

DON DOMBROWSKI AND DOUG EDWARDS MAGNIFICENT PIETENPOL



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SEPTEMBER 1975

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radio control MODELER

THE WORLD'S LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST



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THIS MONTH'S COVER

Paulette Goldstein is as enchanting as Soarcraft Products fiberglass Steen Skybolt. Lamar Steen of Denver, Colorado designed the full sized version and Duke Crow of Soarcraft, designed this scale contest winner. Photo by Max Mills.

SEPTEMBER

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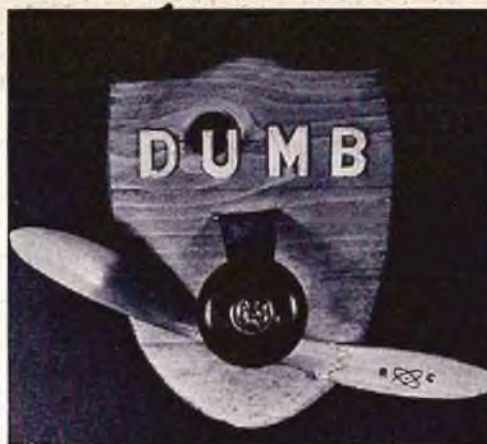
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FROM

DON DEWEY



THE SHOP

● In a recent issue, RCM presented a Flying Proficiency Program utilized by one club to aid the novice flier and to increase the proficiency of the intermediate and advanced fliers in their group. Since that time, we have come across a Pilots Examination which is given by the Forest City Flyers of London, Ontario, Canada to each new member. The time limit for the written examination is three weeks and a perfect score is required to qualify as a pilot in the Forest City Flyers R/C Club. The following is the written examination:

1. What language is spoken by Polish pilots?

2. Give the important characteristics of the ancient Babylonian Empire with particular attention to architecture, literature, law and social conditions; or give the first name of our club's president.

3. Where does the rain come from?
(a) Supermarkets (b) Eaton's (c) U.S.A.
(d) the sky (check one only).

4. What time is it when the big hand is on the one and the little hand is on the five?

5. How many commandments (approximately) was Moses given?

6. Can you explain Einstein's Theory of relativity? Answer yes or no.

7. Who won World War II? Who came in second?

8. Spell - (a) Engine (b) Plane
(c) Canopy.

9. Explain Le Chatelier's principle of dynamic equilibrium force; or spell your last name in Block Letters.

10. The song "O Canada" is the national anthem of what country?

In the belief that every member of the RCM Staff should be a fully qualified pilot, we gave this examination to our staff members and are happy to report that all but one passed with flying colors. The exception was our racing editor, Don Dombroski, who missed questions 1, 7, and 9. Don didn't know the answer to question 1, and felt that World War II was a tie between Poland and Luxembourg, and mentioned that he has always had trouble with writing, particularly when it came to spelling his last name.

Which just goes to prove what we have suspected all along — Fred is the brains behind the racing column. In fact, if it was

left up to Don, it would be about as edifying as trying to eat a bowl of soup with a fork. Until Fred explained it to him, you should have heard what he thought a Quickie 200 was . . . !

☆

Gil Halbleib, the author of the Servo Analyst construction article, presented several months ago in RCM, wrote that the original prototype used the Monsanto Opto Isolator but was scrapped in favor of a home-built opto-coupler for which parts are available. At the time Gil built the original Servo Analyst prototype in June 1973, the MCT-2 was not widely available and the price per unit was over \$10.00. Gil asked us to pass on to any reader who plans to build the Servo Analyst that the Monsanto MCT-2, which is now widely distributed, has the exact same opto-electronic characteristics as the Laser/#47 opto-coupler. Circuit changes are not necessary except for the addition of R11, which limits the current to the internal light emitting diode (LED) of the MCT-2. The unit operation remains the same. The Monsanto MCT-2 opto-isolator consists of an infra-red light emitting diode and an NPN Silicon Infra-Red Sense Transistor.

The optic pulse transition is extremely linear as in the home-made Laser/#47. The circuit and sketches sent in by Gil show the servo analyst modification and the following corrections should be made to the RCM schematic: IC2 pin 2 to pin 6, jumper missing and C5 shown in reverse polarity. The wiring diagram is 100% correct and the above mistake in the schematic will not hinder anyone building this project. Suppliers of the MCT-2 are as follows: Ancrona Corporation, P.O. Box 2208R, Culver City, California 90230 at \$1.45, International Electronics Unlimited, P.O. Box 1708, Monterey, California 93940 at \$.69; and Poly-Paks, P.O. Box 942R, Lynnfield, Massachusetts 01940 at \$1.00.

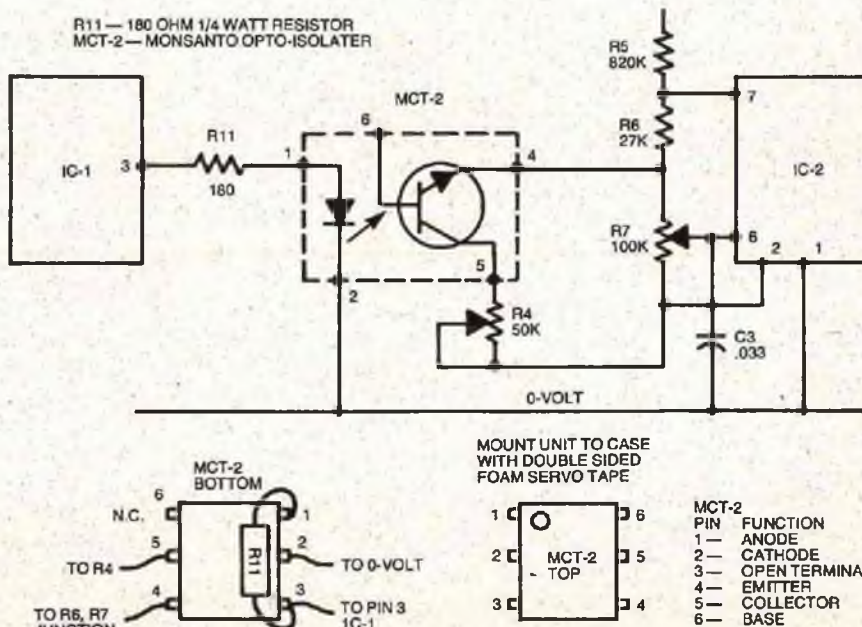
Radio Shack also lists the MCT-2 in their catalog as part number 276-633, three untested units at \$1.29.

Gil's tests on these indicate that chances are very good that any of the three in the 276-633 pack will be okay for this circuit.

☆

While on the subject of things technical, John Novak, Jr. of Chester, Virginia, writes that Edmond Scientific Company has a super solvent for cyanoacrylate adhesives

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● Two months ago we talked a little bit about the mechanical configurations available in servos and how they affect performance. While good servo mechanics can make a difference, it's the electronics that really separates the good from the not-so-good. The so-called digital servo amplifier that is used almost universally today was developed by Doug Spreng and Don Mathes back in the sixties and from a block diagram standpoint hasn't really changed much. Even the system pulse widths and repetition rates have stayed essentially the same as their original Digicon RC system. I was flying a Space Control proportional system at the time with some success, but I remember the first time I landed a plane with a Digicon system. I knew they were on the right track because the response was beautiful. Well, the digital amp was developed and developed from there. The first step was to get rid of the transformer that summed the input and reference pulses. I believe this was done by Bob Elliott while he was at Bonner Specialties. Bob made another improvement when he introduced the bridge output circuit which eliminated the need for a center tap on the battery pack. The integrated circuits engineered by Orbit, Kraft and others also contributed to the overall development. Before the IC's however, a few manufacturers tried to take some short cuts in order to make small servos, such as leaving out the Schmitt triggers. In my opinion, these servos were not very good and, in fact, should not have been called digital because they really didn't saturate the output transistors. It took most pilots a while to adjust to the good IC servos after becoming accustomed to the poor response of the earlier systems, but I think everyone is now using an IC of some sort with built-in Schmitt triggers.

I still get a lot of letters asking if the three wire servo is better than the four wire set-up. The answer is yes. In fact I haven't

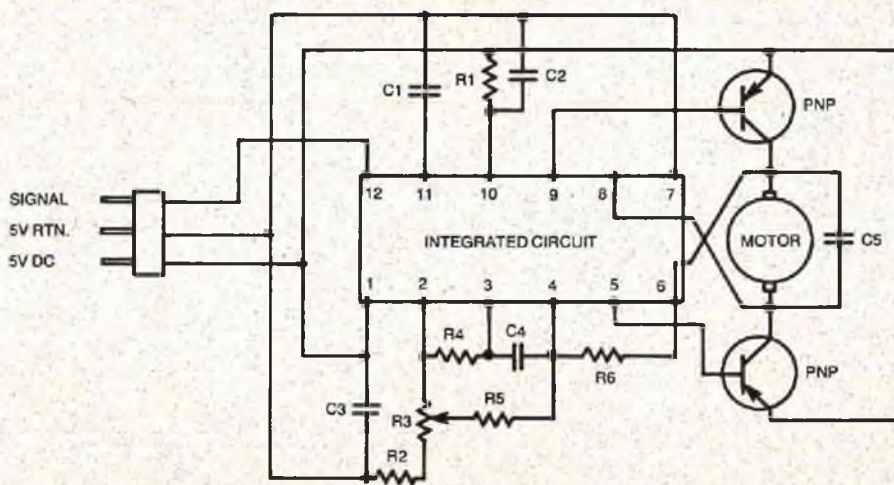
flown anything else since 1968 when it was introduced and I predicted then that everyone would eventually go that way. The big advantage is the fact that a five volt motor is used which will run on 2.5v, or half the battery pack. If the rest of the system will work on 2.5v, you can still land your airplane if one cell goes dead, and maybe even with two dead. With the four wire system, one bad cell meant hardover controls, which usually meant crash. So my advice is to get rid of all those old four wire servos.

The next bit of advertising that may confuse you is the fact that some manufacturers brag about having external pnp output transistors. Generally speaking, these are better because they deliver more power to the motor. It turns out that a low saturation voltage pnp transistor cannot be built into the same monolithic chip as the rest of the amplifier so you end up with less than 4 volts across the servo motor. That is one difference in modern day servos that is obvious but there are a few more that are a little more subtle.

You hear a lot of discussion about

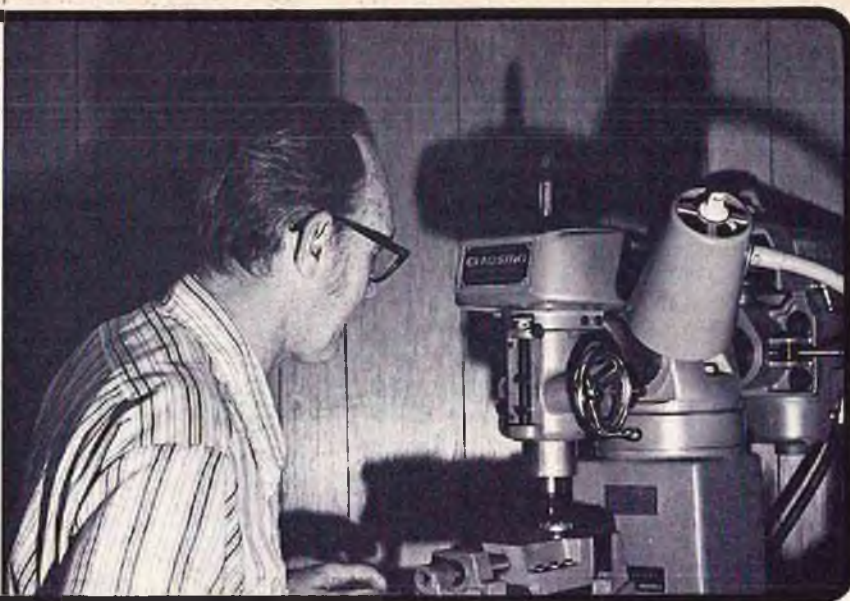
deadband and how "tight" a servo is. This can be evaluated by moving your transmitter trim off neutral very slowly until the servo just starts to move. Then reverse the direction of the trim movement and see how far you have to move the lever before the servo starts to move again. Ideally this should be zero but, practically, you must allow some deadband in order to prevent the servo amp from buzzing, which runs the batteries down faster. Compare your deadband to one of the RC systems that is popular with the top Pattern flyers. Generally these guys demand very tight servos and can detect a large deadband in the way their airplane responds. For those of you who have some accurate test equipment, a good figure for deadband is about 7 microseconds. Deadband measured this way does not completely define how well a servo returns to neutral, under all conditions, such as heavy loads or at various rates. Important parameters here are damping and the minimum pulse to the motor. We have found that a 3.5 millisecond minimum pulse is optimum.

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engine clinic

By
Clarence
Lee



● In the May Engine Clinic I discussed the noise level requirement imposed by the hosting club at the World Aerobatic Championships in Switzerland this September, and the fact that flow-through, or venturi type, mufflers had been banned. The noise level requirement being 82 dB at 10 meters but more recently changed to 84 dB at 7 meters (approximately 25'). I took exception to the banning of the flow-through mufflers and felt that the 82 dB figure was not realistic, being a bit difficult to achieve. However this part of the problem has been resolved as latest word is that all commercially made expansion chamber type mufflers have been found to be acceptable (whether they exceed the dB level or not??) and only home-made mufflers will be checked. It does look as if some one decided to take the easy way out.

As to be expected I received quite a bit of correspondence related to the article. Most people in agreement, but several feeling that the 82 dB figure was realistic and obtainable. Many clubs and individuals sent in results of tests they had conducted with various engine/muffler combinations to prove that the figure could, or could not, be met. First off gang, at the World Championships 99%-100% of the contestants are going to be using high powered .60's. Webra Speed, O.S. Max Schnuerle, Super Tigre Blue Head, Ross, K & B .61 with Perry pump, etc. Contestants using these engines want and need all the power they can get and herein lies the problem — meeting an 82 dB sound level without sacrificing performance. There is no problem meeting this level which seems to be becoming the standard throughout the country with the smaller displacement engines. With the exception of the high winding racing .40's (S.T. X-40 and K & B Schnuerle .40) any of the engines under .60 displacement can easily meet the 82 dB figure with currently available mufflers. It is only the high powered .60's that present the problem. Several fellows sent in results of tests

conducted with home-made mufflers, a new muffler under development in Canada, etc., that did lower the noise level of a .60 into the 82-84 dB range. However some of these mufflers took as much as 1000 to 1900 rpm off of the top end. These were the fellows who took me to task for feeling the 82 dB figure a bit rough to achieve. Sure it can be, but at the sacrifice of a considerable loss of power. And, any muffler that takes 1900 off of the top end of a high performance engine is also going to make that engine very short lived! The problem we face is getting into the 82 dB range and not sacrifice performance!

We are not alone in this problem. The April issue of Hot Rod Magazine carried an article on the requiem for the Z/28 Camaro — the Z/28 being a high performance version of the Camaro. Many states and municipal governments including Boston, Chicago, and the entire state of California have imposed a 1975 noise level requirement of 80 dB drive-by law. By 1978 the noise standards get even tougher as they will be lowered another 5 dB. Detroit engineers could not meet these noise level standards and still maintain the high performance expected of the Z/28 Camaro, so the car has been discontinued. It was not smog legislation requirements that killed the Z/28, but noise. Following, is a direct quote from the article. "So in the end it was not wholly the smog legislation that killed the Z/28. Noise was the straw that broke the camel's back. In 1978, when the noise standards again get tougher, what will it cost to build cars which are another five dB lower? The engineers maintain that there are going to be some very significant cost penalties (read expensive) to achieve the 1978 goals as, at present, Detroit does not have the technology to meet these new standards and will have to spend tons of money to do so!"

Get that gang — even Detroit with millions of dollars at their disposal at this time does not have the technology to meet noise level requirements imposed by

legislators, most of who's mechanical knowledge is limited to sticking the key in the switch and hoping the engine starts. And we are in the same situation. Noise level limits being set with no thought being given to how they are actually going to be achieved.

Enough on that topic, let's get on with the letters.

Dear Mr. Lee,

I have employed with good results the de-varnishing fuel mixture of 1/2 oz. Hoppe's No. 9 gun cleaner per pint of Cox fuel in my MRC Enya .09. This mixture was recommended in a feature entitled "The Care Of Small Engines," by Larry Renger in RCM, February 1974.

My MRC Enya .45 is presently displaying the same symptoms as my small engine. It won't hold a steady peak rpm and sags badly causing frequent dead stick landings after only one lap around the field.

Do you suggest a de-varnishing mixture such as above for my Enya .45 or should I try another method of correcting my problem? The Enya .45 has only had two gallons of fuel through it. One gallon of Dukes fuel and one of K & B 500. I ran it rich for all of the first gallon and only started leaning out to a sharp 2 cycle during the second gallon. I still back off a couple of clicks on the needle valve at peak rpm to a slightly rich 2 cycle.

Your recommendations for trouble shooting will be appreciated.

Very truly yours,
Henry C. Cannon, Jr.
Tallahassee, Florida

I have received quite a few letters since publication of Mr. Renger's article. Particularly since it was re-published in Volume II of the R/C Engine and most people associating yours truly as the author. The article was excellent and the only point on which I take exception is with the use of Hoppe's No. 9 Gun Cleaner as an aid to

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CUNNINGHAM ON R/C

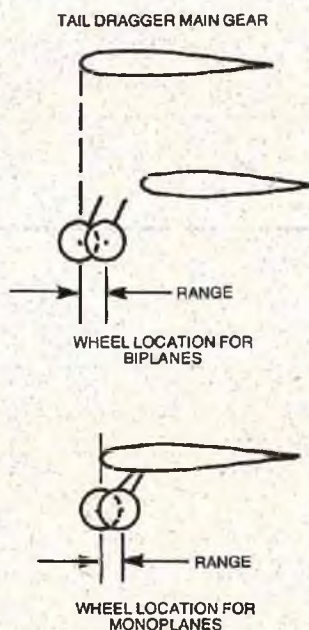
BY CHUCK CUNNINGHAM

● 1975 has to be named the year of the Bipe. Every time that I walk into the Hobby Market I am amazed at the number and quality of new biplane kits coming on the market. I wish that I had the time to try all of them out, as I have been a bipe fan for a long time. In fact, the first bipe that I designed was an .020 powered semi-scale Fokker DVII free flight circa 1950. I was always afraid to toss it into the air for fear that it wouldn't fly. On the other hand, today's bipes all look like they will fly magnificently. There is more work in building a bipe, but there is an awful lot of fun to be had in flying one, because they really *do* fly differently than do most pattern type aircraft. For those of you who don't want to take the time to build a bipe, Lanier is offering their new ARF, the Rebel. I haven't seen one of the kits as yet, but the mailer that I received looks like it will be a welcome addition to their fine line of almost ready-to-fly aircraft. Another model that I am awaiting is the new Pulsar Bipe. I'm told that it really honks on like a pattern aircraft. And, this brings me to a point — I really like to see a bipe fly like a bipe. If you can cram enough power into the nose, and you build a small enough biplane, it is going to fly pretty much like a monoplane. It's only my opinion, but I like to see more realistic flying, and perhaps this is why not too many fliers stick with pattern flying through D Novice and D Expert. Lots of pilots get their kicks cutting their teeth on the A and B Pattern, but once into D, some of the flying thrill is replaced by super fast mechanical skill. Frankly, I can't think of a way to have a flying event that keeps the bipe flying more realistically, but perhaps someone can. If you have an idea, let me hear from you.

☆

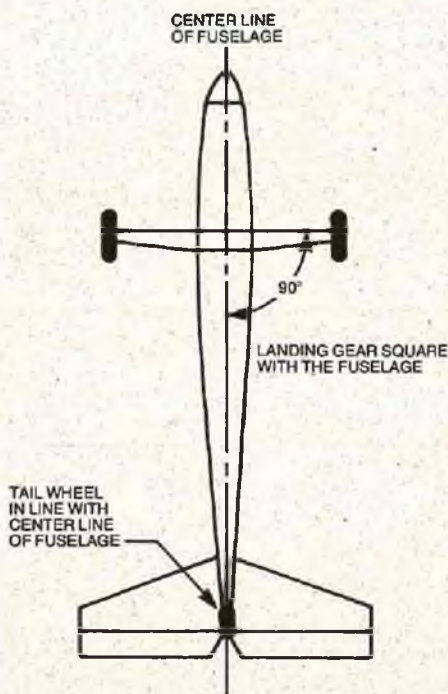
From time to time I have received letters asking the same question, "How do I get this blasted tail dragger to take-off?" I have tried to answer these questions over the years but since this is the year of the Bipe, and lots of fliers are being exposed to double wheel handling, I think that it is time again to investigate how to make a two wheeled take-off, and how to set your landing gear in order that you have a fighting chance at making good take-offs.

First, let's take a good hard look at your aircraft, more specifically, at the main landing gear, and then at the tail wheel. The basic location of the landing gear is important, but has probably been dictated by the design of the aircraft, be it kit, or magazine plan. The landing gear should be so located that the wheel axles should be just about even with the leading edge of the top wing. The wheels can be as far aft as having the front of the wheel just peeking out from under the wing, but no further aft. Get 'em

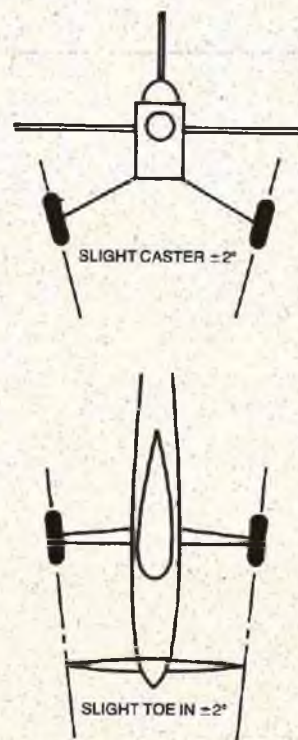


too far to the rear and the aircraft will dump over on either landing or take-off. Get the wheels too far forward and it is hard to steer, and even harder to get the tail off of the ground for the take-off run.

Once the location has been checked, take a look at the squareness of the landing gear placement. Is each wheel equidistant from the fuselage, and is each wheel parallel to the centerline of the fuselage, when looking straight down on top of the aircraft? It is most important that the landing gear track true. How about the wheels themselves, does one wheel track out, or track in? Do both wheels kind of spread out away from



the fuselage? You should set up the landing gear so that both wheels actually toe-in just a little bit — not too much — just a little bit. Okay, all of this is fine, and both wheels run easily on the axles — or does one wheel drag a bit? Be sure that they are free.



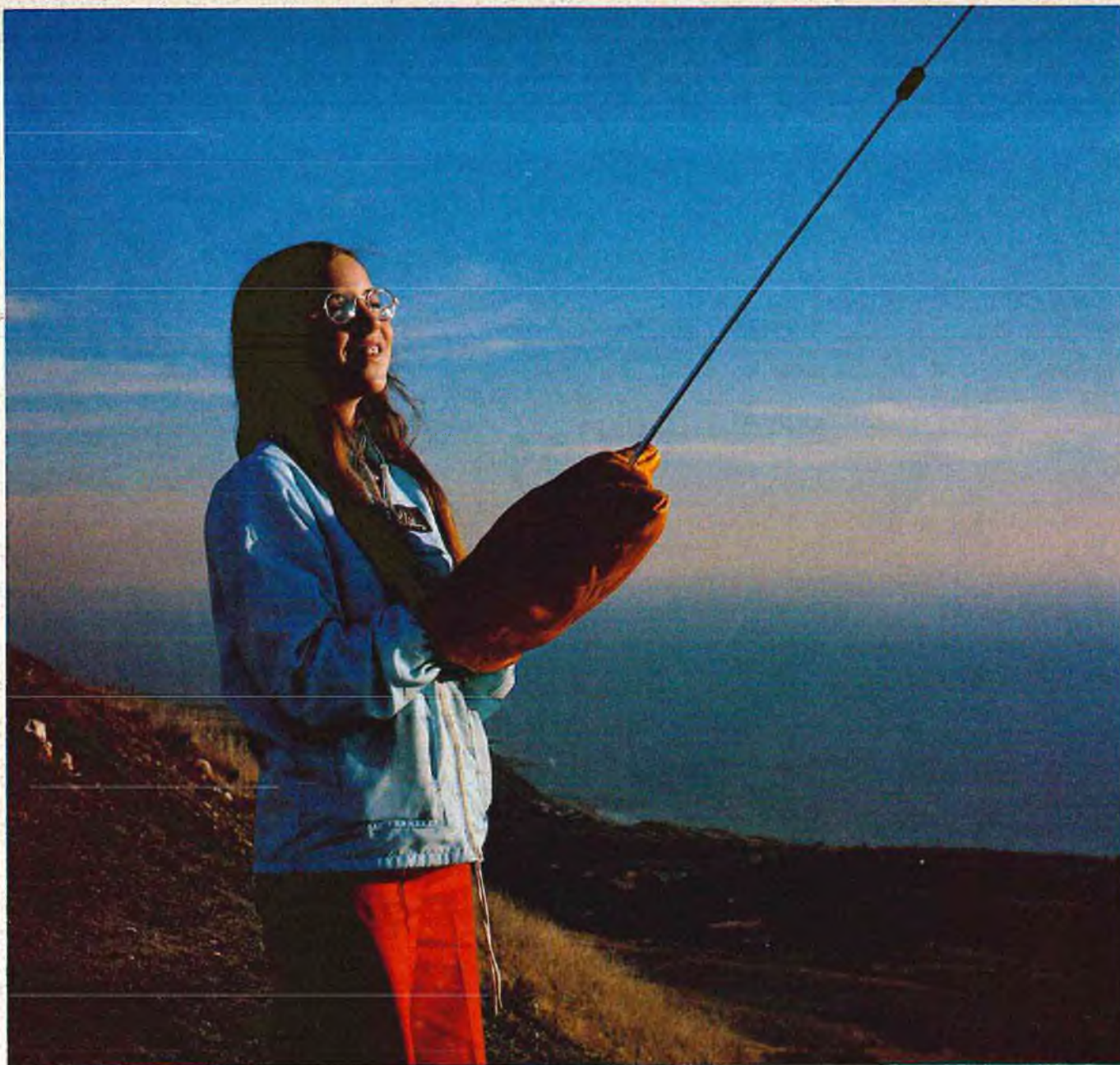
Let's take a look at the tail wheel, the culprit of most bad take-offs. When the rudder is exactly neutral, is the tail wheel in the same line, or does it slant off to the right or to the left? If the tail wheel isn't straight, your take-offs will be pretty lousy. Bend around a bit on the aft end of your bird until you are positive that the wheel is in the same line as the rudder.

Now, test out the rolling characteristics of your aircraft by letting it roll down a slight, paved incline. Start it off straight, and see if it wants to turn to the right or the left. Keep checking until you are happy that it wants to track straight down the incline. Now, you are ready for a flying test.

A good aid for two wheel take-offs is to be sure that your aircraft has a couple of degrees of right thrust built into the engine mounting. Check it. It will get off of the ground just a little easier with a bit of right thrust. If your aircraft is a super over-powered bomb, you probably don't need much help, since that souped-up engine will yank it off of the ground before you have time to get into trouble, but if yours is an aircraft that must gain flying speed prior to take-off, read on.

Start your engine, throttle back, and get set for a taxi test. If the wind is blowing you

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THE MODELERS MUFF

BY JACK HEADLEY

I hope that the California Chamber of Commerce and Tourism will forgive me for letting out this secret, but it sometimes gets damn cold here in Los Angeles during the winter, especially standing on an exposed slope pushing the transmitter sticks around while slope soaring for an hour or so. Wearing coats and boots and hats keeps most of the brass monkey weather away, except for the poor old hands. Now I've tried flying using gloves, but these don't give that mystical touch required somehow, so it's icy fingers forever — or is it?

Anyone standing around our local flying site the other weekend might have noticed a small light bulb appear over my head, just like in the cartoons. Inspiration had struck!

What I needed was a muff type bag, to contain both the transmitter and my hands. Suitable material was quickly purchased, and stitched into shape. The finished product worked very well, and also has the additional advantage that it keeps the transmitter warm, and preserves it from being dinged on the ground. Want to make one? Read on, the construction notes follow.

Construction Notes

Buy a piece of quilted material from the local haberdashery about 24" x 28". Fold, with the inside surface outside to 24" x 14", and stitch along the long edge, and across one of the ends. Now turn the resulting bag inside out, and this hides all

the messy sewing. Tuck the free ends of the bag inside all the way to the top to produce final dimensions of 12" x 14". This should now leave you with a doubly insulated bag, suitable for most transmitters, plus one pair of hands. All that now remains is to make a small hole in the top for the antenna, and it's done.

A further refinement is to make the bag from material colored the same as the transmitter frequency, if available. It may look silly as hell to you, but if you're from the East, or if you've stood on a cold, windy California slope for any length of time, you'll really appreciate the Modeler's Muff.



R/C Eagles Club project - The Air Force's B-1 Bomber.

● Every year, come Spring, there are certain "rites of Spring" observed in human activities. Spring house cleaning, for example, or "the young man's fancy" syndrome.

Radio control, in its various aspects — business, sport, and hobby, has developed its own "rites of Spring." I refer, of course, to the Spring showings of R/C products at the various geographical locations which have evolved in recent years.

The daddy of them all, and still the most prestigious in the eyes of the model trade, is the Toledo R/C Show, staged by the Weak Signals Club. The evolution of this event, from a small "symposium" with a few attendees, whose principal objective was

simply to get together during the bad weather season and shoot the breeze about R/C, to the present highly sophisticated commercial trade show, is an amazing story in itself. It has already been told elsewhere, so I won't elaborate.

As time went on, modelers in other parts of the country, who couldn't get to Toledo, started events of their own, and so now we have, in addition to Toledo, the WRAMS show on the East Coast, the RAMS show in Seattle, the MACS event in Los Angeles, and another newcomer, The Phoenix Show in the Southwest. There are others — but they don't concentrate on R/C.

Now this is all well and good for the R/C enthusiast — it "brings the products to

him." But consider, if you will, the plight of the manufacturers. Putting on an exhibit costs money — lots of it. Which shows should a manufacturer select for his annual presentation of new products? It isn't an easy decision, and it gets tougher with each passing year. Like the modeler, who can't afford to go to all the shows, the manufacturer has to make a choice, because he can't afford to exhibit at all of them.

I don't know how they make their decision. One manufacturer exhibited at Toledo, but not in Los Angeles, "because I'm located in this area, and everybody here already knows what I've got." Another, who showed in Los Angeles but not at Toledo, says "I couldn't afford both, so I chose Los Angeles because it's less expensive due to lower travel costs."

In any event, these annual shows have become almost a tradition now; "R/C's rites of Spring." Like all the rest of you Sunday Fliers, I wish I could go to all of them — for two reasons: One is to see what's new; the other — and perhaps even more important — is to see the absolutely fantastic examples of modeling which are always a part of these shows. And I mean both the static displays and the flying demonstrations.

A third reason, in my case, and with many of you as well, is the opportunity to meet personally with friends and acquaintances that you don't get to see as often as you would like in these busy times. And I can't afford to go to all of them, either.

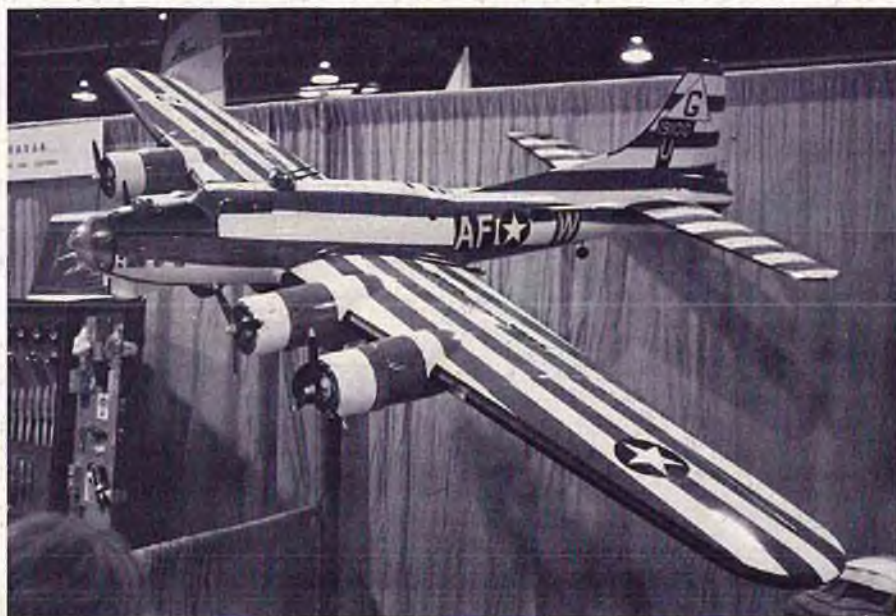
So, this year, I selected the MACS show in Anaheim, just outside Los Angeles, as the one best suited to my budget, and one that I knew would have good participation by the manufacturers and modelers.

As always, it was a good show, but I couldn't really pick out any single product as "best of show." However, in the model displays, even though none of them won prizes, four models really intrigued me — and for different reasons.

One was a model of the Air Force's B-1 bomber. It was built as a club project by the R/C Eagles Club. It is a 1/20 scale model, and as you can see from the photo, a lot of TLC (tender loving care) went into the project. There was no information as to whether it was meant to be flown, but I would assume so. Maybe we'll be hearing more about it in the future.

Next was the Big B-17 by Wes Craft. An interesting model for various reasons — it's huge, for sure, and so is the price tag for the kit. Gad, by the time you've added the cost of the items not in the kit, you've got an investment that will run close to two grand! But it'll probably sell — even if for no other

Wes Craft's giant B-17 - a big model with a big price tag.



reason than status appeal; and it does fly well. Incidentally, notice the downthrust in the nacelles — one reason why it does fly well.

At the other end of the size spectrum, and even more appealing to me, was Bob Rich's P6E Stand-Off Scale job. He used the foam wings from Carl Goldberg's Ranger 42 and designed the rest to fit. With a .35 up front it should really be a hot performer, too. I understand it will be a construction article in a forthcoming issue of RCM. Watch for it!

Finally, I was intrigued by a unique slope soaring design by Bob Root. Flying wings are not unusual, but a variable sweep flying wing certainly is. The idea is worth pursuing when it comes to slope racing. Current racing designs have just about reached the limit of design performance, bearing in mind the need for staying aloft in 8 mph winds, while also having high speed penetration when the winds hit 30 to 40 mph. Variable sweep opens up new possibilities for extending the lift and speed ranges; no sweep in light winds; full sweep when the wind is strong.

Flying demonstrations at the Spring shows are always exciting — and worrisome — at times. Fortunately, the reliability of sport R/C equipment is now so high that the worry factor is low, so long as pilot skill is high.

It certainly was at MACS. And there was no question as to which demonstrations were the most thrilling to the general audience. Although they were entertained by Rick Pearson and Mark Smith, with their sailplanes, they could not fully appreciate the consummated skill which Rick and Mark displayed — unless they were glider pilots, too.

Not so with the helicopters; there was no question of the fantastic ability of the German pilots to command their craft. I'm not turned on yet, personally, to helicopter flying (I leave that to Dewey), but I am aware of the delicate touch which is required to successfully fly one. Then, to see one of the German lads, Mike Bosch, set his helicopter down, about 10' in front of him, lift it off, and then, with the nose of the craft always pointing directly away from him, and in a slightly nose high attitude, make the helicopter describe a complete circle, all the time flying sideways, around the pilot, until it returned to the starting point. That demonstration of simultaneous vertical, translational, angular, and attitude control was, in my opinion, the absolute summit of perfection in helicopter piloting. You helicopter buffs might have appreciated it more than me, but I doubt it. It was simply fantastic. Almost enough to make me want to learn to fly a helicopter.

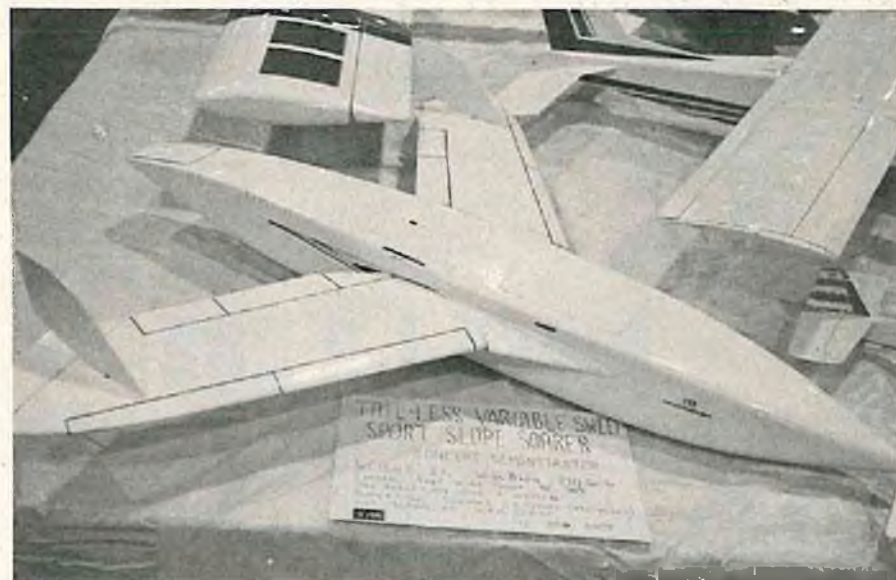
Almost, but not yet. There's a couple of RCM races — 1/2A and slope — that I'd like to take a crack at first.

Meanwhile, I'm looking forward also to next year's "R/C Rites of Spring."

Plan to go yourself. It's worth it.

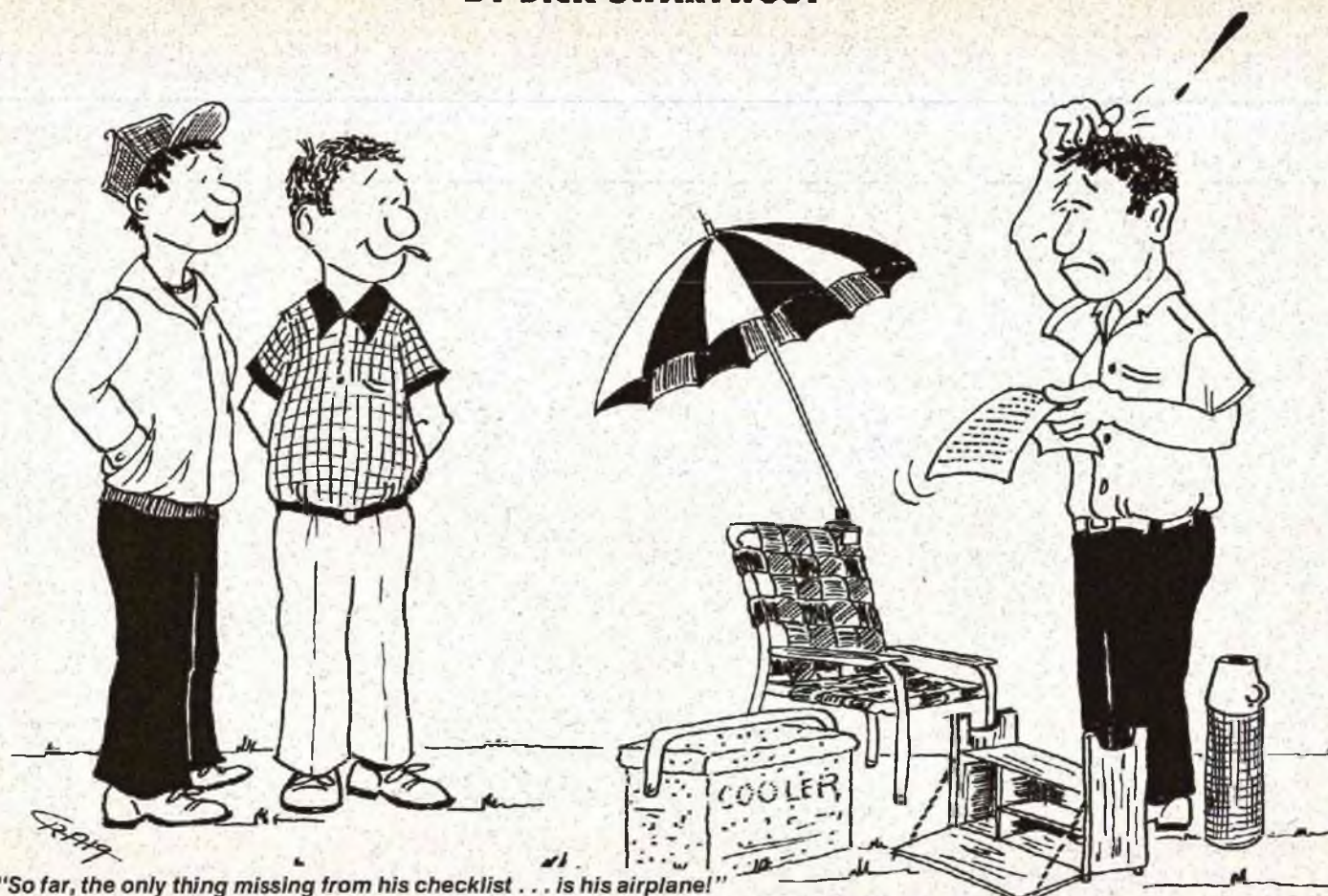


ABOVE: Bob Rich's P6E, to be presented in January '76 RCM. **BELOW:** Variable sweep slope soarer by Bob Root.



BELOW: John Perry of Perry Aeromotive, concentrates on a couple of points put forth by RCM's Executive Editor, Pat Crews, at recent MACS show.





FROM THE GRASS

Times sure have been changing lately. There once was a time when an RC'er was worried about his airplane and how many dollars would be lost if it crashed. Now, with all this new ground support equipment, he is more concerned about someone stepping on his flight box!

The hobby is also getting more and more complicated. Just the other day, I heard a guy yell "I ain't got it", and he wasn't even flying. Another guy was busy for at least a half hour doing an intensive pre-flight before he realized that he had left his plane at home. In fact, some of our gang are so hung up on gadgets that they have standing orders with the mail order houses to ship one each of anything new on their BankAmericard number with specific instructions for the receipt to be illegible for their wives benefit.

We also have our share of crack-pots. One guy shows up at the field with a 1/4 mile Stand-Off Scale model of a 727 and brings with him a well-built Stewardess who serves all of us stale sandwiches while he's flying, and free drinks only to the guys with Pro-Line radios. Then there's this other nut that sees our club sign "No

Alcohol Allowed on these Premises" and spends the rest of the day wondering what we are using for fuel. Needless to say, he didn't dare fire up his rig.

Miniaturization is another facet of RC that seems to be getting a lot of attention lately. One report from a pioneer in this field claimed that his 747 was "shot down" by a Raid can while on its landing approach to the week of June 8th on his calendar pad. Another report claims that Cox is about ready with their latest offering. The "Tolerance" lettering on their drawings has now been changed to "Bore Size" and it is reported that they are getting 7 complete engines from the steel in one paper clip. They are also planning to kit a new plane to compliment the new engine. It has a proposed wing span of 12 inches and is powered by 38 new engines. The list price for this complete package is reported to be about \$2.37 but if costs keep going up as they are, the price may go as high as \$2.49.

Now that we've all gobbled up all the new stuff to baby and pamper our nickel cadmium (how do you burp a nickel cadmium?), I have a few suggestions for the manufacturers to pick up and run with:

(1) A precision photometer that can be inserted into the cylinder through the exhaust port to analyze the "glow" from the plug and to indicate the health of both the plug and battery simultaneously, with a special tip for those who forget to shut off the engine.

(2) A motorized lead screw and weight that adjusts the CG forward as fuel is used up.

(3) Add-on wash-out wing tip sections with in-flight adjustments to prevent tip stalls.

(4) A self-balancing prop washer that sheds particles from its outer periphery until perfect dynamic balance is achieved.

(5) Special tires for better tracking through cow pies.

(6) A safety device on the transmitter that prevents engine rev-up if your palms are too wet.

(7) A voice activated device on the transmitter that responds to the words "I ain't got it!" and answers back, "Yes you do" or "No you don't", whichever applies at the time.

(8) A radio that gives off very bad

to page 147

Editors Preface: Over the past twelve years, in the process of doing kit reviews, building prototype designs for publication, constructing prototypes of construction articles submitted for publication in order to check out their performance capability, I have had the pleasure of building and flying virtually all types and configurations of R/C aircraft. Some planes always stand out as distinctive, either in appearance or because of their particular flight characteristics. Each of us has our own favorite aircraft that we have built and flown over the years.

I can honestly say that I have never derived as much enjoyment from any model aircraft that I have built at any time in my life as the Pietenpol Air Camper designed by Don Dombrowski and Doug Edwards. This Stand-Off Scale model of the famous home-built aircraft of the 1930's, is an aircraft that is easy to build and one that offers more flying pleasure than any model we have ever published. Our prototypes were powered by OS Max .30's and OS Max .35's using 10/6 wooden props. A couple of prototypes were finished with MonoKote and Solarfilm and had only the barest of scale details. Another was finished with Coverite and K & B Superpoxy. Still another was finished with PermaGloss Coverite and was complete with tooled thin aluminum cowl plates and a simulated Ford Model A radiator. A few of the prototypes used the large Trexler air wheels while others used Proctor spoked wheels. Each of the prototypes flew exactly like the one that preceeded it, and all are still flying at the time of this writing. With an OS Max .35 and muffler, the aircraft can be flown at 1/4 to 1/3 throttle, at sufficient altitude, and your wife and kids can have a ball flying big wide circles around the field. With adequate throws on the control surfaces, the Pietenpol will do some of the wildest maneuvers you have seen. At full power, it will climb straight up, hanging on the prop, at an unbelievably slow rate of climb. If you so desire, you can climb it up to altitude, cut the throttle, and go looking for thermals — at its low wing loading it will thermal quite easily on a warm summer day.

And, if you are so inclined, as Don Dombrowski and I were on one particular afternoon of test flying the Pietenpol, you can bring the plane down low, reduce the throttle, and by proper and judicious use of throttle, elevator, and rudder, fly the plane low and slow around you a few feet off the ground, ukie style. You can even shoot one or two wheel touch-and-go's as you're flying around yourself if you want to impress the spectators.

The Pietenpol captures all the nostalgia of the vintage aircraft of the 30's as well as adding a new dimension to R/C — putting the fun back into flying! Whenever I have the chance to go flying, and there isn't a kit or prototype aircraft to be tested, I take the Pietenpol for sheer flying pleasure. I have never enjoyed an airplane as much as this one, and I am sure that you will share this enthusiasm if you build one of your own. Try an OS Max .30 or .35 with a 10/6 prop and find out for yourself what real flying pleasure is all about.

And, if you want to teach a novice to fly, here's an airplane that resembles its full size counterpart, flies like its big brother, and can be handled by your student with ease. Yet, in the hands of a proficient pilot, it will do some of the wildest maneuvers with a degree of grace and realism you won't believe until you build it and fly it yourself. - - - Don Dewey.



A Sport And Stand-Off Scale Trainer

PIETENPOL

By Don Dombrowski and Doug Edwards

● The Pietenpol is an attractive Stand-Off Scale airplane, reminiscent of the full-scale home-builts of the 1930's, capturing both appearance and flying style of the original. It is an easy building stable trainer which is excellent as a first airplane. The extremely rugged construction (plywood fuselage sides and formers) can take the abuse of an "every Sunday" sport airplane. Either version, antique or modern home-built, the Pietenpol is gentle in the hands of a beginner and responsive to the hands of an expert. You can have fun slowly and economically with a Pietenpol.

CONSTRUCTION

Fuselage:

(1) Cut the firewall from 1/4" birch plywood. Position the engine mount (.19-.35) even with the top and center it side to side. Mark and drill the mount attachment holes and install the 6-32 blind nuts on the

backside of the firewall.

(2) Place the engine on the mount. Drill and tap for 4-40 screws.

(3) Cut the fuselage sides, tank compartment floor, cockpit floors, fuselage formers, chin plate, and radio access hatch from 1/8" plywood.

(4) Cut 1/4" x 1/4" balsa stock for the aft fuselage stringers, uprights and diagonals. Place wax paper over the plan and build up two identical aft truss sections.

(5) Cut 4 cabanes from 1/2" x 1/4" spruce, making sure that all are exactly the same length.

(6) Cut 2 landing gear mounts from 1/4" birch plywood.

(7) Place the right hand fuselage side on the plan and mark the firewall downthrust reference line.

(8) Wrap 2 of the 4 cabanes with Saran Wrap and, using them as spacers, glue the

cockpit floors, formers, tank floor, gear mounts and aft truss section to the fuselage sides. **Do not** bond the cabanes at this time. Note: Use a drafting triangle to insure that all parts are perpendicular to the fuselage side.

(9) Using the cabanes as spacers, glue the left hand fuselage side to the cockpit floors, formers, tank floor, and gear mounts.

(10) When the assembly is dry, remove the cabanes. Turn the assembly over top down on the top view of the plan. Using a piece of 1/8" plywood as a spacer under the aft end of the truss assembly, glue the other truss assembly to the left fuselage side.

(11) Glue the firewall in position, making sure that it lines up with the downthrust reference line.

(12) Using the top view center line as a reference, pull the aft end of the fuselage together and glue together at the tail post.





Happiness is flying your Pietenpol against a summer sky. Barbara Norton uses a telephoto lens as RCM's Editor tries to find out how high those clouds really are!

(13) Cut and glue 1/4" x 1/4" balsa cross braces in position along the aft bottom of the fuselage.

(14) When this assembly is dry, turn it upright and glue the cabanes to the fuselage sides and gear mounts. Note: Insure that the cabanes are seated on top of the gear mounts.

(15) Cut the pushrod exit plates from 3/32" x 2" balsa sheeting and glue in place at the aft end of the fuselage.

(16) Cut your 1/4" x 1/4" balsa stock and glue the aft top cross braces in place.

(17) Cut Formers #1, #2, #3 and #4 from 1/16" birch plywood. Place each one on the plan and mark the stringer locations.

(18) Glue the formers in place.

(19) Cut the 1/4" x 1/4" balsa stock and glue the top stringers in place.

(20) Cut out your cockpit blocks and tank hatch cover from 1 1/2" x 3" x 12" balsa blocks.

(21) Contour and notch the cockpit blocks.

(22) Slide the blocks down the cabanes and glue in place.

(23) Cut forward tank hatch holddown plate & aft cleat from 1/8" birch ply.

(24) Glue the hold-down plate to the firewall and the fuselage sides.

(25) Glue the aft cleat to the aft end of the hatch cover, making sure of a 1/8" overhang.

(26) Cut a piece of 5/16" dowel 3/8" long and drill a hole through the center for a 4-40 screw.

(27) Drill the forward end of the tank

hatch cover with a 5/16" drill and glue the dowel in place. Note: Use the side view of the plan for reference.

(28) Place the hatch cover in position. Drill the hold-down plate and install a 4-40 blind nut on the aft side.

(29) Contour the hatch cover to match the cockpit blocks.

(30) Cut the nose block from 3/8" x 2" stock and glue in place.

(31) Cut the spinner ring from 1/16" plywood and glue to the nose block.

(32) Route out the nose block to match the inside contour of the spinner ring.

(33) Glue the 1/8" plywood chin plate in place.

(34) Contour the nose section to match the spinner ring.

(35) Cut 1/4" x 1/4" stock and glue the cockpit side rails to the cockpit floors and blocks.

(36) Cut and bend the 3/32" piano wire landing gear and spreader bar.

(37) Cut, drill and bend 8 wing strut fittings from .032 aluminum sheet.

(38) Cut 2 pieces of 1/4" O.D. brass tubing for axles, using the forward view of the fuselage as a reference for the proper length.

(39) Place the radio access hatch in position. Drill and install the 4-40 blind nuts on the aft side of the gear mount plates.

(40) Attach the strut fittings and landing gear to the gear plates using #4 sheet metal screws and K & B Veco metal 3/32" gear clips.

(41) Solder the brass axle over the 3

protruding gear wires (forward gear, aft gear, and spreader bar). Note: Use the forward view of the fuselage on the plan for reference.

(42) Solder a 1/4" I.D. steel washer to the inboard end of the axles.

(43) Bend the tail wheel assembly from 3/32" piano wire. Install it in a Du-Bro aileron bushing and glue in place.

(44) Cut the vertical stabilizer, horizontal stabilizer, rudder and elevators from 3/16" x 3" balsa.

(45) Cut the 3/16" dowel elevator joiner to the proper length and glue to the elevators using the plan as a reference.

(46) Place the horizontal stabilizer on the plan. Mark a center reference line and glue on the vertical fin, insuring proper alignment.

(47) Glue the stabilizer assembly on top of the fuselage and check alignment several times.

(48) Drill a 3/32" hole in the rudder for the tail wheel wire.

(49) Hinge the rudder and elevators using the plan as a reference for hinge locations.

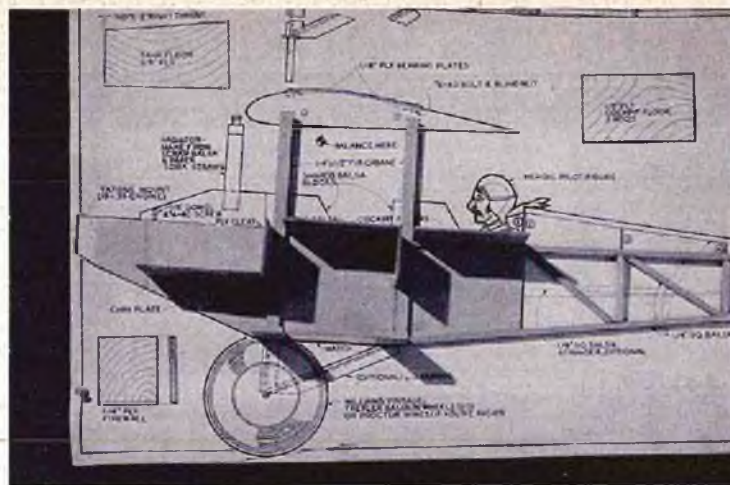
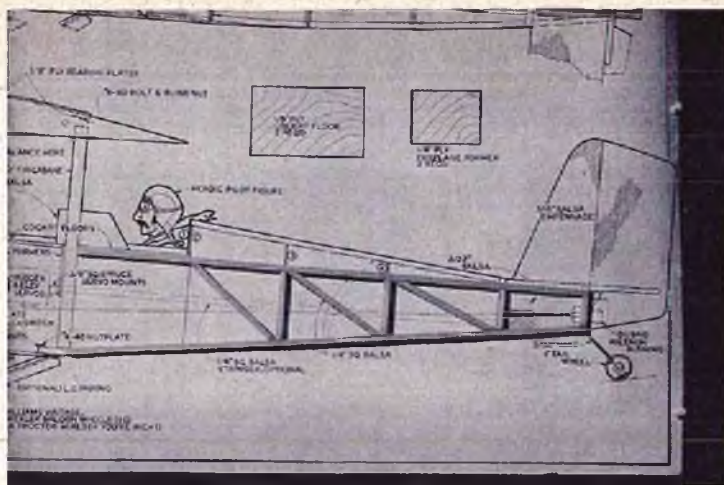
Wing:

General Notes

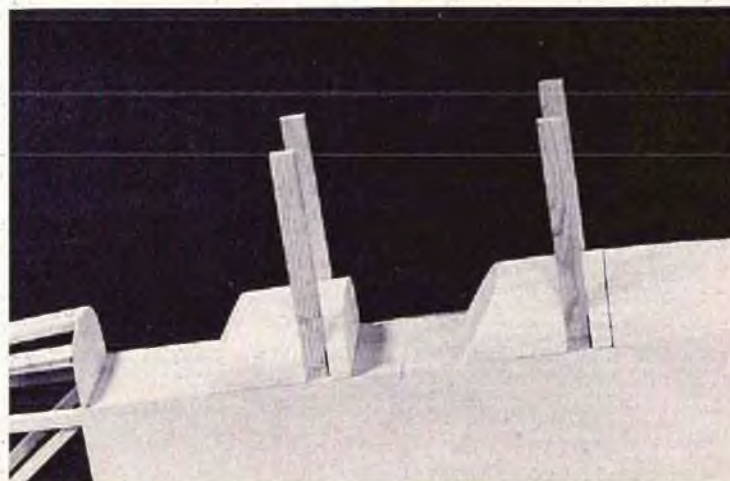
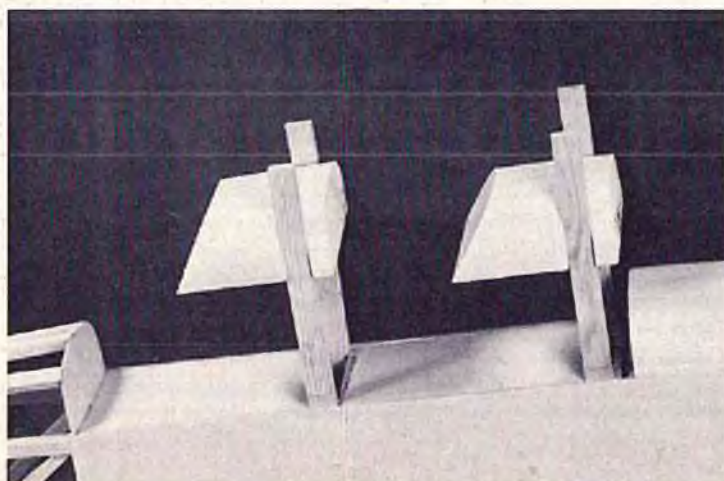
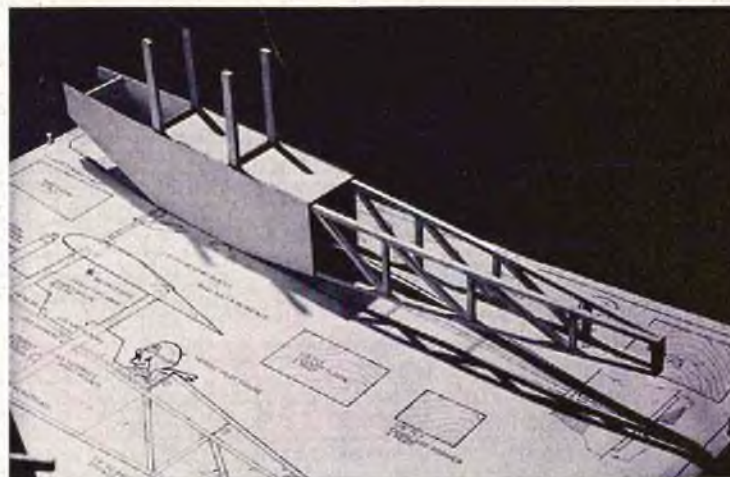
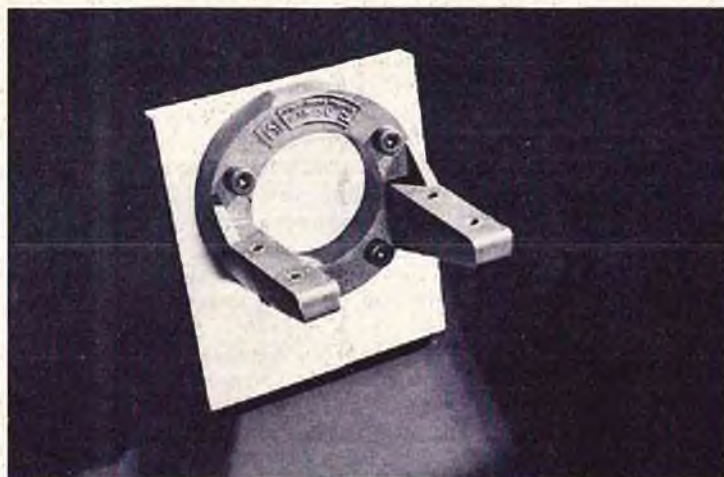
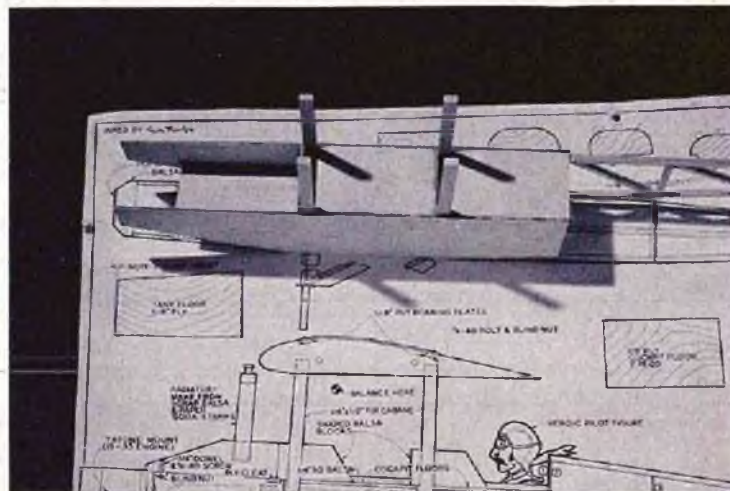
(a) The 5/16" diameter holes in all the ribs can be drilled using a piece of 5/16" O.D. x 3" brass tubing, sharpened on the end using a #11 X-Acto blade.

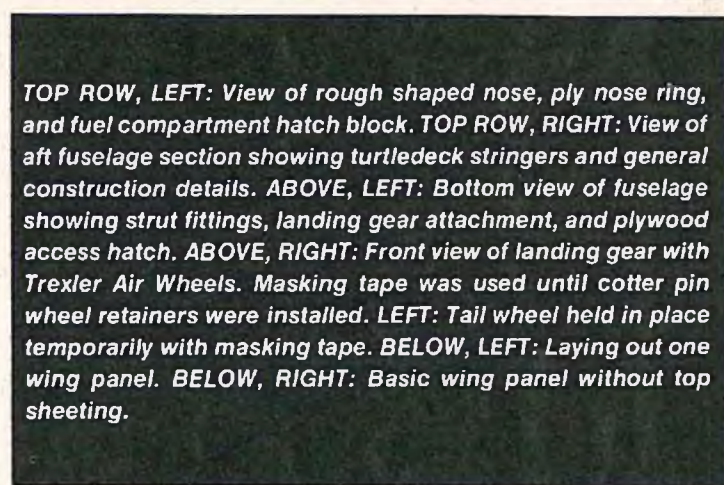
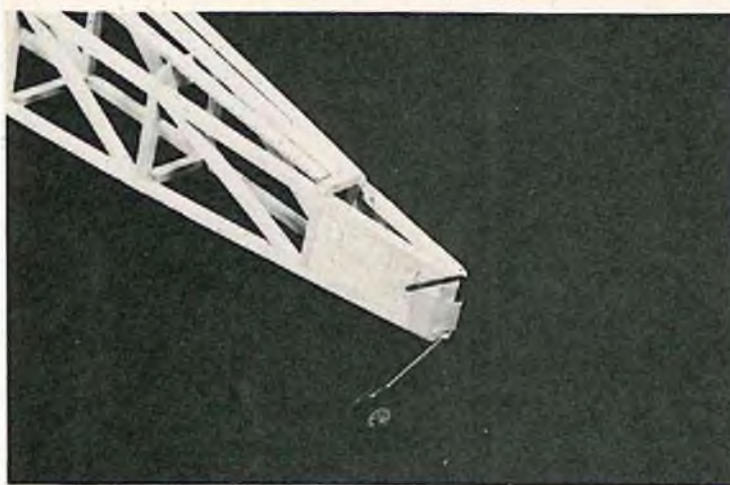
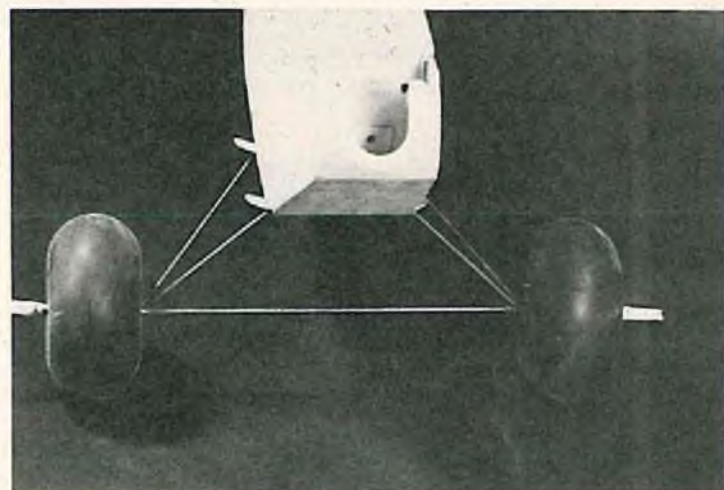
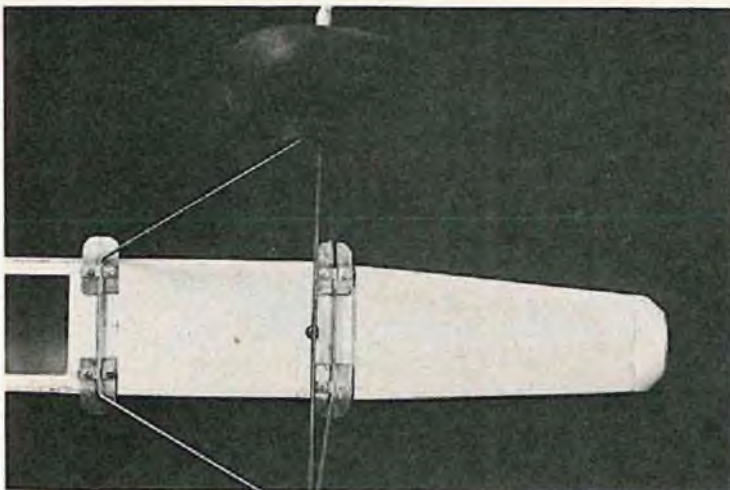
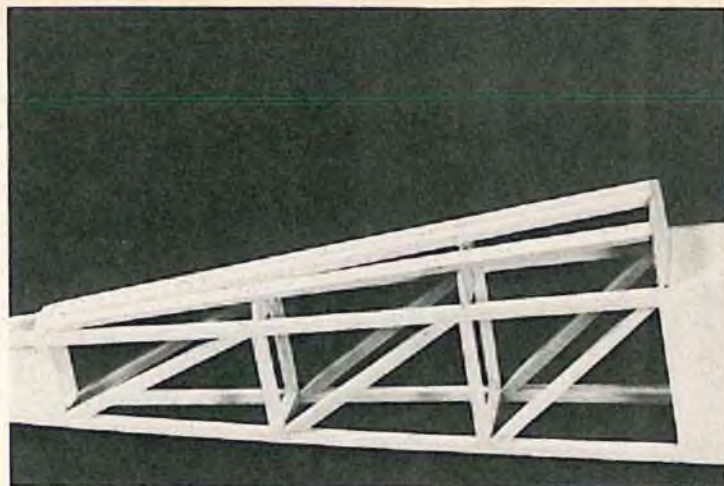
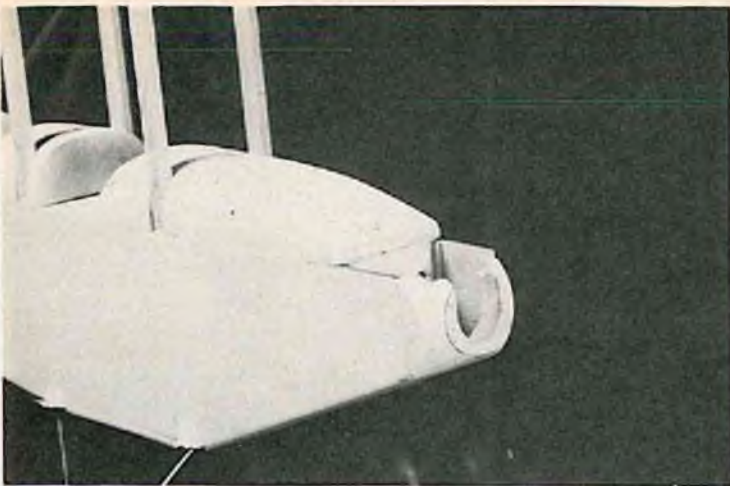
(b) Cut out all the ribs using plywood templates in the "sandwich" method.

(c) The wing design on this airplane utilizes a minimum amount of time, effort, and material to construct. Due to the nature

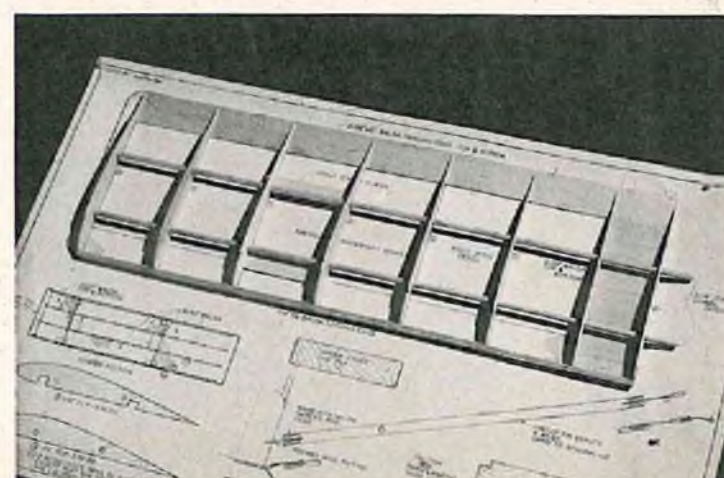
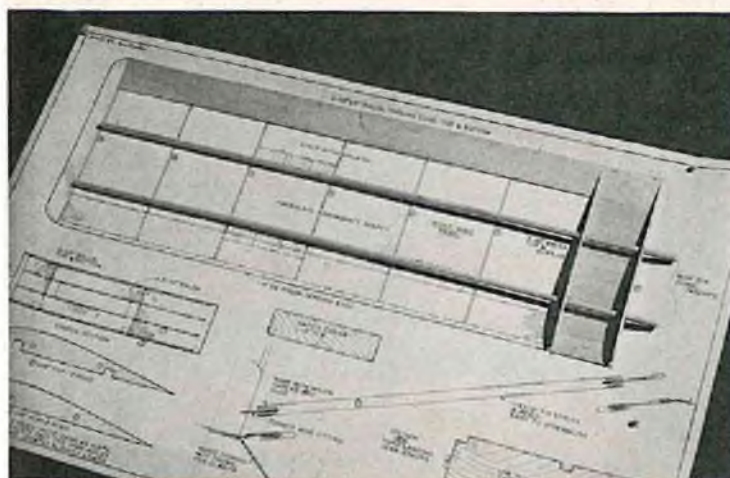


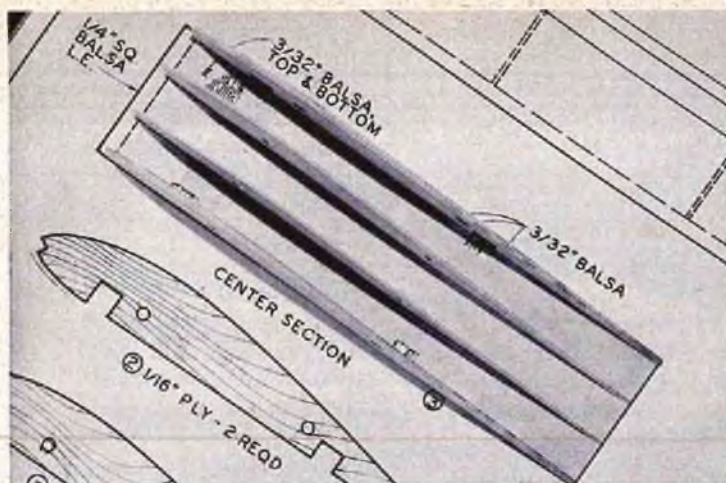
ABOVE, LEFT: Basic fuselage side stringers being laid out over full-size plans. ABOVE, RIGHT: Adding the plywood sides, cabanes, and bulkheads to one side. RIGHT: Second plywood fuselage side added over top view for alignment – rear stringers omitted in this photo. BELOW, LEFT: Kraft-Hayes motor mount bolted to firewall. BELOW, RIGHT: Basic fuselage completed and laid out over top view. BOTTOM, LEFT: Notched and shaped cabane blocks slip down over cabanes. BOTTOM, RIGHT: Cabane blocks in place.



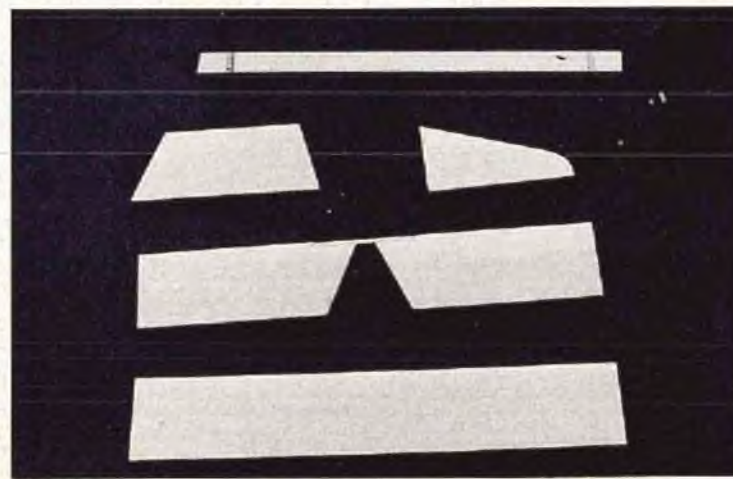
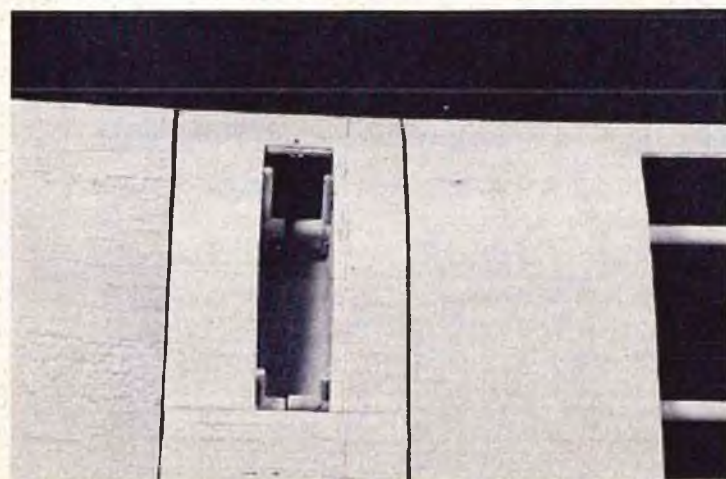
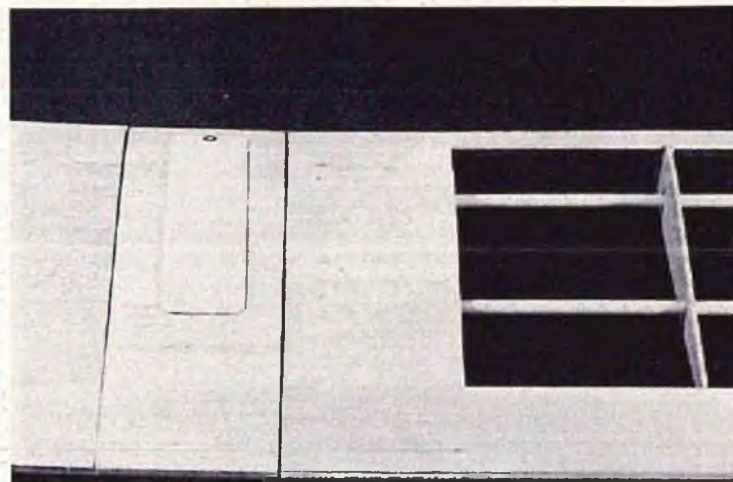
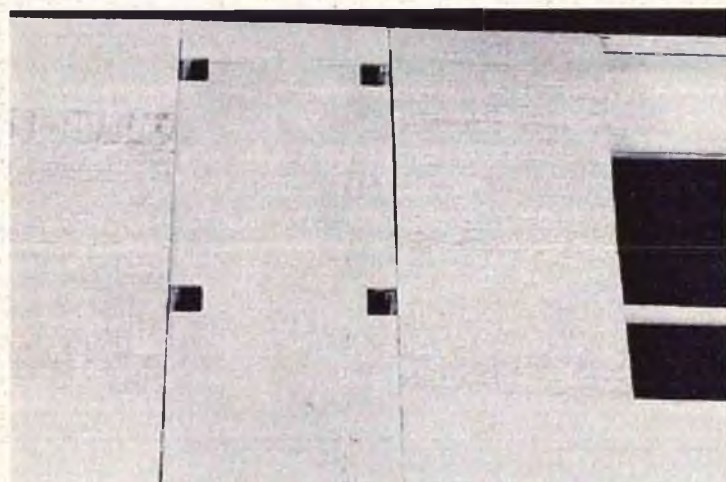
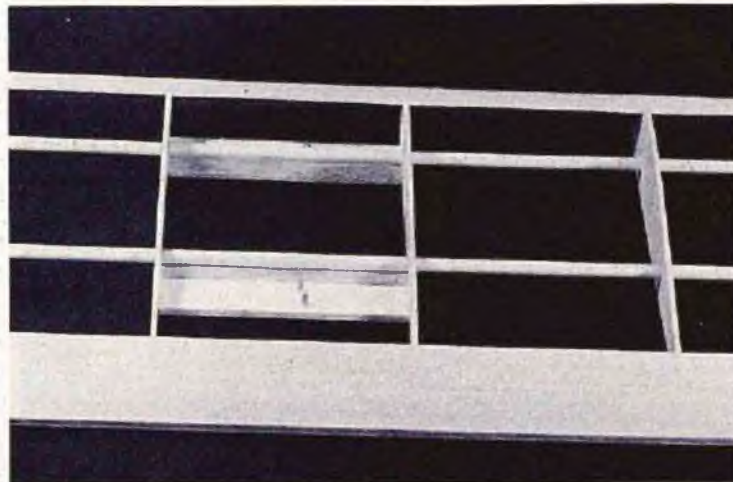
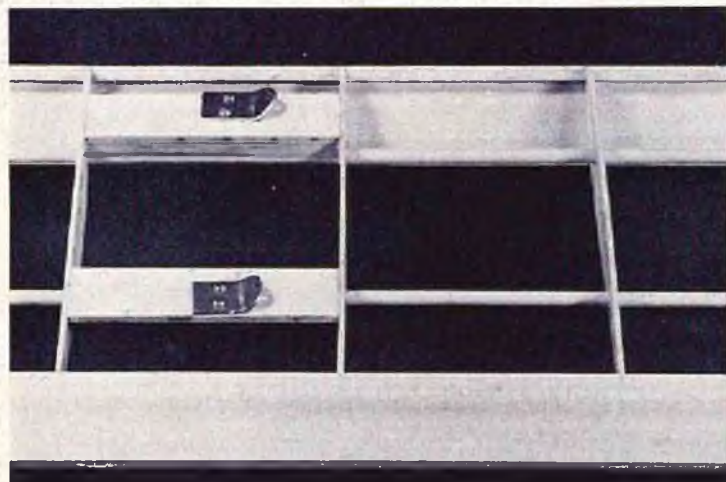


TOP ROW, LEFT: View of rough shaped nose, ply nose ring, and fuel compartment hatch block. TOP ROW, RIGHT: View of aft fuselage section showing turtledeck stringers and general construction details. ABOVE, LEFT: Bottom view of fuselage showing strut fittings, landing gear attachment, and plywood access hatch. ABOVE, RIGHT: Front view of landing gear with Trexler Air Wheels. Masking tape was used until cotter pin wheel retainers were installed. LEFT: Tail wheel held in place temporarily with masking tape. BELOW, LEFT: Laying out one wing panel. BELOW, RIGHT: Basic wing panel without top sheeting.





LEFT: Building the center section panel over the plans. BELOW, LEFT: Aluminum strut fittings installed on wing. BELOW, RIGHT: View from top of wing showing sheet metal screw strut fitting retainers. THIRD ROW, LEFT: Bottom view of center wing panel. THIRD ROW, RIGHT: Top view of center wing panel with plywood access hatch in place. BOTTOM ROW, LEFT: Access hatch removed showing dowel pin retainers through arrow shaft wing spars. BOTTOM ROW, RIGHT: Empennage pieces, joined elevators, and hardwood strut material.



of the wings construction, the struts are required to enable this airplane to perform any maneuver the modeler wishes without fear of wing failure.

(d) The plans have both wing panels shown and it is recommended to build both at the same time if building space allows.

(1) Cut 16 pieces of 3/32" x 2" x 12" balsa sheeting.

(2) Drill, cut and sand 12 #5 ribs and 4 #4 ribs using the sandwich method.

(3) Cut 6 pieces of 1/16" x 2" x 12" plywood.

(4) Drill, cut and sand 2 each — #1, #2, and #3 center section ribs.

(5) Cut 6 pieces of 3/32" x 3" x 3" balsa sheeting. Glue together to form the lower inboard wing bay sheeting.

(6) Cover the wing plan with wax paper.

(7) Cut and pin the 3/32" x 2" x 30" balsa aft lower wing sheeting to plan.

(8) Glue the inboard wing bay sheeting to the forward edge of the 3/32" x 2" x 30".

(9) Cut four 5/16" shafts to the proper length.

(10) Glue both #4 ribs in place and allow to dry.

(11) Insert the 5/16" shafts through the #4 ribs from the tip side until they align with the end of the tip rib. Glue the shafts to the #4 ribs and allow to dry.

(12) Slide the #5 ribs in position and glue to the aft lower sheeting and shafts.

(13) Cut 1/4" x 1/4" stock 30" long and glue to the leading edge of the wing ribs.

(14) Cut the strut attach plates from 1/8" birch plywood and glue in their proper locations between the #5 ribs.

(15) Cut 1/4" x 1/4" balsa stock and glue between the 1/8" ply strut attach plates and the 5/16" shafts.

(16) Sheet the top leading edge and trailing edge with 3/32" x 2" x 30" balsa sheeting.

(17) Sheet the top inboard bay with 3/32" x 3" x 3" balsa.

(18) Glue the 1/4" x 1" tip pieces in place.

(19) Sand the complete assembly and contour the leading edge using the plan as a reference.

Center Section

(1) Cut the cabane plate from 1/16" birch plywood.

(2) Glue #2 and #3 together. Note: Make a right and left hand assembly.

(3) Place the cabane plate on the plan and mark the location for the #1 ribs.

(4) Glue the ribs in their proper location.

(5) Cut a piece of 1/4" x 1/4" 3" long and glue to the leading edge of the ribs.

(6) Sheet the forward lower edge with 3/32" balsa and allow to dry.

(7) Slide the center section on the cabanes and check for proper fit. The cabanes should seat at the top of the notches in the #2 ribs. When a proper fit has been established, bond the center section to the cabanes.

(8) Sheet the top of the center section with 3/32" x 3" balsa sheeting.

(9) Contour the leading edge to the

PIETENPOL MATERIALS LIST

1/8" Plywood (Ramin, Mahogany, Birch, etc.)

2 — Fuselage sides

1 — Tank compartment floor

2 — Cockpit Floors

2 — Fuselage Formers

1 — Radio Access Hatch

1 — Chin Plate

1/4" Plywood (Birch)

1 — Firewall

2 — Landing Gear Mounts

1/4" x 1/2" (Spruce, Fir, Pine, etc.)

4 — Cabanes

4 — Wing Struts

Landing Gear Fairings (optional)

1/8" Plywood (Birch)

1 — Tank compartment hatch cleat

1 — Tank Compartment hold-down plate

2 — Center section hatch hold-down plates

1/8" x 1/4" (Spruce, Fir, Pine, etc.) Optional

Landing Gear Fairing Caps

3/16" x 3" (Balsa)

1 — Vertical Stabilizer

1 — Horizontal Stabilizer

1 — Rudder

2 — Elevators

3/16" Dia. Birch Dowel

1 — Elevator Joiner

1 1/2" x 3" x 12" Balsa Block

1 — Tank compartment hatch

2 — Cockpit blocks

3/8" x 2" Balsa

1 — Nose Block

1/16" Plywood (Birch)

1 — Nose Ring

1 — Cabane Plate

1 — Center section hatch cover

2 — #1 Ribs

2 — #2 Ribs

2 — #3 Ribs

4 — Turtle Deck Formers

3/32" x 2" Balsa

6 — Wing sheets

12 — #5 Ribs

4 — #4 Ribs

3/32" x 3" Balsa

1 — Wing Sheeting

1/4" x 1" Balsa

2 — Wing Tips

1/4" x 1/4" Balsa

Stringers, uprights, and diagonals

5/16" Cedar Arrow Shafts or Maple Dowels

4 — Wing Spars

1 — Tank compartment hold-down bushing

3/32" Piano Wire

1 — Forward landing gear

1 — Aft landing gear

1 — Spreader Bar

1 — Tail Wheel Assembly

1/16" Piano Wire

4 — Wing Strut Ends

2 — Pushrod ends

1/4" O.D. Brass Tubing

2 — Wheel Axles

.032" Aluminum Plate

8 — Sheet Metal Wing Strut Fittings

Hardware

2 — Small cotter pins

4 — 1/4" I.D. steel washers

16 — #4 Sheet metal screws, 3/8" long

4 — 4-40 blind nuts and 1/2" screws

4 — 6-32 blind nuts and 3/4" screws

4 — K & B Veco 3/32" dia. wire clips

proper radius and sand the entire assembly.

(10) Using the plan as a reference, mark and cut out the 3/32" sheeting on top of the center section for the wing shaft attach pin access hole.

(11) Cut the hatch cover plate from 1/16" birch plywood.

(12) Cut two 1/8" plywood hatch hold-down plates and glue in place. Allow to dry.

(13) Place the hatch cover in position. Drill through both the hatch and hold-down plates for 4-40 screws. Install 4-40 blind nuts on the bottom side of the hold-down plates.

Wing Struts

(1) Cut 4 pieces of 1/4" x 1/2" fir 18" long.

(2) Cut and bend four 1/16" piano wire strut ends using the plan as a reference.

(3) Place the 4 Kwik Link ends at mid travel. Cut to length and put a 90° bend as shown on the plan.

(4) Mark and drill both ends of the 4 struts, and install the strut ends using nylon thread and glue.

(5) Install the strut fitting on the wing panels with #4 sheet metal screws.

(6) When the glue is thoroughly dried, install the struts into the fuselage fitting.

(7) Insert the wing panels into the center section and attach the struts to the wing fittings. Adjust the Kwik Links as required to obtain a slight load upward to maintain the proper dihedral angle.

(8) Place a slight load inward on the wing to eliminate any excess gap between the center section and the inboard end of the wing. Mark the 5/16" shaft inboard of the #1 rib for the 1/16" dowel pin location.

(9) Remove the struts and the wing panels. Drill a 1/16" hole through the 5/16" shafts at the previously marked locations for the wing hold-down pins.

(10) Place the wing panels back into the center section. Install the 1/16" wing pins and struts.

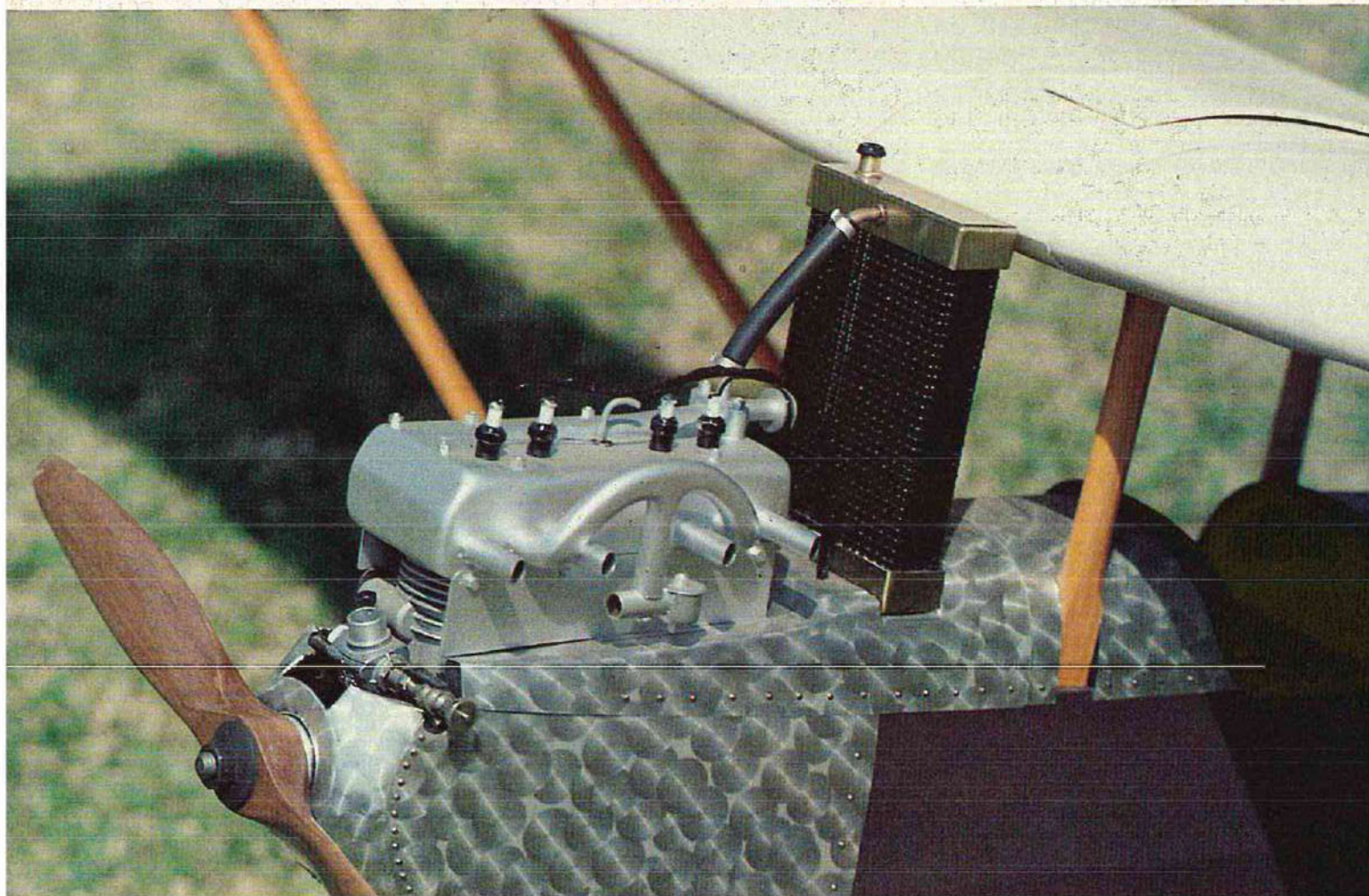
That's it — one complete Pietenpol ready for covering and paint unless we missed something along the way which we probably did. If we did, we are truly sorry, but nobody's perfect. The only modeler I know that is perfect is Don Dewey, except when it comes to flying, building, finishing and trying to drill the 1/16" hole through a Pietenpol wing spar shaft. If you happen to mis-drill the 1/16" holes for the wing hold-down pins like Dewey did and end up with a condition where your wings move in and out of the center section a quarter of an inch, you can correct the condition by bonding 5/16" I.D. washers to the inside face of rib #1.

FINISHING & COVERING

We could go into a long seminar on covering and finishing, but we won't for three reasons.

1. Everyone has his own ideas on the subject.

2. The Pietenpol was designed with fun in mind, so do your thing. If you want it fast and sporty, Super MonoKote and DJ Striping. If you want it vintage still, try



Color photos on opposite page show two versions of the Pietenpol — a close-up of the nose section of the detailed model, and a simpler sport version.

PIETENPOL

Designed By: Don Dombrowski
& Doug Edwards

TYPE AIRCRAFT

Sport — Stand-Off Scale Trainer

WINGSPAN

65 Inches

WING CHORD

11"

TOTAL WING AREA

715 Square Inches

WING LOCATION

High Wing Parasol

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

1 1/2 Inches

O.A. FUSELAGE LENGTH

37 1/4"

RADIO COMPARTMENT AREA

(L) 5" X (W) 2 3/4" X (H) 4 3/8"

STABILIZER SPAN

18 Inches

STABILIZER CHORD (incl. elev.)

6 Inches

STABILIZER AREA

108 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

5 7/8 Inches

VERTICAL FIN WIDTH (incl. rudder)

5 1/4" (Average)

REC. ENGINE SIZE

.19 — .35 Cubic Inch

FUEL TANK SIZE

6 — 8 Ounce

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

2 — 3

CONTROL FUNCTIONS

Rud., Elev., Throt., or Rud. & Throt.

BASIC MATERIALS USED IN CONSTRUCTION

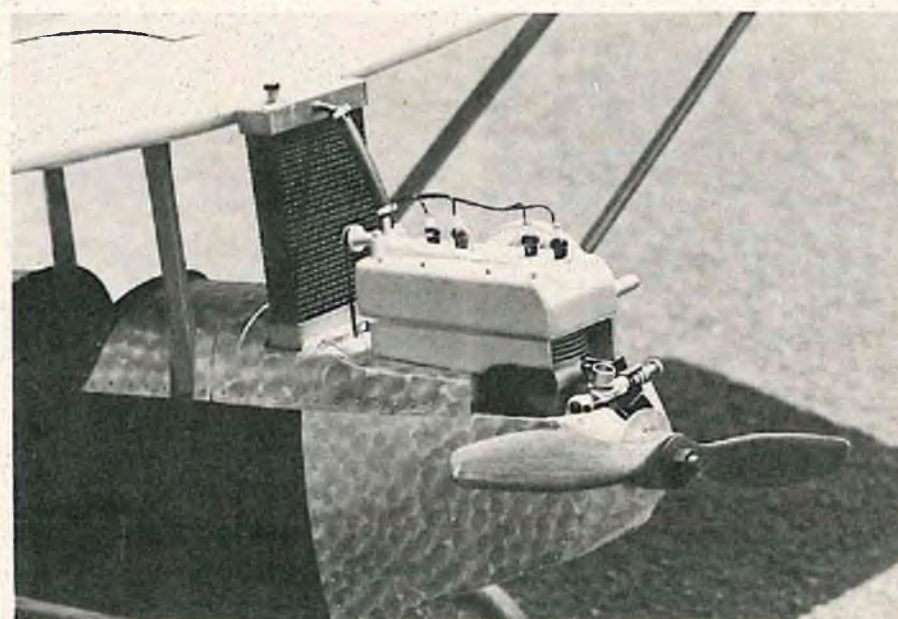
Fuselage Balsa, and Ply

Wing Balsa and Ply

Empennage Balsa

Weight Ready-To-Fly 72—88 Oz.

Wing Loading 14.5-17.7 Oz./Sq. Ft.



Photos to the right show a MonoKoted sport model at the top and the more detailed prototype at the bottom. Cowling is thin aluminum sheet applied with contact cement. Simulated rivets are pins.

In this sequence, Don Dombrowski replaced another 10/6 prop for RCM's CTP. And, somehow, Dewey made it – the Pietenpol chugs off down the field and into the wild blue yonder.

PermaGloss Coverite, wire wheels, and heroic pilot.

3. The last and most important reason is I have a headache and my fingers are tired from writing!

RADIO INSTALLATION

There isn't much to say here except to position the battery and receiver as shown on the plan to get as close to the C.G. range as possible and follow your radio manufacturer's recommendations. The suggested control surface throws with the Center of Gravity as specified on the plans are: Elevator 3/4" up — 3/4" down; Rudder 1" right — 1" left. Controls may be decreased or increased to obtain the desired sensitivity.

ENGINE AND TANK INSTALLATION

The tank is positioned on the plan in such a way that you should not have any problem with fuel feed to the engine or access to the tank. This airplane, at 4½ lbs. will fly realistically with a Veco .19 and you can burn up the sky with a good .35. We recommend a good .29 or .30 for general sport flying.

FLYING AND TRIM

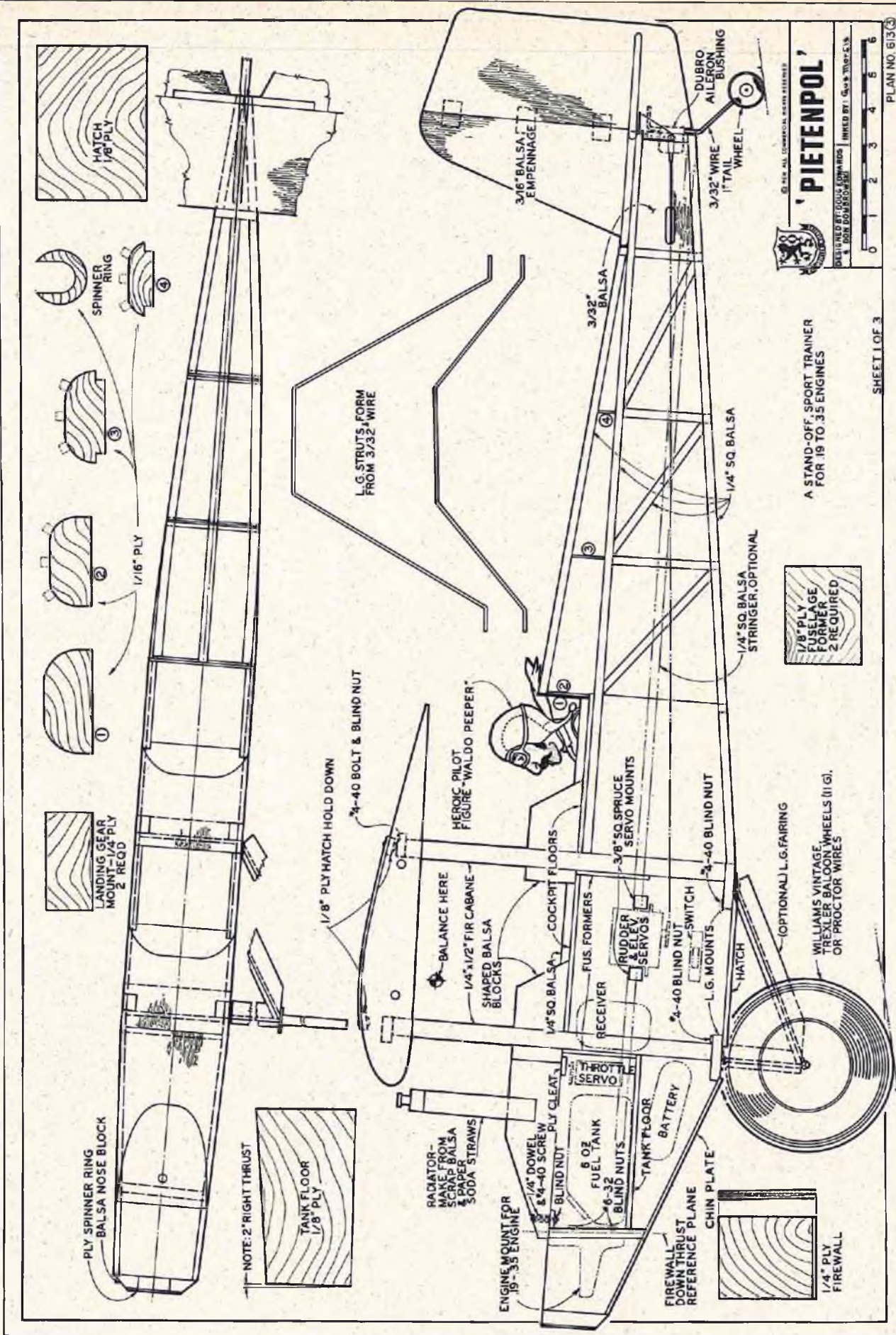
The airplane has no bad habits. In fact, it has such a light wing loading that in a 5 knot wind you can slow it up to a point where your roll out is only 10 feet. Set the controls as recommended for initial flights and adjust it to fit your needs after that.

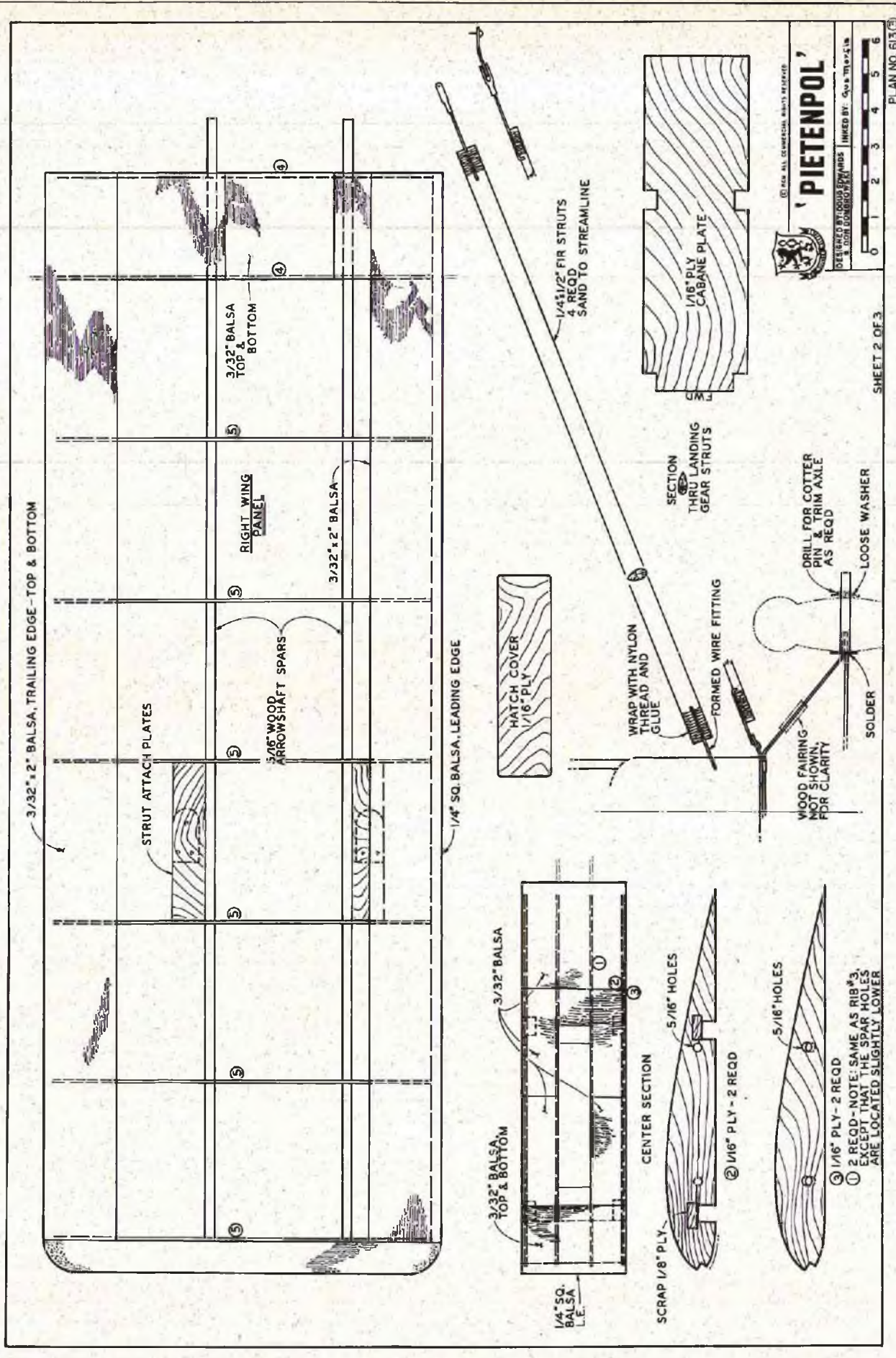
Take-offs are no problem. Hold a slight amount of up, feed the throttle smoothly and by the time you are at full throttle you are in the air. Except in the case of Dewey, RCM's chief prototype test pilot! The first airplane we built (God rest its soul) went through hell in the hands of RCM's chief test pilot just trying to get it off the ground. After many end-over-ends and cartwheels, and not to mention 12 10/6 maple props, the grandstand consisting of Dick Kidd, Doug Edwards, and myself, had doubts about the flying capabilities of this airplane. Then Dick Kidd said he wanted to try it and, lo and behold, right into the blue with no problem. Doug tried it, same thing, no sweat. I tried it and it was gentle as a lamb.

We are not saying we had a problem with RCM's chief test pilot. All we know is that once we installed an autopilot and automatic landing and take-off capabilities in Don Dewey's transmitter and receiver, his take-off problems went away!

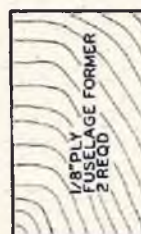
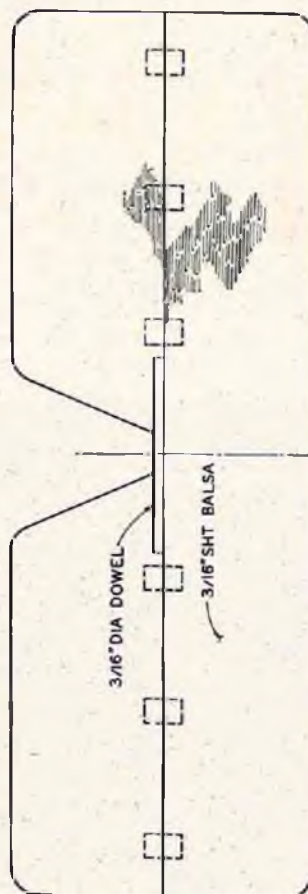
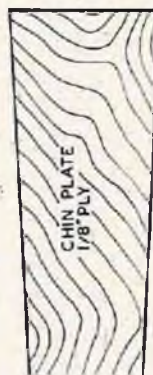
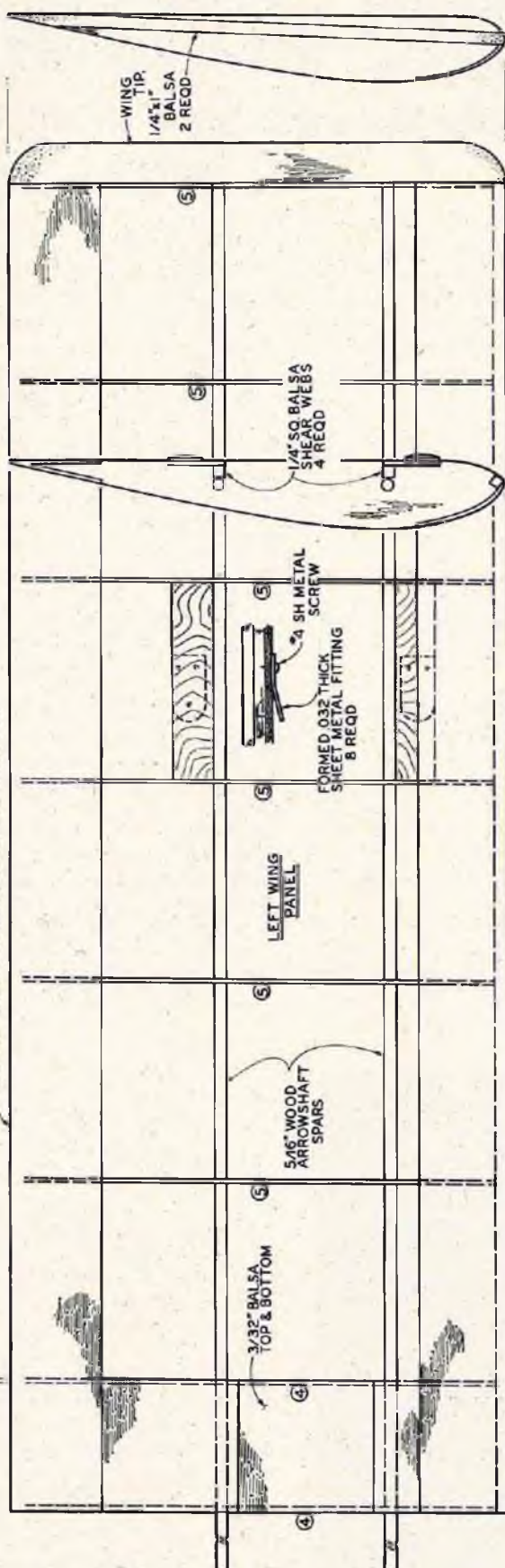
If you want to try a fun airplane low and slow instead of high and fast, try the Pietenpol. □







3/32" x 2" BALSA, TRAILING EDGE-TOP & BOTTOM



DESIGNED BY: DOUG EDWARDS
1/8" BOW CORRECTION

'PIETENPOL'

INCHES BY: GUY HERRICK



SHEET 3 OF 3

PLAN NO. 613

FLIGHT TRAINING SEMINAR

Part VI Of Learning To Fly Your R/C Helicopter Is A Discussion Involving A Little Theory To Help Your Practice.

BY GEORGE H. SMITH

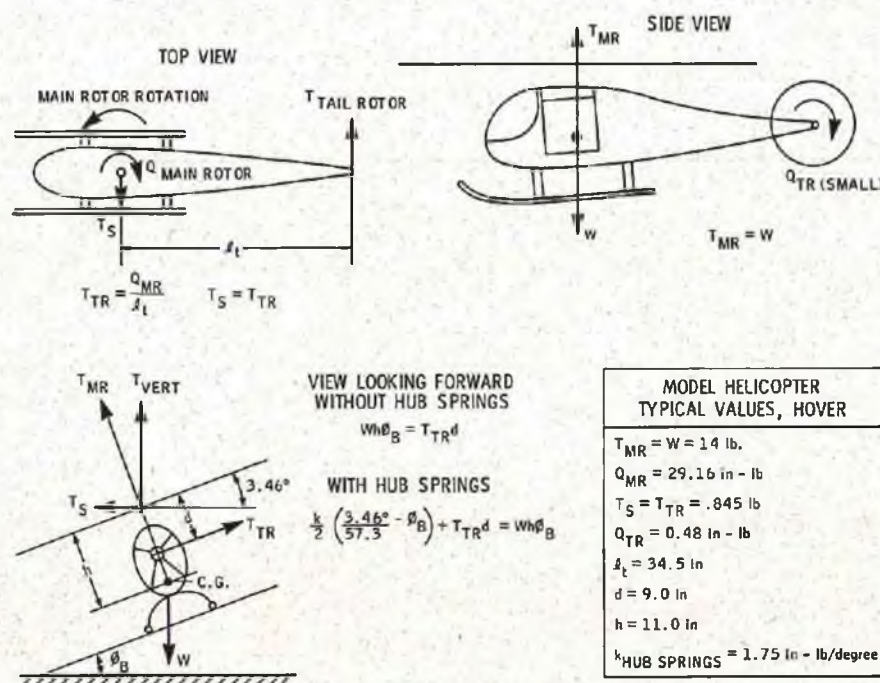


FIGURE 1: FORCE AND MOMENT BALANCE ON A HOVERING HELICOPTER

● A hovering model helicopter requires a certain "knack" to control which must be acquired by lots of practice. Theory states that all forces acting on the model must be balanced, or acceleration due to an unbalanced force will cause motion.

Similarly, all moments (Torques or force-times-arm) about a point must balance or rotation will ensue. Forces and moments are invisible mathematical concepts, so observation of motion is our only clue to required control inputs.

A model helicopter has virtually neutral hover stability, with little or no tendency to maintain or return to the balanced condition, so we must continually input control to sustain the hover.

To further complicate things, controls interact, so that input to one control may require re-adjustment of another.

Forces and moments on a hovering helicopter are shown in Figure 1.

FOUR CONTROLS

If we consider a typical four channel helicopter, control action can be broken into a "Primary" or desired effect and a "secondary" interaction.

(1) Longitudinal (Fore-and-Aft)

Cyclic — Main Rotor

Primary: Tilting the swashplate causes the main rotor to tilt and create a Fore-and-Aft component of thrust.

Secondary: The displaced main rotor thrust vector also creates a fuselage pitching moment (nose-down for forward cyclic). It should be noted that the fuselage tilt which develops is beneficial for control effectiveness, so that some interactions are good. Hub springs (to be discussed later) further enhance this interaction.

(2) Lateral Cyclic — Main Rotor

Primary: Lateral tilt of the swashplate causes a lateral main rotor tilt and creates lateral or side components of main rotor thrust.

Secondary: A rolling moment on the fuselage is developed by the angular displacement of the main rotor thrust vector. Fuselage roll (right roll for right stick input) is beneficial to control effectiveness similar to the Fore-and-Aft case.

(3) Throttle

Primary: If no collective pitch is used, the throttle is the only means available to change rotor thrust and vertical force acting on the model. This action is accomplished by varying engine and hence main rotor rpm.

Secondary: Change in main rotor rpm also means a change in tail rotor rpm and thrust. This interacts on side force and yaw and roll moments. Changing throttle also changes main rotor aerodynamic yaw reaction, which is partly compensated by the tail rotor rpm increase effect noted above.

(4) Tail Rotor Collective Pitch

Primary: Yaw moment is controlled by varying the tail rotor thrust acting at the tail

CALCULATED FUSELAGE AND CONTROL ANGLES						
I FORE-AND-AFT	NO HUB SPRINGS		WITH HUB SPRINGS			
	Fuselage Angle, θ_B	Control Angle, θ_C	Fuselage Angle, θ_B	Control Angle, θ_C		
	C.g. 1/4" Fwd.	-1.30°	+1.30° Aft	-0.98°	+0.98° Aft	
		Nose Down		Nose Down		
	C.g. @ Shaft CL	0	0	0	0	
C.g. 1/4" Aft	+1.30°	-1.30° Fwd.	+0.98°	-0.98° Fwd.		
	Nose Up		Nose Up			
II ROLL	Free Hover	2.83° Left	0.63° Left	2.99° Left	0.47° Left	
	Skids Level	0	3.46° Left	0	3.46° Left	
CONTROL AND INTERACTION TABLE						
CONTROL	F Long.	F Latl.	F Vert.	M Pitch	M Roll	M Yaw
Long. Cyclic	P			s		
Latl. Cyclic		P			s	
Throttle		s	P		s	s
Tail Rotor		s			s	P
"P" denotes PRIMARY or desired action.						
"s" denotes secondary interaction.						

arm length. Pitch on the blades varies this thrust, and hence the moment.

Secondary: The change in tail rotor thrust changes the side-force balance. The low thrust line also produces a Rolling Moment interaction.

INTERACTION TABLE

Interactions and primary effects of the controls are shown in the matrix table presented in Figure 2. Primary or desired action is denoted by "P" and secondary interactions are denoted by "s".

Inspection of the table (Fig. 2) shows that no control is "pure" in its action, since each row contains one or more secondary "s" effects. Going by column, note that there is no Primary "P" control in the M-pitch and M-roll columns indicating that no control is possible. Fortunately, gravity pendular swing of the fuselage automatically balances these moments. We can calculate, but not control the pitch and roll angles of the fuselage which are developed — we must take what we get! (Note, however, that fuselage pitch angle may be **adjusted** by moving the c.g. forward or aft relative to the main rotor shaft center line.) These fuselage angles affect hovering control input required, particularly in the case of lateral inputs.

HUB TEETER RESTRAINT ("DAMPING") SPRINGS

In order to calculate fuselage pitch and roll hover angles, it is necessary to investigate the effect of main rotor hub "Damping" or flap restraint springs. (See sketch, Fig. 3.) If the fuselage is restrained from tilting, theory shows that these springs have almost no effect on rotor tilt ("flapping") response to control inputs. The secondary moments which they create, however, cause the free fuselage to "follow" the rotor tilt. The result is that control effectiveness is enhanced almost 40% by the springs. A penalty associated with these springs is that they introduce a strong 2-per-rev vibration to the fuselage as well as the desirable steady moment.

The damping springs should be rigged with about 0.10 inch pre-load stretch from their free length in order to obtain maximum effectiveness. If one spring goes slack in "compression" during normal flapping of $\pm 6^\circ$, moment is reduced and even higher vibration levels will develop.

A typical hub restraint damping spring has a calculated spring rate of 1.75 in-lb/degree when properly pre-loaded. Due to mathematics which we will not go into here, only 1/2 this value produces steady (non-oscillatory) moment.

CALCULATED HOVER FUSELAGE ROLL AND PITCH ANGLES

In order to expedite things, only calculated results are presented. For those who want to check them, sufficient data has been included in Figure 1.

Hovering tip path plane attitude in space (relative to the horizon) is strictly determined by force balance

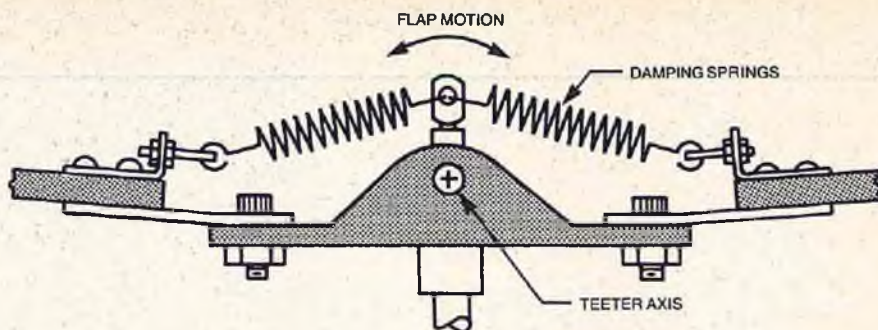


FIGURE 3: HUB DAMPING (TEETER RESTRAINT) SPRINGS

considerations. These attitude angles are independent of fore and aft c.g. position, hub springs, and fuselage tilt angle.

HOVER ROTOR TIP PATH PLANE ANGLES TO HORIZON

Fore-and-Aft — 0°

Lateral Roll — 3.46° Left

If 1:1 gearing between swashplate tilt and paddle cyclic pitch is assumed, the following equation relates Control input, Fuselage tilt angle and Rotor Tip Path Plane Attitude.

$$\text{Control Input} + \text{Fuselage Tilt Angle} = \text{Rotor Attitude}$$

Examination of the Table of Fuselage and Control Angles leads to the following conclusions:

(1) The Control angle plus the Fuselage Angle sums to the Absolute Rotor Tip Path

Plane Attitude, as they should.

(2) Required Control Input angles are less with hub springs than without, showing their effectiveness.

(3) Notice the difference between required control lateral inputs for Free Hover and Level skids. (0.47° Left for Free Hover vs. 3.46° Left when skids Level.)

The practical importance of this last item (3) to model helicopter flying is this: If you have stopped **right** skitter drift of the model when partially airborne with skids in ground contact, you probably have almost 1/2 **left** stick throw inputs, but as you become fully airborne you will have to reduce this **left** stick input rapidly. If you do not, you will lift off with a rapid **left** velocity. (The high **left** input is also noted when using a "dolly" type of trainer like that presented in

to page 146

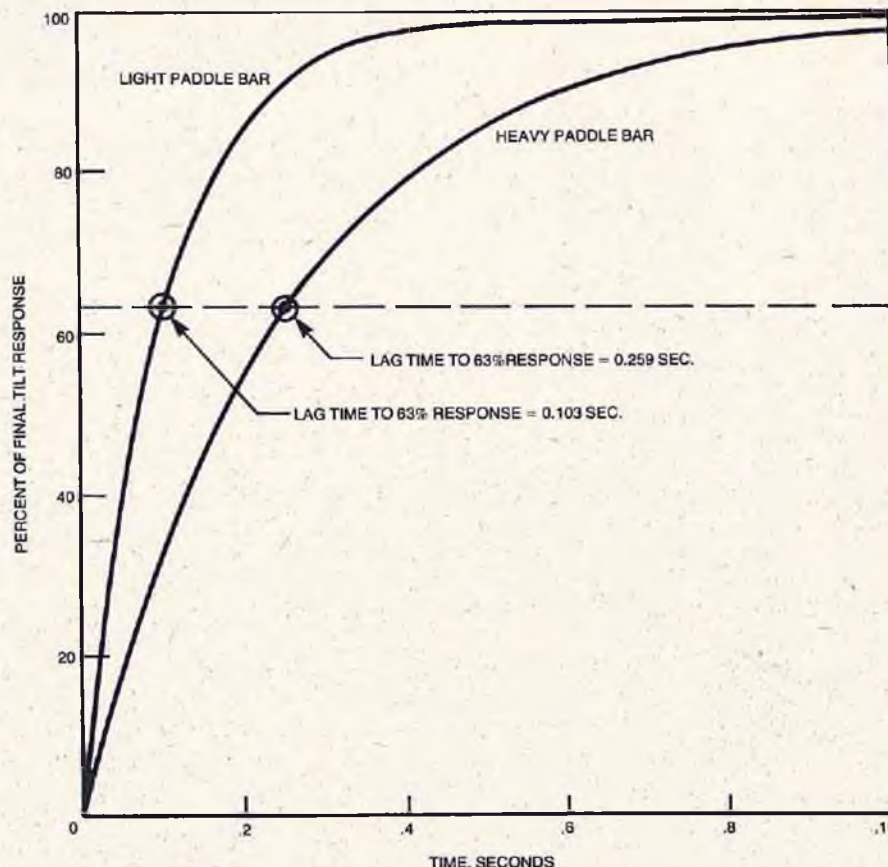
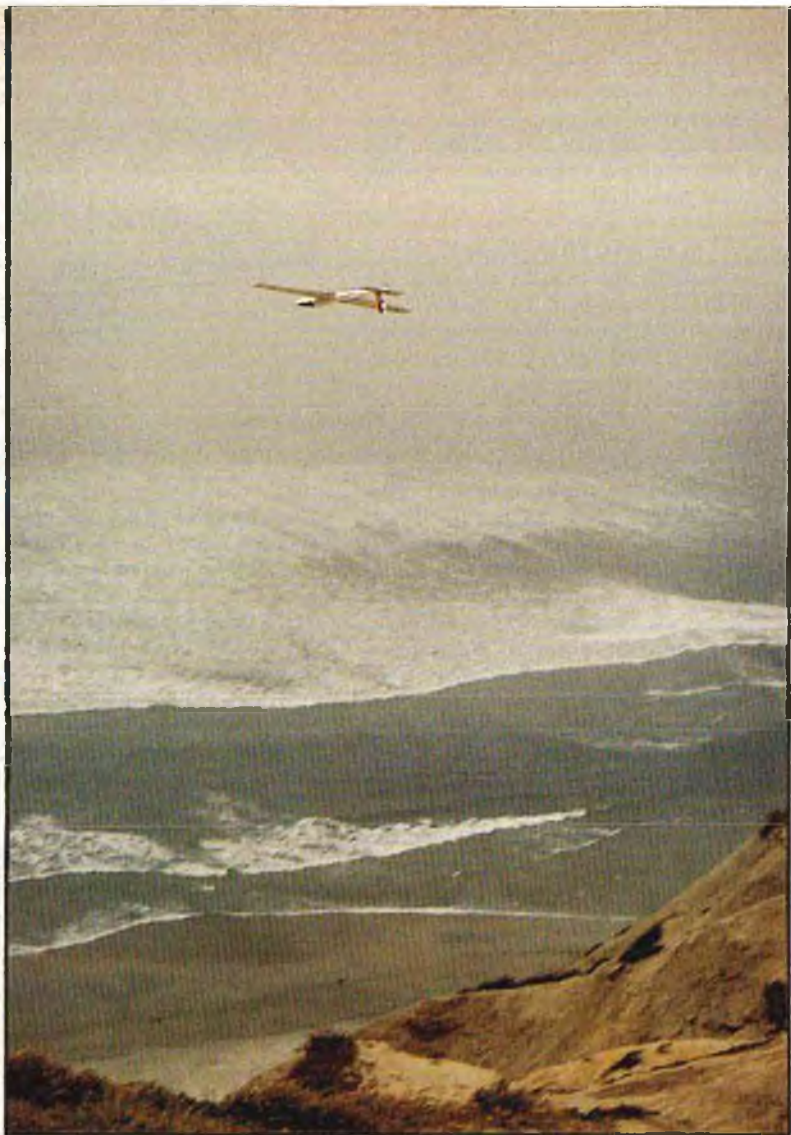


FIGURE 4: PADDLE BAR RESPONSE TO STEP CONTROL INPUT

RIDGE RUNNER II

Designed for slope aerobatic and pylon race events, the Ridge Runner has placed in the finals of both the 1973 and 1974 RCM Trophy Races. Flown by Gary Hover, the design placed third both years after mid-air collisions in second place fly-offs. Five Ridge Runners were entered in the 1974 race, making it the most popular design in the event.

BY DAVE KATAGIRI





Want to try something different in slope soaring gliders? Here is a design that not only provides crisp control authority to fly turbulent ridge currents with confidence, but also has aerobatic abilities that will keep a pattern flyer interested. The Ridge Runner was designed with three basic criteria in mind: (1) Aerobatic with good control authority, (2) Penetration (speed) in strong lift, and (3) Look sharp while flying. Aerodynamic configuration characteristics are shown in Figure 1.

In its stock aerobatic suit the design is capable of all (except spins) maneuvers listed for AMA Class "C" Glider Aerobatic Event described in the 1974 rules book (page 49). In order to do the 2-turn spin, the rudder must be actuated by separate servo. The prototypes are flying with only ailerons and elevator. Coupled ailerons and rudder might spin but the roll will become helical in shape. In addition to the 10 maneuver list the Ridge Runner will loop outside, Tennessee Twist (1/2 outside with 180 rollout at bottom), 180° turn and four-point roll.

Although it was not intended for aggressive FAI weight limit pylon racing the design has fared well in recent slope races, because most have not been blessed with 20 mph winds to permit the 11 pound lead-lined birds to do their best. (How about fly?) Admittedly, the Ridge Runner is no thermal floater, but at the same time it can "hang in there" with any existing 6-footer in a 7 mph slope wind. The original has flown at 36 ounces in 20 mph winds and, at 50 ounces, became a groovy flyer with momentum to carry through maneuvers as if powered. Ballasting beyond this loading may be possible, but not recommended unless more structure is added to increase wing bending strength. A fiberglass body would be another desirable modification for heavy versions that may have to land in rough terrain usually associated with slope soaring. Full wing sheet cover plus glass cloth overlapped 3 inches across the center and out 12 inches from the center should allow a higher loading and safe pylon turns.

Speaking of safe, in any event, when adding ballast be certain it is attached securely and preferably at the bottom of the body so landing loads produced by the ballast won't pass through the body structure. However, in its stock form with a 9 percent thick wing and 9-10 (oz./sq. ft.) it will still leave most cliff hangers behind, and it will expand your aerobatic flying envelope with only 2 channels so let's move on and build one.

*The author, Dave Katagiri,
with one of numerous
Ridge Runner
prototypes.*

RIDGE RUNNER II Designed By: Dave Katagiri

TYPE AIRCRAFT
Sailplane/Aerobatic/Slope Racer
WINGSPAN
72 Inches
WING CHORD
Root 10" — Tip 6-1/16"
TOTAL WING AREA
576 Square Inches
WING LOCATION
Low Wing
AIRFOIL
Flat Bottom (9%)
WING PLANFORM
Swept L.E.
DIHEDRAL, EACH TIP
1 1/2 Inches
O.A. FUSELAGE LENGTH
43 3/4 Inches
RADIO COMPARTMENT AREA
(L) 15" X (W) 2" X (H) 2-3/16"
STABILIZER SPAN
18 Inches
STABILIZER CHORD (Incl. elev.)
4 3/8" (Average)
STABILIZER AREA
78 Square Inches
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
7 1/4 Inches
VERTICAL FIN WIDTH (Incl. rudder)
4 1/2" (Average)
REC. ENGINE SIZE
NA
FUEL TANK SIZE
NA
LANDING GEAR
NA
REC. NO. OF CHANNELS
Two (Three with rudder)
CONTROL FUNCTIONS
Ailerons, Elev. (Rudder Optional)
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage Balsa and Ply
Wing Balsa and Spruce
Empennage Balsa
Weight Ready-To-Fly 36 oz.
Wing Loading 9 Oz./Sq. Ft. (Min.)

*Designed for slope racing
and aerobatics. The Ridge
Runner was introduced
at the '73 RCM
Trophy Races.*

CONSTRUCTION NOTES:

Medium blasa grade (about 7 lb./cu. ft.) was used on the original with good results. Parts such as the leading and trailing edges and ailerons were ripped on a table saw. If one is not available then use the nearest stock size and plane to shape. Notice that the trailing edge section is constant spanwise. The leading edge, however, tapers slightly. The spruce spar caps were cut from dried Sitka Spruce from the local hardware yard. Otherwise, two 1/16" x 3/16" strips can be butt glued. 1/8" diameter dowels for the leading edge should be available in both lumber and hardware stores.

Use your favorite adhesive or what is commonly used on pattern aircraft; white glue or epoxy for plywood, contact cement for body side plywood doubler, and Ambroid for exposed edge joints that will be sanded and finished.

Wing

Let's begin by cutting the ribs and get that chore over with. Make the root and tip rib patterns from 1/16" plywood. Add extra length on these patterns to include the leading edge and trailing edge sections as shown on the plan. (The excess will be trimmed when installing.) Next cut 11 rib blanks and sandwich these between the two pattern ribs so the spar cap notches will line up to be 90° to the plane of the ribs and the bottom edges of the blanks line up flush with the pattern rib bottoms. Apply strips of masking tape along the lower edges of the ribs to retain alignment and secure the stack with pins inserted through pre-drilled holes in the pattern ribs. Use a razor saw and cut into the stack in line with the vertical edges of the spar cap slots (in four places). Hack away the rest of the excess wood from the rib blanks using a plane and sandpaper blocks. Once a half wing set of ribs is made the other half can be cut using each finished rib as a pattern. Note that the tip rib is slightly smaller than rib A. The tip rib can be trimmed after gluing into place using a long sanding block moving spanwise.

Wing assembly starts by laying out the lower sheeting and cutting to exact shape over the plan. Wipe the forward 1" of the bottom surface of the leading edge sheet with a wet sponge. This will cause a slight curl upward. Place shims under the leading edge and pin the parts in place. Glue the bottom sheet parts together including the lower capstrips. Attach the trailing edge, leading edge and the lower spruce capstrip. The latter should be positioned accurately because it will index the ribs positions.

Spread out the ribs over their respective locations and trim the excess length from each rib such that a snug fit is achieved between the leading and trailing edges. Glue each rib in position with the root rib leaning outboard by 2 degrees. Lay a straight-edge chordwise on the root rib to check alignment (these two inboard ribs butt to form the center joint and dihedral). Trim the outboard rib to shape. Cut, trim and glue shear webs to the spar cap and ribs. Use care to insure good fit and bond, because the wing is thin and carries high stresses. Attach the top spruce spar cap.

At this point the wing trailing edge is removed from the work board and shimmed to produce progressive washout. Re-attach the assembly to the work board.

Attach the top sheeting to "freeze" the washout in place. Finish off the top capstrips, trailing edge and the remainder of the top sheeting. After the assembly is dried, remove it and plane the leading edge groove using an X-Acto X-V blade held between the fingers. Use sandpaper rolled over a "Q" tip stem and align the groove. Place the 1/8" dowel in place and check the fit. Try to get it in place to form a smooth transition from the leading edge radius formed by the dowel to the upper and lower wing skins. If thermal bonding film is used for covering, the small groove or crack at the dowel need not be filled. The film will form across the thin gap. This dowel makes a uniform leading edge radius and also adds strength to resist dents and more serious damage from brush and similar obstructions around slopes. Join the wing panels and glass the center section. Cut out the hole for the servo. Leave the wing attach dowel and body fairing until the body is done.

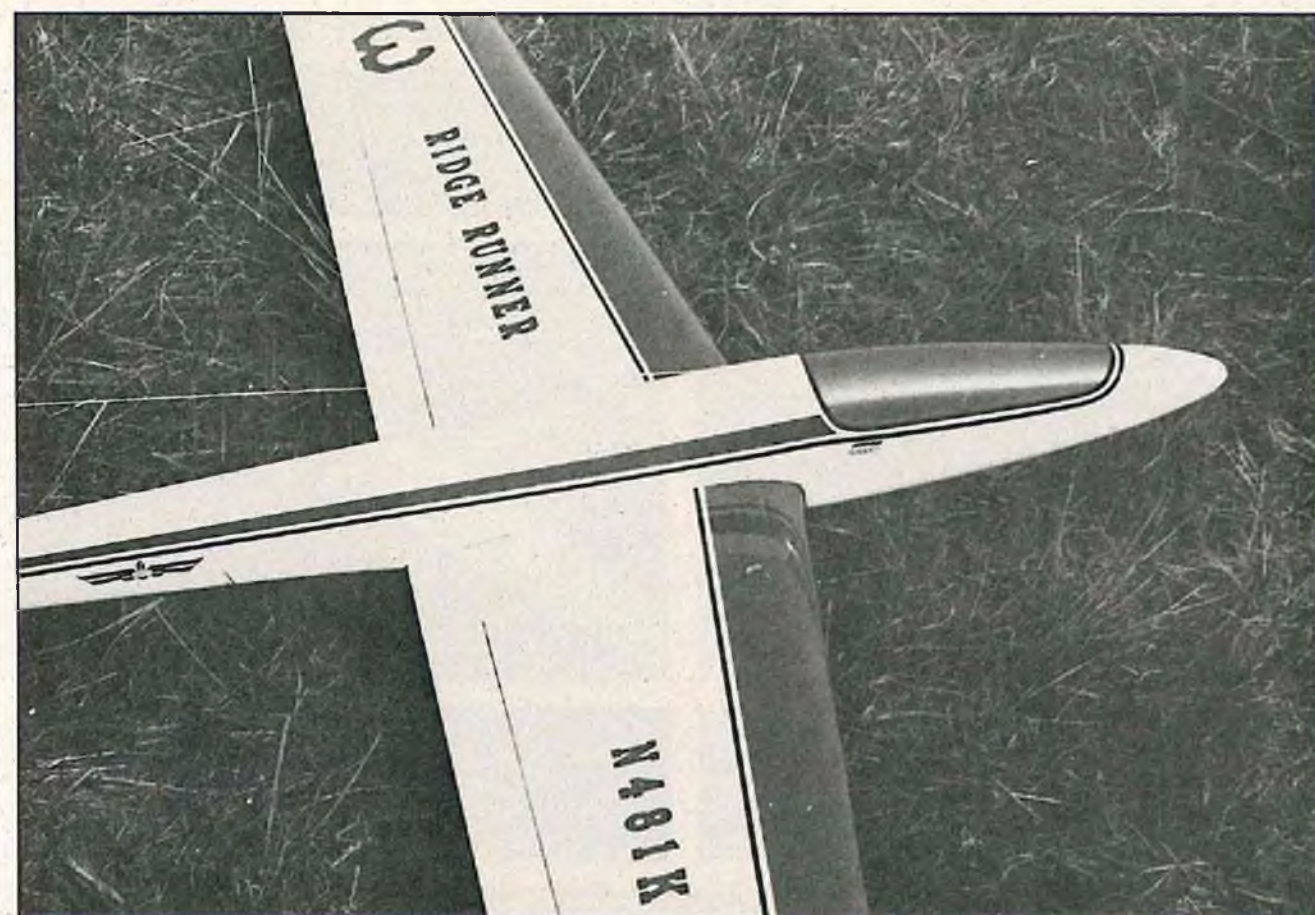
The rest of the assembly is evident from examining the plans. The new Kraft flexible hinges, although slightly stiffer than pin hinged, may be an advantage as they seem to provide a viscous damping effect which may discourage aileron buzz and flutter. (This is an important consideration because glider ailerons and flaperons seem to be more susceptible to dynamic problems than those on thick power plane wings.) The wing can be covered at this stage. Leave a 1 1/2" wide uncovered section at the bottom center of the wing.

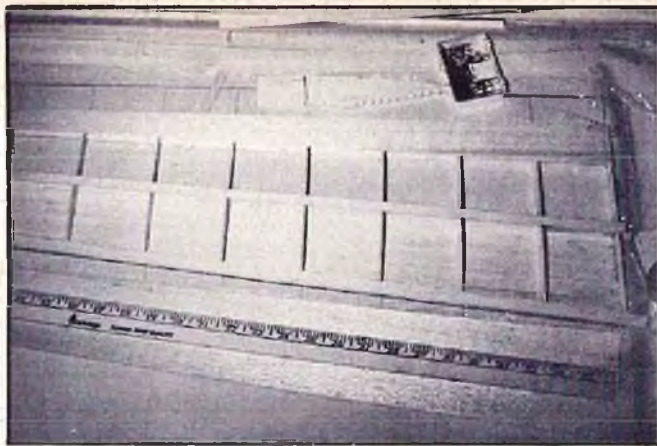
Fuselage

Cut all body frames and make checks for proper fit over the outlines on the plan. Trim as necessary. Cut the fuselage sides to the outline identified on the side view. Mark the locations for all frames on the inside. Cut, fit and contact cement the 1/32" plywood

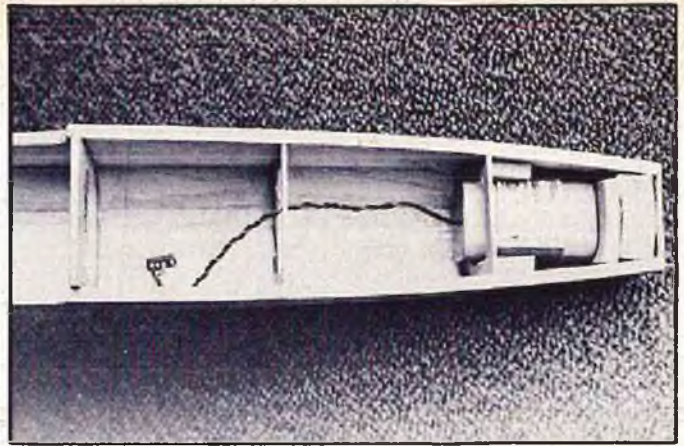
FIGURE 1

	SPAN (in.)	AREA (sq. in.)	ASPECT RATIO	TAPER RATIO	OTHER
Wing	72	576	9	0.6	9% thick; 1 1/2 washout
Horizontal Stab	18	78	4.2	0.75	0.4 Volume Ratio
Vertical Fin	7.5	30	1.9	0.57	0.02 Volume Ratio
Weight (2 channel)	—	—	—	—	36 oz. (stock)
Wing Loading	—	—	—	—	9 oz. per sq. ft. (stock)
Wing & Stab Loading	—	—	—	—	8 oz. per sq. ft. (stock)
Incidence	—	—	—	—	Zero

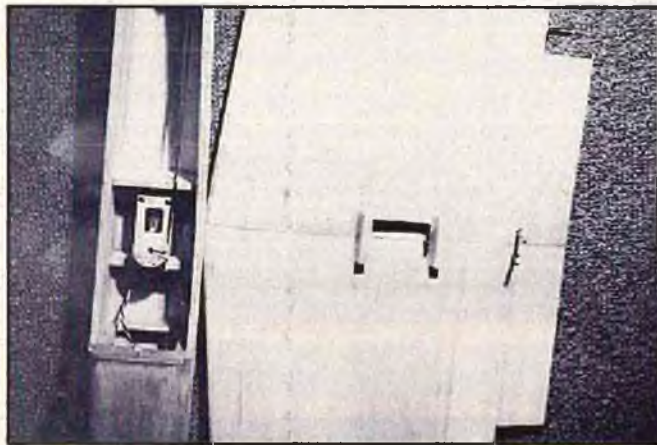




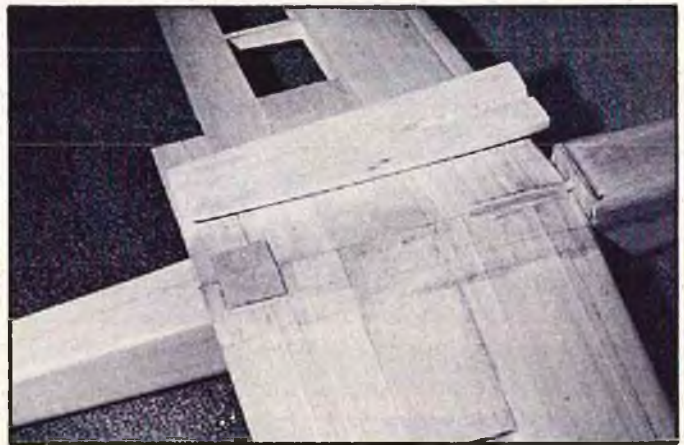
Shim the trailing edge to twist in tip washout prior to freezing shape by attaching top sheet.



The rectangular airborne battery pack is positioned well forward to help achieve proper balance.



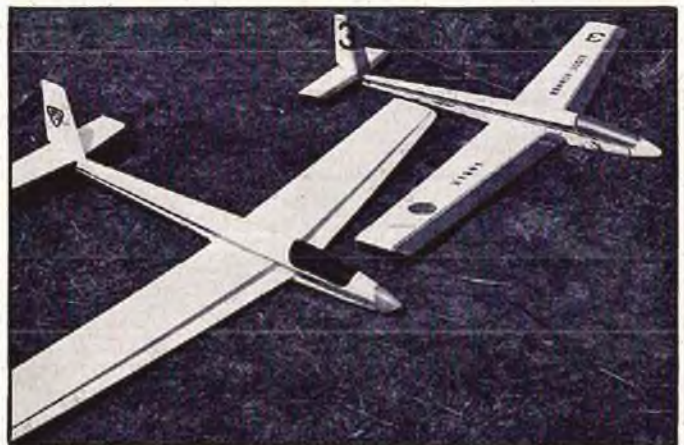
The servo mounting is of typical Pattern plane type of installation. Note aileron servo cut-out in wing.



Fit and epoxy wing dowel with wing taped to fuselage. Lower body fairing can be used for ballast.



A completely framed-up Ridge Runner prior to covering. Make sure the surface is glass smooth, and all nicks filled.



Two Ridge Runners, the one in foreground built by Ralph Kautz, Seattle Boeing Hawks. One of author's prototypes in rear.

doubler to the inside of each side. Glue the triangular longerons in place. Glue frame (6) and the tail end with the bottom on a flat surface. Squeeze the sides together at the nose and glue (4) and (5) in place. (Those new Kraft clamps are helpful here to clamp the sides together.) Add (3), (2), (1), (7) and (8) while positioning the body over the top view to check alignment. Use an 11 inch long sanding block and slide it fore and aft along the body frames to trim their height to insure a smooth top on the body. Chamfer the sides 45 degrees (except where the stab fits) with a plane and the long sanding block. Glue the two 45 degree top pieces in place. Plane off the top edges and glue the final top plank. Attach the nose block and chin block and shape the body. Add body-wing fillet blocks (optional) and shape using the wing to check the fit. Attach the wing hold-down blocks, servo mount, elevator pushrod and glue the aft lower body cover. Glass the body as shown on the drawing and finish resin overall. Primer and AeroGloss was used on the original.

Tail Assembly

The rather skinny tail fin was chosen to minimize the length of surface interfaces and associated interference drag. The low profile fin looks more rakish and would be a better choice if rudder is actuated. The dorsal should aid quick spin recovery. Construction is simple and parts should be covered prior to final assembly. The stab and fin reinforcement fillet strips should be attached to the body and fin prior to assembly.

Wing-Fuselage Fit

Fit the wing to body joint by trimming the fuselage as required. Periodically check the wing to horizontal stab alignment as the fit is adjusted. Measure the wing tip to tail cone distance to align the wing to the fuselage. Rubber band and tape the wing in place, trim the 1/4" dowel to fit along the wing lower surface, and epoxy in place. Measure the location of the wing hold-down screws, and drill pilot holes through the wing and body blocks. Remove the wing and tap the fuselage blocks with a 6-32 tap. Carve, glass, finish and epoxy the body fairing to the wing lower surface.

FLYING

Check the balance point. When balanced at the 30% MAC point the elevator should be set neutral. The aileron and elevator displacements shown are for aerobatic flying. If you feel unprepared, reduce the control surface travel to about 10 degrees each direction. Do not exceed 15 degrees aileron displacement because tip stall can be induced during low speed turns.

Now for some comments on aerobatics! All maneuvers should be started with enough lift (10-15 mph) and altitude (over 75 feet) to permit approach dives. Perform inside loops upwind and off to either side so the shape can be observed. Perform rolls parallel to the slope and position so the inverted part is in front of the pilot. Cuban 8's require a good speed margin to carry through the second half. Do this maneuver parallel to the slope.

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ABOVE and BELOW: SLO Racing Team, Gary Hover and Steve Woodward at 1974 RCM Trophy Races.



BELOW: Good winds, weather, fellowship – and thee. Slope pylon racing comes of age.







JIM JENSEN WINS FORMULA I AIR RACES

**Terry Prather sets pace at Bakersfield with fastest time of 1:17.1
with Joe Foster close behind at 1:17.2.**

BY DICK TICHENOR

The BARKS Club of Bakersfield, California, were hosts at what was undoubtedly the smoothest and most efficiently run major race we have ever seen. Seven rounds of racing were accomplished in both Expert and Standard classes during the two day weekend.

Racing consistency was at an all-time high with three perfect scores requiring a fly-off between Jim Jensen, Bill Preis, and Joe Foster for the first three places in the Expert Division, while Scott Johnson ran up a perfect score to take first in the Standard Class.

There were 47 Expert and 53 Standard entries. Contestants came from 12 states, which included 5 East Coast states, as well as delegations from Mexico and Japan. Model designs were dominated by Toni's, Minnow's, LR-1A's and Rickey Rats.

Safety is an all-important aspect of racing and the BARKS have accumulated protective barriers and communications equipment to provide the best possible conditions. A committee conducted a pre-race airworthiness inspection on each model to assure that the models would safely withstand the rigors of high performance racing. The models not only meet the stringent safety requirements, but every one of them displayed outstanding craftsmanship and beautiful paint jobs.

Close heats and fast times were routine

and should convince anyone that Formula I is not a declining event. Prominent names in Expert are still with us and going fast, but newer names are easing in. There are some promising pilots in the Standard Class who will be giving the Experts a run for the trophies before too long. Among them are youngsters like Steve Sica and Keith Davidson. There are newcomers like Angelo Sanchez who placed 5th in Standard in his very first race.

This reporter enjoys observing the side activity related to the races. Between heats many of the more serious pilots rework and balance propellers. The hot competitors inspect and completely check out their aircraft, attention to details makes for consistency in completing their ten laps. It is interesting to see the growing number of wives and girlfriends assisting and calling for the pilots. Growing in popularity are the motor homes being used to provide comfort and convenience for the modelers and their families. Increasing numbers of vans are allowing spacious transportation for the models and equipment. More and more full-size aircraft shorten the travel time to and from the contests. All of these things, plus visiting with old friends and the excitement of close races, make racing a most unique sport.

From Mexico City were the following group of modelers: Louis Castaneda, Jorge Amor, Paco Gonzales, Manuel Sierra, David Sopkin, Ramon Virgilio and

Salomon Lopez. While they did not take home the hardware, they were highly competitive and, in our opinion, they probably enjoyed the races more than anyone.

Speaking of distance, our friends from Japan traveled a long way to race. They are Messrs. K. Nakamura, Y. Murakami, N. Chujo, H. Nohara and S.H. Jikata. Charming Ms. Mareko Kobayashi accompanied the group and, while she doesn't race, she is a competent R/C sport flier. Prior to these races, Mr. Murakami held the fastest Formula I time in Japan. Mr. Nakamura ran a faster time of 1:23.2 at Bakersfield and then, later in the races, was able to turn 1:22.4. From all indications, these gentlemen will return to take home some of our hardware.

NMPRA President, Glen Spickler, was Contest Director for the fifth consecutive year — another superb organizational job for Glen. A well organized race of this size requires a large working staff. The BARKS are to be commended for their support of this event even though most of them do not participate in racing. Supplementing the BARKS manpower are numerous West Coast modelers who travel to Bakersfield to assist. Among them are Bob Bleadon and Dick Sonheim who kept everyone informed with the continuous words on the public address system. Our congratulations and appreciation goes to everyone who worked the BARKS races. □



1ST ROW: (L) Jim Jensen won 1st in Expert with his ST powered Toni. (R) Bill and Alice Preis, 2nd in Expert. First 3 places determined by fly-off to break perfect score tie. 2ND ROW: (L) Joe Foster, 3rd in Expert with second fastest time of Meet. (R) Dennis Osborn, left, 3rd in Standard. George Templin, caller. 3RD ROW: (L) Jim Maki, MAN PPP, came from Florida for Meet. (R) Bob Violet with his promising new Loki. 4TH ROW: (L) Mike Atzei, Sr.; left, called for son, Mike, who entered first race in Expert. (R) George Flynn polishing LR-1A, Rickey Rat in foreground. 5TH ROW: (L) NMPRA Editor, Jay Replogle, and wife Chris. (C) This happy group from Mexico had fun! (R) NMPRA President, Glen Spickler, welcomed the delegation from Japan. 6TH ROW: (L) Gary Hawk was 2nd in Standard Class. (C) Ed and Carol Hotelling took 5th in Expert - Carol calls for Ed. (R) Keith Davidson, 81C, 6th Place, and Steve Sica, 64C, 10th. These hot young men won't stay in the Standard Division very long.





1ST ROW: (L) Part of nearly 200 Formula I racers lined up for scale judging. (C) Ready line for a heat in Expert – Condra, Prather, Smith, and Lee. (R) John Creagh, left, called for Tony Lopez. Becky Lopez on right. **2ND ROW:** (L) Orbit's Eloy Marez, left, assisted Ron Gilman with 75C. (C) Scott Johnson was 1st Place in Standard with his caller Jeanine Jahelka. (R) Terry Prather was 4th in Expert. Terry took Fastest Time Trophy with 1:17.1. **3RD ROW:** (L) Tony Amezcua getting it all together. (R) A beautiful Thunder Chicken – pilot unknown. **4TH ROW:** (L) Jim Maki's Minnow – an ever popular design. (R) And another one, this time Sigi's Minnow. **5TH ROW:** (L) This flight line action was repeated many, many times. (R) A beautiful array of trophies for the victors. The Fast Time Perpetual Trophy is on the far right. **6TH ROW:** (L) We interrupted the hard working tabulation crew for photo: Left to right, Vicki Boyce, Jeannie Christiansen, Ann Redwine, and Bob Bleadon. (R) Most of the volunteer workers that staffed the races . . . fantastic job, folks!





ABOVE, LEFT: A few of over 25 fly-in aircraft. ABOVE, RIGHT: Dave Lane and Jack Stafford. RIGHT: Motor homes provided comfort for many modelers and their families. BELOW, LEFT: Safety inspection crew Jack Lee, Frank Leggio, Kent Nagy, and Ron Schorr watch how Jim Maki gets a hot engine with a cigarette lighter. BELOW, RIGHT: Joe Zdankiewicz and Jim Rogers. BOTTOM ROW, LEFT: Ron Schorr in the midst of a weight check. BOTTOM ROW, RIGHT: Jeff Bertken and Kent Nagy modifying propellers between heats.



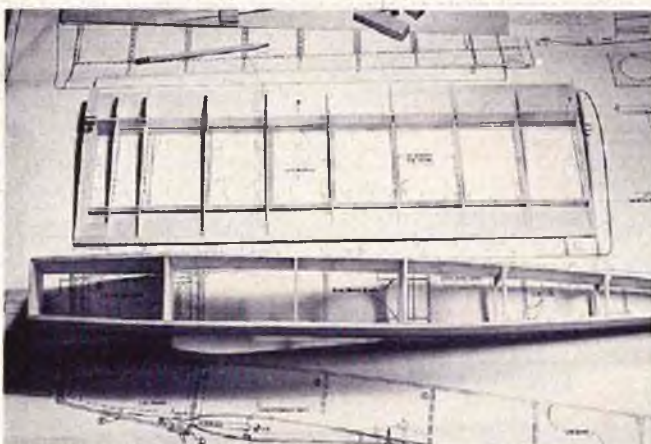


TOP ROW, LEFT: George Killeen doin' his thing. TOP ROW, RIGHT: Clarence Lee, right, was there with his engine expertise. SECOND ROW, LEFT: The K & B crew was backed up with a bevy of beauties. SECOND ROW, RIGHT: Joe Martin and caller. ABOVE, LEFT: Bob Smith now has wife, Cathy, working on his racers! ABOVE: A small part of the BARKS safety and communications equipment. LEFT: S.H. Jikata and K. Nakamura from Japan.

RCM PRODUCT TEST

GLENN SPICKLER RADIOMODELS

QUICKIE 500



● The Quickie 500 is a club type sport racer manufactured by Glen Spickler Radiomodels, 4208 Santa Cruz Street, Bakersfield, California 93307. With a wingspan of 50" and a constant chord of 10", the total wing area is 500 square inches. It is designed for .19 to .55 cubic inch displacement engines with a .40 being recommended for club racing events. The kit is of conventional balsa and plywood construction with landing gear, wing hold-down screws and washers, hinges and control horns included in the hardware package. All parts are machined and fit perfectly. This is an extremely easy to construct aircraft and every piece of balsa in the kit is used with no scrap left over. All-up weight of the aircraft is 3½ pounds with RCM's prototype being covered with silk and butyrate dope. A K & B front rotor .40 and Orbit radio was used in our prototype.

The Quickie 500 is designed for pylon racing for the novice or for fun events and club racing. It is an extremely easy aircraft to fly and land and the landing gear design and location makes extremely easy tail dragger take-offs. The kit is extremely well thought out and all kit parts fit perfectly. Material selection included in the kit was excellent. The only recommendation we would make is that the plans should show the location of radio and servos for the benefit of the novice flier. An outstanding kit priced at \$39.50. □

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging	●					Pre-Shaped Parts	●				
Plans	●					Parts Match to Plans	●				
Written Instructions		●				Overall Parts Fit	●				
Quality of Hardwood	●					Ease of Assembly	●				
Quality of Fiberglass			NA			Fidelity to Scale			NA		
Other Materials	●					Flight Performance	●				
Accessories	●					Overall Appeal		●			
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

SPECIFICATIONS

Name Quickie 500
 Aircraft Type 500 Racing
 Manufactured by Glen Spickler Radiomodels
 4208 Santa Cruz Street
 Bakersfield, California 93307

Mfg. Suggested Retail Price \$39.50
 Available From Manufacturer and Retail Outlets
 Mfg. Recommended Usage Competition
 Wingspan 50 inches
 Wing Chord 10 inches
 Total Wing Area 500 sq. in.
 Fuselage Length 37 inches
 Radio Compartment Dimensions (L) 10" x (W) 2¾" x (H) 2½"
 Wing Location Low Wing
 Dihedral (each tip) 1½ inches or 4 degrees
 Airfoil 15% Symmetrical
 Wing Planform Constant Chord
 Stabilizer Span 16 inches
 Stabilizer Chord (incl. elev.) 6 inches (average)
 Total Stab Area96 square inches
 Stab Airfoil Section Symmetrical
 Stabilizer Location Top of Fuselage
 Vertical Fin Height 5¾ inches
 Vertical Fin Width (incl. rudder) 5½ inches (average)
 Mfg. Rec. Engine Range19 - .55
 Recommended Fuel Tank Size 8 ounce
 Landing Gear Conventional
 Recommended No. of Channels Four
 Recommended Control Functions Rudder, Elevator, Throttle, Ailerons

Basic Materials Used In Construction:

Fuselage Balsa, Plywood
 Wing Balsa
 Tail Surfaces Balsa
 Hardware Included In Kit Landing gear, wing hold-down screws
 & washers, hinges, control horns

Plan Size 35" x 45" (1 sheet)
 Building Instructions on Plan Sheets No
 Instruction Manual Yes (2 sheets)
 Construction Photos No
 Kit Includes Shaped parts
 Mfg. rec. flying weight 3½ lbs.
 Wing loading based on rec. flying weight 16 oz./sq. ft.

RCM PROTOTYPE

Weight, ready to fly: 3½ lbs.
 Wing Loading 16 oz./sq. ft.
 Covering and finishing materials used Silk and Dope
 Engine Make and Disp. K & B FR40
 Muffler Used No
 Radio Used Orbit
 Tank Size Used 8 ounce

PLYWOOD AND FOAM WHEEL PANTS

By John G. Chapis

There are many different methods for constructing streamlined wheel pants for your R/C aircraft, including fiberglass half shells, the conventional built-up balsa and plywood wheel pants, and this method of constructing a pair of streamlined wheel pants from plywood and styrofoam.

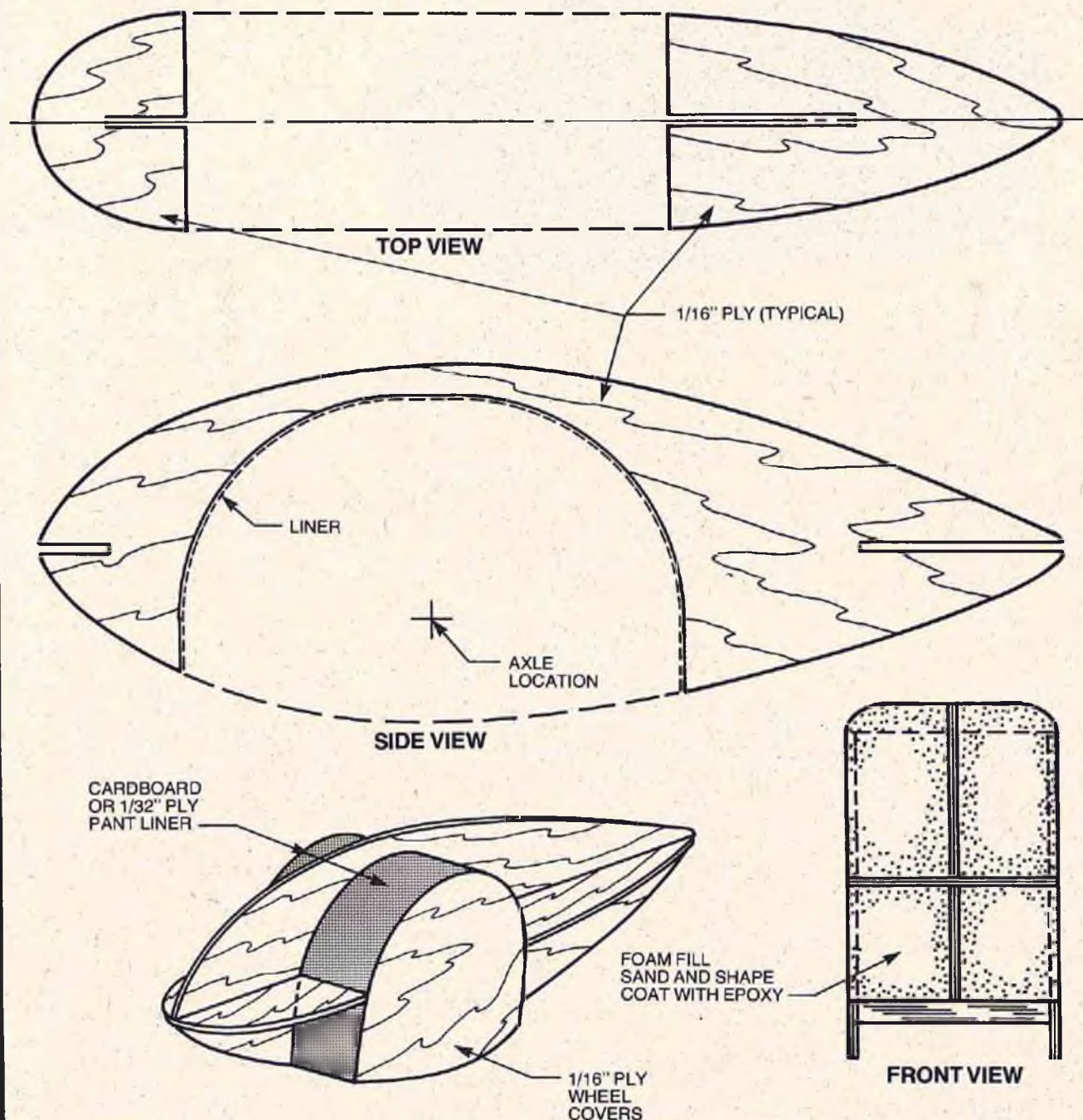
The advantages of this method is that virtually any shape can be fabricated in a

minimum amount of time, resulting in an extremely strong and light weight wheel pant. Construction is begun by making a side view drawing of the size and style of wheel pant you wish to use on your particular aircraft. This side view is then transferred to a piece of 1/16" plywood and cut out as shown in the accompanying sketch. A 1/16" notch is cut in both the fore

and aft portions of the 1/16" plywood profile.

A 1/32" plywood, or cardboard, pant liner is then cut out and glued in place on both sides as shown in the drawing. 1/16" plywood fore and aft pieces are then cut out and notched as shown in the top view and glued in place on the 1/16" plywood profile

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M4 SHERMAN 105mm HOWITZER

MRC-TAMIYA TANK IS AN OUTSTANDING EFFORT IN RADIO CONTROL SCALE REALISM



Manufactured in Japan by Tamiya, the M4 Sherman tank, distributed in the U.S. by Model Rectifier Corporation, is designed for two channel operation. This magnificent radio control project is outstanding in both performance and scale realism. Its dual electric motors and 100:1 gear ratio enable it to climb a forty degree grade with ease.

**Prototype By Dick Kidd
Text By Don Dewey
Photos By Barbara Norton**

● The M4 Sherman 105mm Howitzer tank, manufactured in Japan by Tamiya, world renowned for their detailed scale models, has been imported for U.S. distribution by Model Rectifier Corporation, 2500 Woodbridge, Edison, New Jersey 08817.

The M4 Sherman tank requires two channels of a digital proportional system and six D-cell batteries or a 6 volt 4 amp storage battery for operation. The overall length of the tank is 360mm with a width of 183mm and an overall height of 200mm. The all-up weight of the tank is approximately nine pounds with the weight varying according to the type of radio control mechanism used as well as to the type of batteries.

The power plant consists of two Mabuchi RS-360 G motors which have been fixed to the gear box at the Tamiya factory. The power source for the clutch and drive mechanism can be six D-size dry cells, rechargeable nickel cadmium cells, or a six volt 4 amp storage battery such as a Gel/Cell battery. Dry cells are not recommended, however, due to their short life.

The chassis of the Sherman tank is of aluminum while the sprocket wheels are zinc die castings. Both the road and idler wheels are ABS plastic with solid rubber tires. The support rollers are also formed of ABS plastic.

The tracks for the M4 are stamped metal and plastic, consisting of independent links. The tension can be adjusted by sliding the idler wheel support. The suspensions are die cast zinc and are movable by coil springs. The body is ABS plastic and both the turret

and gun are movable manually. The gear box is all metal and assembled and fitted with motor and clutches at the factory. All gears are of brass or die cast white metal.

The maximum speed of the Sherman tank is approximately 56 feet per minute with a maximum gradient of approximately 40 degrees. Movement consists of digital proportional control of forward and reverse plus sharp turn and slow turn. The duration of run is approximately 90 minutes on a 6 volt 4 amp storage battery or 60 minutes on 6-D size dry cells.

With regards to the model, it is a masterpiece of scale realism of the famous late model 105mm Howitzer, the U.S. main tank M4 Sherman Series (M4-M4A6) which, in World War II, recorded a total production of about 50,000 units. These Sherman tanks lead the Allied Forces to victory and gave undying glory to the pages of tank history. The M4 Sherman 105 Howitzer, as its name indicates, combined the M4 Sherman body with a 105mm Howitzer. There is an early model and a later model, the former equipped with vertical suspension system and narrow tracks. The later model, however, had a horizontal suspension and broad tracks which gave better mobility in flooded ground. 841 of these units were manufactured by the Detroit Arsenal from October 1944 to March 1945 and used by the Tank Battalion Headquarters Companies and the Tank Company Headquarters of Armored Divisions. These tanks demonstrated activity and fire support by exercising the power of their main gun.

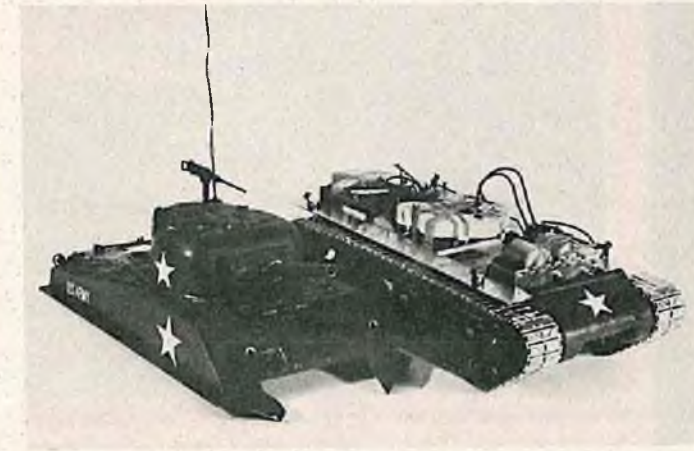
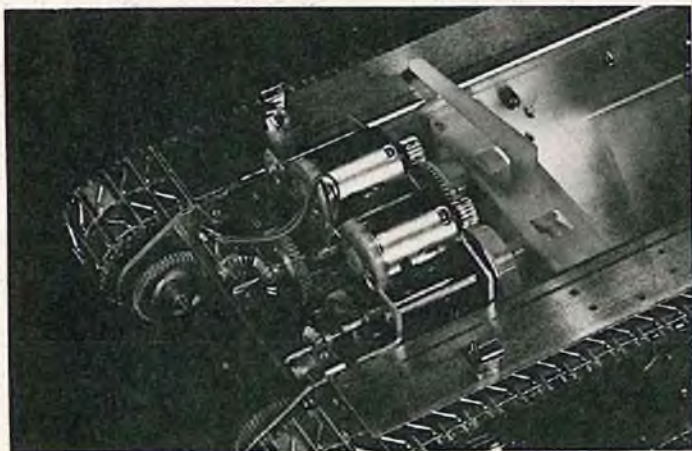
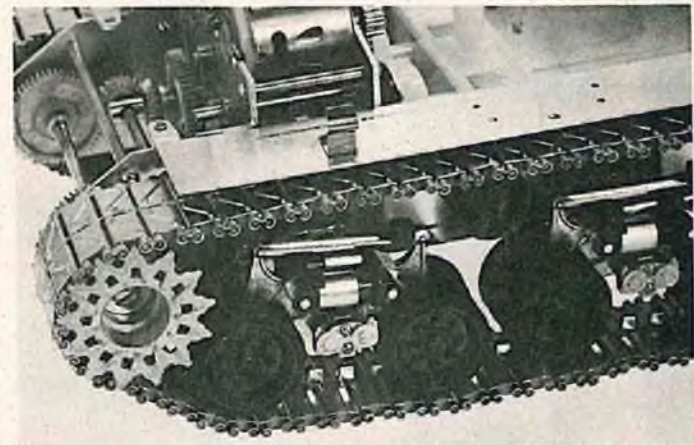
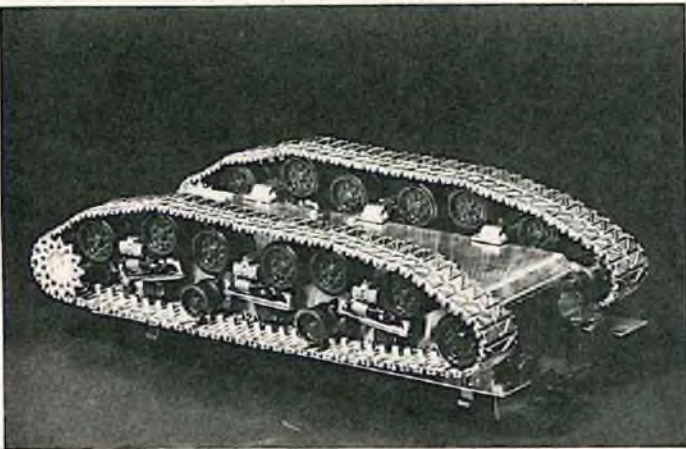
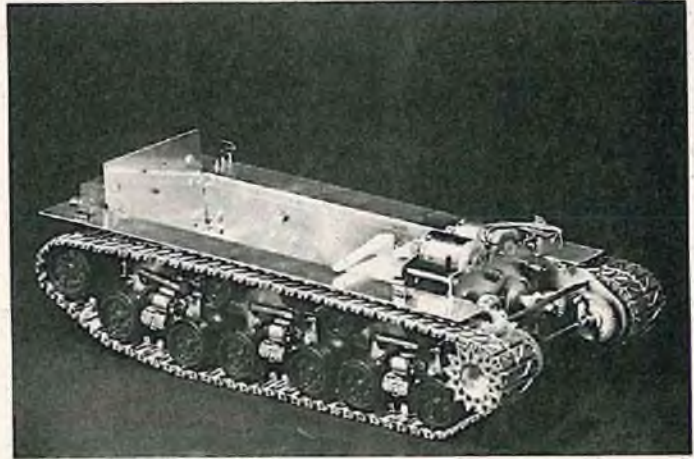
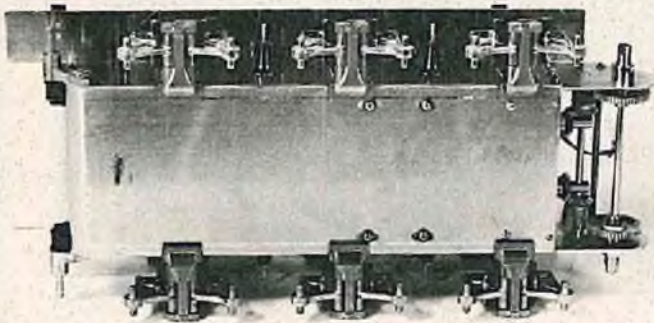
The model of this famous tank, imported by Model Rectifier Corporation, is truly a work of art as you can see from the accompanying photographs. The instruction manual is profusely illustrated with every drawing necessary to supplement the step-by-step instructions — in fact, it is one of the most complete construction manuals we have seen accompanying a model of any type. In addition, there is a secondary manual which explains the functions of radio control in general and, specifically, its application to the M4 Sherman. Throughout both of these excellent manuals there is only one error which was step 14, wherein the forward part of the upper hull was called out as part A9 which, in fact, should be A6. This was a very minor error in an otherwise extensive and extremely comprehensive manual.

Our prototype was not painted before assembly since we were in too much of a hurry to finish it. Some of the metal parts on the suspension arms were painted flat black after assembly but, as mentioned in the manual, all painting should be done as assembly is being completed. Only a few extra hours are required to do it up exactly right according to the manual.

We did enlist some additional help in assembling the tracks since these consist of individual shafts, track shoes, and links and an extra pair of hands is certainly an asset in this stage of construction.

Although several types of glue are provided for the different types of materials, we used Zap throughout the assembly and

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**A Small, Lightly Loaded .15 Powered, Stand-Off Scale
Biplane For Relaxed Sport Flying**

DH-6

Before any of you scale purists begin writing in to complain about the scale fidelity of this particular model please let me explain its origins. Its real genesis was as one of Walt Mooney's very fine peanut scale rubber models. Being a fan of Walt's articles on peanuts, I was really intrigued with the DH-6 when it appeared and noted that its fine lines, all straight, would make a nice R.C. job.

After noodling it for awhile, I settled on a 3X magnification, or Brazil nut scale, which made for a nice .15 size airplane and also matched a set of wing rib templates I already had on hand. It was only after I had drawn plans and begun construction that I discovered that Walt had made some extensive changes to adapt the airplane to rubber power. What evolved is a very, very semi-scale DH-6, but one helluva good scale (3" = 1") model of a peanut scale rubber powered airplane!

Aside from the fact that it is not exact scale, you must admit it makes a very interesting scale type airplane. The flying characteristics are excellent with no tendency to ground loop on take-off and a slow, stable flight. If you're an expert looking for a change of pace or a novice with hankering for something different, yet easy to fly, grab some balsa and have at it.

CONSTRUCTION

In describing the construction I will assume all pieces are cut out beforehand and describe just the assembly unless some special cutting instructions are required. Since weight is not a serious problem on this airplane, select your balsa with more of an eye to strength.

Fuselage:

(1) Laminate the 1/32" ply doubler to the 3/32" sides using contact cement then mark the location of the bulkheads, the cabane struts and engine mounts on the inside of each side (be sure to make a right and a left side).

(2) Epoxy the engine mounts to the sides and glue the 1/8" x 1/4" spruce along the bottom of each side.

(3) Assemble two forward and two aft cabane struts and epoxy them in place being sure they are properly aligned by checking

against the plans and each side against the other.

(4) Glue the remaining longerons and uprights in place on each side except for the triangular stock behind bulkhead F5.

(5) After everything is dry or cured, lightly score the inside of each side at the aft end of the 1/32" ply doubler, just behind F5, and crack the side slightly to the center.

(6) Position bulkheads F3 and F5 on the top view of the plans and epoxy or "Hot Stuff" the sides in place being sure everything is positioned.

(7) Pull the sides into position at the tail and glue together.

(8) Install bulkheads F1, F2, F4, F6 and the top 1/8" square crosspiece in place.

(9) Remove from the plans and glue the floors in place between bulkheads F1 and F2 and between F2 and F3.

(10) Fit the triangular stock behind F5 and glue in place along with the 1/8" square crosspiece on the bottom.

(11) Glue the 1/8" sheet on the sides of F1, F2 and F4. Sand in the required bevel after they're dry and glue the top sheet in place.

(12) Install the tailskid assembly and F7.

(13) Glue the bottom sheeting, plywood gear mounts, top turtledeck sheeting and stab platform in place.

(14) Sand off all the ragged edges and install the 1/8" sheet on the nose and then the 3/8" nose block.

Wings:

All the wing ribs are the same except for wood thickness, so the easiest way to make them is to bolt blanks of the required thickness between two aluminum or plywood templates and sand them to shape. The false ribs were put on only as a finishing touch and may be left out if you so desire. The following is for the lower wing and upper outboard sections:

(1) Cut your trailing edge material from 2" sheet by slicing it down the center using a long straight edge; this will insure one straight edge.

(2) Pin the leading and trailing edges in place over the plans. Be sure to place the straight edge of the T.E. on the rear edge of the wing.

DH-6

Designed By: Paul Strengell

TYPE AIRCRAFT

Stand-Off Scale — Sport

WINGSPAN

39 Inches

WING CHORD

7 Inches

TOTAL WING AREA

540 Square Inches

WING LOCATION

Biplane

AIRFOIL

Flat Bottom

WING PLANFORM

Constant Chord

DIHEDRAL, Each Tip

1 Inch

O.A. FUSELAGE LENGTH

30 3/4"

RADIO COMPARTMENT AREA

(L) 7 1/2" X (W) 2 1/2" X (H) 2 3/4"

STABILIZER SPAN

15 1/8 Inches

STABILIZER CHORD (incl. elev.)

6 1/2"

STABILIZER AREA

99 Square Inches

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Top of Fuselage

VERTICAL FIN HEIGHT

4 3/8 Inches

VERTICAL FIN WIDTH (incl. rudder)

5 Inches (Average)

REC. ENGINE SIZE

.15

FUEL TANK SIZE

2 1/2 Ounces

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

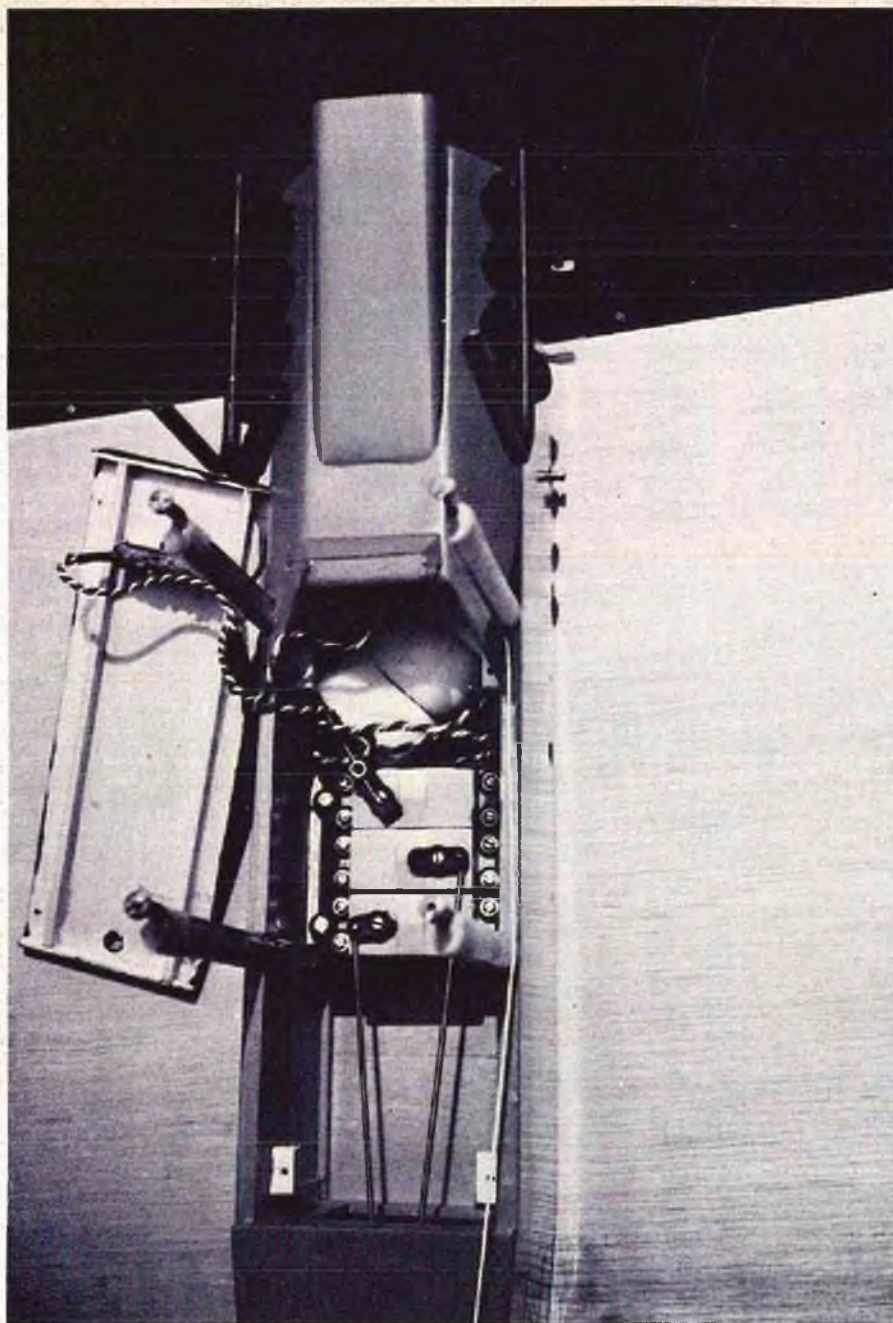
Three

CONTROL FUNCTIONS

Rudder, Elevator, Throttle

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Ply, Spruce and Balsa
Empennage	Balsa
Weight Ready-To-Fly	42 Oz.
Wing Loading	11 Oz./Sq. Ft.



Simple three servo installation in Paul Strengell's DH-6. A vintage biplane with realistic flight performance for everyday sport flying.

(3) Pin and glue all the bottom cap strips in place; note the wider capstrip at the root ribs and the strut ribs.

(4) Pin and glue the bottom 1/8" x 1/4" spruce spar in place over the capstrip.

(5) (a) On the bottom wing sections only, glue all ribs in place being sure the strut ribs and plywood tubing support rib are in their proper location. Then glue in the top spar, the top trailing edge piece, the 1/8" square T.E. piece and all the top capstrips. This finishes the bottom wing sections except for sanding and fitting tubes.

(5) (b) On the upper wing sections install all the ribs except the root rib and the one adjacent to it. Install the top spar. Glue the 1/32" plywood strips on both sides of the spars at the center to form a box for the wing

joiner spar. Be sure the spars are kept apart the proper distance to allow insertion of the joiner spar. Cut a 1/4" R-2 rib and a standard 1/16" R-1 rib apart and fit into their proper location on each side of the spar box. Install the top trailing edge piece, the cap stripping and the 1/8" square trailing edge piece to complete the top wing sections.

(6) For the upper wing center section, first mark the location of the cabane struts off to the side of the end ribs and then pin the leading edge, bottom sheeting and trailing edge on the plans.

(7) Pin and glue the joiner spar in place over the bottom sheeting.

(8) Cut and fit three 1/8" ribs to fit as shown. Be sure the end ribs are vertical.

(9) Glue the cabane strut blocks in their proper location along with all reinforcing pieces, then apply the top sheeting.

(10) Carefully sand the dihedral bevel on each root rib of all four wing sections (top and bottom). If you have a table or radial arm saw they are an ideal way to cut the bevel. If not, block up the tip one inch with the root rib aligned with the edge of your work bench and, using the work bench edge as a guide, sand in the bevel angle.

(11) Spread epoxy (do not use a water base glue like Titebond or white glue) on the joiner spar and upper wing root ribs and slide the outboard wing sections onto the center section. Pin the center section to the bench and block the tips to be sure you have the one inch dihedral under each section.

(12) Fill in the trailing edge of the first bay of each wing section with balsa and then install gussets as shown.

(13) Cut out the slots in the capstrip for the wing struts on each strut rib.

(14) Shape the leading edges and sand the entire structure. Wrap the upper wing dihedral joints with 1/2" nylon tape and glue.

Empennage:

The tail feathers really need no explanation, just make good glue joints to prevent warping. They could be made of soft 3/16" sheet, but this could result in some tail heaviness so use your own judgement.

Miscellaneous:

The landing gear is self explanatory, just bend and solder. The engine mount can be made from aluminum or plywood. The aluminum will probably vibrate less.

The wing struts just need to be rounded off and sanded. The dummy engine cylinders can be cut from 5/8" birch dowel or made any way that suits your fancy (they can even be left off). I bent the exhaust pipes from 3/16" aluminum tubing. Pack the tubing full of sugar and crimp each end closed with pliers (this will help prevent collapsing) and carefully bend around something of the appropriate diameter. Cut to the right length and remove the sugar (don't throw it away)!

Wing Assembly:

(1) Drill 5/32" holes in the fuselage for the lower wing tubing. Slide two pieces of 1/8" brass tubing through the holes and then slide the lower wings into place. Set the fuselage bottom flat on the bench and block each wing tip up 1" for the proper dihedral angle. Carefully apply 5-minute epoxy around each tubing inside the fuselage and at each wing rib they contact. After the epoxy has set, remove from the bench and saw the tubing in two at the wing/fuselage joint using a razor saw. Epoxy the tubing reinforcing strips in place in the wing sections and the fuselage.

(2) Install the hooks in the lower wing sections. After the hooks are dry, slide each section onto the fuselage using 3/32" wire wing rods; mark the hook location on the fuselage and drill it out to accommodate the hooks.

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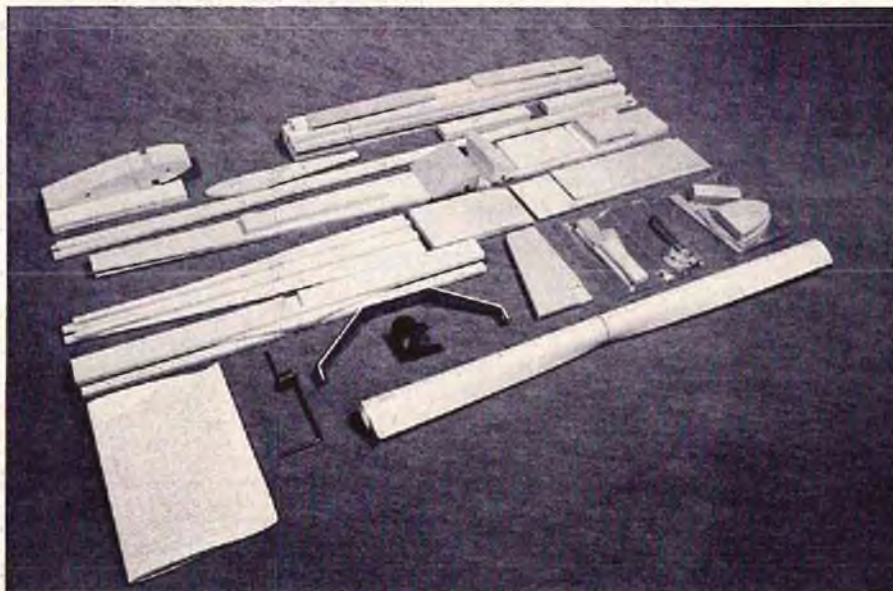


Bridi Hobby Enterprises "T-20", the subject of this and the next two parts in this series.

NOVICE CORNER

Ben Strasser takes you through a three part how-to series on building a popular kit trainer, installing your equipment, and preparing it for your first flight.

The first step is to unpack the kit. Using the plans, completely familiarize yourself with the machine cut parts, hardware, and the locations where the wood strips and sheeting provided will be used.



● The sharp looking T-20 (Trainer 20) is manufactured by the house of Kaos, Bridi Hobby Enterprises, at 1611 E. Sandison Street, Wilmington, California 90744. A recent addition to their line of high quality kits, the T-20 is based on the design of the RCM Trainer .60 that was created by Don Dewey and Joe Bridi several years ago. It has a wing span of $45\frac{3}{4}$ "', a wing area of 412 square inches, is $38\frac{1}{2}$ "' long, and flies from 3 to $4\frac{1}{2}$ pounds.

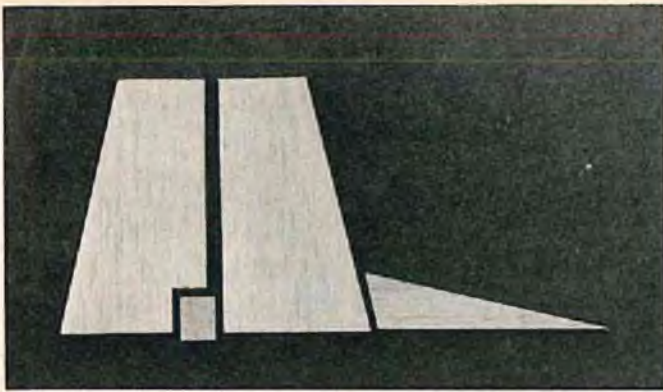
We believe that any "first plane" type trainer should have a tricycle landing gear as the T-20 does. That makes the ground handling like running a radio controlled car and saves props on those "too much nose down" landings that are to be expected of new pilots. When it comes to the radio installation, even though the T-20 is a small plane and built for a .19-.25 cu. in. engine, the fuselage is as wide as many .40 sized airplanes in the servo compartment area. As a result, the radio installation is easier because you have some room in which to work.

While the plane is rugged and stable for those first flights and landings, probably the feature we like most about the T-20 is that it is one of the few small engine size trainers available in kit form with a full symmetrical airfoil; with the top of the wing the same shape as the bottom. Because of this airfoil the T-20 is stable and predictable in the air with absolutely no snap roll tendencies. It grooves in for the landing without any floating so you can put it down where you want it. But more important, when you're ready to fly a loop, the plane's ready and able. When you're ready for an axial roll, it's eager. Inverted flight, a Split "S", a spin, a Hammerhead Stall, a Cuban Eight, and so on are all second nature to this one. In other words, while some trainers are only good for those first flights when you want to fly around in circles to figure out what it's all about, that's not true of the T-20. You don't have to shelve it when flying in circles gets dull. Get better as an R/C pilot and the T-20 gets better with you.

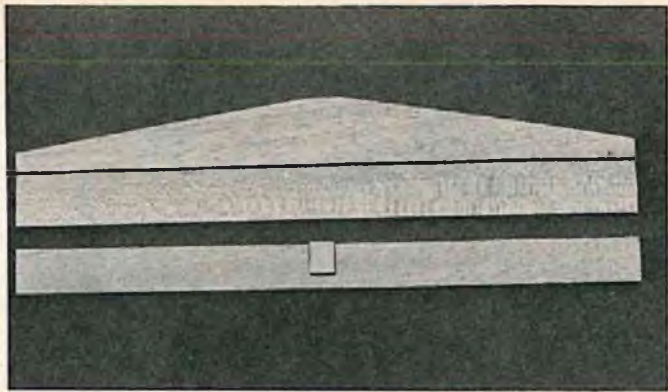
Designed to fly on 4 channels with throttle, rudder (which is connected to the steerable nose gear), elevator, and aileron controls, the plane can be fun with just throttle, elevator and aileron controls. If the T-20 is to be your first plane we recommend you build it as designed, using the dihedral for the wings that is built-in by the center tapered wing rib. However, if you've already flown a glider or other trainer before this one and you want to use it to learn to fly some of the maneuvers, reduce the dihedral called for by half. If you do so you'll find that the inverted flight will be easier to hold and the axial rolls will be smoother.

With balsa and plywood used throughout, the Bridi Hobby Enterprises T-20 is priced at \$34.95 (with the wing kit alone priced at \$15.95) and is available at all hobby dealers throughout the United States. When you open the box you'll find that the pieces are conveniently packaged and easy to find. All of the factory cut parts are

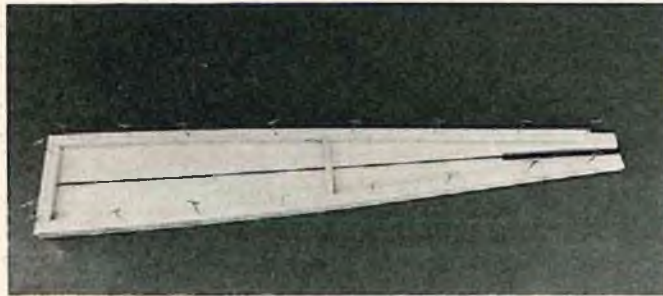
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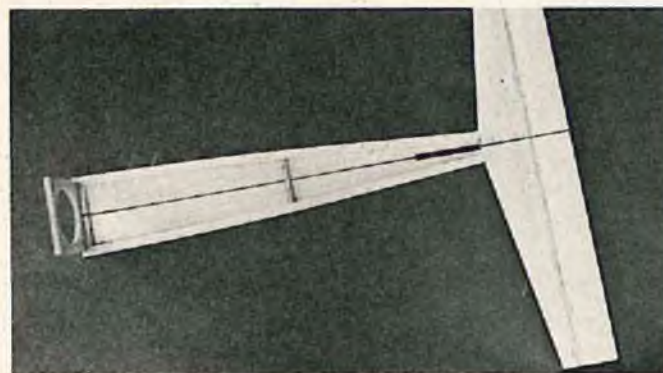
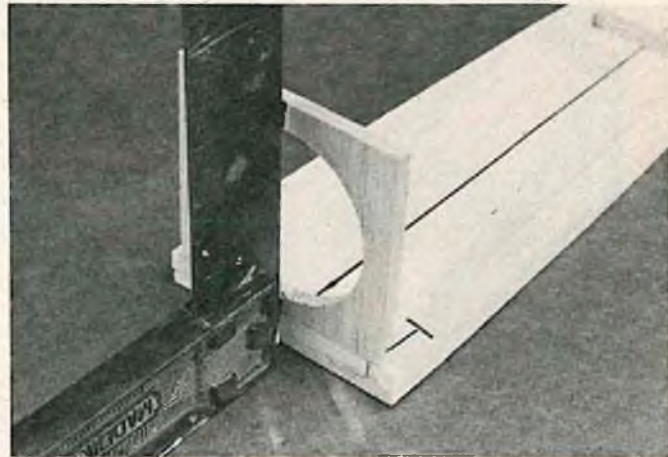
Rudder, vertical and dorsal fin parts. Glue the pine insert into the notch in the rudder.



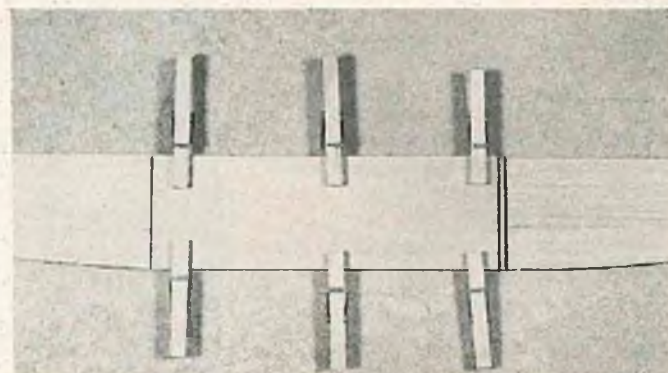
Begin construction by gluing the pine insert into the notch in the rudder and elevator. Then the stab sections are glued together.



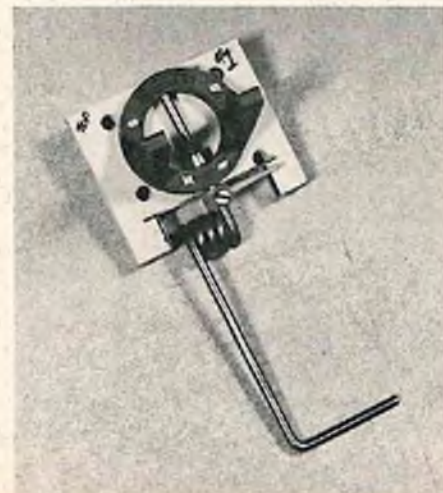
ABOVE: Gluing the stringers and cross braces to the top block. Note the center line drawn down the top block. RIGHT: After the stab is glued to the top block, bulkhead #3 is added.



The completed top block assembly ready for the fuselage sides.



Clothespins used to clamp fuselage doubler to side.



LEFT: Bulkhead #1 prepared for installation. ABOVE: In Part II we'll finish up the airframe.



Quarter Midget

QUARTER MIDGET

BY DON DOMBROWSKI AND FRED REESE

DON DOMBROWSKI



● As we were preparing this month's article, Don learned of the import of 1000 Rossi RC .15 engines by J.T. Finley Co. distributors, and that the engines have been declared legal by the AMA Contest Board for the 1975 Nationals. We have ordered two for evaluation and we will report their performance as soon as possible. The engine sounds good from the performance figures we have heard but the price will be \$97.00 each!



The following is an article by Bob Waechter, secretary of the Middle Tennessee Radio Control Society reprinted from their official bulletin, "The Glow Plug." QUARTER MIDGETS! Fly for Fun.

Participation in Quarter Midget racing by experts as well as the novice flyers is a truly satisfying and sometimes rewarding sport. It is an event that attracts more beginners with its excitement and competitive spirit with each passing year. Much has been written lately about Quarter Midget racing; but unfortunately, most of the criticism is aimed at either changing, altering or in some way butchering the very theme of this exhilarating sport. Some would advocate the 4,000 rpm idle, while others keep bickering over the super thin "profile" appearance of planes, still others support two classes (Novice, Expert) at contests, and some even consider Quarter Midgets too fast.

Hey, wait just a minute fellows! When Quarter Midgets first came on the scene around 1969, it was aimed at one thing — to provide an outlet for flyers who loved the

RACING CALENDER

SEPTEMBER

- 6-7 FI — Balston Spa, NY
- 6-7 Air Circus — Whittier Narrows, CA
- 6-7 QM Nats — Rough River State Park, KY
- 13 Quickie 500 & SP — Monroe, NC (SEMPRA)
- 12-13-14 Reno National Air Races — Reno, NV
- 13-14 FI — Sepulveda Basin, CA (Valley Flyers)
- 14 1/2A & SP & Picnic — Centerville, VA (NVRC)
- 14 QM & Quickie 500 — Tamiami Park, Miami, FL (Tropic Aeros)
- 14 QM — Independence, IA (NCPL)
- 14 FI — Monroe, NC (SEMPRA)
- 21 QM — (MARA)
- 21 1/2A — Long Island, NY (LIRCS)
- 21 QM & FI — Woodland, Chicago, IL (CPC)
- 21 1/2A — Sunnyvale, CA (Pioneers)
- 27 QM — Charlotte, NC (CAM), (SEMPRA)
- 28 Quickie 500 — Charlotte, NC (CAM), (SEMPRA)
- 28 1/2A & SP — Centerville, VA (NVRC)
- 28 QM — Lebanon, PA (PNA)
- 28 Quickie 500 — Sacramento, CA (CMM)
- 28 QM — London, Ontario (Forrest City Flyers)

OCTOBER

- 4 Quickie 500 & SP — SAC Field, Flossmoor, Chicago, IL (CPC)
- 5 QM & FI Regional — SAC Field, Flossmoor, Chicago, IL (CPC)
- 4-5 QM — (MARA)
- 5 1/2A — SP — Centerville, VA (NVRC)
- 12 QM — York PA (CPNA)
- 12 QM — (MARA)
- 19 1/2A & SP — Centerville, VA (NVRC)
- 19 1/2A — Sacramento, CA (CMM)
- 25 Quickie 500 & SP — Monroe, NC (SEMPRA)
- 26 FI — Monroe, NC (SEMPRA)

NOVEMBER

- 9 QM & Quickie 500 — Tamiami Park, Miami, FL (Tropic Aero)
- 16 1/2A — Sunnyvale, CA (Pioneers)
- 23 Quickie 500 — Sacramento, CA (CMM)
- 28-29-30 QM West Coast Championships — Chula Vista, CA (RCM & Chula Vista RC)

FRED REESE



thrill of racing, but hated the money, time and technology needed to fly those expensive and fast FAI, Formula 1 Goodyear racers competitively. Hence, the birth of Quarter Midget racing was seen.

Now it seems that the same bickering and destructive thoughts which once plagued those same expensive racers (and is hastening their demise) is growing (amongst some) today in the Quarter Midget circles.

Most of the complaints today are from those select few who want to minimize almost everything to such an extent that the very life-line of the sport is severed. These same few people would advocate strict enough rules so the novice flyer would be literally "pushed out" of the competition. Let's keep it simple, and broaden the field in order to entice the beginner — not scare him away. Well, in an attempt to end all chatter about change, a little "constructive" criticism follows that may just be of benefit to those habitual complainers and to the true blue novice flyer.

There is a very simple formula that can be followed to insure even the novice flyer (with minimal dollars and time) a chance to compete with and often times beat the so-called Experts of Quarter Midget racing. Surprisingly enough; the formula, in part, is taken from the Quarter Midget section of the AMA rule book. Read carefully the following; and you too can be collecting the trophies, kissing the pretty girls, and endorsing products.

(1) Design: Begin with a design or kit that has proven itself extremely stable — not

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Action shots of the race-horse starts in Nashville, Tennessee.



ABOVE: Bob Reuther's winning 'Miss Cosmic Wind.'
 ABOVE, RIGHT: Gayle Jacobson prepares to unleash the fury of Austin Leftwich's 'Little Gem.'
 RIGHT: Bill Pachak (Pueblo, Colo.) watching helper show Bill's 'Lil Gem' to the flagmen prior to fourth heat of the Rocky Mountain 1/4 Midget Pylon Racing Association's first race of the 1975 season, May 18.
 'Lil Gem' mid-aired with Jack Aycock's 'Rickey Rat' within two laps (Aycock, kneeling, third from left).

NRCHA

BY DON DEWEY (N1A)



● We would like to start off this month's column by extending our congratulations to the NRCHA members listed below who have achieved Grade Levels 1, 2, or 3 in the NRCHA Grade Level Proficiency Program since the last listing. With membership in the National Radio Control Helicopter Association rapidly approaching the two thousand member mark, we hope to see more and more of you participating in this achievement program and earning your various Grade Level Proficiency Certificates. And, by the way, we are looking for the first member to achieve Grade Level 4 — it's a rough one, and it will take time, but it can be done.

As you look at the listing of the NRCHA members who have most recently completed their grade level tasks, you will notice that virtually every type of helicopter, engine, and radio combination have been used including a couple of members who have used the Du-Bro Whirlybird. If you compare the above grade level proficiency read-out charts to the ones printed a few months ago, you will see that virtually every brand of radio has been used successfully in R/C helicopters — and this should disprove the rumors we've heard that certain radios will not work in R/C helicopters. This simply isn't true. Granted,

there may be an occasional radio that is extremely noise sensitive, but by in large all radio systems will work in today's modern helicopters.

• • •

We are also pleased to announce that, while the NRCHA has a Regional Director for almost every overseas Country, we have appointed a Director for all of Europe. This is Jean Bernard Maeterlinck (N1BL) whose address is 65, Frere Orbanlaan, 65, 9000 Gent, Belgium. Bernard is an attorney in Belgium who speaks and writes fluently in several languages, thus enabling the NRCHA to present its grade level programs in several different languages other than English. Bernard has established an NRCHA office in Belgium and has been translating the NRCHA grade level program into several different languages, and has been successful in establishing an NRCHA column in various overseas model magazines. This has enabled the growth of the NRCHA to expand greatly by reaching European helicopter enthusiasts who do not read or speak English. Our thanks to Bernard for his efforts on behalf of the NRCHA, and we welcome all overseas helicopter enthusiasts to the ranks of the NRCHA.

Bernard also forwarded to us a modification that will be of interest to Kavan Jet Ranger owners. As Bernard points out, a factory modification was sent to all Jet Ranger owners who filled in their warranty card. This factory modification changes the previous Bell rotor system (gyroscopic) to a Hiller system (servo rotor). However, the problem is that the links controlling the servo rotor paddle incidence not only moves when the cyclic is applied, but also when collective is fed in, since collective is obtained by moving the swash plate parallel up and down. While this has no effect on the rotor cyclic, this increases and decreases the incidence of the paddles symmetrically and, thus increases the drag. The installation instructions explain that one has to adjust the linkage for zero degree incidence on the paddles with the swash plate collective in the hover position. But, since a helicopter needs less power to fly forward than to hover, that drag problem occurs again when you are in forward motion.

One of the tricks used is to set the paddles

NAME	NRCHA #	HELICOPTER(S) USED	ENGINE(S) USED	RADIO(S) USED
GRADE LEVEL III				
D.G. Keats, Tomy MI	N56E	Polecat	McCoy .19	World Engines
J.K. Smith, Waco TX	N52B	Kavan Jet Ranger	Webra Speed .61	Pro-Line
GRADE LEVEL II				
R. Kubly Jr., Monroe WI	N170E	Graupner Bell 212/Hegi Cobra	Webra .60	Kraft
B.E. Engel, Waco TX	N56B	Kavan Jet Ranger	Webra Speed .61	Pro-Line
GRADE LEVEL I				
R.F. Jones, Euclid OH	N195E	Du-Bro Shark	O & R 1.34	Kraft
C.R. Gottrell, Pacifica CA	N82A	Original	HB .61	Kraft
C.M. Sharp Jr., McMurray PA	N49F	Du-Bro Shark	O & R 1.34	MRC
J.D. Payton, Alexandria IN	N282E	Hegi Cobra	Veco .61	Kraft
F. Guglietta, Unionville CT	N327F	Du-Bro 505	O.S. .40	Orbit
D. Benton, Ontario Canada	N18H	Hegi Cobra	Veco .61	Orbit
J.H. Greiner Jr., Temple TX	N48B	Kavan Jet Ranger	ST .60	Kraft
R.S. Byfield, Ind. IN	N209E	Kavan Jet Ranger	ST .60	O.S.
C. Greenwood, Las Vegas NV	N44A	Kavan Jet Ranger	Webra Speed .60	Kraft
L. Green, Ft. Eustis VA	N180F	Kavan JR/Q&B T. Fuse.	ST .71	RS
T. Frackowiak, Erie PA	N312F	Du-Bro Hughes 300	O & R 1.34	World Engines
C. Lapardo, Warren OH	N93E	Kavan Jet Ranger	ST .60	Pro-Line
G.B. Sawyer, Kansas City MO	N188E	Kavan Jet Ranger	Webra .61	Kraft
H.P. Ritter Jr., Hanover MA	N316F	Kalt Cobra	Erya .60	PCS
M. Gadd, Finland	N8Y	Kavan Jet Ranger	ST .60	Futaba
L. Chapman, Rome City IN	N181E	Kavan JR/Hughes 300	Webra .61/O & R 1.34	Kraft/World Engines
R.D. Wilcox, Little Rock AR	N88C	Kavan Jet Ranger	O.S. .60	Heath
C. Jenkins, England	N8U	Graupner 212/Kavan JR	HB .61/O.S. .61	Grundig/Robbe
D.V. Myers, Clarks Summit PA	N282F	Du-Bro 505	O.S. .40	Kraft
F.J. Luzzar III, New Smyrna Bch FL	N82C	Hegi Cobra	Veco Lee .61	Kraft
R. Westerfield, Wichita Fls. TX	N57B	Du-Bro Hughes 380	O & R 1.34	Pro-Line
J.B. Maeterlinck, Belgium	N1BL	Graupner Bell 212	HB .60	Grundig
J.I. Fox, Spokane WA	N2D	Kavan JR/Polecat	ST .66/ST .23	Kraft
R. Hosteller, Orrville OH	N214E	Kavan Jet Ranger	Webra Speed .61	Pro-Line
W. Hosteller, Orrville OH	N215E	Kavan Jet Ranger	Webra Speed .61	Pro-Line

for zero degrees incidence for less power (forward flight) since drag problems are less noticeable in the hover position. However, as Bernard points out, a better system is to use a device that practically nullifies the incidence changes on the paddles when collective is applied. Bernard noticed such a device on two Jet Rangers at the recent Harsewinkel helicopter contest. A nullifying device made of nylon was photographed on Werner Kaseberg's Jet Ranger, while the more discrete metal one was on Mike Bosch's machine. Although these devices do not nullify the incidence completely, they reduce its throw considerably and the cyclic function is not altered. The photographs and the sketches should be self explanatory. According to Mike Bosch, there is currently no intention on the part of the Kavan factory to make this device available commercially.

Our good friend, Alonzo Richardson of Burlingame, California, submitted the idea shown in Figure 2, which was a tip passed on to him by Dave Gray of Du-Bro Products, on how to stop the clutch in a Du-Bro Shark or Du-Bro Hughes 300 from slipping. The clutch has two shoes that pivot on mounting pins. The surface near each pin should contact the drum. The surface beyond the notch should not contact the drum but will do so in time as the clutch wears. If you find wear on the surface beyond the notch, you should file or grind down that surface until it cannot contact the drum. Alonzo has made this modification and found it works extremely well. The slipping clutch was first thought to be loss of lift due to down draft but, as it got worse, and happened more and more frequently, a bench test of full power and full tail rotor pitch produced unmistakable clutch slippage. An examination of the clutch indicated the difficulty and resulted in the solution shown in Figure 2.

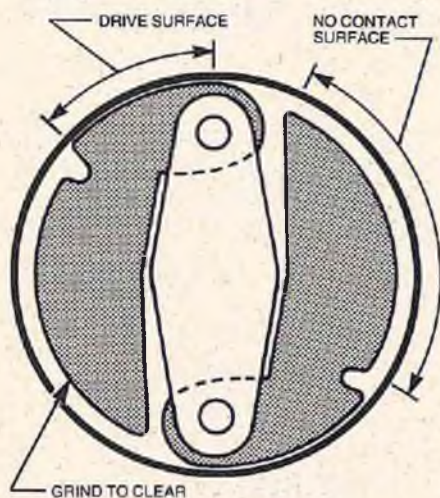


FIGURE 2

George H. Smith of Reading, Pennsylvania, who developed the Table-Top Helicopter Trainer published in to page 116

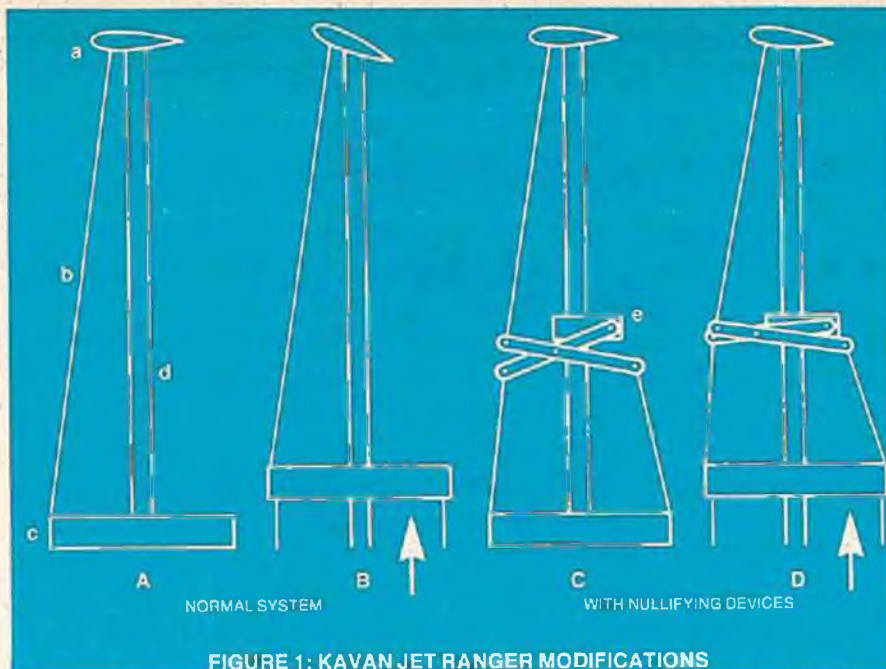
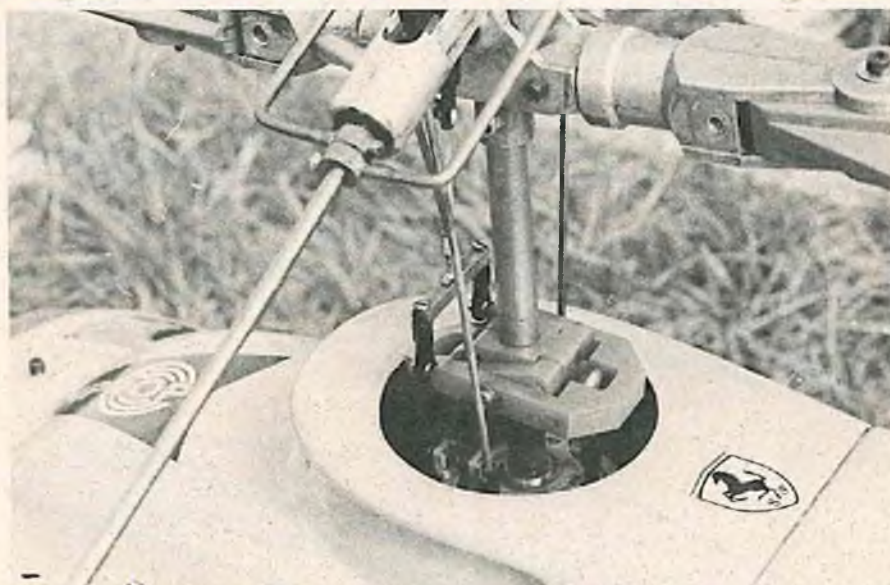


FIGURE 1: KAVAN JET RANGER MODIFICATIONS



ABOVE: Nylon nullifying device on Werner Kaseberg's helicopter. BELOW: A more discrete variation on the paddle nullifying device can be seen on Mike Bosch's Jet Ranger.



HERE'S HOW

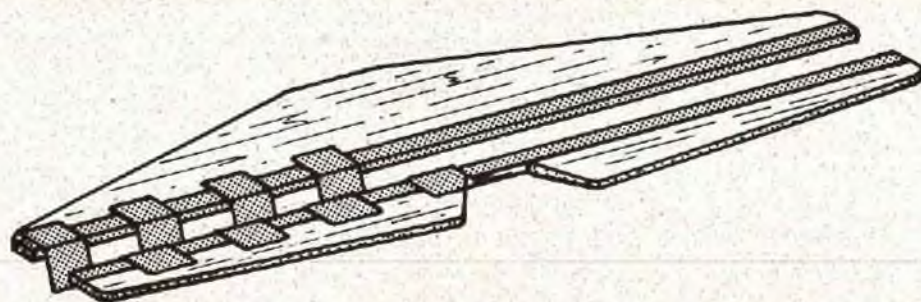
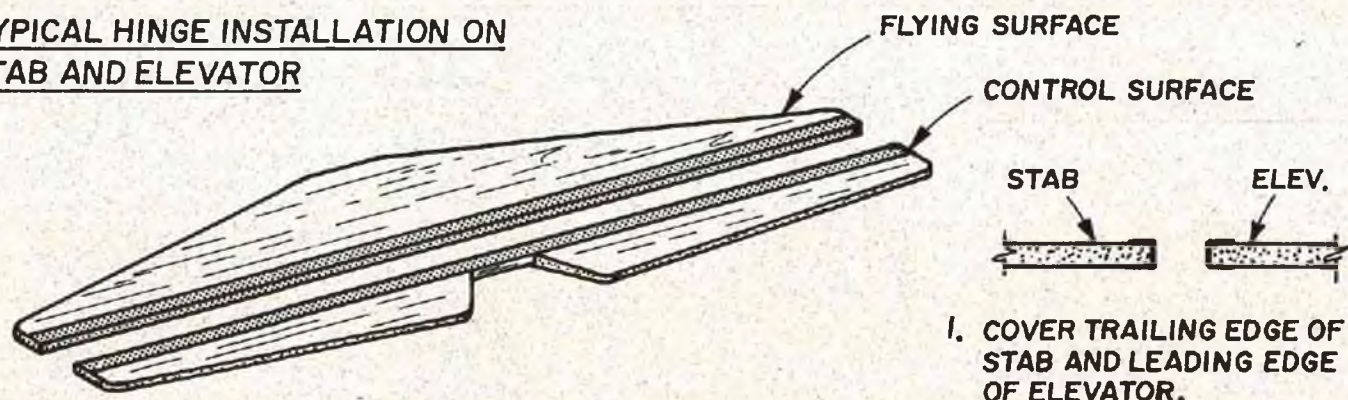
BY JERRY SMITH

MANY MODELERS SHY AWAY FROM MONOKOTE HINGES SIMPLY BECAUSE THEY FEEL THEY ARE INADEQUATE. MY OWN OPINION IS, THEY ARE FINE FOR THE SMALLER SIZE AIRPLANE WHEN PROPERLY INSTALLED. NOT ONLY ARE THEY CHEAP IN COST BUT, WHEN INSTALLED WITH CARE, ADD TO THE EFFICIENCY OF THE CONTROL SURFACE. HOW? BY COVERING THE GAP USUALLY FOUND BETWEEN THE CONTROL SURFACE AND FLYING SURFACE, CONTROL RESPONSE IS MEASURABLY IMPROVED.

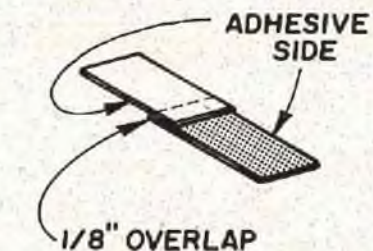
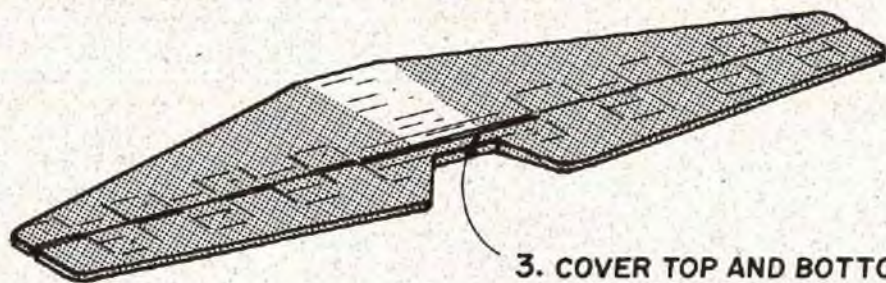
THE MONOKOTE HINGES, AS PRESENTED BELOW, ARE INSTALLED IN A SOMEWHAT DIFFERENT MANNER. AND THAT IS, THE HINGES ARE INSTALLED BEFORE THE FLYING OR CONTROL SURFACE IS COVERED WITH MONOKOTE. THIS PROTECTS THE HINGE FROM PEELING UP AROUND THE EDGES. HELPS PROTECT FROM ENGINE RESIDUE AND WHEN WIPING DOWN THE AIRCRAFT. THIS METHOD ALSO HIDES THE HINGE FOR BETTER APPEARANCE. FOR THE ULTIMATE IN APPEARANCE, MAKE THE HINGES FROM CLEAR MONOKOTE.

THIS METHOD OF INSTALLING MONOKOTE HINGES HAS BEEN COMPLETELY FIELD TESTED AND HAS PROVEN RELIABLE. WHY NOT GIVE IT A TRY. I DID AND FOUND IT LOOKS AND WORKS JUST GREAT!

TYPICAL HINGE INSTALLATION ON STAB AND ELEVATOR



2. IRON HINGES TO TOP SURFACE. JOIN STAB AND ELEVATOR TOGETHER. FINISH IRONING HINGES ON BOTTOM SURFACE.

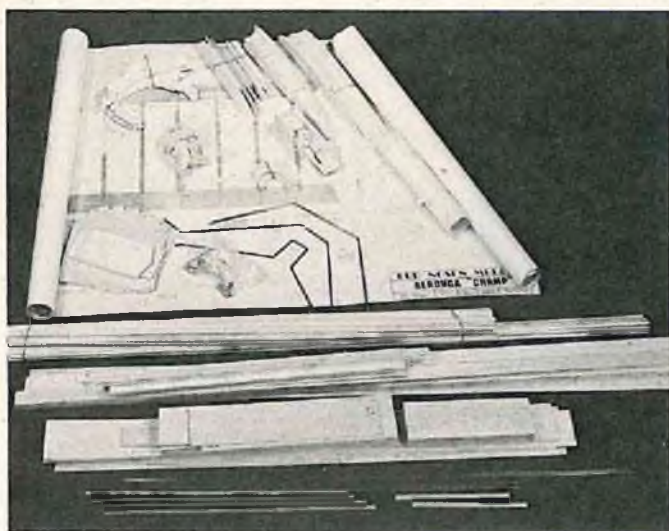


MANY THANKS TO —
TONY DE ROSA, TRI-VALLEY R/C CLUB
SOUTH BEND, INDIANA

TYPICAL METHOD OF MAKING MONOKOTE HINGES.

RCM PRODUCT TEST

BUD NOSEN MODELS AERONCA CHAMP



● The Aeronca Champ is a general sport and Stand-Off Scale aircraft produced by Bud Nosen Models, Box 105C, Two Harbors, Minnesota 55616 and priced at \$99.95. The wingspan is 105" with a wing chord of 15" for a total wing area of 1500 square inches. Designed for three to four channel operation, the all-up weight of the aircraft was 10 pounds with a wing loading of 16 ounces per square foot. Our RCM prototype, which was completely covered with Solarfilm, utilized an OS Max .80 and 13 ounce tank, while guidance was provided by a Kraft radio.

While we could not give the kit, itself, a better than average recommendation, due to its poor and often times weak construction, the flying characteristics of the aircraft are truly excellent. The Aeronca Champion flies like the real aircraft needing both rudder and ailerons to turn. This aircraft is extremely realistic in the air and pure joy to fly low and slow. Our particular kit was missing the 3" x 1/8" sheeting and also did not contain four of the nylon horns supposedly included with the kit. The wing planking was so hard that we were unable to bend it even after wetting the sheeting. The firewall was warped beyond use and a new one had to be cut. We would also recommend the use of 1/4" square spruce in the fuselage instead of balsa which would beef-up the weak fuselage construction. In addition, the method of attaching the vertical fin to the fuselage was quite weak and should be strengthened accordingly. □

IMPRESSIONS	E	G	A	F	P	IMPRESSIONS	E	G	A	F	P
Packaging		●				Pre-Shaped Parts				●	
Plans			●			Parts Match to Plans				●	
Written Instructions			●			Overall Parts Fit				●	
Quality of Hardwood			●			Ease of Assembly				●	
Quality of Fiberglass			NA			Fidelity to Scale		●			
Other Materials		●				Flight Performance	●				
Accessories		●				Overall Appeal	●				
Die-Cutting			NA								

E=Excellent / G=Good / A=Average / F=Fair / P=Poor

SPECIFICATIONS

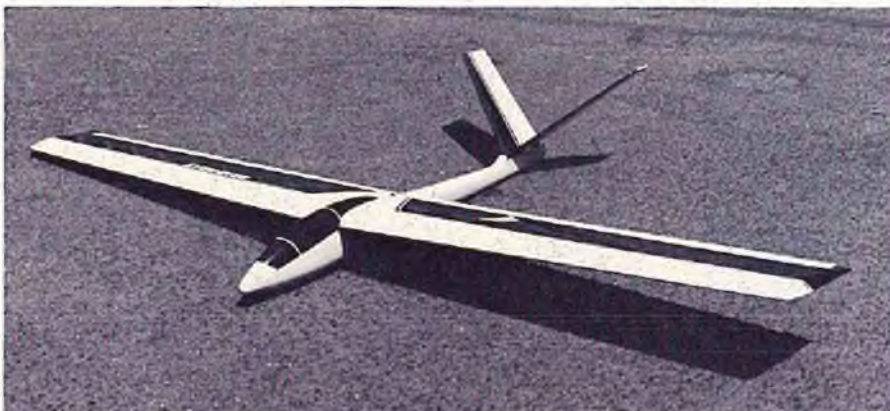
Name	Aeronca Champ
Aircraft Type	Sport/Stand-Off Scale
Manufactured by	Bud Nosen Models Box 105 C Two Harbors, Minn. 55616
Mfg. Suggested Retail Price	\$99.95
Available From	Both Manufacturer and Retail
Mfg. Recommended Usage	Sport & Stand-Off Scale
Wingspan	105½ inches
Wing Chord	15 inches
Total Wing Area	1500 sq. in.
Fuselage Length	62¾ inches
Radio Compartment Dimensions	(L) 16" x (W) 6" x (H) 11"
Wing Location	High Wing
Dihedral	3 inches
Airfoil	Flat Bottom
Wing Planform	Constant Chord
Stabilizer Span	30 inches
Stabilizer Chord (incl. elev.)	9"
Total Stab Area	270 sq. in.
Stab Airfoil Section	Flat
Stabilizer Location	Top of Fuselage
Vertical Fin Height	10 inches
Vertical Fin Width (incl. rudder)	11"
Mfg. Rec. Engine Range	.60 up
Recommended Fuel Tank Size	12 ounce
Landing Gear	Conventional
Recommended No. of Channels	3-4
Recommended Control Functions	Elev., Ailerons, Rudder, Throttle
Basic Materials Used In Construction:	
Fuselage	Balsa, Ply
Wing	Balsa
Tail Surfaces	Balsa
Hardware Included In Kit	Formed gear wires, horns, bellcranks, bolts, quick links, tail wheel bracket
Plan Size	30" x 76" (2 sheet)
Building Instructions on Plan Sheets	No
Instruction Manual	Yes (2 pages)
Construction Photos	No
Kit Includes	Shaped Parts
Mfg. rec. flying weight	160 ounces
Wing loading based on rec. flying weight	16 oz./sq. ft.

RCM PROTOTYPE

Weight, ready to fly:	160 oz.
Wing Loading	16 oz./sq. ft.
Covering and finishing materials used	Solarfilm
Engine Make and Disp.	OS Max .80
Muffler Used	No
Radio Used	Kraft
Tank Size Used	13 Ounce

SOARING

BY JIM SIMPSON



The high performance Deadbeat, from D.O.A. Models.

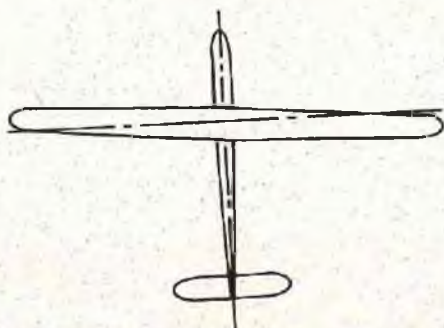


FIGURE 1A

● Trim is the answer to a successful sailplane. It takes proper trim and sometimes lots of it. And what's worse, it too often requires retrim after retrim. But before trim we must have something sound to begin with.

The sailplane must be **straight and true**. How often have you heard the expression, "Close enough for government work"? Therein lies the first problem we have with our sailplanes as well. We are prone to say "That little warp won't hurt anything" or that "the crooked alignment will even itself out." The truth is, that simply isn't so!

For our first illustration, let's consider the problem of misalignment. If the wing is not perpendicular to the fuselage it will cause the fuselage to fly slightly sideways through the air. This increases drag in three critical areas. First, along the side of the fuselage, also along one side of the entire vertical fin and, finally, all along the leading edge of the horizontal stabilizer. If your sailplane is misaligned as in Figure 1A, then adverse drag will occur in the areas shown in Figure 1B.

To prevent this situation, simply insure that the fuselage is straight and that the wing tips are equidistant from the aft end of the fuselage. An easy way is to use a needle and non-stretch thread. Stick the needle in the fuselage tail (on the centerline) and, with the thread tied at the needle hole, pull it taut

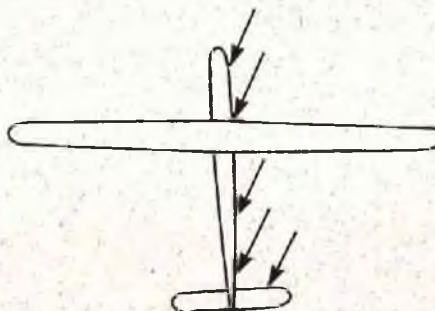


FIGURE 1B

and measure to first one wing tip then the other. Re-adjust the wing until these measurements are equal. Then make marks at the leading edge and the trailing edge of the wing to coincide with similar marks on the fuselage. Or, if you would rather not give this secret away then draw a line on the bottom of the wing, along one side of the fuselage. They can't tell (without looking underneath) if you align your wing or not!

The same general adverse drag will occur if the vertical fin is offset or if the horizontal stab is misaligned in planform such as the previously discussed wing problem. The vertical fin alignment can be "eyeballed" from the nose of the fuselage and the horizontal stab can be aligned just as the wing was only, this time, stick the needle in the nose (along the centerline).

The second greatest misalignment problem is viewed from the rear of the sailplane and is called a tilted stabilizer. It appears as in Figure 2.



FIGURE 2: REAR VIEW

If the stab has a lifting coefficient, it will cause the sailplane to turn toward the high side. Most often, than not, this condition is

caused by unequal fuselage sides or a twisted fiberglass tail cone. Whatever you do to prevent that turn will cause more drag and, again, your plane won't fly as well as it otherwise would have.

It goes without saying that the fuselage must be straight. To check it, you might try holding it alongside anything straight (like a table edge or door frame). While holding it, measure the gap at the tail, then reverse the fuselage and measure it again. The measurements must be equal (Figure 3).

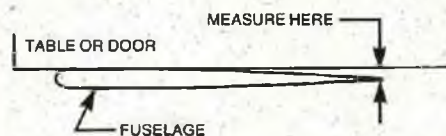


FIGURE 3

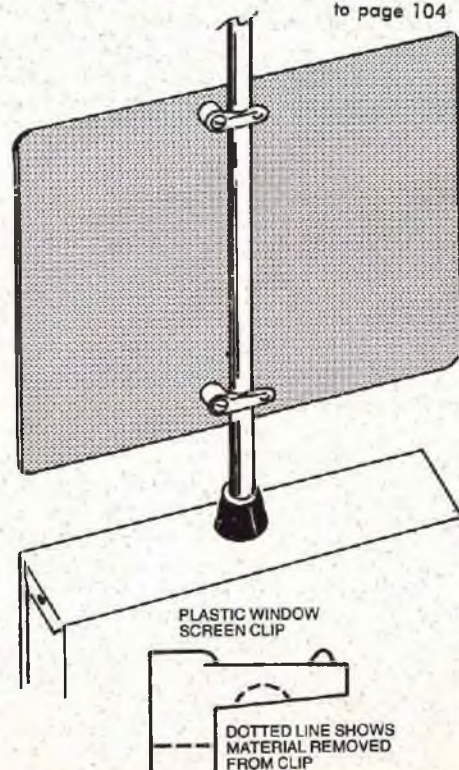
The final point is **warps**. All warps result in less than optimum performance. They are bad, bad, bad! Whether in the wing, fin, elevator — it makes no difference. They are bad! Get rid of them!

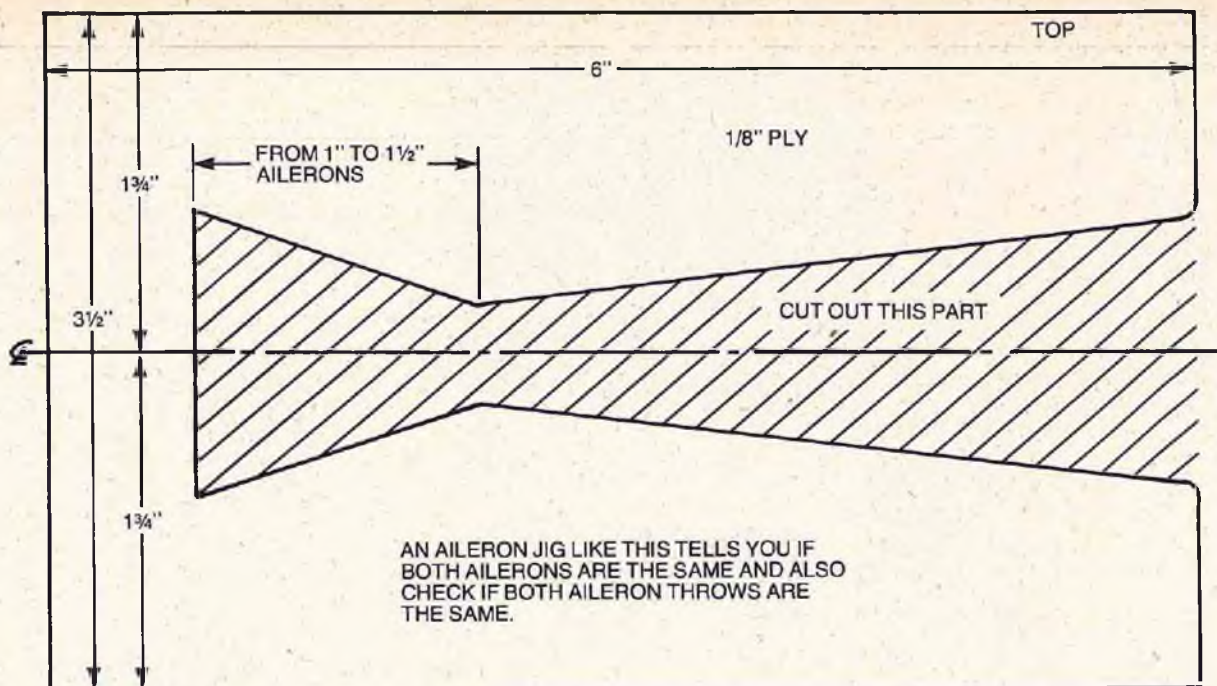
If the warped surface is MonoKoted you're lucky. All you have to do is twist the surface opposite to the warp then re-iron the surface until it is perfectly aligned. Your eyes are all you need to determine proper alignment. Just look at the surface from the rear of the plane and compare the left and right sides. Make sure they are the same. If in doubt, measure them — but make sure!

◇ ◇ ◇

With the advent of the new collapsable transmitter antennas, David A. Smith of Phoenix, Arizona, found it necessary to remove his plexiglass sun-shield after a soaring session in order to fully collapse the transmitter antenna. To make a detachable clamp shield, Dave used two plastic

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SIMPLE AILERON JIG

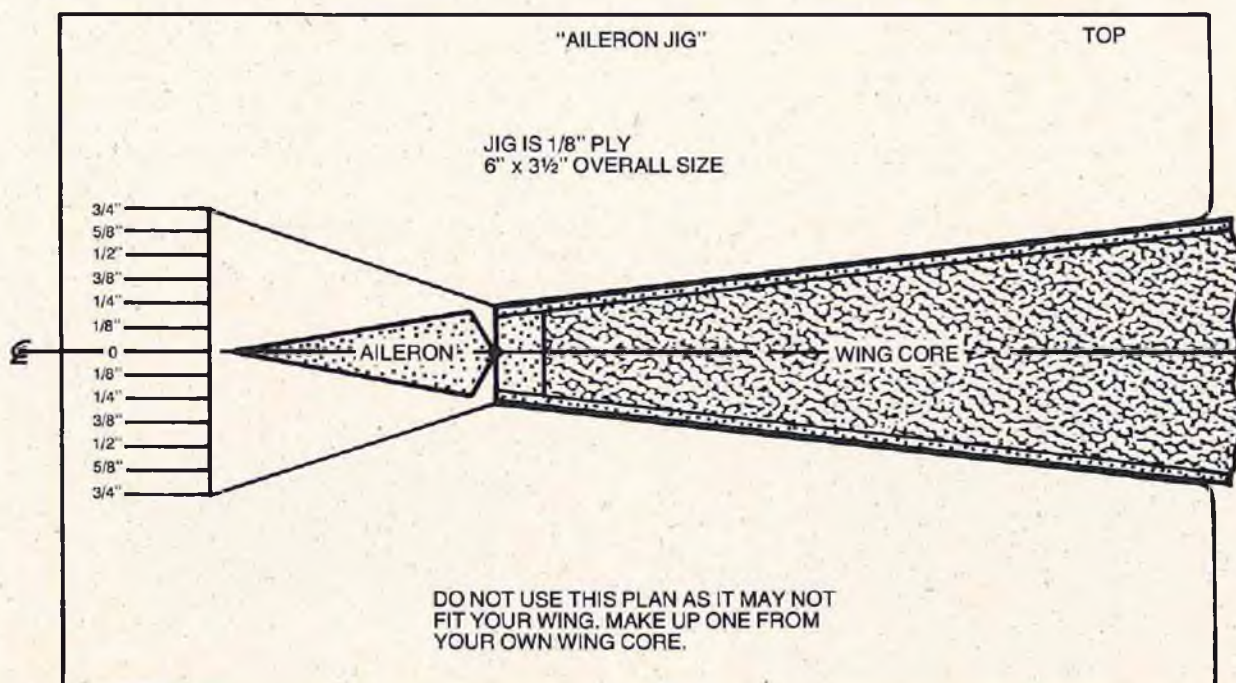
BY TONY VAN ECK (Reprinted From The Forest City 'Flier')

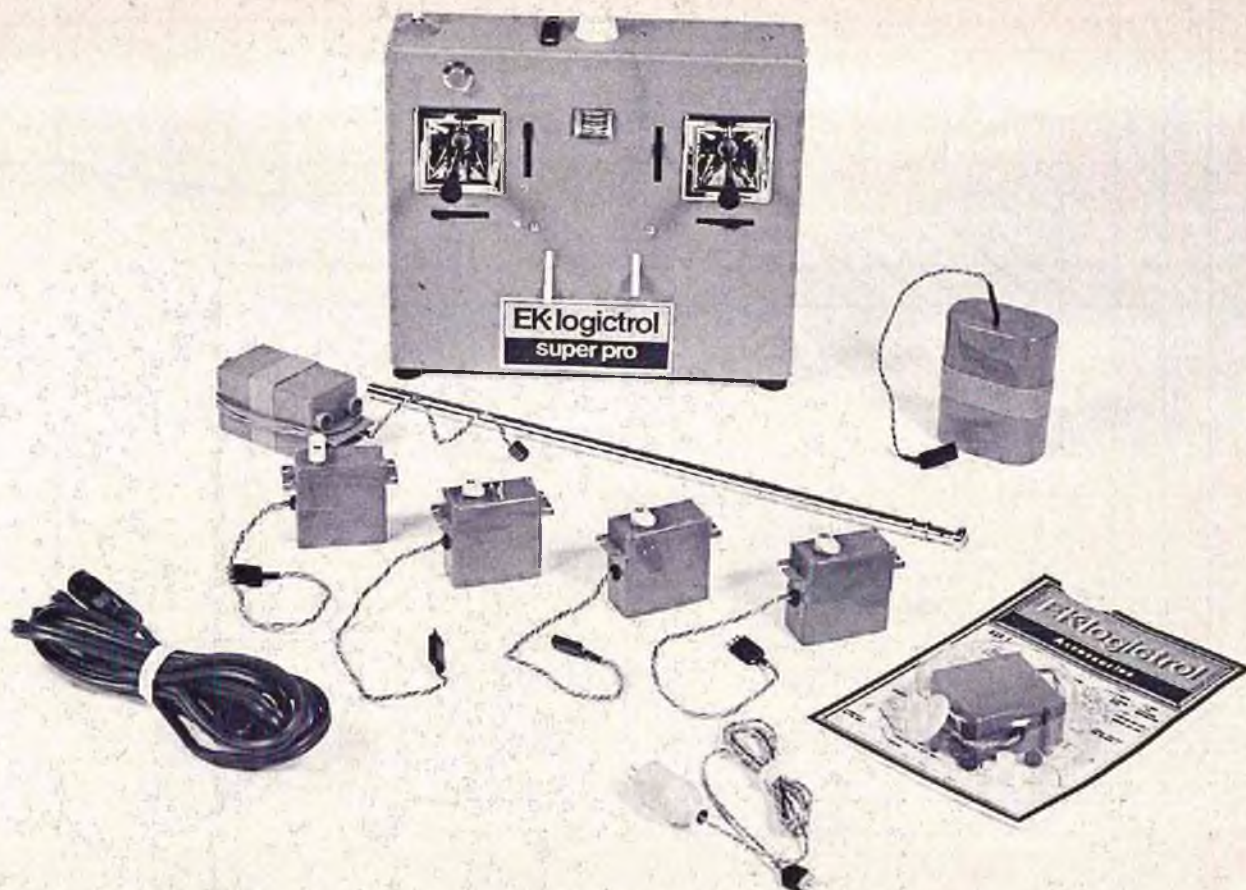
● The proper trim of any R/C aircraft includes having the proper travel on each control surface. Perhaps one of the most difficult control functions to accurately trim is the aileron travel, making sure that both ailerons are exactly the same in the neutral position as well as in the total amount of surface deflection.

The sketches accompanying this article show a simple Aileron Jig which is cut from 1/8" plywood and measures 6" x 3 1/2"

overall. Do not use the wing cut-out shown on the full-size template accompanying this article, but make one up to fit your own particular wing. As you can see from the sketches, this Jig is a sure-fire way of making sure the aileron throw on both ailerons is equal. It also allows you to check, in 1/8" increments, the amount of throw on each aileron so that they can be adjusted for identical control surface deflections.

Use the overall size of the Jig shown on the plans, and cut it from 1/8" plywood. The aileron cut-out is designed for use with ailerons from 1" to 1 1/2" in chord. However, for the section of the template that fits over the wing, use a template from the plan of the aircraft you are building and transfer it to the Jig, making sure that your centerline is accurate with the centerline of the cross section of the wing on which you intend to use this Jig. □





EK-LOGICTROL SUPER PRO

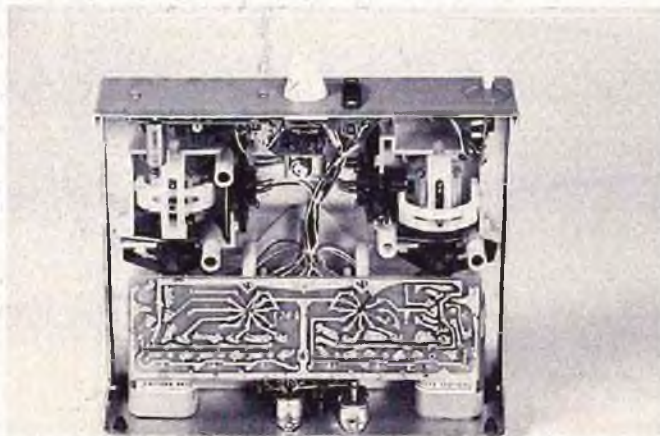
RCM PHOTOS BY BARBARA NORTON

Starting with this issue, RCM is going to attempt to present a look at a different radio system each month. This presentation of a radio system consists simply of photographing the system as a total unit, plus a look both inside and out at the individual components such as receiver and servos, plus flight testing on the part of the RCM staff. These will not be technical type reports and no lab tests or evaluations of

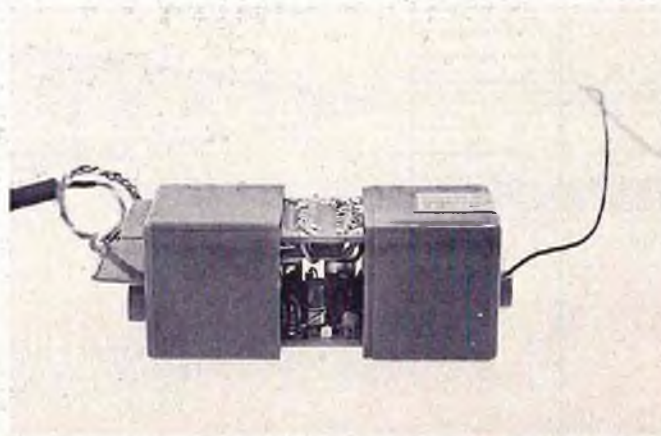
these systems will have been made. What we are attempting to do is simply list the specifications and the features of each of the radio systems currently being manufactured and/or distributed in the United States so that you will have an opportunity to study the specifications along with the photographs, and determine for yourself whether or not the radio being presented is the system in which you would be interested

in owning and flying. These presentations are not a commercial "plug" for any manufacturer and are not being presented in any order of preference nor are they based upon the fact of whether or not the manufacturer is an advertiser with this publication. Each system has been purchased by R/C Modeler Magazine from the manufacturer, or his distributor, and to the best of our knowledge each one is a

EK Super-Pro transmitter layout.



Note two deck receiver package



completely stock off-the-shelf unit.

As previously mentioned, no attempt will be made toward a technical evaluation, either by R/C Modeler Magazine or by an independent testing laboratory, due to the time and expense involved. In addition, such a test on a single unit would be of little value unless several units of the same manufacturer were tested simultaneously and those test results compared. Obviously, this is beyond the scope of any model publication and is not the purpose of this series of articles. Thus, these are not evaluation type articles but simply an opportunity for you to have a closer look at today's current proportional systems along with a listing of their specifications that you might not otherwise be able to obtain. In addition, each system presented has been thoroughly flight tested by a member, or members, of the RCM staff.

For our first unit we purchased an EK-logictrol Super-Pro seven channel system with four Super-Mini servos and 4.8 volt 550 mAH battery pack. The transmitter was ordered with a Mode II stick configuration and on 72.040 MHz.

The transmitter is of conventional size and configuration and clad in red vinyl. The stick units are of nylon construction with ground steel mono-ball stick bearings with cam centering being adjustable for return force. The sticks are completely positive in action while the trims are electro-mechanical and located to the sides and below the stick assemblies in the conventional location. The fifth and sixth channel auxiliary controls are non-centering levers located just below mid-center of the transmitter case while the seventh channel is a two position retract switch located in the upper left hand corner on top of the transmitter. This seventh channel is intended for use with 180° servos and has an adjustable throw facility. The bottom of the case has a two pin connection for the charging input and a six pin connector for receiver battery charging or for a Buddy



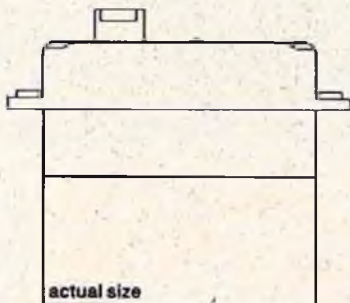
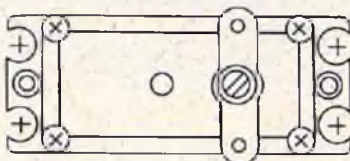
Gear train is Super-Mini servo.

Box trainer cord lead. The transmitter and receiver must be charged together since dropping resistors are used and a light emitting diode indicates the charge mode.

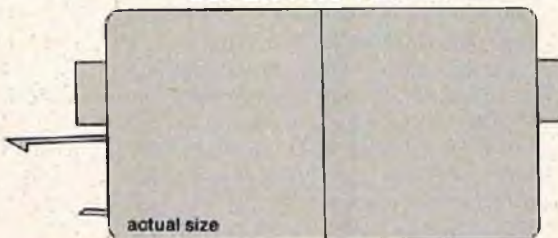
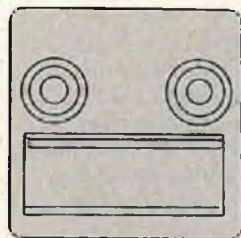
The meter on the transmitter front utilizes an expanded range facility which measures

to page 108

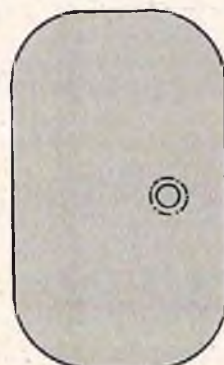
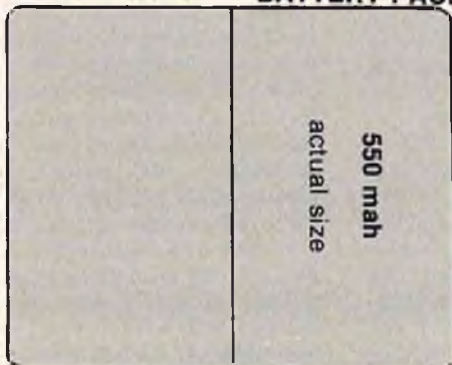
SUPER-MINI SERVO



SUPER-PRO RECEIVER



BATTERY PACK



SPECIFICATIONS (FURNISHED BY MANUFACTURER)

TRANSMITTER (single or dual-stick available)

Size: 7" x 5 1/2" x 1 1/2"

Weight: 1 lb., 15 oz. (including antenna and batteries).

Current Drain: 90 to 110mA (depends on frequency).

Battery: eight 550mAH Ni-Cad cells, 9.6 volts nominal.

Seven Controls: two EK 2-axis sticks or 3-axis stick plus separate motor control, with exclusive menohall and adjustable tension, one-two position toggle switch for retract landing gear and two levers for non-centering auxiliary controls.

Meter: expanded-scale voltmeter (ESV) for accurate indication of battery charge.

Frequency Tolerance: less than .003% over temperature and voltage range.

Modulation: PPM (Pulse Position Modulation) on-off carrier, control pulse width 1.38mSec, frame time approx. 16mSec.

Operating Voltage Range: 7.5 to 10.5 volts.

Operating Temperature Range: 0 to 140° F.

Operating Time: 3 1/2 hours on full charge.

Charger: external, rate 45mA for 14 hours full charge, light-emitting diode (LED) indicator, external plug for charging receiver.

Buddy Box Provision: push-and-hold button, plug on bottom for B/B cable to student's transmitter. (Optional).

RECEIVER (single conv., dual conv. optional)

Size: 1.19" sq. x 2.19" long.

Weight: 2 oz.

Plug-In: designed with receptacle for power and 7 functions (servos).

Operating Voltage Range: 3.3 to 5.5 volts (one-cell-out capability).

Current Drain: 30mA (64mA with 4 servos).

Battery: four 550mAH cells, 4.8 volts nominal, high vibration and shock resistant type, weight 5 oz. with reverse charge diode protection.

Single Conversion, Crystal Controlled Superhetrodyne: with double-tuned front end, one tuned RF stage, mixer 455KHz IF frequency followed by 3 IF stages (4 tunable IF cans), Zener regulated for minimum change of sensitivity over operating voltage range.

Dual Conversion, Crystal Controlled Superhetrodyne: with double-tuned RF stage, 10.7mHz and 455KHz mixers with filter block for maximum rejection of spurious signals, image rejection better than 80 dB, Zener regulated for minimum change of sensitivity over operating voltage range. (Optional).

Sensitivity: 1uV for full control.

Selectivity: bandwidth 3.5KC at -3dB, 20KC at -60dB for single conversion and -80dB or more for dual conversion.

AGC: diode overload protected, dynamic range over 60dB, controls 3 amplifier stages, antenna of transmitter can be placed next to receiver antenna with full control and position accuracy.

Operating Temperature Range: 0 to 140° F.

Antenna: 39", wire.

Mounting: UM-6, UM-7, UM-8.

SERVO (Super-Mini)

Size: 1.41" x 1.38" x .71" (world's smallest servo).

Weight: 1.2 oz. with plug, cable and amplifier.

Output: rotary, 4 lbs. from standing start (torque 1.25 in.-lbs.), three arms provided (long, short and wheel, also adjustable output arm ASA-1 available at extra cost).

Current Drain: 7.5mA at idle, 420mA stalled.

Input Pulse: positive, 1.38mSec at neutral, $\pm$.48mSec at extreme positions.

Response Time: approx. 16mSec (depends on frame rate of information).

Control Accuracy: better than 1%.

Slew Time: to-stop .3 sec.

Travel: $\pm$ 45° (90° total).

Operating Voltage Range: 3.3 to 5.5 volts (one-cell-out capability).

Operating Temperature Range: 0 to 140° F.

Amplifier: three-wire, bridge output with EK integrated circuit, output PNP stage external for full power.

Motor: 11 ohm, 16mm with silver alloy brushes.

Mounting: UM-10 for two servos, UM-11 for three servos or AM-3 or AM-4 All-ron mount for single servo.

OPTIONAL SERVO (Mini-Mite, linear or rotary)

Size: 7/8" x 1-15/16" x 1 1/8".

Weight: 1.8 oz.

Travel: $\pm$ 1/4" (1/2" total) linear, $\pm$ 45° (90° total) rotary.

Motor: 11 ohm, 20mm with silver alloy brushes.

Output: linear 3 1/2 lbs. from standing start, slew time to-stop .3 sec; rotary 2 1/2 lbs. from standing start (torque .8 in.-lbs.), slew time to-stop .2 sec.

Mounting: AM-1 or AM-2 for single servo UM-3 for three servos.



MICRO-MOLD LARK

is currently being imported for U.S. distribution by Aristo-Craft Distinctive Miniatures, 314 Fifth Avenue, New York, New York 10001.

Developed by Peter Valentine from several previous prototypes aimed to reduce the size, weight, and power requirements of R/C model helicopters, but still retain the scale performance achieved by larger continental models, the .19 powered Lark not only fulfills these requirements but has some extremely unique and unusual features.

Peter Valentine has, in the Lark, designed a model which is not only small and light, but extremely easy to build for the Novice helicopter enthusiast, and which is also docile in handling, crash resistant, and easy to repair. Designed for .19 cubic inch capacity glow engines and four channel light weight radio systems, the rotor diameter of the Lark is 41" with a fuselage and tail boom length of 37½" overall. The all-up weight with radio system and engine is 4¼ to 4½ pounds. For the sake of simplicity, collective pitch is not employed and a rigid head rotor head is used with

used for cyclic control while the third channel is used for tail rotor pitch for yaw control and the fourth channel for throttle control to vary the lift. The stability system is based on the Hiller full-size system.

The mechanics of the Lark are tough and can withstand crash damage that would be far more serious with a larger and heavier model. Vulnerable parts such as rotor blades, flybar, and flybar paddles are inexpensive to replace as are the body and cabin. The kit includes a centrifugal clutch with needle roller shaft bearings which drives the first stage by toothed pulleys and belts to the intermediate position, then main drive to the rotors by steel and nylon bevel gear train, and the tail rotor by a flexible wire shaft and one-to-one bevel gears.

The first and most noticeable feature of the Lark helicopter, is the excellent packaging of the kit. None of the mechanical components are pre-assembled, but are packed in polyethylene bags with one bag for each major assembly. All mechanical components are factory pre-drilled and machined as necessary with the exception of the four motor mounting

The second feature, and one which impressed us more than anything else, is the Micro-Mold instruction manual for the Lark. We have, to date, built at least one of every commercially available helicopter kit, and we have yet to see an instruction manual as complete as the one provided with the Lark. This manual, 44 pages long, contains precise and complete step-by-step instructions that leaves nothing to the imagination, and is further enhanced by over 80 drawings accompanying many of the construction steps. These drawings are extremely well done and even the first time helicopter constructor should encounter no difficulty in building the Lark. In addition, every package of parts is numbered and a parts list is contained in the instruction manual, listing each part in each package by description, part number, and name, eliminating the possibility of confusing the parts for the various assembly stages.

Another unique and impressive feature of the Lark is the successful attempt on the part of Micro-Mold to produce a helicopter that is easy to build and functional, yet reducing the complexity to an absolute minimum. It

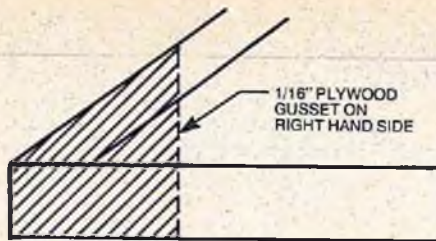


FIGURE 1

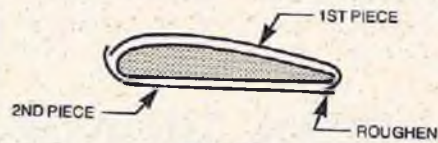
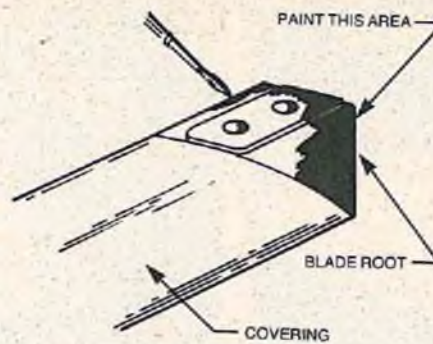


FIGURE 4

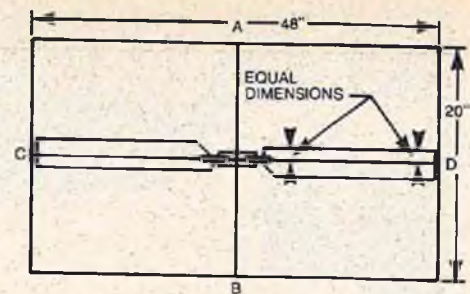


FIGURE 5

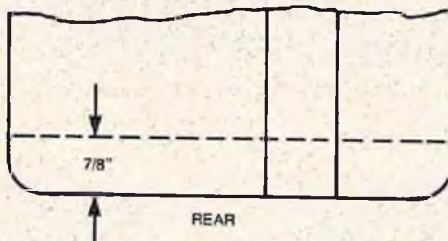


FIGURE 2

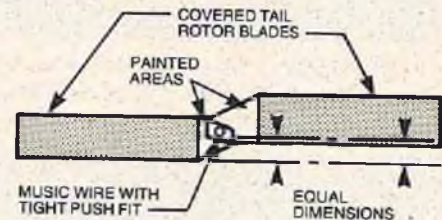


FIGURE 6

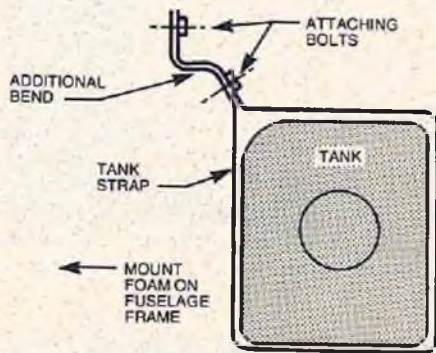


FIGURE 3

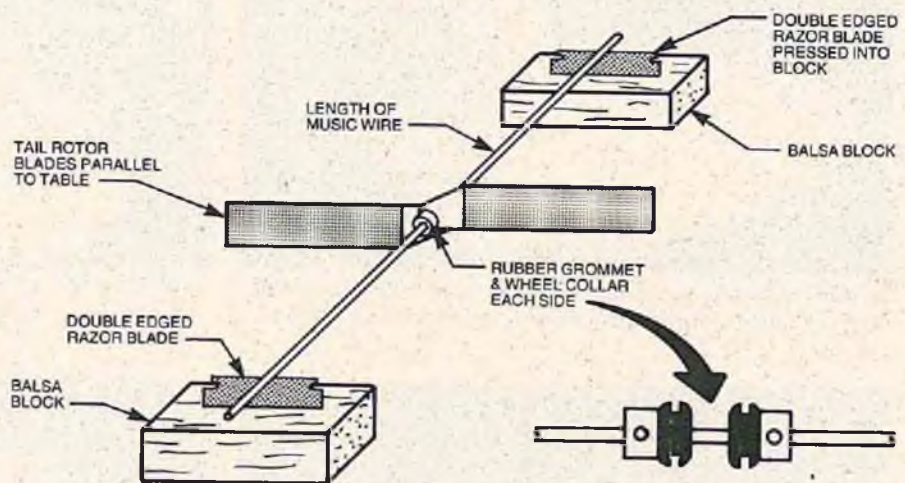


FIGURE 7

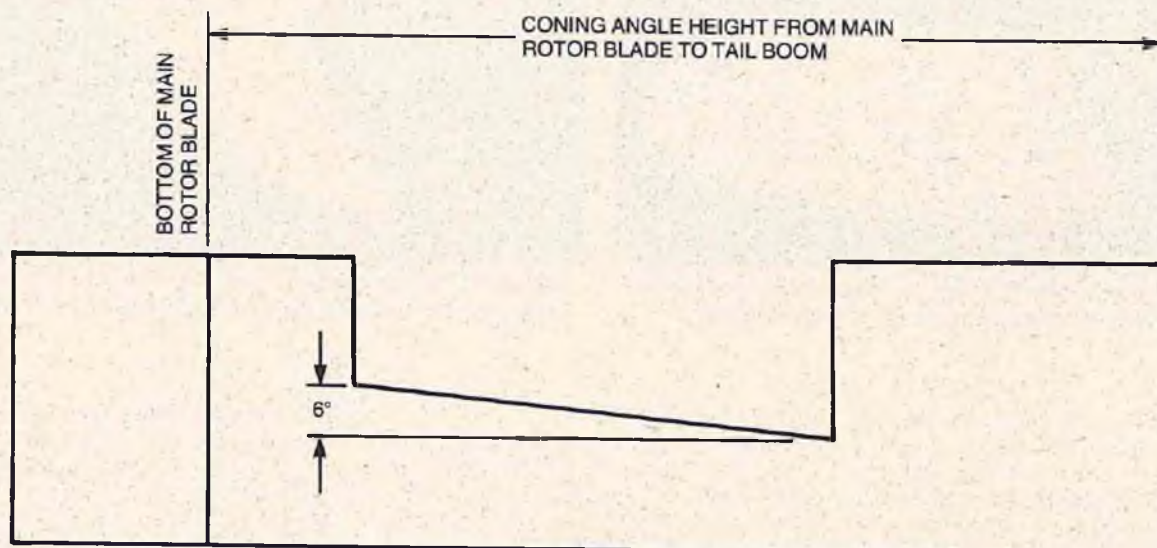
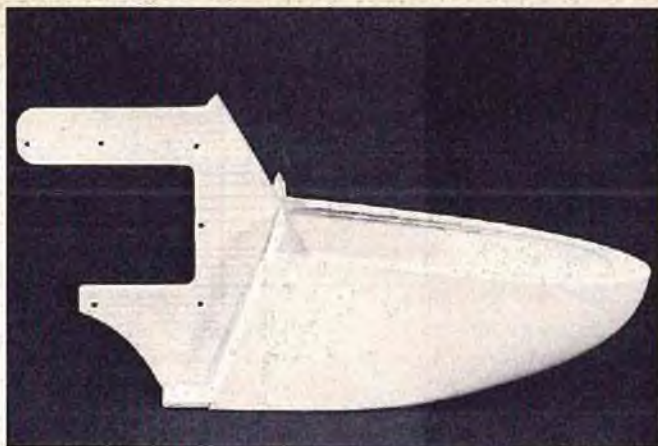
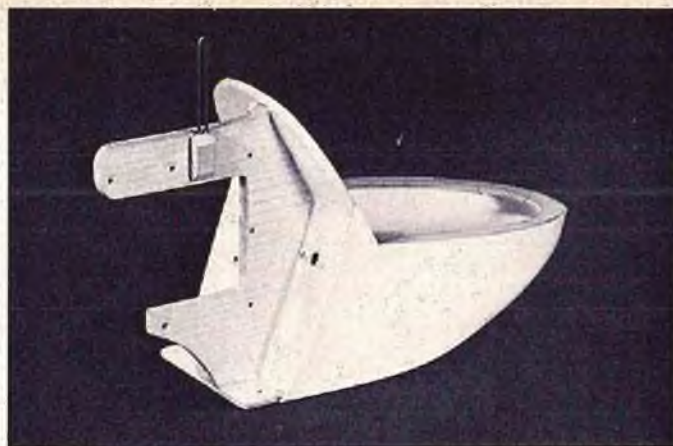


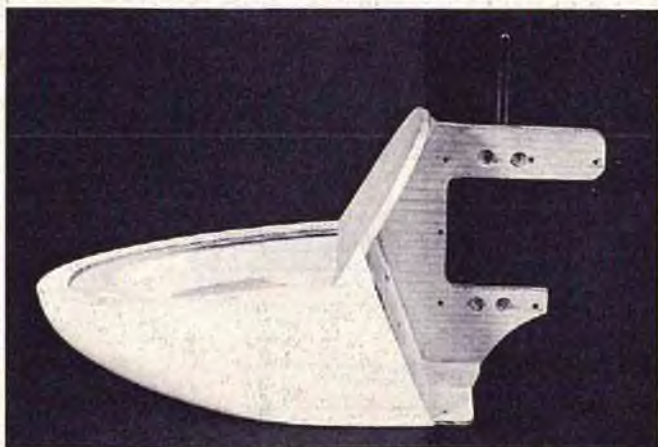
FIGURE 8: MAIN ROTOR BLADE PITCH GAUGE SHOWN FULL SIZE. MAKE FROM 1/16" OR 1/8" PLYWOOD.



The basic ABS fuselage with plywood motor and gear train mount. Note plywood canopy base inside fuselage.



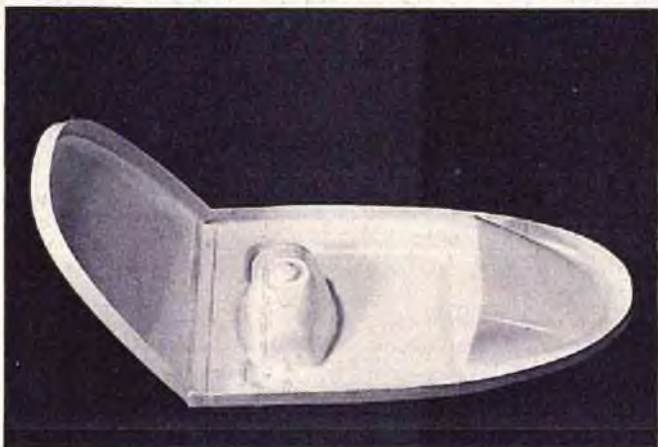
Three quarter view showing access holes for pushrods, drive plate mounting holes, and wire anti-rotation yoke.



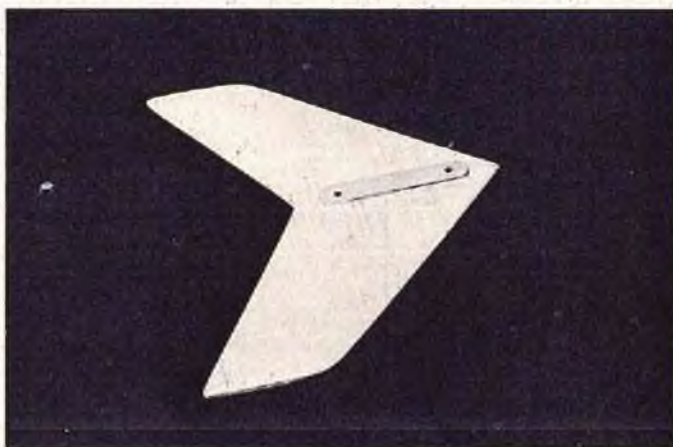
Opposite side view of basic fuselage assembly shows the four countersunk holes to allow flush mounting of drive plate.



Inside view of fuselage showing servo rails and ply supports... latter contact cemented to ABS fuselage sides.



Plastic canopy floor is trimmed to shape and bent at angle shown. Glue edges and internal brace with Hot Stuff.



Vertical fin assembly laminated from balsa and plywood sandwich with plywood mounting braces glued in place.

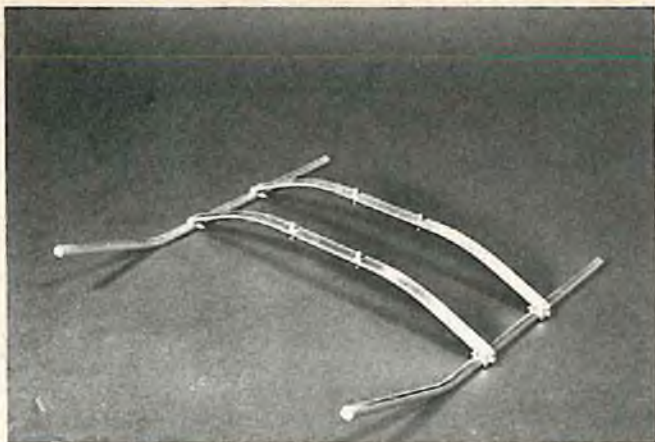
goes without saying, that the amount of engineering required to reduce complexity is far greater than it is if no such attempt is made. And, by reducing this complexity to an absolute minimum, Micro-Mold has come up with a helicopter that is easy to build, maintain and repair. There are a few touchy spots in the construction, and we will try to elaborate on some of these further

on in this article.

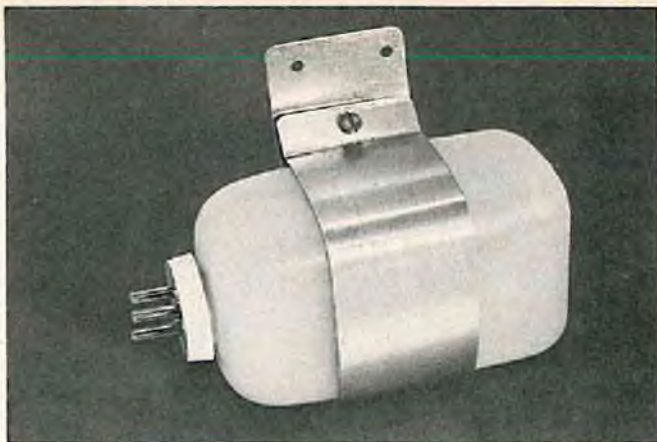
First of all, for a general description of the Lark, the fuselage is comprised of a white ABS plastic molded base and canopy floor, a plywood frame with a plywood and balsa bulkhead which carried an aluminum plate forming a base for the main transmission drive unit. This fuselage section is extremely easy to build and

should pose no problem for anyone who has built a conventional model aircraft.

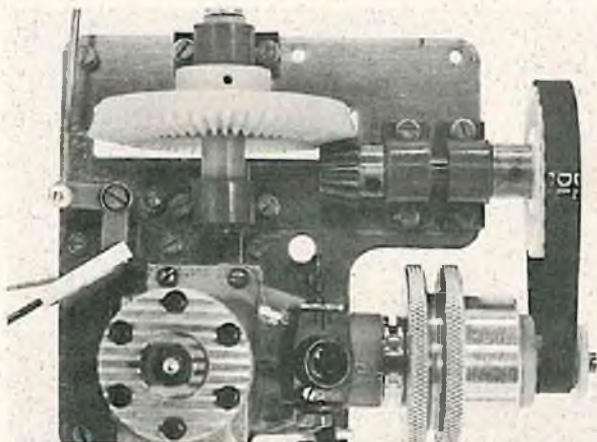
The motor, which is mounted in a sidewinder fashion, is fitted with a centrifugal clutch utilizing steel shoes and a cork clutch liner. This, in turn, drives a shaft through a 3/8" wide toothed belt, which provides a reduction of 25:8. The 90 degree drive to the main rotor is provided by



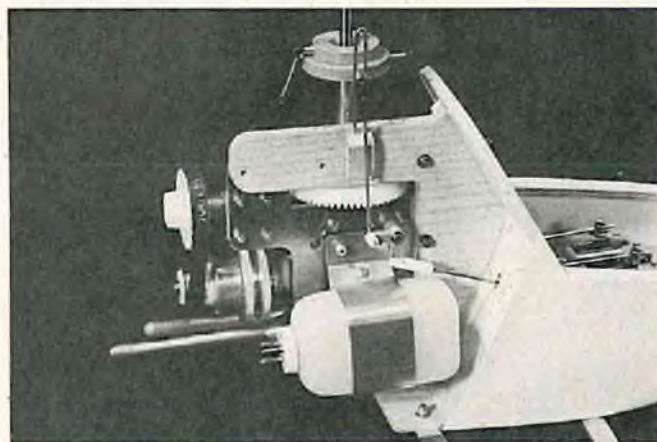
Skid braces and skids scrubbed with Brillo Pad then bolted together. Note plastic inserts contact cemented in skid ends.



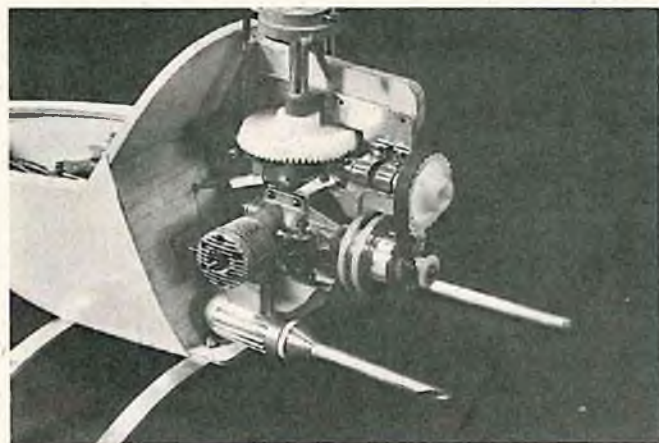
Three-vent fuel tank provided in kit is mounted with an aluminum strap. See sketch for slight modification.



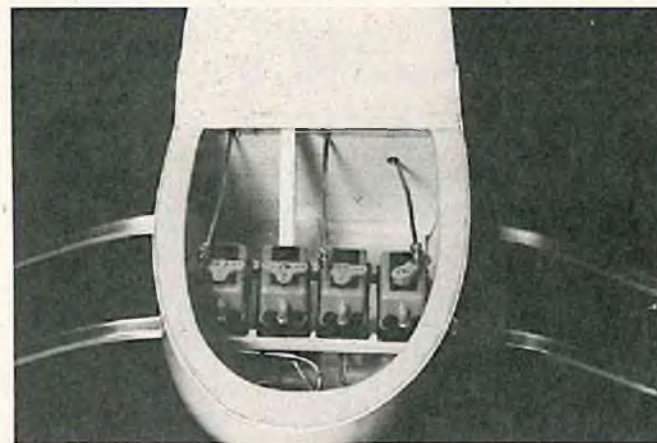
Close-up of motor and main drive train assembly. Note four plastic-housed Oilite bearings, two to each shaft.



Entire drive train assembly mounted to fuselage and pushrods hooked up. After proper fit, remove mechanics and paint fuselage.



Opposite view of drive train temporarily mounted to fuselage. Exhaust extension not necessary, but sanitary.



View of RS Systems servos mounted in fuselage, with pushrods attached via Du-Bro E-Z Connectors.

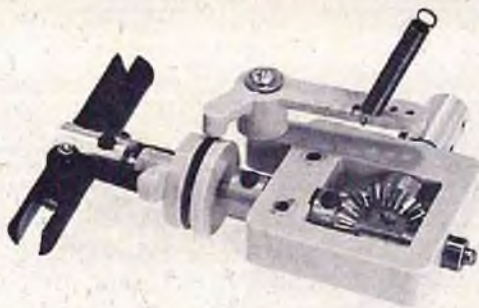
large steel-to-nylon bevel gears giving a further reduction of 4:1. The 1:1 tail rotor gear box is driven directly from the main shaft by a 1/16" diameter piano wire shaft supported by two nylon intermediate bearings. These can easily be seen in the photographs accompanying this article.

The swash plate is unique in that it contains no ball bearings whatsoever but,

rather, consists of three molded nylon pieces — a fixed plate, the rotating portion of the swash plate, and a plastic retaining ring. The bearing between the two plates is nylon and the complete assembly tilts on a nylon ball located on the main rotor shaft. The swash plate, itself, is held onto this ball by a spring which also keeps both swash plate control linkages and tension back to

the servos. An aluminum tail boom is used which is bolted directly to the engine and drive plane mounting plate and to which is fitted a molded plastic "cage" containing the tail rotor gear mechanism. The tail rotor collective pitch mechanism is also molded of plastic and consists of a unique slider mechanism utilizing a spring tension return.

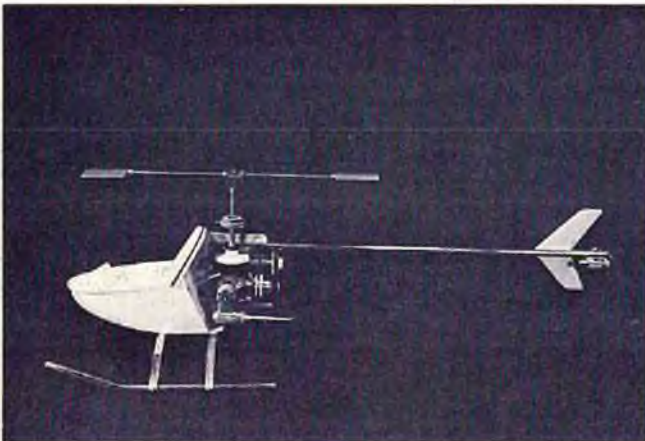
Another unique feature of the Lark is that



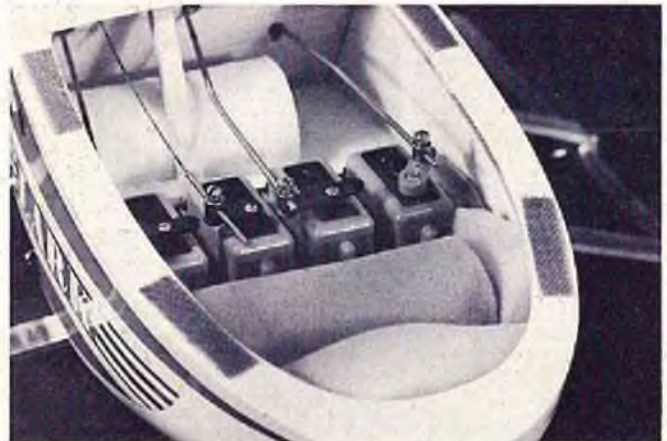
Close-up of tail rotor gear cage and unique collective pitch slider. Mitre gears must mesh exactly with no binding.



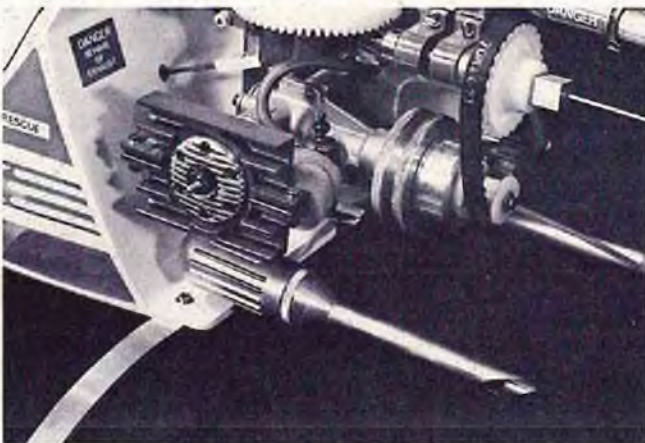
Top photo shows main rotor head without rotor blades. Bottom photo shows tail skid assembly with plastic plug-in mount.



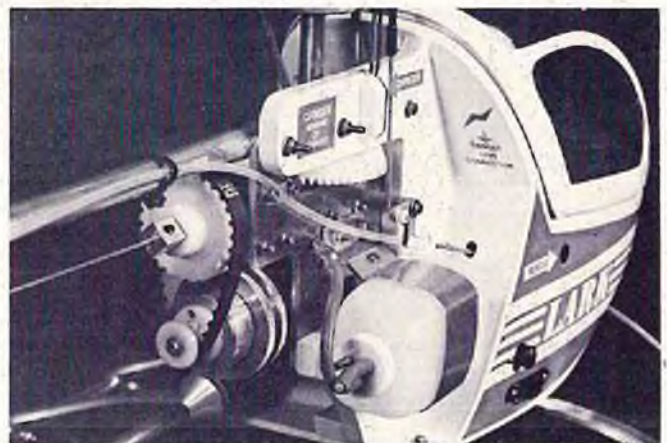
In this photo the main rotor head, tail boom, vertical fin, tail rotor gear cage, and skids have been added to fuselage.



Radio installation after helicopter is painted. Receiver in rear, battery up front. Note Velcro strips for canopy hold-down.



Close-up of final installation after painting. Note K & B Air Filter on Perry carb. Large heat sink necessary for cooling.



Opposite side of finished Lark. Note in-line fuel filter, external switch and charging receptacle.

the toothed belt is simply slipped off the drive unit and the engine started with a pull cord made from a length of nylon sash, or drape cord, with a dowel handle on one end. Once the engine is started and reduced to full idle, the toothed belt is slipped back into place, engaging the drive unit.

Obviously, we are not going to go into step-by-step construction details in this

article since, as previously mentioned, the Lark manual is the most complete that we have seen to date. However, we are going to make a few suggestions based on our own assembly experience and cover a few of the construction steps that may give you a little bit of difficulty. In order to produce a helicopter this small in size, and at a price as low as that being charged by Micro-Mold,

some compromises have had to be made. And one of these is that extreme care must be taken in assembling the helicopter exactly according to the instructions, and insuring that there is complete alignment and freedom of movement of all moving parts. If any of the drive mechanism is out of alignment, or if there is even a minimal amount of binding, you're going to

RIGHT: View of completed rotor head with rotors attached. RIGHT, CENTER: Completed tail rotor assembly. Flat side of blades face outwards, to your right as you view this photo. BELOW, RIGHT: Aft end assembly showing tail rotor drive connection.

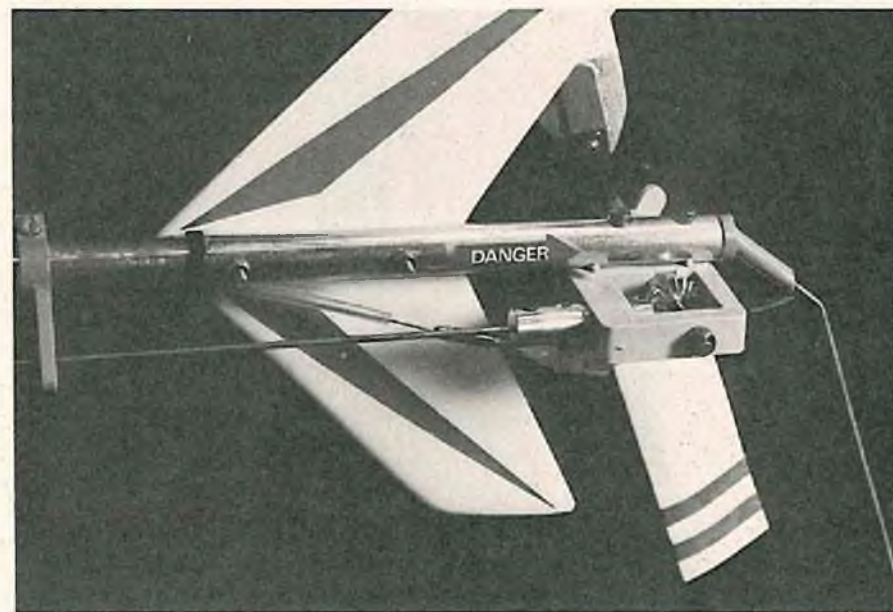
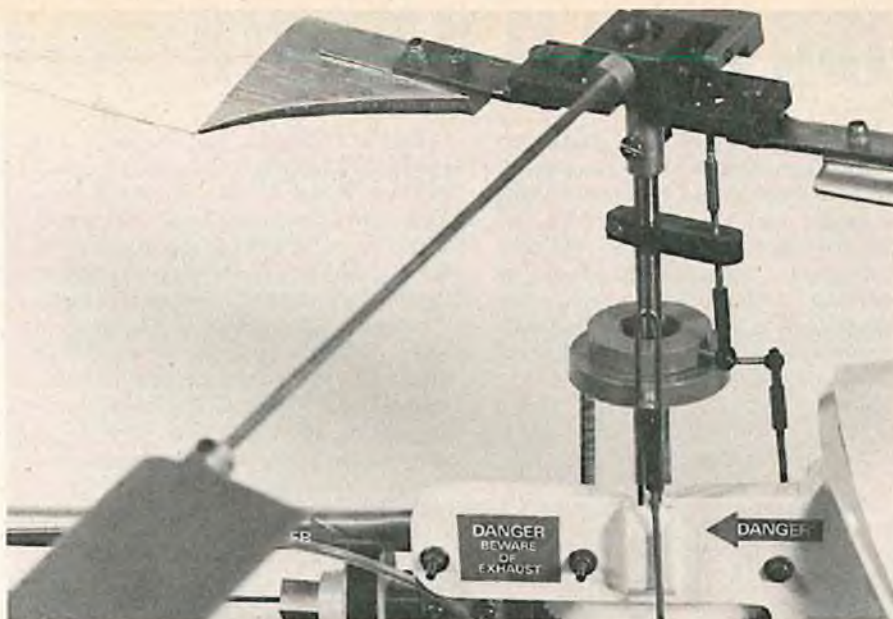
experience extreme difficulty in attempting to fly your Lark. On the other hand, if you follow the instructions carefully, take the time and patience to eliminate any mis-alignment or binding, you will have a helicopter that will be an excellent trainer and is extremely docile and easy to handle.

Construction of the fuselage is extremely simple and should pose no problem for the average modeler. It consists of a plywood crutch, hardwood support pieces, a plywood floor, plywood canopy ring base, and balsa bulkhead. The alignment of the wooden parts to the ABS plastic body is extremely important, however, and should be trial fitted several times prior to actually cementing the parts in place. Check the pre-cut plywood crutch against the full size drawing provided in the plans, and, if the plywood part is cut inaccurately, cut a new one using the accurate full-size template provided. We used GMP 5-Minute epoxy for all wood-to-wood parts and Wilhold Contact Cement for securing the wooden structure to the ABS plastic body shell. Be sure to roughen up the inside of the ABS plastic with fairly coarse sandpaper before applying the contact cement in order to insure a good bond. Referring to page 6 and Figure 4 of the instruction manual, the bevel at the bottom edge of the 1/4" square hardwood to the 3/8" x 5/8" bottom bearer must be accurately mated. If you feel that this is not a strong enough joint, it can be reinforced by adding a 1/16" or 3/32" plywood gusset on the right hand side of the joint as shown in Figure 1.

In order to accurately mount the wooden portion of the fuselage inside the plastic shell, mark a line 7/8" in from the rear of the 1/8" plywood cabin floor. This will indicate the correct position of the rear of the 1/4" balsa former and assist in correctly aligning the latter. Use the sketch shown in Figure 2 for this alignment procedure. Also, use a triangle to make sure that the plywood crutch is vertical to the floor. Also make certain that the bottom edge of the 1/4" balsa former and the notch is beveled to the correct angle.

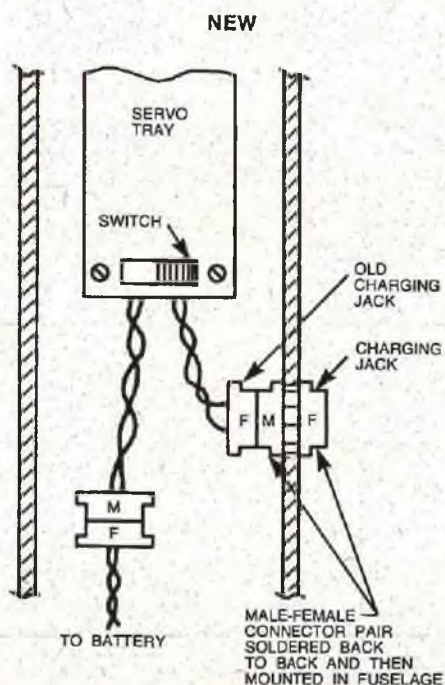
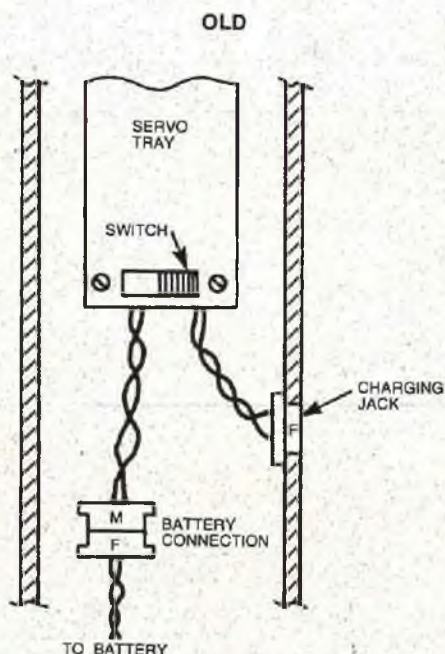
The next problem, and one of the few operations that requires the most patience and is the most time consuming, is the proper alignment of the four Oilite bearings mounted on the metal motor and transmission mounting plate. Due to discrepancies in manufacturing tolerances, the plastic housing for these Oilite bearings are not exactly the same, and one or more of them may be a few thousandths of an inch

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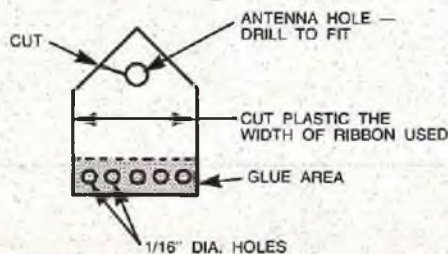


FOR WHAT IT'S WORTH

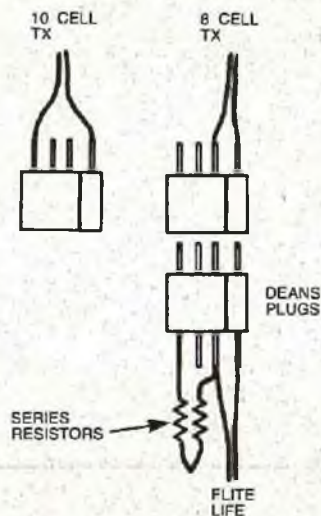
For those who dislike either gluing their receiver charging jack to the fuselage, or wish to use the identical connector on both the battery pack and charging jack, the following simple sketch from Pat Mullarky of Westboro, Massachusetts, should be worthwhile. The charging jack now protrudes a little bit from the fuselage but it is minor and the convenience is well worth the little extra effort.



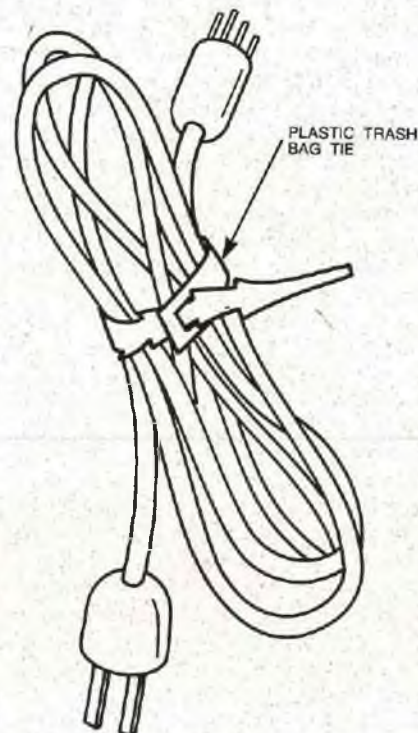
Here's a simple, quick-to-build, and inexpensive frequency flag clip, suggested by Ken Hazen of Bloomingburg, New York. Use a scrap piece of acetate sheet or similar material, and cut approximately to the size and shape as shown in the sketch. Drill holes as indicated, and make a cut in the antenna hole outward. Apply epoxy to both sides of the plastic in the area of the small holes, making sure that the glue works through the holes. For two-color frequencies, apply one piece of 1" wide ribbon of the appropriate color to each side of the glued area. For single color frequencies, cut a small piece of ribbon, just big enough to cover the glued area, and apply to the backside of the plastic. This frequency flag clip works great, holds well, and changes in a snap for those who have rigs on two frequencies.



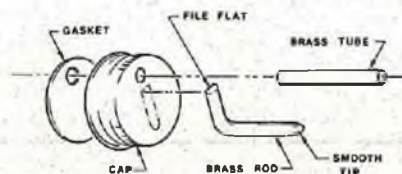
The Flite Life instructions say to use extra series resistors when the transmitter has ten cells in the pack. If you have to keep remembering which is which, this can lead to confusion after a time. In order not to have to remember or worry about any mistakes, Don Swinehart of Ashland, Ohio, does it according to the following sketch. He uses multi-pin plugs on the transmitter and wires the 8 cell transmitter straight through. The same type plugs are used on the 10 cell transmitter, but they are wired to automatically pick up the extra series resistors.



Plastic ties, of the type which are usually enclosed with a set of plastic trash bags sold at the market or the drug store, can be used by the modeler for bundling up trainer cords, bundling up charger cords, tying up cords from soldering irons, heat guns and drills. These tie cords always work much better than rubber bands. This idea was submitted by James S. Miura of Honolulu, Hawaii.



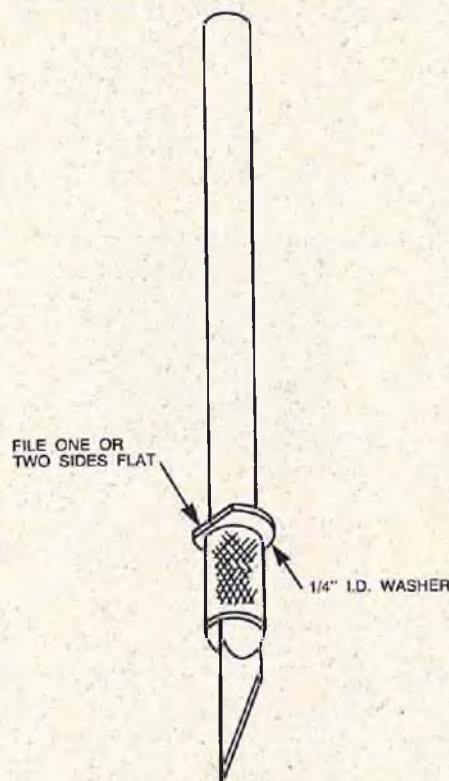
Any sturdy plastic bottle with a metal top can be converted into the handiest fuel bottle you have ever owned. It can be done in a few minutes and for just a few cents. Choose a bottle that fits your hand. For example, the quart bottles that contain outboard motor or gear oil are excellent. First, solder up a cap assembly as shown in the sketch. Then, push the ends of a 3" length of fuel tubing (not shown) over the brass tube and the rod. Rinse the insides with fuel or alcohol and always filter the fuel as you fill the bottle. Fuel tubing closure makes it easy to keep dirt out of your fuel system regardless of field conditions. To fill at the carburetor, uncover the brass tube, insert it into your fuel line and squeeze. If you have one of those neat



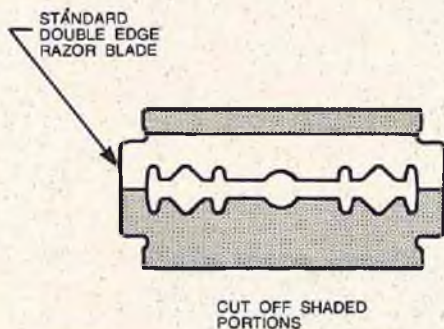
FOR WHAT IT'S WORTH

Tatone tank fillers, slip tubing off the rod and fill through the tubing. Use the bottle to empty your tank as well. This idea was submitted by Don Blucker of Orange, California.

If you're tired of having your X-Acto knife roll off the workbench, or, worst yet, off of your field box and through your airplane, simply slip a 1/4" I.D. washer over the screw shank and file one or two sides slightly flat. This idea was submitted by Bob Petro of Athol, Idaho.

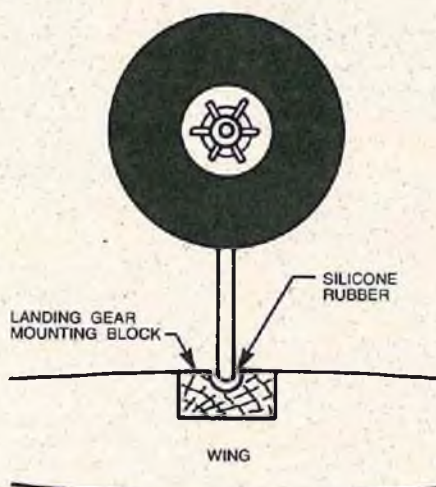


When his O.S. .19 gradually began to lose power, Jim McCurrach of B.C. Canada suspected his Du-Bro Muff-I-Aire to be the cause. After dismantling and cleaning the muffler, the engine returned to normal. After the next weekend's flying session, Jim decided a regular cleaning would be a good idea but that meant removing the copper locking wire as well as the muffler in order to scrape the carbon deposits from the



plates. After some thought and experimentation he devised this tool shown in the accompanying sketch. Take one standard razor blade and trim off the shaded portion. You now have a cleaning tool which can be inserted between the plates of the muffler to do a complete clean out in less than a minute. Since using this method after each flying session, Jim has been able to count on full output from his .19 to pull his Ace All-Star through all but sustained vertical maneuvers.

If you've ever had a problem with noisy landing gear mounted in a wing, try this idea to dampen both noise and vibration. After assuring that your landing gear wire fits properly, fill the hardwood holding blocks with silicone rubber, then place your landing gear into the wing and screw in the holding brackets. After drying, your landing gear will not make the irritating vibration noise and thus insure longer radio and plane life. This idea was submitted by Jim Heil of Ft. Stewart, Georgia.



Here is a simple tool for cutting hinge slots submitted by Chuck Anderson of Tullahoma, Tennessee. It's made from an old #11 X-Acto blade and only takes a couple of minutes to make on a bench grinder. It'll take a little longer with a file, but the time saved in cutting the slots in just one model will more than make up for the time. There is just one thing to remember — dip the blade in water frequently to keep from overheating. If you do goof, the shop is probably full of old blades.



Scott Orten of Grafton, Wisconsin, suggests an easy way for relieving tension or following contours with NyRod or Gold'N Rod pushrod assemblies. The method entails heating them slightly with your heat gun while holding the outside tubing in the desired position. Be sure not to overheat as the tubing will then deform making it useless for our application.

Here's a hot tip for using with Hot Stuff adhesive submitted by Jerry Peters of Council Bluffs, Iowa. Coat the outside of the teflon tubing supplied with Hot Stuff with mentholatum or something similar (not oil). It doesn't prevent build-up of dried glue on the tip but it surely makes it easier to remove. Re-coat the tube after removing the dried glue.

If one of your screwdriver handles ever falls apart and all you have left is the shank, keep it and put it in a variable speed electric drill in order to install screws much faster in a minimum amount of time. This idea was submitted by Scott Stephan of Ames, Iowa.

A considerable effort is made at all flying fields to insure that transmitters not in use are properly controlled. One of the biggest and hardest-to-spot problems is the transmitter in the impound area that is left on. A simple pre-flight check by each flier can detect and eliminate this and most other causes of interference. Just prior to starting your engine, place one or more of your controls in an extreme control position such as down elevator or left rudder. Now turn your transmitter off. The control position should hold. If the controls are noisy or return to neutral, look for the source of interference. It should be noted that leaving your controls centered when turning the transmitter off will not give the same check since an unattended transmitter that was inadvertently left on will also be centered so that control movement will not be as evident. This idea was submitted by Albert F. Niessner, Jr., of Boalsburg, Pennsylvania.

Ray Cole of Baltimore, Maryland, wonders if you've ever tried to install blind nuts in a firewall when there is no hatch to let you have access to them. If so, hustle down to your local hobby shop and get a one foot length of threaded rod with the same thread as the blind nut. Insert the threaded rod through the blind nut hole from the engine side of the firewall until it reaches the open area of the fuselage. Now, screw the blind nut to the threaded rod and pull the rod forward until the blind nut is seated in the firewall. Unscrew the threaded rod and you are finished. Don't forget to save the rod for future use. □

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ENGINE CLINIC

from page 10

varnish removal in a model engine. Hoppe's No. 9 is composed mainly of Nitro Benzene, a very toxic chemical. As a solvent to clean gun bores it is great, but it was never intended to be burned in an internal combustion engine. Nitro Benzene has been used in model fuels for many years and is that 'shoe polish' smell many of you have probably noticed at some time. Used in small quantities it is an aid in keeping high percentages of Nitro Methane and castor oil mixed. Nitro Methane in percentages much over 50% does not want to mix with castor oil. Nitro Benzene is dangerous to handle as it is absorbed by the skin and accumulative in your system. That means it is stored in the system and not thrown off by normal elimination processes. Constant exposure over a period of time can result in serious physical problems.

The use of a small percentage of Nitro Benzene in your fuel would probably not result in any physical problems as long as one is careful to not spill on their hands, breathe the fumes directly, etc. However, many fellows are pouring Hoppe's No. 9 directly down the engine intake which, in turn, results in high concentrations in the exhaust fumes. By doing this you are only asking for trouble. So, although Hoppe's No. 9 will do the job, I do not recommend using it for this purpose. If an engine is varnished-up there is only one sure way to remove the varnish. The engine has to be disassembled and cleaned with an SOS pad and water.

In your case Henry, I would guess that you have some other problem than varnish. With only two gallons of fuel through the engine it no doubt has varnish, but not to the extent that would cause the problems you have indicated. This sounds more like an air leak in your fuel line, dirt in the carburetor, etc.

Mr. Lee,

I have an O.S. Wankel/AT-6 (Aeroprecision kit) combination that I just started flying this Spring. The performance of this Wankel really surprised me even though I'd read various comments praising it. The quiet operation (with muffler) is really a joy and has added a lot to the sport for me. Thus - since I have no problem with the Wankel (yet) - my questions concern maintenance and durability. I believe that I've caught most of the letters pertaining to the Wankel which you have published since your original write up on it. (Possible front bearing that may run dry, and the cure of opening up the case/crankshaft clearance a wee bit), (keep the passage from the glo-plug to the combustion chamber cleaned out), (and the possibility of the build up of goo in the counterweight chamber).

Has there been any further word lately about other Wankel problems?

Do the guys running these motors seem generally satisfied with the length of time that they are getting out of them before the

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performance starts to noticeably drop off?
What has the replacement part situation been on the Wankel?

I'm running this Wankel with a 1015 prop - Supersonic 100 x2c (synthetic oil) fuel - the muffler that came with it - and a Perry carburetor (mainly just because I favor Perry Carbs). The plane weighs 4 lbs. 10 ounces (fueled flying weight).

Until flying this muffled Wankel - I never realized how much the noise of the engines was bothering me personally. (I fly mostly alone, and no one has ever complained to me about noise.) I've always used Silence-Aire mufflers, but this Wankel is literally in a class by itself. I wish I'd started using it when I first bought it three years ago.

Thanks for whatever you can pass on to me about this little rotary gem.

Don Moore

I receive very few letters in regards to the O.S. Wankel so can only assume that RC'ers using them have been satisfied with the longevity, etc. Most letters that I receive have been like yours - favorable. As far as I know, the Wankels are holding up just as well as any of the conventional engines. This is more dependent on the user than anything else. Treated with care any engine will last through many hours of useful life. Run lean, or under dirty conditions, and life expectancy might be only an hour at the most. In fact some guys have burned engines up in less than this.

I cannot really comment on the replacement parts situation as I have never had the need to purchase any myself. I have had no letters of complaint along this line as I have had with several other makes of engines.

Actually the Wankel is an under-rated engine. You see very few in operation. I would guess that one of the things holding back its acceptance by modelers is the size. Being a .30 it has the power of most .35's, however this is not one of the more popular R/C size engines. I would bet that if this engine were produced in a .45 to .60 size it would really gain popularity. However the engine is difficult to make and tooling/production costs at today's scales are one of the main reasons you have not seen more manufacturers producing the Wankel. This, plus having to purchase licensing rights.

Dear Sir:

I am sort of an old time modeler, having built my first powered ship around a Brown Jr. (Does that sort of date me?)

In 1950 to 1953 I was stationed at Clark Field in the Philippines - the Korean disagreement was in full swing and stateside supplies were in very short order, when available, took up to two months for delivery. So we bought most of our supplies from Japan.

Fuji, O.S. and Enya engines were the commonest in use. I had an Atwood 63, two Atwood 51's, two Atwood 49's, one Ohlson and Rice 19, one O & R 29, and a K & B Torp 29, one Dooling 29, and my Brown Jr. and another oldtimer of about 60 size that I'd brought over with me.

B-Team Race and Combat and Stunt was most popular in CIL. While a lot of men were pure Free Flight, Lin Haslam from Salt Lake City was one of the latter.

Now to the reason for this letter - in the July 1974 issue of RCM, you state emphatically that there is no substitute for alcohol based fuels, and gave several excellent reasons why this was so - But!!!

At Clark we never could get enough fuel so we used a lot of stuff from Japan that when burned smelled like shoe polish. On a trip to Kobe Japan I talked to a manufacturer's rep., and he told me the fuel was (as my memory serves me) about 10% Nitro Benzene, 7% oil, 2% either Amyl Nitrate or Amyl Nitrite and the rest Benzene.

Now this fuel let our engines run smooth, start easy hot or cold and could swing as big a prop as the alcohol based fuel.

Remember the old B-Team racer? Limited to 60' lines and 1 ounce of fuel with a fuel shut off.

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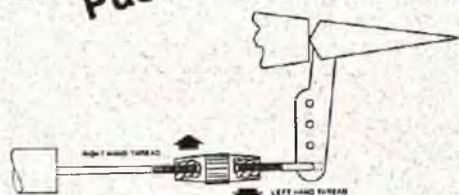

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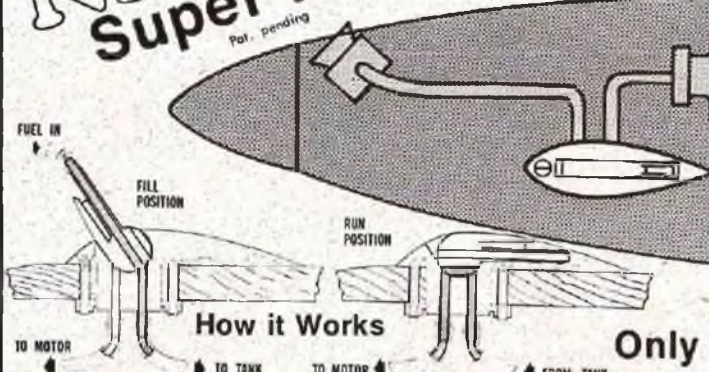


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MICRO-MOLD LARK

from page 77/72

... off which, if not corrected, will provide an incorrect alignment and a binding of the shafts which pass through them.

While it may take you several hours to align these bearings properly, it is well worth the effort since failure to do so will result in a bound-up drive train that will make the Lark virtually

impossible to fly. There are several ways to align these bearings properly, but the method that we used is quite simple, although somewhat time consuming. First, take all four nylon moldings containing the Oilite bearings and rub the plastic bases back and forth on a sheet of #400 wet-or-dry sandpaper, used dry. Lay the sheet of sandpaper on a hard and flat surface and rub the base of the bearing moldings back and forth until the bases are smooth and flat. Next, temporarily bolt the bearing housing in place on the main transmission plate and pass the appropriate shafts through them. You will probably find that, for

each shaft, one of the two bearings will be slightly lower than the other. The easiest way to align these bearings is to put a thin film of 5-minute epoxy under the low bearing, insert the shaft, and compress the low bearing down on the epoxy "shim" by tightening the bolts to such a point that the shaft is free in both of its Oilite bearings. Allow the epoxy "shim" to dry and the bearings will be properly aligned. Once the bearings have been thus "shimmed," if there is still any binding of the shaft in its Oilite bearings, chuck the end of the shaft carefully in an electric drill and, with the

to page 92



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Sponsored by R/C Modeler Magazine, the National R/C Helicopter Association has been established to promote and encourage active participation in sport and competition R/C helicopter flying. It is a vehicle whereby the R/C helicopter builder and flier will have a forum from which to discuss various ideas, helicopter competition rules, and provide a communications media with which to assist the Academy of Model Aeronautics in future programs in conjunction with helicopter contests. The organizational structure is very similar to other established organizations within the R/C framework such as the NSRCA for pattern fliers, the NMPRA for pylon racers and the LSF for sailplane pilots and will be structured in such a fashion as to promote helicopter activities within the existing governing body for all phases of model aviation, the Academy of Model Aeronautics.

As mentioned, the primary purpose of the NRCHA is to encourage the dissemination of information between R/C helicopter pilots as well as to establish and create a self-improvement and achievement program similar to that utilized by the League of Silent Flight. A five step Grade Level Proficiency Program has been established with gold proficiency pins awarded for each grade level you complete successfully.

The Association is a non-profit organization whose administrative and clerical details are handled by the R/C Modeler Magazine staff on a gratis contributory basis. Membership dues have been deposited in a separate account in the name of the organization and those dues are used for actual expenses of membership cards, and physical materials necessary for the initial operation of the organization. A full accounting of all funds will be made on a periodic basis and will be certified by a public accountant. Additional funding has been donated by R/C Modeler Corporation.

As a member, you will receive a membership card in the NRCHA and will be assigned a registration number which you can use on your helicopter which will consist of the letter N followed by a number issued on a first come, first serve basis followed by a letter designating the district in which you reside. These registration numbers will not only serve as an indication of your membership in the organization, but will enable the model magazines to be able to identify the owner of a helicopter in contest photographs by simply checking the organizational file for the individual membership card bearing that number. As a member you will also have the opportunity to associate with individuals across the continent whose interest in the hobby parallels that of your own. It is our hope that each and every one of you will participate in any degree possible within the organizational structure, contributing ideas, building information, flying tips, and/or working and serving on the various committees that will be established in the future. Any assistance that you can render will be appreciated by each and every R/C helicopter pilot in the country. The annual dues have been established at \$4.00 per year to cover postage, printing, etc. All additional costs will be absorbed by R/C Modeler Magazine.

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MICRO-MOLD LARK

from page 88/72

metal bevel gear loosely mating with the nylon gear, operate the electric drill for extremely short periods of time, easing it forward and back approximately 3/16 of an inch, which will ease the Oilite bearings and provide a good mesh of the gears. If you utilize this procedure, do it carefully, and add some 3-In-1 Oil to the Oilite bearings while operating the electric drill. Be extremely careful in this procedure to avoid any damage to the bearings, shaft, or gears.

With regards to your selection of an engine for the Lark, we would strongly recommend the use of a Veco-Lee .19 engine. The Veco-Lee .19 engine, hand assembled by Clarence Lee, should be ordered with a Perry Carburetor and stock Veco .19 muffler. While other engines can be used, the Veco .19 and the Enya .19 have both proved to be more than satisfactory. While the OS Max .25 engine will also fit, and has been used on some prototypes, the thin cylinder walls of this engine give it a great tendency to overheat when used in the Micro-Mold Lark. As you will see from the photographs, there is no cooling fan used on the Lark, and cooling depends entirely on the massive heat sink which is provided in the kit. The Veco and Enya engines, utilizing thicker cylinder walls, are less prone to overheating than is the OS Max .25. If you do encounter overheating problems with the engine of your choice, you can add several pieces of thin sheet metal to the heat sink to increase its cooling capacity.

During the construction of the Lark, you will be instructed to file flats on several shafts used in the drive train. These shafts are for the proper seating of the set screws (referred to as grub screws in the instruction manual), and must be filed carefully by hand. If you simply take one of these shafts and clamp it down in your bench vise, you're going to mess up the shafts royally, to say the least! The proper method for holding the shafts in your vise while filing the flats is to take two small pieces of soft aluminum and bend them to a right angle. Put these angular pieces of soft aluminum sheet in-between your vice jaws and then clamp the shaft between them. The soft aluminum angles will grab the shaft firmly but will not score, or otherwise damage, the shaft as would the rough steel jaws of your vice. File the flats carefully using a straight motion of the file with one hand on the handle and the other on the tip of the file itself. Make sure that these flats are filed exactly according to the instructions, to the proper length, and that they are flat, and not rounded due to an angular motion of the file.

As previously mentioned, it is necessary to drill the engine mounting holes for the engine of your choice in the main drive train plate. The correct position for drilling the engine mounting bolt holes can be determined by some accurate measuring and some lines scribed on the plate

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MICRO-MOLD LARK

from page 92/72

with an awl. The engine is then mounted on alloy pillars that stand off of the mounting plate. Be extremely careful and patient and obtain the correct position of the engine so that the drive pulleys are lined up properly and that the correct drive belt tension is obtained. Do not make the mistake of putting too much tension on the toothed drive belt. The correct tension should be approximately 3/16" to 1/4" play on one side of the belt if the belt is pushed in with the finger. If in doubt, leave the belt on the loose side, but under no circumstances should it have more tension than that called out in the instructions. Once the entire engine and drive train assembly is completed, check for complete freedom of movement of the entire drive assembly through the belt and gears before going on to the tail rotor collective pitch assembly.

The second phase of the assembly which requires the most patience and time are the proper meshing of the two mitre gears that are installed in the tail rotor gear box "cage." These mitre gears must mesh properly and some time and patience must be taken to insure that they do, otherwise your Lark will not fly properly. Once the mitre gears are temporarily installed, check for complete freedom of movement and proper mesh with no binding or slippage. We found it necessary to "face" the base of these mitre gears by rubbing them across number 400 wet-or-dry sandpaper, used dry. Again, lay the sheet of sandpaper on a flat hard surface and move the base of the gears smoothly and firmly across the sandpaper to remove minute amounts of brass until the gears are faced to a point where they will mesh properly. This will require installing the gears and removing them several times until, finally, you end up facing the base of the two mitre gears with crocus cloth for a final smooth fit of the two gears. No matter how many times you

must assemble and disassemble the tail rotor gear unit, continue this operation until the gears mesh smoothly and properly. This is extremely important.

The tail rotor pitch is controlled by a piece of 22 gauge piano wire inside a nylon tube. As can be seen from the photographs and the construction drawings, the tube is clipped to the tail boom with two nylon clamps provided in the kit. However, we found that bowing of the nylon tube did occur when the tail rotor pitch control servo was actuated thus decreasing the amount of servo motion to the tail rotor collective pitch mechanism. This problem was solved by adding two additional nylon clamps to the nylon tube to prevent this tendency to bow. These clamps can simply be of the type available in any electrical supply store for bundling electrical wires together, or of the type used in Sullivan fuel tanks for securing fuel lines to brass fuel tubing.

When mounting the fuel tank provided in the kit, bend the aluminum tank strap carefully. However, the tank can be mounted more rigidly and prevent movement of the tank which could interfere with the swash plate control bell crank by adding an additional bend as shown in Figure 3. Use a piece of 1/8" thick foam, with adhesive on one side, mounted to the wooden fuselage bearer directly between the tank and the fuselage to prevent undue vibration of the tank against the fuselage proper.

With regards to finishing the helicopter, we painted only the wooden and plastic fuselage parts, using K & B surfacing resin on the wood followed by a coat of K & B Superpoxy primer and white Superpoxy sprayed on the entire ABS plastic and wooden fuselage assembly. The high quality Lark decals were then applied and all bubbles carefully rubbed out of the decals. When dry, a coat of clear Superpoxy was applied to the entire fuselage "pod". Additional Lark decals were applied to the tail boom as can be seen from the photographs. The aluminum tail boom and

to page 96

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MICRO-MOLD LARK

from page 94/72

skids were polished with a Brillo pad and water
and left in their natural aluminum color.

The single most crucial part of the Lark
assembly is the careful finishing and balancing of
the main and tail rotor blades. With any
helicopter employing a rigid rotor head, an
immense amount of vibration can be induced by
even the slightest amount of imbalance between
the two main rotor blades or in the tail rotor
system. Here are the steps we recommend for
balancing the main and tail rotor blades.

The main rotor blades consist of a pre-shaped
Ramin hardwood leading edge and 1/4" thick
balsa trailing edge sections. The latter must be
shaped to an airfoil section after being epoxied to
the hardwood leading edge. The proper airfoil
must be carefully sanded into both blades prior to
the installation of the plywood blade mount
strengtheners. Due to the difference in weight
between densities of balsa wood and hardwood,
plus the amount of sanding between the two
blades, there will probably be a difference in
weight between your two main rotor blades. If
you have a grams scale, by all means use it to
determine how much heavier one blade is than the
other. If not, the blades can be carefully balanced
after installation on the rotor head by following
the procedure which we will presently describe.

Due to the use of the plywood strengtheners at
the root of each blade, as well as the epoxy fillet
around these strengtheners, it is advisable to paint
the root of the blades while covering the balance
with Solarfilm. Do not round off the tips of the
blade nor cover them with Solarfilm. Simply
paint the tips of the blade with resin and
Superpox or several applications of clear dope
followed by the color of your choice. The balance
of the blades can be covered with Solarfilm as
shown in Figure 4.

Before mounting the main rotor blades, install
the paddle bars and line them up properly using
the centerline mold mark on the tip of each paddle
as a reference line. This is best accomplished by
setting the paddle bars, installed on the flybar
(which is passed through the rotor head), on two
blocks of balsa of equal height. Using a ruler,
accurately measure from the surface on which the
blocks are mounted to the mold centerline of the
paddle at both the leading and trailing edges of
each paddle. Adjust the paddles until the
dimensions are exactly the same when measured
from the flat table surface to the centerline mold
mark at the leading and trailing edges of the
paddle. Next, install the rotor head with flybar
and flybar paddles attached to the Lark main rotor
shaft and slide the flybar back and forth until the
assembly is balanced with the paddles level.
When this balancing procedure is accomplished,
lock the flybar in place with the collar and the
pitch crank using the set screws provided. Make
sure that the flybars are balanced properly before
proceeding to the installation of the main rotor

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blade.

The proper alignment of the main rotor assembly will be easier if a large sheet of white cardboard is used as shown in Figure 5. This sheet of cardboard should be approximately 48" x 20" with a centerline scribed from A to B and C to D as shown in the sketch. These centerlines should be accurately drawn using a draftsman's T-square. Before aligning and balancing the main rotor assembly, however, it should first be fitted on the Lark and the coning angle adjusted relative to the tail boom as described in the text. When the coning angle is properly aligned, remove the main rotor head assembly and set it on your white cardboard upside down. Measure from the leading edge of the rotor to the center of the attachment bolts at the root. Measure an equal distance at the blade tips and mark the position on the tip of each blade. Align the flybar over the line you have drawn on your board from A to B with the rotor head centered directly at the intersection of the two lines. Adjust your blades until the marks on your blade tips coincide with lines C and D. When you have properly aligned the main rotor blades and the flybar paddles so that they are at exactly right angles to each other, lock the blade mounting bolts in place and remove from the board.

Now we will balance the entire main rotor head assembly. Once again, we will use the two blocks of balsa wood which were used to adjust the flybar paddles. Move these blocks in to a point where the flybar itself is resting on the blocks, one block under each side of the flybar. The paddles should extend beyond the blocks and not be resting upon them. With the rotor blades installed, the heavier blade will now move to a position closer to the table while the lighter blade will be higher in the air. Weight must be added to the lighter blade until both blades are exactly the same height from the table with the flybar resting on the two balsa blocks. We found it necessary to add an additional sheet of Solarfilm to the bottom of the lighter blade as well as adding two additional strips of trim tape to the end of the same blade. In addition, the final balancing of the lighter blade requires drilling a small hole in the tip of that blade and epoxying in place a 3/8" length of a 4-40 screw with the head removed. The tips of both blades were then given one coat of K & B surfacing resin to seal the tip and prevent loosening of the Solarfilm covering. Before removing the head assembly from the balancing jig, make sure that both blades, when the balancing is completed, are exactly the same height from the table when measured at the leading and trailing edges of the tips of each blade. This is extremely critical and patience must be exercised until the blades balance exactly.

With regards to the proper pitch of the blades, do not use the drawings shown in the instruction manual since this is not drawn to scale and does not represent a six degree angle. A full size pitch template accompanies this article and can be simply cut from 1/8" plywood for checking the

to page 100

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MICRO-MOLD LARK

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pitch of the main rotor blades. In addition, a mark can be made on the template to indicate the distance from the tail boom to the bottom surface of the blade when the main rotor blade is parallel to the tail boom. Thus, the pitch gauge can also be used to check the proper coning angle of the blades at the field.

Before mounting the rotor head on your Lark, re-check the coning angle, re-check the proper pitch of each blade and, if any corrections are necessary, make those corrections and then check again for proper balance, pitch, and coning angle. This is a time consuming process, but once you have learned the procedure, it is relatively simple and can be accomplished in a few moments time.

Balancing the tail rotor blades is also crucial and is accomplished much in the same way that

one conventionally balances a propeller for a fixed wing aircraft. First, sand both blades, shape according to the instruction manual, and add the plywood blade mount reinforcements. Paint the tips the same as you did on the main rotor blades, and cover the balance of the blades with Solarfilm and a colored trim tape of your choice. Now, take a length of music wire that will be a tight fit through the blade mounting holes drilled in the tail rotor blades. Mount the blades on the rod as shown in Figure 6 with the blades perfectly parallel to each other. Slide a servo mounting grommet on each end of the music wire and up against the blades. Compress these grommets tightly against the blades by installing a wheel collar of the appropriate size on each end of the music wire and tightly up against the grommets. This will hold the tail rotor blades in position for balancing and perfectly parallel to each other when the set screws in the wheel collars are locked tightly against the music wire. Now,

according to Figure 7, install a double edged razor in each of the two balsa blocks you previously used for balancing the main rotor head. Lay the piece of music wire with the tail rotor blades mounted in the center across the edges of the two razor blades. This procedure will allow you to instantly determine the heavier of the two tail rotor blades. The heavier blade will move closer to the table while the lighter blade will move further up in the air. Balance the lighter of the two blades by adding additional Solarfilm or trim tape until both blades are exactly parallel to the table and the same distance from it when measured accurately with a ruler. When this has been accomplished, your tail rotor blades are balanced and can be removed from the jig and installed on your Lark helicopter. Save the tail rotor balancing fixture for later usage in case it should be necessary to replace your tail rotor blades.

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MICRO-MOLD LARK

from page 100/72

One of the most common problems with those who have built the Micro-Mold Lark helicopter is the improper installation of the tail rotor blades. Since the blades are mounted on the side opposite from that normally found on most helicopters with similar main rotor blade rotation, the flat portion of the tail rotor blades faces to the outside of the helicopter, while the airfoiled section of the blades faces towards the boom. This is hard to determine from the instructions and probably even difficult to see in our photographs. However, your blades are properly installed if the airfoil is facing towards the boom and the fin with the flat portion of the blades facing to the right of the helicopter when viewing the helicopter from the rear of the tail boom looking forward.

And now, a few final thoughts on your Lark before your first flights. During construction, use Torqueseal provided in the kit for fixing all conventional nuts except elastic stop nuts. Be sure to clean all parts in dope thinner to which Torqueseal is to be applied and make sure they are thoroughly dry if you expect the Torqueseal to hold. Torqueseal takes approximately three hours to dry so the parts should not be moved until complete drying has occurred.

There are two schools of thought with regards to whether or not your helicopter engine should be broken-in with a conventional fixed wing aircraft propeller before installation in the helicopter. Our thoughts on this matter are that it is better to run-in your engine in the Lark which will also free-up and properly seat the Oilite bearings in the various components in the drive mechanism at the same time as you are breaking-in your engine. In addition to breaking-in your engine and running in the drive train components at the same time, you will also

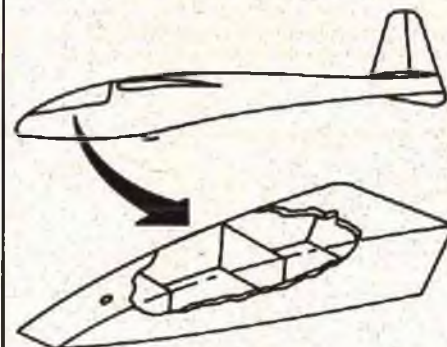
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SOARING

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window screen clips modified as shown in the sketch. The plastic was removed by means of an X-Acto knife and a soldering iron. The two clips were then bolted with 6-32 nylon screws to the plexiglass sun-shield. The use of plastic and nylon, will in no way, de-tune the transmitter antenna. An added advantage is that now there is no need to buy a shield for each transmitter as it can easily be removed from one and installed on another.

◇ ◇ ◇
Donald H. Drury of Ann Arbor, Michigan, submitted the sketch of various methods of ballasting your sailplane as needed for penetration. As shown in Figure 1, a block



canopy can be built up of 1/32" plywood with several chambers built in. Lead shock can then be added to these chambers through 1/4" access holes in the top with plastic tape or Solarfilm or MonoKote used to seal the holes. Referring to Figure 2, conventional sailplanes usually have the center section planked on both top and bottom. This is an ideal spot for carrying ballast.



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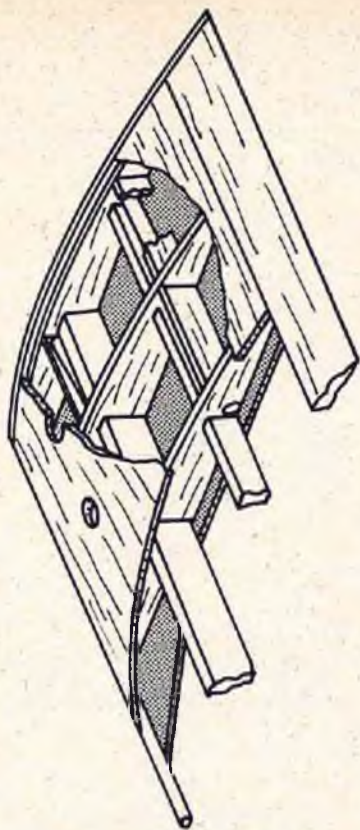
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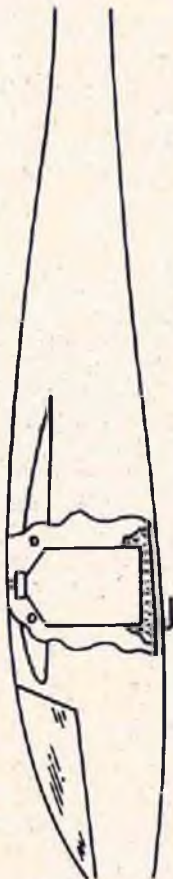


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As shown in Figure 3, a 4 ounce Titebond or similar glue bottle will hold 16 ounces of lead to page 112



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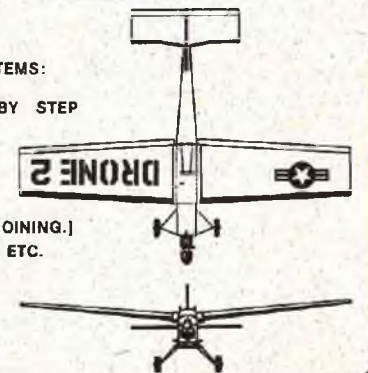
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MICRO-MOLD LARK

from page 104/72

become familiar with the operating characteristics of your helicopter and you will find any out-of-balance or poor trim conditions during this period before you go out to the field for your first flights.

With regards to training gear, Micro-Mold also provides an excellent float kit for use with their Lark helicopter. This lightweight float set enables you to fly off grass and provides a soft cushion for

those initial "learning bumps." However, the use of floats requires some trim changes in your helicopter. For example, you may find that, even with your engine running at peak efficiency, your Lark will not lift-off cleanly with the floats installed. If so, it will be necessary (as with any other helicopter) to slightly increase the pitch of the main rotor blades from the standard six degrees to six and one half or, possibly, seven degrees pitch. This is due to the fact that the mass of the floats absorbs a large portion of the down wash of the blades requiring additional pitch in the blades to achieve proper lift off. Due to the

wide track and upsweep of the Lark landing gear, we would recommend using two fiberglass arrow shafts strapped across the skids with a lightweight plastic training golf ball (wiffle ball) mounted on each end of each arrow shaft. The upsweep of the skids will, for the most part, prevent forward tip-overs, while the extra width provided by the cross bars will prevent sideward spills. This type of training gear has been widely used for some time on various types of helicopters and has proved quite successful and requires no trim change to the main rotor blades.

to page 108

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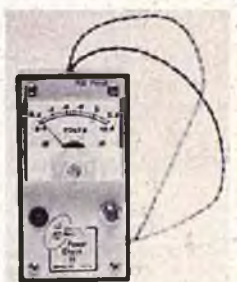


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Wing Area: 180 sq. in.
Wing Span: 28.5 in.
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Weight (as built): 17.5 oz.
Engine Size: 1.5 cc.

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MICRO-MOLD LARK

from page 106/72

Follow the flight instructions carefully in your Lark manual and learn to hover before attempting forward flight. While the latter is quite a bit easier than hovering, it is necessary to hover in order to land your helicopter, so take the time and learn to hover successfully. Learning to fly with any helicopter takes a considerable amount of time and patience and the Lark is no exception. Where the Micro-Mold Lark excels as a trainer is the fact that the rigid rotor head provides exceptional stability and docile flight characteristics that make it an ideal trainer. Later on, you may wish to add the new teetering head which will soon be released by Micro-Mold and which will improve the maneuverability of your Lark. For the time being, however, keep your Lark balanced properly, keep your engine clean and watch for any signs of overheating, and put in as many hours of practice as possible. You'll find that you can learn to fly this little machine quite rapidly if you persevere through the initial training curve which can sometimes be frustrating and exasperating. The advantages of the Micro-Mold Lark helicopter are its ease of construction, its extreme ease of transportation, and its ability to withstand abuse that would cause severe damage to the larger and heavier .60 powered chopper. Peter Valentine, the designer, and Micro-Mold of England have done an exceptional job of designing the Lark helicopter---the rest is up to you. □

EK SUPER PRO

from page 71/70

a very small voltage difference above a fixed minimum level giving a broader indication of the transmitter batteries safe operating range.

The receiver is of two board modular type construction housed in grooves in a two piece molded plastic case that separates in the center. The circuit utilizes a double tuned front end and four IF's. It is available in single conversion, with a dual conversion receiver being an optional extra. There is a built-in block connector for the power input plus six servo outputs while a separate aileron servo exits at one end of the receiver lock connector. The receiver unit also carries mounting grommets which are designed to fit on a special installation tray designed by EK for the mounting of the servos plus the receiver. However, the receiver can be mounted in a conventional fashion by simply wrapping in foam rubber and installing in the receiver compartment of your aircraft.

The Super-Mini servos are extremely small and weigh 1.2 ounces with plug cable and amplifier with a manufacturer claimed control accuracy of better than one percent. These are extremely powerful small servos with fast and accurate resolution. Mounting is conventional with four grommets in the servo end brackets designed for installation in the special EK trays or the individual servo mounts also available from EK-logicrol.

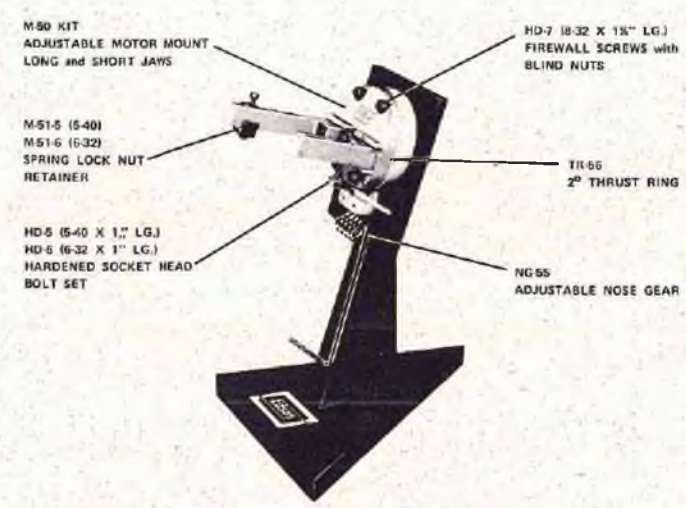
The battery is a four cell, 550 milliamp, 4.8 volt tubular type nickel cadmium pack with the cells epoxy bonded together. Weight of the battery is five ounces.

A complete line of accessories for the EK-logicrol Super-Pro are available including a complete variety of installation trays to fit almost any aircraft need, servo accessories, and the like. To the best of our knowledge, EK-logicrol is the only manufacturer who provides a servo tray that houses the receiver, servos, and switch unit so that the entire radio system can be removed from one aircraft and installed in another simply by removing four mounting screws.

All flight test subsequently carried out on our EK-logicrol seven channel Super-Pro were excellent and no difficulties or problems of any kind were encountered. □

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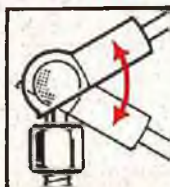
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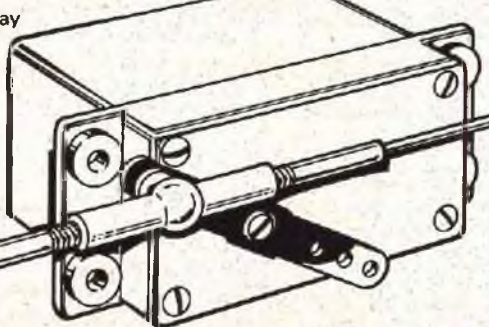


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SOARING

from page 105/68

shot. This bottle can be located in the fuselage at the Center of Gravity with the access hole in the top. Don secures the bottle into the top planking and locks it to the bottom of the fuselage with rubber caulking. Any one of these methods may be suitable for your sailplane so, if you're going to use ballast, plan on it ahead of time and build accordingly.



Two new Hi-Starts have been introduced by Craft Air, 5901 Oakdale Avenue, Woodland Hills, California 91364. The one piece surgical rubber tubing is wrapped on a convenient plastic storage reel. The reel and nylon line are white, making them easy to see in the field. Craft-Air Hi-Start parachutes come with a steel tow ring and steel stake. Two sizes are available; the Deluxe Standard Class Hi-Start, for sailplanes weighing less than 45 ounces is priced at \$34.95; and the Deluxe Heavy Duty Hi-Start for sailplanes weighing more than 35 ounces is priced at \$37.95. Available from your neighborhood hobby shop, or direct from Craft-Air.

Another outstanding new product is the Dead Beat high performance sailplane from D.O.A. Models, 12128 Woodruff Avenue, Downey, California. While we do not have the price on this fiberglass kit which consists of a high quality fiberglass fuselage and built-up wing and empennage, we do know that the performance is outstanding. Our RCM staffer, Bill O'Brien, has been flying several of these prototypes for sometime and, while primarily intended for high performance slope soaring aerobatics, this machine also will thermal soar from a hi-start with adequate lift. It has an extremely light wing loading although it can be loaded as desired. Its performance with ailerons is virtually fantastic and will turn on a dime. It is quite spectacular to see the aerobatics that can be done after a release from a Hi-Start not to mention the F.A.I. pattern type performance on the slope. For further information, contact the manufacturer direct or telephone him at (213) 869-9614. Price is not available at the time of this writing.

While talking about ballast a few moments ago, one of the most useful sailplane accessories we have seen to date is the Ballast Lok from Scott Research Company, P.O. Box 22, Costa Mesa, California 92627. As shown in the photograph and sketch, the Ballast Lok can be mounted in the base of your fuselage on or near the Center of Gravity and lead weights added and removed as needed. With this inexpensive accessory, adding

to page 116

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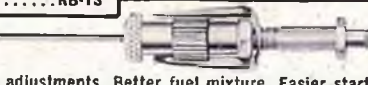
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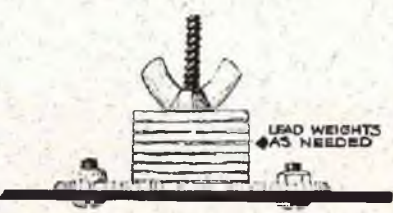
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SOARING

from page 112/68

ballast for fine tuning your sailplane for maximum performance, is a matter of unscrewing the wing nut and adding a few lead weights until the required amount of ballast has been installed. An excellent and most useful sailplane accessory. □





LEAD WEIGHTS
AS NEEDED

NRCHA

from page 65/64

... the September 1974 issue of RCM, passed on a few comments on the training dolly using Shepherd Casters presented in a recent installment of the Helicopter Flight Training Seminar. George mentions that we wrote in the article that, "when fully airborne, the helicopter requires less control to produce motion than on the dolly", which we attributed to dolly weight (mass) and ground friction being absent in full flight.

As George points out, this is indeed true, but another important factor which should be

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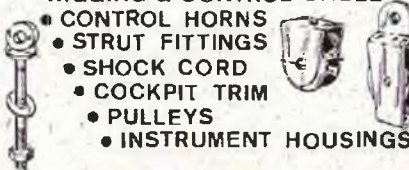


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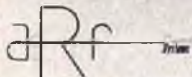
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NRCHA

from page 116/64

mentioned is the fact that the dolly, in ground contact, does not allow body tilt in response to control input or other forces and moments which act on the helicopter when it is a perfectly free body. For example, George noted that almost 1/2 left lateral stick throw was necessary to compensate for the right tail rotor thrust when on the dolly. (Note: The swash plate neutral was rigged level, longitudinally and laterally.) Short hops required much less left lateral input when fully airborne, since left body roll helped produce some of the required swash plate tilt. The body roll results from the tail rotor thrust acting below the main rotor hub, producing a left rolling moment.

The message that George is trying to get across is that you should not trim the swash plate lateral for stick-center neutral on the dolly if you are now going to fly fully airborne. Expect new trim settings when leaving the dolly training phase and going to fully unconstrained flight. George suggests trimming the swash plate 0-0 degrees to the main rotor shaft is the best place to start when beginning trimming for free (unconstrained) flight.

If you think that helicopters are all fun and games, our R/C choppers are also serving more practical purposes — in fact, one R/C helicopter alone has saved the lives of seven people in one month!

A radio controlled Kalt Hucy Cobra, was purchased by the Chief of Police in Japan's Yamanashi Police District for taking aerial photos of traffic crashes in that mountainous district of Japan. However, the police department soon found that the Kalt machine was even more effective for difficult rescue work.

According to Police Chief Hidetashi Akaiki, five members of a family had become trapped on a mountain ledge that they had climbed during an afternoon picnic. When the police arrived at the scene, it was dusk and the temperature was only two degrees above zero. Realizing that time was of the essence, and that the five people would soon freeze to death if they weren't rescued quickly, the police chief thought of using the R/C helicopter. It was utilized in the rescue by attaching one end of a cord as well as a bright light to the chopper and then having the R/C pilot fly the helicopter up near the ledge where the family was trapped. One of the trapped members then reached out and started pulling the cord in. In the meantime, the police, down below, attached a heavier rope to the smaller line that had been taken to the ledge by the helicopter. This heavier cord, too heavy for the Kalt Cobra to carry to the ledge, was then pulled up by the father of the family and tied to a large rock. This then enabled three members of the police rescue team to climb the rope and bring down the entire family.

A few days later, a small boat capsized on a lake near Tokyo and the man and woman passengers managed to swim to a tiny rocky island but were unable to make it to shore. Police Chief Akaiki again utilized the Kalt Cobra by attaching one end of a long cord to the helicopter and the other end to a rubber raft, then flew the helicopter out over the island. The man grabbed the cord and pulled the raft to the island. Both survivors then got in the raft and the raft was towed back to shore with a heavy rescue line that had been attached to it.

Since the R/C helicopter has proved itself well in rescue operations, and, in fact, has saved the lives of seven persons during a thirty day period, police chief Akaiki has ordered two more of these helicopters from the builder, Akitoshi Tsukahara of Kofu, Japan.

And we call them toys?

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QUARTER MIDGET

from page 62

only in the turns, but also on take-offs and landings. Attention should be given here to a plane with as minimal amount of frontal area as possible (e.e. drag). Some designs have twice the net frontal area as others. Once you've found the right design for you — stick with it. Build a couple for racing season; you can't win if you don't have anything to fly. Look at the U-control boys, they may bring ten to twenty combat ships out for one contest.

(2) Construction: One theme should be followed during the entire construction of your

ship — keep it light! A maximum all-up weight of 2 1/2 pounds is tops. If your plane is an ounce heavier "you've lost already." The so-called experts would never dream of trying to compete with an over-weight racer.

(3) R.P.M.'s: With the superb engines on the market today, "super tuning" is not that important. Most .15's can reach their maximum torque and rpm's by simply breaking them in, in the proper manner. In the case of Super Tigres, it may mean flying several gallons through them before they come in; K & B, on the other hand, may need only a gallon to do the job. At any rate, the end result should be adequate. Of course, changing or packing the bearings, balancing the crank, enlarging the intake and many more tricks will help, but aren't necessary and some border on being illegal. The term "stock" should apply to everybody. With plenty of running, the engine

should reach peak power on it's own and still maintain a reasonable idle. The idle is one thing that can be mastered by the novice with simple adjustments and "no" reworking.

(4) Flying: There are some experts around who could take a 3 1/4 pound ship and literally fly the wheel pants off a novice flying a 2 1/2 pound one. A sure-fired way of getting the checkered flag first is to fly a "tight" course — each and every lap. No ballooning in the turns or corrections on the straights can be tolerated. The only way that someone should be able to cut inside of you in the turns would be to go through the pylon. Practice here is extremely important! Not everyday, but on the weekends and by attending as many contests as possible. This will help to build your expertise as well as your confidence.

to page 124

NEW PRATHER PANTHER \$89.95 SPORT - FUN - PATTERN - Quick to Build - Epoxy-Glass Fuselage - Firewall Installed - Foam Wing and Stab - Wing Span 64 In. - Engine Size .60 Flys so smooth even a novice can handle the Panther. Yet is still capable of the most complicated maneuvers. Easy to Fly - Dural Landing Gear - All Wood and Wire Parts - Complete Plans and easy to follow instruction pamphlet	LITTLE TONI SCALE: FORMULA I Pylon Racer - World Record Holder - Won 1974 NMPRA Championships Complete Custom Kit — \$99.95 Economy Kit — 69.95	NEW Nose Wheel Brake - Easy to Hook Up - Reliable - No Springs to cause trouble - Shoe puts pressure on tire \$1.49 NEW Sanding Block 89¢ The block is large 9" x 3 3/4" and is great for sanding large areas. Cut to size for smaller jobs. Comes in 3 grits, fine - medium - coarse. NEW Dzus Fastener Works great for hatch covers and cowls. Comes complete with wire retaining loop. \$1.29
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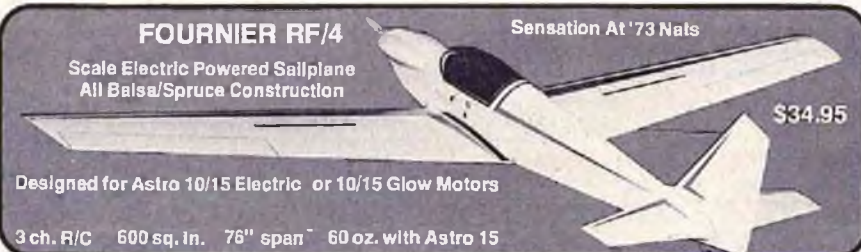


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QUARTER MIDGET

from page 122/62

(5) Consistency: This is probably the most important key to successful racing. Take close note of these different keys, because without all of them, you can't open the door to the trophies: Your engine must start every race, your engine must idle every race, your engine must run its best every race, you must fly a tight course every race, and last but not most important, you must not crash!

Remember: The law of large numbers is in your favor as a novice; if you fly in enough races, the "Experts" will slip up eventually and there you'll be holding the brass. If it certainly mean a whole lot more to you than the Experts who win "almost" every contest.

Try Quarter Midget racing, it can be inexpensive, should be rewarding (a win), and definitely will be tremendous fun — after all, isn't it the fun you're after anyway; with the win being only a by-product?

A recent decision not to hold FAI pylon races at the US Nationals has had far reaching effects in that event here in the Northeast. From what I gather, this will be the last year that the event will be seen here. We would like to invite the people who participated in FAI to join the ranks of Quarter Midget racers. I'm sure if they accept the invitation, the people now involved in QM had better be prepared for some pretty sharp competition. It is in our own interest to clean up the fairness of QM now. These guys play by the rules if you do, but burn them once and they're going to run all over you. Reprinted from the MARA Newsletter.

Pringle's New Fangled Potato Chip cans make excellent prop containers for up to 8" propellers.

A hint from the Black Hawk RC Pilots Newsletter by Warren Brecheisen suggests that canopies can be polished out with a preparation that is used to polish motorcycle face masks. If the canopy is really bad, use some Crest toothpaste on it first.

Another hint comes from Fred Carey of Renton, Washington, for 1/2A racers. If you have trouble keeping tubing on the stock crankcase pressure nipple on a TD .049 or .051, try this: Cut a 1/4" length of inner Gold'N Rod and remove the ridges then, after cleaning and roughening the engine in the tap area, epoxy the Gold'N Rod over the existing nipple taking care not to get epoxy in the tap hole. Fuel tubing will not slip off the enlarged pressure fitting as before.

Hints submitted by individuals to this column or to the magazine that are published in this column receive a free one year subscription to RCM.

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QUARTER MIDGET

from page 124/62

The Chicago Pylon Club has adopted a motion by Dan Kane to require engines to idle until touchdown, with a full point being penalized for engines that stop prematurely. There will be no other idle requirement. The club passed the motion unanimously.

From the Pilot Log of the Fort Worth Thunderbirds by David Moore. On April 20, 1975, Roger Cirelle and David Moore ventured to Keller, Texas for the monthly 1/2A pylon race sponsored by the Great Southwest Radio Control Club. Dave was tied with two GSRCC members for second place at the end of the day. In the fly-off, Dave captured the third place trophy.

Both Dave and Roger came home with a lot of enthusiasm for 1/2A racing. The Keller Club sponsors one of these races on the third Sunday of each month. Rules specify the airplane must have a minimum of 200" of wing area and an engine not to exceed .051. Congratulations to The Great Southwest Radio Control Club for a well organized contest.

Jack de Vries, editor of the Pikes Peak RC Club Newsletter from Colorado Springs sent in a race report of the first QM race of the Rocky Mountain Pylon Association. Jack also reported that Joe Bridi was there on a visit and didn't do too badly with a borrowed airplane. We won't embarrass Joe by saying how badly he did!

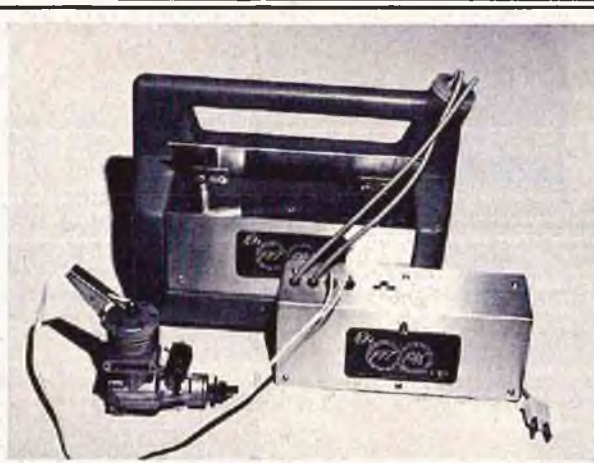
First — Heitkamp, ST powered Miss Dara. Second — Gates, KB powered Spirit of St. Louis. Third — McGinnis, KB powered Spirit of St. Louis.

Bob Waechter again reporting from Tennessee:

April 26-27 found Nashville, literally packed with QM flyers and racing fans. The thirty-five entrants came from all over the South to compete for some outstanding trophies and prizes. A total of six rounds were flown, three on each day, in an unhurried and relaxed atmosphere. Each round consisted of nine four-plane heats over the standard two mile course. Fastest time of the two day event was turned in by Austin Leftwich, 2 min., 2 sec.

First — Bob Reuther, Skyglas Miss Cosmic Wind, KB, Pro Line. Second — Austin Leftwich, Little Gem, ST, Pro Line. Third — Gayle Jacobsen, Little Gem, ST, Pro Line. Fourth — Robert Jessec, P-51, ST, Pro Line. Fifth — O.B. Stewart, Minnow, KB, Pro Line.

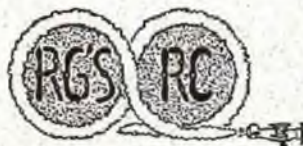
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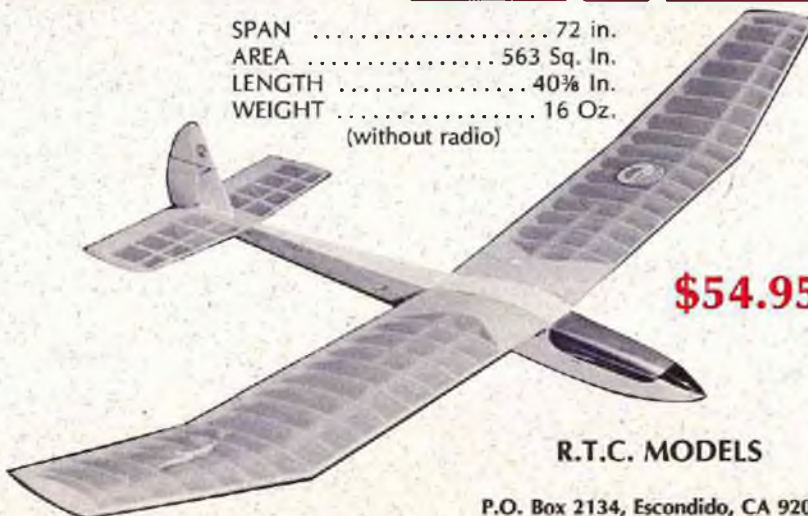
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QUARTER MIDGET

from page 128/62

QMRC ran a muffler race at Mile Square in Fountain Valley, California, on Mother's Day. There were 23 entries with mothers and mufflers cutting attendance somewhat.

First — Joe Zdankiewicz, Miss Dara, ST, RS (fastest time). Second — Bob Novak, P-39, KB, RS. Third — Jack Stafford, P-51, KB, PCS. Fourth — Tony Depadova, P-51, KB, Kraft. Fifth — Kent Thomas, P-39, KB, RS.

The 1975 Quarter Midget Championship races hosted by the Louisville Radio Control Club and the Kentucky State Department of Parks and Recreation will be held at Rough River State Park, Falls of the Rough, Kentucky, on September 6 & 7. Entries are accepted up to 10 PM on September 5 and processing starts at 8 AM on September 6. Large cash prizes and trophies will be awarded through tenth place. AMA provisional rules will be used and AMA and FCC license required. 15% fuel will be supplied by World Engines. Entry fee is \$7.50. This is always a great event and a fabulous vacation spot for the entire family. The race is held on the park's landing strip adjacent to the hotel, restaurant, and tennis courts. Golf, fishing, boating and camping are all within the park area. Write to Rough River State Park, Falls of the Rough, Kentucky 40119, for room reservations and park information, or call (502) 257-2311. For inquiries and pre-registration, write W.H. Holsclaw, C.D., 9008 Trentham Lane, Louisville, Kentucky 40119 or call (502) 425-3970 (evenings). □

NOVICE CORNER

from page 60

machine cut. Notched spars and leading and trailing edge stock make building the wing easier and offer a strong airframe. If you are going to use a wing jig to build the wing, the holes are already drilled in the wing ribs for you. In addition to full sized plans and perhaps the most comprehensive building instructions and photos provided with any kit (which were used as the basis for this article), you'll also find a Kraft-Hayes glass filled motor mount already drilled for the nose gear strut, a piano wire nose gear, dural main gear, aileron torque rods, nose gear steering arm, motor mount mounting screws, and rudder and elevator horns. Like other you-build-'em kits, there are some items you'll need which are not provided in the kit. To make your work a bit easier, we've included a list of those materials at the end of this article.

The prototype we built and are flying — and which son, Kurt (age 13), is learning to fly on — is powered with a Veco .19 engine and muffler. For an adhesive we used mainly Bridi's Super Stik aliphatic resin glue, with Devcon 5-Minute epoxy in some locations. The fuselage is painted with K & B's Superpoxy paint, the wings are covered with MonoKote, and some of Bridi's striping tape was used to jazz up the job.

The construction procedure we'll outline in the remainder of this and the follow-up articles certainly is not the only way to get from a kit to a plane, but it's one way that works. If you don't like to read, there are some construction photos to study. Obviously, our primary concern is that you end up with a good flying ship that you'll enjoy. In our view the Bridi folk have done their part by bringing you a plane that's based on a thoroughly tested design and builds well. But what goes into the kit is only part of the story. What you make out of it is the other part. To get a good flying ship the parts must be assembled correctly, accurately, and with care. Check out your building board to make sure it's perfectly flat. When you glue a part in place, make sure it is properly aligned and stays that way while the glue dries. Use pins, spring loaded clothes pins, clamps, masking tape, elastic bands, weights, blocks or whatever you have handy to hold the

to page 132



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NOVICE CORNER

from page 130/60

parts in place. Incidentally, if any of your clamps dent the balsa, putting a couple of drops of warm water on the dent may take care of it. When you use other than epoxy adhesives, put the glue on both of the surfaces to be joined and wait a few minutes for the glue to soak in. Add some more glue as necessary and join the surfaces. If you use aliphatic resin for most of the construction as we did, use only a thin coat. Except in some special

cases, building this type of glue up around the glue joint won't make the glue joint any stronger. As a matter of fact, a blob of glue around a glue joint may actually prevent the glue from drying properly and give you a weaker joint than you may have otherwise. In addition, a blob of glue left to dry now may be in your way later when you install the next part. When you use epoxy, be sure to apply the adhesive to both surfaces. And, above all, remove any glue that squeezes out of the glue joints while the glue is wet. It sure is hard to remove dried glue without sanding down the balsa around it as well. And who wants a finished

plane with wood that looks like a 3 dimensional map of the Sierra Nevada Mountains? Makes it hard to clean!

Speaking of sanding, to make sure you get parts like the leading edge of the wing sanded straight and get no waves in your stabilizer or fuselage, we recommend that you prepare a 12 to 18 inch long sanding block. A piece of 1/2 x 2 aluminum channel stock with sandpaper glued to the face with contact cement works very well. The sanding block is straight, light, and easy to handle. Since you will have to pick up some

to page 134

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NOVICE CORNER

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hinges for your control surfaces, we recommend that you use either the nylon hinges that have a hinge pin or the one piece nylon hinge strips. The hinge strips come in 3" lengths. They should be cut into 1/2" wide hinges. We used the hinge strips on our prototype and they have been working very well. We'll say more about installing the hinges later.

And one final comment. Since the way this or any other plane flies is affected by the way the wing, stab, and fin are installed, please follow the alignment procedures outlined carefully when you get to them.

BUILDING THE T-20

The construction sequence we'll follow begins by putting the pine insert into the rudder and elevator and then putting the stabilizer together. Then you'll work on the fuselage, which is built upside down on the building board. First the top block, or top back half of the fuselage is assembled and the stabilizer is glued in place. Then the fuselage sides and bottom are added, the cabin blocks and sides are glued in place, and the fin is installed. Note that the nose gear is mounted into holes pre-drilled in the engine mount so you won't have a separate nose gear bearing. With the fuselage completed, the wing halves are built, they are joined to the tapered rib and the center is glassed with resin and glass tape. Finish the plane, install the radio, check out the operation of the control surfaces and you're ready. Now wasn't that easy? Time to get to work.

THE RUDDER AND FIN

While the thing that sticks up at the back of the fuselage is usually referred to as the rudder, the actual rudder is only the control surface; the part that moves. The other large part that is fixed to the fuselage is the fin. And sometimes there is a forward smaller piece attached to the front of the fin called a dorsal fin. Your first bit of work is to find the 3/16" thick pine rudder insert. This pine insert is the base on which the rudder horn is installed. Apply glue to both edges of the insert that will mate with the rudder and to the notch in the rudder. Allow the glue to penetrate into the wood and add more adhesive as necessary. Put the pin insert in place into the notch in the rudder and set it aside to dry. Do not glue the fin to the dorsal fin yet. They are glued together later when the fin is installed onto the fuselage. When the glue on the pine insert has hardened, sand both sides of the rudder. Do not, however, round the leading or trailing edges yet. For good flight characteristics of any plane it's important that the hinge gaps be as narrow as possible. The larger the hinge gap, the more air that spills through and, subsequently, decreases the effectiveness of the control surface. In order to make the rudder hinge gap as narrow as possible, cut a slight "V" notch into the trailing edge of the fin. Sand the leading edge of the rudder into a slight "V" shape.

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ELEVATOR AND STABILIZER

Right. The elevator is the control surface and the stabilizer is fixed to the fuselage. Find the 3/16" thick pine *elevator insert* and glue it in place as you did the rudder insert. Sand the top and bottom of the elevator when the glue has dried.

Next the *front* and *rear stab sections* need to be glued together to form the stab. Lay the stab sections on your building board to find which edge of the rear stab section best mates with the front section. Sand the mating edge as necessary to assure a solid glue joint. While holding the front and rear stab sections together tightly, put a piece of masking tape over the length of the joint. Turn the stab over and fold the masking tape hinged joint open and apply glue to both edges that are to be glued together. After you've given the glue some time to penetrate into the wood and have added additional glue as necessary, fold the glue joint closed. Pin the stab down on your building board. Wipe off all of the excess glue. It's easier now than after it dries. When the glue has dried, use your king sized sanding block and sand the top and bottom of the stab. Prepare the "V" shape in the elevator leading edge and stab trailing edge as you did with the elevator. Note

that the pine insert is located on the leading edge side of the elevator.

THE TOP BLOCK

Work begins on the fuselage. To make sure that you build the fuselage as straight as possible you have some center lines to draw. Find the *top block*. It is the balsa sheet cut to fit onto the top rear portion of the fuselage. Draw a center line down the length of the bottom side of the top block. And, while you have your pencil and ruler working, draw a center line down the stabilizer from the leading to the trailing edge and down the length of the bottom side of the *fuel tank compartment hatch*. Also draw a center line on the back of bulkheads 1, 2, and 3. Note that the bottom edge of bulkhead 1 is cut at an angle to conform to the shape of the fuselage. To save yourself grief later, mark the bottom front side of bulkhead 1. And the grain of bulkheads 2 and 3 should run from top to bottom.

Refer to the plans and measure and mark the location of the rear cross brace on the fuselage top block. Next, get out your sandpaper and shape the top side of the trailing edge of the top block as shown on the plans.

Now you're going to need a reference line, to line up the fuselage as you assemble it. Use a straight-edge to draw a line longer than the length of the fuselage down your building board. Pin the top block down on the reference line so the center line aligns with it. Locate the two 1/4" x 3/8" balsa *stringers* that glue to the top block. They are pre-cut to the proper length and will not run all the

way to the back of the top block. Double glue the stringers in place. Pin the stringers in place so they are flush with the front end of the top block and the edges. Before the glue on the stringer has set-up, install the two *top block cross braces*. The front cross brace is 3/16" x 1/4" x 3" and the rear is 3/16" x 1/4" x 1 1/4". Put the front cross brace in place so it is even with the front end of the top block. Move the stringers in as necessary so they fit snugly to the ends of the front brace. Glue the rear cross brace in place and adjust the stringers accordingly.

The stab is glued in place onto the top block next. The stab is located by butting it up against the back ends of the stringers with the stab center line aligned on the top block center line. Double glue the stab to the top block. To assure the stab will be level when it is glued in place, locate the 2 1/16" ply servo compartment doublers. Put one on top of the other and slide them under the rear of the stab to support it while the glue dries. Put one pin through the front of the stab into the top block and building board. Then in order to double check the alignment of the stab before the glue sets up, tie a long piece of string or thread to a pin and stick the pin into the front of the fuse top block on the center line. Use the string to make sure the distance is the same from the pin to both rear corners of the stab. Adjust the alignment of the stab as necessary and pin it firmly in place.

To finish up the top block, double glue bulkhead 3 in place onto the front cross brace so it is flush with the front end of the top block and centered between the sides. The center line on the back of the bulkhead should line up with the center line on the top block. Use a carpenter's square to ensure that the bulkhead will be glued in place at 90° to the top block. Pin it in place. The top block is completed.

THE FUSELAGE SIDES

Lay one fuselage side on top of the other to check that no stresses have warped either of them. So you won't build two right or left fuselage sides, lift up the top fuselage side as though it's a book cover hinged along the top and lay it back on your workbench. You should end up with two fuselage sides laying side by side. The straight edge of both fuselage sides should be next to each other. Mark one fuselage side "right" and the other "left."

Now to prepare the fuselage sides by gluing the fuel tank compartment doubler, the servo compartment doubler, and the fuselage side vertical brace in place. Use bulkhead #1 as a temporary spacer to locate the *tank compartment doubler* on the fuselage side. Repeat the process on the other fuselage side.

Use the same approach, locate and install the

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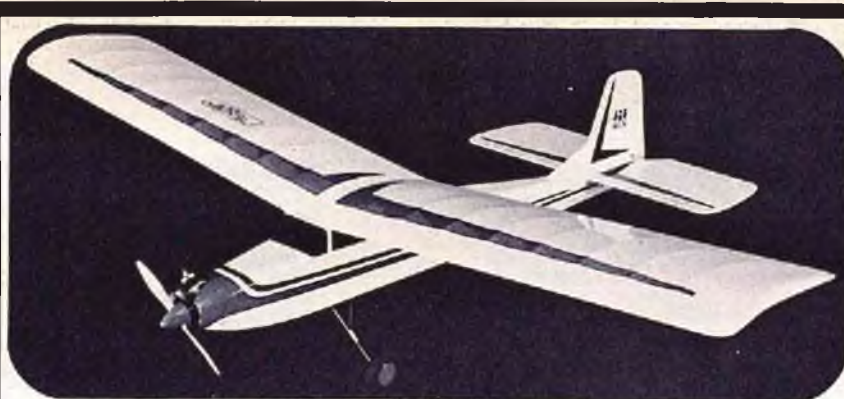
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NOVICE CORNER

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ply servo compartment doublers. Use bulkhead #2 as a spacer by putting it up to the back of the tank compartment doubler. Weights or spring loaded clothespins may be used to hold the ply doubler in place while the glue dries.

The vertical brace is installed toward the rear of the fuselage sides. To find the exact place, measure the distance from the front of bulkhead #3 to the front of the cross brace on the top block. Mark both of the fuselage sides and glue the vertical braces in place.

PREPARING BULKHEADS 1 & 2

While the glue is drying on the fuselage sides you'll have to drill some holes for the engine mount screws, nosegear linkage, throttle linkage, and fuel tank feed lines in bulkhead #1. Holes for the nosegear linkage and throttle linkage will have to be drilled in bulkhead #2. Before you get out the drill though, you have a decision to make and you have to check out your engine. First the decision. The plans for the T-20 call for a 4 oz. fuel tank for a .19 engine. That will give you from 5 to 7 minutes of flying time, depending on your engine. If you want longer flights than that, you can modify the plane to build in a 6 oz. Pylon brand slant face tank #SS-6. Or, you can build it up for a 4 oz. tank now and convert it later if you wish. At any rate, if you are going to use a 6 oz. tank, don't drill the fuel feed and vent line holes in bulkhead #1. We'll discuss what else you will have to do to fit the larger tank into the fuel tank compartment at the proper times as we go through building the plane.

Next you have to check your engine to find out whether the throttle arm is on the right or left side of your engine to find which side of the bulkhead you'll have to drill the hole for the throttle linkage. And because the throttle servo is located on one side of the servo compartment and the rudder servo on the other, knowing what side your throttle linkage is on tells you what side your nosegear linkage is on. Throttle on the right side, nosegear linkage on the left side. Or visa versa.

Find bulkhead #1 and mark the top front side. Note that the bottom edge is cut at an angle to conform to the shape of the bottom of the fuselage. Hold the engine mount supplied in the kit in place on the front of bulkhead #1 so the top of the engine mount is even with the top of the bulkhead. The top and bottom holes factory drilled through the engine mount for the nosegear strut should line up with the center line on the bulkhead. Mark the holes to be drilled in the bulkhead for the mounting screws. Also make a mark across the bulkhead center line at the bottom of the engine mount. You'll use this mark to cut out the notch for the nosegear spring later.

Drill the 4 engine mount holes in bulkhead #1 and install the blind nuts supplied in the kit on the back side of the bulkhead.

While you're working with the engine mount, it's a good time to drill the holes in the engine mount arms for the engine. There are two ways you can mount the engine. One way is to drill and tap the engine mount arms for 4-40 screws. If you don't have the tap you need, you can just drill out the holes and use a nut and lock washer on the screws. But in order to have a flat surface for the nut on the bottom of the engine mount arms you'll have to file the area around the bottom of the holes flat.

When the engine mount has been drilled for the engine, temporarily bolt the engine mount onto the bulkhead. Because the engine compartment sides will fit snugly to the engine mount arms, make some marks around the outside of the engine mount at about 10 o'clock and 2 o'clock. Depending on the location of the throttle arm, one hole will be for the throttle linkage and the other for the fuel feed line. Mark and drill another hole at either 8 or 4 o'clock for the fuel tank vent line. The hole for the fuel tank vent line should be on the same side as the throttle linkage.

The next job is to cut out the notch in the bottom edge of bulkhead #1 for the nosegear

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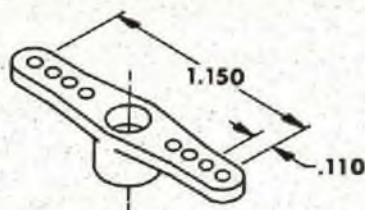
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NOVICE CORNER

from page 138/60

spring. With the engine mount removed from the bulkhead, draw a line across the bulkhead at the mark you made earlier so it is parallel to the bottom of the bulkhead. The sides of the notch are 1/2" in from the sides of the bulkhead. Mark and cut out the notch.

Find and cut off the nylon nosegear steering arm just beyond the inside hole. When the nosegear is properly installed the coiled spring portion of the strut is to the rear of the nosegear. Install the nylon steering arm on the nosegear strut so it rests on top of the coiled spring. The arm should be oriented to the side of the nosegear opposite the throttle arm. The screw should be toward the front. Then put the nosegear strut up through the bottom hole in the engine mount, put a wheel collar onto the nosegear, then pass the top of the strut up through the top hole in the engine mount. The steering arm should fit up snugly to the bottom of the engine mount. The wheel collar should be tightened on the nosegear so it rests on the bottom of the engine mount. That keeps the nosegear from dropping out of the engine mount while you're flying.

Put the engine mount/nosegear assembly temporarily in place on bulkhead #1. Make a mark for the nosegear linkage hole to be drilled in the bulkhead just above the steering arm so it is centered on the hole in the steering arm. Remove the engine mount/nosegear assembly and drill the nosegear linkage hole in bulkhead #1.

While you're at it, drill the holes for the throttle and nosegear linkage in bulkhead #2. The throttle linkage hole in bulkhead #2 should be at about the same height from the bottom as it is in bulkhead #1. The nosegear linkage hole in bulkhead #2 should also be at about the same height as the throttle linkage, but on the other edge of the bulkhead. Both holes should be as close to the sides as you can drill them. Bulkheads #1 and #2 are ready for installation.

Other than the list of additional materials you'll need to build the T-20 which follows, that's the end of Part I. In Part II we'll get into putting the rest of the fuselage together and building the wing panels. In Part III we'll finish her up, make comments about installing the radio equipment, building the pushrods, control surface movement, and say a few words about your first flights and locating the CG according to the way the plane flies. More later.

ADDITIONAL MATERIALS YOU'LL NEED

Here's a list of the additional materials you will probably need to finish up the T-20. In some instances there are substitutions you can make if you want to do so. For example, we call for wheel collars which are used to hold the wheels in place. A washer soldered to the axle will do the same job. Wheel axles are called for; these are added to the dural landing gear. If you want, a long screw with a brass tubing sleeve can be used instead. So, the list we've prepared is certainly not a "must" list. Rather, it's a list of the additional materials we used on our ship.

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from page 140/60

Clevis and clevis rod (4 ea. — two are needed for the aileron, 1 for rudder and 1 for the elevator pushrod).

12" length of 1/2" x 1/2" servo mounting rails.

Glass tape for the wing center section reinforcement.

Resin for wing center section reinforcement and to seal and strengthen the balsa if the fuse and tail are painted.

Paint or other finishing material such as Solarfilm, MonoKote, or Flite Kote.

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from page 58/57

(3) Drill through sheeting on the upper wing at each cabane strut block. Install lower wing on fuselage and then mount upper wing on cabane struts. Slip four small pieces of 3/16" tubing onto the spokes of each cabane, then screw the spoke nipples loosely onto each spoke. Tubing should be a rather loose fit in the cabane strut block, if not, remove wing and ream out a little. Position the top wing so it aligns perfectly with the lower wing when viewed from above, then 5-minute epoxy each tubing to lock it in place.

(4) After the tubes are set, remove the upper wing and glue the strut pads to the lower side of the wing. Place the wing back on the cabane struts before the glue dries to position the pads properly.

Covering:

If an airplane ever lent itself to MonoKote, Solarfilm, etc., this is it. I covered mine with silkspan and dope, but whatever suits you, tickles me to death. Since the DH-6 was originally a military trainer and reconnaissance plane, you can color it O.D., complete with roundels and red, white and blue rudder, or you can make it civilian as I did, with clear flying surfaces and a colored fuselage, or all one color such as red or orange. Please, no red, white and blue with stars! Be sure to fuel-proof engine compartment with clear Superpox or equal. Clear dope or Superpox should be used on struts.

Final Assembly:

Hinge the rudder, fin, stabilizer and elevator as shown. Glue rudder and fin to center of the stab, being sure everything is perpendicular. Fit rudder and fuselage hinge and assemble the empennage on the fuselage. Assemble front rubber band hook for the landing gear on the fuselage and temporarily band the gear to the fuselage. Make brass landing gear clips and install them on the rear L.G. strut. Position the landing gear until the axle is perpendicular to the fuselage and mark and drill the clip bolt holes. Install 4-40 blind nuts to hold clips in place.

Make the fuel tank by cutting down a Perfect #13 tank to about 2 1/2" long and installing a new pickup and vent tubing. Mount tank in the position shown using two brass angle clips soldered to the tank. Install the servos using a tray or mounting rails glued to the fuselage, whichever suits your equipment best. Try to keep them as far forward as possible and still leave room for the receiver and batteries. Installing batteries may be a problem on some equipment so plan their location carefully. They must also be as far forward as possible. The position shown on the plans is ideal, but you may have to remove the plastic case and convert to a square pack if they are in the flat configuration. Use long Goldberg horns on the rudder and elevator. Using small servo arms, the outside hole on the elevator and the inside, or second to inside, hole in the rudder horn should give proper control movements.

Make the cockpit hatch cover as shown and

to page 142



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paint it flat black. I installed the switch in this cover and mounted it (the cover) in the airplane with #2 sheet metal screws. Use "Hot Stuff" to mount the windscreen, cylinders and exhaust stacks in place. A little extra epoxy should be used on the connection between the exhaust and cylinders.

Install the engine mount plate using #4 sheet metal screws. Depending on the engine you use (don't use anything larger than a .15), it will probably be necessary to make some modifications to allow room for the needle valve. For the O.S. Max .15, this amounts to cutting away a small portion of the nose bulkhead and soldering an extension on the needle valve. Hooking up the throttle should complete construction.

One note on installing the wings: Install both wings with the top wing spoke nipples loose, spread the panels apart and insert the struts carefully. After all struts are in place, install the rubber bands on the outer struts and tighten the spoke nipples.

Flying:

Now for the fun part. Check the balance, it should be on the wing spar, and check that all control surfaces are neutral. Clear up any warps by heating (gently) and twisting as necessary. Measure the distance between the wing leading edges and between the wing trailing edges. The leading edges should be about 1/8" further apart than the trailing edges. If not, shim at both the cubane struts and the outer wing struts until they are.

As I mentioned previously, weight is not too much of a problem. The original weighed 2 3/4 pounds and 3 pounds wouldn't scare me at all. Run the engine on the ground through all its ranges to shake everything loose that is loose and adjust the throttle for a good low idle (or you may not be able to get down).

On the first take-off be prepared to feed in a little right rudder for torque. After flying speed is reached, touch a little up elevator and you should be on your way. If your .15 is pretty healthy, you'll probably have to back off some on throttle or the climb may be a little steep, in fact, unless you use considerable down trim you rarely need full throttle even on take-off. Don't be surprised at the rudder control as it is not at all sensitive in spite of that huge flapper at the tail. Elevator is very smooth. Stalls are slow and mushy, but the sink rate at idle is pretty good because of all that drag.

I don't recommend any violent maneuvers in deference to the methods of construction, but it is capable of loops, rudder rolls, snaps and spins if you don't allow speed to build up excessively.

Landings are a dream because of the low speed and good sink rate. Just line it up with the runway and when you're about two feet off, start pulling up elevator until it settles in.

On dead stick landings, set up a real short approach or you may find yourself pretty short of the runway. Without any power the sink is even faster, so be prepared.

That about does it. I hope you enjoy your plane as much as I have mine. I'd appreciate any comments you might have, so drop me a line c/o RCM. □

SHERMAN TANK

from page 54

... have found it to be perfect for the construction of the entire tank. Since it has been completed, the MRC-Tamiya M4 Sherman 105mm Howitzer Tank has been a sensation wherever we have demonstrated it. It has been loaned out to numerous individuals (including the Sierra Madre Police Dept.), as well as RC'ers who "would never be caught dead with anything but an airplane." The performance of the tank is almost unbelievable since it will climb grades so steep that the tank will actually fall over backwards before losing speed while taking the incline. We will caution you, however, to keep your fingers out of the tracks since you can

to page 144



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SHERMAN TANK

from page 142/54

sustain injuries if caught between the gears and the metal tracks.

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RIDGE RUNNER

from page 45/40

Wing-overs should be started parallel to the slope, then pull up past the pilot so the top of the glider is viewed to the right or left of the pilot. Without rudder the pull-up must lead into the wind (away from slope) slightly so it will always turn into the wind. Inverted flight passes the pilot

parallel to the slope. The tail slide heading is upwind and slightly off to the side. Stay forward of the hill so that in the event of a stall turn, recovery room is available. The horizontal eight is easiest when the longitudinal axis of the eight is parallel to the slope. Place this one overhead starting with a parallel heading. Outside loops, like the Cuban 8, require the most speed. Upwind seems to be easier to complete than downwind.

Because of the control authority available on this design it can be flown fast and only a wing span distance away from the edge of the ridge.

Thus, the Ridge Runner! □

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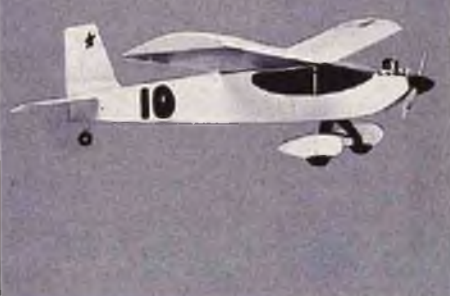
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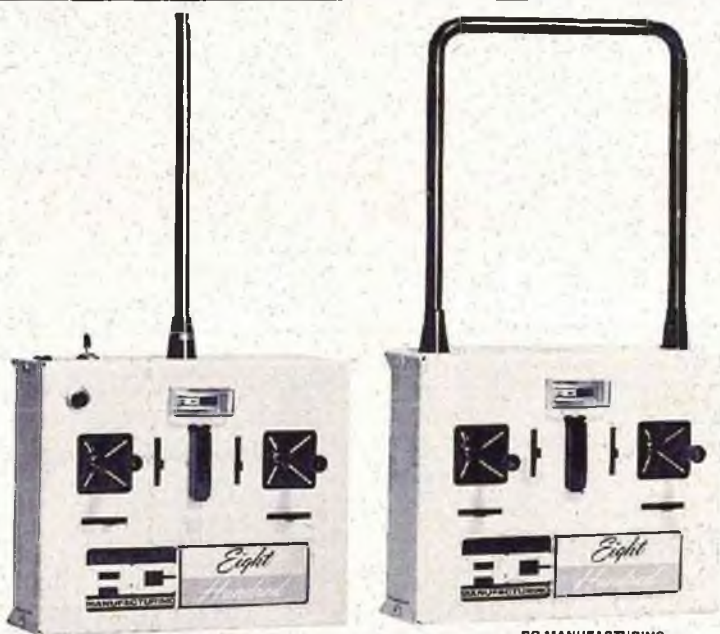
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from page 53

... center crutch. 1/16" plywood wheel covers are then glued in place over the plywood, or cardboard, pant liners.

All that remains now is to fill the open areas with scrap styrofoam and sand to the shape of the horizontal and vertical plywood crutches.

Once the wheel pant has been sanded to shape, the entire structure can be coated with epoxy glue and fine sanded in preparation for painting. If you prefer a stronger wheel pant that can take more abuse, cover the sanded wheel pant with K & B lightweight glass cloth and coat with epoxy.

Finally, after finish sanding, the wheel pant can be primed and painted with K & B Superpoxy. □

FLIGHT TRAINING SEMINAR

from page 39/38

the Flight Training Seminar of the June 1975 RCM.) When landing, the sudden angle changes may also lead to tip-up problems when the skids level at touchdown.

To obtain a smoother lift-off, the design cure seems a little radical, but here it is: The fuselage must be tilted to approximately the same angle as is calculated for free hover flight. Wedging or blocking the skids for a 3° left Roll angle will do it. Inserting wedges between the fuselage and skid assembly is probably the easiest way.

The 3° angle involved does not seem like much, but when you consider that this is almost 1/2 of your available control it takes on a more realistic aspect. Helicopter control is a matter of small angles and their adjustment.

For those of you who design your own, note that the fuselage roll angle in hover is largely due to the tail rotor thrust acting below the rotor hub. Raising the tail rotor thrust line involves some mechanical complications, but you might consider it worthwhile if you do not fancy the "tilted" ground stance as a cure.

PADDLE BAR ACTION

To conclude our theoretical romp, let us consider how the paddle bar controls cyclic pitch inputs to the main rotor, and how design parameters affect its action.

Introducing cyclic pitch via a swashplate tilt angle causes the paddle to change pitch according to its angular position while revolving. At its maximum pitch change location, one paddle has a nose up pitch while its opposite has a nose down pitch. Aerodynamic forces cause a moment to be developed, which "precesses" the paddle bar like a gyroscope. Mass (moment of inertia) characteristics of the paddle bar determine response times in conjunction with the applied aerodynamic moment. Since the paddle bar acts as a gyroscope, maximum tilt occurs 90° in the direction of rotation after peak cyclic paddle pitch change.

Tilt of the paddle bar rocks the Main Rotor Hub to produce cyclic pitch change on the main rotor blades, tilting the tip path plane and, therefore, the thrust vector, again with a 90° phase lag.

The net result is that, on a typical model helicopter, the main rotor follows the swashplate and eventually settles down to exactly the same tilt angle and direction that the swashplate tilts if 1:1 gearing between paddle bar and swashplate is used.

Theory shows that main rotor flapping response is about 10 times more rapid than paddle bar response, and therefore response times are almost negligible by comparison. The main rotor follows the paddle bar tilt cyclic inputs almost immediately for practical purposes.

Paddle bar response with time is shown in Figure 4 for a "light" and "heavy" bar. Control input is assumed to be an extremely rapid "step" type. Note that for both bars the initial response is rapid, but that it slows as the final value is approached. This behavior is typical of a system with feedback.

Since the ordinate of the graph in Figure 4 is a percentage of final response, we must conclude that the size of the input is not important. For a given percentage of final response, input size does not determine time. Small control input

corrections take just as long to produce effects as large ones!

Characteristic lag time is often taken as the time to produce 63% of final response. As noted in Figure 4, these times are .103 seconds for the light bar and .259 seconds for the heavier. If these lag times are modified by changing paddle bar mass, effects may be expected in stability and control, but with a sort of "trade-off", since an increase in one means a decrease in the other. A rapid response to control inputs also means a rapid response to disturbances, so be careful! □

FROM THE GRASS

from page 22

smelling fumes if left unattended for more than 2 days after being shipped back to the manufacturer for repair, to help encourage fast turn-around service.

(9) A tip mounted hoop for trainers that changes cartwheels into merry-go-rounds.

(10) Frequency color coded shirts, jackets and slacks for people who can't see those tiny ribbons. Or how about an 8" wide velcro attached sash that one wears while flying?

(11) A device that incinerates the plane upon loss of signal for those who want more "gusto" in their life.

(12) A 1/1000 scale model of the J.F.K. control tower for the club that needs a new project.

All rights are reserved on any of the above items but my consulting fees are reasonable. All I really need is \$2.37 for that fabulous Cox package.

Finally this "Sun-Dazed" flier has a great idea for a new contest event. The only design parameter is Wing Area to be equal to or less than engine displacement x 1000. The maneuver (or manure) is to take-off, turn 180 (down wind leg), turn 90 (base leg), 90 again and land. Points are scored as follows: Total gross weight upon landing divided by Total time from lift-off to touch-down, highest number wins. Now that alone should open up a brand new market for lead weights and high lift airfoils! □

CUNNINGHAM ON RC

from page 12

... may have to forget the taxi test and carry your aircraft out to the flight line. Tail draggers — and particularly biplane tail draggers — are pretty tough to taxi in the wind, they just have a rough time going crosswind. If there is no wind, then taxi out to the flight line and let the aircraft go on its own for a bit to see if it has any inclination to want to run either way when it is taxiing. While you are taxiing, hold in full up elevator to keep that tail firmly in the "tail dragger position." You hold up only when you are taxiing, not when you start the take-off run. Taxi into the take-off location and turn the aircraft exactly into the wind. Check your controls once more to see that everything is working properly, and that your ailerons are hooked up correctly. Now, take a deep breath, and ease forward on the throttle. If your ship starts to track straight ahead, go on with the take-off run. If it starts to swing either right or left, chop the throttle and get ready for another attempt. If your aircraft starts to track down the runway continue to ease in the throttle. Don't cram it on all at once, but ease into it. The tail should lift off and the aircraft should assume a flying attitude very quickly. When flying speed has been built up, ease in a little back stick and take-off into the wild blue.

Some models like to start their take-off run very slowly and to pick up speed, while others will go squirrely on a slow take-off, and the only way to get into the sky is to have a helper hold onto the aircraft while you shove the engine to high throttle for a "leap into the air" type of take-off. Frankly, I have found that all of the five biplanes that I have owned all liked a slow type of take-off. Rudder correction is generally a must when taking off a tail dragger and, yet a lot of

to page 150

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CUNNINGHAM ON RC

from page 147/12

great take-offs have been made by guys who keep their thumbs away from the rudder stick. You will find that, once the tail wheel comes off of the ground, the aircraft will streamline itself with the wind and generally make a smooth take-off. The problems come about in those few seconds when you are trying to build up speed to get the aft end into the air. Just a bit of down stick will lift up the tail, but this is dangerous since a bit too much down stick will get your aircraft's nose stuck in the ground! Any rudder corrections that need to be made should be made at about 1/4 the corrections given to a trike geared type aircraft. When making a take-off run with a trike geared ship you really can feed in a lot of correction without very much effect. This is simply not so with a biplane. You have to be very gentle with the stick movement, and ease in just a little bit of correction. Quite often I have seen a flier try and take-off a tail dragger where a bit of right rudder is needed, but too much is fed in. This, then, calls for a bit of left rudder and, again, too much is used, and back and forth the aircraft goes, getting wilder all of the time, usually ending in a flip-over type of stop. If you feed in the correction ever so slightly, chances are that your aircraft will take to the air without too much trouble. A very wide spread landing gear will also aid in elimination of bad take-off tendencies. My Miss Bikini design (RCM October 1969) had a very wide spaced landing gear and always made very straight, beautiful take-off runs, with almost no corrections needed.

Let's go back over this procedure one more time. Check your landing gear and your tail wheel. Make your take-off run directly into the wind. Ease the throttle to high, and make corrections very, very gently. Get the tail off of the ground as quickly as you can. If you follow these directions you should have many, many good flights. Remember, if you have to trim in some rudder movement to get your aircraft to fly straight due to some unknown warps, you should go back and re-align the tail wheel so that it is parallel with the fuselage center line even though the rudder may be off to the right or the left just a bit.

Good luck, and happy take-offs. □

ENGINE CLINIC

from page 87/10

I always will believe that anyone of several of our bunch could have swept the A.M.A. Nationals clean if we could have been able to get back to compete.

Now what I'd like to know is — if there is no substitute for alcohol based fuels then just what were we using, that would go twice as far per ounce and almost as fast?

Yours,
Smith Richardson
Farmington, New Mexico

Sorry, Smith, but you are arguing against a proven point, not just my opinion. If there were fuels better than alcohol you wouldn't see the Indianapolis cars running alcohol. Fuel dragsters running alcohol (along with high percentages of Nitro Methane) or any performance engine where power is a necessity, using alcohol. If a benzene based fuel could be made to perform as well then it would be used. The use of benzene is certainly not new.

A few months back during the energy crisis, the model fuel manufacturers had their supplies of alcohol limited and a search was underway for a good substitute. About every combination of volatile chemicals you could think of under the guidance of one of the country's largest chemical manufacturers was tried. Many combinations came close, but nothing would equal Methanol alcohol as far as power and operating temperature.

You are citing an isolated case involving a specialized event where economy is of prime

concern along with good speed. Having been active in B team racing myself many years ago I am well aware of the event. In fact one of my team racer designs was kitted — the Redskin by Veco Products. We went the benzine, gasoline, etc., route with many fellows using these for the 100 lappers. The economy was there, but not the speed. The only gain was through the elimination of a pit stop. I am sure that, in order to obtain decent economy even with the alcohol based fuels, you were running fairly small venturis. This, in itself, does not give the alcohol a fair comparison. On my own team racers I had several interchangeable venturis, depending on whether speed for the heat races was necessary or smaller venturis for the 50 and 100 lap events.

If you were to mix up some of the fuel as you listed and try it in an R/C sport ship you might be surprised at how poor it actually performs. And this is what I was making reference to. After all, the column is for R/C, not U-Control. Frankly, with 7% oil the engine would not last very long. Nitro Benzene, also known as Oil of Mirbane has a very slight lubrication content, but not enough to be of any real lubrication value. As mentioned in the previous letter, I sure do not recommend its use.

Dear Mr. Clarence Lee,

I'd appreciate your help in answering the four questions I've listed below as I'm puzzled with the thoughts.

1. Could I dip my .60 R/C engine in the same acid chemical used by auto mechanics to clean the scum from the carburetors without damaging the engine? If your answer is yes, then for what period of time would you recommend the engine being submerged in this chemical?

2. I'm building a Top Flite P-40. The engine manufacturer states "Use props from 11/6, 11/8, or 12/6", the plane kit manufacturer states, "Use an 11/8 prop". I'd like to use a three bladed nylon prop, so what size prop should I use?

3. I'm lucky if I get a chance to fly my planes once or twice a month and because of this I'd like to know if I should remove the muffler from the engine after each flight, (to keep from building up moisture) or should it remain in tact? Also, does it matter as to the type of fuel used, castor oil vs synthetic based fuels?

4. Would using the new Perry fuel pump/regulator and carburetor aid in running inverted engines?

I'd appreciate your answering these questions for me, a.s.a.p.

Sincerely,
Albert Movsesian
Fresno, California

I don't recommend the use of the automotive carburetor cleaners as most usually have a slight etching effect on aluminum. This can result in the sleeve becoming looser in the case, the ball bearings if used loose in their bores, etc. If you do use an automotive cleaner be sure it says safe for aluminum on the container. The best thing for this that I have found is still Sunbeam Metal Kleen available in many large super markets or direct from any Sunbeam Appliance dealer.

Whether an 11/6, 11/8, or 12/6 prop is used will depend on the particular engine and how heavy the model turns out. No one prop can be right for every engine or aircraft. If you have the ground clearance a 12/6 will generally be the best bet for a scale type model. Nobody makes a three bladed prop in wood or nylon larger than 10/6 to my knowledge so you can forget about that.

Removing the muffler after a flying session isn't going to buy you anything. The moisture is formed during the combustion process while the engine is running. The only thing you can do is load the engine with penetrating oil such as 3-in-1 after each flying session. This doesn't stop the moisture but does stop the rust that results from moisture. Fuels using castor oil for lubrication do seem to have less tendency to form rust but on the other hand they do form more carbon and varnish. I prefer the synthetic oils myself. Less varnish and carbon, easier to clean off of the airplane, especially in cold weather, etc.



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The Perry pump/regulator brings the fuel to the carburetor under regulated pressure. This would have no effect on the engine whether upright or inverted. Inverted engines are naturally easier to flood but the pump/regulator is not going to change this. You will have to be a little more careful about flooding the engine as fuel is supplied to the carburetor every time you flip the prop so you would not want to sit there choking and flipping away with the prop. Being inverted the excess fuel would run out of the carburetor rather than into as with an upright installation. Whether upright or inverted you have to be very careful about choking with the Perry pump/regulator. As far as an aid in running inverted engines it does nothing here.

Dear Mr. Lee:

I am presently building a 9' scale J3 Cub and plan to power it with an OS Max .80. The recommended 14" prop looks silly as hell on a plane this size when trying to maintain scale appearance. The closest to scale prop I can find is an 18/4 AHM Superthrust.

Can this engine and prop combination be used successfully, and if so, what muffler can you recommend in this cowled type installation?

The engine is new and has had 1 quart Fox Superfuel and 1/2 gallon K & B 100 with castor oil run through on the bench using your break-in method. Should I do anything special to this engine before trying this new prop?

Thanking you in advance for your help.

Sincerely yours,
Michael S. Hanich
La Palma, California

Mike, a 14 inch prop may look silly as hell on a J3 Cub but you have to stay within the power limitations of the engine. An 18/4 is just too much prop for even an O.S. .80. It would swing it but the engine would be over loaded, resulting in over heating, and be very short lived. Sorry, but I do not like to recommend any specific muffler. If I recommended one particular muffler I would get letters of complaint from the other muffler manufacturers.

With a quart of Fox Superfuel and 1/2 gallon for K & B 100 through the engine it is ready to fly. Nothing special needs to be done other than to use the prop size within the capabilities of the engine and run it a tad on the rich side the first half a dozen flights. □

RADIO SPECTRUM

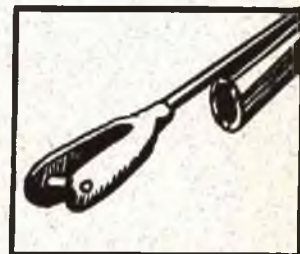
from page 6

Some of the earlier digital servos had 5 to 7 millisecond minimum pulses and resulted in the servo moving in small little steps. If the minimum pulse is too short the servo will not have much power near any null condition. This can easily be observed by letting the control stick snap back to neutral. You should not see the servo slow down to a creep when it gets close to neutral. Overdamping can cause the same phenomena and is to be avoided. Some flyers actually like to be underdamped so the servo overshoots neutral and comes in from the other side. I'm not in favor of this approach either. All of these parameters are controlled by components external to the integrated circuit servo amp and therefore all manufacturers do not get the same results even if they use the same IC. All externals must be selected carefully.

Figure 1 is a schematic for a typical integrated circuit servo amplifier, with an explanation of the purpose of the external components.

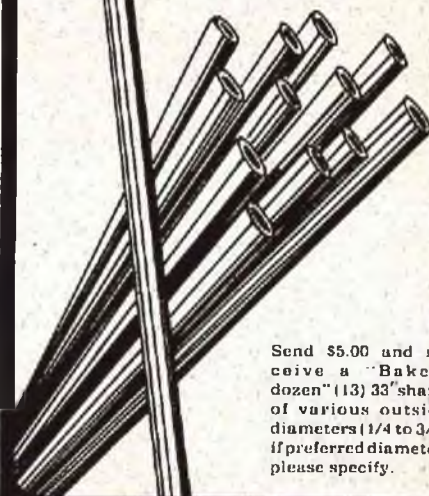
With regards to Figure 1, an integrated circuit servo amp, C1 — Adjusts deadband, should be set at 3 to 7 microseconds; R1/C2 — This RC time constant adjusts the minimum pulse to the servo motor, should be set at 3.0 to 4.0 milliseconds; C3 — Filter across power leads, should be at least 2.2µf; R4/C4 — This RC time constant along with the feedback pot, control the pulse width of the reference generator. Their temperature coefficients must be matched to the IC; C5 — 4.7µf motor noise suppression capacitor; R2 — Adjusts total "throw" of servo;

servo push rods, etc.



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R3 — Feedback pot driven by gear train; R5 — Isolates pot from reference generator; R6 — Damping, adjust for overshoot; PNP Transistors — Provide low saturation voltage drop insuring maximum voltage across motor.

One problem with the IC amplifiers that I've played with is that they are subject to motor noise and you must be careful how you filter the motor. The noise causes false triggering of the reference generator particularly around neutral. I'd love to be able to get inside the circuit and put in a trigger circuit like we had in our old discreet component servo amp. We have taken motors that won't work in the IC servos and had no false triggering in the discreet amplifier.

There has been a lot of complaining about the high idle current of the IC servo amps for the last few years and, admittedly, if you have a seven servo airplane with 20ma per servo you can use up to 1/3 of your battery pack just idling. However, there are IC's available now with the idle current less than 9ma.

We talked about linearity before and I kind of minimized its importance. Obviously it must be reasonable because you don't want a lot more right than left or up than down. All servo amps, to date, had an inherent non-linearity due to the use of a resistor/capacitor (R/C) network as the timing element. The capacitor charges on an exponential curve which causes the non-linearity. This can be minimized by properly choosing the servo direction so the non-linearity of the transmitter compensates for it. (By the way, I was told that Kraft does use a constant current source in the servos of the Signature Series instead of the R/C network so his overall system linearity should be very good.) My experience has shown that when you have a servo that is very non-linear it is usually due to the feedback pot itself and replacing it usually does the trick.

Drift due to temperature and voltage changes have virtually been eliminated by the IC servo amps. However, they are somewhat dependent on the external components. In a future installment we'll talk about the electro-mechanical components in the servo.

Let's take a look at the mailbag and see what's going on. I like the first one because it is informative and I don't have to write an answer.

Dear Mr. Oddino.

I am writing in response to the question asked by George Kutcher in your column in the May 1975 issue. He asked about a monitor for 27.145MHz. May I suggest a more simple solution? Get a cheap superregenerative Citizen's Band 100 Mw. walkie talkie (like kids use). (Select a superregen as there is no need to buy a crystal.) Then simply fire up your RC transmitter, and tune the receiver to that frequency and there you have it. Radio Shack's Archer Space Patrol is only \$7.95 each and is tuned to channel 14. 27.145 is between channels 15116, so you'd only have to tune up a small bit.

Yours truly,
J. Bradley Flippin
San Diego, California

That was so easy I think I'll try another!

Dear Jim,

In the May '75 issue, John J. Drewski asked about dry cell batteries for RC. I have a World Engines M.A.N. 2.3.4. rig that originally had a nine volt dry cell in the transmitter. This was changed to nicads after the second crash of my glider, caused when the battery lost power due to the cold. The first time this happened was at a contest in January and 20°F weather. The plane was out of range as it came off the top of a winch tow. The second time was at the slope in December and about 35°F. I was flying my LSF 1 hour slope and had just finished the hour and flew off down the slope about a hundred yards to make a landing approach and lost it.

The set worked fine otherwise, so I would advise Mr. Drewski to avoid cold weather if he uses dry cell batteries.

Yours truly,
Ed Huffman
Spokane, Washington

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Good point, Ed. You've also got to be careful of nickel cadmium batteries when it's cold because their capacity is reduced, but they will definitely provide more current than the dry batteries, and this is very important in the aircraft. Even in a two servo sailplane you could have demands for peak currents of over an amp which would cause a large drop in the terminal voltage of a dry battery which could reduce receiver sensitivity. Of course we don't have those problems in sunny Southern California.

Dear Jim,

The growth and development of radio equipment has obviously been fantastic, but why can't we eliminate that silly piece of wire hanging out of the receiver we call an antenna? With all of our technical advances why can't we eliminate or at least reduce this antique? Couldn't it be replaced with a signal amplifier? I can sure think of a lot of reasons for getting it out of the way.

Yours truly,
Ron Porter

South Lake Tahoe, California

You could replace that silly piece of wire called an antenna but you can't eliminate the antenna. In other words the antenna could take some other form. The cleanest antenna I ever saw was a slot in the fixed fin on a missile that was tuned to the telemetering transmitter in the missile. I also read about an amateur radio experimenter who used the body of his automobile for an antenna on his mobile rig. However, from a practical standpoint I recommend sticking with the wire but I agree we ought to get it out of the way. What I've been doing for the last few years, (since I've been using fiberglass fuselages) is to cement a piece of nylon or teflon tubing to the inside of the fuselage from the radio compartment back to the top of the fin. I like the idea of going to the top of the fin, but I'm not sure it is necessary. All you do then is stuff the antenna in the tubing when you install

the receiver and you're in business. I don't guarantee this will work with all radios but I don't know of anyone having any trouble, and it sure is nice not to have that silly wire hanging out when handling and cleaning your airplane. I've also seen a couple of schemes guys have submitted to "For What It's Worth" where they put the antenna inside a built-up wing. However, this means you must install some kind of a connector that must be handled each time you assemble your plane, so the reliability would go down.

Peter Moore, a former Californian now residing in Hong Kong, wrote us a nice letter that included some questions that might be of interest to all. Pete flies on 27MHz and is wondering if tuning is required when changing frequencies on the 27MHz band. He points out that Futaba's don't require retuning. My experience has shown no tuning is required but it depends on the crystal

to page 156

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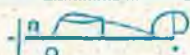


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RADIO SPECTRUM

from page 154/6

tolerances. The critical tuning is the intermediate frequency (I.F.) amplifiers which have a bandwidth of approximately 5.0KHz. If your crystal tolerance is .005%, your transmitter could be off 1.3 KHz one way and your receiver 1.3KHz the other. The total, however, is still within the original 5KHz so you shouldn't have any problems. The "front end" has an even wider bandwidth and therefore is even less critical.

On a similar subject, Bob Dale of Riverside, California, who holds a General Class Amateur Radio License found out he could drop a set of 10 meter crystals in a 27MHz receiver, retune and eliminate all of the CB interference. Many Los Angeles flyers have been doing that for the last fifteen years with great success. Zel Ritchie was the first that I recall back in those Space Control days I talked about. Remember you need a General Ticket to use the 10 meter band. It would also be a good idea to monitor it, before you ordered crystals. We always had good performance on the high frequency end of the band. You do have to retune the front end.

Back to Peter Moore. He wonders why most manufacturers operate on such low power on 27 when 3 to 5 watts is legal. 25 watts is legal on 27.255MHz but here in the USA there are other radio services on that frequency so it isn't used much. Legal power on the other 27MHz spot frequencies is 4 watts. I guess the reason why no one goes that high is economics, but you are right, more power would help and 2 watts would be acceptable from the battery standpoint. Unfortunately just changing the output transistor won't help much. Anyone out there got a good circuit for a 2 watt 12V transmitter RF section?

LTC A.G. Breitwieser of Kailua, Hawaii, asked about soldering to nicads. It's best to buy cells with solder tabs so you don't have to solder directly to the cells, however, you can do it if you are careful. Use about a 45 watt iron and tin a spot on the cell using a good flux. I recently tried some stainless steel flux from Sears that worked fine but be sure and clean it off because I'm pretty sure it's acid. Once you've got a spot tinned the rest is easy. The idea is to try to get a small spot hot fast and then get off so you don't try to heat the whole cell. The Colonel is working on a B-36 and is planning to use separate servos on each aileron. He wanted to know if 28" extensions would give him trouble. I know it isn't going to help the radio but it probably will be okay. As I mentioned before, I saw 12" extensions on a standard RC system in an RPV project. There was a 1 watt telemetering transmitter in the plane to make it even more surprising.

By the way, I'm planning to use a servo on each aileron in my new Stiletto pattern bird. It makes a kind of neat installation with short pushrods and none of the usual torque tube problems. And if one servo motor quits I just might be able to get her down.

Well let's wrap it up this month with a question. Paul Levy liked Dan Reiss' article on tapping 12 volt motorcycle batteries. What he'd like to know is how to tap his newly acquired gel-cel battery. Any suggestions? □

FROM THE SHOP

from page 2

such as Hot Stuff and Zap, and it quickly and safely releases these adhesives and similar products and is suppose to be safe for external use on human beings. Price is \$4.25 per ounce. For further information on this and other products, write for a catalog from Edmond Scientific Company, 380 Edscorp Building, Barrington, New Jersey 08007.

We recently received a communique from Colonel Jethro E. Culpeper, Commander of the Confederate Air Force and their headquarters at Rebel Field, Harlingen, Texas 78550 concerning their spectacular Airshow '75.

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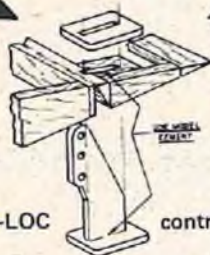
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The CAF's goal is to have an outstanding four day flying event which will provide a gathering place for pilots and enthusiasts from across the nation. The four day program to be held on October 9 through the 12th will include these attractions: Precision flying and P-51 aerobatics by renowned pilot Bob Hoover; the Red Devils aerobatic team; Art Scholl doing spectacular aerobatics in a Super Chipmunk; a demonstration by the Silver Eagles, the Army's Helicopter team; spectacular jumps by the Golden Knights, the Army's Parachute team; unlimited class drag races by P.R.P.A. pilots; static exhibits of World War II Warbirds; E.A.A. participation with antique, home-built and experimental aircraft; Exhibits of aircraft and their many components; plus the famous Ghost Squadron of the Confederate Air Force.

The finest flying in the country will be on the agenda for the four day program. There will be evening entertainment with dining and dancing in the World War II hangar. You and your family can vacation in the surf on Padre Island beach and see Old Mexico. Advise your friends to set these dates aside and plan to come early, stay late, and bring the wife and kids.

All necessary information for participants and guests including a schedule of all activities, motels and trailer park costs with phone numbers and addresses, and reservation blanks for events and their costs will be available from Colonel Jethro E. Culpeper, Commander, Confederate Air Force Airshow '75, Box 645 Harlingen, Texas or phone (512) 423-2775.

Mark your calendar for a "Once in your lifetime" fun week where you will see P-47 Thunderbolts, the F8F Bearcat, the P-39 Airacobra, the B-29 Superfortress, the A-20 Havoc, the Junkers JU-52 and the rest of the Confederate Air Force fleet of aircraft which will roar into action for this great celebration at Harlingen, to compliment the outstanding performances expected by the rest of the participants. Airshow '75' is expected to become another great annual rivaling Oshkosh, Reading, and Reno — don't miss it!

★

Rich Booth of Fayetteville, North Carolina, submitted the lead photograph for this month's column which is a picture of the ancient and royal association of Dashing Undaunted Model Busters. This trophy is presented to a club member with the following bit of prose:

Congratulations! You have been elected to be a member in this grand old association whose ideals and history of outstanding contributions and achievements date back to early this afternoon.

The long history of DUMB is dedicated to those who either have a short front gear or a nose down attitude - to those who see model after model plow into the ground with that same sinking feeling in the pit of their stomach - to those who stupidly collect each tiny piece and blindly rebuild, only to repeat the same procedure over and over, each time saying "now I know what caused the crash, it won't happen again - all I need is a new radio, a better plane, or to be more careful." And, for never realizing that there are an infinite number of reasons for crashes and an infinite number of solutions. There can be only one reason why any man would put himself through such agony - DUMB, real DUMB.

I declare, on this day the (insert date) that you, (insert name) qualify.

What's even worse is we still keep at it . . .

★

In closing out this month, I would like to mention that we answer approximately 500 reader's letters each month, most of which contain questions concerning the building of R/C aircraft. (This is primarily due, I believe, to the fact that we don't know our posterior from a post hole when it comes to any other type of model.) However, if I've told you guys once, I've told you a thousand times, there is only one way to build an R/C aircraft: You get a large block of balsa wood and carve away all the pieces of balsa that don't look like an airplane.

Now don't write me no more — just go do it . . .

POXY POINTERS

Hi there,

I'd originally intended to do this column earlier, but what with various interruptions for special advertisements it got put off. However, the subject's still valid, in many parts of the country the problem's still with us, so let's talk about it.

I'm referring to the effects of excessive humidity on certain epoxy glues and paints, ours as well as theirs. Most of you are probably familiar with what humidity does to some things; water-base glues don't dry, dope blushes, your clothes stick to you . . . all that good stuff. (Stop laughing, you guys in Arizona!) But have any of you noticed what happens to the exposed surface of Formula 2 glue after it's cured? **I'm not talking about the inside of a glue joint . . . everything's fine in there.** I'm talking about the exposed surface, like what you have when you use the "Easy Does It" method of finishing with Formula 2. The epoxy gets a waxy coating on it! It feels just like somebody painted it with a thin smear of candle wax. **Don't panic! Just wipe it off with a little bit of Hobbypoxy Thinner or alcohol, or sand it off. It's not going to ruin anything. It won't interfere with adhesion. It has no detrimental effects at all.** What is it? I don't know. It happens in humid conditions, but I don't know what causes it. But I don't worry about it either. Incidentally, **some people have suggested that you wash it off with dishwashing detergent. I don't recommend it because then you have to be very careful it remove ALL the detergent or your paint won't stick. Just wipe the waxiness off with Hobbypoxy Thinner. That's easiest and safest.**

I've gotten a few letters from people who've complained that Hobbypoxy enamel seems to come out of their sprayguns in globs sometimes, which spatters the finish. I get these letters in the summer mostly. Can you guess what the cause is? **Right! It's water in the spray system.** Your compressor sucks in all that moist humid air, and when it comes down the line to the gun the moisture condenses into water drops which come out the nozzle and onto your model. **It appears as if the globs are in the paint, but they're not. The only solution is to put a good water trap in your spray system, or go the CO-2 route.** A lot of good builders are buying new or used CO-2 fire extinguishers, fitting them with regulators and hose fittings, and spraying with carbon dioxide rather than compressed air. You get good pressure regulation, no moisture problems, and, aside from a gentle hissing sound, there's no noise to bother anybody.

Well, that wraps up this month's lecture. To sum it up, what you really ought to do is build during the dry winter and fly in the muggy summer. Then you wouldn't have all these problems. Or, you could move to the Southwest and build and fly all year long. Let me know when you do and I'll come with you!

See you next month . . .

John E. Poxy
John E. Poxy

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