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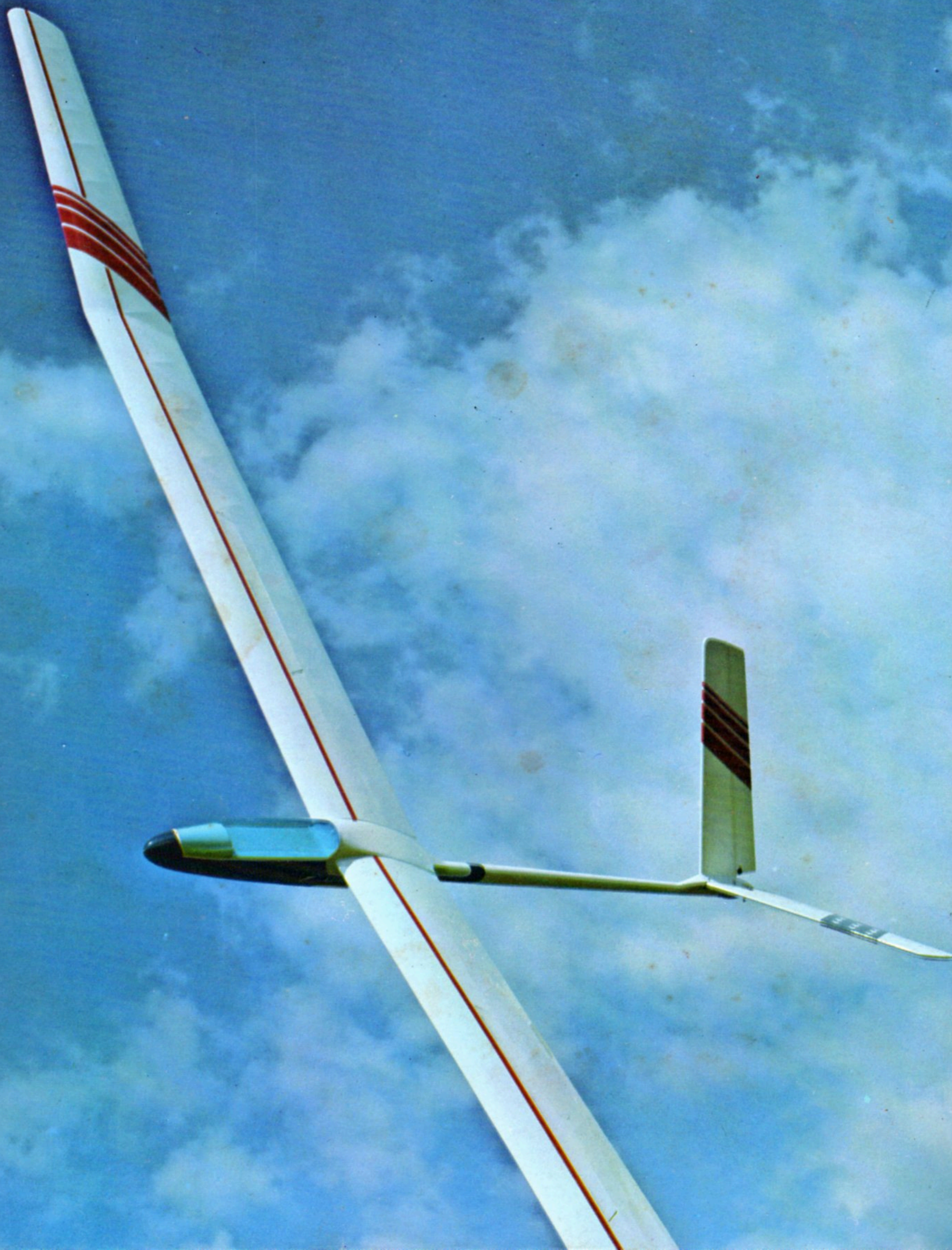

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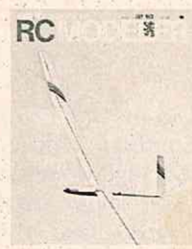

THIS MONTHS COVER

An unusual shot of a magnificent sailplane, the Super Esprit, designed by Lee Renaud and built by John Simone. Ektachrome transparency by Dick Tichenor.

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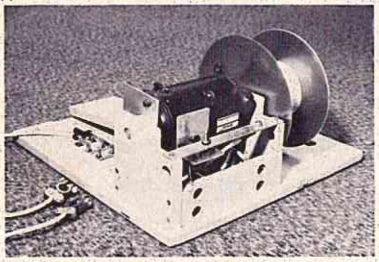
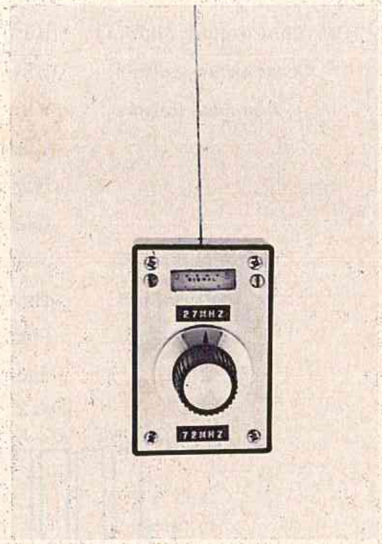
FROM THE SHOP

DON DEWEY

EL BANDITO

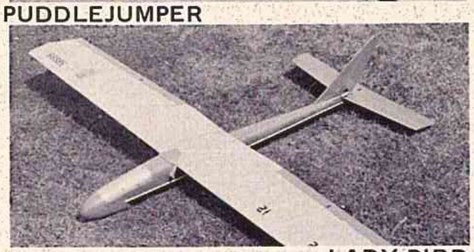
WINCH





FSM

PUDDLEJUMPER



LADY BIRD

This month we're proud to present Fred Reese's "El Bandito," the 1972 Southern California Quarter Midget Champion. This highly modified "Shoestring," is faster than just about anything you've seen in the Quarter Midget category. One of the notable characteristics of last year's high point champion is its phenomenal ability to groove and to turn the pylons without losing altitude. If you're a Quarter Midget enthusiast or, have been thinking of getting into this phase of R/C competition, the "El Bandito" is definitely for you. Fred, a pharmicist by profession, recently sold his home and drug store and, with his lovely wife, is touring the United States for two or three years. During this time Fred will be visiting many of the R/C clubs and flying fields around the country. The motor home Fred is driving is completely equipped with a carrier for his models, field equipment, and building supplies, and even has a custom building board inside! In fact, I was so impressed by Fred's unit, that I traded in my own chassis mount and recently purchased a 25' motor home. So, Fred, wherever you are – maybe we'll see you on the road this summer.

Ken Willard's Puddlejumper is a quickly built seaplane designed around the Midwest Cardinal foam wing and stabilizer. As a matter of fact, you can even use a Model Dynamics "Gryphon" power pod to further speed up construction time. This little machine performs beautifully on water and flies every bit as well in the air. And, for those who like the design but have no access to an aquatic flying field, the Puddlejumper is easily converted to a land plane.

The rest of this month's issue consists of a variety of articles in which we hope you'll be interested. And, if RCM is not presenting what you'd like to see, be sure to fill out the Reader Interest Survey form which appeared in last month's copy of R/C Modeler Magazine. Only if **you** complete this form and let us know your likes and dislikes, can the staff of RCM produce the type of magazine you want to read.

•

Orbit Electronics Corporation, 1641 Kaiser Avenue, Santa Ana, California 92705, has set their Invitational Helicopter Competition for June 29-30, 1973, at Anaheim, California. This meet is to be held in cooperation with the annual MACS show. The competition will take place at La Palma Stadium with top winners being invited to fly an exhibition on Sunday July 1 for the MACS show at the Anaheim Convention Center. The general plan is to schedule events which will show the skill of the contestants in precise maneuvering. Scoring will be objective, based on the time required for control rather than speed for a winning time. Trophies will be awarded for all events and an overall combined winner trophy will be awarded as well.

All events in the Orbit Invitational Helicopter Competition will use a regulation baseball diamond. Pilots must not leave the pitcher's mound, and the helicopters will start and end each event at home plate. Bases will be either landing pads or pylon locations for various tasks. In addition, a series of pylons in the infield will require the helicopter to follow a winding course with and without a load suspended under the Center of Gravity. All ...... **to page 115**

PLASTICS: SHOW AND TELL

PART SIX

BY RAY HANISCO

Upon awakening this morning, my eyes were greeted by a beautiful sunrise. I felt that nothing could exceed the beauty of Mother Nature. Feeling so great, I decided to take a swim in the lagoon.

After swimming around and enjoying the tepid but refreshing water, my eyes were greeted by another beauty, this time in a sarong. I approached her and asked her name. She quickly replied, "My full name is Poly Ethyl Ene." Her voice was like the whisper of the winds. Then as quickly as she spoke, she started to disrobe, unveiling her true form. It was, as all of the other gals we met in our journey, a thermoplastic, and her name is Polyethylene.

Yes, here is a plastic that is being used at a rate of millions of pounds every year, and its use is ever increasing. Polyeth, or P.E., has a background of almost thirty-five years of experience. It did not really start showing its possibilities until after World War II. (That was the "Big One," for those who fought in it.)

Let's take a look at this plastic and see what we can uncover.

Polyethylene is a material that is almost a cousin to Polypropylene when we inspect it without any testing. It has a specific gravity of .91 to .96. This means to us that if it is dropped into water, it will float.

Polyethylene can be obtained in various compositions, such as "Low Density" and "High Density." High Density Polyeth is due to a chemical feature known as "Cross Linking." Do you remember how, in the rubber modified Styrenes, the Butyl aided the plastic in its ability to snap back? Well, in Polyeth, the material kinda' wants to form in layers and has sort of shear planes. Let me explain what a shear plane is.

Suppose you had a stack of typewriter paper. If you lay them on a table, place your hand flat on the stack, and slide the papers apart – you are separating them on their shear planes. This is O.K. in Polyeth for certain applications, but others require the material be more rigid and devoid of these shear planes. So, cross linking is added to give the material that extra "Zip." Let's look at the typewriter paper again. Stack them up again, but this time before putting them back on the table, get out the sewing machine and just randomly sew the paper together. Do it all over the paper, until it is well sewn. Now if you try to separate the papers as you did before, you will find the shear planes are there, but are tied together with the thread. Cross linking is not done in this fashion with Polyethylene, but the results are similar. With the plastic, cross linking is done either by irradiation with high energy electron beams, or through the use of chemical cross linking additives. GAD!, this is interesting!

Low density P.E. scratches fairly easily with your fingernails, if they are as hard as my nails, while high density P.E. is much more resistant.

Polyethylenes are flexible and have good fatigue resistance.

They have excellent chemical resistance as well as being tasteless and odorless.

This material has many uses in our homes as you can observe by the number of food packaging bags.

If you have ever had a fuel tank burst and spray fuel over your electronics, you probably found out quickly that if you had taken the time to place your receiver in one of those plastic sandwich bags you could have saved yourself many problems. (Airborne battery packs should be treated in the same way.)

Testing of this material will be a surprise to some of you. Now, let's get our "X-Acto" knives out again and cut a sliver of the plastic. Oh, Oh, you don't have any Polyeth. Eh? Try the plastic flexible lids you can find on coffee cans, or plastic milk bottles, bleach bottles, and even some refrigerator bowls. Back to testing . . . .

Grip the one end of the sliver in your pliers, hold it over the kitchen sink, and ignite the opposite end of the plastic. The flame will have a blue color with a yellow top. The molten material will have a tendency to drip and the drippings may burn.

Get your sniffer ready – blow out the flame – sniff, and you will find your surprise. It smells like Paraffin or hot candle wax.

Now for the rest of our tests. Take a piece of the Polyeth and drop it. It now has a distinct sound of partially chewed "Beef Jerky," or day-old hamburger rolls.

Due to Polyethylene having excellent resistance to chemicals, solvents, and alkalies, solvent welding is not recommended, nor possible. Mechanical assembly is the best.

The same basic methods for using adhesives on Polypropylene basically apply.

It is possible to get paint on P.E., but if the material is flexed after the paint sets up, it will flake off so easily you can simulate a snowstorm in your own basement.

Ever wonder what your plastic fuel tanks are made of? Cut off a sliver and test it. Matty Sullivan chose the right material for the Pylon Brand fuel tanks . . . Yep, Polyeth.

The bottles you see in this fine material, in most cases are done by a method called "Blow Molding." This is a process wherein the plastic is heated to a molten stage and is squeezed through a ring shaped opening. This forms a tube of a smaller diameter than the finished bottle. The soft plastic tube lowers into an area between two plates that have been hollowed out to the desired shape of the bottle. These plates are brought together and entrap the soft plastic tube between them. At this point, the bottle gets the point (needle, that is). That's right, a needle is inserted into an area usually at the pour area of the bottle. This needle is something like the needles used for inflating footballs or basketballs.

With the plastic tube entrapped, and the needle inserted, all that is left is to pump it full of air. The soft plastic inflates until it reaches the walls of the hewned out plates (molds), and WOW!, we have a blow molded bottle.

When you want a tray for mixing epoxies, try a coffee can plastic lid. After the excess epoxy has hardened, flex the lid and you will find the epoxy peels off with ease.

Next month we will cover a plastic that has some characteristics that are almost impossible to believe, and I feel it will be used to a great extent in the not too distant future. □

engine clinic

By Clarence Lee

In the March 'Engine Clinic' I mentioned a new synthetic lubricant that K & B has had under development during the past year. K & B, in conjunction with one of the countries largest chemical companies, have been developing the new oil expressly for use in model engine fuels. Whereas other synthetic oils have been developed for other uses and adapted to model use, the new oil developed by K & B is strictly for model engine use. Naturally, the K & B oil can be used for other purposes such as Go-karts, Snowmobiles, etc., but its main intent is for model engine fuels. This new oil was developed in a $1,000,000 laboratory set up expressly for developing and testing new oils. Break-down and endurance tests were performed in the laboratory using model engines supplied by K & B during the oil development program. Field testing started late last summer with the new oil first being used in some of K & B's racing fuel. If the oil would hold up under the grueling conditions required for racing engines, you can be sure it will most certainly stand up under normal sport flying conditions.

As this column is being written the first shipments of the new oil are going to your friendly hobby dealer. Name of the new oil is X 2 C. Say that fast and you have the name of the new oil – ECSTASY. The oil will first be available in graduated plastic quart bottles. Later, possibly by the time this column appears in print, the oil will be available in gallon and five gallon cans as well. Both K & B 100 and 1000, that have contained castor oil lubrication in the past, will continue to use castor oil for those of you who do prefer this type of lubrication. Two new versions of these fuels will be marketed using the new synthetic oil. These will be called 100+ and 1000+. So you will have your choice of the same fuels, one using castor oil lubrication and the other the new synthetic. K & B 500 and the K & B racing fuels have always used a synthetic oil, namely Klotz. These also will change to the new K & B synthetic which tests have shown to be superior to the Klotz.

Many of you are probably wondering just what is the advantage of using a synthetic oil over the old favorite castor oil. As far as straight lubrication goes, castor oil is one of the best lubricants available for our model fuels. However, it has many drawbacks. In hot weather castor oil is not too much of a problem. But when the cold weather comes along the problems begin. In cold weather it thickens, making the engines stiff and hard to start. Wiping it off of the airplane becomes a real chore as it becomes real 'gooey'. This is due to the viscosity of castor oil changing considerably with temperature. At normal temperatures castor oil has approximately the same viscosity as 60 weight motor oil. At lower temperatures it thickens and at higher temperatures it thins. Your synthetic oils have a flatter curve in this respect and do not thicken as much at low temperature nor thin near as much at higher temperature. For this reason your synthetic oils can be of a lower viscosity to begin with. This means they are much easier to wipe off of the airplane, the engine does not stiffen and become difficult to start in cold weather, if allowed to set for any length of time the oil does not turn to gum, etc. An added advantage of the synthetics is their clean burning characteristics. They will cause far less carbon and varnish build-up than castor oil. With muffler operation becoming more prevalent, and the use of a muffler causing an increase in carbon and varnish, the use of a synthetic lubricant is a real help.

One of the shortcomings of the synthetic oils in the past has been their tendency to break down at higher operating temperatures due to lower flash point and film strength – flash point being that point where the oil starts burning itself. When this happens you can forget about the oil as a lubricant anymore as it is going out the exhaust as smoke. This was the main advantage of castor oil in the past. It had a flash point considerably higher than any of the synthetics and as much as 100 degrees higher than some. This gave you that little extra reserve needed for those lean runs where the operating temperature of the engine came close to, or exceeded, the flash point of the oil. Normal operating temperature of the head of your model engines is in the 360 to 380 degree range. Some of your synthetics have a flash point of 425 degrees. It is very easy to exceed this temperature with a slightly lean needle valve setting. Castor oil has a flash point of 535 degrees which, on an extremely lean run, can be exceeded but the chances of doing so are naturally less. Through research and development with different synthetics, the synthetic oils are now achieving flash points and film strength comparable to castor oil. The first synthetic oil, in my opinion, to really

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Turn

Jim Simpson

The following is a rebuttal to Jim Simpson's original installment of 'Turn,' wherein he spelled out some of the hazards, pitfalls, and dangers confronting the racing scene today. Authored by Terry Prather and Bob Smith, two of the nations top Formula I pilots, this article is an opposing viewpoint concerning these controversial issues - - - Don Dewey.

● There has been an unfortunate controversy in the NMPRA and the AMA concerning Formula 1. This has brought on unnecessary resentment toward Formula 1 racing. We would like to set the records straight. Rather than talking in general, we will go over each controversial issue, step by step, so that the true facts will be known.

The K & B Schneurle Engine

K & B has been criticized for producing only 100 Schneurle engines. The purpose of this may have been confusing to many modelers. K & B and many NMPRA members felt that the present 100 engine rule was inadequate for the 500 NMPRA members. This limited production run brought to the surface why the 100 engine rule is inadequate. Hopefully, this rule will now be changed. Other manufacturers have now decided to make Schneurle port engines in quantities greater than 100.

Examples of engines to be delivered during this racing season are: Super Tigre, OPS, HP, RAF, and a larger production run of the K & B Schneurle.

Cost of Formula 1 Racing

It has been said that the guy with the most cubic money wins. If time were money, this would be true. It is the dedicated modelers who are winning in Formula 1 racing. Re-worked racing engines are not as costly as many people think. A re-worked GMA Tigre costs $76.50 and a re-worked Lee K & B Schneurle costs $75.00. (These prices include the engines.) These prices are comparable to a stock pattern or sport engine. The Formula 1 kits are generally priced the same as Pattern ships and even some Sport ships. Naturally a great deal more can be spent if you have someone else build your airplanes.

Claiming Clause

The claiming clause would be impractical and nearly impossible to enforce. (Who gets the winner's engine?) It would not serve its intended purpose because it is not the engine alone that makes a winner. It is the combination of flying ability, engine, prop, fuel, and airplane, that makes a winner. To break this down into a percentage; 50% is flying ability, 25% is your engine, and 25% is the combination of prop, fuel and airplane. It's the long hours that gets this complete combination to work.

An attempt to set the record straight - - - -
Terry Prather and Bob Smith offer a rebuttal to Jim Simpson's criticisms of Formula I racing. Here's the other side of the controversy - - - -

Slowing Down Formula 1

Some have criticized our event and say that pylon racers are dangerous. We agree. We feel our event requires more safety precautions than other events. As a plane's speed increases the more safety precautions are needed.

We feel that our event can be made safer, even though the planes' speeds are increasing, by strictly enforcing safety rules and by developing new safety precautions. During the past year the NMPRA So. California District has made great progress in making our event safer. The following precautions and rules have been put into effect.

1. Established a safety committee and safety directors for each race.
2. Pylons were constructed to give the pylon judges protection.
3. Barriers were made to protect lap counters.
4. Barriers were placed at the No. 1 pylon to protect flagmen.
5. A First Aid Kit was made mandatory on the flight line at all times.
6. Helmets were provided for all workers.
7. Helmets were recommended for pilots and callers.
8. Ear protection was encouraged for both pilots and callers.
9. Eliminated all unnecessary people on the flight lines.
10. We moved the lap counters to a safer position, just inside the No. 2 pylon.

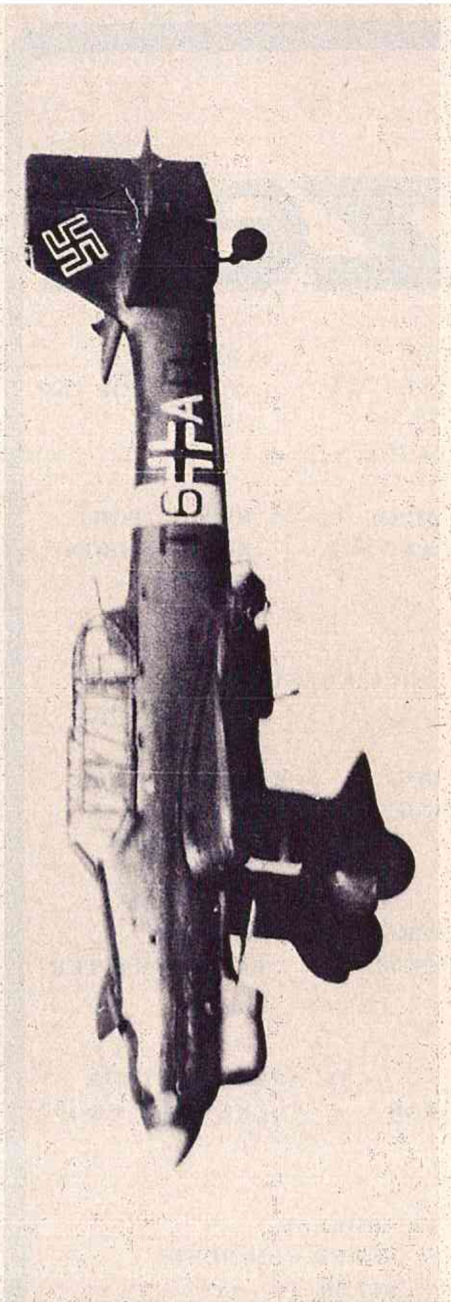
Close calls were virtually eliminated this past year by enforcing these regulations in the So. California District. This coming year, as speeds increase even further, we will be adding additional safety precautions. These will include safety inspections of all aircraft and enforcement of the new 450 feet spectator safety distance. Additional safety precautions, such as these, will continue to improve safety conditions in Formula 1. As these types of regulations are developed in each district, the NMPRA is working to make them mandatory across the nation. Eventually, these rules will be adopted into the AMA regulations.

Idle and Pit Stop Rules

One just has to look at the control-line carrier event to see how complicated carburetion systems can get to make a speed engine idle. This would give the engine experts an even bigger advantage, which is contrary to what most people want.

In Formula 1, landings cause more damage to the models than anything else. Pit stops would make the airplane attrition rate greater than it currently is. The mass confusion caused by landings, and take-offs, during a pylon race makes pit stops the most dangerous proposal to date.

Formula 1 remains one of the most exciting events in R/C, and one of the most appealing to spectators. By continuing to refine our event we can, and will, keep Formula 1 the great sport it was designed to be. □



If reader Al Pickup doesn't pull some up-elevator soon, he'll need more than fiberglass covering to hold it together! A fine action pic of a JU87B in characteristic attitude by Al Signorino.

SCALE IN HAND

BY DAVE PLATT

During the past couple of months, things have been happening which took a severe toll on my time. A change of employment and relocation from the Chicago area to Ft. Lauderdale, just to name a couple of small ones. This might help to explain our absence from these pages and along with the explanation, our apologies to our regular readers who look for this column each month (don't all rush at once).

Even so, as any real modeler knows, it takes more than a couple of minor upsets like these to hold a guy back from model-building. We've been moving right along in this department and have learned a few things since we last met here. As an example read the following letter:

Dear Dave:

I have just finished reading your column in the December 1972 issue of RCM, and a comment or two came to mind.

First, I do enjoy your column and some of the ideas you present on scale techniques from research to cockpit detail. Personally, I am a hacker and am primarily in the hobby for the fun and self-satisfaction I receive. Your ideas are a bit more innovative than the pattern, sport or pylon writer. I do not wish to imply that one cannot learn from the other specialties, and this, really, is what prompted this letter.

Bob Palmer (a modeler of some renown in his own right) constructed a model wherein he used very light glass cloth in conjunction with Francis Resin as a base to color. In your column, you mention using dope and silkspan with resin overcoats for finish. I have not tried your technique, but I strongly urge that you try this method:

1. Properly sand the model (all dings, etc., filled).
2. Mix a small (1 or 2 oz.) batch of Francis Resin.
3. Coat an appropriate area that is easy to handle; i.e., top of one wing panel.
4. Lay on 1/2 or 3/4 oz. glass and stretch/pat wrinkles and bubbles out.
5. Roll with toilet tissue to pick up excess resin and press cloth to surface. As the tissue fills with soaked-up resin, unroll a bunch and toss in trash.
6. When cured, sand the edges to remove excess and/or loose strands and do another section.
7. When the entire craft is glassed, a light sanding is needed over-all and another coat of Francis Resin.
8. Wet-sand out.
9. Pick up your ideas from here on; rivets, panel lines, etc.

I have substituted nylon fabric for glass cloth with about equal success, but it does not handle compound curves as well.

I suggest that, in the long run, this technique is stronger and lighter than dope/paper/resin system. Butyrate takes an inordinate amount of time to gas-off all of the contained solvents. Also, Butyrate does not have the adhesion qualities that nitrate dope demonstrates and much less than resin.

One major problem with resin finishing you did not touch on is epoxy areas that may be on the surface to be resin-coated. Resins will not normally cure over epoxies. "Devcon 5-Minute" seems to be an exception. I have cured Francis over Sig Epoxy by super catalyzing the resin and then applying low heat (heater fan). Once sealed, normal procedures work well.

I guess that's about it. Keep up the good work.

Very truly yours,
Earl Harting
Reseda, California

By pure coincidence, at the time we received Earl's letter, we had just been talking to another old friend, Al Rabe, of C/L stunt fame, who had made similar suggestions regarding the fiberglass cloth.

Furthermore, we soon began hearing quiet mumblings about this subject from several other sources. Rumor was rife that the technique of covering a model with glass cloth and Francis (K & B is identical) Resin was the best yet developed.

Clearly, we had to investigate.

Right about then we had a new Stand-Off Scale RC model ready to finish, so this became the test-bed. We'll get into a detailed analysis of the methods in just a moment. But first, let us say that the results we obtained have convinced us that this is, in our opinion, without any question the superior method of finishing a scale model or, for that matter, any other RC model especially for fuselages.

Such a sweeping statement might not mean so much coming from a modeler who normally accepts every new idea as the greatest – but this writer is by nature an ultra-conservative. We've tried just about every new covering and finishing method to appear over the past twenty years, and yet still found ourselves returning to standard paper-or-silk and dope on every model which really mattered. The real breakthrough came with Francis Resin but, as we reported in an earlier column, this material, unsupported by a binding agent, was simply insufficient.

Anyhow, we tried the method described by Earl Harting. It worked O.K., but we found it easier to lay the cloth on the bare balsa and brush the resin on from the outside, working out wrinkles as we went. We suggest you try both ideas and see which suits you best. The final result is the same in either case. We end up with a bare balsa frame covered with glass cloth, impregnated by one coat of resin.

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PUDDLE

JUMPER

A simple, but different, flying boat, for the sport flyer. Midwest foam wing and stab, O.S. Max .10 and a quickly built fuselage and power pod add up to an excellent amphibian.

By Ken Willard

At the Model Aircraft and Trade Show in Anaheim last summer, Jim Newman of Midwest Products showed me their new Cardinal molded foam model. I was intrigued, particularly with the wing. It was just the right size for a small, quickly built sport model, which many of you have been asking for. So, back to the drawing board for some ideas.

Let's make it simple, but different. How about a small flying boat, that could be hand launched and landed on grass or, alternatively, could be fitted with a quick removable landing gear? And, of course, it should perform well off water, since that's the main idea. Out of all this daydreaming came the Puddlejumper. A real fun job.

One of the complaints we get at RCM is, "Hey! Knock off that phrase, 'Wing construction is straightforward,' and give more detailed instruction!" So, let me begin the construction part of this article with detailed instruction on how to build the wing and stab.

Reach into your wallet, pull out the price of the Midwest Cardinal foam wing and stab set, go over to your friendly hobby dealer's shop and pick them up! Not in stock? Have him order a set. It should arrive in a couple of days, just as you finish up the hull.

As for building the hull, it is simplicity personified - - - a straight box slab-sider, disguised to look rounded by the use of ½" triangle stock for top longerons which are shaped so they fair into the top sheeting aft of the wing, and match into the forward hatch block ahead of the wing. The bulkheads establish the side curvature, and the flat bottom gives excellent water take-offs.

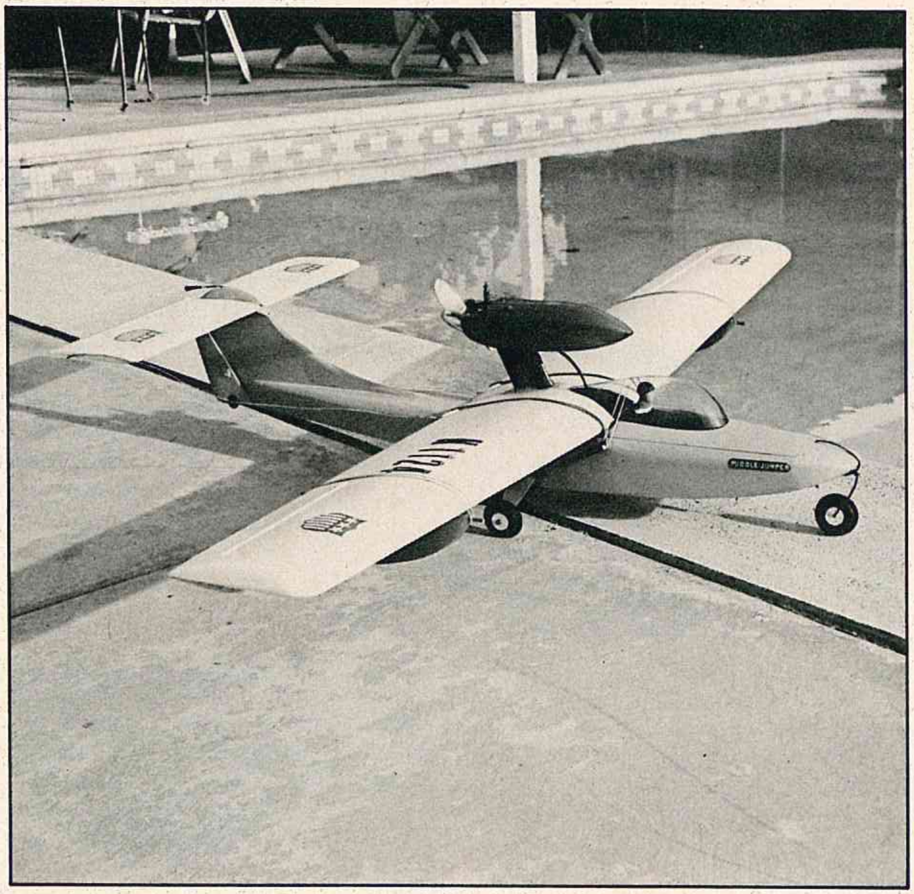
The T-tail keeps the stab up from the water – a good idea when you use the foam stab of the Cardinal set, because it isn't quite as strong as sheet balsa, but plenty firm for this model. The leading edge of the fin is curved so the flexible control rod can be epoxied directly to it and still have a radius of curvature which won't cause binding. It looks nice, too.

During the building process, I used various adhesives: Ambroid for the triangular stock, because it carves easily when dry; Formula 4 Hobbypoxy for the bulkheads since it sets fast and seals well; Weldwood contact cement for the plywood bottom forward of the step because it makes it easy to stick it in place. Cut the plywood a bit oversize (run the principal grain crosswise so it's easy to fit to the curve) and then trim after sticking it in place. Caution: Don't use Titebond unless you seal over it with dope; otherwise, it'll dissolve on prolonged contact with water.

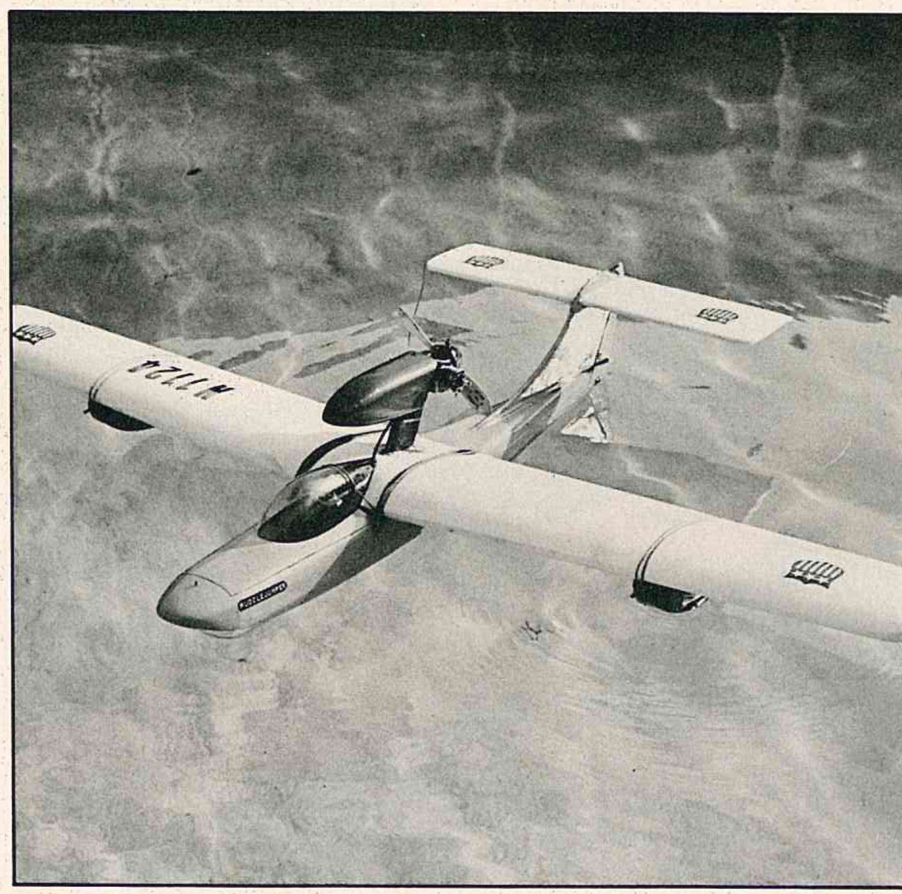
Maybe it's an over-simplification, but if you look carefully at the plans, you can figure out the way that suits you best in putting the hull together.

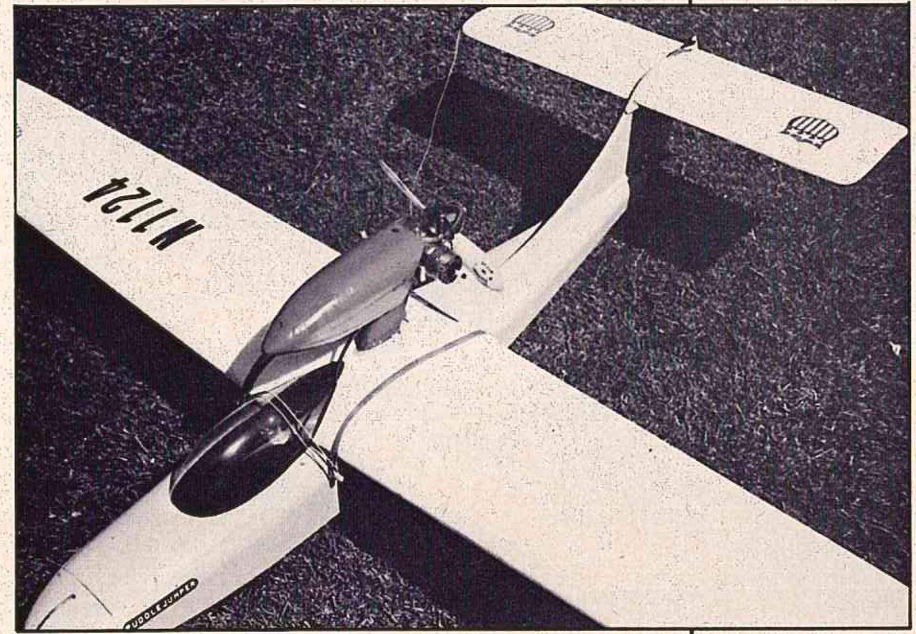
The same goes for the engine pylon. In fact, if you are so inclined, you can buy a Gryphon engine pylon kit for the Max .10 from Model Dynamics and modify it to fit the Puddlejumper. Note that the pylon is inserted into a cut-out in the wing and extends down to the bottom. Epoxy it in, and the center section will be even stronger than before.

The canopy, which is a commercially available size, is trimmed to fit the top of the forward hatch and the wing. It is, of course, strictly for appearance, and can be left off if you prefer. I didn't mount my canopy permanently – just held it on with a rubber band over the top from the



ABOVE: The Puddlejumper is as versatile as it is quick to build. Here it is shown in its landplane configuration. The landing gear can be quickly removed to make it a - - - - -seaplane which is at home on any lake or pond. An easy-to-build, easy-to-fly first amphibian. If you've never flown a seaplane, try the Puddlejumper.





forward wing dowels.

Radio installation is entirely accomplished with servo mounting tape on my version, except that the receiver is "floated" in foam behind the 225ma battery pack, which you'll note is stuck to the nose bulkhead with servo tape.

Wing tip floats are of the strap-on variety, so you can remove them for land flying.

As for a detachable landing gear, it's optional. I had to modify mine from a "tail dragger" configuration to a trike gear. I forgot that with the pusher prop behind the C.G. it accentuates any ground loop tendency, and made the model squirrely on take-off. But when I moved the main gear back – it, incidentally, is also stuck on with servo tape – and added a nose wheel, take-offs and landings were fine. I didn't make a steerable nosegear, so ground handling isn't as good as it could be, but by using rudder and engine blasts you can steer wide turns.

With the gear off and the model in the water, steering is great. The bottom of the rudder works as a water rudder.

And don't forget, water will get in any opening, no matter how small. So be sure to seal the joint between the wing and the hull with seating tape so that when you cinch the wing down with the mounting rubber bands, the opening is closed and sealed completely. The forward hatch must also fit snugly in place, and when you fly off water, tape the hatch in place with Mystic plastic tape. As for the switch, I just used a direct connection from the battery to the receiver, and plugged it together before sealing the hatch. It's easy enough to peel off the tape and put on a fresh strip for each flight, and ensures that water won't get into the switch. If you prefer, you can use a push-pull wire coming out the side through a snug hole.

Finishing is a matter of builder's choice. The foam wing and stab need only be sanded slightly to remove any

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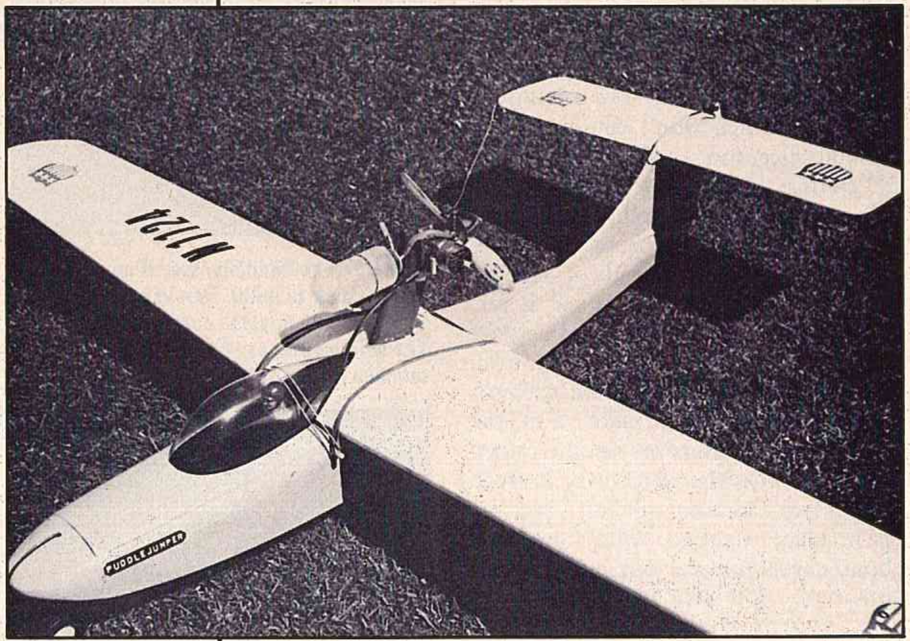
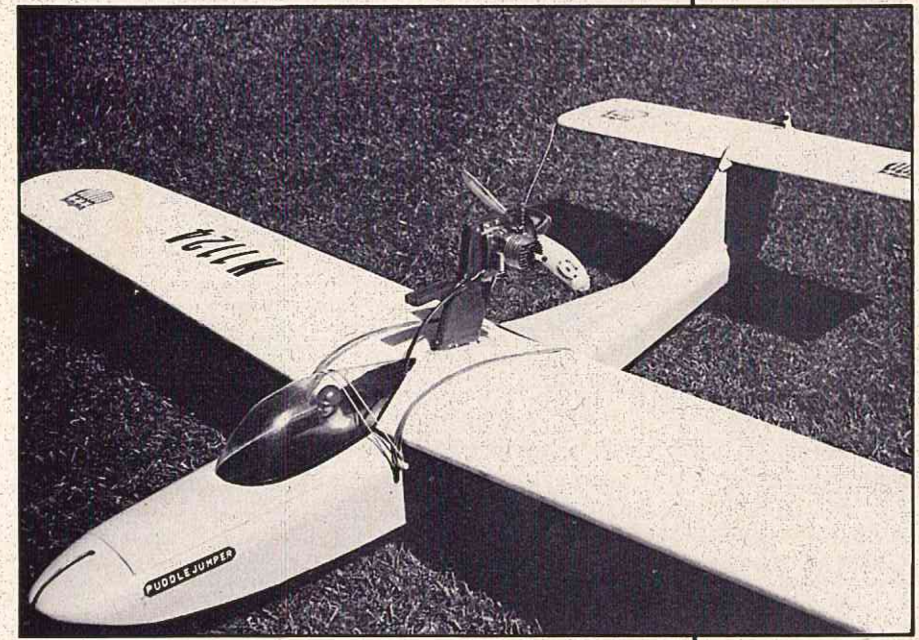
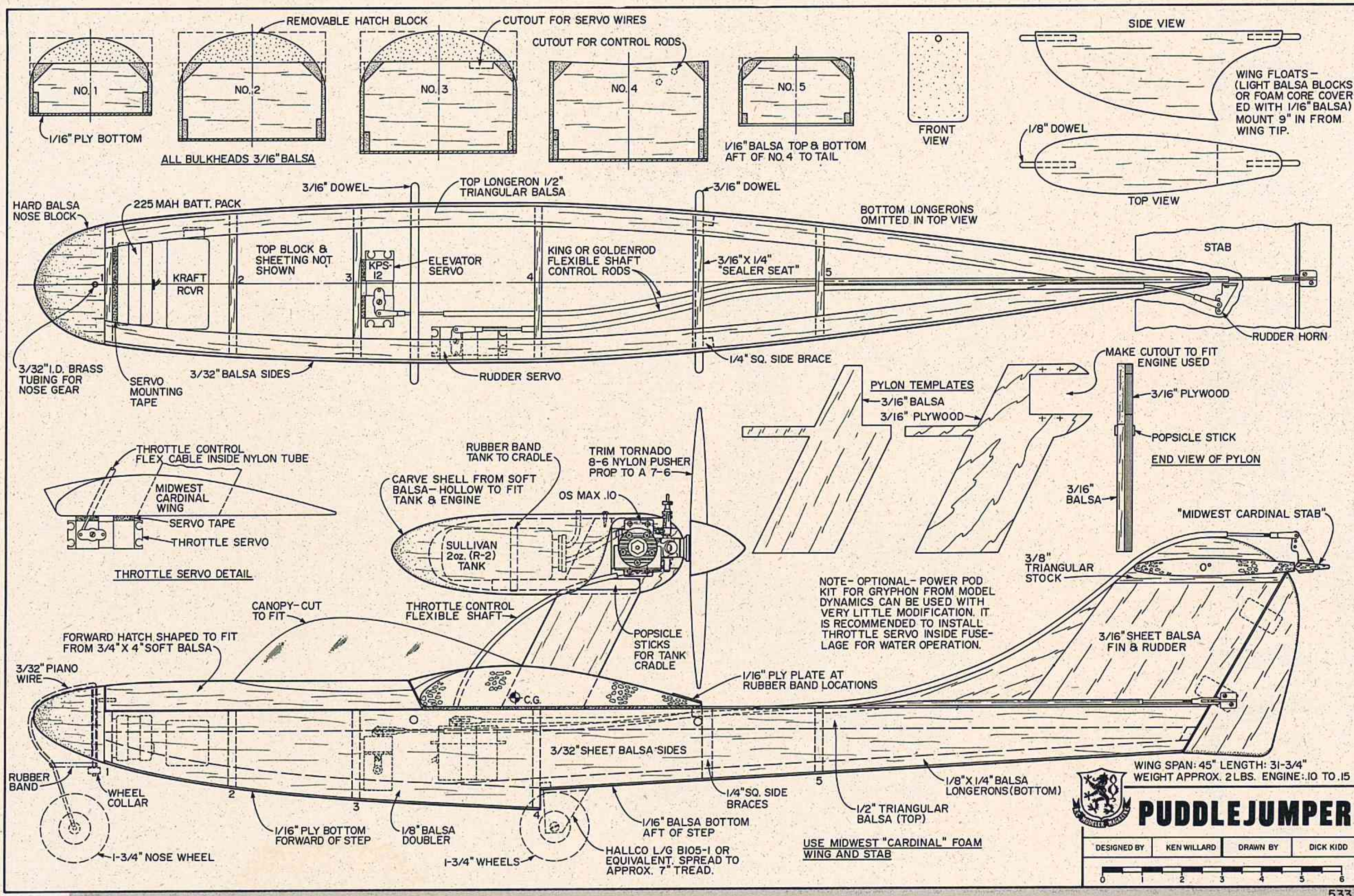




These three photos show the pylon motor mount. The balsa filler between the "Popsicle Stick" cradle supports for the tank. The tank is strapped to the cradle with rubber bands and the streamlined shell slips over the tank and is held in place by screws into the top edge of the pylon.

FULL SIZE PLANS AVAILABLE — SEE PAGE 118



Chuck Cunningham Introduces The RCM

WW1 SCRAMBLE

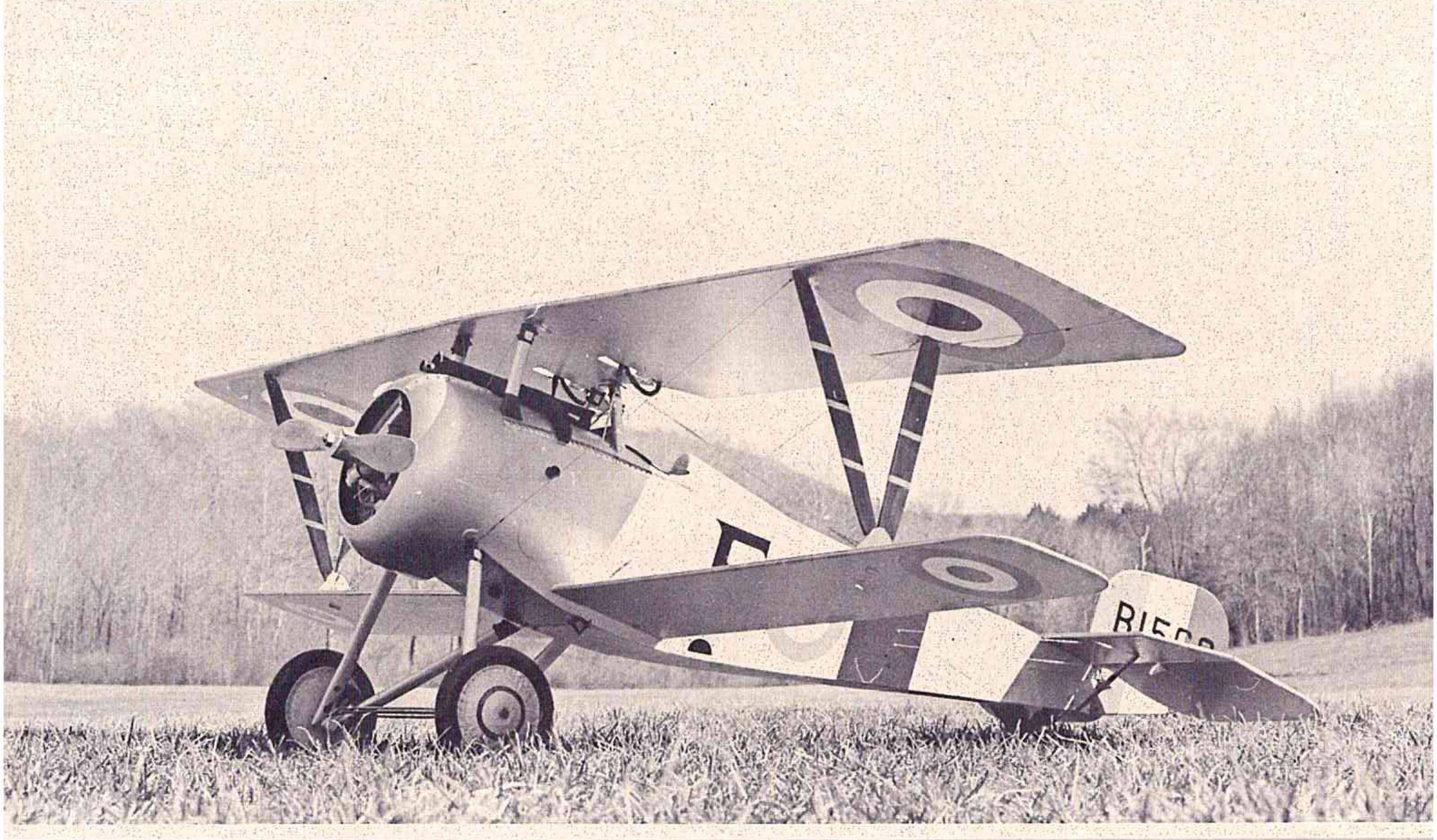


Photo By John P. Garde

An exciting new event for sport fliers from the father of Quarter Midgets. . . .

The morning fog rolled over the still sleeping aerodrome. The air was damp, the ground moist, and here and there through the fog you could just make out the shape of buildings. Far in the distance you could hear the crump-crump of artillery shells as they made their lonesome way over the front lines. Finally, something stirred near one of the buildings. It was a small, rather grubby looking man. Slowly he pushed back the sliding door of the building and went inside. Grunting and tugging, he began to pull the aircraft out of the hangar on to the tarmac.

In another part of the area men were waking and going about their business of starting their work day. The "dog-robbers" began waking their charges, lean, tanned, young men. It was usually a battle to get them up and out of their cots, but the "dog-robbers," used to the chore, kept at their tasks even though they often had to duck flying chamber pots for their trouble. Finally, the young men assembled in front of their hangars, leather jackets buttoned, helmets and goggles dangling from their hands. It was time for their briefing.

On the other side of the lines, similar young men were, at the same time, hauled out of their warm beds to face another day of roaring engines, singing rigging wires and the harsh bark of machine guns spewing their message of death and destruction.

The aircraft on both sides of the line were readied by the mechanics, gun belts checked, controls checked, surfaces given a going over for loose fabric and, finally, the pilots climbed into the cockpits and the engines were started. Off across the grass field the fighter aircraft trundled, taxiing downwind, to turn and then, with a burst of power, to take to the air. On one side of the line Spads, Se5a's and Bristols were taking the air, while to the east the Fokker D-VII's and Triplanes, and others, were winging their way into the misty early morning sky. It was a WORLD WAR I SCRAMBLE . . . . .

And so, some fifty-five years later we bring you the latest idea in Radio Control Sport, the World War I Scramble.

I have long believed that the best way to really get your kicks from this hobby is to have fun. Spell that with a capital F-U-N! With that idea in mind Quarter Midget races were born, and with this issue of RCM the latest in a long line of great sporting events for the RC'er is being hatched, the World War I Scramble.

I have been casting around for an idea that would combine the fun and thrills of racing with some other things

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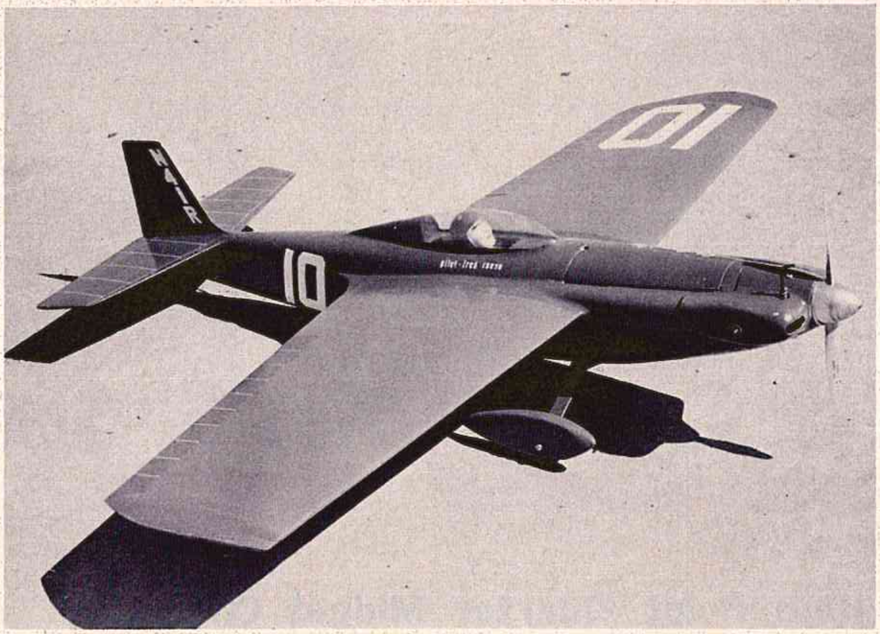
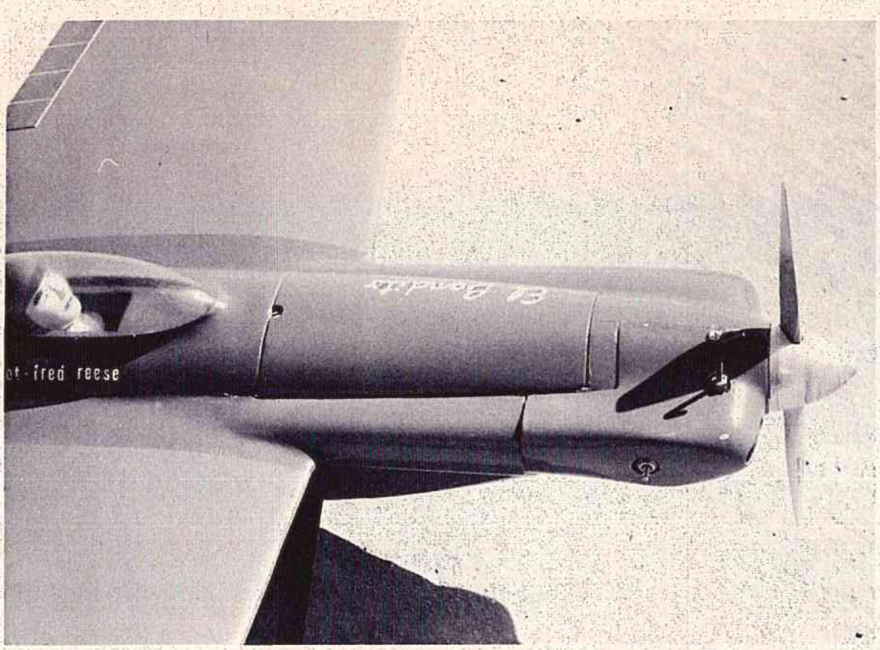
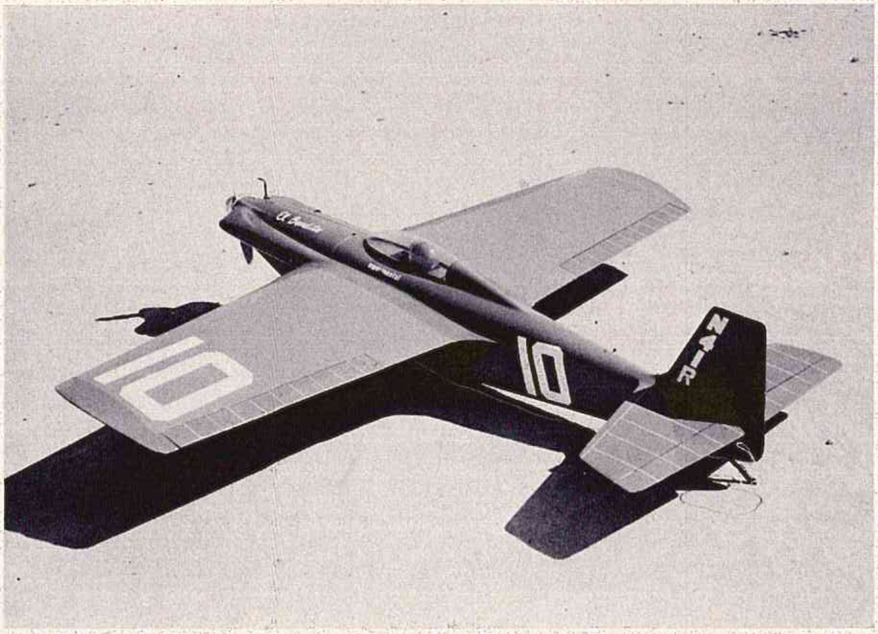
EL BANDITO

Fred Reese's 1972 High Point Quarter Midget Champion







The El Bandito Quarter Midget racer is a race-proven design having won three of the last four races entered and ending up as the 1972 QMRC Southern California Champion. The El Bandito has raced against and beaten the fastest Southern California racers. It has turned in the fastest time of the day on a very short course and on a two mile course. The two mile time was 2:07 on a three pylon course.

The El Bandito is very close to my Shoestring design which was published in the June 1972 issue of RCM and was actually built from a prototype "House of Balsa" Shoestring kit. After building two Shoestrings, I knew the design was sound but I wanted something different while still maintaining the same general outlines. The Sleek Frenzel "El Bandito" was the most logical choice as it only involved different tail and wing tip outlines as well as relocating the canopy. The scale color scheme is overall red with a gold spinner and leading edge trim with white lettering and numbers. (Number ten is the scale racing number and also my QMRC racing number.)

The major reason for the success of the El Bandito is the wing. The root section is a very low drag laminar flow symmetrical airfoil which tapers to a lifting airfoil at the tip. The tip airfoil was chosen for its low drag at high angles of attack which really helps in the turns. The El Bandito can easily turn inside most racers and generally has a speed advantage down the straights because of its overall low drag. The wing has excellent stall characteristics which maintains positive aileron control at all speeds and allows very slow, nose high landings. Incidentally, the wing is ten percent which makes it legal by all rules.

My El Bandito is powered by a stock ST .15 FI RC engine which was very carefully and slowly broken-in. A break-in that is too fast will result in a mediocre engine that will wear out quickly. Just running a couple of tankfulls and then, flying will ruin a good lapped engine. The people who are winning are the ones who put out a little more effort than the others. Many of you will be buying the new K & B rear valve .15 now, so break it in slowly and wear ear plugs during any engine break-in to prevent ear damage! Plan on about two to three hours of running time starting very rich and gradually leaning out until the engine will hold a maximum rpm

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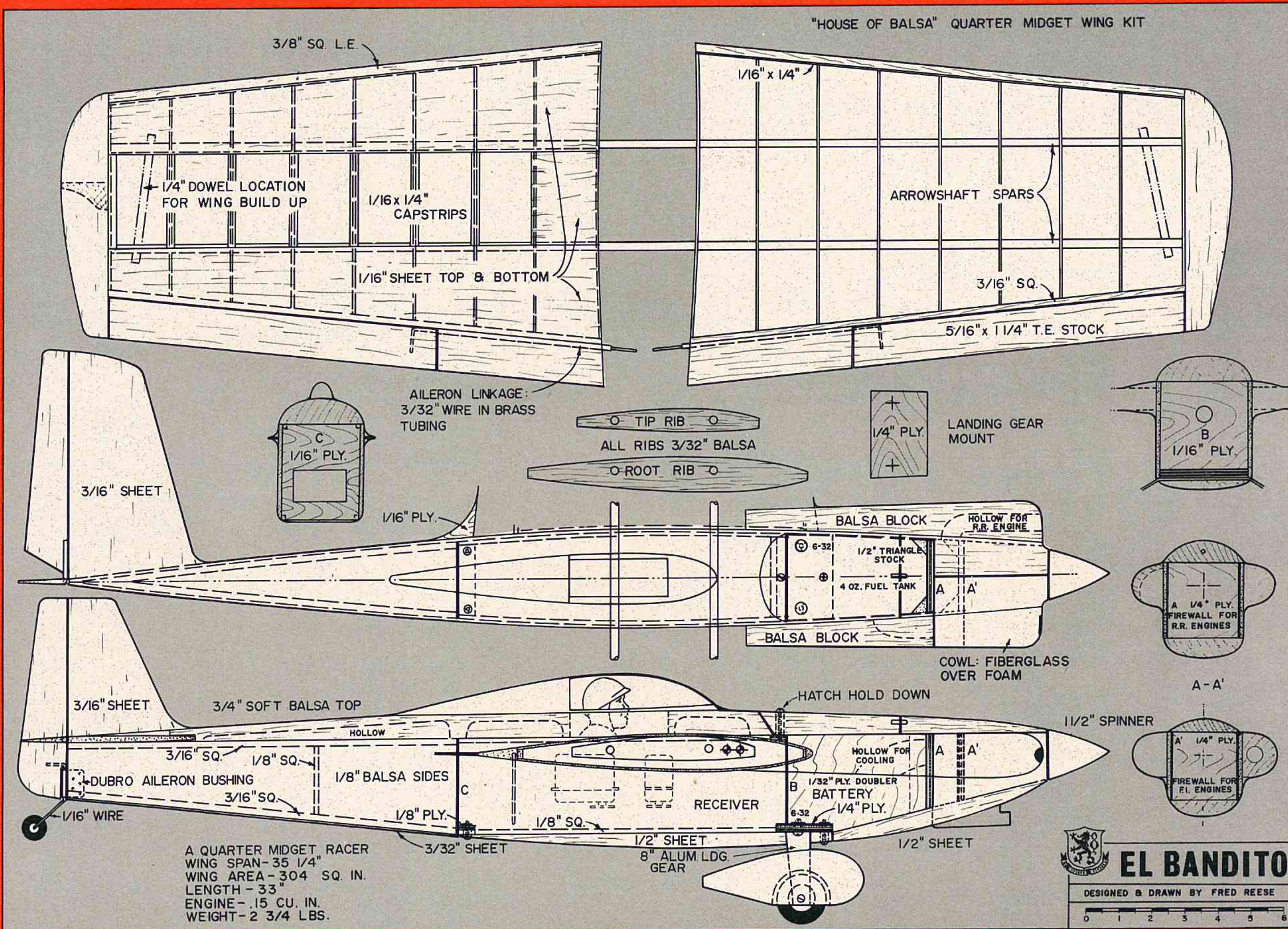
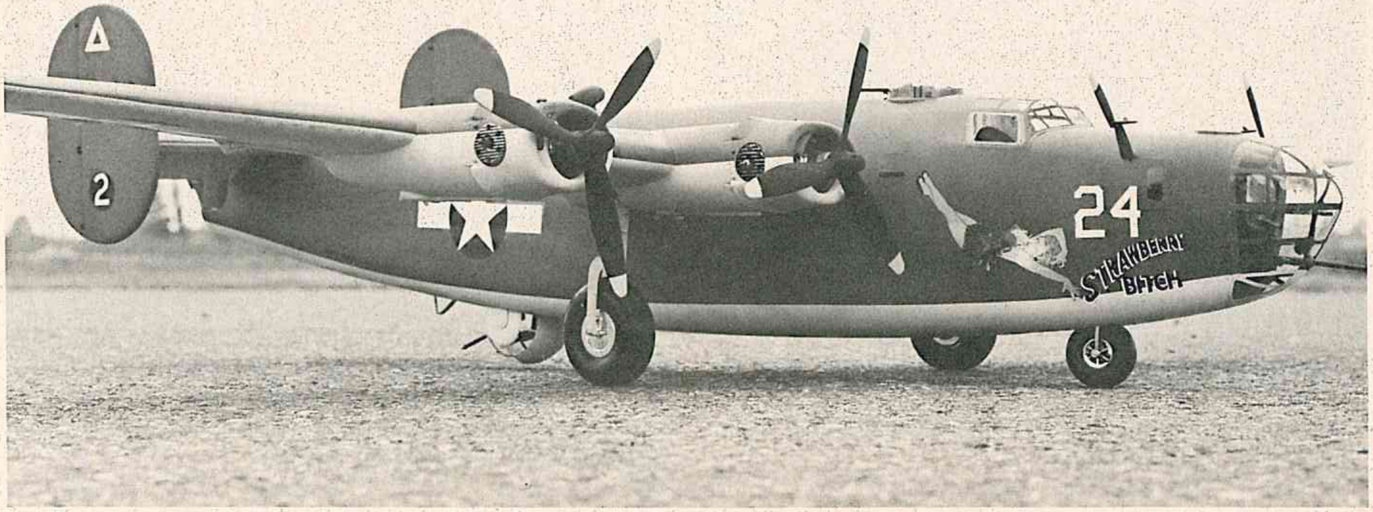
FULL SIZE PLANS AVAILABLE – SEE PAGE 118




24
STRAWBERRY BITCH



Jack Stafford's B-24D is the most ambitious kit project we've ever seen - - - almost unbelievable realism. Prototype built by Sonny Meyers. 90" span Stawberry Bitch powered by four Veco .19's.

JACK STAFFORD'S B-24D

BY DICK TICHENOR

It is no secret that Jack Stafford has produced some of the finest kits available to the R/C enthusiast. In addition, Jack's Formula I and Quarter Midget racers have long held a predominant spot in competitive racing circles. Nonetheless, when we first saw Jack's drawings of his proposed B-24 kit almost 2 years ago, we felt he had to be out of his mind!

But, as usual, Jack knew exactly what he was doing and, reminiscent of WW II, the Strawberry Bitch is flying again! That specific B-24D that was based in North Africa is reproduced in her original Libyan desert camouflage colors in 1/14 scale, approximately 1-7/8" equals 1'0". Her vital statistics come out to a 90" span with an all-up weight of 10 lbs. ready to fly and powered by 4 Veco .19 engines. Split trailing edge wing flaps are functional and, of course, she has retractable landing gear. The latter, Goldberg retract units, are operated by Sonic Aire actuators. And, when the landing gear goes up, the belly ball turret comes down.

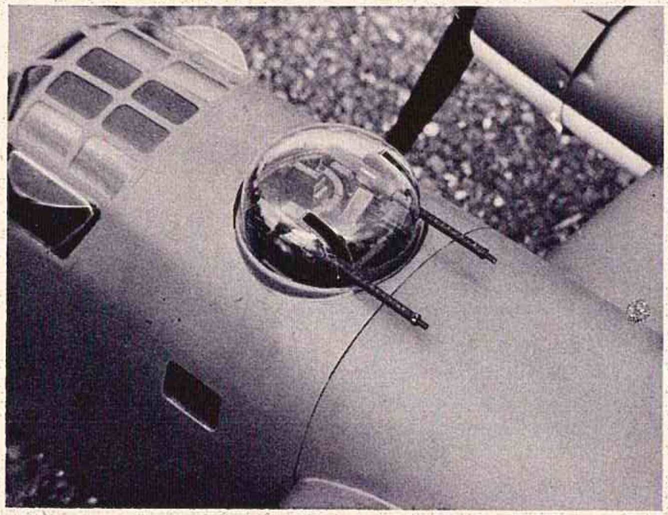
These photos show the prototype model of Jack Stafford's kit. We find it hard to believe, but he did it. As usual, Sonny Meyers did an excellent job of building the prototype which was initially shown at the 1973 Toledo Conference.

Extensive research required for the accurate detailed scale information has resulted in a bushel of drawings, photographs, and data. Gathering the information has been a tremendous task – phone calls, letters, and even two trips from Los Angeles to Wright Patterson Air Force Base at Dayton, Ohio, where the original aircraft is on display in the Air Force Museum. A booklet containing detailed information to a degree of completeness never before attempted will be included in the Stafford kit.

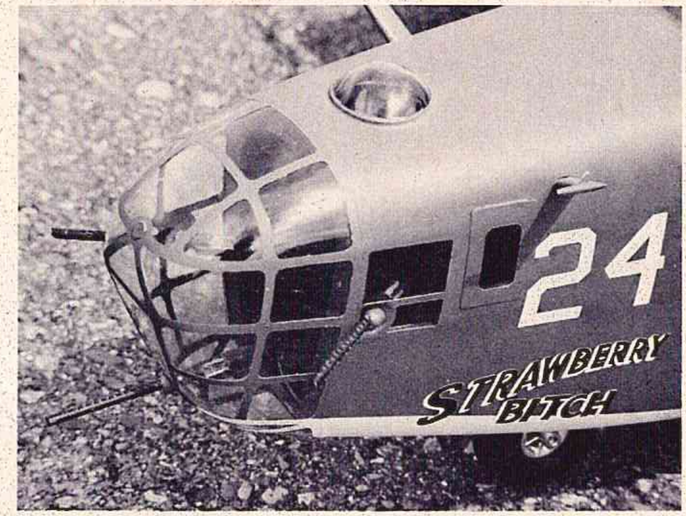
A total of 11 different forms have been made to take care of the turrets and other molded details. All four cowlings are the same so that only accounts for one vacuum forming mold. The B-24D carried 10 Browning machine guns and these will be provided in the kit. Just think – the first 100 kits will require 1,000 guns! Do you get a clue why it takes so long to get this kit on the hobby shop shelf?

Jack Stafford's B-24D is complete and accurate enough to be a one-of-a-kind model and worthy of a presentation in RCM from that standpoint. Being available as a kit is considered an additional benefit for scale enthusiasts. Jack plans to have kits in the hobby shops by early Fall of 1973.

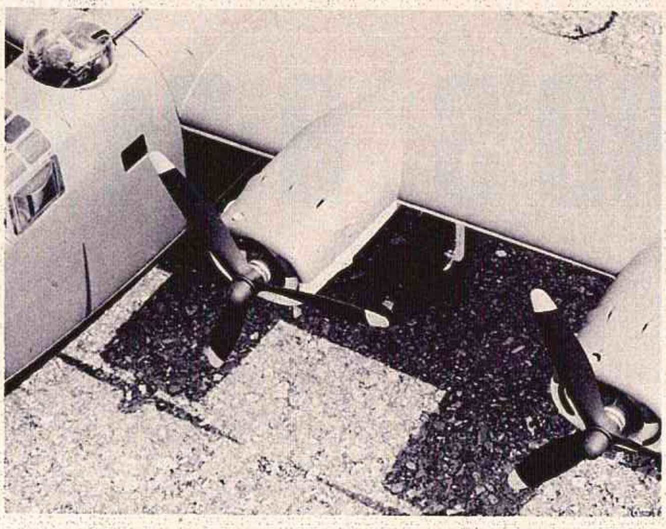
Kit or no kit, Jack Stafford's Strawberry Bitch is a magnificent beauty from any standpoint. □



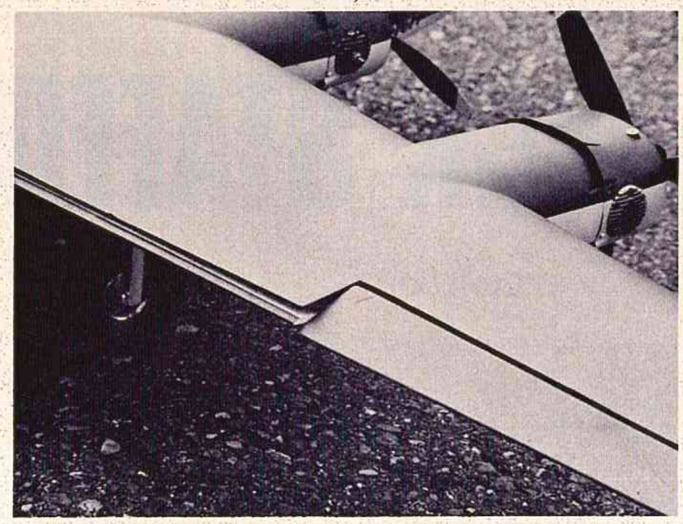
Look at all the machinery in that top turret! The number of molded parts in the B-24D are unbelievable!



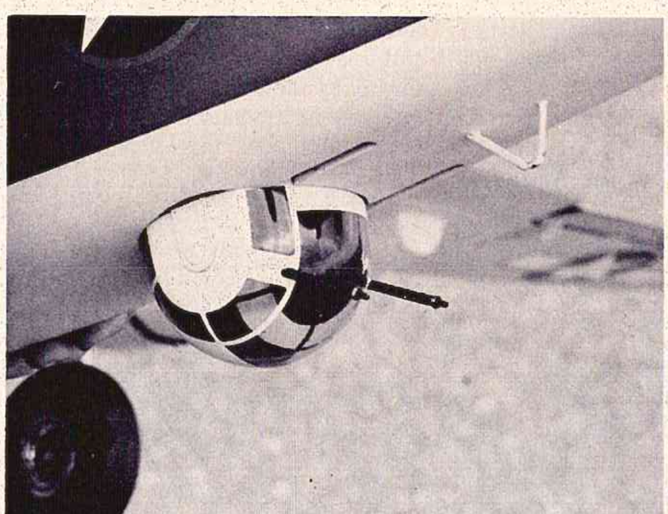
The only thing missing is a Norden Bomb Sight! Look carefully at the amount of detail included on this prototype.



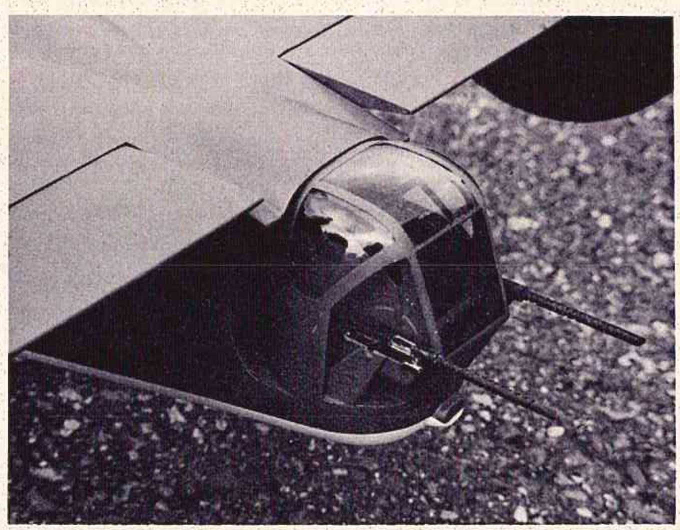
The cowlings are accurately reproduced including the cowl flaps. Imagine the roar from those four Veco .19's!



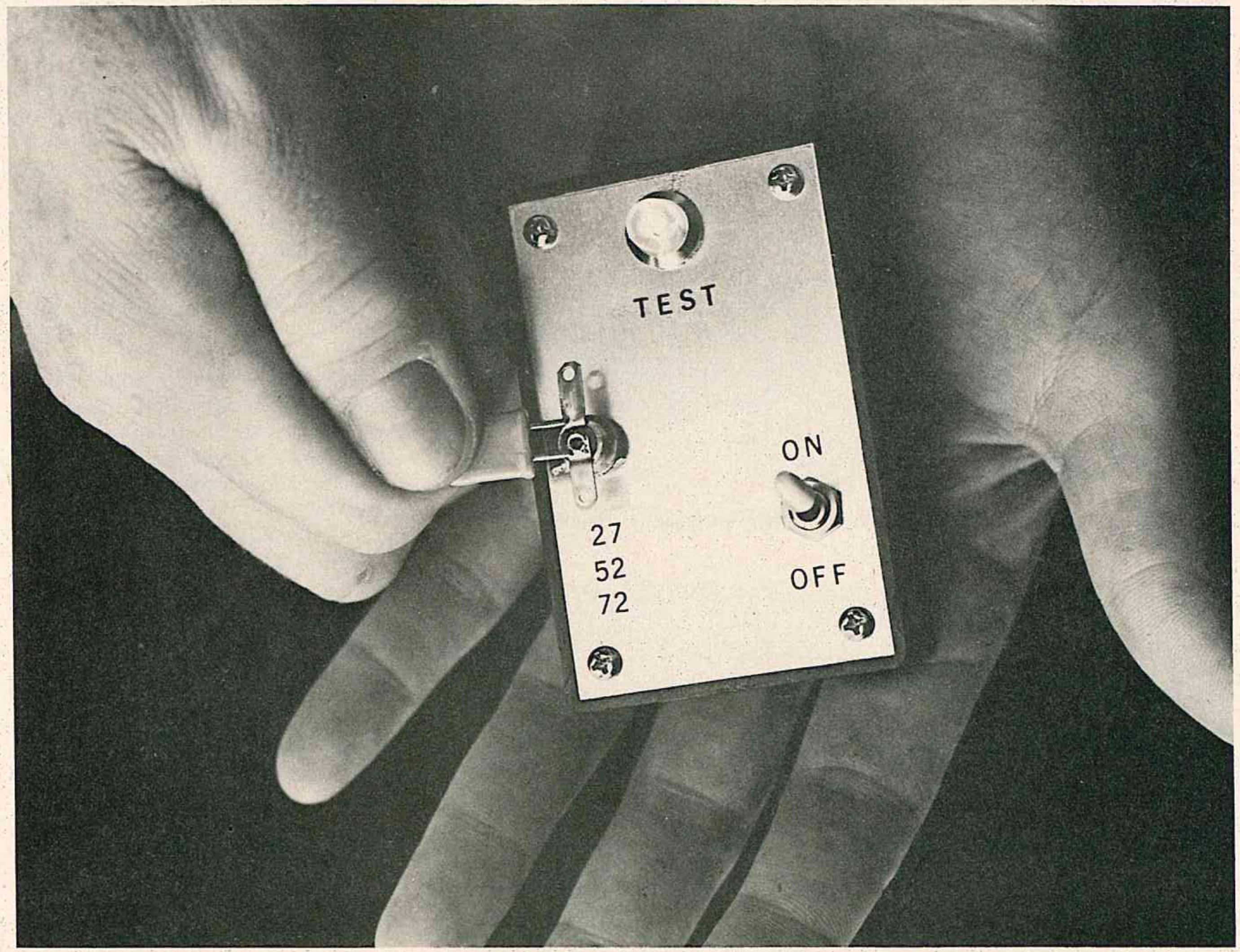
Split trailing edge wing flaps are partly open here to show that they are fully functional.



Belly ball turret retracts for ground clearance when the wheels are down - - - extended here for photo.



Here's the reason the tail turret was called the "stinger." Looks business-like!



UNIVERSAL CRYSTAL CHECKER

Superhet receivers with broken crystals are deaf to transmitters. And the crystal is the weakest link in your radio system. Build the UCT and save yourself some time and repair bills.

By J. P. Dobyns.

It happens even to the best R/C flyers. **Crrruuuuuunnnch!** Call it a rough landing; but however you euphemize it, your once-noble bird is sprawled there on the grass, alas, using the uncrunched part of its wing to scribble a fast application for a new pilot. This is bad enough but, after excavating various pieces of odd-shaped balsa, you discover (Oh, no!) that your receiver isn't working.

Be **sure** that it's the receiver. Check to see that all servos are still connected. Try every channel. Hmm, it's the receiver; and you feel chronic indigestion coming on.

Don't panic or fling yourself into the nearest whirring propeller. Cooly rise to your feet and shake clenched fists at the (usually overcast) skies. If

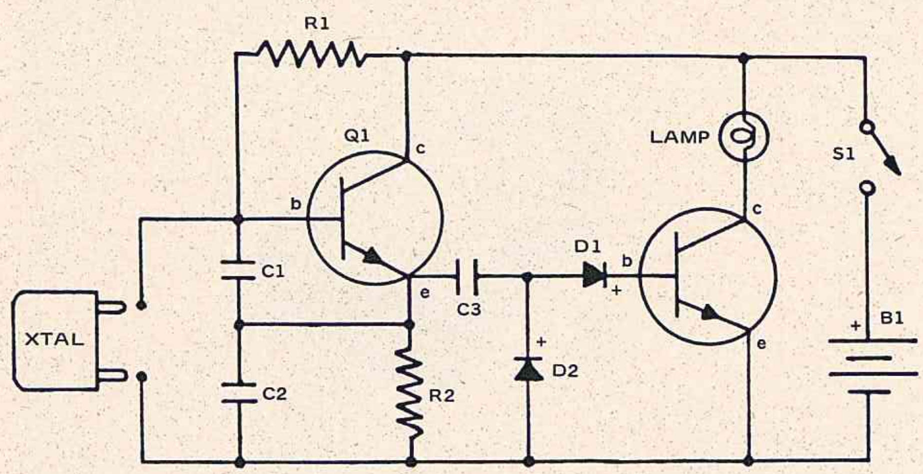
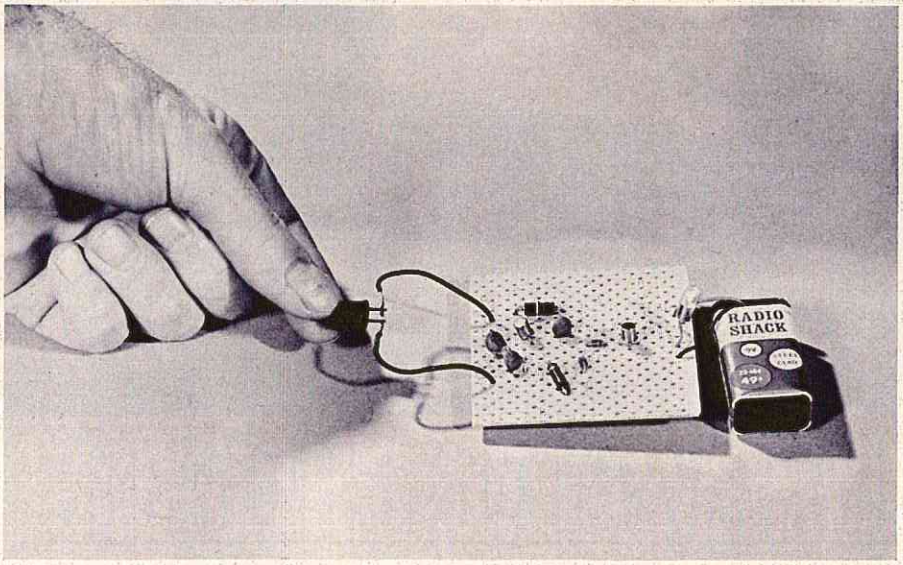
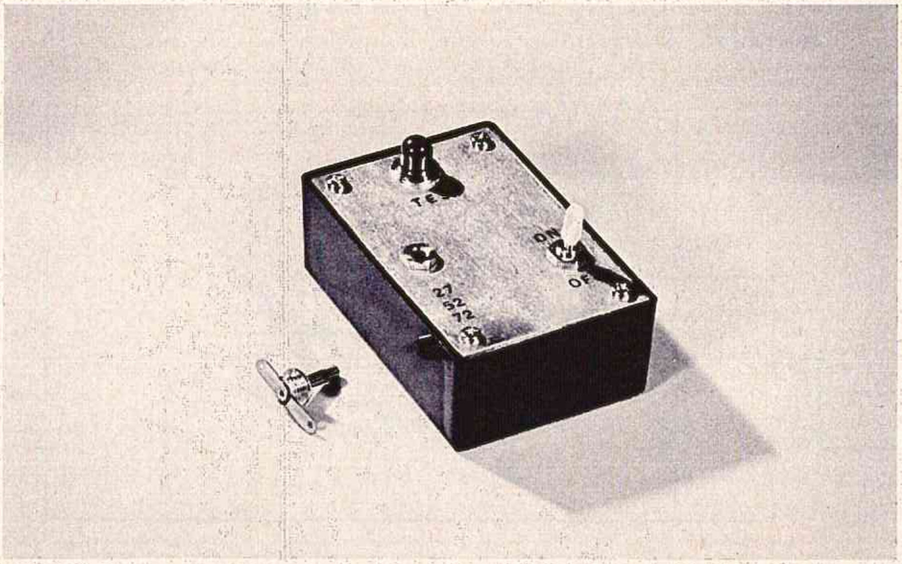


FIGURE 1: SCHEMATIC. TESTER IS ACTUALLY AN UNMODULATED TRANSMITTER. Q1 AND COMPONENTS ARE THE OSCILLATOR. THE A/C OSCILLATOR OUPUT IS CONVERTED TO D/C BY THE DIODES, AND THE LAMP IS DRIVEN BY THE Q2 AMPLIFIER. FOR THE "WORKSHOP" VERSION, SWITCH IS OPTIONAL.

The workshop version of the U.C.T. builds in a jiffy. Test probes are hook-up wires with bared ends tinned with solder.



Miniature telephone plug's solder lugs are spread-eagled, flattened, and trimmed with an old pair of scissors. Spread arms then serve as a universal crystal "socket."



A faulty crystal fails to turn on the green lamp. Just be sure the tester's switch is on before consigning the crystal in question to oblivion.

this won't bring your sleeping receiver back to life, go home and:

1) Test your battery pack with a voltmeter. You should get at least 4.8 volts. Nickel Cadmium batteries can short out or vibrate to death if you've had them long enough. As for dry cells, you really shouldn't be using them anyway. Nickel cadmiums are far more reliable and, in the long run, cheaper to use. If you do not get any reading at all, look for broken wires from the battery to the switch. If this doesn't do it, then:

2) Test the switch. Sometimes a connection has jarred loose. Use your voltmeter to see if current is flowing through the switch. To do this you'll need to remove the switch's plastic case. Take care about polarity; the rod probe of your meter must go to the red wire's solder point on the switch, and the same is true for the black.

Everything fine, except that the receiver still doesn't work? Pull the receiver from the plane and open the case. Then:

3) Look for broken wires in the receiver itself. Engine vibration and rough landings have a way of breaking wires.

Okay, you did that; and there weren't any broken wires or squashed I.F. cans, and your receiver still won't even cough up a glitch. Now, what?

You could bundle up your radio equipment and haul it away to the Post Office. Depending on the repair service you've chosen, your radio will be back in anywhere from three to six weeks, accompanied by a bill. If you're like most of us and have only one radio, the wait – and the bill – aren't much fun when flying weather is around.

The niftier alternative is to test the receiver's crystal. This is the demon most likely to be haunting your set. Superhet receivers. with broken crystals are stone deaf to transmitters.

Granted, there are a half dozen methods for testing R/C crystals – all expensive, except one. What you need is a Universal Crystal Tester, one anyone can build at low cost.

The project illustrated is a simple, two transistor transmitter that will test crystals on any R/C frequency (including transmitter crystals). No tuning or adjustments are necessary to test crystals of different frequencies. For convenience, all parts are readily available from Allied Radio Shack. A breadboard or "workshop" version can be assembled in less than an hour. If

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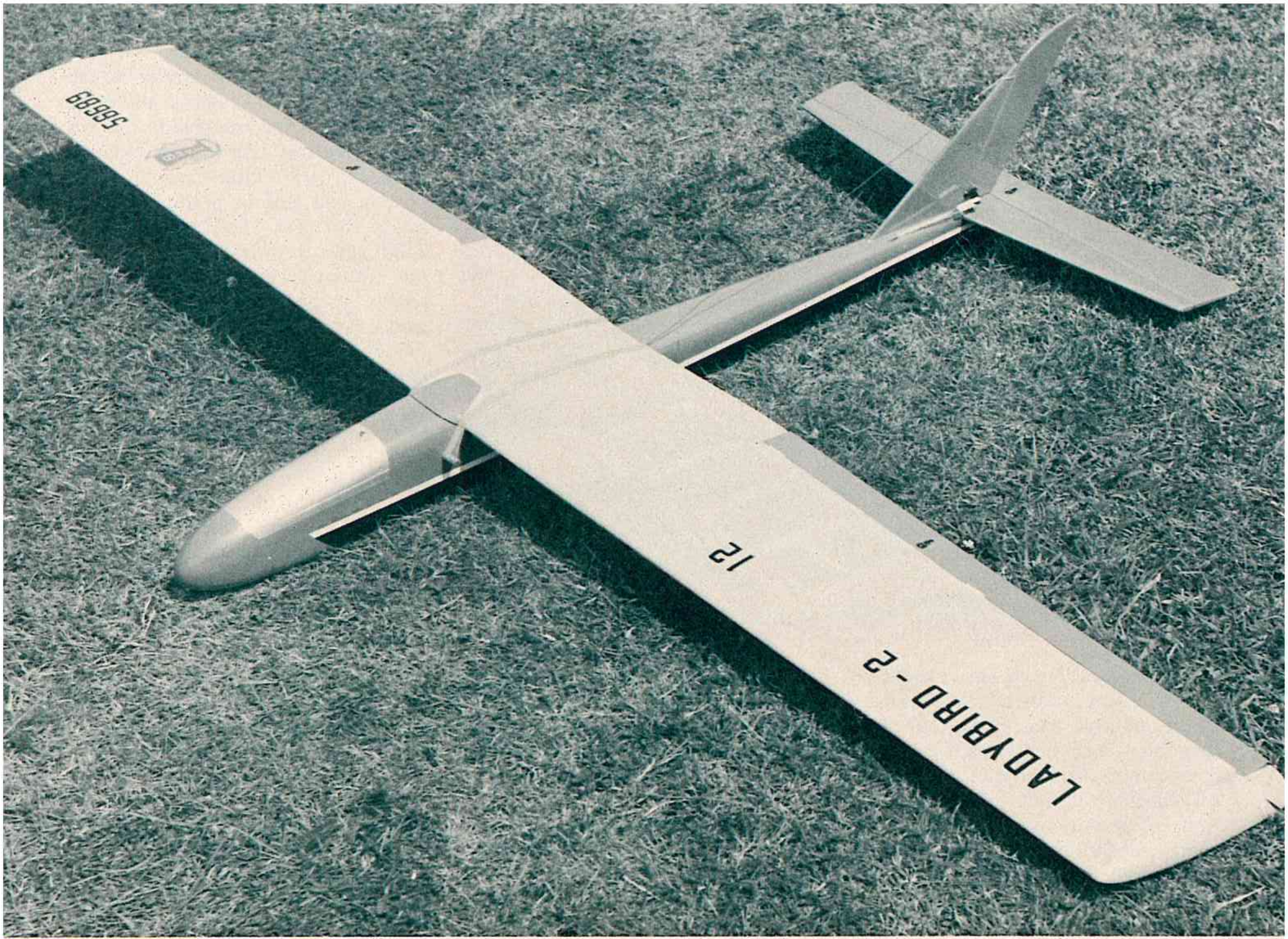


LADYBIRD MK2

For expert pilots, Brian Shaw's fully aerobatic slope soarer.

Introduction:

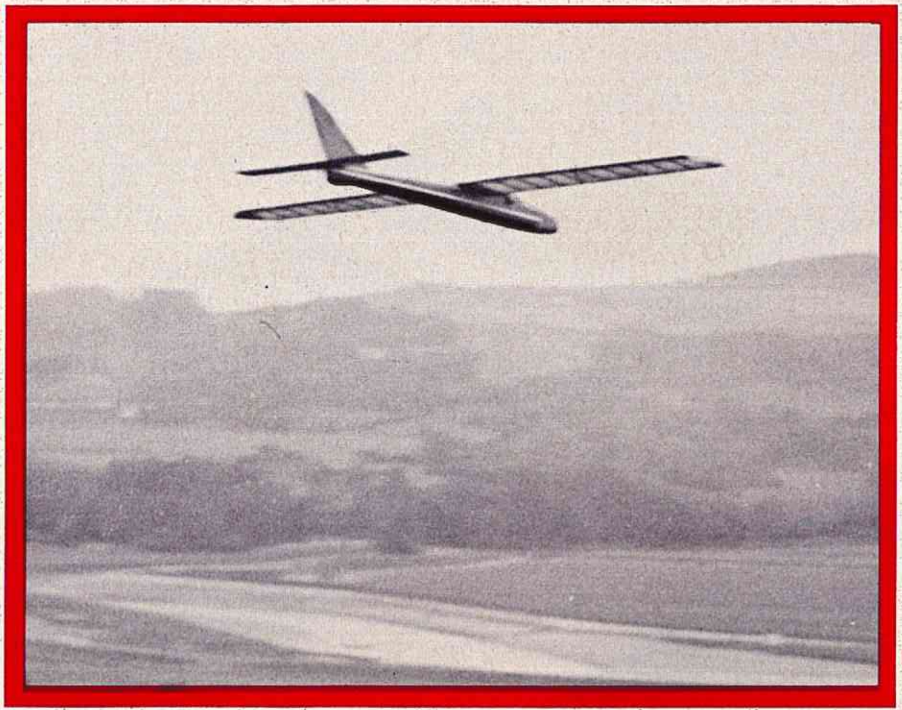
Ladybird Mk 2 is by far the most successful of a series of four fully aerobatic slope soarers built to date. For several years I had flown rudder and elevator models with lifting section wings, using single channel, then reeds and, finally, proportional.

Early in 1970 Ladybird Mk 1 was flown and revealed the great possibilities of a low aspect ratio wing of near symmetrical section equipped with ailerons. Mk 1 was functional with little regard for appearance, but it was easy to fly, being very reluctant to stall, and the ailerons were effective at even the lowest speeds. The span was 53".

Mk 2 presented here is larger at 59" span, the appearance is improved, and the airfoil changed more towards the symmetrical but still retaining a slightly lifting section. Large inset ailerons are used to give a very rapid roll rate, and rudder function is provided. It should be noted that this function may be omitted, the only loss will be in stall turns and spins.

This model has turned out to be very pleasant to fly and it will do any aerobatic maneuver within the ability of the pilot. I believe the Horner tips give smoother penetration in gusty conditions, and the airfoil is quite good in poor lift, but still capable of good inverted performance. Ladybird Mk 2 has been my number one model for over a year, and has probably flown about 2000 miles!

I have experimented with two other designs; a smaller version of 54" span and a larger one of 64" span, but neither of these demonstrated the good performance characteristics of Ladybird Mk 2. The smaller model was faster but would stall and snap roll if too great a 'G' loading was applied. The larger model was less responsive. It seems, therefore, that a span of about 5 ft. and a loading of 11 oz. per square foot is near to the ideal, and this is confirmed by the excellent design 'Phase One' by Chriss Foss, one of our best soarers and fellow member of the Sussex club.



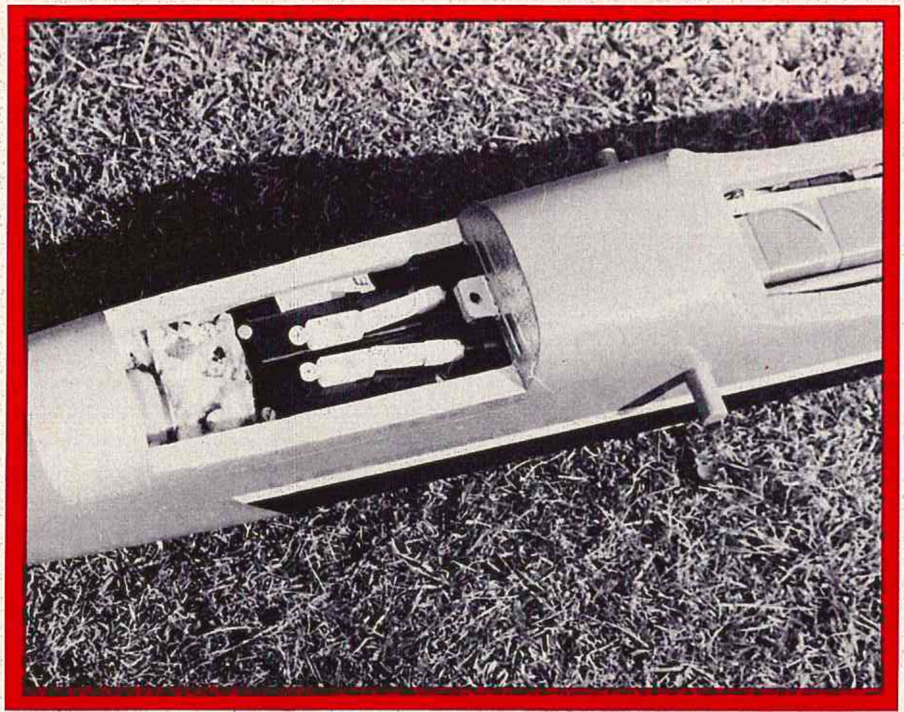
For those who have yet to see this type of model in action, here are some of the possible maneuvers: Consecutive loops and bunts, square loop, consecutive rolls, hesitation roll, vertical climbing roll, inverted flight, stall turn, spins and inverted spins, horizontal and Cuban Eights, and even the double stall turn (if the pilot is sufficiently skilled).

The only change on the plan from the model in the photographs is a slight alteration in the nose shape to permit the inclusion of a transparent canopy as this does greatly improve the appearance.

Fuselage construction:

Cut the two fuselage sides from 1/8" medium sheet, cutting to the chain dotted outline shown on the plan, thus allowing for the top and bottom sheeting. Work as if the cockpit was to be left solid. Glue in position the two spruce longerons, steaming, if necessary, to achieve the curve shown on the plans. The bottom longerons are cut from very hard balsa. Take care to get the two sides identical, and sand the edges as a pair. Use Titebond except where stated otherwise.

Add the ¼" square vertical stiffeners to the sides. When the sides are dry, insert a dummy former at the widest point of the fuselage and bring the nose together and glue to F1. Pin the tail together with scrap as a spacer. Take the 1/8" sheet medium balsa bottom and glue in position the ¼" square stiffeners. The latter define the width and curvature of the sides. Glue the bottom in place, keeping the assembly square with pins and scrap wood. Add the ¼" soft sheet fuselage top in the same fashion, noting that this extends forward to approximately mid-chord of the wing, and is later cut away to form the wing seating. Add soft block to complete the top of the forward section of the fuselage. Add the external doubler to the bottom of the nose section, using 1/8" hard balsa. When all is dry, roughly shape the fuselage with a razor plane. I use laminations of chipboard for the nose block, hollowing by cutting out the inner laminations. (I have found hardwood to shrink after assembly, giving a line under the finished paint work). Shape the nose block roughly before gluing in place. Now shape the fuselage to the well rounded section as shown on the plan. If you are going for the clear canopy (which greatly enhances the appearance of the model) the time has come to mold it. Cut out the block from the fuselage to use as a mold tool and mold the canopy. Face the front and rear of the cockpit cutout with 1/16" ply. The canopy has a floor, front and back of 3/32" sheet. This can now be assembled to be a snug fit in the fuselage cutout. It is not glued in position as it serves as the hatch. Bring the interior of the cockpit to a good finish and spray a matt grey. Add the instrument fairing – a small section of 1" x ¼" T.E. stock. Paint or stain this and then glue the canopy in position, including a pilot's head, if desired. Paint over the glued area with your trim color. Glue two ¼" square cross members across the bottom of the cockpit to locate it in the fuselage. Although I did not bother with a cockpit on my original Ladybird Mk 2, I did build one as described for the larger version, and the improved appearance was worth the extra work. Leave the fuselage now and start on the wing.



Wing construction:

I use a wing jig of simple construction, and having 3/16" steel rods tensioned across a strong steel frame. The wing can, of course, be built on a

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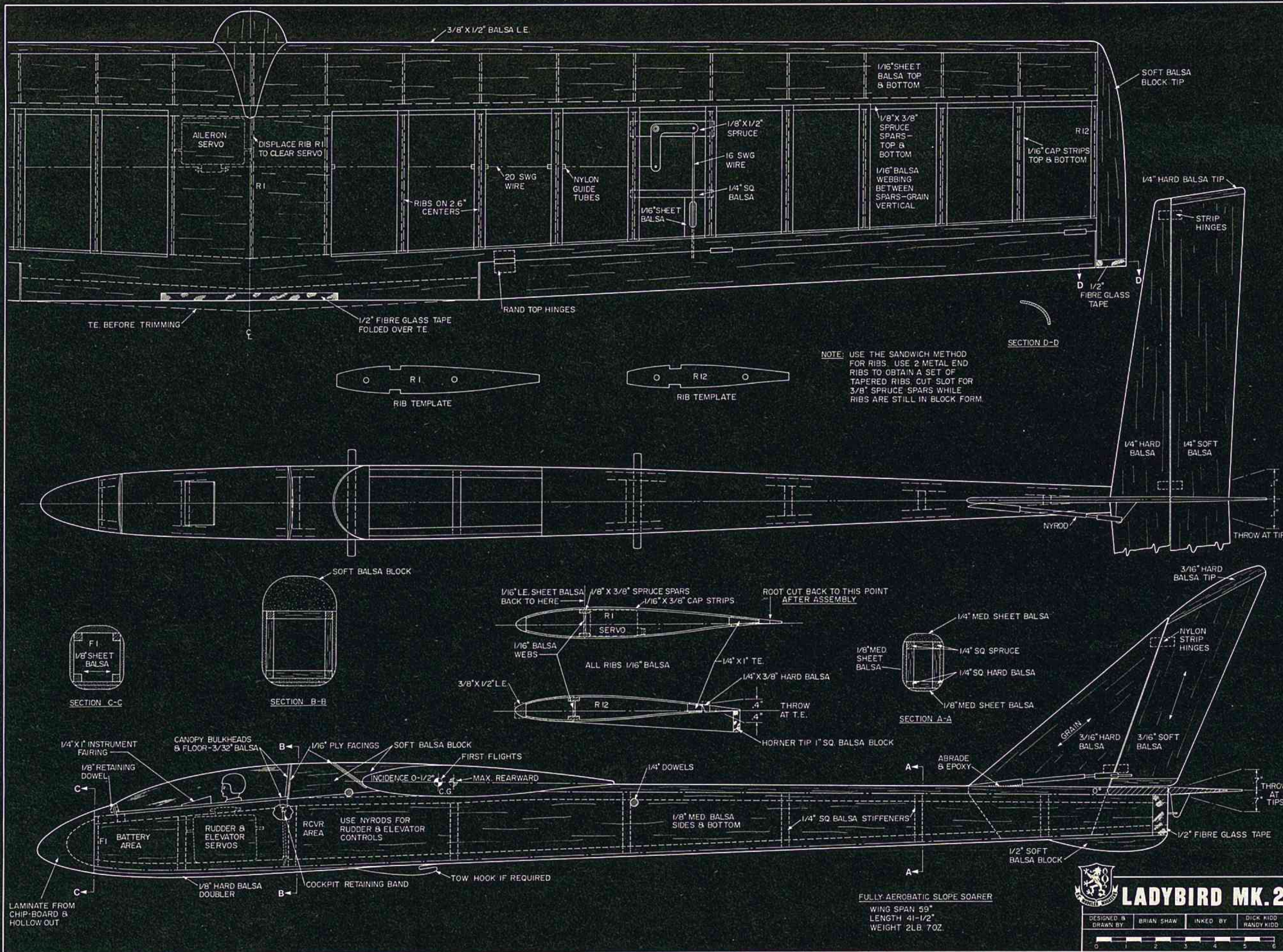
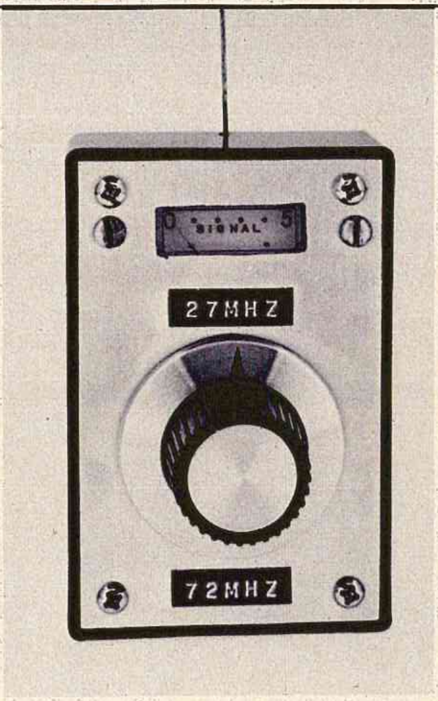
FULL SIZE PLANS AVAILABLE — SEE PAGE 118



Build A Battery-Less, Pocket-Sized

FIELD STRENGTH METER

By HARRY J. RIETHER



GENERAL

The only way to be certain your transmitter is operating properly is to actually measure the energy radiating from the antenna. That measurement can be a nuisance if a battery powered field strength meter is used for regular checking. True, such meters may have great sensitivity, however, they lack simplicity, ruggedness, are unnecessarily expensive, and they are one more piece of equipment which must have a battery checked or replaced at the most inconvenient times.

The Field Strength Meter (FSM) presented here is small, cheap, easy-to-build, covers all present R/C frequencies, and needs no battery or other power source. All power to deflect the meter comes from the radiation being measured. Therefore, no meter reading means no power radiated from the transmitter. Likewise, an abnormally low reading means abnormally low power output from the transmitter. This is the kind of fault you can determine quickly and easily with this field strength meter. Built in "power meters" in most R/C transmitters do not indicate radiated power anyway. They only sample the power provided by the final RF stage.

USING THE FSM

All readings are to be taken with the FSM antenna parallel with the transmitter antenna at a spacing of 6 to 8 inches. The transmitting antenna may be only partially extended during this check. Just make all subsequent checks with the same amount of antenna extended. Usually one section extended is sufficient. With the transmitter antenna fully extended, the antenna spacing will be about 10 inches for a half scale meter deflection using a typical 5 channel transmitter. With the transmitter on, turn the FSM knob to tune the FSM tank circuit for maximum meter deflection. It may be necessary to move the FSM further from the transmitting antenna to avoid full scale meter deflection. Tuning the meter cannot be done accurately when the meter is fully deflected. Retune the FSM as necessary for a peaked meter reading and measure the spacing between the transmitter and the FSM antennas. This spacing is to be used when this particular transmitter is checked in the future. Record the reading and the antenna spacing in the chart on the back of the FSM for a handy and permanent record. (See Figure 7.)

The next time you are flying and experience any range problems or unusual "glitches," first verify your transmitter is radiating enough power

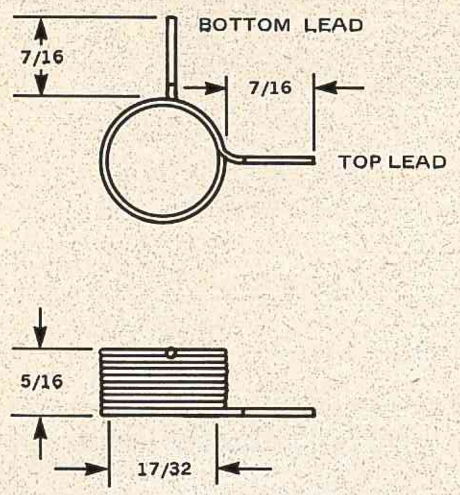
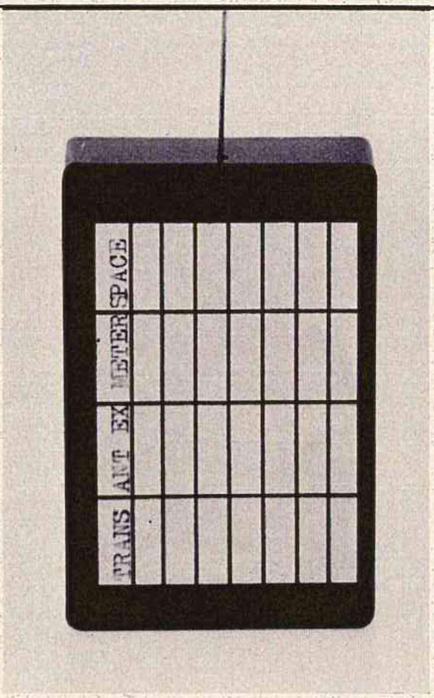


FIGURE 1 TANK COIL L
10 TURNS, 22 AWG



by duplicating the test readings listed on the chart. If the FSM readings are low compared to those recorded readings, then the transmitter should be recharged or repaired, as necessary. Frequently antenna connectors are overlooked as a trouble spot. Keep them clean and tight.

CIRCUIT OPERATION

See Figure 6. The frequency of the FSM tank circuit formed by L and C is tuned to the transmitter frequency by varying C. Diode D1 and Meter M tap some of the energy from the tank and indicate the presence of this energy as a meter deflection. You provide part of the antenna ground plane for the FSM as you do for your transmitter. Therefore touch the FSM front panel during all measurements.

CONSTRUCTION STEPS

Of all the items you may build yourself, there aren't many as simple as this one. Just be sure that the tank coil L wound in Step 1 is positioned close to, but not touching, the plates of capacitor C.

Step 1 – Wind tank coil L per Figure 1 using 10 turns of 22 AWG enameled wire. The coil can be wound on an AA size battery. Protect the battery with a layer of waxed paper. Two coats of Ambroid cement will keep the turns in place. Prepare the coil ends by scraping clean and tinning with solder when the Ambroid is dry.

Step 2 – Modify the front panel according to Figure 2. The panel can be kept relatively scratch-free if it is covered with wide masking tape before marking and drilling. Remove the tape before mounting capacitor C. The meter opening can best be cut out by first drilling an access hole, then using a jig saw such as a Dremel Moto Shop to cut along the outline. Drill the three remaining holes as indicated. The four corner holes already exist in the panel. Although an elaborate panel marking scheme can be used, the author used a plastic tape labeler for fast, easy frequency marking.

Step 3 – Make the meter clamp from any aluminum 1/32" or thicker as detailed in Figure 3. It holds the meter in place under slight pressure.

Step 4 – Using 16½" of 1/32" music wire, put in the bottom bend now per Figure 4. The top safety loop is bent as the very last step in the assembly. Drill the 1/16" hole in the plastic case per Figure 5.

Step 5 – Mount the tuning capacitor HF-15 to the back of the front panel through the 5/16" hole with the hardware provided. Orient the capacitor terminal posts. Using the clamp you made in Step 3, mount the Heathkit meter in the meter cutout using two 1/4" x 40 sheet metal screws.

Step 6 – With just 4 parts to be soldered in place, the assembly is nearly finished. Refer to the photos for the location of tank coil L. Solder each lead to the capacitor left hand terminal post and solder the lug as shown. Coil L should **not** touch the plates of capacitor C. Mount diode D1 with the cathode (bar) soldered to the + terminal of the meter. Solder the anode (arrowhead) to the left hand terminal of capacitor C as shown. Use a heat sink to protect the diode. If the diode is installed backwards, the meter will peg below zero when a measurement is attempted. Solder a 1" length of 22 AWG solid hookup wire between the – terminal of the meter and the solder lug of capacitor C. (Note that capacitor C has 2 terminal posts, i.e., a

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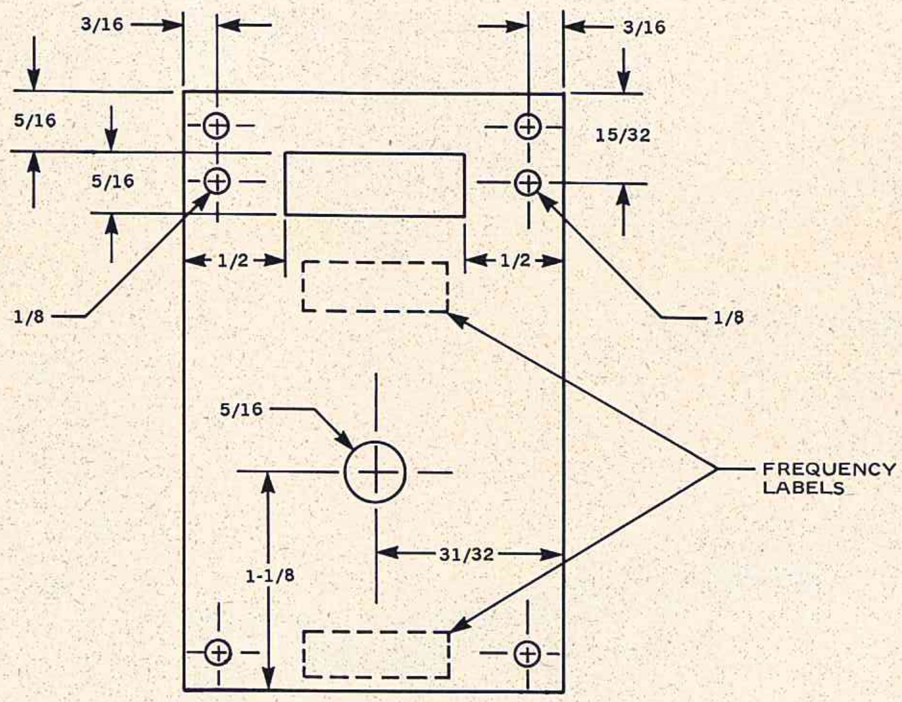
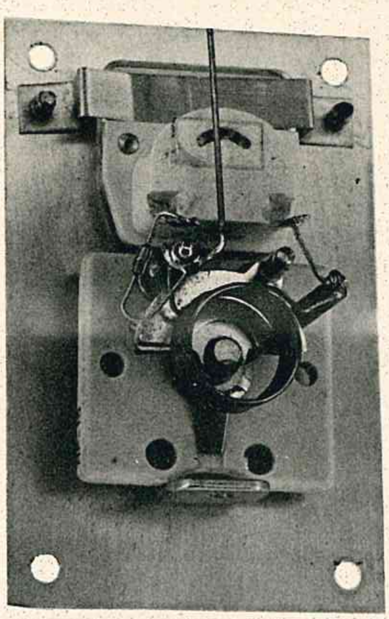


FIGURE 2 FRONT PANEL MODIFICATION

Transmitter	Antenna Spacing	Antenna Extended	Meter Reading	Remarks
1. Mk. II Mule	9½"	All	2.5	No modulation
2. Mk. II Mule	7½"	All	2.5	Tone modulation
3. Mk. II Mule	5"	1 sect.	2.5	No modulation
4. Heath 19-1	21"	All	2.5	–
5. Heath 19-1	5"	1 sect.	2.5	–
6.				
7.				
8.				



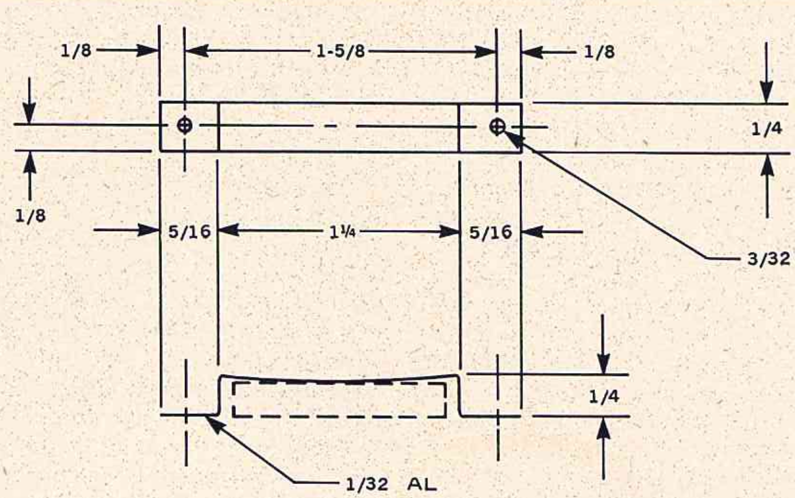
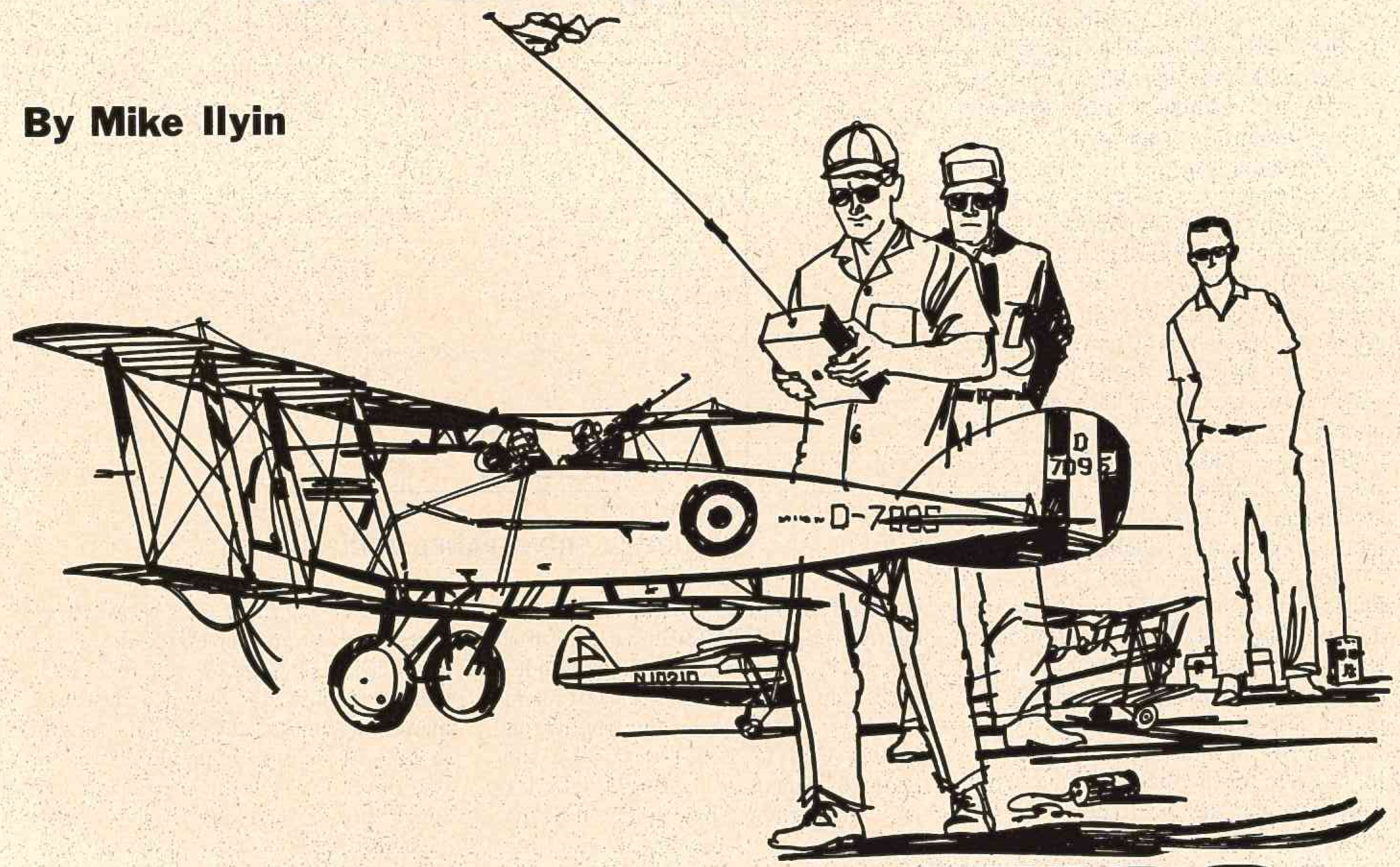


FIGURE 3 METER CLAMP

PRACTICAL



By Mike Ilyin

AERODYNAMICS

Mike Ilyin is a professional airline pilot and flight instructor, as well as an instructor for his local R/C club. In this series of articles Mike is presenting R/C aerodynamics so that you can understand how and why your radio controlled power model flies the way it does - - - or doesn't, as the case may be. The series is written in laymen's terminology with a minimum of complex formulas so that the material can be readily understood and practically applied. We hope you will both enjoy and benefit from this series, and your questions and comments are both welcomed and invited.

- - - - Don Dewey

PART I

This is the first in a series of articles on practical aerodynamics as it pertains to radio control models. Hopefully, this series will unveil some of the mystery surrounding our hobby.

I find one of the problems encountered in discussing aerodynamics with R/C enthusiasts is the lack of consistency in semantics. So that we know what we are talking about let's all use the proper terms.

To begin with, let's look at a typical airplane (Figure 1). It, like all airplanes, has three axes of flight. These axes intersect at a point known as the Center of Gravity. The lateral axis extends horizontally through the airplane (wingtip to wingtip), and movement around this axis is called **pitch**. The longitudinal axis extends the length of the airplane (nose to tail), and movement around this axis is called **roll**. The vertical axis extends through the airplane (top to bottom), and intersects the longitudinal and lateral axes. Movement around this axis is called **yaw**.

Airplanes are equipped with flight controls to control movement about the three axes of flight. The **primary** flight controls are the pitch control device (sometimes called elevator), the roll control device (sometimes called aileron), and the yaw control device (sometimes called rudder). In flight it is proper application, or blend of the primary flight controls, that allows us to fly the airplane properly.

There are four forces acting on an airplane in flight. They are gravity, lift, thrust and drag. (Figure 2.) The most predictable of these is gravity. Gravity is the same as the apparent weight of the airplane. As we shall learn later an airplane's apparent weight can change. The force that counteracts gravity is lift. Lift is generated by the airfoils or flying surfaces. There are many different airfoil shapes all designed for a specific purpose; high lift, low drag, high speed, etc. Thrust is the force that moves an airplane through the air. Generally thrust is accomplished with an engine. (Gliders and sailplanes depend on gravity for their thrust.) The force that counteracts thrust is drag. Drag is the total resistance of the air to movement of the airplane. Drag is broken into two parts, parasite drag and induced drag. Parasite drag is the drag of the airframe, struts, skin, etc. Induced drag is that drag that is caused by the forces that produce lift. The product of parasite and induced drag is total drag.

All of these forces are interrelated. Let us consider an airfoil that is being thrust through the air at 40 miles per hour. (Figure 3.) As the air flows around the airfoil, the air that flows above the airfoil is forced to travel a longer distance and has to flow faster in order to reach the trailing edge at the same time as the air that flows under the airfoil. The net result is a decreased pressure region over the upper surface of the airfoil. It is this negative pressure region in combination with the positive pressure region under the airfoil that produces lift. Of course the action of producing lift also produces drag.

The amount of lift an airfoil produces can be increased by increasing its velocity, or within certain limits its **angle of attack**. The angle of attack is the angle formed by the relative wind (the direction which the airfoil moves through the air) and its meanchord line (a reference line in the airfoil that measures its average width). Figure 4 shows the same airfoil as Figure 3, but with an increased angle of attack. Now the air strikes the lower surface increasing the pressure there. The air over the upper surface has an even greater distance to travel, further decreasing its pressure. The net result is greater lift. However, the induced drag increases as well. Lift is not without its penalties.

There is a limit as to how much the angle of attack can be increased. The critical angle is the stall angle. At the stall angle the airflow over the upper surface breaks down, and all lift is lost. (Figure 5.) Consider an airplane in level flight where all forces are in balance. That is: The thrust is equal to drag, and the airplane does not accelerate or decelerate. Also, the lift produced by the airfoils is equal to the

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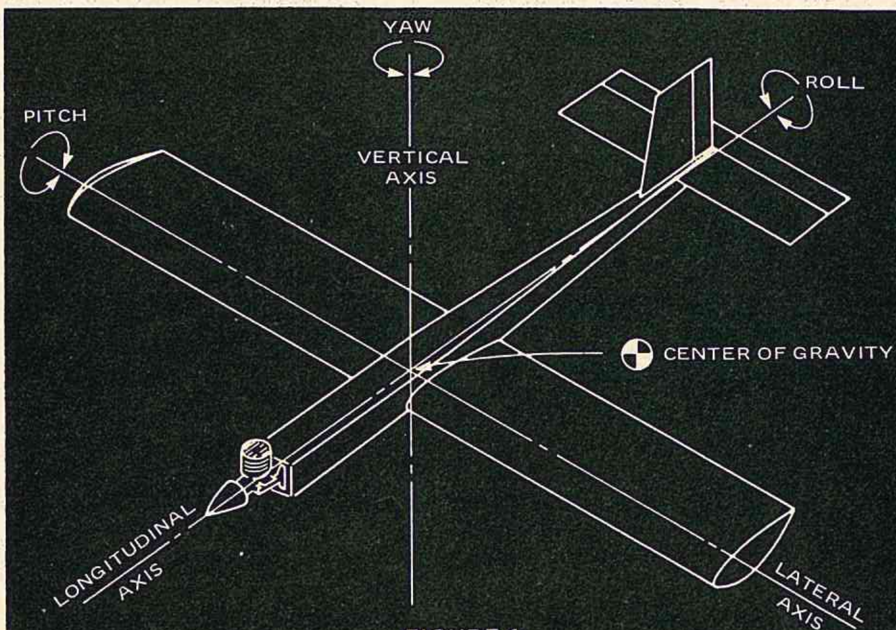


FIGURE 1

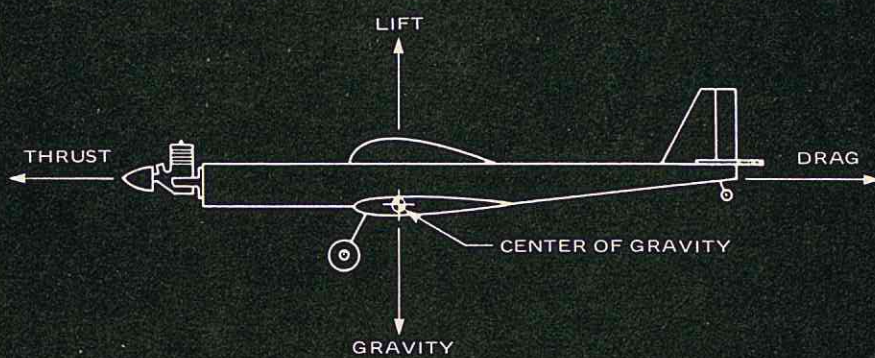


FIGURE 2

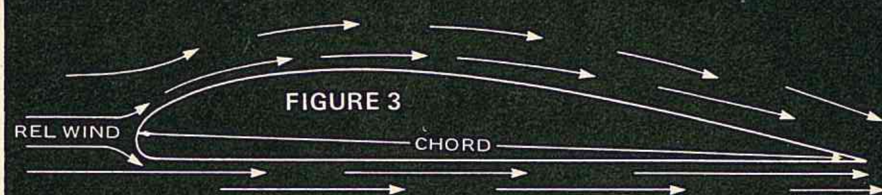


FIGURE 3

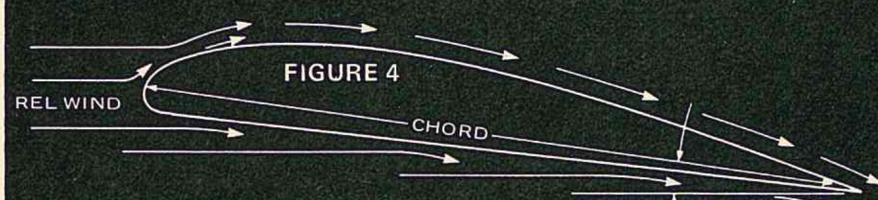


FIGURE 4

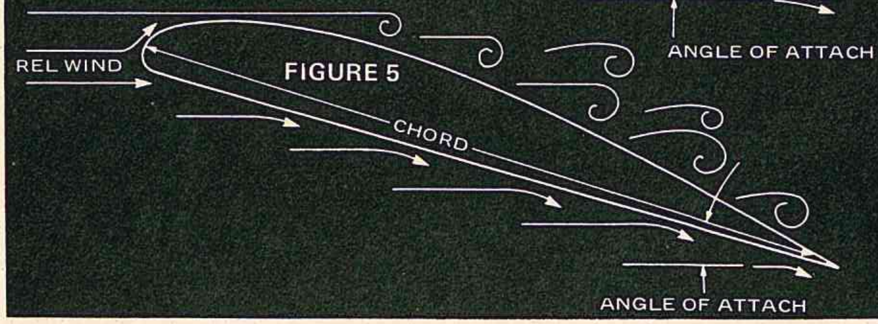
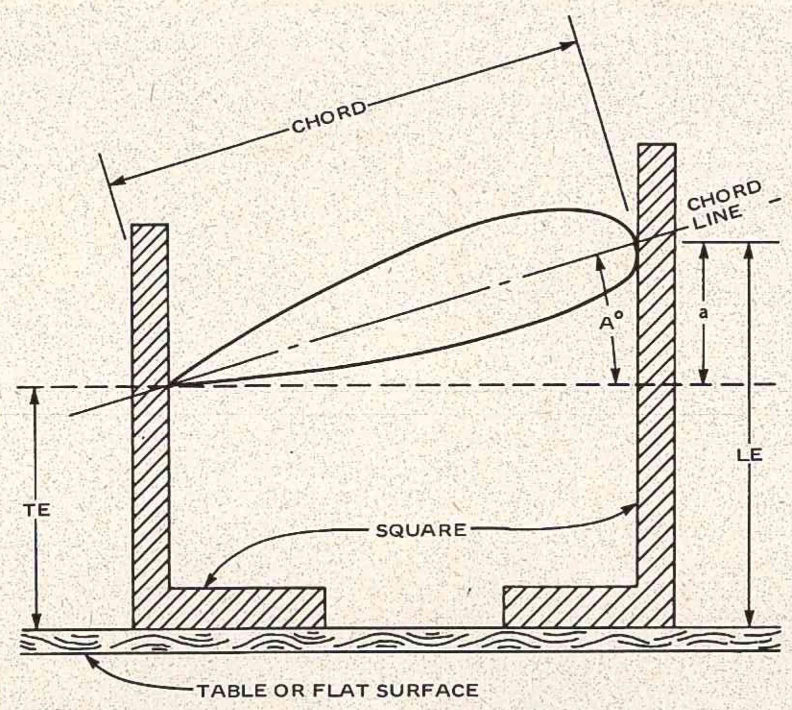


FIGURE 5



CALCULATING INCIDENCE ANGLES

The old eyeball method is good enough until the first time you're wrong!

It seems that many RC'ers cannot discuss incidence angles of their models except in vague terms and for the most part, rely on "eye-ball" measurements. This comes from the inability to take exact measurements without building complicated platforms and devices which, in my opinion, are not at all necessary.

Building a plane generally requires some knowledge of incidence angles but considering the kits and plans available, these factors have already been taken into account and are built into the model. It only requires a fine adjustment after the first test flights. However, for the interest of all concerned, these various angles can be easily calculated with simple tools available to most builders:

1) A flat surface (floor or table).
2) A right angle measuring device with at least 1/16" divisions.
3) A decimal conversion chart for fractions of inches.
4) A sharp pencil.
5) Pad of paper.
6) A long fingernail to scratch your head while figuring a few problems.

I think you'll agree that this does not constitute elaborate equipment but, in spite of its simplicity, you will be able to generate plenty of accuracy. Before making any calculations, however, the theory used in these measurements is very simple. Just figure the angles . . . so, put your model down and let's start measuring.

If the relationship between the stabilizer and wing are zero degrees, then no matter at what angle the ship will sit, both the wing and stab will have the same angle with the ground. Now, if there is a difference in angle between wing and stab . . . let's say positive 2 degrees . . . in that case the stab and wing would be different from the ground by the same two degrees. For example, if a plane at rest on the ground had the stab at 4 degrees in relationship to the ground, the wing would, therefore, be 6 degrees. So, in effect, all we have to do is measure the angular difference.

In order to have a base reference, I suggest that the stabilizer be considered as that base reference line. It would normally be more logical to consider the Thrust line as the base reference, but thrust differences can be adjusted after test flights and, therefore, thrust forces do not enter into our computations. On the other hand, I don't want to give you the impression that stabilizer incidences are always zero degrees because that is far from true. Consider then, if a design calls for the stabilizer to be positive 2 degrees incidence and the wing maintain a zero degree attack, in this case our calculations will show an angular difference of 2 degrees. For purposes of yet another example, the stab is positive 2 degrees and the wing is a positive 3 degrees. In which case, you will compute for an angular difference of 1 degree.

Considering a stabilizer at zero degrees, I guess the easiest way to start is to prop up the tail-dragger so that the leading edge and trailing edge are equidistant from the ground. In the case of a tricycle geared ship, raising or lowering the nose wheel could accomplish the same end. In any event, if you do manage to level the plane, the job is half-way done. All we need now is to measure the leading and trailing edges of the wing to determine their distance above the ground and then measure the chord of the wing at that exact point measured to ground.

For purposes of identification, the chord of an airfoil is a line passing through a point on the leading edge and to a point on the trailing edge. So, don't go measuring to the bottom of the wing – or stab – unless it is a flat surface.

Referring to Figure 1, the chord measurement is the width of the surface at the exact point the distance from the table is measured. Therefore, any taper, sweepback or dihedral, will not effect the final answer. However,

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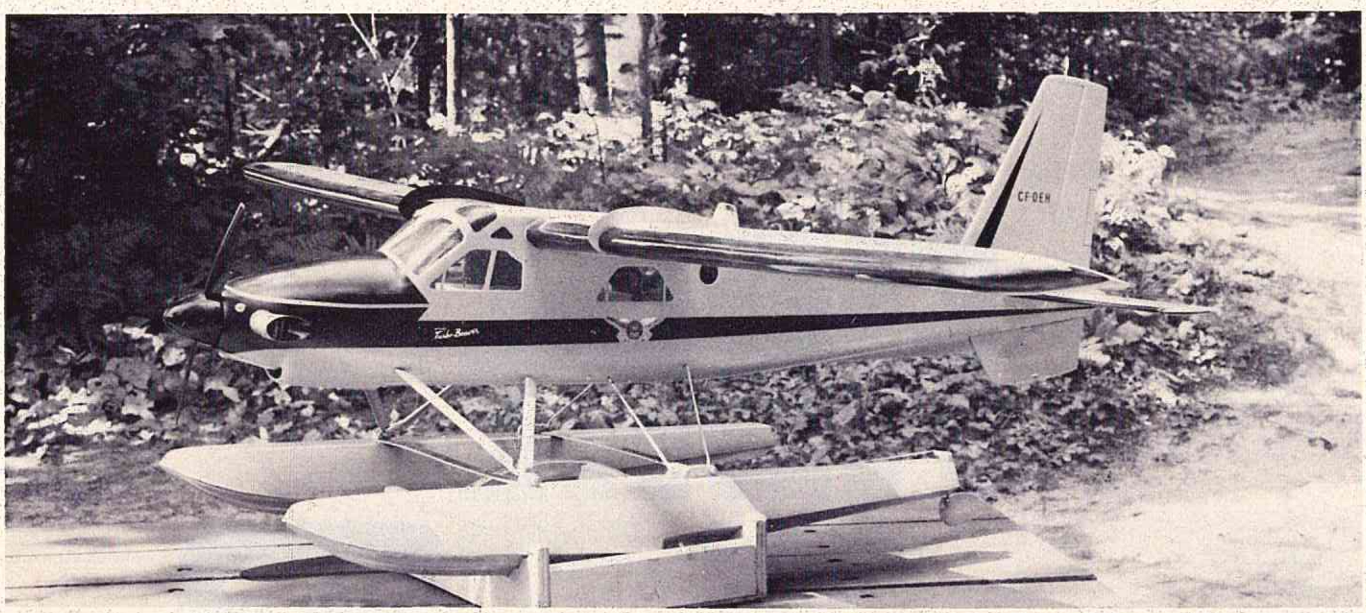
FIBRE GLASS

BY D.W. McTAGGART



The author's DHC Turbo Beaver features a wing and tailplane, as well as fuselage, molded of fiberglass. Avoiding the use of wood prevents soaking balsa and the subsequent need for drying out.

It's that way with both weather and fibreglass – many people talk about it, but so far, few people have done anything about it. There are many beautiful fibreglass fuselages available on a commercial basis, but not many "home-builts." That doesn't mean it isn't possible to turn out a superior product in your own workshop, without all the special equipment. In fact, all that's needed to build a fuselage, cowling, or even a boat, is the fibreglass materials, wood working tools, a large pair of scissors and a ventilating fan.

Fibreglass has many advantages over balsa for an R/C fuselage. With the attrition rate from Sunday flying ("must have been interference") and the lack of time available for building, the speed of reproducing from the master mold easily solves the time problem.

In watching some of the more experienced contest fliers, I have noticed that they stick with a good design and, with modifications, may build 5 or 10 prototypes, sometimes 2 or 3 concurrently (just in case). The ready duplication from a fibreglass mold makes this practical. It proved to be so easy and fast – and just plain fun – that I didn't stop until I had a half dozen completed. Another advantage that appealed to me was the beautiful compound curves obtainable. They can be achieved quite effortlessly and without adding the weight which can't be avoided in built-up balsa block structures. These curves also serve to give the fuselage rigidity and strength. This factor – the strength of fibreglass – has been recognized for quite some time in model building. For example, fibreglass has been used for reinforcing the front end of balsa fuselages for several years.

If you can obtain any shape you want in fibreglass, why not one that looks like the real thing? The Hawker Tempest, illustrated here, was selected because of its pleasing appearance and similarity in aero-dynamic configuration to successful multi aircraft. The method described, however, would suit any aircraft. The detailed construction information is followed by a summary.

CONSTRUCTION

The fashioning of the male mold or "plug" will require your most careful attention – your final product can't be much better than this original. The object is to make both halves of the fuselage at the same time and in one piece, but in such a way that they can be separated into equal halves. This was accomplished with dowels as illustrated in photo 1.

Two clear pine planks were doweled together after cutting the basic shape (top and side views) with a band saw. (Sort of reminds you of the old solid balsa models, doesn't it?) Wing fillets were individual blocks of pine, white-glued into position before carving. Carving was done in the rough with a chisel, then long sweeps with a plane, followed by a disc and drum sander in a ¼" power drill applied to the curved areas. Incidentally, if you have a lumber yard that sells imported wood, it may be possible to get large blocks of balsa to use instead of pine. The balsa can always be re-used later for another project. Final sanding should be done with a sanding block to prevent a raised grain. The polyester resin used with fibreglass, or epoxy may be used as a wood filler. Block sand between coats. When the wood grain is completely filled, mount each half on a ½" plywood plank by screwing them on from the back. (See photo 2.) This will make it possible to provide for the flange on the female molds. Fill any cracks between the plugs and planks with polyester putty or car body-filler. It is important that the finish is well hardened before the female mold is started. This will prevent having the finished lift off when the resin is applied. For a smooth final finish, rub down with fine sandpaper. Now your "plugs" are done.

The fibreglass female mold will be mounted like a bathtub in a ¾" plywood frame. (See photo 3). The first step is to apply mold release with a brush then wax and polish the "plugs" thoroughly with Simoniz or mold release wax #5. The mold won't stick with a coat of P.V.A. (poly vinyl alcohol) release agent on the plug. It will form a light, even and easily-released film.

The next step is to apply the polyester gel-coat by lightly brushing. (Don't forget the hardener!) If you wish to spray, it can be done by

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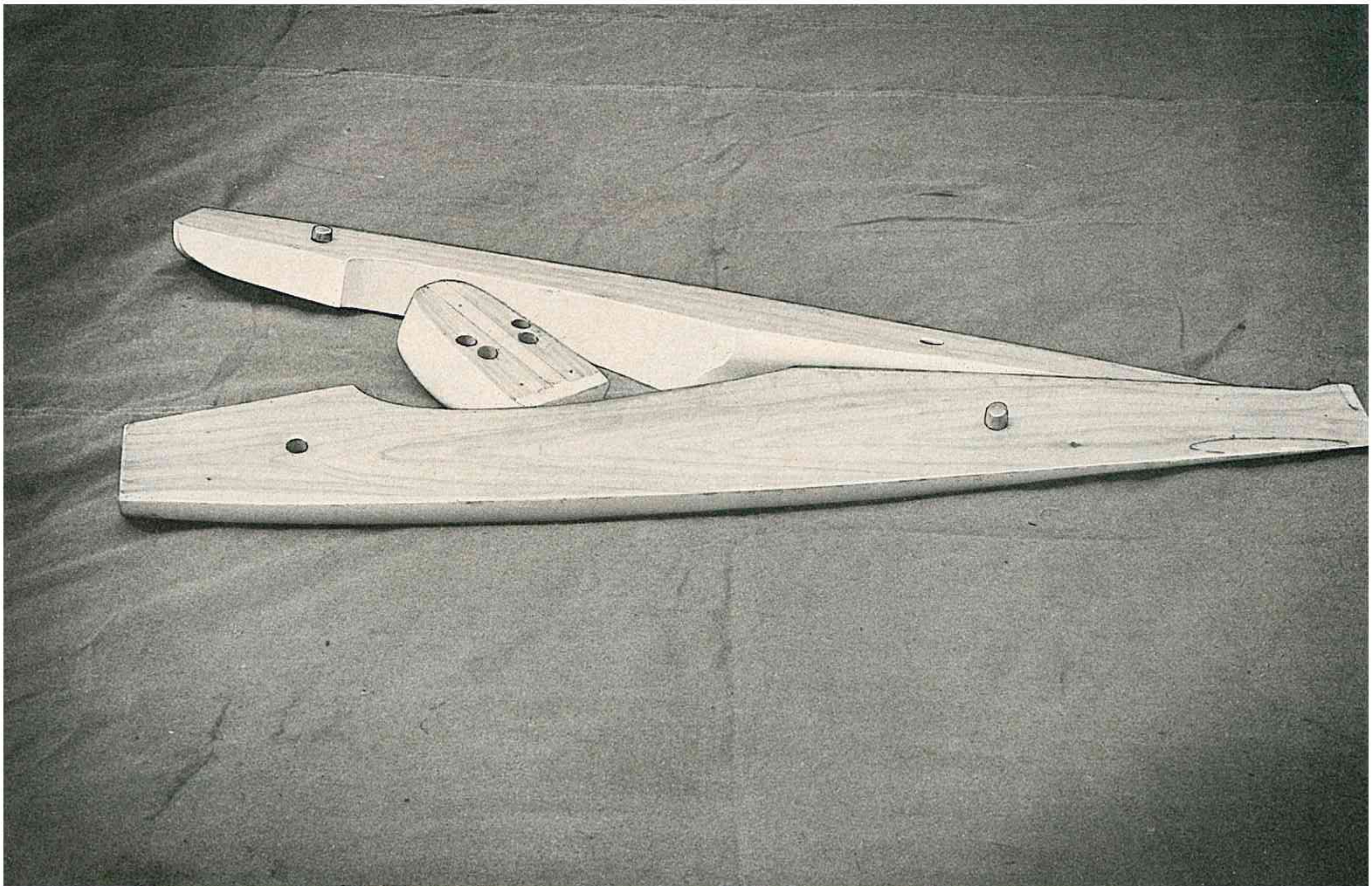
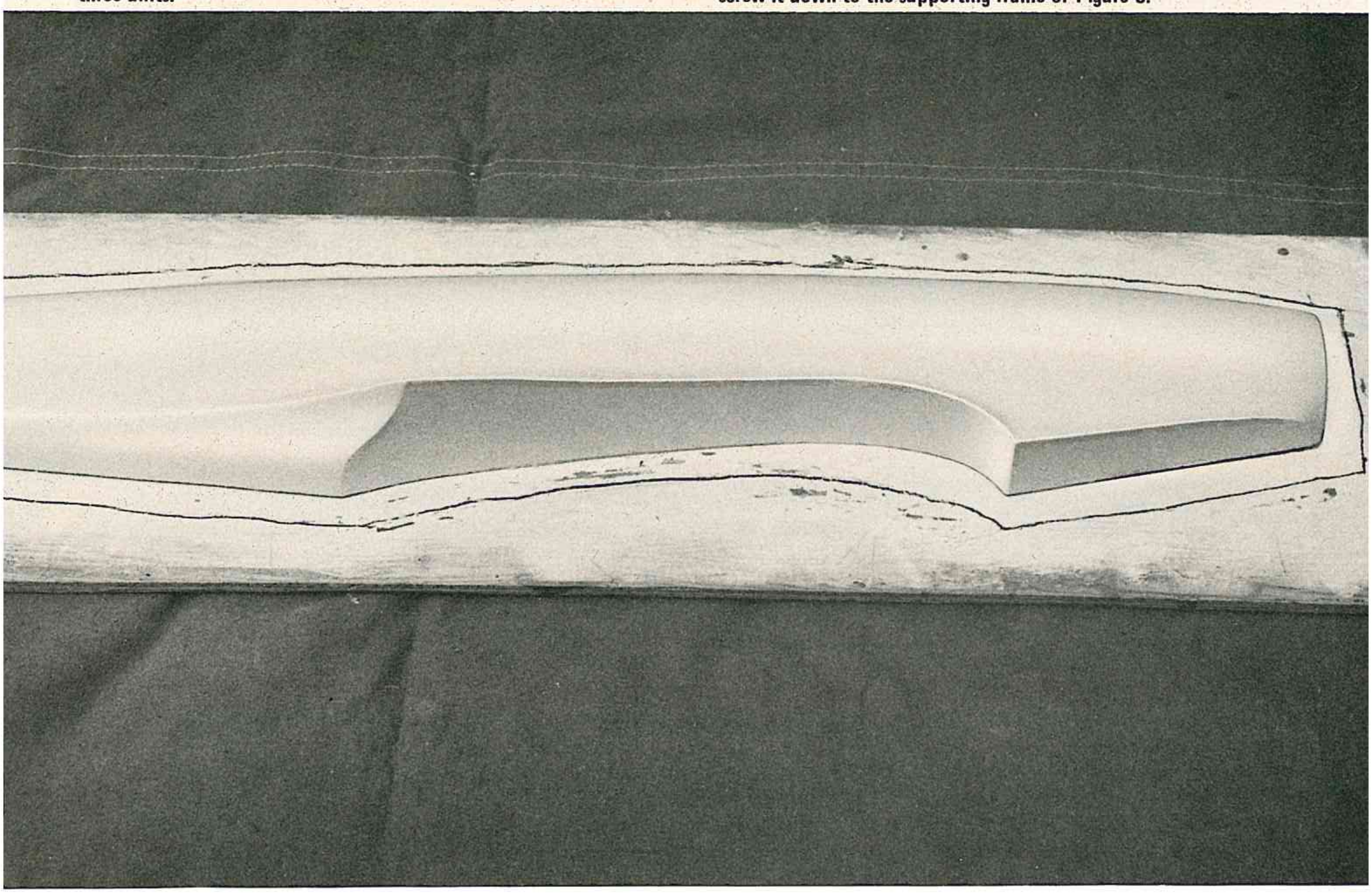


FIGURE 1: The carved "plugs" showing the dowels joining the two halves as a single unit while shaping. The chin radiator was also dowelled under the nose to assure the curves flowed between the three units.

FIGURE 2: The "plug" was screwed to a plywood plank. The line drawn on the plank outlines where the female mold should be trimmed to provide a flange. The flange on the female mold serves to screw it down to the supporting frame of Figure 3.



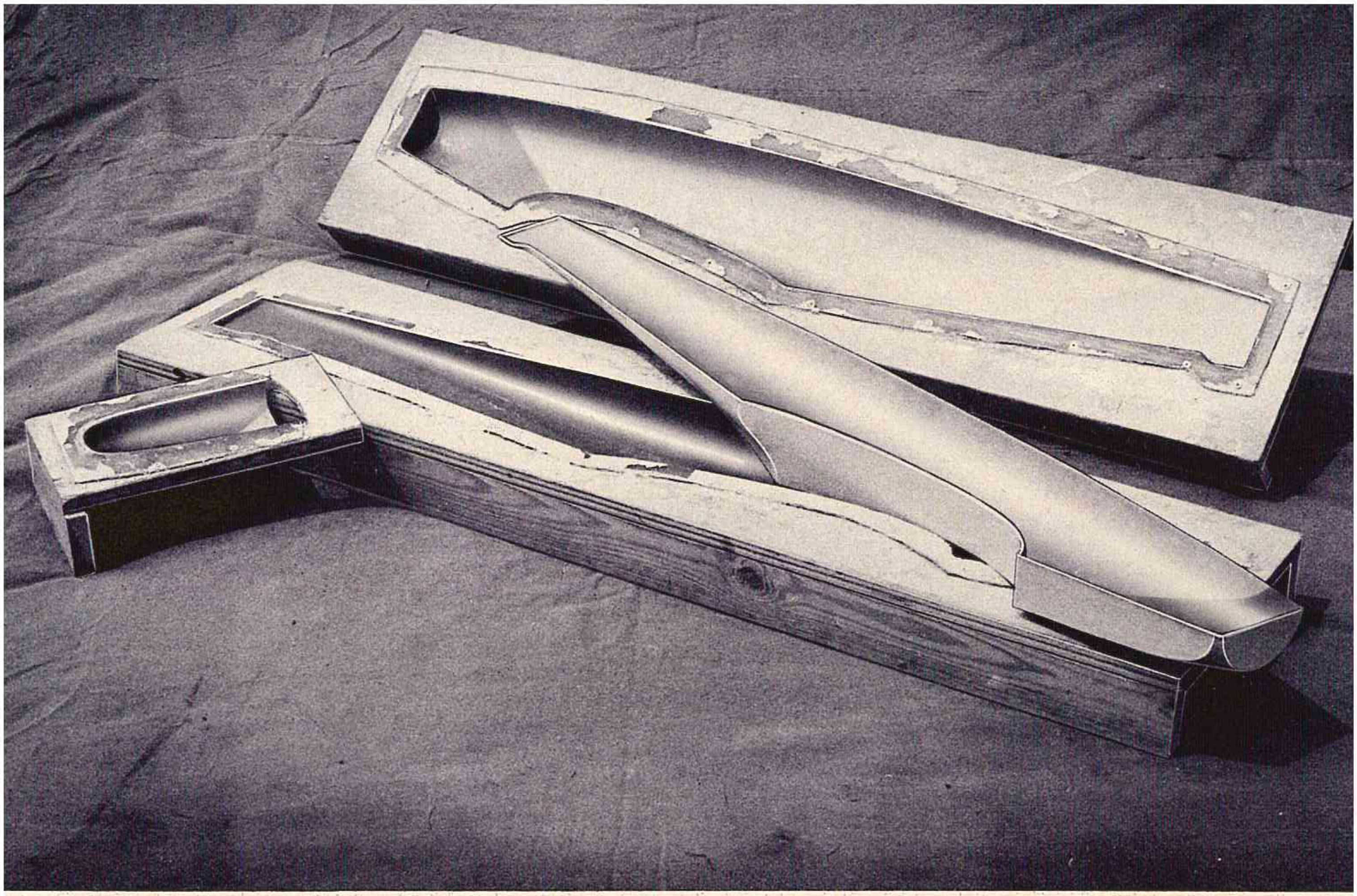
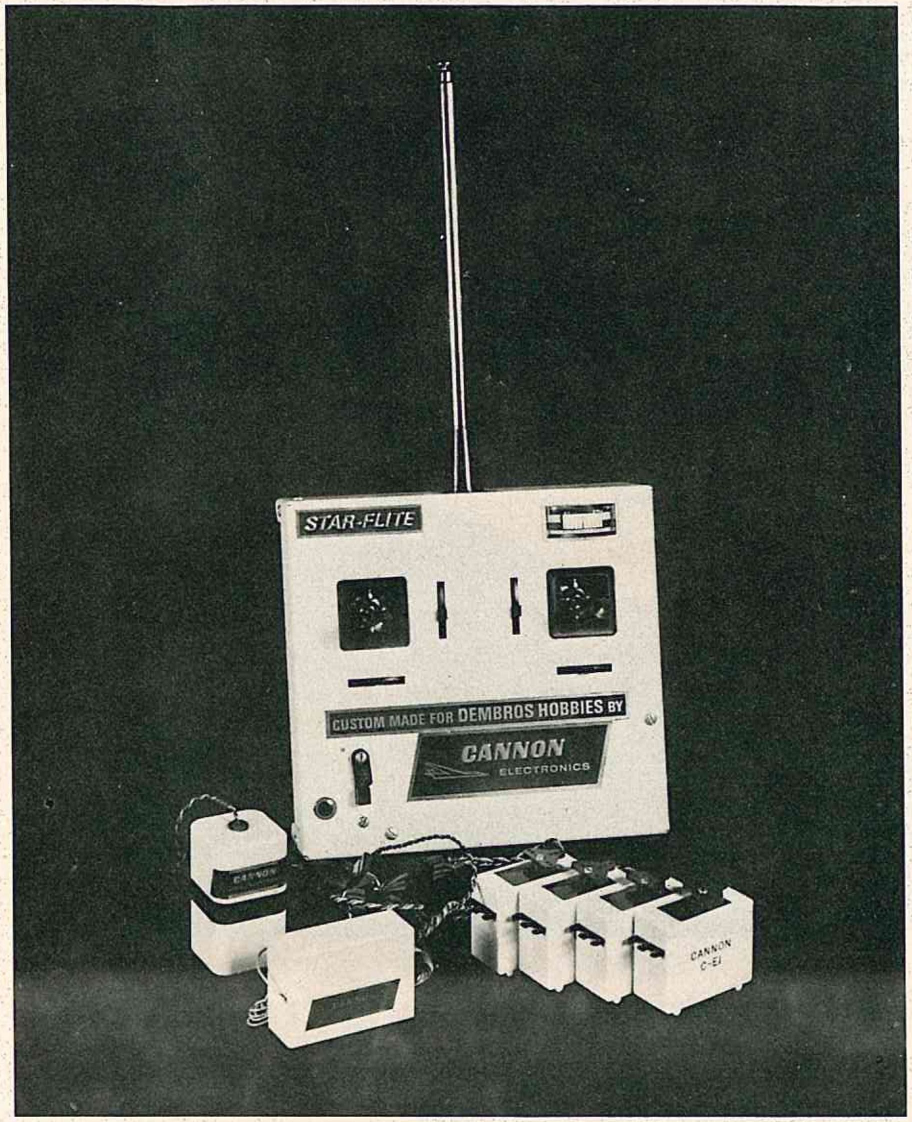


FIGURE 3 – The Female Mold: The top mold has a finished fuselage half, yet to be released. The reinforced nose section can be seen. The lower fuselage mold has been released and the fuselage half is sitting free. The small mold contains a chin radiator cowl.

FIGURE 4 – The Four Stages: BOTTOM: The carved "plug"; the female mold in its frame; a finished fiberglass shell before joining; TOP: The joined and finished Tempest fuselage.



TEST REPORT

Product Test: Ed Eggert

RCM Tests The
DEMBROS STAR-FLITE

1972 will be remembered for wage and price controls and runaway inflation at the supermarket.

From an RC'ers standpoint it will be remembered as the year U.S. radio manufacturers met the foreign competition head on with competitive prices. The magic number was the market for radios in the $200.00 price range. For the most part, the radios were produced by major manufacturers for private labels, and sold by the country's larger hobby dealers.

The latest entry in this market is a four channel radio produced by Cannon Electronics exclusively for Dembros Hobbies, 58 Lake Street, Nashua, New Hampshire 03060. Anyone who reads RCM will recognize the Cannon name from their ads over the years. Dembros is primarily known in the New England states as one of the regions larger hobby emporiums devoted to the RC enthusiast.

The transmitter is done up in a white vinyl case with gold flecks and measures 6½"W x 6½"H x 2"D. The unit has a relative output meter, as well as a red light to indicate that the internal nicad charger is operating. The stick assemblies are the popular Rand units. The system we received did have a sticking condition when actuating the elevator. We have run into this in one of our other systems that also uses the Rand sticks. The remedy is simple and consists of removing the transmitter back and then loosening the sticking bale set screw. Carefully insert a small bladed screw driver between the centering star wheel and the assembly case and just move it slightly toward the center. Retighten the bale and the assembly will be completely smooth. The throttle stick, by the way, has a ratchet, which seems to be extremely popular with fliers today.

The antenna does not collapse into the case but does unscrew for transportation. Inside, the transmitter encoder and RF assembly were neatly constructed on premium glass circuit boards, and the connections were hand soldered. Connections to pots were all covered with shrinkable tubing which avoids the possibility of shorts. One feature that should appeal to sailplane enthusiasts is the extreme amount of trim control available.

The airborne equipment consists of the excellent D & R servo mechanism with rotary outputs and a three wire single chip Cannon designed amplifier. The amplifier was also built on a glass board and wave soldered which is desirable on all airborne equipment subject to vibration. For those desiring the ultra miniature D & R Bantam or a linear servo, they are available for $3.00 per servo extra.

The receiver is housed in a flat nylon case which easily opens with your thumbnail for servicing or inspection. The circuit boards, again, were glass and wave soldered. The decoder contains two (2) IC's cutting down the parts count.

The nickel-cadmium battery pack is the new two (2) wire system and the buyer has the option of a standard square, flat pack or, for a flea-weight system, a 225 mah pack.

Ground range checks with the antenna collapsed to 8¾" was approximately 400'. At this range we could begin to get the servos to jiggle by waving the transmitter around or by placing it behind a wire fence. Extending the antenna gave a strong signal with which we could bore right through the fence without a glitch. The fence test was conducted due to some glitches we have developed in another system when flying near a similar metal obstruction which caused us "to lose it all." A flying buddy just lost a brand-new ship, equipped with a low priced system, to ignition noise generated by a lawn tractor, so we were anxious to check this system out. We were able to get a slight jiggle out of the system only when the receiver

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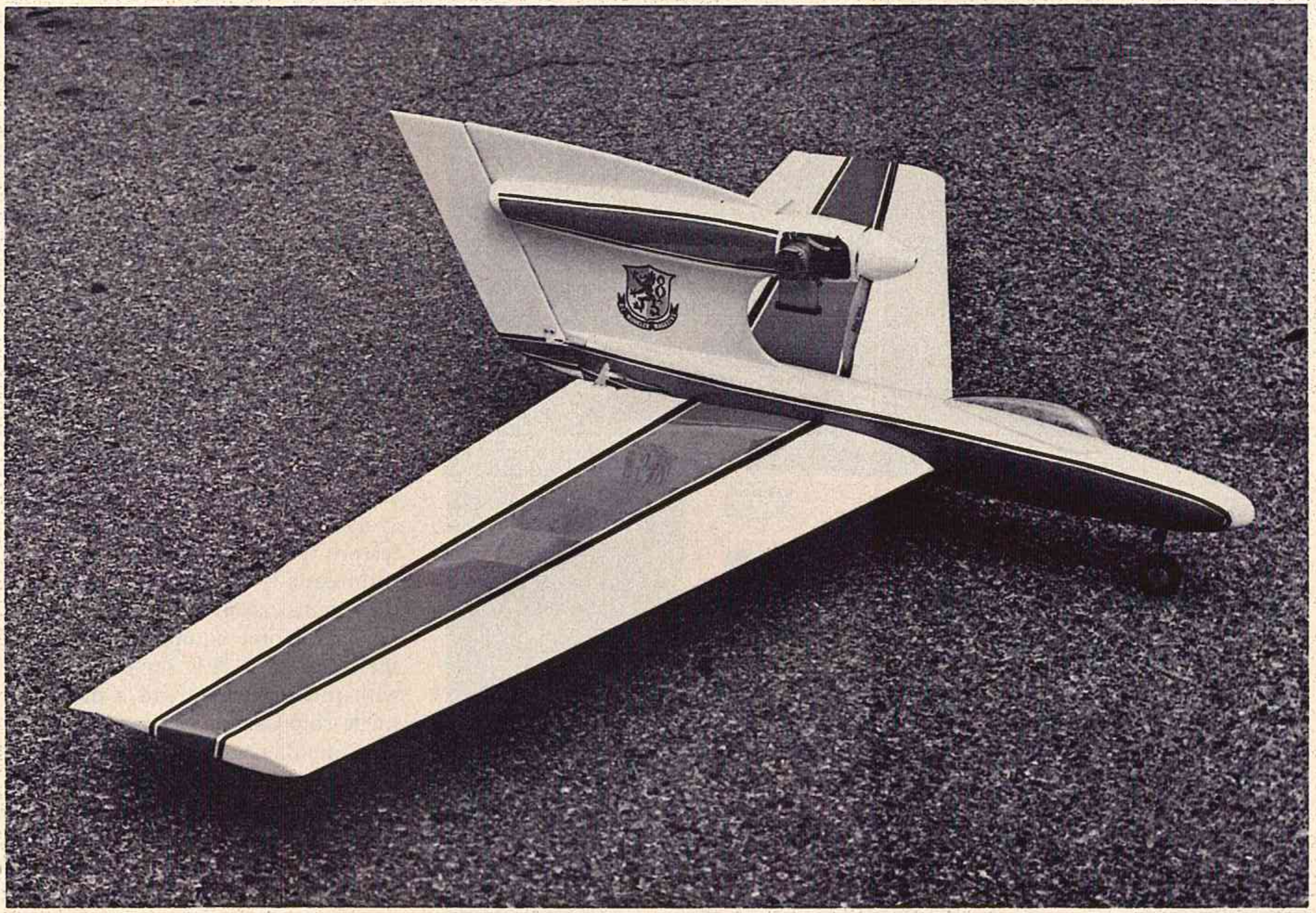


RCM Builds The Model Dynamics

SHRIEK

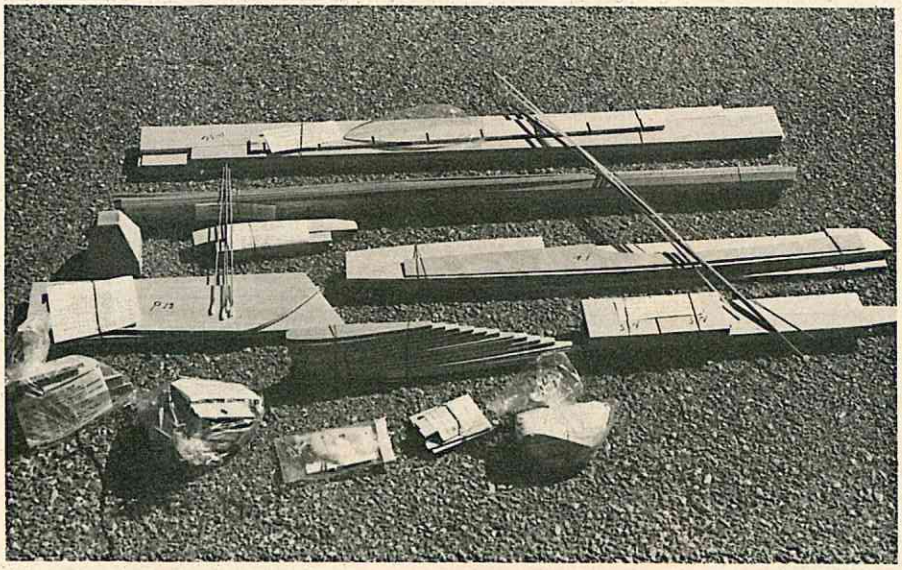
TEST REPORT

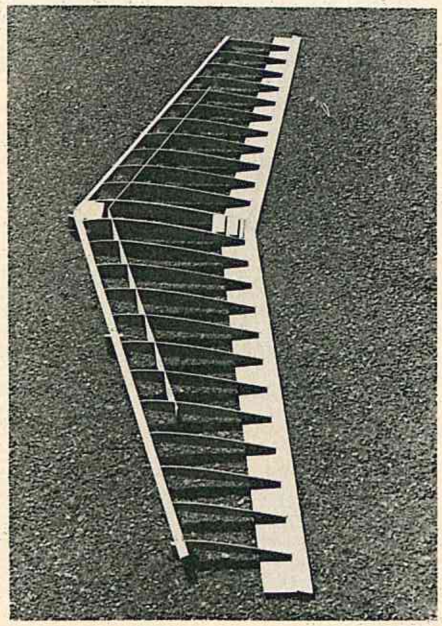
Product Test: Dick Kidd *Photography: Don Dewey*

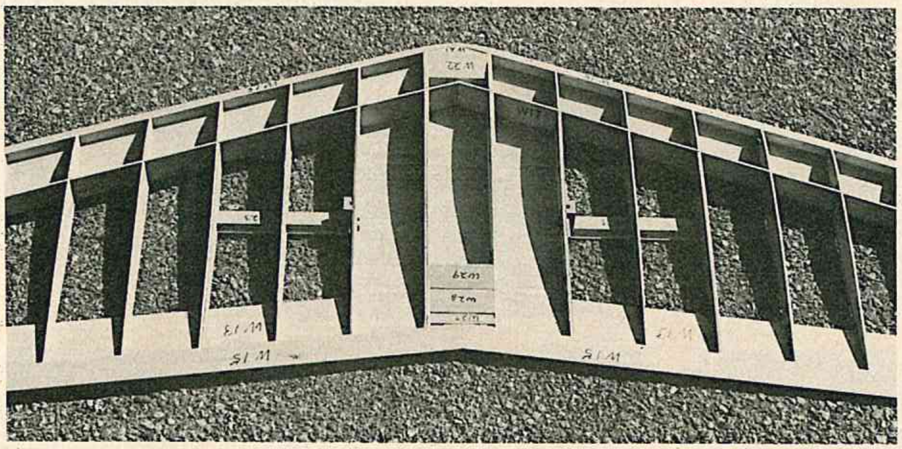
The Shriek, manufactured by Model Dynamics, P.O. Box 2294, Orange, California 92669, is a "flying wing" with a 67" span and a total wing area of 887 square inches. Designed with a pylon mounted engine from .29 to .46 cubic inch displacement, the total flying weight with four channel proportional system is 4½ lbs.

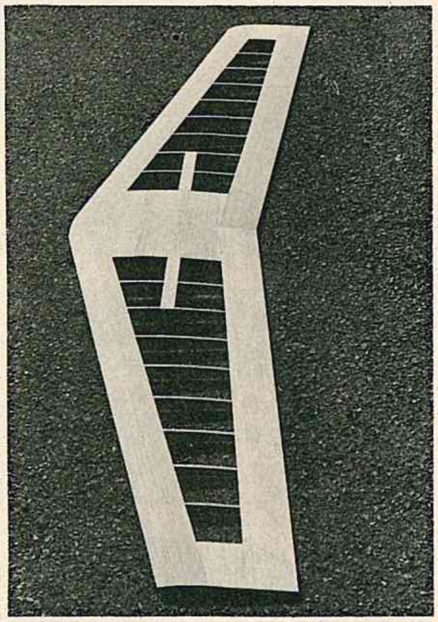
In our opinion this is an excellent kit in all respects. The parts are all hand cut and sanded and individually packaged in plastic bags with a complete parts list in each bag containing the part number and the size and description of the part. The only equipment that has to be purchased, in addition to what is included in the kit, is the engine, spinner, fuel tank, covering material, and wheels. We settled on a K & B .40 FR with a Du-Bro muffler, 2¼" Midwest spinner, a Pylon SS8 tank, Kraft wheels, and Super MonoKote covering. It is important that your engine and tank and spinner be purchased before starting this kit as the pylon and engine pod is shaped around the spinner. In order to construct this model you need a flat working surface of at least 6' x 2'. The two cements that are recommended by the manufacturer for the building of this model are Titebond and Weldwood contact cement or their equivalent.

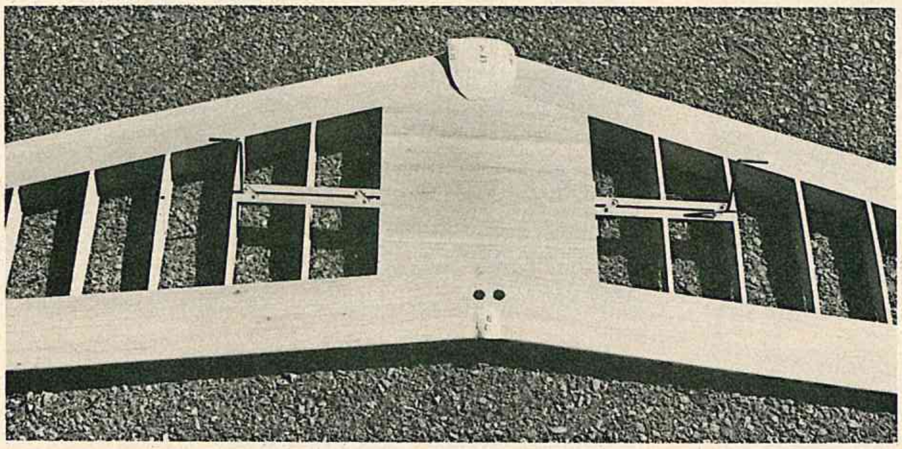
The first building step is to lay out the wing construction lines on your table as shown on the plans. This is very important as your entire wing will be built using those lines as a trailing edge guide. Glue the trailing edges to the trailing edge skins and, very carefully, pin to the construction line drawn on your workbench. The next step is to pin the tip ribs and the center ribs in place being sure that the shear web slots are up and then pin the leading edge to them. Continue to add the rest of the ribs, checking alignment as you proceed. The ribs can now be glued in place and the trailing edge can be glued together. Pin the leading edge together in the center but do not glue at this time. The wing bolt mounting pad can be glued in between the two center ribs. After the wing has dried, remove from the board and re-pin the

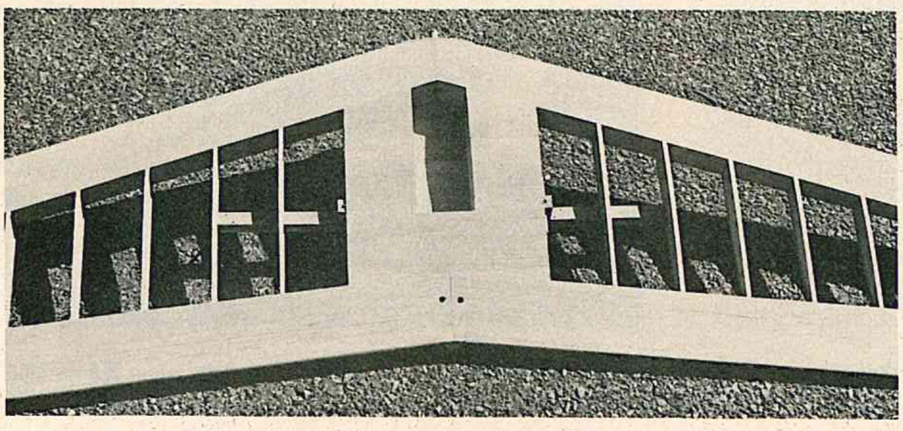








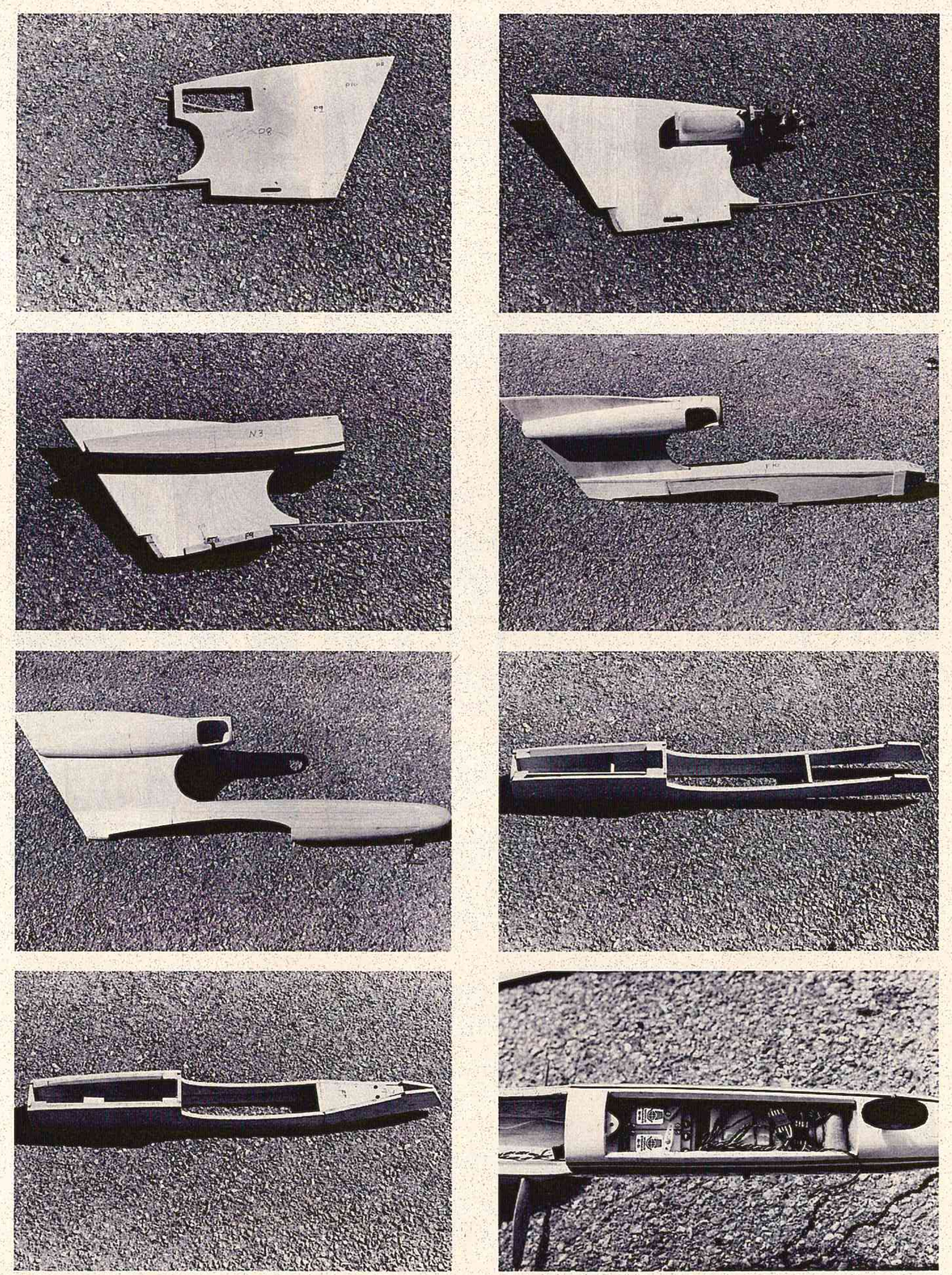




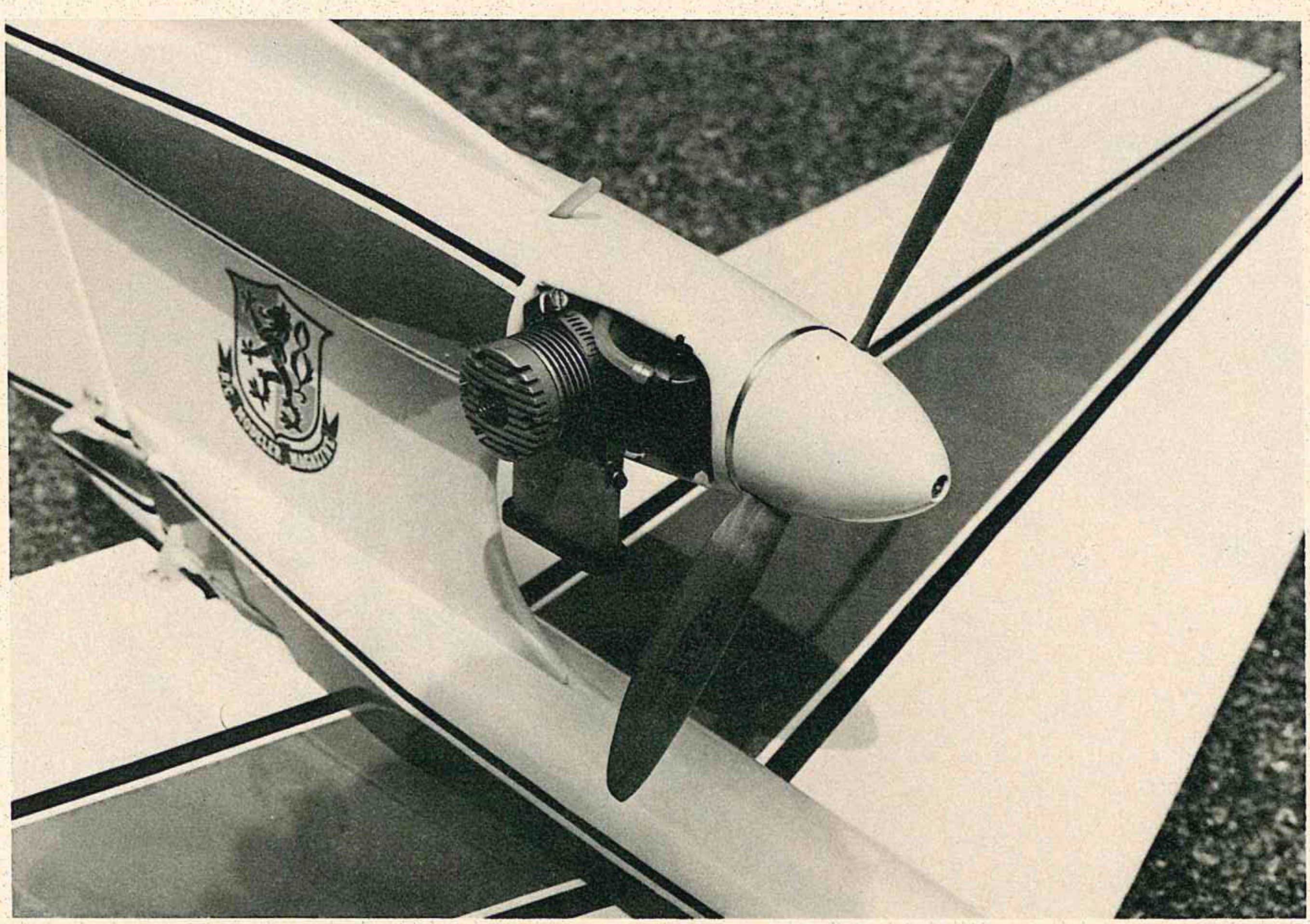
ABOVE: The out-of-the-box kit parts plus wing assembly sequence.

wing down as shown on the plans with the leading edge blocks pinned in place and the extreme trailing edge only pinned to the table. Glue the leading edge and the dihedral brace together at this point. Follow through with the dowel mount shear webs and the wing mount plates and fillers. The plywood back-up ribs can now be added to the center section of the wing. Be sure to keep the notches in the plywood ribs down. Let this entire structure dry before removing it from the work surface.

With a sanding block carefully sand the ribs to the leading and trailing edge and the shear webs to the ribs. The wing bolt mounting pad at the rear can now be shaped and sanded to contour



ABOVE: Assembling the pylon, motor and tank mount, nacelles, and simple fuselage structure. High degree of pre-fabrication insures rapid construction. **BOTTOM ROW, RIGHT:** RCM's completed Shriek with Hobby Shack Cirrus radio installed.



Close-up of RCM's Shriek. K & B .40 FR, Du-Bro muffler excellent power combination. White and orange MonoKote finish. An excellent kit of a unique aircraft that you'll really enjoy flying.

and notches cut in for the landing gear mounts using the plywood ribs as the guides. Glue the landing gear mounts to the torque mounts and glue these blocks in place. When the landing gear is thoroughly dry add the bottom skins and capstrips. This is done while the wing is free from the table. At this time trim the front of the center section flat approximately 2½" wide and fit, but do not glue, the 3/8" dowel in place. This completes the bottom of your wing.

Now the wing is turned over with the top of the wing up. Pin the trailing edge, only, to the bench using your blocks under the leading edge. Now, sheet the top of the wing and add the capstrips. Make sure the wing is thoroughly dry before removing from the table. The excess skin at the tip ribs can be trimmed off and the wing tips added. Also, sand the leading edge flush and add the leading edge cap.

At this point the wing can be completely finished sanded but not covered. The wing mount bolt holes, the dowels, and the dowel plate and fairings, will be located with the fuselage when it is complete. That is the reason for not covering the wing at this point.

Now, begin the fuselage by first building two sides, a right and a left. Add the plywood doublers and all triangle stock. The one piece of triangle stock at the hatch opening will be glued to the fuselage side in a little different manner. Be very careful to note this on the plan detail. When these fuselage sides are dry, they can be glued together with the three bulkheads. Place the spacer in position between the front two bulkheads but don't glue in place. When the bulkheads are dry, carefully cut through the rear portion of the fuselage at the rear bulkhead but don't cut through the plywood doubler. Then pull the rear of the fuselage together and cement it and the pylon base in position. The crack on the side of the fuselage can now be filled with epoxy. At this time the nosegear can be mounted using blind nuts set in epoxy. Assemble and fit the nose gear in place and shorten the steering arm. You have to shorten the steering arm since there isn't room inside the fuselage for it - - - it has to be shortened plus grooving a notch in the fuselage side in order to provide clearance for the arm. Now the bottom of the fuselage can be sanded flush and the hatch pieces can be glued into place. Set the fuselage aside now and go on to the nacelle and pylon.

At this point you will have to decide just which way you're going to mount your engine. As the pylon starts to build up you have to know where your throttle arm is going to be in order to establish just exactly where your throttle tube should come out — at the top or the bottom or the right or left side. Once you get the pylon together you can't change your throttle tube. There are eleven parts making up this pylon and four of them are cut to the finished outline. We won't go into any explicit detail on building the pylon as several of the accompanying photos show excellent views of the pylon in various assemblies. One thing to make sure of before buttoning up the side of the pylon is that your throttle tube is below the core surface and sticks out at least 1" beyond the firewall face.

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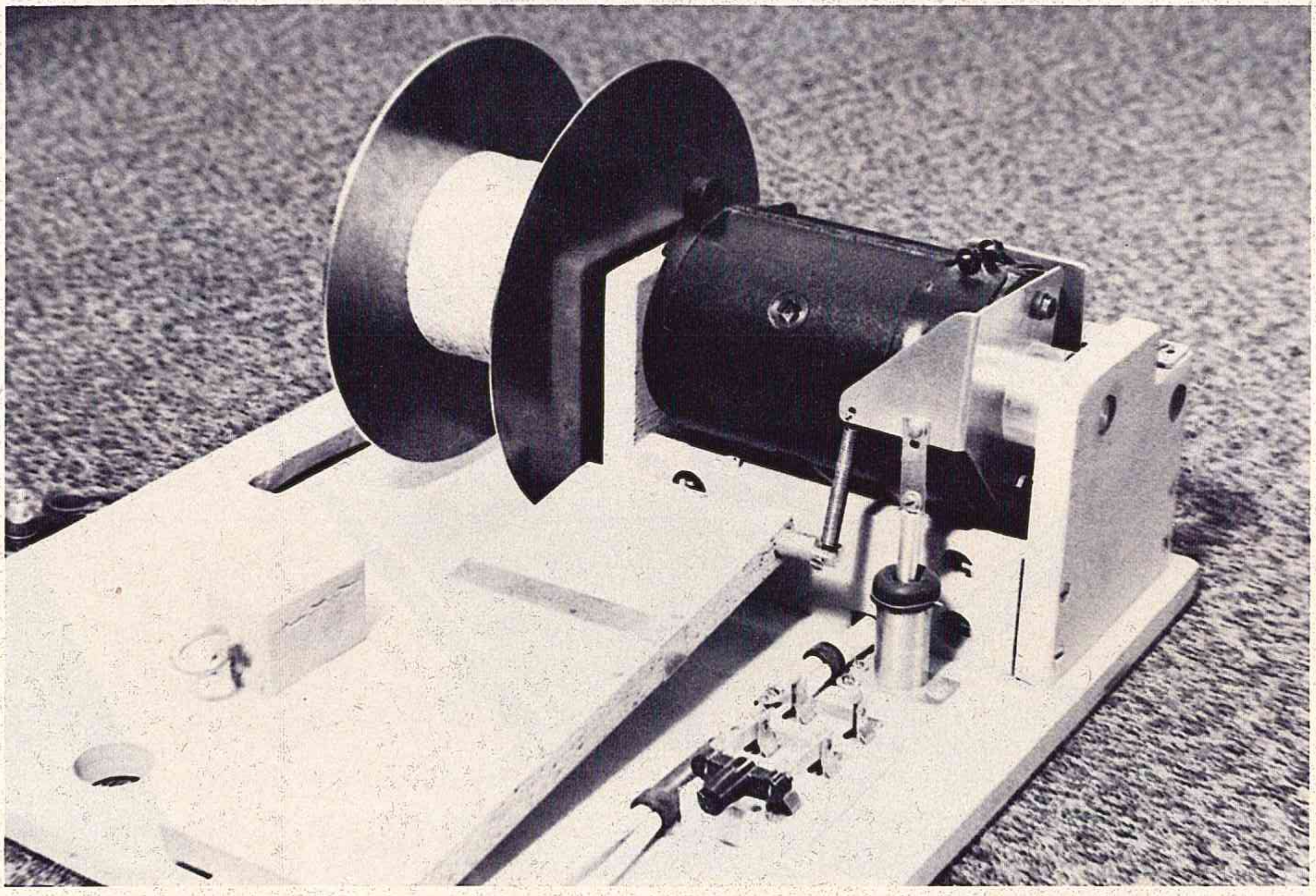
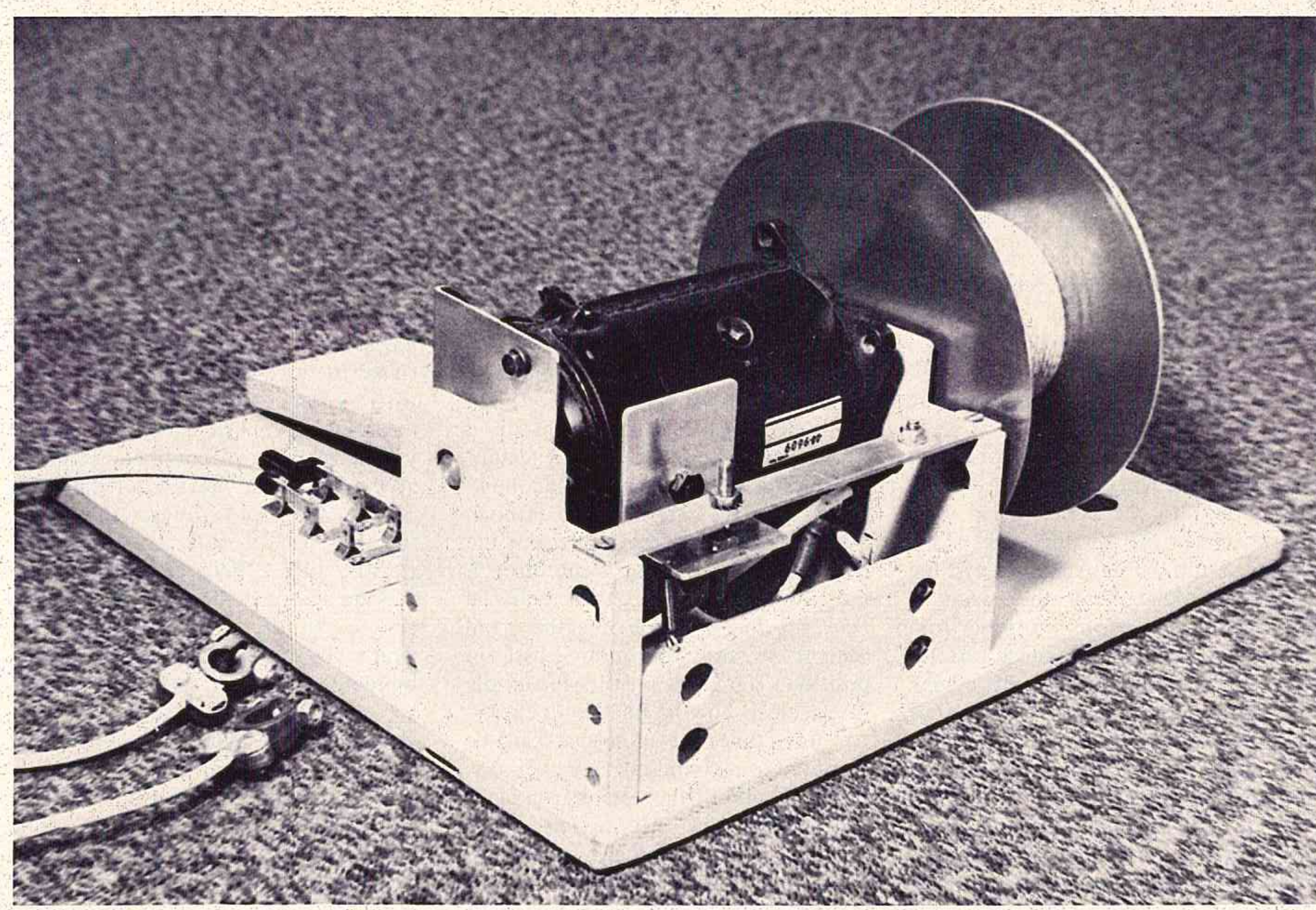




For Sailplane Enthusiasts, A Variable Speed

CONTORK WINCH

BY DICK BEURRIER

PHOTOS BY RICHARD A. POLK

Not too long ago a group of fliers (both of big planes and small ones) were at lunch, indulging in some "hangar flying" and Leon Harmon popped up with the question, "Why not build a glider winch with an electronically controlled torque?" It sounded like a good idea to me, with the exception of the word "electronic." Although my bag is electronics, that solution left me cold. A lot of wild and some good ideas got batted around. I wasn't seriously interested in the whole thing until the realization came that the counter torque on the body of a motor with high available forces could be utilized directly to control torque. A series of sketches and diagrams were generated and turned over to Leon. He came up with a design and put a beautifully controlled torque winch together.

We set up his creation in a school field in Gladstone, New Jersey. Bruce Russel hooked up his "homebrew" slope soaring glider, turned the winch on, and off it went. It only took a few flights to get the hang of it and to decide that we liked it.

Later, Bruce and I decided that what the thing needed was a 'gas pedal' to control the torque, rather than being operated at a fixed torque like Leon's. Bruce wanted to build one, and I wanted to develop the idea a little more.

The design is along the line of conventional "on-off" electric winches for two reasons. The first reason is that they are successful, and the second, they have already determined the best reel size and motor to use.

METHOD OF OPERATION

Referring to Figure 1, note that the motor armature shaft and reel are directly connected together (fantastic!). Not clearly shown in Figure 1 is the motor body mounting which is unconventional. The body is free to rotate, although it only needs to be through a few degrees. There is a contact mounted to the motor input terminal, and a fixed contact positioned to mate with the motor body (moving) contact. The circuit is completed back to the motor body through a safety or arming switch.

Also connected to the body of the motor, is a light spring which holds the contacts open, so that the thing "parks" in the off condition. On the other side of the motor body, a control pedal is hung through a control spring. Also on this side is a fluid filled dash pot.

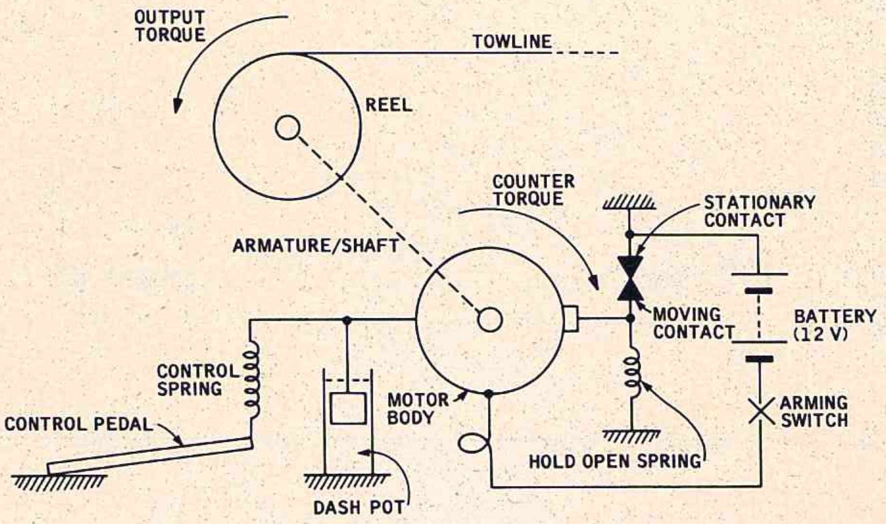
At rest, the system is arranged so that the contacts are held open a bit with the "hold open" spring, which is just strong enough to overcome the friction of the "mounting" bearings, the spring back of the heavy ground return wire, and the weight of the control pedal.

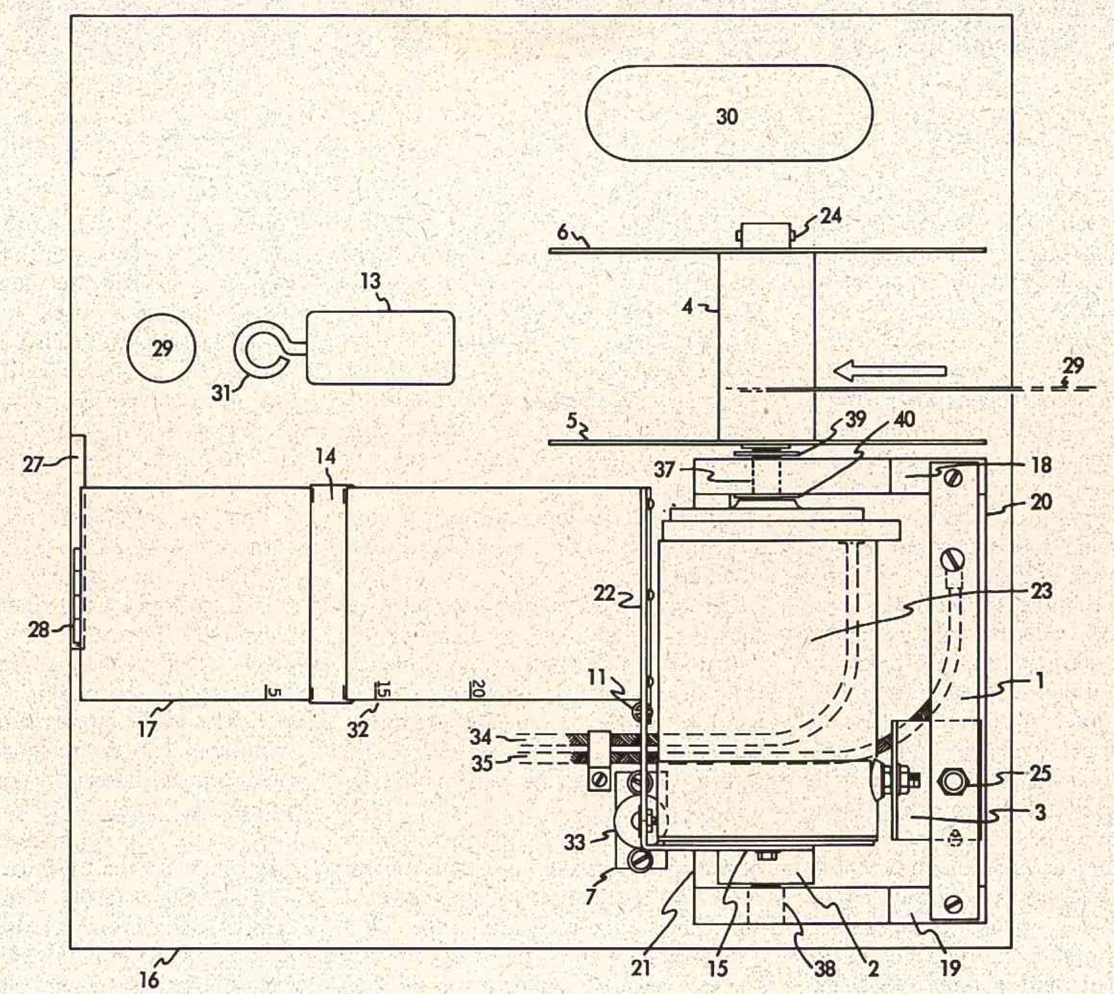
After closing the arming switch, a downward pressure on the control pedal rotates the body of the motor to close the contacts. Current flows and torque is applied to the reel. Whether the reel turns or not depends on what is connected to the towline and for the moment doesn't make any difference. The important thing is that there is an equal torque generated in the opposite direction also applied to the motor body. This opposite, or counter torque, rocks the body so that the contacts open. When the contacts open, the current stops, the counter torque stops and the control spring swings the body back to close the contacts again. This causes the cycle to repeat itself again, and again, etc. Each time the contacts hit, of course, a shot of torque is delivered to the towline. In this manner the thing rattles back and forth between pulling and non-pulling at an average torque which corresponds to how far down the control pedal is pushed.

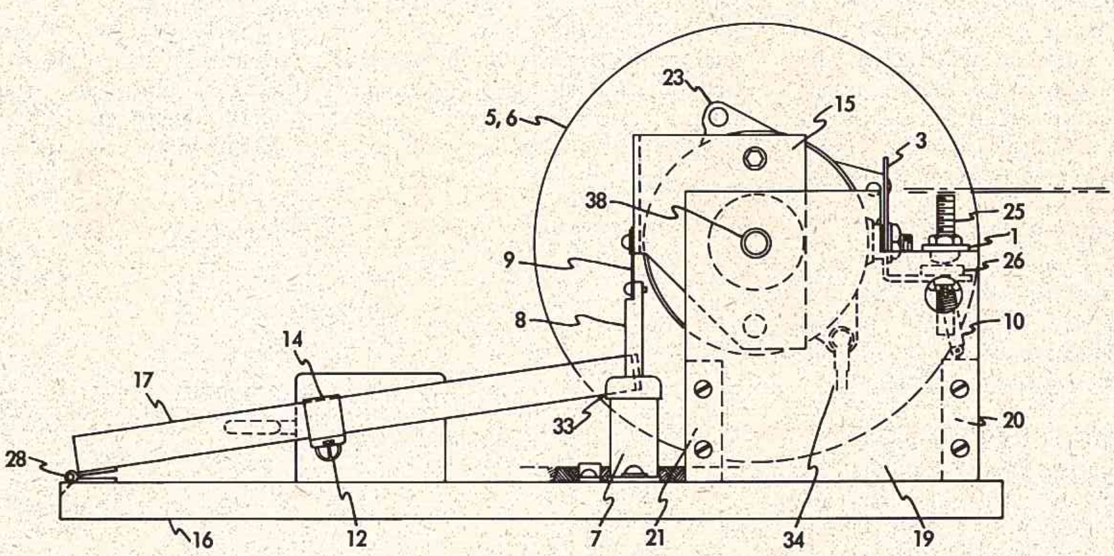
The dash-pot keeps the body from swinging so far that it bangs back and forth, which would deliver a series of hard jerks to the towline. Instead the system actually buzzes and delivers a smooth pull to the towline. When the pedal is pushed down further, the buzz automatically adjusts itself to a higher duty cycle, and to a higher average output pull on the towline.

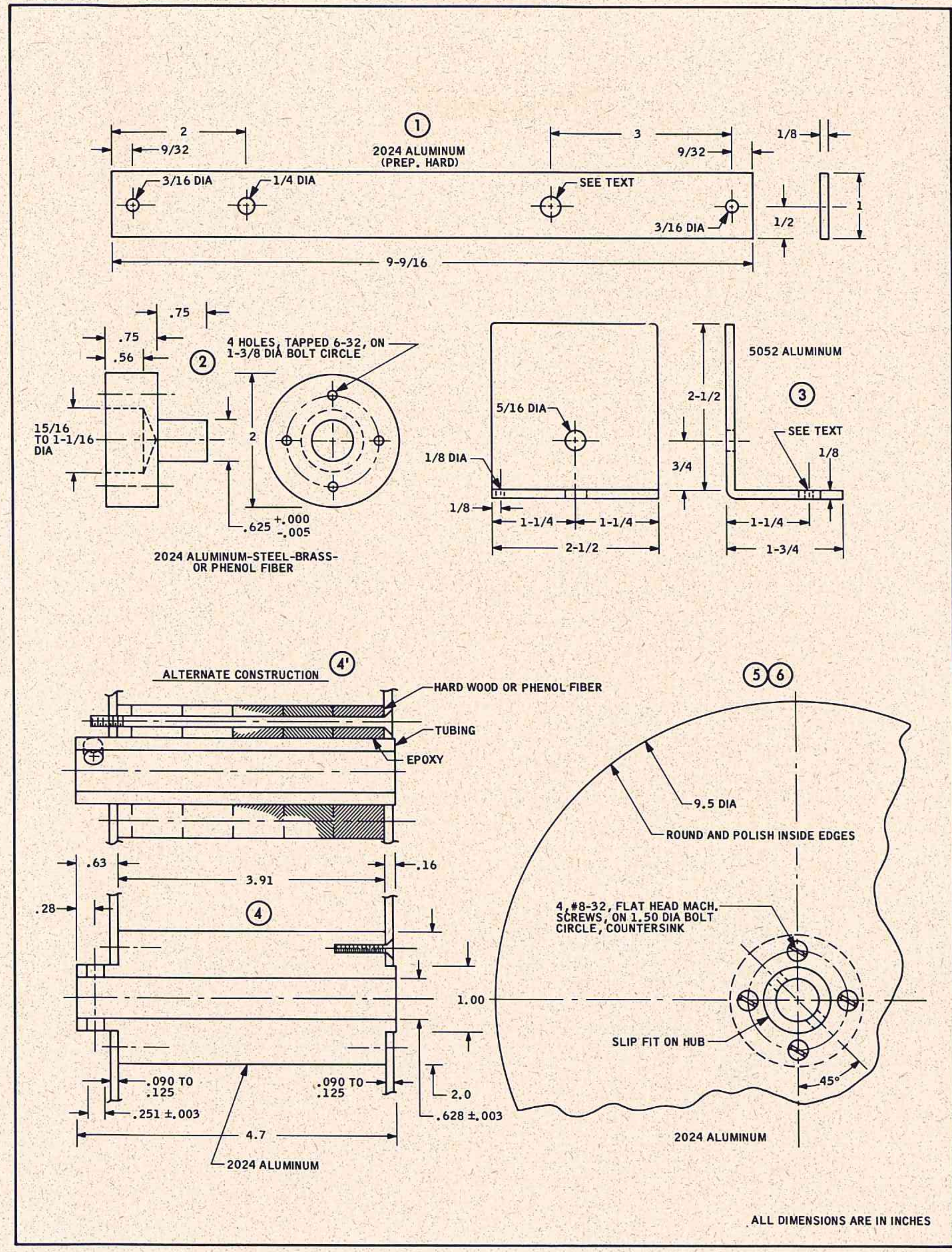
This pull is relatively independent of how fast the line is being reeled in, up to a rate determined by the battery voltage. As long as the thing is buzzing, the torque output depends on the pedal position.

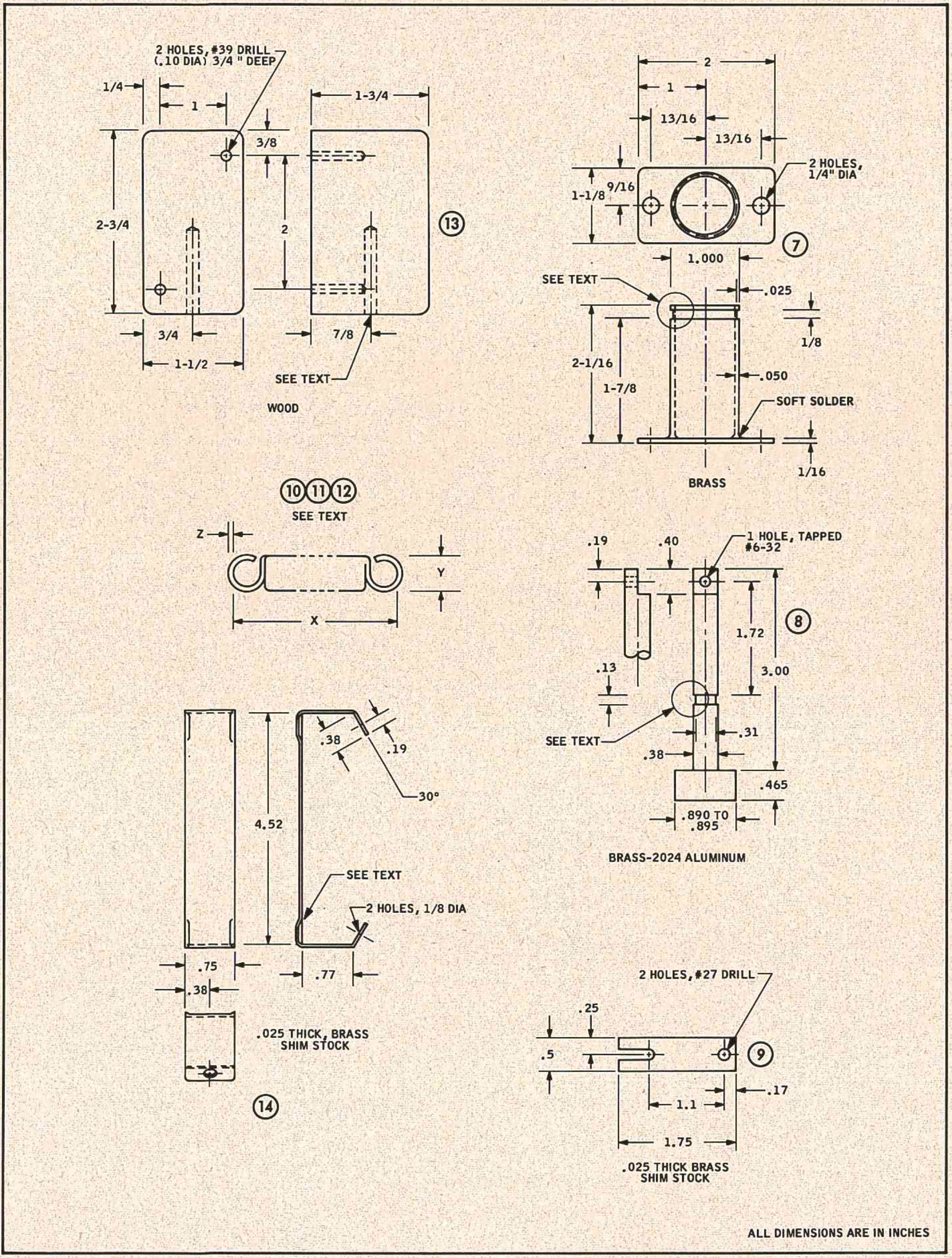
Although our Contork Winch (Controlled Torque) is set up for a pull which is controllable from about 3½ to 20 pounds, this is by no means all the pull that it can give. The maximum

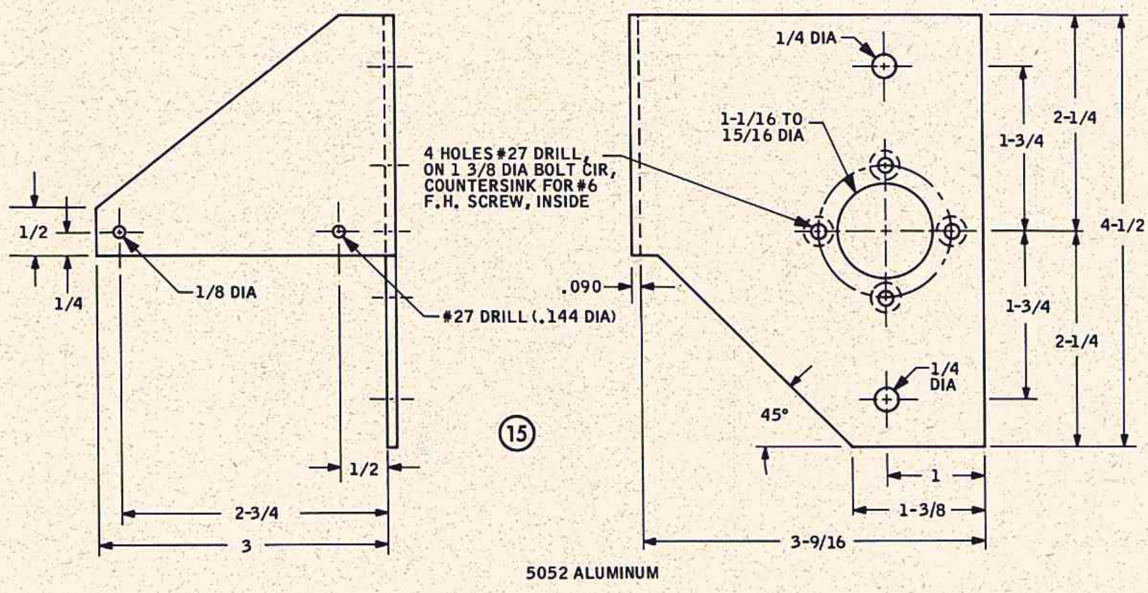


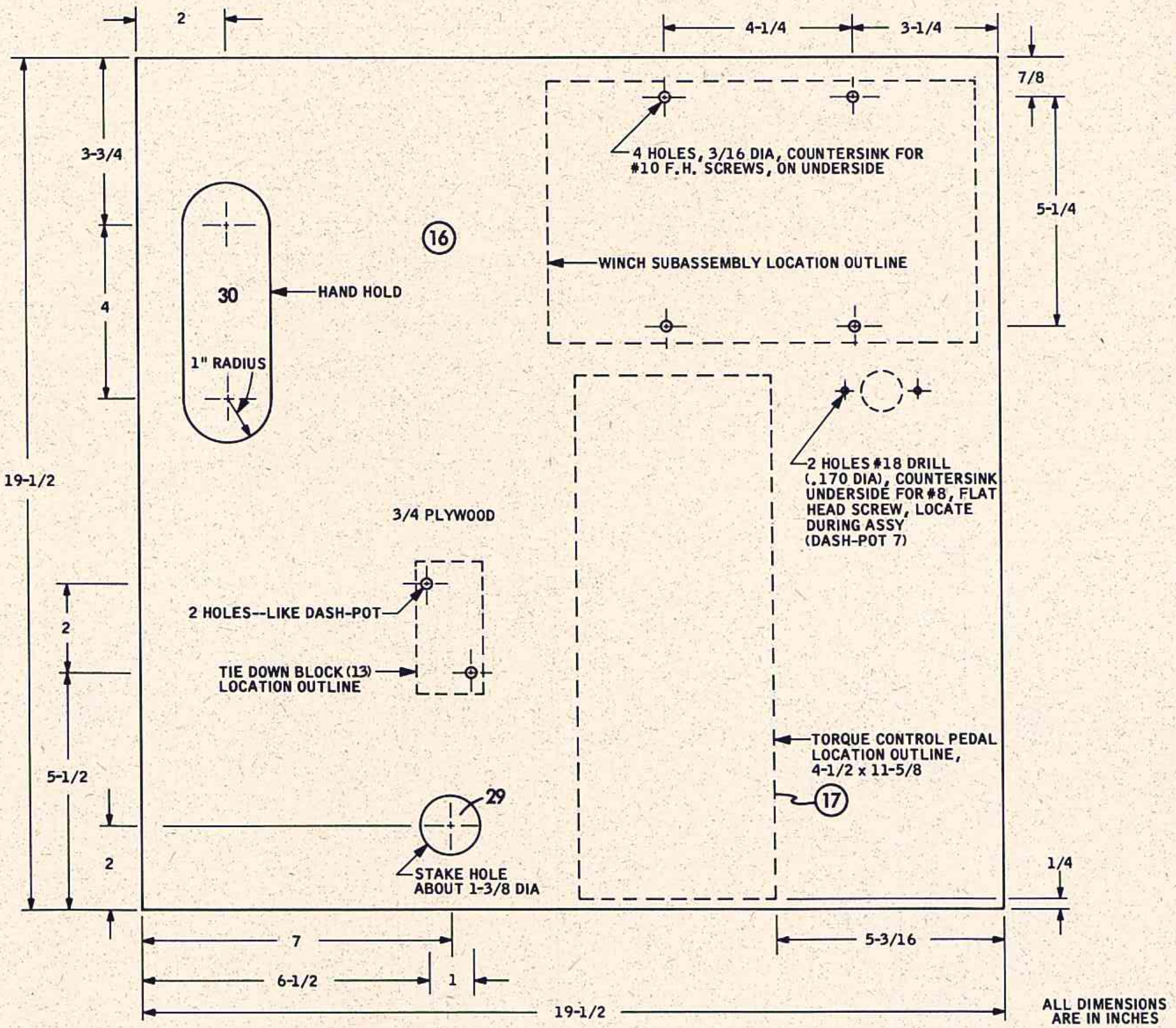

30
24
6
13
4
29
31
29
5
39
40
27
14
37
18
20
22
23
28
11
5
15
20
1
17
32
34
35
25
33
3
7
16
21
15
38
2
19

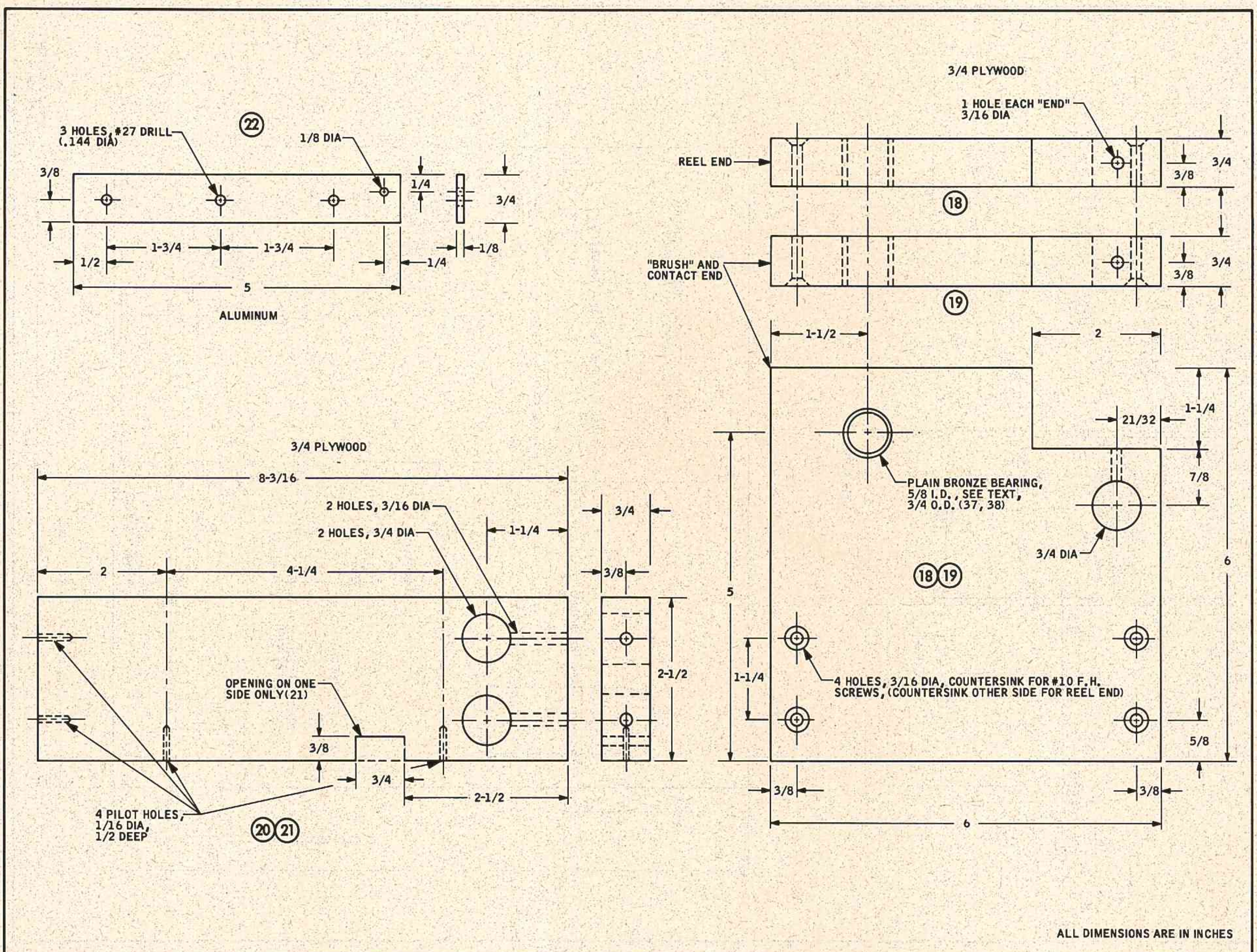

23
15
5, 6
3
38
25
1
26
9
10
8
14
17
33
20
28
16
12
7
21
34
19


1
2024 ALUMINUM
(PREP. HARD)
2
9/32
3/16 DIA
1/4 DIA
SEE TEXT
3
9/32
3/16 DIA
1/8
1/2
1
9-9/16
2
.75
.75
.56
4 HOLES, TAPPED 6-32, ON
1-3/8 DIA BOLT CIRCLE
15/16
TO 1-1/16
DIA
2
.625 +.000 -.005
2024 ALUMINUM-STEEL-BRASS-
OR PHENOL FIBER
3
5052 ALUMINUM
5/16 DIA
2-1/2
1/8 DIA
3/4
SEE TEXT
1/8
1/8
1-1/4
1-1/4
2-1/2
1-1/4
1-3/4
4'
ALTERNATE CONSTRUCTION
HARD WOOD OR PHENOL FIBER
TUBING
EPOXY
4
.63
3.91
.16
.28
1.00
.090 TO .125
.090 TO .125
2.0
.251 ±.003
.628 ±.003
4.7
2024 ALUMINUM
5 6
9.5 DIA
ROUND AND POLISH INSIDE EDGES
4, #8-32, FLAT HEAD MACH. SCREWS, ON 1.50 DIA BOLT CIRCLE, COUNTERSINK
SLIP FIT ON HUB
45°
2024 ALUMINUM
ALL DIMENSIONS ARE IN INCHES


2 HOLES, #39 DRILL (.10 DIA) 3/4 " DEEP
1/4
1
1-3/4
3/8
2-3/4
2
13
3/4
7/8
1-1/2
SEE TEXT
WOOD
2
1
13/16
13/16
2 HOLES, 1/4" DIA
1-1/8
9/16
7
1.000
SEE TEXT
.025
1/8
2-1/16
1-7/8
.050
SOFT SOLDER
1/16
BRASS
10 11 12
SEE TEXT
Z
Y
X
.19
.40
1 HOLE, TAPPED #6-32
8
1.72
3.00
.13
SEE TEXT
.31
.38
.465
.890 TO .895
BRASS-2024 ALUMINUM
.38
.19
30°
4.52
SEE TEXT
2 HOLES, 1/8 DIA
.75
.38
.77
.025 THICK, BRASS SHIM STOCK
14
2 HOLES, #27 DRILL
.25
.5
9
1.1
.17
1.75
.025 THICK BRASS SHIM STOCK
ALL DIMENSIONS ARE IN INCHES


1/2
1/4
1/8 DIA
#27 DRILL (.144 DIA)
4 HOLES #27 DRILL, ON 1 3/8 DIA BOLT CIR, COUNTERSINK FOR #6 F.H. SCREW, INSIDE
1/2
2-3/4
3
15
1/4 DIA
1-1/16 TO 15/16 DIA
.090
45°
1/4 DIA
1-3/4
1-3/4
2-1/4
2-1/4
4-1/2
1
1-3/8
3-9/16
5052 ALUMINUM


2
4-1/4
3-1/4
7/8
4 HOLES, 3/16 DIA, COUNTERSINK FOR #10 F.H. SCREWS, ON UNDERSIDE
5-1/4
3-3/4
16
WINCH SUBASSEMBLY LOCATION OUTLINE
30
HAND HOLD
4
1" RADIUS
19-1/2
2 HOLES #18 DRILL (.170 DIA), COUNTERSINK UNDERSIDE FOR #8, FLAT HEAD SCREW, LOCATE DURING ASSY (DASH-POT 7)
3/4 PLYWOOD
2 HOLES--LIKE DASH-POT
2
TIE DOWN BLOCK (13) LOCATION OUTLINE
TORQUE CONTROL PEDAL LOCATION OUTLINE, 4-1/2 x 11-5/8
5-1/2
29
17
2
STAKE HOLE ABOUT 1-3/8 DIA
1/4
7
5-3/16
6-1/2
1
19-1/2
ALL DIMENSIONS ARE IN INCHES


22
3 HOLES, #27 DRILL (.144 DIA)
1/8 DIA
3/8
1/4
3/4
1/2
1-3/4
1-3/4
1/4
1/8
5
ALUMINUM
3/4 PLYWOOD
1 HOLE EACH "END" 3/16 DIA
REEL END
18
"BRUSH" AND CONTACT END
19
3/4
3/8
3/4
3/8
1-1/2
2
1-1/4
21/32
7/8
PLAIN BRONZE BEARING, 5/8 I.D., SEE TEXT, 3/4 O.D. (37, 38)
3/4 DIA
18 19
6
5
1-1/4
4 HOLES, 3/16 DIA, COUNTERSINK FOR #10 F.H. SCREWS, (COUNTERSINK OTHER SIDE FOR REEL END)
5/8
3/8
3/8
6
3/4 PLYWOOD
8-3/16
2 HOLES, 3/16 DIA
2 HOLES, 3/4 DIA
1-1/4
3/4
2
4-1/4
3/8
2-1/2
OPENING ON ONE SIDE ONLY (21)
3/8
3/4
2-1/2
4 PILOT HOLES, 1/16 DIA, 1/2 DEEP
20 21
ALL DIMENSIONS ARE IN INCHES

available is only limited by the motor and battery used. The speed of the towline pull-in is determined by the load.

MOTOR AND MOUNTING

The motor (23 in the drawings) is a 1957 to 1961 Ford passenger car starter. A dummy shaft (2) is screwed to the control arm (15) and then both are bolted to the brush end of the starter by the two long bolts which hold the ends of the starter on. This gives you one rotating output shaft and a dummy shaft on which to support the "swinging" motor assembly.

Two sleeve type plain bronze oil impregnated bearings are needed (37, 38) one for each end of the motor assembly. Two Boston Gear Works, catalogue number B-1012-6 (5/8" ID by 3/4" OD by 3/4" long) bearings are recommended.

BASE

All wooden parts are assembled to the base (16) with wood screws in pre-drilled clearance and pilot holes and epoxy, with the exception of end frame (19) which supports the brush end of the motor. This part (19) must be removable to permit assembly and disassembly. Before any epoxy is applied, a dry run should be made with the bearings pushed in place in frame ends (18 and 19).

If the motor assembly (2, 15, and 23) is free to rock and alignment is O.K., then the bearings and other wooden parts (excluding 19) can be epoxied and screwed in (or up, as the case may be). On the frame sides (20 and 21) use #10 flat head machine screws with the nuts in the ¾" holes, and four #10 flat head wood screws through the base (16) into 20 and 21.

If alignment is not O.K., it may be necessary to open up the ¾" holes for the bearings to make them sort of self-aligning and then depend on the epoxy to make the bearings firm. Bearings should be epoxied in even if the holes are aligned. Put some kind of release agent inside of the bearings, on the motor shaft and motor end boss, for obvious reasons.

CONTACTS

The contacts we used were taken from a starter relay (usually called a solenoid switch) from a 1956 Falcon. Even a well used one should provide a good pair of contacts, because the normal wear is on one side of each contact, which have somewhat "T" shaped heads. This winch uses the top of the "T".

With the winch as assembled to an appropriate level, one of these contacts (26) is mounted hand tight in the heat radiator and moving contact holder (3). (The drawing doesn't specify the hole size for this contact because the builder may want to substitute or make up his own contacts.) The stationary contact holder and heat radiator (1) is mounted and the hole location for the contact (25) located.

We positioned our contacts with the centers offset about 3/16" each, so that each contact hits 1/4 the way from one end along the top of the "T". In this manner, when the contacts get chewed up, they can be loosened and rotated 180° (end for end). When the "new" ends are equally chewed up; then and only then are they dressed up a little with a file. They needn't be smooth and shiny.

DASH-POT

The dash-pot cylinder (7) is made from a length of standard brass tubing. The groove around the top (open) end is to accomodate an optional standard rubber ¾" brake cylinder cap (33) – Wagner Lockheed, U.S.A., FC-17738 – which, while not absolutely necessary, does keep the brake fluid in if you carry the winch by the hand-hold (30). The shank of the piston (8) has a similar groove in it for the inside hole of the cap. In final assembly, a turn of wire around the cap, with the ends twisted together makes a gentle "hose clamp."

An alternate for the machined piston is a 3/8" carriage bolt with the head acting as a piston, working in some heavy duty truck differential lube. This will work, and the "fluid" is stiff enough to stay in without a cap when the winch is up ended during a reasonable carrying time. The lube is somewhat sensitive to temperature extremes.

The dash-pot assembly is located during final assembly. Do not permit so much end play in the motor mounting that the dash-pot will bind, due to the motor body sliding back and forth along its axis. From .02" to .03" clearance should be O.K., and is "adjusted" by using washer shims (39 and 40) on the reel end.

The connecting link (9) is installed and tightened last, since the stiffness of the rubber cap helps to set the "park" or off position of the motor. The contact gap should be set at a clearance of 1/16" to 1/8".

CONTROL PEDAL

The control pedal (17) is a rectangular piece of ¾" thick plywood, hinged at one end (no direct drawing, see 16). The hinge (28) used should be of the loose pin variety to permit the pedal to be easily removed. Note the relief groove or bevel (27) in the base to let this pin out (shown only on the assembly drawing).

The slider (14) and its spring (12) act as a stop that can be adjusted in the field to limit the maximum pull available during a given launch. The spring holds the slider in position and provides a big enough "bump" on the underside of the pedal to act as a stop. Pulling the slider back toward the hinge, limits the towline pull to a lower value by limiting pedal travel. Control spring hanger (22) is screwed to the end of the pedal to accept the bottom end of the control spring (11).

SPRINGS

The most important spring is the control spring (11) which is dependent on four factors. First, the "hold open" spring (10) which was mentioned earlier must be overcome; second, the stiffness of the wire (34) to the starter body; third, how much line you've still got wound up on the winch when you are ready to launch (since it effectively changes the hub diameter of the reel); and fourth, how stiff the rubber cap on the dash-pot is. Since the control spring is a function of these four variables, it should be selected last. Table 1 lists the dimensions of the springs used in our winch. The X, Y, and Z in the table refer to dimensions on the drawing for the springs (10, 11 and 12).

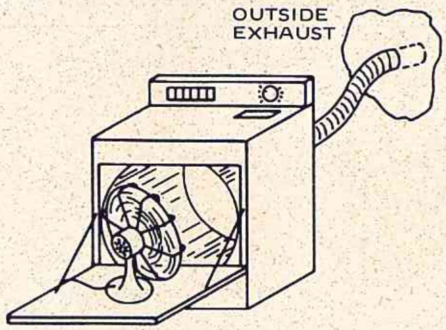
TABLE 1

Spring Detail #	Dimensions (inches) X	Y	Z
10	1.10	.236	.020
11	2.75	.310	.050
12	2.00	.555	.050

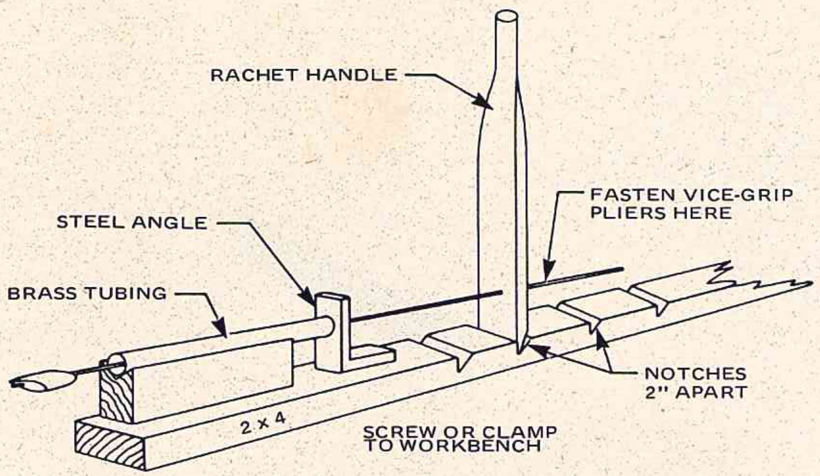
The "hold-open" spring (10) and slider spring (12) have been discussed in enough detail for the builder to select or make ones to work with the help of the table. The control spring is a little more trouble. The easy way out is to make up or buy a family of springs including one with the "X" and "Y" dimensions shown in the table, with one or two of heavier and one or two of lighter gauge wire. When in the field with a "normal" amount of line on the winch, you can test static pull with a spring scale on the tow ring. When you get a control

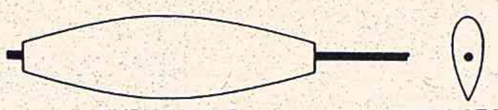
to page 66

Needing a work area to dope in winter months when he was unable to vent through a window, Ken Rose of Ontario, Canada, dopes models in front of the clothes dryer and vents the odors outside, rain or shine. This method does not require a fan, but the addition of a fan in front of the dryer door really speeds up the job.



Jim Kiger of Fremont, California, got tired of waiting for streamline brass tubing to become available to the modeler. Being hard pressed for five or six sizes of streamline brass sections for scale models, Jim came up with this easily made rig which pulls dies of various sizes through brass tubes and gives them a nicely streamlined section. The dies are about 2" long and are ground and filed from short lengths of bolts or cold roll steel, tapered to each end and drilled to receive 1/8" music wire which is sweat soldered in with about 24" protruding from the end. The wire is threaded through the tube and through the angle then passes through the small hole in the ratchet handle. A pair of vise grip pliers snapped on the end of the wire completes the set up. Grease the die liberally and start pulling. Now you can make beautiful landing gear and cabanes and, by making consecutive sizes, the smaller one makes the strut and the large one makes the socket when one is desired. Being made of brass makes for easy attachment of fittings.





If you're looking for an easy method of lettering your models, try Para-Tipe. According to Cliff Pemberton, of Hayward, California, this is a pressure type dry transfer available at office and artist supply stores. Para-Tipe comes on a 10" x 12" sheet and is available in a large variety of letter styles and sizes. One word of caution is that, after application of the lettering, put a protective coat of clear enamel such as Pactra over it to protect the lettering from fuel, oil, and handling.

William Martin of Tamaqua, Pennsylvania, being a steel guitar player, found that .026 to .046 gauge wound guitar strings are excellent for throttle and nosegear hook-ups. Bill even used these on Duke Crows Emeraude for aileron hook-up when he built it 3 years ago and they're still working perfectly.

For those disgusted with the fraying edges when working with fiberglass cloth, the following is an idea submitted by Art Olsen of Pacifica, California. First, lay your cloth out and mark it with a felt tip pen along the lines of your intended cuts. Now, simply raid your wife's cosmetics cabinet for her hair spray. Use the hair spray to spray along the lines you are going to cut. You will find that the hair spray is lightly lacquered and will hold the edge of the cloth in place. The lacquer is light enough so as not to cause the cloth to stiffen to the point where it becomes difficult to work with. For wing center sections, use a lightweight glass cloth and lay the cloth in place. Use a brush and polyester resin and start painting your cloth. The brush will not dislodge the lightly laquered glass fibers, but your fingers **will**, so keep them off! If you want a better than average finish, go ahead and glass resin the whole wing. You will find that after three coats of resin (each sanded) that you will have an excellent preparation for paint and you will not be able to feel the edges of the cloth center section.

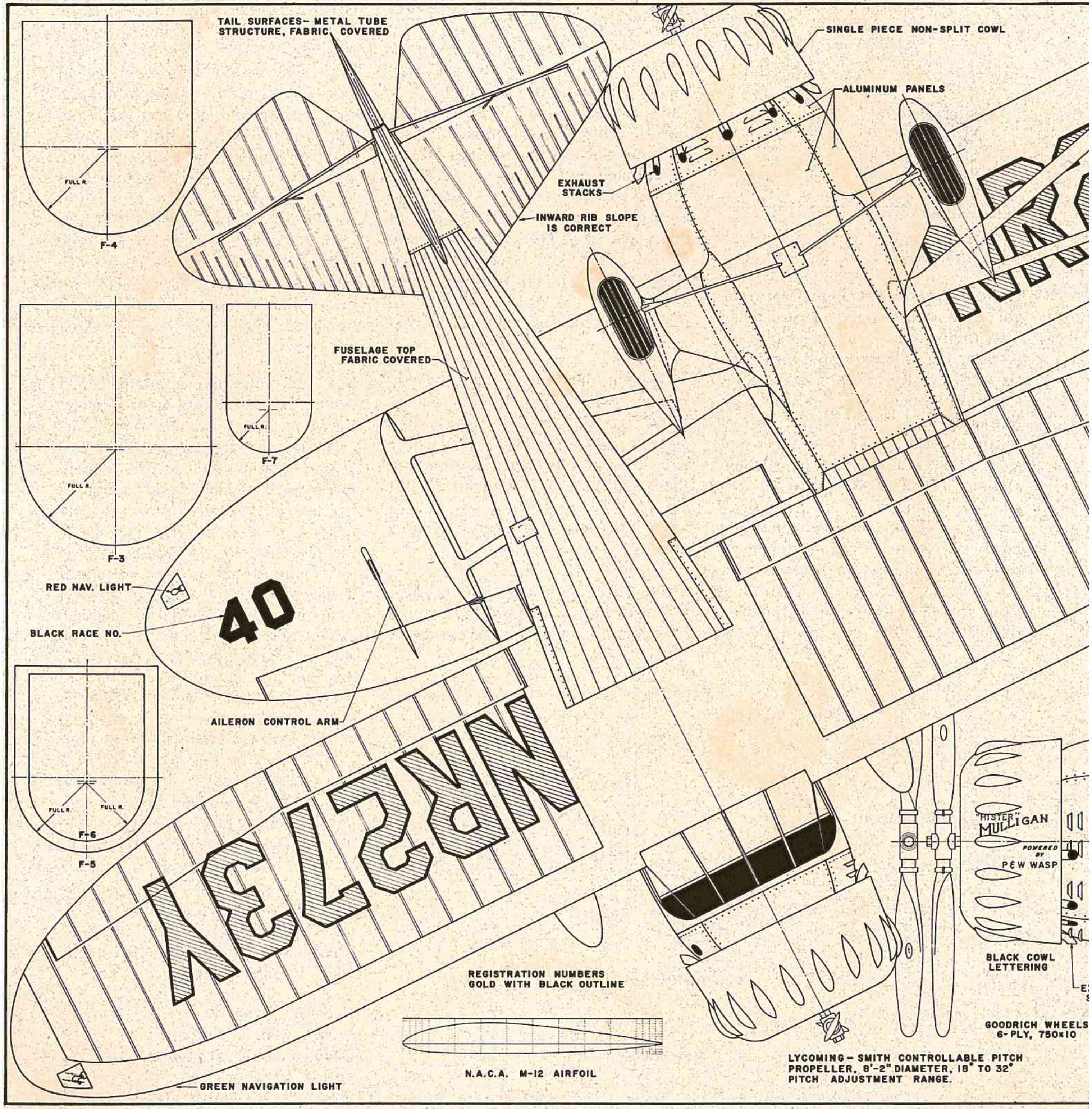
If you would like an excellent fuel container with a "built-in" fuel pump, try your local Ford dealer parts department, as suggested by Michel Borduas writing in the MARS "Pulse." Ask for a windshield washer container for the 1972 Ford Pinto. The container is 60 ozs. capacity, is made of fuel-resistant plastic, and the electric fuel pump is built into the bottom of it. The shape of the container allows it to be mounted onto a flat surface such as the end of your toolbox. Now, you will only need a 6 volt battery (it is designed for 12 volt operation but Michel says that it works too fast at this voltage for our purposes) and you're ready to pump fuel into your aircraft at a fast rate – about 10-15 seconds for a 12 oz. tank. The price is about $12.00, not including the battery. There's only one disadvantage to the above – you cannot reverse the pump to take fuel out of your aircraft since the pump will run in only one direction even if you reverse the battery leads. This item was originally from the Orange Coast R/C Club "Hangar Talk" newsletter.

Receive a free 1 year subscription, an Anthology Book, or $5.00, at publishers option, for your 'For What It's Worth' idea.

R/C MODELER MAGAZINE'S SCALE PLANS FOR THE SCRATCH BUILDER

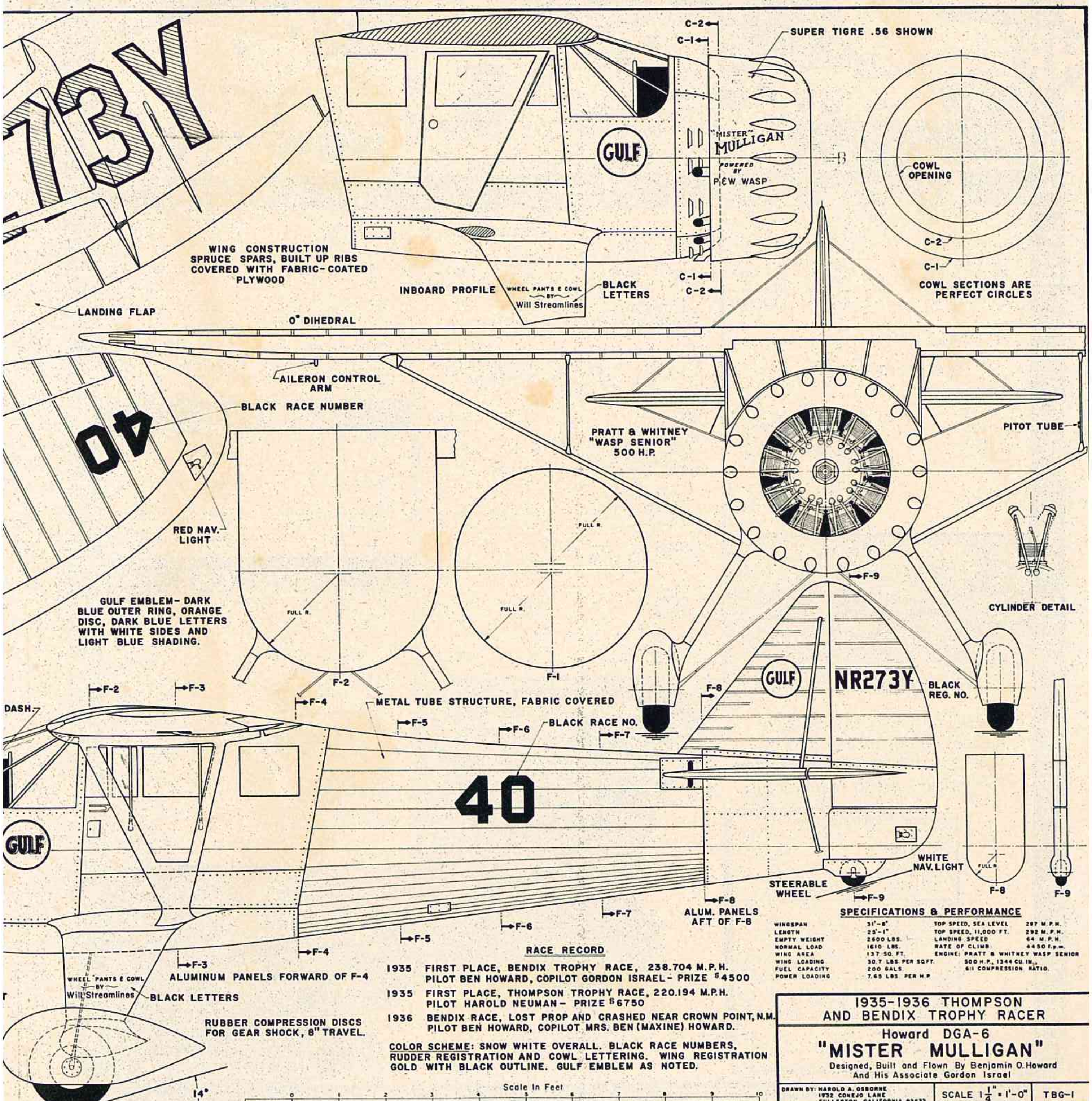
BENNIE HOWARD'S

“MISTER M



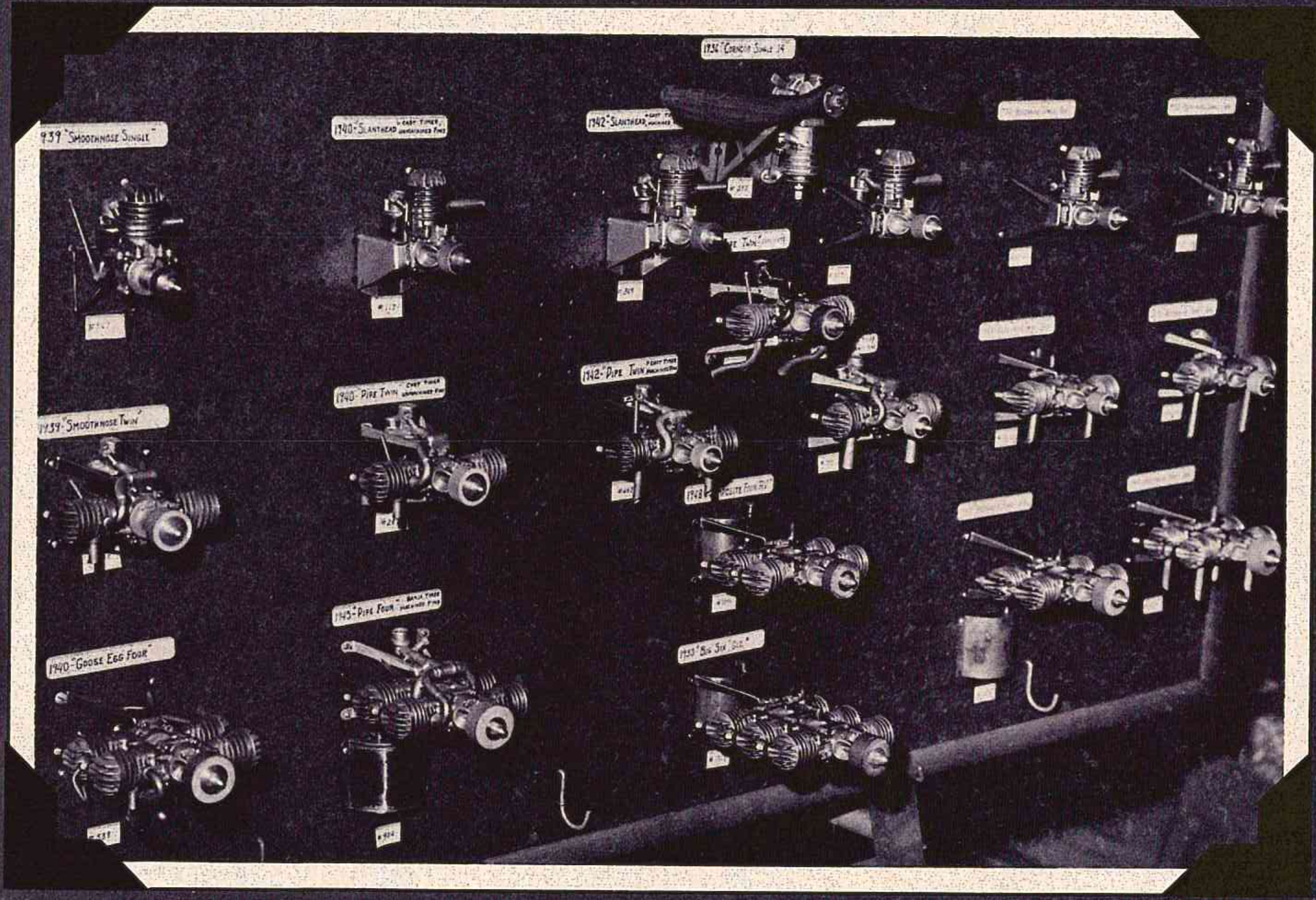
PRINTS OF THE DRAWING ARE AVAILABLE IN TWO SIZES: 56 INCH SPAN, 500 SQUARE INCH AREA $3.50 POSTPAID FIRST CLASS. 40 INCH SPAN, 252 SQUARE INCH AREA $2.35 POSTPAID FIRST CLASS. ORDER FROM HAROLD A. OSBORNE, P.O. BOX 2033, FULLERTON, CALIFORNIA 92633.

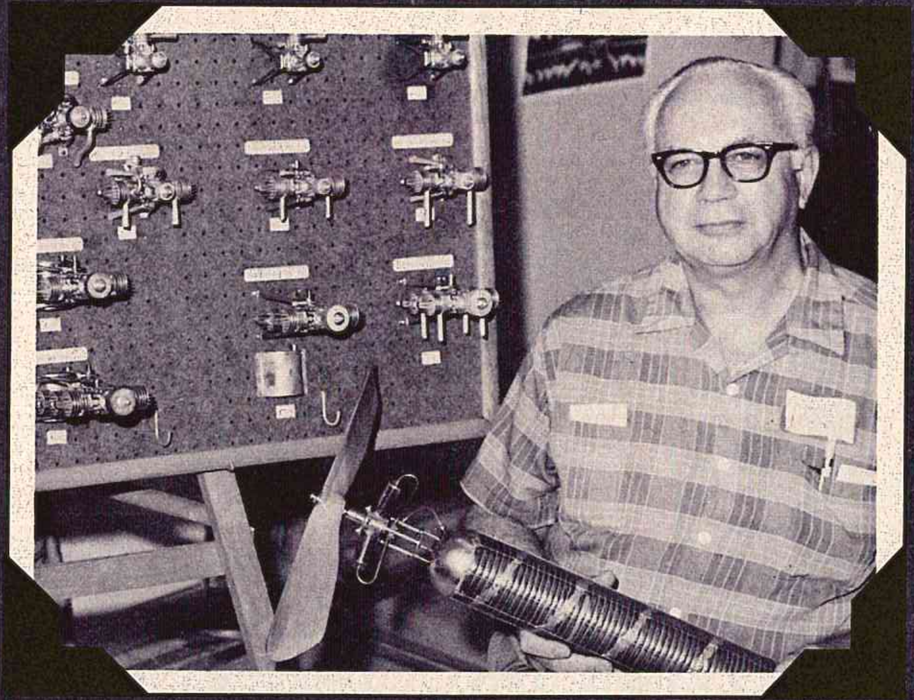
ULLIGAN"



A Page From Dick Tichenor's PHOTO ALBUM

WHEN THE PLURAL OF ELF IS NOT ELVES





Mr. Alan Shively (right) of Palos Verdes, California, has assembled the most outstanding engine collection in the world. In fact, the only one of its kind in existence. He has a mint condition example of each of Dan Calkin's famous Elf engines. Eat your heart out, old timers.

BASIC SAILPLANE DESIGN

BY PRESTON ESTEP JR.

PART V: AIRFOILS

SLOPE RACER FLYING AT 50 FT./SEC.

NACA 4409

SPAN 84.00 AREA 625 WEIGHT 144.00 Est. Cdp = .020 A R 11.29 OZ/SQ FT 33.18

C/L	C_{DO}	C_{DI}	C_{DT}	L/D	V	V_v	Time From 300 ft.
.75	.013	.018	.051	14.629	50.536	3.454	1:26

NACA 2412

SPAN 84.00 AREA 625 WEIGHT 116.00 Est. Cdp = .020 A R 11.29 OZ/SQ FT 26.73

C/L	C_{DO}	C_{DI}	C_{DT}	L/D	V	V_v	Time From 300 ft.
.60	.013	.011	.044	13.425	50.711	3.777	1:19

REYNOLDS NO. = 85,000

AIRFOIL NEAR CLIMAX

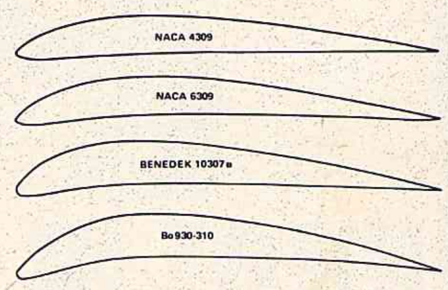
SPAN 84.00 AREA 625 WEIGHT 36.00 Est. Cdp. = .020 A R 11.29 OZ/SQ FT 8.29

C/L	C_{DO}	C_{DI}	C_{DT}	L/D	V	V_v	Time From 300 Ft.
GOTT 342							
1.00	.018	.032	.070	14.189	21.882	1.542	3:14
FLAT PLATE							
.50	.040	.008	.068	7.340	30.947	4.216	1:11
NACA 4409							
.90	.017	.026	.063	14.217	23.066	1.622	3: 4
NACA 6412							
1.10	.025	.039	.084	13.049	20.864	1.598	3: 7
NACA 2412							
.80	.024	.020	.064	12.348	24.465	1.981	2:31
NACA 4412							
.90	.028	.026	.074	12.112	23.066	1.904	2:37
NACA 6712							
1.20	.035	.046	.101	11.792	19.976	1.694	2:57
NACA 0009							
.50	.026	.008	.054	9.238	30.947	3.349	1:29

● Just to illustrate what the choice of an airfoil means to a soaring design, let's take some of the airfoils whose wind-tunnel tests were detailed here last time and plug 'em into a typical design – 84 inch span, 625 square inches, weighing 36 oz. and having a low-drag pod and boom configuration.

As you can see, the choice is important, but not critical. Any smooth handling undercambered section will do almost any job well; a good example is the 4409. Now, could you use the 4409, for example, for slope racing? Sure you could, as well as the popular 2412. Let's trim both to fly at 50 ft./sec., which is 34 mph.

As you can see, the 4409 plane will require less lift to keep aloft at that speed, and can dive in for the finish and win; it just requires more ballast.



The 4309, which can be easily modified to a 9% flat-bottomed Clark Y type of section, is a good general purpose section and is widely used in that form. It is superior to the Eppler 387 or "flat-bottomed 385" because the forward camber point reduces separation. A logical move on a flat-bottomed section is to adopt a sharp edge and a discontinuity at 33%, as shown in the last issue. The 6309 with a sharp leading edge is great for thermalling or, with enough loading, for slope. Its near-twin, the 6409, shows super results on the Zaic G88 and G99 wings. When you build an Olympic or American Eagle, keep the L.E. fairly sharp. This airfoil, unlike the Eppler sections, recovers beautifully from stalls and other disturbances because the T.E. separation comes on gradually and in a controlled manner.

The B10307 and BO930-310 are more highly cambered airfoils, 7% and 9% respectively, to be used on all-out thermal jobs. I think the 930-310 is probably only suited for pretty big planes which fly at Re of 80,000 and up, because that's a lot of camber. The 10307 is a proven success on medium-sized ships and could be used on planes as small as, for example, a Lil T.

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CONTORK WINCH

from page 55

spring in there that you are happy with you can pencil in a few convenient calibration points (32) on the pedal. I don't think permanent calibration makes too much sense. As the towline is reeled in, it builds up on the reel, which is like operating with a larger diameter hub. With a given control spring tension, the towline pull is inversely proportional to the effective hub diameter. Fortunately this effect doesn't become serious during a normal glider launch, especially since you're going to "let off the gas" toward the end of the tow anyway. On top of everything else that has been said, the slider just keeps you from pulling the glider inside out if you get excited and "floor" the pedal.

Another thing that you can do at this time is to determine the minimum voltage that will operate the winch at various torque settings. This is only practical when you can make contact to individual cells in the battery, which is very seldom, since most modern batteries have the cell to straps buried inside the case. However, the use of a pair of 6 volt batteries, instead of a single 12 volt one, would give you the option of at least two operating voltages. In any case, not using much more voltage than necessary for a given launch torque will save wear and tear on the contacts.

REEL

The drawings call for some machine work to be done on a metal lathe capable of swinging a 10 inch diameter disc for the reel sides (5 and 6). To be specific, the side flanges are 9½" in diameter. If such a lathe is not available there are alternatives. While the

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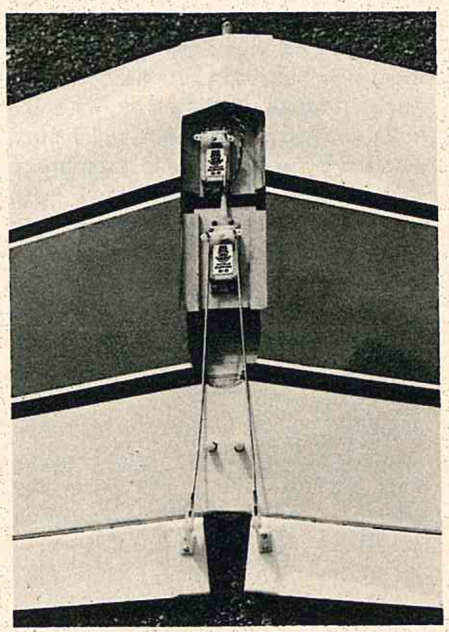
THE SHRIEK

from page 47

With the pylon constructed, cut out the tank area and fit the tank in with the nacelle bulkhead in place but not glued. The lower slot in the pylon should be cut out to accommodate the plywood nut plate. At this point, if you're satisfied that your fuel tank fits properly, glue in the center bulkhead. Next, center your motor mount and be sure of its position on the firewall.



Shriek wing showing World Engines servos in the sliding tray elevon hook-up. Effective linkage and extremely positive control.

The motor mount can be mounted to the firewall using the blind nuts and 6-32 screws supplied in the kit. Set the engine in the mount and locate the propeller flange face on the engine exactly 3-3/8" from the firewall face. Drill the engine mount and mount the engine. The thrust is established at this time and, using the front edge of the pylon, it should be 0 degrees right or left and 2-3 degrees up. This can only be checked with the pylon on the fuselage. If you have followed the building instructions carefully this will all happen automatically.

Now glue the firewall to the pylon assembly and back it up with 2 pieces of ½" triangle stock. Drill through the firewall for the throttle tube and the fuel tank tubing. Hook up the throttle wire at the engine only and fit the fuel tank tubes. Glue the cowl sides, top and bottom together, and then glue in 1" pieces of triangle stock to the inside front and allow it to dry thoroughly. When this is dry, hollow out the inside of your cowl assembly per the plans and pin it to the firewall with the engine mount in place but with engine removed. Be sure that the throttle tube and the fuel feed line have ample clearance. Then cement the cowl to the firewall. The nacelle sides have to have ½" triangle stock glued to them and, once again, make sure you make a right and a left side.

After this dries, trim the triangle stock at the rear and glue in the rear bulkheads on both sides. Then fit the nacelle assemblies to the pylon with the tank in place. The rear bulkhead may have to be cut further on the chamfers to allow the sides to fit correctly. Now remove the tank and glue and clamp the sides to the cowl, the bulkhead, and the rear of the pylon. Set this assembly aside and let it dry thoroughly.

Measure and mark on the sides of the nacelle the location of the rear bulkhead and align it ½" back from the rear of the firewall. These lines locate the tank hatch cutout. Sand the tops and bottoms of the nacelle sides flat to match the bulkheads and glue on the tops and bottoms. After drying, rough carve the four corners of the nacelles at 45 degree angles. The angles on the firewall corners will enable you to determine how far to carve. Leave a little material on the nose so you can fair into the spinner. Now, shape a hole for the engine, fitting and enlarging it until the engine fits properly. After the engine is installed, take a piece of ¼" x 3" x 3" plywood and attach a coarse piece of sandpaper to it and place it on the engine like a prop. With this sandpaper facing the nacelle, rotate it back and forth to sand the face of the nacelle block back to clear the spinner. By adding shims between the block and the paper, take the face 1/8" back from the prop flange and glue on the spinner bulkhead. Cut out the center of the spinner bulkhead to clear your engine. Complete the carving and sanding to a finished shape inside and outside. Remove the engine and motor mount and coat the entire interior with epoxy to seal out the fuel and oil. Now cut out the tank hatch opening using your previous reference lines as a guide. The hatch can be hinged and latched in place, however it is highly recommended that you simply MonoKote it in place using no glue as it is seldom necessary to go back into the tank if your initial installation was done carefully. This method also keeps the tank sealed and helps to prevent spilled fuel from getting inside.

The next step is to glue the pylon guides to the bottom of the pylon. These have to be notched out for the nut plate. Glue in place making sure that you have installed the ¼" x 20 T-nuts in your nut plate. These have to have some filing done on the flanges to fit nicely inside the fuselage. After fitting the pylon to the base of the fuselage (which includes sanding down the rear of the pylon trailing edge to match the rear end of the fuselage) drill the clearance holes for the wing mounting bolts so that the bolts pass freely through the fuselage. With the bolts screwed in place into the T-nuts, glue the pylon and nacelle assembly to the fuselage, filling the gaps with epoxy. Now take the finished wing and align it on the fuselage, marking the fuselage outline on the wing. Fit the wing to the fuselage and cut the center of the leading edge back to clear the fuselage by 1/8" to allow for the dowel plate. When everything is aligned properly locate and drill the clearance holes for the wing mounting bolts. Remove the dowel plate and bolt the wing to the fuselage. When everything is in place carefully cut a slot in the bulkhead and fit the 3/8" dowel so the wing is snug in this cradle. Next, glue in the 3/8" dowel and, when dry, fit and trim the top of the dowel plate to the wing. The bottom of the dowel plate is left alone until the fuselage is carved and the fuselage is used to mark the plate.

At this time add the two pieces of ½" triangle stock to either side of the fuselage behind bulkhead F3. Sand the fuselage top flat and cement the fuse-

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lage top to the fuselage and pylon assembly. The nose block is added and, when this is complete, carve and sand the entire fuselage and finish the hatch as shown on the plans. Mark the bottom of the dowel plate to the fuselage with the wing in place. Glue the dowel plate to the wing and also add the front and rear wing fairings. When this assembly has dried, carve the fairings to blend into the fuselage. Now glue the plywood stiffeners to the top and bottom of the elevons and sand the elevons to shape. Do not radius the back edge – leave it square. This will increase the efficiency and require less up and down travel to do the job. Fit and finish the rudder.

It is now time to make your radio installation, being very careful to keep all of your linkages tight and free from any slop. The drawings show the recommended placement of your servos. One precaution to take is with the sliding tray – it must slide completely free. (A 1/32" sideways clearance is permissible.) When you're completely satisfied with your installation and everything is working properly, fit the wing to the fuselage and clear the fuselage at the rear to allow the elevon pushrods free movement. It will probably be necessary to make servo cable extensions for your two servos in the wing in order to reach your receiver. If your radio comes with an aileron extension cable you may be able to get by using just one.

It is now time to cover your Shriek with your favorite material. Ours was covered with Super MonoKote, all done in white, using orange trim with black pin striping. The plans recommend hinging your elevons with MonoKote type hinges. The necessity of this is to have a gap of 1/32" between the elevons and the trailing edge of the wing. The performance will deteriorate in proportion to the width of the gap. Be sure to set up the CG exactly as shown on the plans and also take specific note of the angle of the main landing gear - - - approximately 20 degrees forward.

The Shriek flies like any other airplane with one exception – if you are stalled, or coming into land with power off and you add full throttle all at once, the nose will have a tendency to drop. To correct this add throttle slowly or be ready to add a little up elevator if you hit the throttle too hard. Your take-off run should be a normal 30-60 feet depending on your engine size. The Shriek won't rotate until flying speed is up and if you have problems with rotating check your CG. If it hugs the ground bend the main gear forward more and extend the nosegear to add positive incidence to the wing. However, if you follow the drawings and instructions you should have no problems whatsoever. Landing is standard – just don't let the nosegear hit first.

A word of caution about extremely high speeds such as diving and so on. This can cause the elevons to become less effective because of the large surfaces and increased air pressure. If this occurs, ease back on your throttle and your Shriek will pull up easily. The airplane is very clean and fast so ease off on the throttle on your downhill maneuvers. It is highly recommended that, until you get used to a flying wing, fly at slower speeds and you won't become disoriented quite so easy. Also, keep the airplane fairly close to you at all times. The farther away you get the harder it is to determine what attitude the airplane is in.

The Shriek, by Model Dynamics, is an aircraft designed for those who

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want something rather than the run-of-the-mill pattern type aircraft that offers extremely high performance in conjunction with its unique appearance. The Shriek is all of this and much more – an excellent and unusual aircraft that you will enjoy building and, even more, completely enjoy flying. The Shriek kit evidences outstanding engineering on the part of its designer, Ron Neal, and excellent quality control on the part of the kit manufacturer. Tested, Approved, and Recommended by RCM. □

DEMBROS STAR-FLITE

from page 43

antenna was connected to the lawn tractor directly. These "tests" may sound extreme, or radical, but if specific problems such as these have caused problems in your area, then your system should be tested for immunity to them.

We did not test for resolution or how the radio performed on a pylon racer since a radio in this price range is not specifically designed for serious contest pattern work or racing. On the other hand, if you are a typical Sunday flyer or glider guider, and the price of groceries is getting to your budget, the Cannon/Dembros Star Flite is worthy of your consideration. To ease the burden even further, if you do not wish all four servos at once, you may deduct $25.00 for each one you don't want.

The Cannon/Dembros Star Flite is available only direct from Dembros Hobbies, 58 Lake St., Nashua, N.H. 03060, for $199.95. 53 or 72 MHz at $10.00 additional, with a 90 day warranty.

RCM is pleased to be able to Approve and Recommend this system.

FIBERGLASS

from page 40

adding acetone to achieve a thin enough viscosity. A dark-coloured pigment in the gel-coat will make it easier to gauge that you have an even coverage.

Fibreglass material is available in cloth and as a non-woven mat. The mat is preferred for this job because it will conform to almost any curve once it has been wetted with resin. It is also much stronger and will hold its shape much better than the cloth. The mat fibres are not bundled like the strings of cloth, thus the resin penetrates more thoroughly. The mat should be 1½ oz. weight split in half. This thinner layer will adhere tightly to the gel-coat as it is rolled on. The best applicators for applying the resin to the mat are a small roller brush such as those used for trim when painting a wall, and a small stiff brush for patting out air bubbles. It is essential to eliminate all air bubbles as they will form weak spots and distortions in your molds or finished product.

When this first layer of mat has hardened to a "cheesy" toughness, cut the surplus off, leaving a 1" flange all around the plug on the plank as shown in photo 2. Apply two more full thicknesses of mat over the half thickness and trim each one when it is "cheesy." If you let them harden completely you'll need a hacksaw to trim them – and dull a good blade.

Wait for the mold to harden before releasing it from the "plug." While you are waiting, prepare a ¾" plywood frame to support your female mold.

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The frame will make the mold stable when you are working with it, and will prevent it from becoming distorted.

Now you have all but finished your production mold. Release it from the "plug" by wedging it up with pine splints all around the outside. It should then break free with a satisfying "pop". All that's left to do now is screw it into the frame. (See photo 3).

JOINING FUSELAGES

The female mold should be smooth. This is accomplished with fine sandpaper. Brush on mold release and allow it to harden, then wax. The gel-coat for the fuselage may be coloured – preferably a light colour to contrast with the dark female mold. (Sky blue was used for the Tempest). It should be sprayed on for a light even coverage. Thin it with acetone to spraying viscosity.

Lay in a half thickness of 1½ oz. mat. It should be possible to do it with one sheet. Once it is wetted with resin, you will not have any trouble making the mat conform to the shape of the mold with roller and brush. Be sure to get all the air bubbles out. When it hardens to a "cheesy" consistency, trim the edge with a sharp knife. Reinforce the nose and wing area with a second application of half thickness mat, and trim. Incidentally, have a quart can half filled with acetone (with a lid) handy in which to dunk your brush and roller between layers, otherwise they will harden and be useless. You should be able to reproduce both fuselage halves in an evening.

JOINING THE HALVES

Inasmuch as your original plug was made in one piece, the edges of the two halves should meet perfectly with little need for trimming. They should be fitted together with fibreglass tape on the inside, wetted with polyester resin.

Before joining the two halves, be sure they fit easily and then cover the bottom outside seam with masking tape from the tail to the wing-saddle. The tape will serve as a hinge when you open the two halves (like a clam-shell). The masking tape will also hold the two halves in position while you apply a 1" strip of mat wetted with polyester resin down the inside seam.

Close it up again while the tape hardens. Then put masking tape along the top outside seam and apply a wetted one inch strip of mat down the inside seam, through the wing saddle. Do the same to the seam forward of the wing-saddle. Grind the outer seams flush and fill with polyester putty or car body-filler to be sanded smooth when hardened.

One bulkhead is all that will be necessary. A cardboard dummy should be fitted to determine the shape for a 5/16" mahogany firewall for a Merco .60 on a Tatone mount. Fibreglass mat wetted with polyester should be used to anchor it in place. Spruce servo rails are fitted and resined to the fuselage sides. Total weight of the Tempest fuselage including engine mounts, bulkhead, and tailwheel is 18 oz. Finishing with Hobbypoxy or car enamel should be done only after fine sand-papering.

SUMMARY

The various stages of the project are illustrated in photo 4, and are detailed as follows:

A. THE MOLD

1. Carve and finish a "plug" or master mold from 2 halves

to page 76

doweled together.

2. Mount them on 2 plywood planks, fill cracks and sand.
3. Apply mold release and then wax and polish.
4. Spray or brush dark-coloured gel-coat.
5. Apply split (½ thickness) 1½ oz. mat with polyester resin and trim when "cheesy," to give 1" flange.
6. Apply 2 layers of full thickness mat and trim when "cheesy".
7. Release all around with pine splints and mount in frame.

B. THE FUSELAGE

1. Sand and apply mold release to the female mold. Wax and polish.
2. Spray in light coloured gel-coat.
3. Apply ½ thickness of 1½ oz. mat and trim. Add ½ thickness reinforcing to nose and wing areas and trim.
4. Join bottom half with masking tape on the outside seam.
5. Open like a clam shell and apply a one inch mat strip wetted in polyester resin. Do the same procedure (4 & 5) for the top seam.
6. After two halves are joined and resin has hardened fill seams with putty to be sanded when hardened.
7. Fit bulkhead, motor mount and servo rails, sand, then paint finished fuselage. □

CALCULATING INCIDENCE

from page 38

it is most desirable to take these measurements close to the root section of the wing to avoid miscalculations due to wing-warping or wash-in/wash-out conditions.

Referring again to Figure 1, the dimensions TE and LE should be as accurate as possible and attempting to calculate to the 1/32nd of an inch. The line "a" is the difference between LE and TE:

$$LE - TE = A$$

Now you measure your model and I'll hum a few bars of "Wild Blue Yonder" while you're getting these figures together.

Now, I'm going to lay it on you, Jack, and I'll bet you're going to read this next bit of news a couple of times before it fits together.

When working with Right Triangles,

to page 78

the ratio between the opposite side of any of the angles and the hypotenuse (all of which represents the Sine of Angle A) remains the same regardless of the length of the sides providing Angle A is constant. It is also a fact that this ratio can be used to determine the exact number of degrees in the angle.

FACT: The ratio of .0175 represent mathematically, one degree at Angle A.

EXAMPLE: (refer to Figure 1)
Let's assume:

CHORD = 9½" = 9.5
TE = 8" = 8.0
LE = 8½" = 8.5

therefore: a = LE – TE = 8.5 – 8.0 = .5
then:
Ratio = a/Chord = .5/9.5 = .0526
since: .0175 = 1 degree, then .0526/.0175 = 3 degrees.

CONCLUSION: Relative to the above conditions, the wing has a positive incidence of 3 degrees.

What kind of change will be required to obtain only a 1 degree positive incidence?

EXAMPLE: (using the same figures from the previous example) solve for "a":

RATIO = a/CHORD
.0175 = a/9.5

a = .0175 x 9.5 = .16625

Using the decimal chart and converting .166 into inches, we find that, in order to have a 1 degree positive incidence, the leading edge should be between 5/32" and 11/64" difference in distance above the ground than the trailing edge.

Now, for lazy guys like me, I find it too much trouble leveling out the tail so I just figure all of my angles just as the plane sits. With a bipe, you can figure angular differences in the two wings. As a matter of fact, it is possible to calculate wash-in or wash-out by using this same method.

It is also possible to calculate engine off-set using the same method but, frankly, the practical need for this computation appears unnecessary. □

PRACTICAL AERODYNAMICS

from page 37

weight of the airplane. Any imbalance of these four elements will cause a change in the airplane's equilibrium.

Let us consider the relationship of these four forces on an R/C airplane. We start our engine and taxi out to the runway and stop. At this time gravity and weight of the airplane lift is zero. Thrust is zero. Drag is zero. Result: The airplane is immobile. We increase thrust to maximum; now we have more thrust than drag, and the airplane accelerates. As it accelerates, airflow over the airfoils increase, causing lift. When the lift equals the weight of the airplane (gravity), the airplane flies. If the lift is more than gravity, it climbs. However, as we accelerate drag also increases and, when the drag equals the thrust, we are in equilibrium (in this case in a climb). If, at this point, thrust was reduced slightly, the rate of climb would decrease. The reduced thrust would cause a slight deceleration which would reduce the lift which, in turn, would reduce the rate of climb. A total reduction in thrust would make our airplane a glider, and to maintain our thrust we would have to pitch down to maintain enough airflow over the airfoils to sustain the required lift. By maintaining this glide we could return to the ground and land.

It is important to remember that the thrust obtained in a glide is actually provided by gravity. Gravity has to be overcome by some other force (in this case an engine) in order to gain the altitude from which a glide can take place. Remember, the only device that provides altitude is power. In an airplane the power is an engine. In a glider the power is in rising masses of air. The theory that "pulling back on the stick makes the airplane go up" is wrong. If you don't believe it's wrong, just set your airplane on the living room floor, turn on your radio, and "pull back on the stick." I have a feeling your airplane won't go up!

As you can see there is an interrelationship between the forces acting on an airplane. Next month we will explore, further, these inter-relationships and see how we can use them to better control our airplanes. □

BASIC SAILPLANE DESIGN

from page 65

Finally, for those of you who go for the flying plank type of machine, I suggest the NACA 11-H09. However, I cheerfully admit I haven't tried it. It sports a very good L/D ratio on full-sized wings, without resorting to laminar flow. □

FIELD STRENGTH METER

from page 35

right hand and a left hand terminal post plus a solder lug to the right of the two terminal posts. The right hand terminal post is not used here.) Referring again to the photos, locate and solder the antenna to the left hand terminal post of capacitor C. Use a heat sink to protect the diode.

Step 7 – Insert the antenna through the antenna hole in the plastic case and slide the plastic case into position behind the panel. Mount the tuning knob on the capacitor shaft with 1/16" clearance between the knob flange and the panel.

Step 8 – Using your favorite transmitter, position the FSM as described above and tune for a peaked meter deflection. If none occurs, recheck your wiring per Step 6 and the schematic Figure 6. (Did you turn the transmitter on?) Once a tunable meter deflection is possible, loosen the tun-

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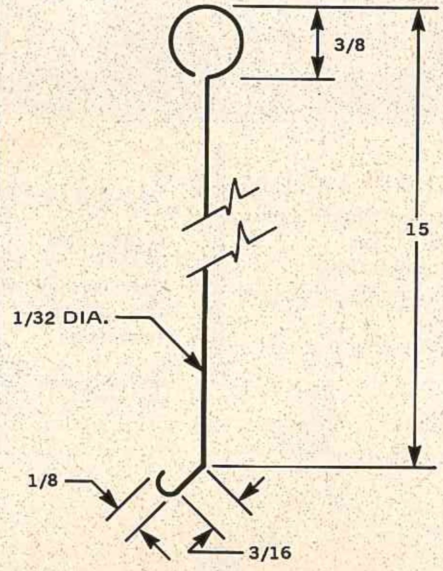

FIGURE 4 ANTENNA

FIELD STRENGTH METER

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ing knob and locate the pointer as desired for that frequency without changing C. Re-tighten the knob set screw. Mark this location using decals or label plastic tape, whichever you like. The FSM is not selective enough to require retuning of frequencies in the same band. Therefore, all 27 MHz frequencies can be labeled "27 MHz" at one knob location. Likewise for 53 and 72 MHz.

Step 9 – Insert the 4 panel mounting screws that came with the case. Bend a safety loop of at least 3/8" diameter in the antenna top, and that's it. Figure 7 is a full size chart of readings which can be snipped from the page and contact cemented to the back of the FSM. Fill in the table as described above. Some typical readings and antenna spacings the author found are as follows:

Note that the single channel trans-

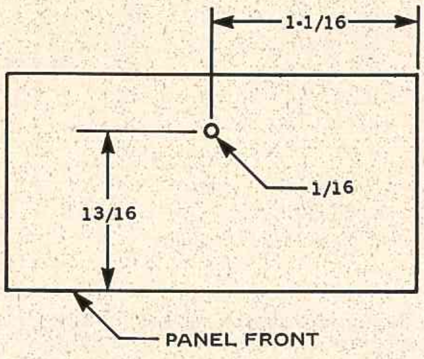

FIGURE 5 ANT. HOLE IN CASE TOP

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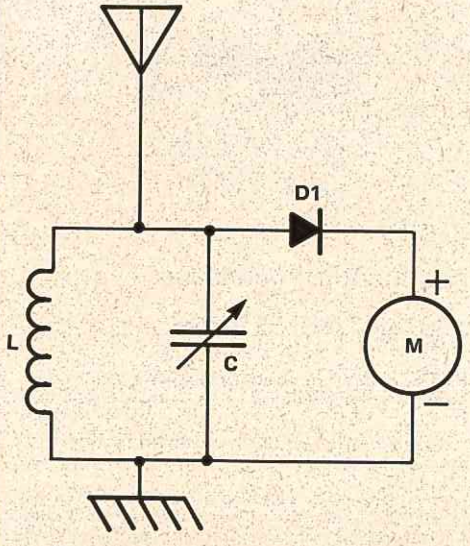

FIGURE 6 FSM SCHEMATIC

mitter gives a higher meter reading with no tone sent than with tone modulation present. Include on the chart whether you choose to check your single channel transmitter with or without the tone modulation present.

This field strength meter is intended to be a rugged, dependable, inexpensive addition to your field box which will allow you to quickly and simply check the radiated power from your transmitter. If it prevents you from making that one last flight of the day with a weak transmitter, it will have paid for itself in spades.

PARTS LIST

1. Utility Case with front panel & screws
   Archer Part No. 270-230 .... $ .89
2. Tuning meter,
   Heathkit Part No. (27)407-1163 ..... .60
3. Tuning Knob
   Archer Part No. 274-391 ...... 3 for .99
4. Tuning Capacitor
   Hammarlund No. HF-15 .... 1.45
5. Diode, small signal, IN34A or equiv. . .15
6. Tank Coil — 10 turns 22 AWG .... —
7. Meter mounting bracket
   1/32" Aluminum .... —
8. Sheet metal screws—two ¼" x 40 .... .10
9. Antenna — 16½" x 1/32"
   dia. steel wire .... .15
10. Hookup wire — 1 x 22 AWG .... —
11. Chart for meter readings .... —

TRANS.	ANT EXT	READING	SPACING

FIGURE 7 READINGS CHART

LADYBIRD MK 2

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flat board by packing up the leading and trailing edges. Please note that it is essential to end up with a perfectly true wing.

All ribs are cut from medium 1/16" sheet, using the sandwich method with two metal end ribs, to obtain a set of tapered ribs. Cut the slots for the 3/8" spruce spars while the ribs are still assembled as a block. Note that the root rib is longer than the final root chord at this stage. Assemble all ribs on the rods at the spacing shown on the plan, and add the ½" x ¾" medium balsa L.E. and the 1" x ¼" T.E. Make sure that the T.E. is at the correct angle. Make a careful job of splicing L.E., T.E., and spars, as this model will be very highly stressed during aerobatics. Add the bottom spar and then the 1/16" sheet webs with the grain vertical; cut these very carefully to size to insure an accurate location of the top spar. Splice the L.E. sheeting to length, using medium sheet, and add the top sheeting. From the underside, make sure that this sheeting is firmly down on all ribs. Now add the bottom sheeting. Note that the sheeting only half covers the spars, leaving half the spar available for the attachment of capstrips. Now cap all ribs except the center three, with 3/8" x 1/16" strip; these overlapping the front of the T.E. by 1/16". Add the center sheeting and make the cutout for the servo. The latter is offset to bring the leads out over the center of the fuselage. With a steel straightedge, cut away the surplus T.E. to make the aileron cutouts. I consider it most important to achieve very close fitting ailerons for low drag and fast aileron response. Complete the T.E. by adding the 1/16" strips which are glued on to the 1" x ¼" T.E. close up against the capstrips. Add a small section of T.E. to extend the center section to the full chord. Build up the aileron from 1" x ¼" T.E. and 3/8" x 1/4" hard balsa.

Bevel the front edge of the ailerons to allow proper downward movement.

Plane and sand the L.E. to the required section and sand the wing all over. Fit the 1" x 1" soft block tips and sand to the section shown. Reinforce the T.E. of these blocks with ½" fiberglass tape, folded over the T.E. and secured with resin. Hold this tape in position by covering with polyelthene film and pressing into position with foam rubber while the resin sets. The mountings for the bellcranks must now be fitted, followed by the installation of the bellcranks and pushrods. Use 20 swg piano wire between the servo and bellcranks, running in a straight line and guided through nylon tube in alternate ribs. This gives a rigid but very light drive. From bellcranks to aileron horns, use 16 swg piano wire. It should not be necessary to use adjustable links here, as with a true wing, very little trim adjustment will be required. (No torque problems with sailplanes!) Be sure that there is no play at all in the linkage. This is important as the model is very sensitive to ailerons. Hinge the ailerons with three ¼" Rand top hinges; take care to insure very close fitting ailerons.

Note, that to keep the wing as thin as possible, the thickness is such that the aileron servo just fits in the depth of the wing. As the servo is offset from the fuselage center line and is not, therefore, covered by the fuselage, it is necessary to take the covering over the servo opening. If you need to remove the servo frequently for use in other models, the opening can be covered with MonoKote which is easily replaced.

Aileron horns can be of your choice, but I cut them from 1/16" fiberglass circuit board, removing the copper, and fixing in position with epoxy into slots in the ailerons. No differential movement is provided other than that arising from top hinging, which also gives minimum drag in normal upright flight. With a steel straightedge, trim the T.E. to a straight line between the ailerons as shown on the plan. This thickens the T.E. and removes an otherwise fragile T.E. (In the photo you may notice that I overdid this and ended up with slight inverse taper over the center section.) Fold ½" fiberglass tape over the center section and secure with resin. Give the wing a coat of sealer and rub down, then apply a couple of coats of clear dope and rub down ready for covering. Cover with nylon, taking great care to avoid warps. The

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LADYBIRD MK 2

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ailerons are, of course, removed during the covering of the wing. Now cover these with heavy silkspan. Applying a coat of sealer, clear dope, and finally, spray with the color of your choice. Re-fit them to the wing.

Having now almost finished the wing, carve out the wing seating in the fuselage, and face the front surface with 1/16" ply. When you are sure that the wing is true to the fuselage and at the correct angle of incidence, add the soft block fairing to the top of the wing, facing its front surface with 1/16" ply.

Completion of the fuselage:

Complete the sanding of the fuselage, making sure that the wing fairing follows the fuselage line. Bind the rear of the fuselage with ½" fiberglass tape using epoxy as the adhesive. Cut the tailplane from ¼" hard balsa, round the L.E., and epoxy to the fuselage, making sure that it is true with the wing. Cut the elevator from soft ¼" balsa and add the hard balsa tips, sanding to the section shown.

Cut the fin from 3/16" hard balsa, sand the leading edge to shape and slot into the fuselage. Secure with epoxy, adjust to be at right angles to the tailplane and hold in position with pins through the fuselage bottom while the epoxy sets. The rudder is made from soft 3/16" sheet.

Add the ½" bulge under the tail; this raises the tail slightly and reduces the possibility of damage on landing.

Cover the fuselage with nylon. (I strongly recommend nylon as the best material for withstanding the very harsh treatment of repeated landings.) Give a coat or two of sealer, then clear dope and finally spray with color. Add ¼" wing dowels and a tow hook, if you want to use a Hi-Start when the wind is light, although it is advisable to have a light soarer available for such conditions.

When selecting your color scheme, choose those that will give the good visibility required for a small fast model that will probably be flown at a much greater distance (in search of lift) than would a power model of the

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is a 20 page booklet designed to acquaint the general public with the sport and hobby of radio control. It was written by Don Dewey and published by RCM to be used by clubs and manufacturers, at trade shows and contests - - - wherever the general public is in attendance. It is being sold at cost plus handling and postage and may be resold by clubs, if desired, at a price not to exceed 25 cents per copy. The back cover has been left blank for club or manufacturers to imprint their own message.

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same size.

Install your radio equipment and check the balance point. For first flights, it should be at the point shown, adding weight to the nose, if necessary.

Flying:

The recommended control surface movements are shown on the plan. The elevator and aileron will be found sensitive, while rudder only produces a yaw. Do not bother with the rudder during early flights. Initial flights are best attempted when a moderate wind insures adequate lift. If you have not flown a sensitive sailplane before, and can find someone who has, let him trim out Ladybird Mk 2 for you. If you are on your own I hope you have plenty of flying experience behind you so that your reactions are automatic. This is **not** a model for beginners!

Launch the model straight into the wind over your slope, trying to avoid places of obvious turbulence caused by trees, bushes or very uneven ground. Launch fast, and have the left hand ready on the elevator trim for quick correction. If the wing is true, out-of-trim aileron should not give trouble. Fly straight out from the slope and keep the model moving fast enough to give plenty of penetration. If all is well, ease back a little on the stick to climb, thus reducing the speed. Make a gentle turn and fly along the ridge, allowing the model to drift back towards you and, when appropriate, turn away from the slope. Do not make turns towards the slope until you have a little experience.

For the first landing, do not fly back over the crest of the hill more than absolutely necessary (it may be very turbulent) but try to approach along the slope and make a sharp turn into the wind and put the model down quickly. This model is extremely resistent to stalling and tight turns at low altitude which would be the sure way of "re-kitting" a high aspect ratio model!

When you feel able, try a few loops and rolls, and then try to hold inverted flight. Some down elevator will be required. If the model seems fairly stable longitudinally when flying normally, try moving the C.G. to the rear in small increments by removing nose weight. Fly with the C.G. as far to the rear as possible consistent with having a stable aircraft. This will give a high spin rate, as well as inverted flight requiring minimum down elevator. The prototype finally had 1 ounce of nose weight and weighed 2 lbs., 7 oz. The final trim is such that when the model is put into a dive and, on releasing the stick, the pull-out is very gradual.

This is a very sensitive model to fly but, in spite of this, I describe it as docile in that it has no nasty habits and can be recovered from what looks like impossible situations by a pilot with fast reactions. This is because very high "G" loadings can be applied without stalling or snap rolling. IF and only **IF THE WINGS ARE FREE FROM WARPS.**

Here are a few comments on aerobatics:

Loop: Dive at about 30° and ease back on the stick, full up will not usually be required. Ease off the stick at the top of the loop to keep it from tightening up.

Roll: Shallow dive, pull up slightly above the horizontal and apply aileron. Give a slight touch of down and release as the model rolls through the inverted position. Too much down will give a fast and barreled second half to the roll.

Bunt: Apply down elevator gradually only reaching full down after about 200° of rotation, ease off again for a smooth recovery.

Inverted: Half roll and apply slight down. Remember that down is now up but aileron response is, of course, normal.

Stall turn: Dive steeply and pull up into a climb of 80°. As the model slows, gradually apply rudder as well as a little down, reaching full rudder just before the model rotates. Pull out along the path of entry into the stall turn.

Vertical roll: From a prolonged vertical dive, pull up vertically and apply full aileron. One and one half rolls can be obtained. Full down at the top gives recovery into level flight.

Spin: Full up, full rudder, full aileron.

Inverted spin: Full down, full rudder, full opposite aileron. Recovery from both is fast, but neutralize and un-stall the model before applying slight up for the recovery, otherwise the spin may re-start.

That covers the basic maneuvers, the rest is up to your skill, since most others are combinations of the basic maneuvers.

I hope you have success with Ladybird, the prototype is still in excellent condition after over a year of very hard use, and you can continue to improve your flying with a model of this type over a considerable period of time. In England the improvement in design of this type of model has been tremendous over the past two years, and it is very difficult to see where any further major changes can be made. □

COMING SOON!

An all-new step-by-step series of articles on building your own proportional system. The finest R/C system ever presented by the model press.

WATCH FOR IT!

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you don't mind spending a few more dollars, a deluxe version will provide you with a little black box, switch, green light and universal "socket."

Set on parts? Fine. All you need now is a 25-watt soldering iron. Plug it in and let's get started.

A Workshop Universal Crystal Tester

The workshop version assembles fast, is just as easy to use as the deluxe job, and costs less. Follow the schematic of Figure 1, and assemble the components on a piece of perf board. Use insulated hook-up wire to connect components under the board. A switch isn't necessary. You can snap a 9-volt transistor battery into the battery clip when you need the tester. Or, use a battery eliminator (see parts list). You may prefer the latter because testing is likely to occur only once or twice a season (hopefully) – and by that time, the old battery may have passed away.

It's important that you use a 9-volt battery. Don't use an 8.4-volt mercury transistor battery – the voltage isn't high enough to operate 72 MHz crystals. Since we're talking voltage, if you'd like to double the intensity of the test bulb, just connect two 9-volt transistor batteries in series. The 18 volts will make for a very cheery lamp and can't harm the circuit.

While soldering, it's a good idea to keep the transistor bodies 1/8" away from the surface of the perf board to avoid heat damage. Something else to watch: If you buy the diodes at Radio Shack, be sure the package contains at least two diodes with **banded** ends. The band indicates the cathode ("plus") end and must face the base of Q2, as indicated by the schematic.

Suppose you can't find a package with banded ends. To identify the diode's cathode side, hook up a 68-ohm, ½-watt resistor to the **positive** terminal of a 6-volt lantern battery. Run the other lead of the resistor to a No. 49 panel lamp. Touch one lead of the diode to the negative terminal of the battery; touch the other diode lead to the unused terminal of the lamp. If the bulb lights, the plus side of the diode is the one touching the battery's negative terminal. If the bulb doesn't light, turn the diode around so that its leads are just the opposite. This should turn on the lamp (unless the diode is defective). You may even wish to use this procedure to check out banded diodes before soldering them into the circuit (diodes are sold untested).

Use hook-up wire for the test probes. Touch the bared ends of the probes to the legs of the crystal under test. A good (oscillating) crystal will light the bulb; a cracked or fully broken crystal will not. It's as simple as that. However, the test must be made **with the crystal removed from**

the receiver in order to avoid damage to the receiver circuit.

Once you've assembled the unit, test it with a good crystal. If the bulb fails to light, carefully check the circuit to be sure it is correctly wired. Be sure you're using a fresh battery. If you still get a zero, substitute a 200,000 ohm potentiometer for the 150,000 ohm resistor, and adjust the pot until the lamp glows. While you're at it, you might as well adjust the lamp to maximum brilliance. Then remove the battery from the clip and measure the setting of the pot with an ohmmeter. Replace the pot with a resistor that closely approximates the reading. Don't go by the resistor's color band code alone. This type of resistor has a manufacturing variance of plus or minus 10%. You want a resistor that matches the reading of the ohmmeter.

By the way, the intensity of the test bulb means nothing. 72 MHz crystals will not produce a glow quite as bright as a 27 MHz crystal, for instance. All that matters is whether or not the lamp will light. If it doesn't, the crystal is the culprit, Watson.

On the other hand, if your receiver won't operate with a good crystal, and you've checked the battery and wiring, and you aren't an electronics technician, you're a pretty hard luck kid. Send the mean thing back to the factory for curse removal. Just make sure they don't try to sell you a new crystal. You know better!

A Deluxe Universal Crystal Tester

Some men can't stand the sight of naked capacitors. The compact version, as illustrated in the photographs, uses a green indicator bubble, a switch, and a spread-eagled plug as a universal "socket." The latter is necessary because R/C crystals don't have standard width legs (or even standard leg diameters).

Because the bakelite utility box is quite small (3¼" x 2-1/8" x 1-1/8"), you'll have to make your own perf board from a small sheet of 1/16" plywood. Cut the plywood to 1¼" x ¾". Use a 1/32" drill for the holes and keep the components as close together as possible.

Drill out the case's aluminum face to accomodate the green bubble, switch, and jack. You can arrange these as shown in the photograph or to suit yourself. Tuck the assembled perf board into the end of the box.

If you like, you can dress up the unit with black Letraset press on letters (see photograph). A thin coat of clear Polyurethane varnish over the aluminum face will keep the letters from smearing.

Now to that neat green bubble. Remove the lower half of the bubble assembly and insert the 1½-volt bulb. Use 5 minute epoxy to lock the bulb in place; the tester couldn't possibly be used enough to burn out the bulb.

One last gasp. You probably don't relish the idea of yanking a crystal out of a working receiver to see if the U.C.T. works. Why not buy a citizens band crystal? These cost only 1/3 to 1/2 what an R/C crystal costs. If the CB crystal (27 MHz) will light the test bulb, so will any R/C crystal, if it isn't broken.

All set? You probably are, because crashes that result in dead receivers can't spook you anymore. You're now armed with a tool that will save you time, nervous indigestion, and even money.

If you can afford it, keep an extra R/C crystal on hand for your receiver(s). Otherwise, it usually takes a week or so for one to arrive in the

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speedy mail. When one comes through the mail, test it to see that it wasn't damaged in transit.

At this point you're probably asking yourself why not just solder a new crystal into a receiver and see if it works? Okay, but what if it doesn't work? How do you know if the new crystal wasn't damaged in transit? Suppose the problem isn't the crystal at all? How are you going to **know**?

With a U.C.T., that's how! The repair services probably won't be as fond of you as they once were, if you build one of these testers; but you can inform them that's the way the crystal crumbles.

PARTS LIST FOR WORKSHOP U.C.T.
(all parts are available at Allied Radio Shack)

B1	9-VDC transistor battery (RS 23-464) or 9-VDC battery eliminator (RS 270-415)
9-Volt	Battery clip (RS 270-325)
C1	470-pF, disc capacitor (RS 272-125)
C2	47-pF, disc capacitor (RS 272-121)
C3	.01-uF, disc capacitor (RS 272-131)
D1, D2,	1N4148 or 1N914 diodes (RS 276-612)
Q1, Q2	2N957 transistors (RS 276-2010)
R1	150,000 ohm, ½ watt resistor (RS 271-000 series)
R2	1,000 ohm, ½ watt resistor (RS 271-000 series)

Lamp – 1½ volt, 25 mA pilot bulb (RS 272-1139)
Perf board – (RS 276-1575)
Hook-up wire – (RS-278-025)

PARTS FOR DELUXE U.C.T.

S1 Miniature SPDT switch (RS 275-603)
Miniature phone plug (RS 274-286) and jack (RS 274-251)
Panel lamp indicator assembly, green (RS 272-1535)
Bakelite utility case (RS 270-230)
MISCELLANEOUS: Letraset press-on letters, black; Polyurethane varnish; small sheet of 1/16" plywood. □

EL BANDITO

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setting without oscillating. The engine is broken-in when there is no longer any shiny ridge at the top of the piston. When flying make sure the engine doesn't go lean and overheat. It is better to back off than to ruin an engine. My Tigre is currently turning 16,500 rpm with a 7 x 6 Rev-up series 400 prop and K & B 500 fuel and is still improving.

FUSELAGE

For the scratch-builder, House of Balsa makes the "Glass Spar Wing Kit" available as a separate kit for $11.95 as well as fiberglass cowls at $4.95 each, canopies at $1.49, landing gears for $1.25, and a racing decal sheet for $1.49, which has all of the racing companies' stickers in a 2" to the foot size.

If you build the El Bandito from the Shoestring kit use the motor mount assembly as supplied in the kit. The plans in this article show a firewall and commercial metal motor mounts for simplicity for the scratch-builder. I used the same wooden mounts as my earlier Shoestring but added fiberglass reinforcement. I cannot impress too much the importance of a solid front end. The motor mounts must absorb and transmit to the entire airplane and dampen the engine vibration or there will be a loss of engine rpm. Consequently I have added 1/32" plywood doublers from bulkhead B through the firewall on the plans. I would also recommend adding fiberglass around the firewall. The top hatch in the plans is shorter than the original, but adds more rigidity to the firewall area. Another, and even better, alternative would be to eliminate the top hatch altogether and make the entire top block in one piece. This would entail removal of bulkhead B after construction to allow tank and battery access but would not be difficult if B were only tack glued to the fuselage sides. After the removal of bulkhead B, add triangle stock above the ¼" ply landing gear mount. Decide now which way you will build and proceed.

Construction is begun with the fuselage. The wing is built into the partially completed fuselage. The plans show two firewall locations for rear valve and front valve engines. As different brands of engines vary in length, check yours on the intended mount against the plans for fit. Adjust the firewall location if needed. Cut the two fuselage sides noting that the left hand side extends all the way to the spinner. Cut bulkheads B and C from 1/16" plywood and the firewall and landing gear mount from ¼" plywood. Carefully locate and drill the two ¼" holes in the fuselage sides for the arrow shaft spars. Glue down the 1/8" square and 3/16" square and the 1/32" plywood doublers and bevel the sides at the rear. Mark the centerlines on the bulkheads and the firewall and then bond in bulkheads B and C between the fuselage sides using the plan top view for alignment. Remember to just tack bulkhead B in lightly if you intend to remove it later. When dry, bond the fuselage sides together at the tail, still using the plan top view to insure the assembly is straight. Epoxy in the firewall and the ½" triangle stock, again using the plans for alignment. Epoxy in the landing gear mount and install the blind nuts in the firewall for the engine mount. Add the ½" sheet balsa bottom front block and the 3/32" bottom rear sheeting. Tack cement the ¾" soft sheet top block and the ½" sheet balsa bottom hatch into place. Mark the canopy location on the top and leave that area flat

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EL BANDITO

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when shaping. With a razor plane and large sanding block, shape the entire fuselage except for around the cowl. When finished, remove the hatch and the top block and hollow as shown for lightness. Glue a piece of 1/8" x 1/2" balsa across the rear of the bottom hatch for reinforcement and to key the hatch between the fuselage sides. Also bond in the two 1/8" plywood hatch hold-down plates. Set aside the top block and the lower hatch and begin the wing construction.

WING

Cut a root and tip template from 1/16" plywood and drill the two ¼" holes. Take care so that these two holes line up perfectly with each other and with the holes in the fuselage. Cut 18 rectangular rib blanks and using the two templates, drill ¼" holes through all of the ribs. Cut two each of the tip ribs and the root ribs directly from the templates and set them aside. Using ¼" bolts, bolt seven rib blanks between the two rib templates and carve and sand a stack of ribs. Repeat for the opposite wing panel. Epoxy the two fiberglass arrowshaft wing spars into the fuselage while the fuselage is upside down on a flat surface with short lengths of ¼" dowels under the spars. At the same time, while the epoxy is still wet, slide on the root ribs and the tip ribs and wiggle the spars until they lay flat on the dowels without additional pressure. When dry, bond the root ribs to the fuselage sides and slip on the remainder of the ribs in proper sequence. Using slow drying epoxy, or Titebond, coat the spars at each rib location and move the ribs into the exact location. Place the loose, wet structure back onto the flat surface with the dowels in place and twist the assembly again until the spars rest on the dowels at each wing tip unrestrained. When dry, cut and glue the 1/16" x 1/4" balsa leading edge and the 3/16" square trailing edge to the ribs. With the assembly still flat on the table, add the bottom sheeting and capstrips and allow to dry. Lift the assembly from the table and add the top sheeting and capstrips. Add the 3/8" square leading edge. Make the two aileron linkages from 3/32" piano wire and 1/8" O.D. brass tubing. Cut the two stationary, inboard trailing edge pieces and groove them to accept the aileron linkage. Epoxy the linkage and the trailing edge to the wing taking care to keep the epoxy from the ends of the tubing. Cut and fit the ailerons and the hinges but do not glue at this time. I concave/convexed all of the control surfaces to reduce the air gap using sandpaper and a piece of ¼" dowel. Add the wing tip blocks and shape with coarse sandpaper. Now go over the entire assembled wing with the ailerons in place with a sanding block and remove any bumps or ridges and fair the ailerons and tip blocks perfectly into the wing.

Permanently bond the top block into place and, if you want a tank hatch, cut it away now. The front of the hatch is held in place with a short piece of 1/8" dowel epoxied into the hatch and keyed into the nose block. The rear of the hatch, as well as all of the bottom hatch, is held in place with 4-40 bolts and blind nuts or No. 6 sheet metal screws. To prevent the screws or bolts from crushing the balsa hatches, short pieces of ¼" dowels are epoxied to the hatches and then drilled out for the bolts. Inset the dowels about 3/32" so the screw heads will be flush with the surface.

TAIL ASSEMBLY

Join the two sides of the elevator with a piece of 3/16" dowel. Slot the stab and elevator for the hinges and slide the assembly together without glue. Sand the stabilizer-elevator assembly to an airfoil shape as shown on the plan. Do the same with the fin and rudder. Disassemble and, with the aid of a square, epoxy the fin to the elevator on the centerline. Epoxy the stabilizer-fin assembly to the fuselage taking the greatest of care that the stab is square to the wing and the fin is in line with the centerline of the fuselage.

Add the balsa block cheek cowls and hollow as needed. Rear rotor engines run faster if the intake air is cool. If possible, add a baffle to protect the carburetor intake from the hot air coming from around the cylinder, and supply cool air into the area from a duct in the other cheek. The fiberglass cowl is made directly over a piece of styrofoam that was fit and shaped along with the cheek cowls and the rest of the front end. "Pro-foam" or polyurethane cellular foam is perfect as it is not attacked by polyester resins. If this material is not available you can use any other foam and Hobbypoxy II. The cowl is just one layer of six ounce glass cloth and two or three coats of resin, sanding between coats until the cowl is smooth. After the resin has cured, cut and sand away all of the foam. Where the screws pass through the cowl, glass in washers or small "V's" of fine wire to protect the cowl from wear or cracking. I used No. 6 sheet metal screws into hardwood blocks epoxied to the fuselage to attach the cowl. To get a really good fit of the cowl to the fuselage and cheek, wax the inside of the cowl and add a bead of resin and micro-balloons or other filler around the edge of the engine compartment and then screw the cowl into place and allow to set. This provides a shoulder for the cowl to seat against and reduce the air gap and drag.

FINISHING

After detailing and painting the cockpit area, tack cement the canopy into position. When dry, mask the canopy and smooth a fillet of Hobbypoxy II around the canopy with your finger. Remove the tape before the epoxy sets and no further filleting is needed. Add the 1/16" plywood wing fillets and mix up a batch of resin and micro-balloons and fill and fillet all seams and junctures. Finish off with vinyl spackle and sand with No. 400 paper in preparation for finish.

The wheel pants are balsa cores with 1/16" plywood sides sanded to shape. I used 1½" Williams Brothers military wheels and 6-32 bolts and nuts to attach the wheels and pants to the aluminum landing gear.

The wings are covered with Super MonoKote and the remainder of the airplane was finished with one coat of K & B Epoxy Primer, sanded with No. 400 paper and then one finish coat of K & B Superpoxy color was sprayed on. Numbers were cut from MonoKote trim and protected with a coat of clear Superpoxy.

Epoxy in all of the hinges and add the control horns. I used plywood horns epoxied and faired into the rudder and elevator.

The radio installation is primarily three servos side-by-side across the fuselage using the center servo for the

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ENGINE CLINIC

from page 10

come close to equaling castor oil was the Klotz Special Formula oil. K & B's new oil has now surpassed Klotz in this respect. So try it — you'll like it!

Dear Clarence:

I have a K & B .40 (F.R.) mounted on a Goldberg Falcon "56". I am using a Kavan muffler with the open venturi disc. My question is this: Everyone has told me that I have to remove the exhaust baffle to use the engine with a muffler. Do I have to remove the baffle? If so, how would you suggest plugging the holes in the exhaust port?

Also, the K & B I mentioned above has never been run in as yet. Per the answer to my previous letter, I am using K & B "100" fuel for the initial run in with the stock K & B glo plug. I took the engine out to the field yesterday with a temperature around 27 degrees outside, (on the plane, of course) with the intention of running it in. I could not get the engine to even fire. I checked my battery, glo plug, fuel feed, and pressure plate (on rear). Still nothing. Some friends told me I should be using a hotter glo plug and maybe prime the engine with "500" or even K & B "1000". This theory is against all that you have said, but I still would like your opinion. I can't run the engine indoors as I live in an apartment. I have a tight work schedule, so I have to go out when I can. Any suggestions you have will be appreciated.

Sincerely,
Michael Holliday
Lou., Ky.

First off, Mike, the reason for removing the exhaust baffle when you install a muffler is due to the fact that the muffler retaining clamp would interfere with the exhaust baffle linkage. It has nothing to do with the performance of the engine. It would actually be desirable to retain the exhaust baffle in conjunction with the muffler but, due to problems with linkage created when installing the muffler, the baffle usually has to go. Most mufflers intended for engines that do have the rotary type of exhaust baffle come with plugs for the holes left by the removal of the baffle. If not, these plugs are available separately from your hobby dealer. Semco for one, markets the plugs separately. You most certainly do have to plug the holes when you remove the exhaust baffle.

As I have mentioned many times in the past, it only takes three things to make a model engine fire. Good compression, fuel, and a hot glow plug. There is no big mystery to these engines — they are very basic in operation although I admit they can be very frustrating at times. You can com-

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CONTORK WINCH

from page 66

aluminum sides called for are desirable, plywood would probably not be so bad (although I have no intention of trying it out).

An alternate hub design (4') shown in the drawings, uses a wooden hub. This is a stack of pre-drilled ¾" thick discs, that would be a lot easier to do up than trying to drill true holes lengthwise all the way through a solid single piece of wood. The discs and wooden sides (if used) could be assembled in rough form, attached to the shaft of a partially assembled winch, and the winch itself used as a wood lathe, run with its own motor on battery power.

Another alternative is to adapt a junk plastic or metal wire spool. Bear in mind when selecting a spool, that all that towline wound up in tension can exert a tremendous amount of pressure on the hub and, to a lesser extent, the flanges.

MISCELLANEOUS

Take exceptional care in drilling for the fitting, the roll-pin that locks the reel to the motor shaft. This machine does not like a loose reel connection. It must be tight.

The hole (29) in the base and the eye bolt (31) in its mounting block (13) will be convenient if the winch is to be operated on some slippery surface. In which case, a stake driven through the hole, or a rope tied through the eye, with a few guys standing on it, could keep it from moving. I don't think this is going to happen very often, however, since most likely, the glider pilot is going to be standing on the base himself.

GENERAL COMMENTS

Please resist the normal urge to beef the thing up. Stuff like this can get awfully heavy when you are carrying it out to the field. The only parts that I can see profiting is an increase in the thickness and area of the contact mountings to pull the heat away a little better. Other than that I think it's strong enough.

The arming switch, shown in the photos, is not shown in the other drawings. We used an old-fashioned double pole knife switch with a porcelain base. The two poles were strapped together (paralleled) and the switch placed in series with one of the wires. Since at rest, the winch is normally "off," the arming switch is only operated during a no current condition. Please don't omit the switch. Any winch can be dangerous and an emergency stop should be provided. I've had towline burns to prove it.

CLOSING

At this point in most articles the reader usually finds himself wading around in a glowing account of how great the thing just promoted – works. This article will be no exception! Putting kidding aside, the machine does work and works well. Both the prototype built by Leon and the design described here worked well, with a minimum of experimentation. The roughest thing you can do to them is to static test them against a spring scale and although we did a lot of this kind of testing, the winches still work.

Bruce, Leon and the author are confident that this winch, and the inevitable new versions of it that will appear, will be a great boost to the sport of R.C. glider flying.

CALL-OUT LIST FOR DRAWING:

1. Holder, Stationary Contact & Heat Sink
2. Dummy Shaft
3. Holder, Moving Contact & Heat Sink
4. Reel Hub
5. Reel Side
6. Reel Side
7. Cylinder, Dash pot
8. Piston & Shank, Dash pot
9. Connecting Link, Dash pot
10. Spring, Hold Open
11. Spring, Control
12. Spring, Slider
13. Block
14. Slider, Torque Limit
15. Control Arm
16. Base
17. Control Pedal
18. Frame End (Reel)
19. Frame End (Dummy Shaft & Brush End)
20. Frame Side (Outside)
21. Frame Side (Inside)
22. Hanger (Pedal to Control Spring)
23. Starter Motor
24. Roll Pin
25. Stationary Contact
26. Moving Contact
27. Relief Bevel
28. Hinge
29. Towline
30. Hole, Hand Hold
31. Eye Bolt
32. Marking (Calibration)
33. Cap, Brake Cylinder
34. Wire, Body Return
35. Wire, Stationary Contact
36.
37. Sleeve Bearing
38. Sleeve Bearing
39. Washer
40. Washer

□

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pletely remove the carburetor from the engine and even remove the back cover for that matter. With a small exhaust prime and a hot glow plug the engine will fire up and stop. I don't recommend you try doing this with the back cover removed, however, as the back cover also keeps the connecting rod on the crank pin. I have proven this in the past, however, with my old Lee .45's that had a snap ring to hold the con-rod in place.

But back to your problem, Mike, you are probably trying to start the engine without an exhaust prime and, in cold weather, this is an absolute necessity. A hotter fuel or hotter glow plug is **not** necessary. Just be sure the glow plug you are using glows bright orange, not dull red. As for using a higher nitro content fuel, this will gain you nothing. Whereas a fuel containing nitro will start easier than one that does not, addition of more nitro will not help matters. The addition of an igniter such as propylene oxide will help. This can be purchased at any large chemical house. Add about 2% to your fuel. Propylene oxide has a very low boil point, much the same as ether, so do not let it set with the can open or let the can set in the sun in the summertime. It would also help to keep your airplane in the car prior to starting the engine in 27 degree weather. A cold soaked engine is not going to take off like a nice warm one in the summertime — especially if you are inexperienced in engine starting.

Dear Mr. Lee:

I've just had a common problem with the Perry carburetor on my new FR K & B .40 series 71. It relates to your comments on the problem in the March RCM. It wouldn't 4 cycle or even break-in and out of 4 cycle. This engine appears to have the new type carburetor. It has a hole located in the center of a very thin slit in the aluminum mixture disc. I tried enlarging the hole slightly with no improvement. Then I noticed the close clearance (and long engagement before the needle seat) of the needle O.D. (.057") to the brass tube I.D. (.067"). I opened the I.D. of the brass tube to .070" and all works well.

I'm fairly certain that this problem occurs in part from the higher viscosity of fuel due to cold temperatures (these test runs at 25 to 30 degrees F). I noticed slight differences in Fox Superfuel for break-in (thicker) and a homebrew fuel with 25% synthetic oil 75% nitro. The engine would not 4 cycle on either fuel cold until the above modification was made. Perhaps your readers will benefit from these observations.

I believe that most of your problem is cold weather and high viscosity fuel. Fox Superfuel is 28% castor oil and does require the needle to be backed out farther than some of your lower oil content fuels. If opening up the I.D. of the tube solved the problem there is certainly nothing wrong about doing this. If any of you other fliers out there have experienced problems getting the latest style Perry carburetor to richen up as Russell did you might do as he did and drill out the tube to a larger diameter. However, be sure you only run the drill to the needle seat — not all the way through. If you do run the drill all the way through you will have the opposite problem — you will be unable to lean the engine in.

Dear Clarence:

Being the only R/C modeler for miles around, I am pretty dependent on what I can get my hands on to read in order to figure out my problems. Your Engine Clinic has been a great help and your book, The RC Engine, has also saved my neck a few times but I have a new question that I have not been able to find in print yet.

A few issues back, you mentioned in your column that you should never break-in a .60 with a muffler. You stated that you should run at least a gallon of fuel with plenty of castor oil in it through the engine

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如你要找向日本強力的銷路，就把你製造出的商品目録和价格単寄给下边的地址。我们感兴趣的東西就是一切的玩具，比方说；无线飞机、小艇、遊艇、滑翔机、帆船和这样用的发动机什么的。
请向日本办事处用中文、英文或日文给連络吧。还有、向欧州代理店请用独文或西文给連络吧。

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Nel caso che Lei sia interessato a vendere Vostri prodotti nel Giappone, sareebbe favorevole di non perdere tempo e di contattare gli distributori che hanno la più granda esperienza e capacità del paese. Siamo interessati alla importazione di R/C aeroplani di modello, barchete, motore di modello, alianti, panfili, modeli di navi historiche ecc. ecc. Vi preghiamo di rivolversi – allegando cataloghi e listini dei prezzi d'esportazione – direttamente alla ditta principale a Giappone in inglese, o in italiano alla nostra representanza per l'Europa in Austria.

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ENGINE CLINIC

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first. The other day I ordered a Veco .61 by mail and although I do not have it yet, I got to wondering how to break it in because it comes with a muffler. If I take the muffler off to break it in, I will not have the baffle in the exhaust port to control the idle. What should I do?

Thank You,
Bob Goodspeed
Pipestone, Minn.

It is desirable to break an engine in without the muffler if at all possible. Mufflers do create back pressure and heat. A new engine is going to run on the hot side to begin with until broken-in. The increased heat from the muffler only adds to this. Then, too, a new engine has to be run on the rich side. This means carbon, varnish, and goop. Increased heat from the muffler will add to this problem. New rings have to seat to the cylinder wall and, if they become varnished or glazed prior to being seated, the break-in period will be greatly extended. In some cases they may never seat properly. So, if at all possible, the first five or six flights on a new engine should be without the muffler. If you fly at a field where mufflers are required, then you have no other choice. Leaving the muffler off the engine will increase the idle speed but, in the case of the 72 series Veco .61, the engine will still idle okay. The speed will be a little faster and acceleration a little slower but do not be concerned or try to do too much adjusting until you do install the muffler. For that matter you want to hold all idling to a minimum to start with. Idling also causes a lot of slush in the engine that will, in turn, slow down ring seating and break-in. Too often RC'ers will start up a brand new engine, cut it to idle, and if it dies then spend the first hour of running time the engine ever sees trying to get it to idle. Forget the idle until you do get a little time on the engine. When I break in a new engine myself I always take the airplane out to the take-off position, start it up and have a helper release the airplane without ever attempting to idle the engine for the first two flights. The rings will do their most seating during this period.

Dear Clarence:
I have just acquired two Minnesota Engine Works jet engines model No. MEW 307. These engines are 20½" long. The problem I have is that I believe this company has gone out of business. I was wondering if you or any of the readers of

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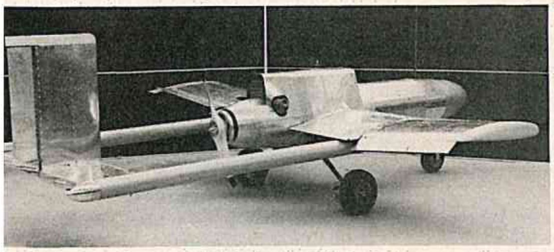
R/C MODELER MAGAZINE'S MODEL OF THE MONTH CONTEST

This program is designed to encourage the sport and novice competition flier to submit details of his most recent kit or scratch-built model to RCM in order to encourage general model craftsmanship and the overall promotion of R/C flying.

Each month R/C Modeler Magazine will award a Dremel Model 261 Moto-Tool Kit featuring the Model 260 Moto-Tool. On alternate months the first place will receive a Dremel #572 Moto-Shop as illustrated in the photographs. The second and third place winners each month will each receive a one year subscription to R/C Modeler Magazine or, if they are a subscriber, an extension of their current subscription.

See the December 1971 issue of R/C Modeler Magazine for complete contest rules.

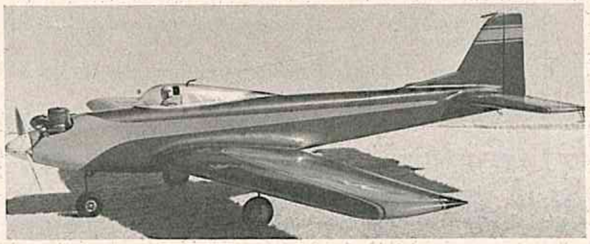
MAY 1973 WINNERS



1ST PLACE

Col. Sherwin Arculis
113 Hines Road
Fort Huachuca, Arizona 85613

A scratch-built "Two Boomer," a model of a Lockheed Missile and Space Division RTV-1 study vehicle. 50" wing span, O.S. Max .58, Kraft 71 Airborn Pack with KPS 12 servos.



2ND PLACE

Peter C. Wardell
541 Beryl St., Broken Hill
NSW Australia 2880

Ron Chidgey designed "Tiger Tail" from MAN plans. 66" wingspan, 8¼ lbs. Webra .61 with a Kraft Gold Medal 6-channel radio and Kraft Hayes Multicon retracts.

3RD PLACE

Gerald Barbieri
236 Moline Court
Aurora, Colorado 80010

Scratch-built "Tiger Moth" from RCM plans. Powered by a .61 Veco engine and controlled by a Logictrol 5 radio. Silk and dope covered. Weighs approximately 6 pounds.

ENGINE CLINIC

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RCM have information on how to start, how the air is pumped in, and how well they perform? I have seen the Dynajet and thought of possibly changing my engine, fuel, and air line to work the same as theirs. Is this at all possible? I'm new to jets and would like help if possible.

Thank You,
Neil Lee
25 Bolster St.
Everett, Mass. 02149

I am afraid I can't help you with the MEW jet engine, Neil. I have never had any experience with the engine other than remember having seen the magazine ads some years back. I am running your letter in case some of the readers might be able to help. Any of you out there who might be able to help Mr. Lee might drop him a line.

We'll close the column this month with another jewel from the hacker's hacker — Wings Whiplash.

Dear Mr. Lee:

I notice that you are quite pleased when one of your readers solves his own problem so I thought I would let you in on a clever solution to one of my problems.

What, with all the rain, wind, and the field flooded and not being able to go flying, I thought I would fix up a few things around the house as my wife has been complaining that I spend too much time and money on my hobby. First off, I fixed the wringer on her washing machine. Then I put a brand new set of re-conditioned plugs in her '53 Dodge and then I taped up the leak in her garden hose. Having thus made a few Brownie points I turned my attentions to fixing my Lee Custom, thus saving some more money.

As I wrote you in my last letter, my Lee Custom .61 didn't feel like it had any compression ratio left after performing 222½ hammerhead stalls. I figured that if it didn't have no compression the cylinder must be too big for the piston. Now, get this Clarence - - - er, Mr. Lee - - - I put the top part of the motor (where all the grooves are) in my bench vise and squeezed it, but here's the clever part — I kept TURNING it as I squeezed it to make sure it stayed round! Now it has lots of compression even without the glow plug screwed in. I can hardly wait to get out to the field to try it. One other hint for the fellows, why buy an expensive test stand when you can just clamp your motor in the good old bench vise? The secret here is to make sure your vise jaws has those gripper teeth in them, otherwise the motor will come out when its running and may break your prop when it hits the garage wall.

Well, that's it, Mr. Lee. Hope this will help some of your readers. My next project is to fix my Kraft 73 series radio . . . .

Your Friend,
Wings Whiplash

ENGINE CLINIC, c/o R/C Modeler Magazine, P.O. Box 487, Sierra Madre, California 91024.

EL BANDITO

from page 99

ailerons and the other two for elevator and rudder. The throttle servo is mounted crosswise, as shown on the plan, or can be mounted along side of the receiver against the fuselage side using an aileron servo mounting bracket.

FLYING

In the beginning, adjust the control surface movement to give 3/16" travel in each direction for the elevator and ¼" travel for the rudder. Aileron travel can be from 1/8" to 3/16" in each direction. I prefer a slower roll rate as I can fly more smoothly. The elevator is later adjusted for maximum travel without causing the airplane to snap out of a 90°, full up elevator turn. Note: Do this testing fairly high or you may have to start over!

For that first flight please check and recheck all control surfaces for binding, movement, and position of neutrals. Everything should be straight and the engine should be adjusted to give the most reliable slow idle. It does not take much power to keep this airplane up, so you must be able to slow it down to land it, especially if it is out of trim on that first flight. Check the CG with the tank empty and adjust it until correct according to the plan. Do not attempt to fly if the CG is not right. My El Bandito is balanced at the rear point shown on the plan.

For take-off have someone hand release the airplane at full power. Hold up elevator and only add rudder gently, later in the roll-out when needed. Mine begins to swing left after it has rolled about thirty feet and the tail is up. It takes very little rudder to keep the take-off straight. Keep the airplane climbing until it reaches about 200 feet before touching the trims. Once trimmed out, it should fly like it is on rails. There is no tendency to balloon when turning into the wind as do some high lift airfoils. Most impressive is the airplane's speed and smoothness and its ability to corner.

For landings use a long approach as the glide is fast and flat. Start slowing it down early so that by the time it touches down you are holding full up elevator. The stall speed is very slow and aileron control is positive to the end. □

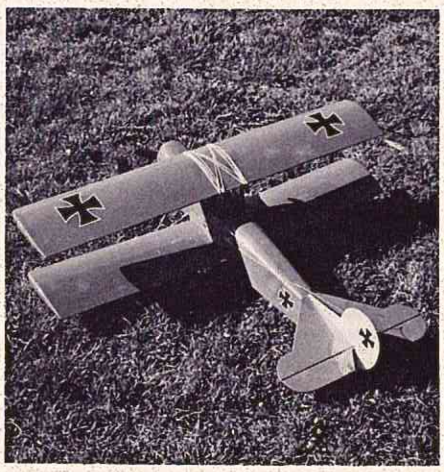
WW I SCRAMBLE

from page 22

and, finally, the idea evolved. Why not an event that did combine racing with some simple maneuvers, and then combine this with some of the fun of the Rhinebeck World War I events? After letting this thought drift around the back of my head for awhile the finished product fought its way to the surface.

First, the aircraft are limited to replicas of World War I Biplanes (and only biplanes). Next, because of the tremendous growth of Quarter Midgets, and the resultant influx of outstanding engines, keep the engine size to the fantastic .15's. The aircraft then will have the following design limitations: Total wing area (both wings combined) of a minimum of 425 square inches. Fuselage width at 2¾" minimum, height of 4" minimum, excluding windshield, head rests, etc. – and not including the top wing. Weight to be 2½ lb. minimum, and 4 lb. maximum. Engines must be throttle equipped. The engine limitations and idle rule of Quarter Midgets should also be retained. As you can tell, the fuselages are about the same size as a Quarter Midget, and the wing area figures out to two wings, 6" wide and 36" long, plus tip blocks. Paint jobs should stress scale-like appearance. The Fokker D-VII is a natural for this as well as the SE 5. Again, the aircraft should appear like one of the WW I bipes, but super scale is not stressed, only that it should **look like** its full sized counterpart.

Now, to the race itself. This race **isn't a race**, it is a **scramble**. Three or more aircraft should be flown in each heat, and each race should be ten laps around the standard Quarter Midget course. But here the similarity ends. In each race the following have to be done: After the second lap, and before the end of the eighth lap, you must make a Touch-and-Go landing with your aircraft. The wheels must touch the ground. Also, between the second and eighth lap you must make one Loop, either upwind or downwind, one complete roll, either barrel roll or axial roll, and one two turn spin. Think about it for a minute. The idea is to put the **fly** back in flying. There is more to this race than just getting



A WW I Scramble bipe is a five evening project. The author's Fokker.

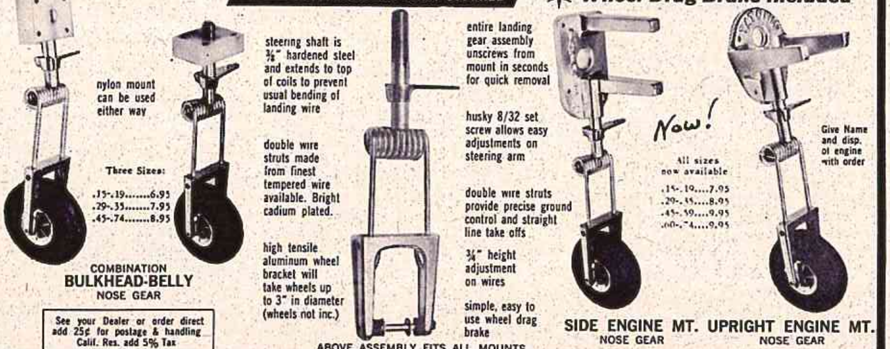
around the pylons quicker than the other guys. You have to be able to fly that little bird, and to land it, and get off of the ground again. The dog fight was really popular in World War I, and therefore the loop, the roll and the spin are right at home with this type of airplane. Also, dropping down out of the sky to pick up a fallen comrade was very much a part of the game, so thus the reason for the Touch-and-Go. Plus the fact that this will really lend a lot of excitement to the race. The super hot engine may be great in the straights, but the reliable engine will get you down on the ground and into the air again time after time. The engine that can draw through a tight loop or spin, and then come back to full power will be the engine that will bring home a winner for you. The new .15 engines will do it, but so will the older Max .15 which is a fine little engine, though not in the super-fast class with the Super Tigres and the K & B Schneurle .15.

All of the racing methods of Quarter Midget should be retained; fuel should be furnished by the contest, and should be limited to 15% nitro. One thing that I forgot to mention on the aircraft is that the wings should have a minimum thickness of 5/8" for each wing, and the lower wing should not have less than 30% of the total wing area.

A lot of people have expressed the idea that a racing event should be developed for biplanes, and some bipe races have been held; but this event, with the small and easy-to-build beautiful little bipes will give you all of the fun of racing, along with the thrill of seeing your own Fokker DVII scooting around the sky. One advantage is that the aircraft are simple to build. For example, I built my prototype Fokker in just three evenings, covered it with red MonoKote on the fourth evening, and installed the radio gear on the fifth evening. One sheet of MonoKote, or Solarfilm, is enough to cover the entire airframe. The finished weight of my bird, ready to take to the air, is just 2¾ lbs. A good idea might be to incorporate mufflers for the engines in this class since you have to keep the weight well up front anyhow and, with the shorter nose moments of these aircraft, the added weight of a muffler would be a big help. You can plan to use either a three or four channel radio. Actually, with this type of aircraft and this type of flying, a three channel will work just great using coupled rudder and ailerons. The prototype was first constructed with no ailerons but, after the pictures were taken, it was decided to add ailerons into the bottom of the wing to help in the rolling and spinning maneuvers.

There you have it, the World War I Scramble. I think that you will like it. It just might be the answer that we are all looking for to lower the speeds in a racing event. You can bet that if you had to make a Touch-and-Go during a Formula I race the aircraft would be of a slightly different design, and the speeds would be greatly reduced! I agree with my friend Cliff Weirick, writing in MAN, the speeds in racing are too fast. I quit trying to keep up with a fast Formula I when they were much slower than they are now. I wouldn't fly one on a bet at the speeds they now travel. Maybe it's O.K. for the pilot who has kept up with it, but for someone else trying to break in, it's pretty fast. Quarter Midgets are becoming a haven for ex-Formula I pilots and, frankly, I don't like this too much. The idea behind Quarter Midgets was to have a simple racing event for everyone to fly in. Now I am hearing from lots of fellows who don't want to fly in Quarter Midget because there are too many Formula I pilots winning all of the races. Well, how about this for an answer? Handicap the expert racing pilot. Let the beginner, or non-Formula I pilot, have a lap head start in each heat that he flies. If he is flying a Max .15 then he should have a lap head start over the highly specialized .15 engines. If the non-Formula I pilot places 1, 2, or 3, in any racing event, he then loses his lap headstart in any future racing events.

This simple thought would let the beginners compete with the better



fliers, and make for more fun for all. This same idea can be used in local Formula I races where the entry is light due to the same people walking off with all of the trophies all of the time. Let the beginner have a chance to get his feet wet without taking a horrible licking and, who knows, next year he may be the guy to beat!

If you decide to try a World War I Scramble in your area, drop me a line and tell me how things come out. I think that a sample race should go something like this: The aircraft take off at one second intervals. At the start of the third lap one of the aircraft makes an attempt at a Touch-and-Go. Maybe all of the aircraft try it at the same time and, if so, this adds more sport to the race. If one of the aircraft fails to touch down, he still has plenty of chances to do it. If he touches down and can't get into the air again, he is eliminated from that heat. Then, after making the Touch-and-Go, the aircraft rounds Number One pylon and heads downwind, the perfect place for the single roll. Then around Number Two and Three pylon, and heading into the wind. Great place for a loop, into the wind, and before he gets to Number One pylon again. Next comes the two turn spin which can be entered from a snap roll. Then if you have completed all of the requirements you can settle down to rounding the pylons to see if you can scoot home in first place. Chances are that in each heat one or more aircraft will be eliminated by the Touch-and-Go. But, as the pilots become used to this, more and more will be made, and then it becomes a race to see which pilot and aircraft can get through his scramble the quickest. It's different, and it will be fun, and I know that you will enjoy it. Give it a try, and let me have the results. Good Luck, and have a good SCRAMBLE.

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One last item - - - what's a "dog-robber"? Well, back during WW I officers were accustomed to the services of an orderly. In France, these orderlies were called "dog-robbers." I'm not sure if it was because they stole dogs, or swiped from dogs. My Dad was a Company Commander of Artillary in France in WW I and he told me about the "dog-robbers." Many years later when I was a young Second Lieutenant during the Korean War the idea of a "dog-robber" had disappeared from the military, along with trench warfare, spotters balloons, and dog fights right above the ground!

PUDDLEJUMPER

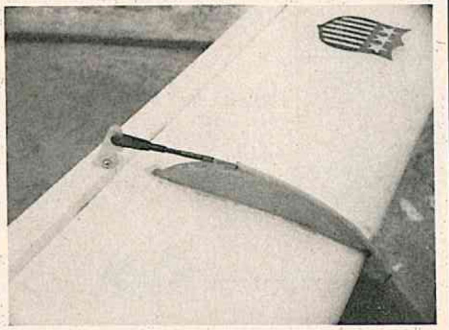
from page 20

molding "flash" which may be evident. To keep the model light, I'd recommend using the bare foam surfaces, with decals attached, or you can use Top Flite Trim Strip cut to your fancy. Sig's Trim Tape will also work. To finish the hull I covered it with MonoKote, making sure the seams overlapped for water proofing. In addition, I doped the inside of the hull, just in case water should get in. Then, at least, it won't soak into the balsa.

The Puddlejumper weighs about two pounds, and the Max .10 handles it nicely, although you have to trim a Tornado 8-6 nylon pusher prop down to a 7-6, and use hot fuel. You could, also, use a Max .15 if you want hotter performance. Too bad the prop men don't make a pusher 7-4.

The Puddlejumper is a good, simple, R-E-M sport job that'll give you a lot of fun. It's easy to fly, handles well off water, and very easy to build – and repair. A Sunday Flier special. □

Elevator control horn connection to flex cable atop T-tail.



SCALE IN HAND

from page 16

Following a **light** sanding, another coat of resin flowed on wet, and a final go-to-town sanding. At this point the surface will accept color paint. The whole process has taken only as many hours as earlier methods used in days; roughly 20 hours seems average.

What we now have is that most rugged and durable combination we've yet encountered – a balsa airplane inside a fiberglass shell. Not the least of the attractions is the fact that the "sinking" of wood joints and the "starved horse" appearance of sheeting sanded endless times, characteristics of dope (or any solvent-type paint) are eliminated forever.

Here are a few tips from our experience which might help anyone trying this method for the first time:

a. Sand the model **very well** and be especially careful to remove any traces of epoxy glue, Epoxolite, etc. The resin will not cure over these surfaces. See Earl's letter.

b. Dig out epoxy glue lines with a knife. Fill the cavities with vinyl-spackle – "Muralo" brand works well (some brands act like epoxy). The spackle **must** be totally dry before sanding.

c. Lightest cloth available is 1/2 oz. per sq. yd., obtainable in a K & B package. This material is ideal for wings and tails, also fuselages if weight-saving is important. For Stand-Off models, or others where we aren't chasing weight, 1-oz. cloth (from Sig, etc.) is great for fuselages. Either material compounds outstandingly, being the best we've ever seen in this respect, far easier than wet tissue.

d. A stiffish (hog-hair) brush about ¾" wide works best for the covering coat. We use a Grumbacher 1060, available at artist-supply outlets. For subsequent coats, a soft squirrel-hair about 1" wide is suitable.

e. Do not over-catalyze the resin. Mix only 1 oz. at a time at all times. For final coats, thinning the resin with lacquer thinner makes a smoother coat.

f. If it is desired to color the resin (to help sanding – it is easier to see a level surface when it is colored), use only **powdered** tints from a fiberglass supply outlet. Liquid tints do not work at all well.

Well, that about wraps up our update on base finishing and covering procedures. All of this has squeezed out our progress to painting techniques in this continuing series, but we felt it was more important to put the horse first, so to speak.

Try the fiberglass cloth covering method – we're sure you'll like it for simplicity, speed, economy (one 4-dollar can of resin will cover two full-size .60 models, and cloth costs no more than silk) and, above all, for the super-strong result. Perhaps the most telling statement we can make is that we know no modeler who, having done it once, plans to return to a previously-used method. Next time (promise!) we'll get on to painting of scale models. One last thing before we sign off for this month: We've had a number of letters asking us to devote a Scale in Hand series to scratch-designing and building Stand-Off Scale models. Fellows, you'll get your wish. As soon as this present series is concluded, that's what we'll do.

(Temporarily correspondence to Scale in Hand should be addressed to this writer, c/o R/C Modeler Magazine, P.O. Box 487, Sierra Madre, California 91024. Do **not** write to our earlier Bolingbrook address or to Top Flite Models.) □

FROM THE SHOP

from page 2

registrants will be required to demonstrate their control of a helicopter by completing a basic task within a specified time limit. Only those who successfully complete the qualifying round in two tries will be eligible to enter the formal competition. Using a regulation baseball diamond, the pilot will stand on the pitcher's mound with his helicopter idling on home plate. The task is to make spot landings in an 8' circle at each of the bases and return to land at home plate. The maximum allowed time from initial take-off to final landing is four minutes.

The R/C Bee's Club of Placentia, California, has volunteered to man the competition. The registration fee of $5.00 will be donated to their club treasury. To register, write for a registration form to Contest Director, Orbit Helicopter Competition, Orbit Electronics, 1641 Kaiser Avenue, Santa Ana, California 92705.

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On the subject of contests, here's an event that you and your family have been waiting for! The magic of Mexico holds something for all of us – Novice and Expert alike. Don't miss this opportunity to enjoy your hobby together with the wonders of beautiful Mexico in the contest you'll remember for all time. The 1973 Cal-Mex Fun Fly scheduled for July 2 through July 11, 1973.

By special arrangement the contest tour includes a round trip jet flight via Western Airlines, 9 nights at the Holiday Inn – Pink Zone, Airport transfers and baggage tipping on arrival and departure, briefing party with Mexican entertainment, a tour of Mexico City, the services of a professional escort and transportation of one airplane box (maximum weight 50 lbs., maximum size 16" x 27" x 63"). All of this is available for only $263.00 per person based upon twin bedded rooms at the Holiday Inn. Children of ages 2-11 sharing room with parents: $115.00 each. Three adults sharing a hotel room is $237.00 per person with a single room supplement at $53.00.

A deposit of $50.00 per person is required at the time of booking with full payment due no later than June 1, 1973. Late bookings require immediate full payment. The tour price is based on the group air fare, round trip from Los Angeles. For those who wish to join the Fun Fly Tour at Los Angeles, but who will arrive in Los Angeles for the Trade Show scheduled for June 29 – July 1 from other areas, there are some special triangle/circle fares available. For further information about the Mexico Fun-Fly vacation call Joe Bridi at (213) 834-0801 or (213) 326-5013.

Try this one on your family and see how their attitude about modeling suddenly changes!

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The National Multiwing R/C Championship scheduled for July 7-8 at Omaha, Nebraska, introduces a new concept in R/C competition. Judging from the reception received at the Toledo Show, the event is long overdue. This is a "full-fledged" two-day AMA sanctioned Invitational R/C Meet with Pattern (Novice and Expert), Sport Pylon and Sport Scale events, but limited to biplanes and triplanes only! This concept has great potential from the standpoint of both participants and spectators.

The meet is being sponsored by the Nebraska-Iowa R/C League which consists of the Omahawks, Nebowa, Frontier Flyers and Cobra R/C Clubs with a combined membership of over 200 individuals. Prizes will consist of trophies and engines for the four first place winners, trophies and first line bipe and tripe kits for each of the four second and third place winners. Awards and other merchandise down the line will exceed a total value of $700.00.

The National Multiwing R/C Championship will introduce "Free Style" to the Pattern event, flying the Class A Pattern as school maneuvers and injecting a 3 minute free style period after the stall turn. This will consist of any 5 maneuvers of the flyer's choice combined into one presentation through smooth transition flight. Scoring of all maneuvers will be per AMA rules. In addition, transition will be judged 0-10 and overall free style presentation quality will be judged 0-20.

The Sport Pylon event will be per AMA regulations with two deviations (to modify for multi wings). The minimum airfoil at the root requirement will be reduced to 10% while the minimum wing areas required will be increased by 25%. Sport Scale will be per AMA rules.

We hope that all of you who are able to attend will enter the National Multiwing R/C Championship. For further information contact O.L. Olson, Contest Director, Hobby Center, 6111 Military Avenue, Omaha, Nebraska 68104, or telephone (402) 551-4662.

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On July 7th and 8th, 1973, the Sky Rovers Flying Club, Inc. will host the 1973 New York State Fun Fly Championships. This event will take place about 3 miles outside of Lyons, New York on the Layton Street Road. Special advance notices have been sent to all R/C clubs within a 300 mile radius. Personal invitations have also been sent to last year's contestants. This year the Sky Rovers expect a larger turnout than ever before, and are inviting RCM readers to participate in their 1973 Fun Fly Championships. The meet will consist of four events but details of the events are not given in advance of the meet in order to give all contestants an equal chance of winning. Only the Sky Rovers know what the events will be and the Sky Rovers will not compete. For contestants and their families there will be a cook-out type dinner on Saturday night after the day's events. There will also be a refreshment stand at the field with reasonable prices where you may purchase your lunch. There is plenty of free parking, places to set up campers, arrangements to charge your batteries overnight and sanitation facilities. Should you require anything else to make your stay more enjoyable, the Sky Rovers will do all they can to see that your needs are taken care of. For further information contact Harold Ford, 11 Stephens St., Clifton Springs, New York, or telephone Harold at (315) 462-2235.

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We hope you enjoy this issue of RCM and we'll see you at the flying field. □