which to make a decision whether you want to go for Precision or the Speed-Distance flight. So you declare for the latter. Then you proceed upwind from the release point to a pre-determined pylon location, where an official will signify that you have passed the point; then you turn and go downwind to another pylon, where another official signifies that you've passed the point. You will then turn and come back upwind to the finish line, which will be some five hundred feet downwind of the winch launching area (to avoid interference with winch launches in progress) and between two markers about two hundred feet apart. The whole distance traversed will be one mile, so you can see that some thermal assistance will be required – unless you get a winch tow to about six hundred feet, have a glide ratio of better than 10 to 1, and there's no wind. And, that's not likely to occur.

The option of the contestant to select the task after one minute from release is an interesting variation, and should present quite a challenge. Of course, if you opt to do the Precision Event on the first three flights, because the conditions look right, then the remaining three flights naturally have to be the Speed-Distance. And you have all of the intermediate permutations and combinations, so decisions will be critical.

One of the decisions you will be faced with before that minute after release will be "What voltage shall I use on the winch?" You will have a choice of six or twelve volts – nothing in between. So how do you decide? That will depend upon the airplane you are flying, and the wind conditions. Most sailplanes will go up satisfactorily on six volts, if the wind is a direct headwind. I say most sailplanes; that means those that weigh in around three pounds, even up to three and one half pounds – certainly those that are lighter. Of course, if you have a small, fast job (which might do well in the Distance/Speed Event if it hits a good thermal) you might need twelve volts – not to pull the model up, but just to make it go fast enough to go up.

The big jobs at over four pounds will need the twelve volts, unless the wind is blowing pretty hard against the winch. But, twelve volts may be too much – and under certain circumstances even six volts can be too much. So, what do you do? Well, I'll tell you what I do and you can do it too, if not in the LSF Tournament, then in any event you enter where winches are used. If you're not sure of your own capability (and I don't always trust mine) then get help! There are always good, experienced winch operators at any truly major contest, such as the LSF, and they are more than glad to help. And the thing that the experienced operator can do is pulse the winch so you get just the right amount of pull for your model. Take a guy like

Jerry Wolfram, for example. He's been a "winch boss" in so many meets he can't remember, and he knows just how to get the maximum height out of a winch tow by pulsing the winch switch with his foot so that the model takes fullest advantage of the tow speed and the wind. "Old Twinkletoes" I call him – and whenever I can get him to tow me up, I know I'll get the best there is. But there are others – Rick Walters, Paul Denson, Dan Pruss, John Donelson, just to name a few. They'll be there and if you want help, ask for it. Your old Chief Sunday Flier plans to, you can bet on it, and it's legal, too.

From what I hear, some of you will be planning to come in your motor homes or campers. Fine – but be sure you have a reservation or are self-contained. Unfortunately, there will be no facilities for parking overnight on the base; you can come in for the day, both on Saturday and Sunday, but you can't stay the night.

As of the time of this writing, the central motel for a sort of unofficial headquarters hasn't been named, but there are plenty of motels in the Oxnard area. I would suggest, though, that you get an advance registration. It is a resort area and motels will fill up. In fact, I'm hoping to stay over on Monday and go deep sea fishing. If any of you are fishermen, as well as glider guiders, how about joining me?

As in the past, two classes of competition are planned – Open and Scale. And with the number of contestants expected it's going to be a real achievement to get in all six flights – but it will be done, one way or another. Various thoughts are under consideration – straight flight order, group flight order, "decision winch" and "open winch" option, but the final selection will have to wait until the entries are analyzed.

One thing – due to the number of LSF members, the entry list this year will have to be limited to LSF Level I members or higher. As a result, the sanction from the AMA will require identification of the LSF Tournament as a Class 'B' contest. Don't let that fool you; in this case, that 'B' will stand for the 'Best,' because the LSF is one of the few organizations in the world today in which you just cannot buy a membership – you've got to earn it by performing certain tasks which qualify you for the coveted Level I identification.

Sure hope you can make it – even if only to watch. □

UNDERSTANDING YOUR AIRCRAFT

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unless there is a flow of air over them (as when on the ground on a windless day). Their efficiency is related to the speed of the airflow over them. It is because of this that you have little control over an aircraft which bounces high on landing. There are some maneuvers which are difficult to perform owing to this fact – such as a tail slide, a stalled turn, and entry into a spin. At your highest point of climb, immediately prior to dropping back, your aircraft is completely stationary in the surrounding air.

You have a little airflow over your tail surfaces from a slow running prop, but not enough for adequate control. Your ailerons are useless at this stage. So how do you achieve a stalled turn? You either cheat a little and climb slightly to either side of perpendicular, or open your throttle a little at the top to give you some tail end control – this will also help you with a spin entry.

Cross Wind Take-Offs and Landings

You will have noticed that cross wind take-offs are easier to control **on the ground** than cross wind landings. This is because on take-off at full revs you have adequate tail control provided by the slip stream from the prop, but on landing with throttle closed, as your plane slows down it will tend to weathercock into wind, but there is nothing you can do about this.

Cross wind take-offs are also easier than cross wind landings in another respect. On take-off there is no sideways drift until you are airborne, but when landing, if you head straight down the runway you will be drifting sideways when your wheels touch the ground. This will cause your "into wind" wing to lift, and if the wind is strong enough it will flip your aircraft over sideways.

The answer here is to head a little into wind, so that you are tracking straight down the runway, then at the point of touchdown use a little rudder to point the nose straight down the runway, otherwise you will run off the edge.

Side Slipping

A common fault with beginners when they are coming in to land, is that when they find they are too high, they give down elevator to lose height; but this, of course, increases your speed and achieves nothing. Going round again is the answer here, unless you are experienced enough to side slip. Side slipping is the only satisfactory way of losing height quickly without increasing your speed.

To do this you give left aileron and right rudder (or vice versa) at the same time. If you have given the right amount of each, your aircraft will not turn, and the extra drag set up by the opposing control surfaces will reduce your height rapidly.

Do not attempt this maneuver until you have practiced it quite a few times at a safe height, but be cautious and make sure you straighten out in plenty of time. If you master this maneuver it could prevent damage to your aircraft if you are overshooting during a forced landing.

Ballooning

If your aircraft tends to balloon when landing, this could be because of the geometry of your landing gear. In the normal flying attitude your wings

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have an angle of attack in relation to the air flow. If your aircraft's wings are at, or near this angle when it is resting on its landing gear, your aircraft will want to remain airborne if it is moving above its stalling speed.

There are two ways to overcome this, you can either stall you aircraft onto the ground from just above the surface – this being the correct procedure for aircraft fitted with a tail wheel or skid. If you have a tricycle undercarriage you can reduce your nosewheel height, but make sure your prop has enough ground clearance afterwards.

Wing Balancing

If you wish to perform good aerobatics with the aircraft you are building it is essential that it has good lateral balance (wing tip to wing tip). This should be done before covering the wings, and with **all** of your equipment installed. Probably the easiest way of doing this (assuming your prop shaft is centrally located in the front end of the fuselage) is to suspend your aircraft by two pieces of fine string, one looped around the prop shaft, and the other around the top rudder hinge. If one wing drops you can perhaps move some equipment nearer the lighter wing, or weight the lighter wing as near the tip as possible – where less weight will be required.

If your wings are not balanced, when you loop the heavier wing, having more inertia, will have a greater tendency to resist changes in direction, which will cause your aircraft to twist or skew.

Banking In Turns

If, while flying straight and level, you apply right rudder only, your left wing will rise without any aileron movement and this is because of the fact that the outside wing, when turning, is traveling faster and therefore getting more lift.

Again if, while flying straight and level, you move your aileron control to the left without touching the rudder control, why does the aircraft bank **and turn to the left** instead of just rotating around its axis?

This is because the lift force which is vertical when flying level, is now inclined to the left and will pull the aircraft in that direction. It is because of this fact that when doing a slow roll your aircraft wants to barrel roll – a little down elevator throughout the 360 degrees will help to correct this. This effect is not so noticeable when doing fast rolls because inertia helps to overcome this tendency.

Stability

The inherent stability of an aircraft type is an important consideration when deciding which type of aircraft to build. If you are a novice it is strongly advised that you build a high wing aircraft – this being the most stable type. The fact that most of the weight is below the lift force of the wings, acting as a pendulum to keep the aircraft level. On a low wing aircraft some of the weight is above the lift force, so to counteract undesirable top heaviness, dihedral is invariably introduced into the wing to help with the pendulum effect. The majority of high wing aircraft have no dihedral as it is not usually necessary; this applies, also, to some mid-wing aircraft. It follows from this that although low wing aircraft are less stable, it is their relative instability that makes them easier to aerobat.

On the subject of stability it is important that your Center of Gravity is slightly in front of your center of lift, which is normally about 1/3 of the way back from the leading edge of the wing. (This should be checked when your fuel tank is empty.) The reason for this being – that if your engine cuts, your aircraft will automatically assume a normal angle of glide with hands off the controls, making a forced landing easier to cope with. You will also have no drag from an elevator which is either trying to keep the nose up or down.

For normal landings with engine running, you should always attempt to make your final leg a glide approach with throttle closed; then if your engine does cut at this critical stage, you are never in trouble. □

ENGINE CLINIC

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You did not say if this helped the starting problem or not, but I doubt if it did. The tips are only a small part of the lobe that has to seal. The fit of the lobe between the front and back plates of the case is also very critical and increasing tip seal tension would not help here.

Dear Mr. Lee:

The subject is pusher props. Since the prop, a BD-5, is at the rear and following

the fuselage slip stream, the prop is turning in turbulent air. Should the blade shape be slightly wider at the center section (compared to Top Flite Super "M" 12 x 6) to achieve the same efficiency? Would a higher pitch prop be better? The ship is 3/8th scale, 13 lbs., 10 oz., wing loading 39 oz. Flaps installed, but hadn't planned using them on initial flight. Webra .60, no muffler and I was thinking of carving an 11 x 8 or 12 x 6 pusher prop. What is your opinion on prop selection? I know about reversing the engine, but for design purposes I prefer a reverse pitch prop.

Thanks for your help.

R.J. Milne
Roxboro, Que.

No need to change the blade shape just because the propeller is to be used in pusher configuration. Slip stream over the BD-5 fuselage is not as turbulent as you are probably thinking. In fact, this is one of the reasons the full size aircraft gets its high performance with a low power engine. A standard 11-8 or 12-6 propeller would work fine with no blade alteration required. By reversing the direction of rotation of the engine, stock props could be used. However, there is one major problem that you do not seem to be taking into consideration and that being that in no way is a Webra .60 going to be enough power for a 13 lb., 10 oz. airplane with a 39 oz. per square foot wing loading. Even with an O.S. .80 for power your wing loading is too high and you are going to have a snap rolling terror on your hands. Better get the weight down if you expect to fly the model.

Dear Mr. Lee:

I am trying to get a timer housing for an old O & R .23 ignition engine which I hope to put in an R/C plane or maybe an R/C boat. I understand there is a model engine periodical which has listings of new and old engine parts such as spark plugs, coils, etc. I would appreciate it if you could send me the address of this model engine magazine so I could look into the availability of the housing part.

Thank You,
Robert Haugeto
Newton, New Jersey

Trying to pick up a timer housing for an Ohlsson .23 is going to be pretty rough, Bob. The hobby of old time engine collecting is becoming very popular as is flying the old time free flight models. The Ohlssons are a very popular engine for this event. Hundreds of fellows, myself included, are always looking for parts such as timers, needle valves, and tank assemblies for the old time engines. These are always the parts that are missing. When the glow plug came along the first thing everyone did was to remove the timer assembly and promptly throw it away. Then they quickly discovered that glow fuels dissolved the plastic gas tanks so these went in the trash next.

The model engine periodical you ask about is the Engine Collectors Journal published by Tim Dannels in Denver, Colorado. Tim puts his Journal out on a every other month basis but occasionally there will be an even longer period between publications. A subscription to the Journal costs $4.00 for six issues and the mailing address is P.O. Box 15162, Lakewood, Colorado 80215. The Journal contains a classified section where fellows list engines and parts they have available or engines and parts that they are looking for. For 50 cents you can run an ad in Tim's Journal. However, very seldom will you be able to buy needed parts outright. Most collectors prefer to trade extra parts that they might have for needed parts. Some fellows do specialize in making replica parts, but I know of no one who has the Ohlsson timer housings.

And, incidentally, for you fellows out there who are interested in collecting old time engines, there is a group of fellows called the Model Engine Collectors Association (M.E.C.A.). Membership fee is $5.00 for a year and you send your money to Dick Dwyer, 1837 Flood Drive, San Jose, California 95124. Membership in the organization brings you a monthly bulletin that keeps you informed on happenings with the old time engines and a swap sheet in which members list available parts and engines or engines and parts one is looking for. This swap sheet is usually composed of several pages and considerably more extensive than the classified section of the Engine Collectors Journal. □

FIBERGLASS COWLINGS

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when desired, to obtain side and down thrust by carefully filing one end of the square length as necessary to the desired angle.

The next step is to drill a hole centrally on the front bulkhead then mount the spacer by screwing it on and then bolting on the front plywood ring. This is where the filed angle on the spacer can be set up for side and down thrust. There is also another thin plywood plate that goes between the bulkhead and the spacer, the necessity for which will become apparent later on. The space is then filled in with chunks of scrap balsa and sanded to blend in with the fuselage lines down to the front plywood ring. The entire assembly is then cut loose and removed, leaving the rear plywood plate in place. The unit is then sealed with dope or other sealer of your preference and then covered with a release agent. Mix up a batch of Plaster of Paris after mounting the nose block to a chunk of wood and plaster it well to a thickness of at least 1". Incidentally, I never use a box to contain the plaster – I just splash it on and you will find that it will stick perfectly well.

After the plaster has set, remove the pattern block and place the plaster mold in the oven overnight at a low temperature to dry it out thoroughly. Now, cast a fiberglass skin inside and allow it to set up and harden. Remove the fiberglass cast. Cut the rear plywood off the pattern and carefully trim it to fit inside the fiberglass cowl and then glue it in place. You will now have a cowl that will fit your fuselage perfectly with the side and down thrust angles built in. Mount the engine and then install the unit on the bulkhead using the bolt hole as the locating point. Cut the holes in the cowl and rear plywood to clear the engine (I use a reamer mounted in the lathe or drill press for this operation).

That's the end of a very simple construction sequence. Finally, mount the cowl in the bulkhead with a tight fitting dowel at the top and a screw into the bulkhead at the bottom. You'll find after doing this method only once, that it is one of the simplest and easiest methods for constructing a fiberglass cowl. □

FROM THE SHOP

from page 2

This new fast charge battery was developed by General Electric's Battery Products Section and will be commercially known as Powerup-15. The cells have been specially designed to eliminate the need for expensive cell grading and matching which is a normal requirement for fast charging. In addition, the Powerup-15 batteries permit the use of a charger with a relatively simple control circuit. To prevent damaging the battery while it is being charged at such a fast rate due to overheating or excessive voltage, a new sensing cut-off automatically terminates the fast charge current when either the battery voltage or cell temperature reaches a pre-determined point. If the battery is left on charge more than 15 minutes a lower trickle charge continues to flow into the battery without causing cell damage or loss of performance. In fact, according to G.E.'s section manager, the battery can be left on charge for months without causing cell damage or loss of performance due to the temperature sensor.

The new Powerup-15 batteries have been designed for a multiplicity of uses including garden tools, hobby equipment, small appliances, communications equipment and photographic usage. They will be available in ratings from 100 mAh to 3.5 Ah in all the standard G.E. sealed cylindrical cell sizes. It is our hope here at RCM that our proportional system manufacturers will take note of these new batteries and make them available, either as a standard item on 1974 proportional systems, or if the cost is prohibitive, make them available as an optional accessory.

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Our sincere apologies to Herb Merel for the unintentional omission of his name as the author of "Calculating Incidence Angles" which appeared on page 38 of the July 1973 issue.

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The Pennsylvania Avenue R/C Society of Brooklyn, has been running an All-Scale contest which has been growing steadily each year. In 1973 the Fourth Annual East Coast Scale Championships will again be sponsored by the Pennsylvania Avenue R/C Society of Brooklyn and will be held at Riis Parking Lot in Rockaway, New York, on September 30, 1973. Both cash and trophies will be awarded and for those fliers interested in attending this All-Scale event are invited to contact the Contest Director Joe D'Amico, 9224 Rost Place, Brooklyn, New York 11236, or telephone Joe at Cloverdale 11680.

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Another event of interest to RC'ers is the Third Annual Model Flying Circus and Auction sponsored by the Rockland County R/C Club which will be held at Ripples of Rockland in New York City on October 14, 1973. The main events will be an auction, swap shop, and flying display. For further information on this event you are invited to contact Harvey Landis of the Rockland County R/C Club, 14 Rosemont Drive, New York City, New York 10956. □