49115 APRIL 1977 $1.50

# RCM radio control MODELER

THE WORLDS LEADING PUBLICATION FOR THE RADIO CONTROL ENTHUSIAST

## MORANE SAULNIER
**Type 'L' Parasol**

## RCM TWIN SCOOTER
**Twin .049 Tractor-Pusher**

## MISS KAT BRAT: A P-51 MUSTANG
**Designed For Pattern Competition**

# RC MODELER

VOLUME 14 1977 NUMBER 4


## FEATURES



APRIL




**THIS MONTH'S COVER**
Tom Mahon of Carmichael, California, poses with his KG-2 Old Timer. This was an Autumn shot taken with a Rolleiflex and Ektachrome film.


**R/C MODELER MAGAZINE** is published monthly by R C Modeler Corporation. Don Dewey, President Editorial and Advertising offices at 120 West Sierra Madre Boulevard, Sierra Madre, California 91024 Telephone (213) 355-1476 Entered as second class matter at Sierra Madre, California, and additional offices



**EDITORIAL CONTRIBUTIONS** are welcomed by R C Modeler Magazine, but cannot be considered unless guaranteed exclusive. Manuscript must be accompanied by return postage and any material accepted for publication is subject to such editorial revision as is necessary. In our discretion, to meet the requirements of this magazine Editorial material is selected on the basis of general interest to the radio control enthusiast and the publisher assumes no responsibility for accuracy of content The opinions stated in published material are those of the individual author and do not necessarily reflect those of the publisher. R C Modeler Corporation assumes no responsibility for loss or damage of editorial contributions Upon acceptance, payment will be made within 30 days of publication, at our existing current rate, which covers all authors rights, title to, and interest in, the material mailed including, but not limited to, photos, drawings, and art work, which shall be considered as text Submission of the manuscript to R C Modeler Magazine expresses a warranty, by the author, that the material is in no way an infringement upon the rights of others

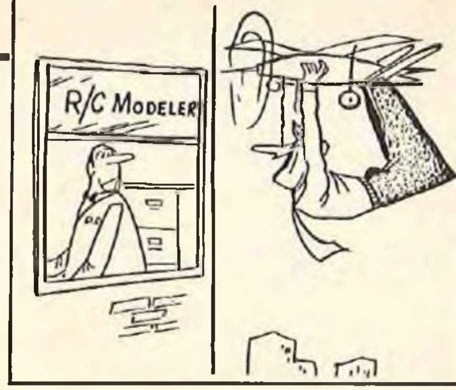

**SUBSCRIPTION RATES:** The United States $16 50 per year, $32 00 two years Single copies $1 50 each Add $2 50 per year for postage outside of the U S (except APO's and FPO's) Change of address notices, undelivered copies and orders for subscriptions are to be sent to P.O Box 487, Sierra Madre, California 91024. Allow 6 weeks for new subscriptions and changes of address

**ADVERTISING:** Send advertising copy and complete instructions to Advertising Department, R C Modeler Magazine, P.O. Box 487, Sierra Madre, California 91024 Telephone (213) 355-1476.

# From The Shop

**DON DEWEY**

HEY! I'VE GOT A GREAT DESIGN FOR YOU!




**JOHN NOLLENDORFS**

● The following is RCM's second in a series of profiles of club newsletter editors. This month, RCM salutes John Nollendorfs, editor of *The Clanking Armor*, newsletter of the Lincoln Sky Knights.

John Nollendorfs began modeling with 1/2A U-control at the age of 8, graduated to free flight at 13, and joined the Lincoln Sky Knights Free Flight and U-contorl Division. He designed and built an Unlimited Class rubber ship for a math project in the 9th grade and flew the ship at the 1963 Nationals held at the Glenview Naval Air Station. Soon after that, he flew his first single channel radio controlled model and promptly lost it on the second flight! Shortly thereafter, John's modeling career took a nose dive and he was inactive until he caught the bug again in August of 1975.

In fact, John's return to modeling was quite by accident, when a friend at work decided he would get into RC, and John stopped by a couple of times to offer his assistance. He found all sorts of new things had come along, such as fully proportional radio gear (just being talked about when John left modeling 11 years previously), and materials such as Super MonoKote and Solarfilm, Hot Stuff, 5-minute epoxy, foam core wings, and, in John's words, "A hell of a lot of plastic." John joined the Lincoln Sky Knights Radio Control Division in October 1975, and flew his first plane in January of 1976. During that same month, he also put out his first issue of the Lincoln Sky Knights Newsletter.

Since 1973, John Nollendorfs has been an Industrial Photographer for Norder Laboratories of Lincoln, Nebraska, a manufacturer of Veterinary products. Previous to that, he worked for a year and a half as Public Relations Director for the Nebraska Crime Commission where he edited a monthly newsletter and published many information pamphlets and books.

While attending the University of Nebraska, John worked for the local newspaper part-time as a photographer. He graduated from the University in 1970 with a Bachelor of Science Degree in Journalism and continued on to do graduate work at the University of Oregon. Presently, John is 29, married to Barbara, and has two girls, Kristina and Alisa.

When asked what he considered to be a pre-requisite for being a club newsletter editor, John replied that the prime attribute is "having an extremely tough skin, plus an occasional club member who will give you support and encouragement, especially when you've been severely criticized for the latest newsletter! Of course, a bit of pride doesn't hurt when the first few pages of the newest newsletter comes off the press."

As John points out, the Lincoln Sky Knights is a very sociable group of about 60 sport fliers. They even have several members who don't fly any more, but still enjoy the fellowship of the club and turn out for an occasional meeting and, of course, at all the big social events and extra special fun-flys. *The Clanking Armor* is a very valuable communication device for the club, keeping the relatively inactive members on top of what is going on at the meetings, the current crop of stories and, of course, pictorial coverage of all big events. The biggest criticism John frequently receives is for over-quoting someone at the meeting, or including off-the-cuff remarks. But, as he points out, such is the life of a newcomer editor who is also a newcomer to the club.

Congratulations to John Nollendorfs of the Lincoln Sky Knights as our club newsletter editor of the month.

●

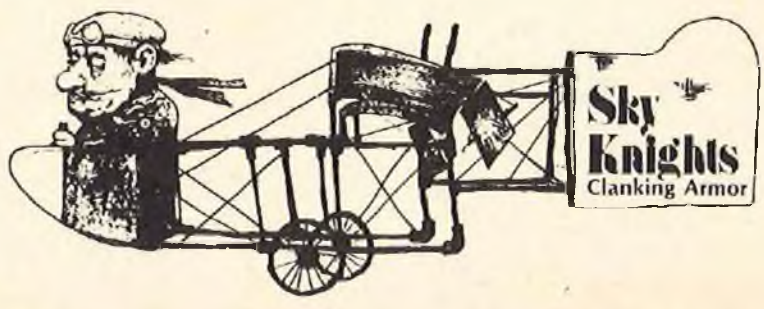
The following letter was received from E. Scott Hinckley of Tempe, Arizona, and concerned the criticism of the Foam Cutter which appeared in the From The Shop column in the January 1977 issue of RCM.

*Dear Don:*

*I have reviewed the allegations put forth by Mr. Carter and find that he has made some good points, as well as some errors. I have consulted with a Professor of Electrical Engineering who is also Manager of the Engineering Analysis Center, Brigham Young University, and he agreed that the foam cutter described could be dangerous if mis-used, but that the addition of an isolation transformer of the type described by Mr. Carter would not make the unit any safer.*

*There is no way a hot foam cutter, of any type, can be made totally safe. If the bare wire is touched while current is flowing, an individual will be either burned, shocked, or both. I made the*

to page 6



## FROM THE SHOP

from page 2

*mistake of doing my foam cutting on an older table saw which had an ungrounded motor. It is the opinion of the professor I talked with that this was probably why I received a mild shock. I was not touching the cutting wire (which is isolated from the bow by plexiglass).*

*The cutting wire cannot be made totally safe. Neither can a table saw, radial arm saw, Moto-Tool, or any other piece of cutting equipment, if care is not exercised. Following are several rules pertaining to safety with foam cutters:*

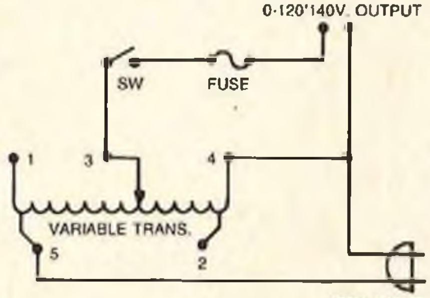
*(1) Never touch the cutting wire unless the cutting bow is disconnected from the power supply.*

*(2) Do not use foam cutters on metal surfaces.*

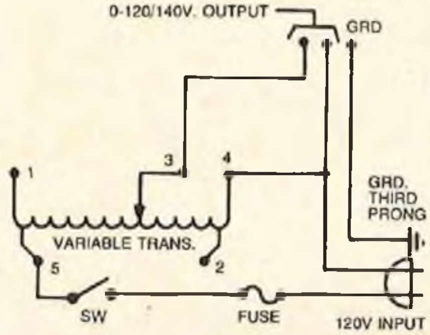
*(3) Follow common electrical safety rules, i.e., no wet hands, puddles, etc.; no touching of bare wires or sockets; disconnect main power cord before working on appliances.*

*(4) Do not use metal foam cutting templates.*

*I have checked several foam cutting articles in various magazines on hand (July, August, and November 1969, and March, 1976, RCM; January 1977, Model Builder); as well as criticism in the October 1969 RCM much on the order of Mr. Carter's. It seems that if a modeler wants to cut foam wings, he must take some risks. It is my belief that these risks can be minimized, and almost eliminated, through the implementation of safe practices on the part of the operator.*




ORIGINAL




NEW

*There are a few modifications of the schematic which I have made in order to protect the variac and also to ground the duplex outlet used. The new schematic is shown below:*

*The metal cutting bow can be grounded by running a three wire cord to it and soldering the third wire (ground) to the bow itself. This should eliminate any problem with electrical leakage, whatever the source.*

*In conclusion, I would appreciate, as I am sure RCM would also, the additional comments of those involved in electronics as pertains to the safe design and use of foam cutting hot wires and their power supplies.*

*Sincerely,*
*E. Scott Hinckley*

•

Our good friend Jack Immelman of Redipak (Pty.) Ltd., in the Republic of South Africa sent us the following news clipping from the Johannesburg newspaper *The Star*:

**HARDLY A MODEL LANDING**
**Vereeniging Bureau**

*The Sasolburg airfield looked convincing from the sky – good runway, wind-sock tugging in the breeze – but the young Durban pilot discovered after he landed that it was intended only for model aircraft.*

*Yesterday the pilot was the most embarrassed airman in town when members of the Sasolburg Model Flying Club and traffic officers dragged the twin-engined plane off the model runway.*

*The traffic officers closed a stretch of road nearby and the pilot used it as a runway to take off again and find another airfield.*

As Jack pointed out, this really happened — only 50 kilometers from Johannesburg! Jack personally checked it out with Mr. Jurgens Wagenaar, Chairman of the Vaal Fliers. The aircraft mentioned was a late model Cessna twin, no less! As Jack noted, they'll have to ask for government legislation against full-scale pilots — or maybe settle for landing fees!

•

The Sault Modelers Radio Control Club will be staging its annual Upper Great Lakes Model Meet on May 28 and May 29 at Sinclair Park Model Airport in Sault Ste. Marie, Ontario, Canada. This MAAC sanctioned event will have three classes of Pattern, plus Stand-Off Scale. All MAAC and AMA members are warmly welcomed to this low-key affair. The CD is Craig Knight, 11 Broadview Drive, Sault Ste. Marie, Ontario. Craig's phone number is (705) 949-6893. Pre-registration would be appreciated.

•

That's it for another month — hope you like the issue. If you don't, let us know about it. □

# Engine Clinic

CLARENCE LEE

● In the December Engine Clinic, I made mention that Bob Siegelkoff of CB Enterprises had decided to discontinue his line of spinners, machined from bar stock, due to rising material and labor costs. Since Bob's 2" spinner was the most popular spinner used on the Formula I aircraft, Ron Schorr, President of the NMPRA, had Bob make a special order of 200 2" spinners. Schorr, in turn, made these available through his RNS Products. Some fellows seem to have taken this to mean that Bob Siegelkoff and his CB Enterprises was going out of the spinner business. This is not correct. Bob is still in the spinner business and producing his plastic spinners with machined aluminum back plates and new die-cast aluminum spinners. Both of these items can be produced at considerably less cost, keeping the retail price at a competitive level. Only the full machined bar stock spinners were discontinued. Even these may be put back into limited production in the future but, at present, are only available from Ron Schorr. For those who may have missed the original mention, Ron's business address is RNS R/C Products, 5224 Teesdale, North Hollywood, California 91607. Price $14.00 each, plus postage.

Also mentioned in the same article was the RNS R/C Products aluminum motor mount. In the past, these excellent motor mounts had only been available for the K & B 6.5/.40 and Super Tigre X-40 to be used in the Formula I pylon racers. Ron had expanded the line to include many of the popular .60 size engines as well. Because the demand for the line of mounts was exceeding the time available, the RNS R/C Products line of motor mounts has been sold to Prather Products and, in the future, will be part of the Prather Products line of accessories.

Prather Products continues to expand their line of products and, this past month, we received several of their new offerings. These will have been covered separately in the new products section of the magazine, but one item, in particular, I would like to bring to your attention. That is the new Spinner Balancer. Most modelers are aware of the importance of balancing a propeller to reduce vibration, but very few pay any attention to the spinner. And yet, the spinner can cause far more vibration problems than an out-of-balance propeller. This is due to the weight and mass involved. Many fliers have found that bad vibration problems can be cured by simply removing the spinner from those aircraft that are using them. Many of your plastic and die-cast aluminum spinners will have a thicker wall on one side than the other which, in turn, means a heavy side. This is the main advantage of a fully machined (from bar stock) spinner — constant wall thickness and better balance. However, the machined type spinners are only available in the smaller sizes and most sport, pattern, and scale models require 2½" and larger diameter spinners. Some of these larger spinners have been the cause of many unexplained cases of unknown interference — instances of, "I haven't got it," etc. Vibration gets to the servos causing the motor brushes to bounce or pot wiper contacts to vibrate. The aileron servo, usually being the most solidly mounted, is often the first to be affected. The flier throttles back, regains control and lands, and then starts looking around to see if someone had their transmitter on in the pits, etc. The lucky ones, that is! Some do a roll into the deck on take-off — become panic stricken, and forget to throttle back - - - in turn, sticking it in the ground, etc. So the point behind all of this is that, with the Prather Spinner Balancer, you can stop the source of a major cause of vibration — an out-of-balance spinner. Although the spinner balancer, itself, may look like part of a "Tinker Toy" project, it does do the job. When you get to checking a few spinners you will be really surprised at how far out of balance some will be. Any imbalance at the rpm's we are running our engines today is going to cause serious vibration. Most pattern engines are now turning over 13,000 on the ground and Formula I pylon engines 21,000 or better. Of course there is more to this spinner business than balance alone. The hole in the backplate must be centered and the nose of the spinner run true. Remove the glow plug from your engine and turn the engine over slowly by hand. Use the edge of your tool box, or something solid, as a reference and check to see if the nose of the spinner runs true or gyrates around. It should run dead true. If not, find the cause, such as a bent backplate, bent attaching screw or stud, crooked threads in the prop nut, etc. Many times the front face of the propeller hub will not be true with the back face, i.e., the propeller hub actually has a slight wedge shape. This cocks the propeller, prop nut, or both. Try screwing in the spinner attaching screw, or stud, and leaving the spinner off. Turn the engine over slowly and note if the screw or stud wobbles. This must run dead true if you expect the spinner to run true. It is attention to these small details that makes a big difference in the way an engine performs, especially when you get into the high rpm ranges the racing engines are turning. Many fellows wonder why they cannot get their Formula I engine to turn over 20,000 when other fliers are turning in excess of 21,000 with the same engine/prop/fuel combination. It is the little things, such as tracking your prop and spinner, balancing same, etc., that gives the edge. Vibration is a power killer so the smoother you can get the unit to operate, the more that will be developed.

I feel that the Prather Products Spinner Balancer is a very useful item and, when used in conjunction with their prop balancer, and pitch gauge, can result in a considerable improvement in engine performance. Their use could also save you an airplane.

to page 183

# For Old Time's Sake

RANDY CARMAN


*This pretty gal is Miss SAM Champs of '77 - - - Tricia Webster of Manchester, Tennessee. She certainly is a "Foxy Lady!"*

**Weak Signals Toledo Show**

● The annual Weak Signals R/C Expo is now set for April 1st through 3rd at the Sports Arena in Toledo, Ohio. You may remember last month we told you that there would be static judging of R/C assisted old timers. Well, "SAM Speaks" has outlined the rules for the competition as follows:

1. Entered aircraft shall conform to prevailing SAM rules for Old-Timer Models with Radio Assist.
2. Entries shall be displayed complete with engine, tank, and radio installation. A muffler is optional.
3. Entrants shall provide a judging 'book' containing:

A. Construction plans and Builder-of-Model certificate.
B. Proof of design authenticity — photocopies are OK.
C. Description of unusual features, R/C adaptation, etc.

4. Any legal engine may be mounted — type, antiquity, value, etc., won't affect judging, but appearance can affect score.
5. Confusions and conflicts will be resolved in keeping with the spirit of the SAM rules Preamble.

There will be a possible total of 100 points given each entry: 30 points for fidelity to the original design, 30 for construction and R/C adaptation, 30 for finish and overall appearance, and 10 points for general public appeal. Anybody build a "Spook" lately? That would appeal to the general public!

Should you have any questions, get in touch with Tom Barnes, Chairman, Toledo '77 SAM Judging Committee, P.O. Box 1071, Butler, Pennsylvania 16001, (412) 282-1509. Help keep Tom and his committee out of mischief at the show — enter your latest model!

●

**SAM Champs are Rolling!**

The Eleventh Annual SAM Champs to be held in Las Vegas, are moving right along. The events for free flight and R/C Assist have been scheduled:

**Free Flight Events**

Tuesday, June 28 — "C" Cabin, "A" Pylon, 30 Sec. Antique, Cabin Rubber.

Wednesday, June 29 — "A" Cabin, "B" Pylon, Stick Rubber, .020 Replica.

Thursday, June 30 — "B" Cabin, "C" Pylon, Fuel Allotment Antique, Scale.

**R/C Assist Events**

Tuesday, June 28 — Class C (Glow), Class A (Glow), Class C (Ignition).

Wednesday, June 29 — Antique (Glow and Ignition Combined), Class B (Glow), Class A-B (Combined Ignition).

Thursday, June 30 — Texaco (Ignition and Glow), .020 Replica.

The R/C Assist Rules have also been listed, so here they are:

1. All SAM rules will apply in the standard events.
2. Ignition and glow powered entries will be run as separate events in Classes A, B, and C.
3. Texaco Event fuel allotment will be restricted to 1/8 oz. per pound of model up to a maximum of seven pounds.
4. The run motors assigned to models in the Antique Class will be based on a maximum weight of seven pounds.
5. .020 Replica Fuel Allotment Event will follow all SAM rules except as noted:

A. 1½ cc of fuel (to be provided by the Contest Director).
B. R.O.G. only.
C. Five minute max. flights.
D. 50 point bonus for landing in 50 foot circle.
E. Six attempts to attain three officials.

to page 180


# PAINT YOUR TRANSMITTER

## BY SCOTTY R. CEDERGREEN

● Don't like the color of your transmitter? Paint it! How? Use vinyl spray paint, of course, because what most all of them ol' boxes are covered with is vinyl.

Now, seriously, let me get down to some specifics here. First off the President of our club talked me into purchasing a Royal Tech RC radio, the kind that is a complete kit. Unfortunately, it comes covered with gray vinyl. Being active in government circles, more specifically serving with the U.S. Navy, the color gray does not excite me as a color at all! So I figured I'd give the box a new paint job if I could. Now there are numerous vinyl sprays on the market mostly designed for automotive use. So I purchased a can of paint - - - the label said it was dark red. A very attractive color but it is really more of a maroon than dark red. To make a long story just a little shorter it worked! As a matter of fact it worked great! The brand name of the paint I used is Mar Hyde. I sprayed the charger case first to test for fuel resistance. After allowing the case to dry for 24 hours I daubed on some fuel and let it set for 30 minutes. After wiping the fuel off, the paint stayed! Hey, I said to myself, this looks like a good deal. So to finish my scientific testing, I used a fingernail to scrape the painted case. No dice, that paint is on to stay! It adheres like crazy to the vinyl that graces the transmitter and some chargers. However, the vinyl spray simply will not adhere to metal so don't waste your time spraying the inside of your case.

So now I have a much nicer and more appealing (to me anyway) custom transmitter and charger case. One small detail should me mentioned. Prior to painting make sure to wipe down all parts to be painted. I used isopropyl alcohol and it worked perfectly. Do remember not to touch the parts after you have wiped them down.

Now, admittedly this process is much easier done on radios that are purchased as a kit and built yourself. However, I'm sure that anybody with a little electronics experience can disassemble his or her own transmitter case and paint it whatever color that tickles one's fancy. So your only limitation on the color of your transmitter is what the various paint manufacturers offer in the way of colors. And paint schemes are almost limitless! Paint your transmitter case in your frequency colors, or red, white and blue, or your plane's colors, or whatever.

So if you don't like gray, or that horrible shade of blue, or that flat red, or that drab brown, just paint it! And if you can't disassemble your own transmitter check out your other club members. One of them surely can.

So there you have it. As a matter of fact the President of our club liked the color of my transmitter so much he wanted to paint his own. So what with modelers being really great people, and me being a modeler, I let him have the rest of my can of spray paint. Now our club has two formerly gray transmitters that are now a beautiful maroon color. And besides now our President owes me a favor! Try it, you'll like it! □

# Radio Spectrum

JIM ODDINO

● For a change of pace, I thought I'd let a letter introduce our feature subject this month.

*Dear Jim,*

*I thought I'd drop a line to tell you how much I enjoy your column. It is honest, straightforward and informative. I have become interested in electronics at least as far as our radio systems are concerned and am trying to learn all I can. Part of the problem, as you are probably well aware, is the lack of printed information applied to our systems. I am currently studying electronics through the Heathkit study program during my spare time. There are many things that a person with a little training can do in the way of maintenance, etc., but the difficult part comes in finding this information. After I finish the Heathkit course, I'm not sure where to go for the proper study material.*

*Your article in the December issue of RCM is what prompted this letter. I hope you will continue with your series of articles describing the operation of RC and its associated electronics. A while back you began talking about test instruments, the oscilloscope in particular, their specifications and applications to radio repair and experimentation, with a promise of more detailed information in a future issue. I had hoped that this would help me in future equipment purchases.*

*I would like to offer my encouragement to you for the continuation of your column with information along the above lines. With all of the subjects you have to write about regarding the electronics of radio control, I hope to be reading your column for many years to come.*

*Sincerely,*
*Douglas Schleifer*
*Columbus, Ohio*

It is very encouraging to get letters from people who are not afraid of electronics, even though they have little or no formal training. In many ways electronics is much easier to master than almost all of the other sciences applied to models. It is a fairly exact science until you get up into VHF and UHF radio frequencies, but then it becomes more exact again when you get up into micro wave frequencies. For example, if you apply a known voltage (which is easy to measure with a volt meter) across a known resistor (which is also easy to measure) you will get a specific current. You can calculate it ahead of time and it will come out the same as your calculation when you build the circuit. You sure can't say the same thing about aerodynamics, or two cycle engines, fuel, paint, etc., etc.

And the equipment required to build an electronic project is so much simpler and the time required a lot shorter. With a soldering iron, multimeter and oscilloscope, you are in business. Changes can be made quickly by unsoldering one part and putting in a new value.

If you want to build something mechanical like an engine or retractable landing gear system, you need a machine shop and, if you change one part, you usually have to change many others.

Why then are so many people afraid of getting into electronics? My guess is that they develop mental blocks because they can't "see" what is happening inside those magic black boxes. With a mechanical system you can visualize pistons going up and down and cranks turning.

Most of you probably understood my little example of steering by hand signals because you could visualize someome putting his hand up and down and someone else reading those signals. In our electronic encoder we perform a function similar to the hand signal only a lot faster. We simulate the hand up and down signal by creating a voltage which goes up and down. Here is where some people get lost because they can't "see" voltage. Many smart electronics people can visualize what a circuit does by looking at a schematic, but sooner or later they too will want to look at what is happening in the circuit. An oscilloscope is the instrument that lets them see what is happening.

Think of voltage in the same way you think of pressure, whether it be gas pressure or fluid pressure. The higher the pressure, the greater the flow through a given orifice. You can't see pressure either unless you have a gauge. If you want to see voltage you also need a gauge which we call a meter. A meter is fine for measuring steady state voltages but, because of the mass and inertia of the movement, it is no good for measuring voltages that change rapidly. In the oscilloscope, an electron beam which has insignificant mass is moved so it has almost no limitation on how fast it can be moved. So let's see how we can measure voltage with an oscilloscope which I'm going to call a scope for short.

The voltage to be measured is connected to the vertical amplifier of the scope. The scope is usually adjusted so that, with no voltage applied, the beam is in the center of the screen. If the applied voltage is positive, the beam deflects upward and if it is negative, it deflects downward. A high grade scope will have an accurate calibration such that the amount of deflection is directly proportional to the voltage applied. The scales are usually switchable just like they are on a meter but instead of calling them the 1V or 10V scale as you do in a meter, the calibration is given in volts per centimeter or volts per division refering to the gradicule on the face of the scope. So if you wanted to measure your airborne battery voltage you would connect it to the vertical input and go to the 1V per cm scale. If the beam deflected 4.8 cm it would indicate 4.8 volts. Once again this assumes you have a calibrated scope and, in this case, it must have DC response. Some scopes have neither, but that doesn't mean they're not useful in RC work. In our digital systems, the voltages in the encoder, decoder, and servos switch from close to zero to the supply voltage and we can use a voltmeter to measure the supply voltage, and any other steady state (DC) voltages. The various pulse trains we've talked about will come through fine on an AC coupled scope.

So, let's talk about measuring a frame in our digital pulse train. A frame is usually 14 to 20 milliseconds (msec) long so we would like to see what the voltage is doing during that period. We would set the horizontal time base for 2 msec per centimeter which would give us 20 msec across our 10 cm gradicule. We've established that the beam can move that fast but now we have a new problem. Our eye wouldn't be able to see much of anything if the beam only swept across the screen once and did it in 14 msec.

What we must do is synchronize the

**to page 18**

horizontal sweep so that it always starts at the beginning of a frame so that each suceeding frame causes the beam to travel the same path each time. Then it appears to be continuous to the eye. The high grade scopes have calibrated horizontal scales so the pulse widths can be read directly. They also have trigger inputs so it is easy to sync the horizontal trace to the waveform we are trying to measure. Again, you don't need a calibrated horizontal time base and a trigger input, but it sure is nice.

Scopes are available with very high frequency response which would actually let us see our RF carrier on a cycle-by-cycle basis. These are still pretty expensive but we can get around that, too.

Enough of this dry stuff. Let's assume we have a simple scope. How can we use it in RC? The first place is in measuring your transmitter output and peaking it up. By putting a scope in place of the meter in a field strength meter, we can display the envelope of the transmitter output. We don't see each cycle of the RF, but the vertical size of the envelope is a measure of the output power of the transmitter and, of course, the encoder waveform is also apparent. See Figure 1.

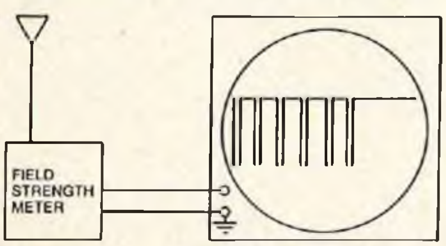


FIGURE 1

Once we get to know what our transmitter output should look like, we can check it in a matter of seconds. If the amplitude is too small, something is wrong with the RF. We can peak it up by tuning for maximum amplitude without disturbing the wave shape. If the shape of the envelope is different, something is wrong with the encoder.

If this is the case, we can go inside and look at it stage by stage. For instance, if we only had three pulses in each frame of a five channel system, we could get in on the third channel and find out what was wrong. Assuming a standard half shot type encoder, the waveform on the collector of the transistor should look like Figure 2.

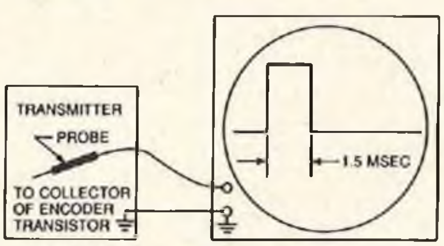


FIGURE 2

If it wasn't there you would look for broken wires and open pots. If that didn't yield the answer, you could get on the base of the transistor where you should see the waveform in Figure 3.

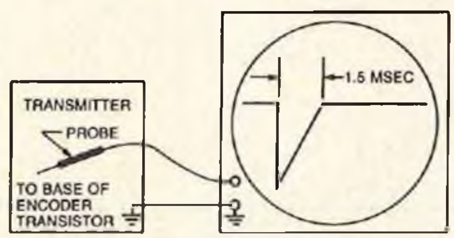


FIGURE 3

I don't want to make this a system trouble shooting manual, but I do hope it illustrates how a scope can be used. Obviously a DC meter would be useless in trying to measure the pulses we've shown in all of these figures. The scope gives us an added dimension by displaying things that are happening in very short periods of time.

Some words of caution in using scopes is in order: When looking at waves as we've just described, you don't want to pick up RF in the leads which can cause shifts in the display. I usually put an RF choke in the ground lead and a 47K resistor in the probe lead or use a 10 to 1 probe which accomplishes the same thing. Probes are used where it is important not to load the circuit. That is, very little current flows into the scope and, therefore, the circuit under test is not affected, when a probe is used.

This has been a rather simple introduction to the oscilloscope which I hope will stir up some interest. If you have any specific questions on marking measurements, drop us a line and we'll try to get you an answer.

★

Last month I recommended some diodes that ought to work in Chuck Salkowski's glow plug exciter circuit in the Nov. 1976 issue. After thinking about it, I started to get worried about the forward voltage drop at currents as high as 20 amps. I decided to make some measurements and my suspicions were confirmed. You can easily develop over two volts across the two diodes which won't hurt the diodes, but which will probably take out your glow plug. The solution is to put some resistance in the line to the plug. The circuit would now look like Figure 4.

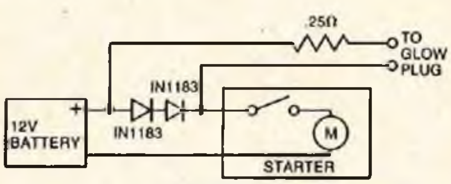



FIGURE 4

You can make a .25 ohm resistor with nichrome wire or by paralleling four one ohm resistors. The final resistor ought to be rated at at least five watts.

I don't know why Chuck never ran into the problem but it might be because his starter never stalls. He uses a starter motor from an outboard engine.

★

*Dear Mr. Oddino:*

*I have just finished reading the December RCM, in particular the article on the Servo Exorcisor. The device is along the lines of something that I have been looking for but lack the knowledge of electronics to design. I want to build the Table Top Helicopter Trainer described in a previous issue of RCM. To operate the device with a transmitter and receiver would require a licensed operator to be present. This would restrict its usefulness for children.*

*What I would like to know is: Do you know of a circuit that could operate the two servos directly, thus simplifying the system? A two channel unit similar to the Servo Exorcisor would be ideal, the joystick would add to the enjoyment of operating the unit. I am currently using a Hobby Lobby 4 outfit with five wire servos.*

*I hope you will be able to help me with this problem or can tell me where I can find the answer. In any case, thank you for taking the time to read this and keep writing the articles for RCM; I look forward to them every month – they always bring up something I need to know.*

*Sincerely,*
*Kenneth Wolma*
*Evanston, Illinois*

There are quite a few ways to do the job, Ken, but the easiest might be just what you suggest. Build the exorcisor with two sets of electronics. You don't need the cycler part, that is, everything left of the 5K control pot in the schematic. I'm sure the East Side Bowery Boys would be glad to sell you the added parts you need including a two axis stick. Sounds like you may have an idea for a new parlor game.

★

I hope you've been enjoying Doug Spreng's projects as much as I have. The exorcisor, "to run the devil out of your servos," is a must for every shop. The expanded scale voltmeter is a winner too. Once you've started using one you'll never want to be without it. You'll probably want one for your transmitter too. I would like to caution you that ESV's can be used to discharge your cells, but they do not turn off automatically like the flight life or super cycle. you must watch it and turn them off or you could ruin your batteries. Also be sure to read Doug's caution on using the automatic charger at high and low temperature if you want your batteries to last. I hope you noticed the difference between the G.E. and Panasonic batteries in the performance curves Doug printed with his battery management system. The moral? Buy American.

★

to page 179

# Sunday Flier

KEN WILLARD


***Which is harder to fly --- a hot little airplane, or a hot big one?***

***The author's stable of little bipes and a racing glider converted to .40 power.***

● What's the best way to start an argument — assuming that you want to in the first place?

Nothing to it. Just make a positive statement like, "The best way to start an argument is . . . " No matter how you finish that sentence, you'll have an argument on your hands. Another way, "Gliders are more fun than power planes." With that one, though, you have to be selective. Make the statement at a 1/2A pylon racing event, for instance.

In any event, the infinite number of different opinions as to what phase of R/C flying — or any flying for that matter — is the most fun, or alternatively, what is the best way to run a contest, constantly provide grist for the Sunday flier's fun mill. Finally, there is the virtually unlimited field of aerodynamic theory, where opinions are so different that they almost get violent at times. Some of my recent correspondence has expressed some very strong opinions on various subjects. I thought you might like to hear some of them.

When I published the descriptive article on the SE-5 Peanut scale model, I mentioned the fact that when the engine quit and the model went into a glide, it glided faster than it flew under power. I asked for opinions from the readers as to why this was the case. I received a number of responses, some logical, some not so logical. The most logical explanation that I received was from Karl Williams in Manitoba. After a rather long description of the trials and tribulations of flying in the late Fall and Winter in the Canadian climate, he said, in part, "The reason your Peanut scale SE-5 glides faster than it flies under power, lies right in that phrase 'under power'. Your model has such a high power loading that just to maintain altitude and climb slowly, it is flying at a higher angle of attack than it assumes in a glide. The slipstream of the prop of the .010 engine is passing over the wings much faster than the actual forward speed of the model, so the wing is actually working in air that is fooling the model into thinking it is going faster than it really is. Then, when the engine quits, the model finds this out, and has to pick up speed to compensate. Thus, it glides faster than it flies under power." Sounds logical to me.

In contrast, though, here's a letter from Edmund E. Depue (whose address was mysteriously spirited away from my desk - - - more voo-doo?).

*Dear Ken,*

*I was much impressed with your Peanut sized biplane. I think the problem you are having, faster glide than powered flight, is due to Don Dewey. He is a worshiper of voo-doo, no doubt he has a small replica of you plane made of sticks and mud, and has stuck T-pins all over it while chanting incoherently. You may be able to restore a healthy glide to your little biplane by stealing despicable Dewey's replica of it and removing the pins, placing it inside a painted circle (blessed Hobbypoxy works best), pouring Cox racing fuel over it, lighting it and holding a picture of Dewey over the flames. But be careful while obtaining the copy Dewey has made, for he is a truly dangerous man, capable of anything. You can see it in his eyes; just look at the photos of him in RCM – very scary.*

*I have just gotten my own Cannon Supermini. I really like it, as I am sure you do yours. I enjoy small planes; the smaller, the better for me. Can you tell me where I might get an exhaust restrictor for an .010? I really want to try a tiny one.*

*Sincerely,*
*Edmund E. Depue*

Sorry Ed, the exhaust restrictor I have is a sample of one which was made a number of years ago, and which is no longer on the market — at least it isn't advertised anymore, and I've lost the name of the outfit that made it (more voo-doo?). Actually, it was more of a conversation piece than anything else. Whenever the model was flying, it had to have maximum power to stay aloft. Later on this year, in response to the number of requests, I will publish the plans. They will show an .010 in the nose, but if I had the time, I'd replace mine with an .020, eliminate the third servo for the engine, and have a better flying model, although the glide will still be very steep. Maybe one of you modelers will try it and let me know. I'll try to get the plans out this summer. The flying weather is better in Canada then. Right, Karl?

★

Another fertile field for argument is in the selection of events for a soaring contest which will reduce the luck factor; a corollary is the selection of a landing procedure so that short flights, with precision landings, don't wind up as "winged spearing" events.

Several methods have been tried to reduce the airborne luck of being in the air when the thermal is overhead. Man on man is one. It helps, but as Don Burt points out in the February RCM, it has its drawbacks. Open winch is another method, but it hasn't proved too successful either. A third method is the "wild card" flight, where a contestant has the choice of staying with his scores for previous flights, or making one more flight, designating it as a replacement for one of the prior flights, and trying to better his score. If he succeeds, great, but if the flight turns out to be worse, then he's had it, since the wild card flight score is the

to page 166

# Soaring

**AL KINDRICK**

● When that new sailplane is ready for covering, and the color scheme and trim is set, it is time for that "added touch of class" by tinting the canopy.

Many new builders should try it and the more experienced should do it more often. It is not very difficult, nor is it a difficult task to perform, and the results are very rewarding.

The first step is finding a pan that can be used to heat water — one that is not used for food preparation. The best bet is to look through second hand or salvage stores for a "bread pan shape" container.

Bring the water to a boil, but do not have the canopy in the water at this time. Add the desired color dye to the water at about one teaspoon per quart of water. Rit, or any good quality dye, will give excellent results. Turn the heat down now to a simmer.

Now clean the canopy thoroughly. This step is *very* important. Remove all oil, grease, dust, and fingerprints. Use alcohol or a non-oily glass cleaner. *Don't* use any abrasives, and be careful not to scratch the plastic.

Using tweezers or your wife's canning tongs, submerge the canopy into the dye solution slowing and agitate continually at all times.

Now comes the part requiring some finesse - - - matching the color to the covering or trim color.

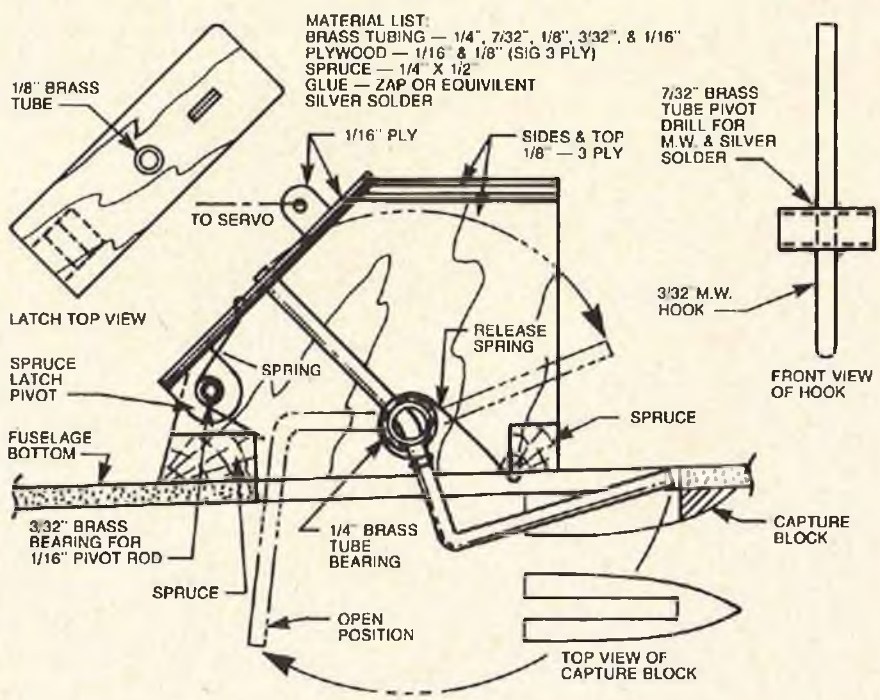
The longer you leave the canopy in the dye, the darker (or truer) it will get to the basic color dye used. It doesn't hurt to pull it out frequently, rinse it off with clear tap water, examine it and replace it in the simmering dye solution. During these inspection operations, do not touch it with your fingers.

When the desired tint is achieved, rinse it off and wipe with a clean soft rag. The latter should be disposable since some of the surface dye will wipe off.

I have found that the red shades go towards a rose color, and the dark blues lean towards the purples on long dye applications.

If your canopy was clean the dye job will be even, with no streaks, and uniform in color. Shrinkage of the canopy is almost zero, and this little extra work will add that touch of class to your new sailplane. By the way, the glue put out by Wilhold called R/C-56 dries clear and flexible, and does a great job for attach-

to page 26




**CAPTURED RELEASEABLE TOW HOOK**
SCALE 1 TO 1

## SOARING

from page 22

ing that canopy.

A word of caution: Don't dump that used dye down the wife's kitchen sink! Take it out behind the garage and feed it to the weeds.

•

The following notes by Bob Gill are reprinted from the Tri-State Soaring Society Newsletter:

Without any drastic changes to an existing sailplane, that plane can achieve a higher launch with the same pilot at the controls using a captured releasable tow hook.

A releasable tow hook has become a performance, as well as a safety, feature on many sailplanes. As a performance feature, the launch doesn't include that anti-climax at the top of the line when the decision to release has been made, but now you have to wait and watch your glider drop to develop the slack needed to self-release. Every launch loses at least 20 feet.

The safety part of the releasable hook is that the pilot can get off the line at any tension. This aspect comes for most at the top of a high launch. With a hi-start we tend to dive then pull up to release a line under tension. If the plane doesn't come off after the dive this, then, develops a greater pull on the wings than any other time in flight. The dive can take the plane past its terminal velocity because gravity is helped by the tension of the line. I have seen gliders actually break their wings just after releasing because the change of angle of attack at this high speed created more lift than the wings could stand. A releasable tow hook used properly takes the strain off the plane as it helps achieve a higher-than-average launch.

The "captured" part of a captured releasable hook is insurance for those of us who tend to pop off the line every now and then. At the Soar Nats this year, I launched right through the sun on the second day in heavy wind. When I wasn't looking at the plane while in the sun, a gust of wind changed my course and the plane came out of the sun sideways and down. Without a captured hook, the plane would have popped off, resulting in a low launch. As it was, I just continued the turn and made a 360° on the line and then continued up to a high launch and released at the top.

In most wind conditions, a kite launch will result in a higher launch than a straight-up launch. I haven't done a kite launch because we were always afraid of popping off the line. The last half of the last round of the Soar Nats, the wind shifted 90° to the east and each launch was crosswind. I made sure none of the downwind winches were in use, then released and, at 30 ft. of altitude, made a hard turn downwind and maintained the same length and the same 30 feet of altitude until the plane was directly downwind. Then I made a normal ascent and got the highest launch of the round.

This design negates the built-in safety of a stationary open hook. If the new flyer gets into trouble with an open hook and dives past a right angle, the line releases by itself, giving the flyer a chance to recover his plane after the resulting zoom. The captured releasable hook is not so kind. It works on the premise that you know what to do when the plane is going straight down.

The design is *not for the beginner;* it is used for a competitive edge by a flyer that can control his plane well. For the beginner, this is one more gadget that will do nothing but get him into trouble at the wrong time.

**CONSTRUCTION**

1.) Cut the sides out of Sig 3-ply light plywood. Match these together by holding and sanding each side on a flat surface.

2) The bearing holes should be drilled with the sides clamped together for ease in alignment later.

3) Cut the two tow hook pivot bearings from 1/4" brass tubing.

4) Cut the latch pivot bearings from 3/32" brass tubing.

5) Bend the hook from 3/32" music wire.

6) Cut hook pivot from 7/32" brass tubing.

7) Drill 3/32" hole in hook pivot for the hook.

8) Cut braces from the 1/4" x 1/2" spruce.

9) Now install the hook in its pivot. *Don't solder yet.* Put in all the bearings, check the fit of the hook assembly in the sides with the braces for spacing. The hook should rotate freely and the latch end should not touch the upper brace and follow through the center of the space between the sides. The latch centering is adjusted by pushing the bearings on each side until they just touch the hook wire. Don't continue until you're satisfied.

10) Disassemble carefully, and use Zap to secure the pivot bearings. Also silver solder the hook to its pivot. Reassemble and use Zap to install the braces. Trim the excess brace material and continue. Now the hook is done except for the latch and spring mechanism.

11) Cut latch from 1/16" ply and drill 1/8" hold from brass insert. Cut brass insert and install with Zap. Sand bottom of latch so brass is smooth with the plywood.

12) Cut the latch pivot from spruce brace material and drill 3/32" hole at appropriate spot. Check for clearance in assembly. Sand, if necessary.

13) Cut and install 3/32" brass bearing in latch pivot. On side of assembly, mark a line from the center of the hook

to page 162

# Cunningham On RC

CHUCK CUNNINGHAM

● This winter there must be a monumental plot afoot to keep model builders busy building models. Although Spring will be beginning to make itself known when you read this, I am writing when the temperature is 12 degrees, and 2" of ice is covering the ground. This is the fourth or fifth major storm this Winter. Each one has fallen on the weekend and each one has been nasty. Of course, all of you northern and eastern types are used to this, but here in central Texas, we expect to fly sometime each week, and it seems just a bit strange to have each and every weekend locked in with ice and snow. Now, don't you really feel sorry for all of the guys, and gals too, who are not model builders? Frankly, I can't imagine how people can spend the winter and *not* be model builders. Spread the word, this is the greatest hobby and sport in the world - - - there's something in it for everyone.

'Nuff of this Winter stuff, but each year I try to urge you to get on your building horse during the Winter and get several aircraft ready to fly when that good old flying season comes again. Anyone who is new to this sport should realize rather quickly that he, or she, can't make it on just one aircraft. Something will come along to keep that aircraft from flying, and it's a darn good idea to have another one just waiting to be flown, and even another one just about in the finishing stages, and perhaps yet one more in the back of your mind that you want to build. Of course, this activity sometimes has to be camouflaged from the little gal who cooks your morning breakfast, but if you can get her interested in model building, and flying, then it sure does make life easier.

•

Several months ago, I worked on a series of articles about the design of RC aircraft, and this series seems to have been well received. I received a question about some further thoughts on such things as to what type of airfoils to use; what engine size is correct; where and when; and so on. So, this month let's take a look at some of these items and I will try to shed a bit of light on this problem.

First, let's consider airfoils, and let us put them into four broad categories: (1) Undercamber, (2) Flat Bottom, (3) Semi-Symmetrical, (4) Symmetrical.

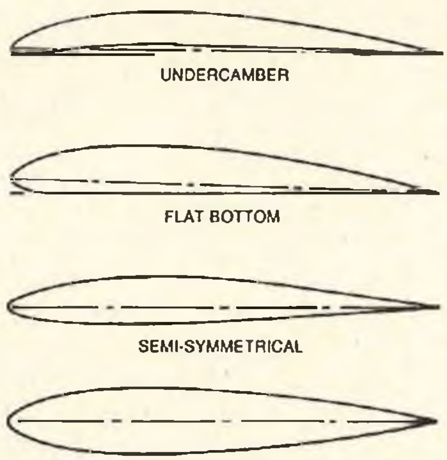



**FIGURE 1**

In order that you fully understand what each of these classifications mean, look at Figure 1. The first two groups are called lifting airfoils in that wings constructed with these types of airfoils are used where a high lifting power is needed or required by the type of aircraft flown. The undercambered airfoil is basically derived from a bird's wing, and this type of airfoil was found on all early full size aircraft as well as models. A great deal of thought has been given over the years as to just what type of undercambered airfoil to use, how thick the section should be, what type of leading edge would be the best, and so on. For general powered RC flight, the undercambered airfoils are not used because they generate a bit too much lift, with the result that it's somewhat harder to make the model go where you want it to fly without the problems of ballooning into the wind. By "ballooning" it is meant that, when the aircraft is turned into the wind, it tends to lift its nose and drift back with the wind, rather than to "penetrate" into the wind. As an example, if you have a cabin aircraft with ailerons on the wing, and an undercambered airfoil, then, with all of the lift generated by this type of wing, when you turn into the wind and the nose picks up to a "mushing" attitude the ailerons become rather ineffective, and your ability to control the aircraft becomes greatly restricted, thus making it much harder to fly.

Many free flight aircraft, and of course, the Old Timers and Antiques use undercambered airfoils, as this was the accepted method of getting a great flight thirty years ago. Many soaring aircraft use undercambered as well as flat bottom airfoils. Generally, the soaring aircraft with undercambered wings fly slower than do the soarers with flat bottom wings. This type of glider usually covers more sky looking for the elusive thermal.

The flat bottom type of airfoil has found very wide use in models of all types, and has the distinction of being the easiest of all to build, and cover. Most early RC aircraft used flat bottom wings because of their good lifting ability needed to carry around a couple of pounds or more of radio and batteries. The most popular of this type of airfoil is the Clark-Y section. This airfoil has been widely used on light planes as well as larger airliners and, for all around use on a trainer or sport flying model, it is pretty hard to beat.

Again, this type of airfoil has a similar problem to the undercambered type in that it is subject to ballooning at unwanted times, especially during landing. Many early RC designs that used flat bottom airfoils, set them at a rather large angle of incidence with the stab (see Figure 2) and depended upon this setting to generate a lot of lift and a great measure of stability. But, this large angular setting was primarily used on early RC aircraft that were flown under rudder-only conditions. That means that the *only* control that the flier had over his model was the rudder. Some of this type of flying still lingers today in the smaller 1/2A sizes. The only way to get this type of aircraft to pull out of a dive was the lift of the wing, and the way to generate this lift was to set up the wing and tail so that the wing almost worked like a parachute. This may seem like a weird explanation, but a rudder-only type aircraft flies with its nose up in a climbing attitude at all times. Early rudder-only types also did not have any type of throttle, the latter

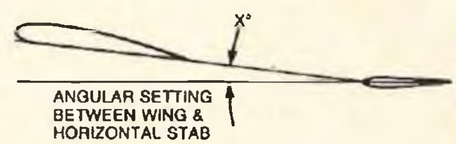



**FIGURE 2**

to page 30

# Sullivan

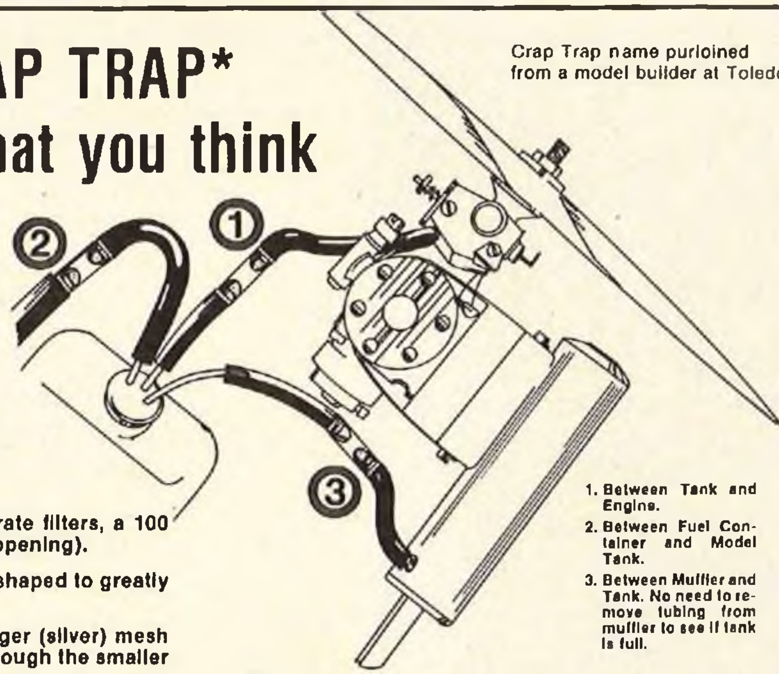
PRODUCTS, INC. 535 DAVISVILLE ROAD • WILLOW GROVE, PA. 19090 • (215) 659-3900

# We call it the CRAP TRAP*
# It does exactly what you think

Crap Trap name purloined from a model builder at Toledo

Finally, there is a filter to keep modern engines truly clean. Call it an IMPURITIES FILTRATION SYSTEM if you want... we call it the Crap Trap.

Newer, more sophisticated carburetors and pumps are very sensitive to fine particles that can get through most filters. But not the Crap Trap. Here's why:




1. Between Tank and Engine.
2. Between Fuel Container and Model Tank.
3. Between Muffler and Tank. No need to remove tubing from muffler to see if tank is full.

- **DOUBLE FILTRATION—Includes two separate filters, a 100 mesh (.007 opening) and a 120 mesh (.004 opening).**
- **MORE FILTER AREA—Both filters are cup-shaped to greatly increase filter capacity.**
- **COLOR CODED—Fuel must go through larger (silver) mesh first to filter out larger particles and then through the smaller (bronze) mesh. This is a must.**
- **WATCH IT WORK—Filters are encased in see-through tubing.**
- **CAN TAKE THE HEAT—The extruded Teflon casing can handle temperatures up to 600° F.**

You've got to try this great new filter to believe it. Watch it in action. Then, enjoy your model and its cleaner, smoother-running engine.

*Patent Applied For

**NEW BUNA-N TUBING**
**It hangs in there and won't crack**

Here's the newest development in tubing. Unlike silicon, it won't crack when bent and won't lose its elasticity when subjected to heat (near the muffler, for instance). Matty has had it on his model for two seasons and it's still going strong.

Buna-N is not a see-through tubing but who needs see-through now that we have the Crap Trap?

## HOW TO SOLVE THE TUBING PROBLEM: RETIRE.

By Matty Sullivan

One problem area in model airplanes that has always bothered me is the tubing. There doesn't seem to be any one kind that will do everything. Before World War II, the neoprene tubing was good enough for the gasoline fuel but it became scarce and clear vinyl came into the picture. Vinyl was the first tubing that was clear and it was intriguing to watch the fuel bubbling through it.

Next came surgical tubing. That was because the new alcohol fuel made vinyls harden and vibrate off. We put a yellow coating on our surgical tubing for identification purposes but recently we learned that this coating makes it about 90% fuel proof on the outside and extends its life.

Next came silicon. It can take some heat and has good fuel resistant qualities but it cracks near any sharp edge. Also, it's expensive.

That's why tubing was one of my first projects when I retired from my packaging business. I found a new type of rubber, called Buna-N. It has higher heat resistance than surgical tubing or neoprene, higher fuel resistance and better gripability. It even works well between the muffler and the tank. Because of the muffler's heat, this is the place where silicon loses its elasticity. How many times have you seen the pressure line from the muffler blow off while in the air?

I've been testing this Buna-N tubing on my own model two seasons now and it's still going strong. It works well everyplace except in the klunk tank where surgical tubing is best. Incidentally, this tubing should be replaced at the end of each season. The tank should be flushed with clean alcohol before storage.

Buna-N tubing is ideal between the muffler and the tank and the tank and the engine. It's not a see-through tubing, but, if you use the new Sullivan see-through Crap Trap, who needs see-through tubing?

The Crap Trap was developed for today's more sophisticated carburetors that are affected by very fine particles getting through even our nylon filter. A finer mesh screen was not the answer—larger particles clog it up too quickly. So we designed a new filter with two different sized screens and put them in a see-through Teflon case. Teflon is expensive—it's being used to replace human blood vessels—but the Crap Trap only uses one inch of it.

Being retired and working on these problems is resulting in some great new products for you. And it's a lot of fun for me. The only unhappy people are our competitors.

## CUNNINGHAM ON RC

from page 28

being the second control to be added to this type of flying. A typical flight of a stuntable rudder-only aircraft, was a hand launch into the wind, short blips of rudder to keep the aircraft climbing generally where you wanted it to go and, once sufficient altitude had been reached, a hard hold on the rudder to cause the airplane to spiral down. After a couple of turns toward the ground, the rudder control was released and the high lift and general stability of the aircraft caused the nose to come up. The speed of the dive and a bit of opposite rudder applied at just the right time, making the aircraft go into a loop. Takes lots of practice to do a good loop, and with a bit more application of rudder, consecutive loops could be done. Also, the same type of aircraft, with the same set-up, could be rolled by application of rudder at just the right time at the bottom of the spiral dive. This is a bit of digression, but is intended to point out why the flat bottom airfoils also were shunned when more controls were finally introduced to the RC spectrum. The aircraft were still being designed with the nose of the flat bottom airfoil pointed up, thus causing the unwanted ballooning. Today, this type of airfoil is again being used with much success, because of its lifting ability, but the bottom of the wing is placed in line with the center line of the elevator section.

Semi-symmetrical airfoils were the first departure from the flat bottom type and found wide usage in trainer aircraft and in early pattern designs because this type of airfoil generated a lot of lift without the unwelcomed ballooning effect. Again, early in the game, this type of airfoil was set at a high angular setting with the horizontal stab but, in later years, came to be set at zero to the stab. Probably the most popular of this type airfoil is the NACA 2412 and 2415 series. Many great aircraft over the years have used these sections. Many of today's racing type aircraft use thinned out semi-symmetrical sections as they generate more lift than do the symmetrical sections - - - lift that is needed at crucial spots in rounding the pylons, especially at the turn at number two pylon. When racing aircraft were in their younger years, and engines were not so fantastically powerful, the number two turn ate up a lot of aircraft because of high speed stalls, caused by too tight of a turn, not enough lift in the wing, and not enough engine power.

Symmetrical airfoils were first used in model aircraft for stunting type U-Control airplanes. It took a long time for pattern designers to embrace the fully symmetrical airfoil for use on RC aircraft. For quite some time, the semi-symmetrical airfoil was the thing to use and then, suddenly, the swing began to the fully symmetrical wing section. This type of airfoil has the ability of not knowing up from down. In other words, the airfoil acts the same way right side up as upside down. Also, this type of airfoil pretty much eliminates the ballooning problem and is less affected by adverse winds than the other types of airfoils. While mentioning winds, I would like to again wonder a bit and put forth a few thoughts on the effect of wind on our aircraft. First, we must realize that we are not flying in a constant wind mass, and that the wind does have a great effect upon our aircraft for several reasons. First, we are not in the aircraft, but at a fixed point upon the ground, and we do all of our flying with reference to that fixed point. Second, we are not flying in a clean air mass, but rather one that is a great boiling mass of turbulence created by the earth and things growing, or built upon the earth, since generally we are flying near to the ground. With wind moving over the surface of the earth, much turbulence is created simply by changes of elevation or masses of trees, or roads, or a group of parked cars, or the down slope of a distant hill. Aircraft must be designed to fly in the best possible manner to adjust for the problems that surround it. As an example, an aircraft that has been designed to fly well in a part of the country that has winds of two or three miles per hour, with relative flat flying spaces, may not fly at all well where the average wind conditions are 10 to 20 mph on any given flying day. Fast flying pattern aircraft that must give the maximum to the pilot on any contest day (which is going to be windy at least 110% of the time) is a product of a symmetrical airfoil, a heavy wing loading, and a super powerful engine.

Think about the type of aircraft that you are designing. What is the purpose of the aircraft? What type of engine are you going to use, a super powerful engine, or a moderately powerful one? On the average, you will have a more enjoyable aircraft to fly if you consider these factors before you set about to design your own. As another example, consider that you want to build a low wing model for a .19 size engine. Generally, you will be happier if you use a semi-symmetrical airfoil than a symmetrical one because the semi-symmetrical wing generates more lift at a slower speed than does the symmetrical wing. Of course, I know that a number of fine small aircraft have been designed to use the symmetrical wing, and have been good flying models, but perhaps they might have been even better with another type of airfoil.

Engine sizes and power output are another factor of model design that may be overlooked if you are not careful. Just because an engine is a .61, does not

to page 160

# WOODY'S PUSHER

**A SEMI-SCALE MODEL OF THE POPULAR HOME-BUILT AIRCRAFT, THE WOODY IS DESIGNED FOR .049 TO .10 ENGINES AND THREE CHANNELS. OPTIONAL TRACTOR ENGINE CONFIGURATION IS SHOWN. AN EXCELLENT SPORT SHIP.**

**BY PAUL AND BILL DENSON**

### INTRODUCTION

After visiting several EAA fly-ins in Rockford, Illinois, with his father, a young teen-ager suggested to Dad, an aircraft design engineer, that he design and build a home-built airplane such as the Pietenpol. This was the impetus necessary to get Harris L. Woods busy. His efforts culminated in one of the better known home-builts, the Woody Pusher, sometimes known as Woody's Pusher. The plane was finished some seven months later in time to have its first showing at a fly-in in Dayton, Ohio in May of 1965. It was here that many interested people talked him into selling plans.

Young Robert Woods logged many hours in the plane and the Woody was instrumental in earning him his pilot's license a few weeks before he graduated from high school.

The Woody Pusher was flown to the EAA fly-ins at Rockford in 1965-66-67 and 1968; the last two times by Robert. These were his first long cross country solo flights. At the 1965 fly-in it received a great deal of attention and the trophy for being the most unique design.

The original Woody is now located at Holly Springs, North Carolina and has been flown many hours since it was moved there in 1971. There are many other Woody Pushers being flown all over the United States and Canada, all built from plans designed by Harris L. Woods.

I was sorry to find out, while making plans for this article, that Mr. Woods was killed in an aircraft accident on September 5, 1975. Prior to his untimely death Harris Woods designed seventeen aircraft, among which were seven Gyros, one Flex Wing, two Hovercraft and seven Fixed Wing airplanes. For readers of the EAA Journal *Sport Aviation* names like Woody Pusher, Quail, Rail, and Scamp, are all familiar. Woody's wife, and Bob's mother, Mrs. Eva Woods, wanted to thank us for our continued interest in aviation and hoped it would be there for a long time because, "Woody lived aviation and contributed so much to it and enjoyed every minute." A fitting tribute to Mr. Harris L. Woods, aircraft designer.

### THE MODEL

This is a brother act, one brother, Bill, in Indiana the other a resident of sunny Southern California. Bill, the designer, indicated this Woody was not built to exact scale, it was not even built to Stand-Off Scale, kinda like stand-way-off similarity. It was built for fun and fun it has been. The one you see here is my Woody I, I had the privilege of building my plane from his plans and my payment was to write the article, draw the plans for publication, then take the pictures. Woody I was the victim of a dead cell in the flight pack, straight in from 20 to 30 ft. Straight in, to the adobe surface of our flying field, is like concrete anywhere else. Disintegrated is the best word I can think of. Rebuilt it will be, since I cannot remember a plane I have enjoyed as much or which has provided as much fun. My Woody II is in the construction stage and should be finished long before this gets into print. Even if you do not intend building a Woody Pusher, read on or wade through the following, there are all kinds of interesting tidbits for you RC buffs, no matter whether you fly .049's or .60's.

| | |
|---|---|
| **TYPE AIRCRAFT** | Semi-Scale Sport |
| **WINGSPAN** | 46 Inches |
| **WING CHORD** | 7⅜ Inches |
| **TOTAL WING AREA** | 339 Square Inches |
| **WING LOCATION** | Parasol |
| **AIRFOIL** | Undercamber |
| **WING PLANFORM** | Constant Chord |
| **DIHEDRAL, EACH TIP** | 1¼ Inches |
| **O.A. FUSELAGE LENGTH** | 31½ Inches |
| **RADIO COMPARTMENT AREA** | (L) 10" X (W) 2¾" X (H) 2¾" |
| **STABILIZER SPAN** | 15 Inches |
| **STABILIZER CHORD (Incl. elev.)** | 4" (Avg.) |
| **STABILIZER AREA** | 58 Square Inches |
| **STAB AIRFOIL SECTION** | Flat |
| **STABILIZER LOCATION** | Top of Fuselage |
| **VERTICAL FIN HEIGHT** | 5¼ Inches |
| **VERTICAL FIN WIDTH (Incl. rudder)** | 4¼" (Avg.) |
| **REC. ENGINE SIZE** | .049 Cu. In. |
| **FUEL TANK SIZE** | Cox Engine Tank & 1 Oz. Auxillary |
| **LANDING GEAR** | Conventional |
| **REC. NO. OF CHANNELS** | 3 |
| **CONTROL FUNCTIONS** | Rudder, Elevator & Throttle |
| **BASIC MATERIALS USED IN CONSTRUCTION** | |
| Fuselage | Balsa and Ply |
| Wing | Balsa and Ply |
| Empennage | Balsa and Spruce |
| Wt. Ready-To-Fly | 30-32 Oz. |
| Wing Loading | 12.7-13.6 Oz./Sq. Ft. |

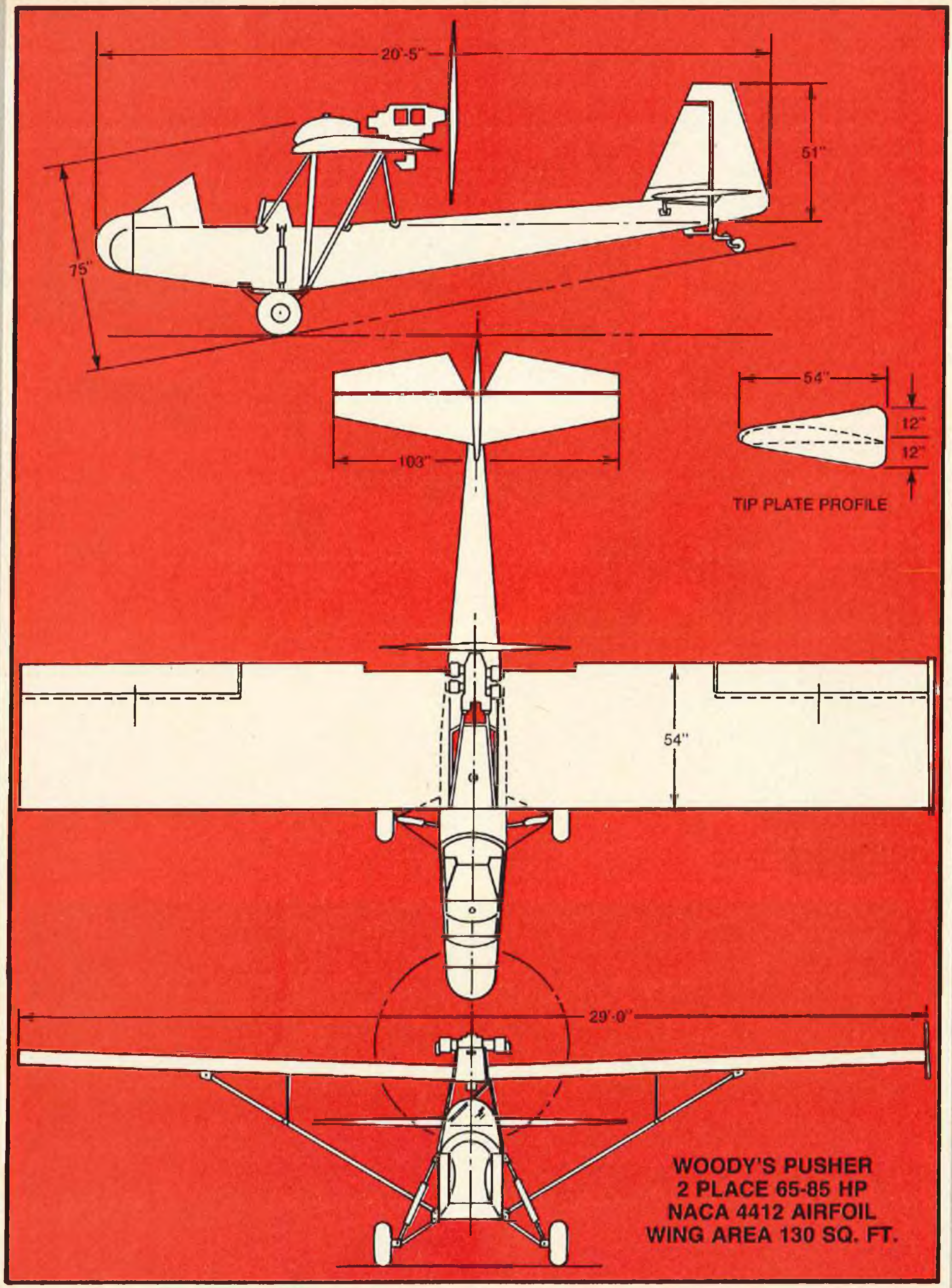
### CONSTRUCTION

**Fuselage:** Extend all bulkhead lines on the plans 1" beyond the top and bottom. Cut two sides from 3/32" medium balsa, tape them together, and sand until they are the same. Place the two sides on the plans and, using the marks you made, mark the top and bottom edges with the location of all bulkheads and doublers. Separate the two sides and lay them out on your workbench, top edge to top edge. You must make a right and left side. Glue on the doublers.

When dry, add to one side, in the proper location, bulkheads 2, 3, and 4. Using a small right triangle, make sure they are square to the side and allow to dry thoroughly. Put glue on the top edges of the formers and put the other side in place. Use masking tape to hold it together. Bring the two tail ends together and clamp with a clothespin. Sight down the fuselage and make sure it is symmetrical. Check the formers and make sure they are square with both sides. Add former No. 1 and the 1/16" ply doubler for the landing gear. Cover the bottom from former No. 1 back to former No. 3 with very hard 1/16" sheet balsa, cross-grain. Cut the cowls between formers 1 & 2 and 3 & 4 to shape from 1/16" medium balsa. Fit and trim, then glue in place. Temporarily install the servos and pushrods. When connected to your satisfaction, remove and add the top and bottom sheeting. **Note:** The top sheeting runs all the way from former #4 to the tip of the tail. This piece fits over the stab and around the fin. Keep it one piece all the way - - - it adds strength and acts as a doubler to hold the stab down and the fin square and upright.

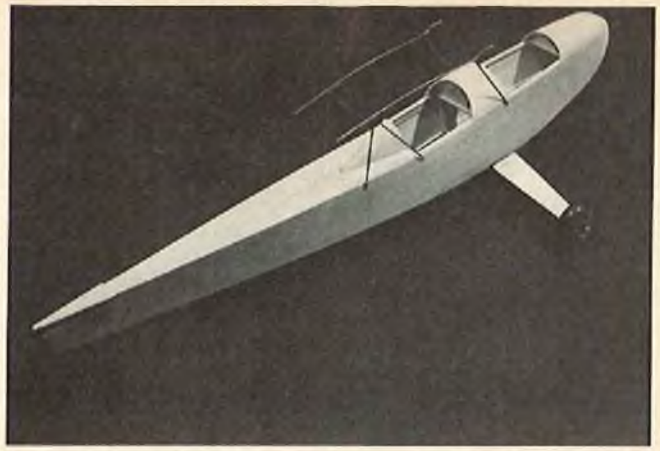
**text to page 150**

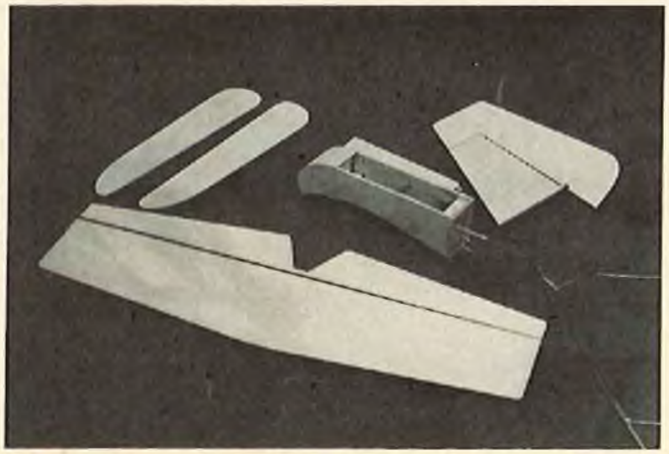

61

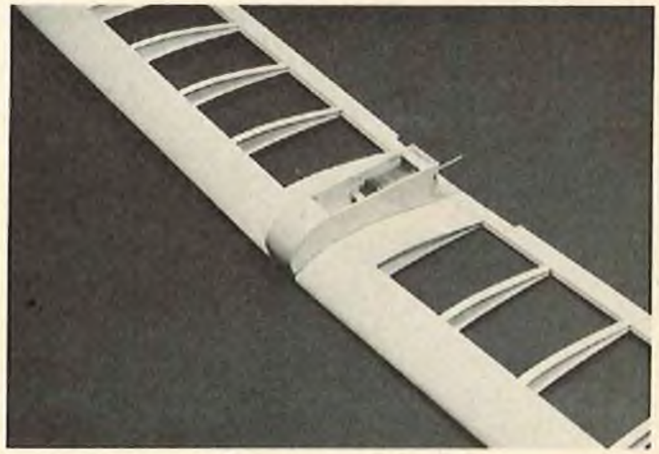


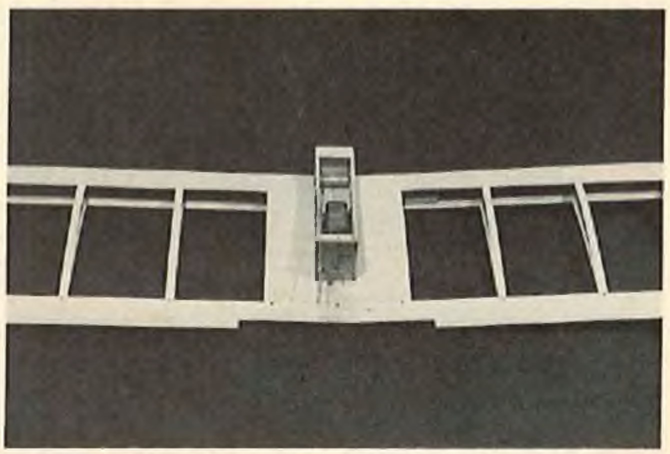
20'-5"
51"
75"
54"
12"
12"
103"
TIP PLATE PROFILE
54"
29'-0"
WOODY'S PUSHER
2 PLACE 65-85 HP
NACA 4412 AIRFOIL
WING AREA 130 SQ. FT.

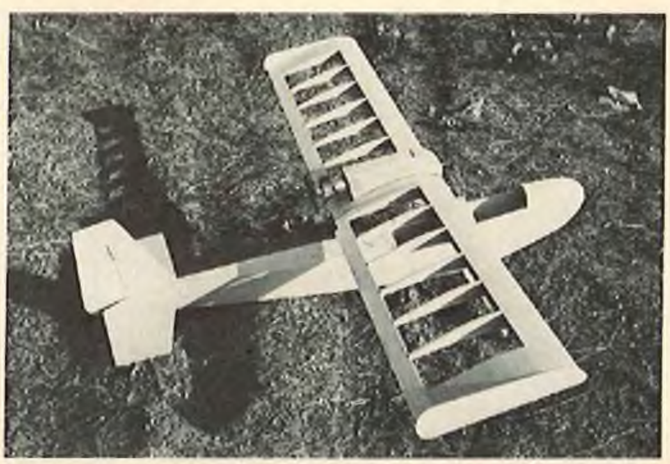
*RIGHT: The Woody's Pusher fuselage with cabane struts and landing gear in place. 2ND ROW, LEFT: Empennage components, wing tips, and engine nacelle. RIGHT: The nacelle installed on the wing center section. 3RD ROW, LEFT: Another view of the nacelle. See text for details on tank. RIGHT: The completed basic framework. 4TH ROW, LEFT: Another view of Woody's Pusher prior to covering. RIGHT: The completed .049 three channel version, ready-to-fly.*

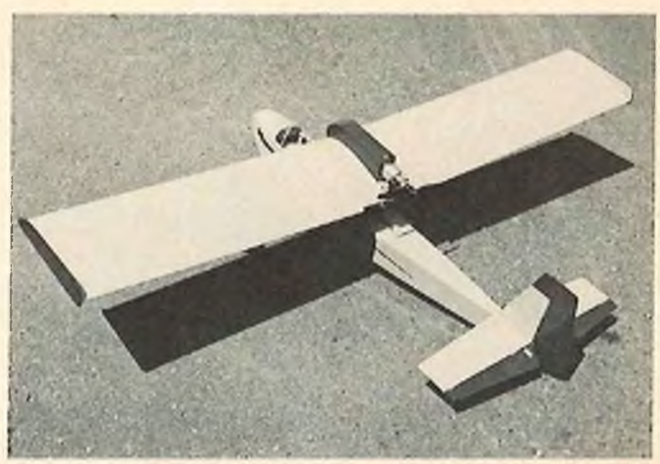


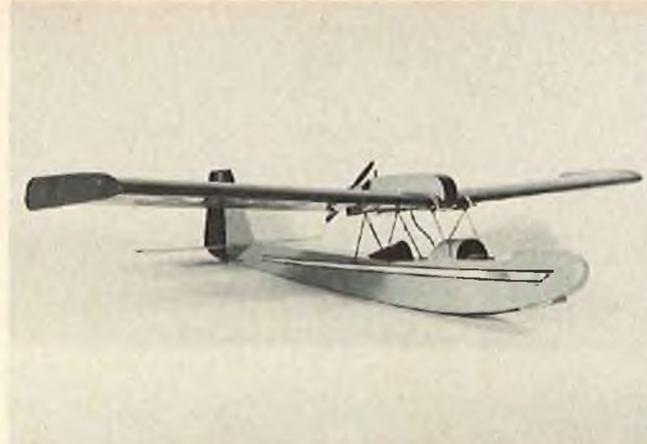


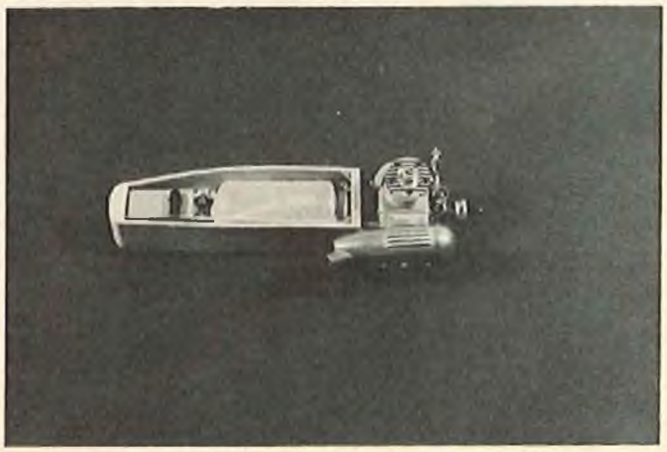


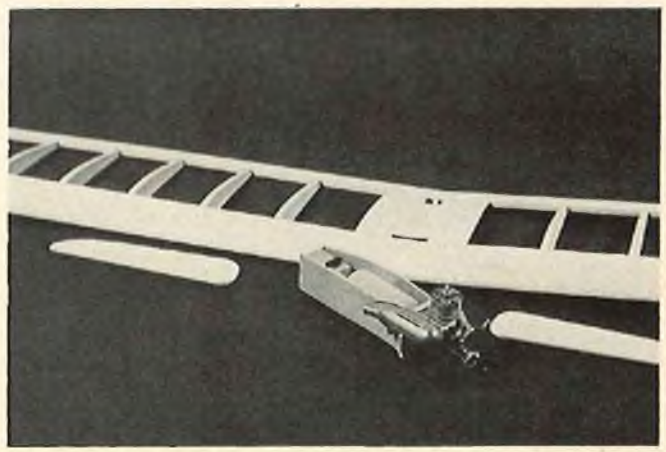


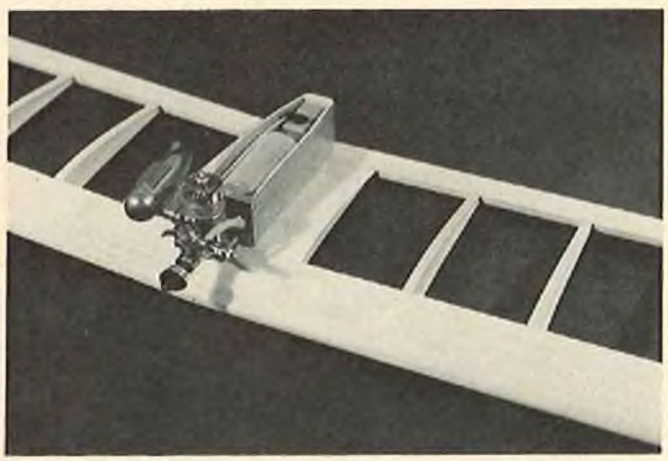






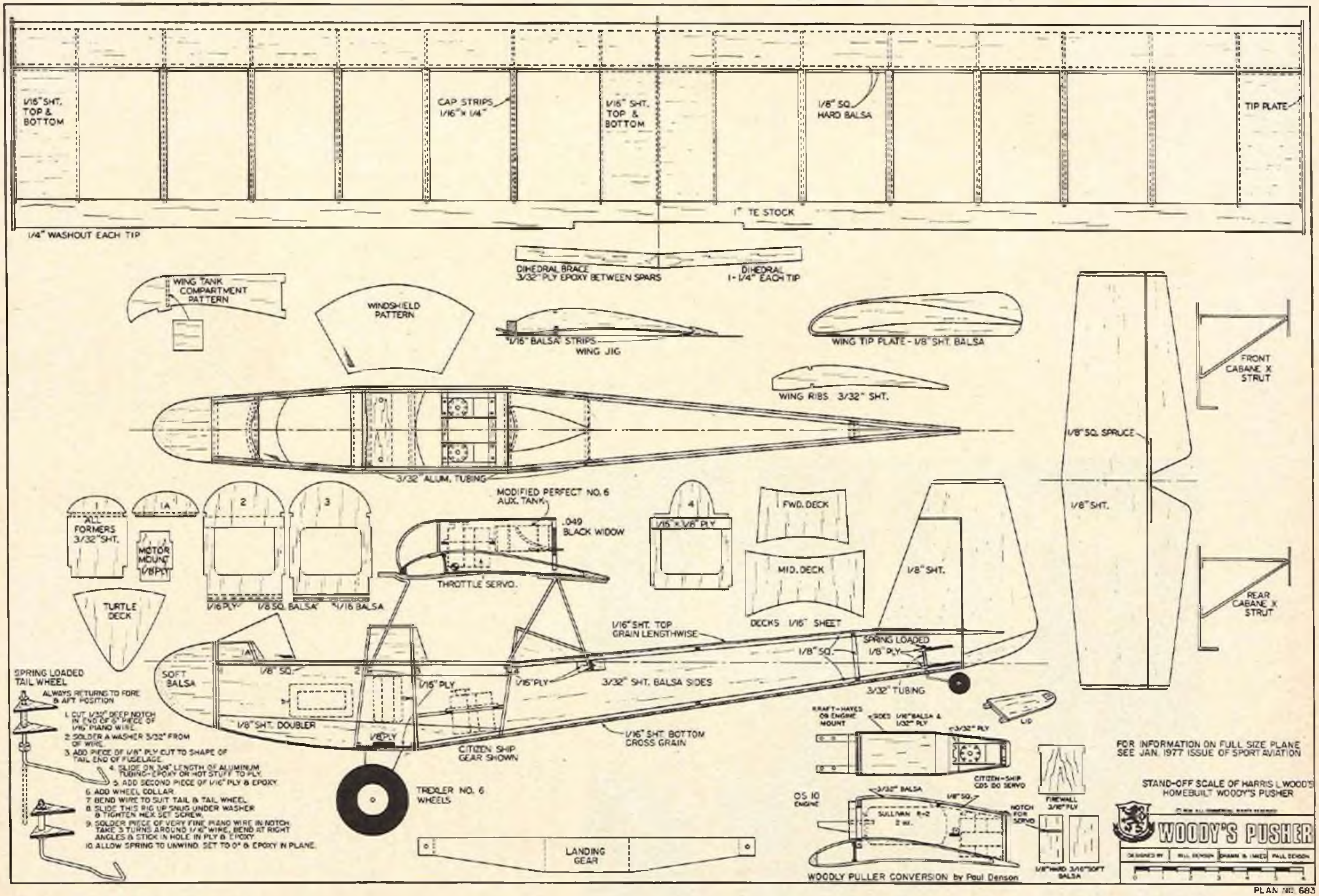






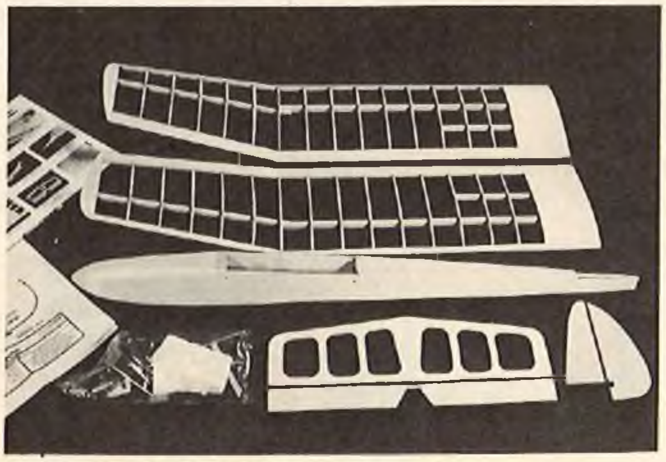
*1ST ROW, LEFT: The author's Woody's Pusher ready for a day's flying. RIGHT: Another version with a glider skid for rough field flying. 2ND ROW, LEFT: Building the nacelle for the O.S. Max .10 powered tractor version. RIGHT: The nacelle, ready to install. 3RD ROW, LEFT: The tractor nacelle mounted on the wing center section. RIGHT: A close-up view of the "Woodly Puller". LEFT: The tractor version, with .10 power is more than adequate for use as a seaplane.*

FULL SIZE PLANS AVAILABLE — SEE PAGE 190



# RCM PRODUCT TEST

## RTC MODELS WANDERER



● The Wanderer from RTC Models, is a framed-up sailplane where the consumer has only to join the wing panels and tape the center section then make up the pushrods. The model is completely built of conventional balsa, spruce and plywood construction and is ready to cover. The Wanderer is a 72" span Standard Class sailplane with a total wing area of 563 square inches, and a fuselage length of 40⅜". This well known sailplane has already made its mark in sport flying and competition circles and was designed by one of the nation's top sailplane competitors, Mark Smith. With regards to the framed up Wanderer, there were several small items we discovered that should be corrected. Since we obtained our prototype, RTC Models has been purchased by a new owner, and these problems have been brought to his attention and have been subsequently corrected. The framed-up Wanderer is a perfect way to get into sailplanes if you don't have time to build or, simply, want a back-up ship. Control horns, hinges, nylon clevises with links, and tow hook are included with the Wanderer. There is one plan sheet plus a page of construction notes and a sheet of photos. Our prototype weighed 28 ounces ready to fly, for a wing loading of 7.17 oz./sq. ft. Our test model had its fuselage covered with white Solarfilm and trimmed with DJ's Trim Tape while the wing and stabilizer were covered with transparent orange MonoKote. An EK-LRB two channel radio was used for guidance. Priced at $54.95, this is an excellent beginners sailplane as well as an all around sport glider. Hi-Start launches are smooth and require little or no correction on the tow. The Wanderer performs well in light lift conditions, turns well, and is very responsive to controls. All in all, this outstanding sailplane is a pleasure to fly for both beginner and expert. □

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

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

## SPECIFICATIONS

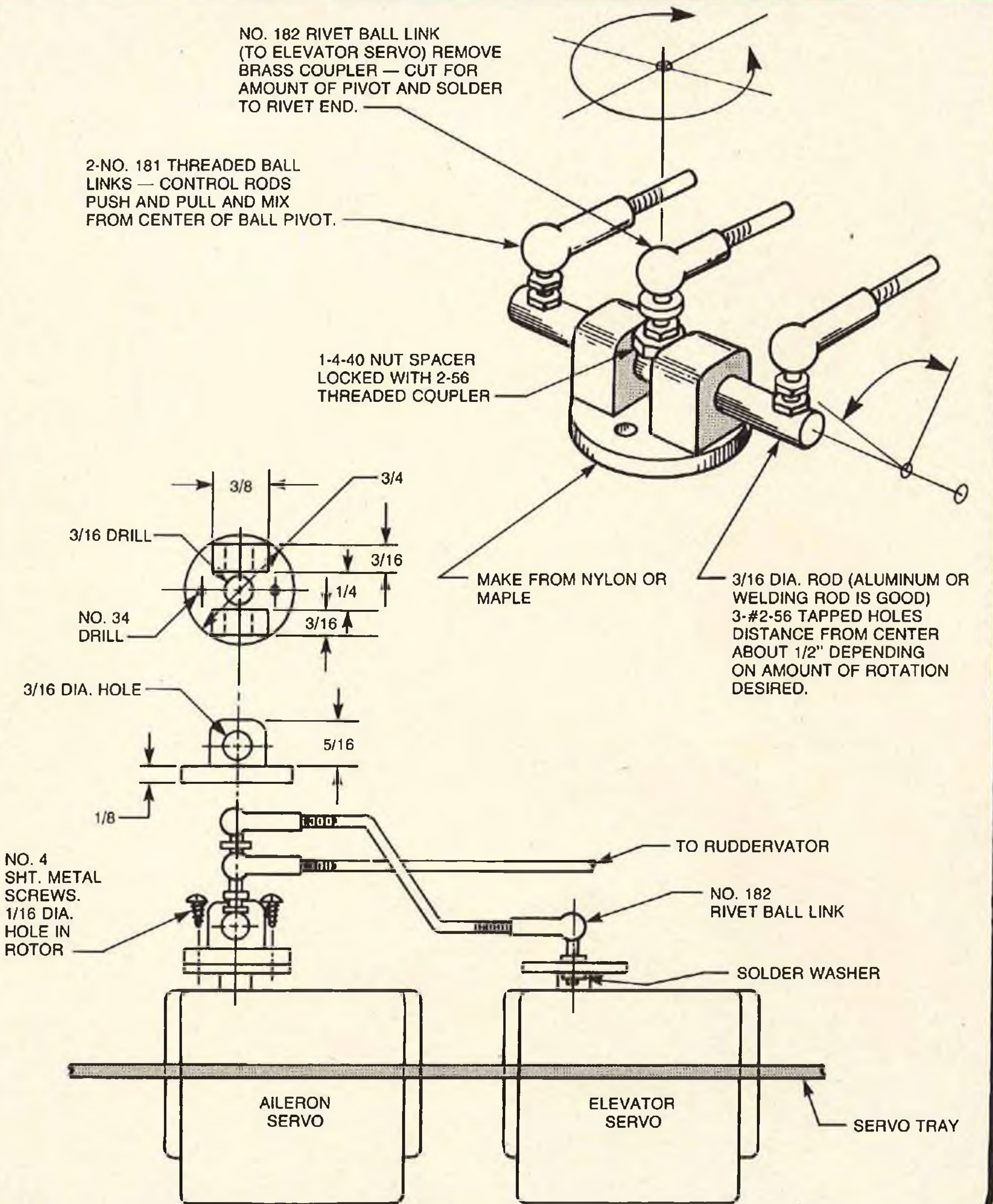
Name .......... Wanderer
Aircraft Type .......... Sailplane
Manufactured By .......... RTC Models
P.O. Box 792
Escondido, California 92025
Mfg. Suggested Retail Price .......... $54.95
Available From .......... Direct from Mfg.
Mfg. Recommended Usage .......... Sport Sailplane
Wing Span .......... 72 Inches
Wing Chord .......... 8 Inches
Total Wing Area .......... 563 Square Inches
Fuselage Length .......... 40⅜ Inches
Radio Compartment Dimensions .......... (L) 7⅜" x (W) 2" x (H) 2"
Wing Location .......... High Wing
Airfoil .......... Flat Bottom
Wing Planform .......... Constant Chord
Double Taper Tips
Polyhedral .......... 1¼" — 3¼" (2nd panel)
Stabilizer Span .......... 18 Inches
Stabilizer Chord (incl. elev.) .......... 5½" (Avg.)
Total Stab Area .......... 94 Square Inches
Stab Airfoil Section .......... Flat
Stabilizer Location .......... Top of Fuselage
Vertical Fin Height .......... 6 Inches
Vertical Fin Width (incl. rud.) .......... 4½" (Avg.)
Mfg. Rec. Engine Range .......... NA
Recommended Fuel Tank Size .......... NA
Landing Gear .......... NA
Recommended No. Of Channels .......... 2
Recommended Control Functions .......... Rudder and Elevator
Basic Materials Used In Construction:
Fuselage .......... Balsa & Ply
Wing .......... Spruce & Balsa
Tail Surfaces .......... Balsa
Hardware Included In Kit .......... horns, hinges, nylon clevises, links, tow hook
Plan Size .......... 45¾" x 36" (1 sheet)
Building Instructions on Plan Sheets .......... No
Instruction Manual .......... Construction Notes
Construction Photos .......... 1 sheet of photos
Mfg. Rec. Flying Weight .......... 25 Ounces
Wing loading based on rec. flying wt. .......... 6.5 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly .......... 28 Ounces
Wing Loading .......... 7.17 oz./sq. ft.
Covering & finishing materials used .......... MonoKote & Solarfilm
Engine Make & Disp. .......... NA
Muffler Used .......... NA
Radio Used .......... EK-LRB
Tank Size Used .......... NA

# V-TAIL OR FLAPERON MIXER USING DU-BRO BALL LINKS

**BY JOHN L. HOOVER**



# MISS KAT BRAT

## A COMPETITION PATTERN MUSTANG

BY JIM VORNHOLT


JS N

***A competition pattern aircraft does not have to look like a pregnant Guppy simply because the current trend may be going in that direction. Designed by a two time Nationals control line stunt champion, Miss Kat Brat is proof that a pattern RC aircraft can combine scale appearance with competitive performance.***

● A chance to fly in a real P-51 Mustang must be every modeler's dream. This dream became a reality for me at the 1975 E.A.A. Convention in Oshkosh, Wisconsin. That is where I met Jack Shaver of Atlantic City, New Jersey. Jack is the pilot of Miss Kat Brat, the P-51 Mustang that my model was painted after, and is a close friend of Tom Wood of Indianapolis. Tom also owns a P-51 Mustang. After a short discussion with Jack and Tom on the subject of R/C Mustangs, Jack asked me if I would like a ride in Miss Kat Brat. Well, I ask you - - - who could say no to a question like that? When we took off Tom went with us in his beautiful P-51 painted in 8th Air Force configuration. Tom Wood owns one of the largest Pontiac dealerships in Indiana and is a heck of a nice guy. Jack Shaver works for a large airline, the name of which slips my mind at this time.

Upon climbing into the cockpit, Jack strapped himself in and made a quick check. Then the huge four bladed prop began to turn. With a slight puff of smoke, the engine fired. Taxiing across the field with Tom in front of us, I could look out either side of the canopy and see Corsairs, Bearcats, Thunderbolts, and P-38 Lightnings. The steady roar of the Rolls Royce engine, and seeing the other war birds sitting in a row as though they could leap into action at a moments notice, was like a time machine sending me back thirty years. With a little imagination you could see pilots sitting around the Officer's Club discussing the days action over the faint sound of Glenn Miller on Armed Forces Radio, playing in the background. Jack and Tom are both top notch pilots and there is nothing that can compare to the feeling of flying upside down, and going through a series of rolls in a Mustang. We were in the air for about one hour, with Jack and Tom chasing each other through the skies as if they were in an actual dog fight. The most beautiful sight was flying what was called "Tail End Charlie" during W.W. II. That is when we were at 6 o'clock — to the rear — and about 50 ft., just below Tom. Looking up through the canopy, seeing the bottom of Tom's plane was a sight beyond description, and one few people will ever see. My thanks to Jack Shaver and Tom Wood for making August 3, 1975 just about the most important day of my life, for, from the first turns of that big prop, I knew I had been born 20 years too late.

●

I have been a modeler for 20 years and have loved the Mustang ever since I was a small boy. The first 17 years of my modeling career were spent flying control line stunt (Pattern for the R/C boys) and I was lucky enough to win the Nationals twice, in 1960 and 1961, and placed fourth in 1962. I dropped out of modeling in 1963 to pursue a full time career of chasing girls. But, as the old saying goes, "Old modelers never die, they just get married and return to building model airplanes." So, about three years ago I took up the magic box and found that ten years can take its toll on your nerves and reflexes.

**P-51D "PATTERN MUSTANG"**
**Designed By: Jim Vornholt**

**TYPE AIRCRAFT**
Pattern/Stand-Off Scale
**WINGSPAN**
60 Inches
**WING CHORD**
Root 15⅛" — Tip 7¾"
**TOTAL WING AREA**
660 Square Inches
**WING LOCATION**
Low Wing
**AIRFOIL**
Symmetrical
**WING PLANFORM**
Double Taper
**DIHEDRAL, EACH TIP**
2-9/16" (5°)
**O.A. FUSELAGE LENGTH**
51-15/16"
**RADIO COMPARTMENT AREA**
(L) 13" X (W) 4¼" X (H) 2"
**STABILIZER SPAN**
21¼ Inches
**STABILIZER CHORD (incl. elev.)**
5½" (Avg.)
**STABILIZER AREA**
115½ Square Inches
**STAB AIRFOIL SECTION**
Flat
**STABILIZER LOCATION**
Top of Fuselage
**VERTICAL FIN HEIGHT**
7⅜ Inches
**VERTICAL FIN WIDTH (incl. rudder)**
6⅜" (Avg.)
**REC. ENGINE SIZE**
.60 or Larger
**FUEL TANK SIZE**
12 Ounce
**LANDING GEAR**
Conventional
**REC. NO. OF CHANNELS**
4-6
**CONTROL FUNCTIONS**
Rudder, Elevator, Ailerons, Throttle (Flaps & Retracts)
**BASIC MATERIALS USED IN CONSTRUCTION**

| | |
|---|---|
| Fuselage | Balsa, Ply & Hardwood |
| Wing | Balsa & Ply |
| Empennage | Balsa |
| **Weight Ready-To-Fly** | 104 Oz. (120 max.) |
| **Wing Loading** | 22.7 Oz./Sq. Ft. (26.2 max.) |

Now, for a few words about the model. It is 98% scale and uses a symmetrical airfoil with the exception of ribs 1-5 which had to be cut thinner on the bottom to allow the wing to fit under the scoop. The alignment was changed to a zero—zero set up, removing the incidence and washout from the wing. Two ships were built at the same time, the second by Jerry Caldwell, President of the Indianapolis R/C Modelers Club (the oldest R/C club in Indianapolis, I might add). My main goal in this design was not for a Stand-Off Scale model, but a light weight, high-performance Pattern ship with scale appearance. I sometimes wonder why most modelers have a "Monkey see, Monkey do" attitude towards modeling. If a hot dog has a Pattern ship that looks like a pregnant Guppy, then other modelers believe they have to fly a pregnant Guppy if they want to win contests. I have believed for years that a semi-scale can compete equally in the Pattern Event if the ship is designed correctly. This was what I set out to prove, and I believe I have accomplished my goal.

There are three factors to keep in mind at all times with this type of model.

(1) Weight is very critical and should be kept under 7 lbs. This sounds impossible for this size model, but it can be done by using fuselage planking instead of blocks, white glue instead of epoxy, and Zap or Hot Stuff instead of glue. But most important, use only Sig 4-6 lb. balsa.

(2) Alignment: The best way is to center line every piece you make and build on a flat table. One bad habit the ship has is a tendency to roll to the left on take-off. This is true of any tail dragger, but more so with the Mustang. This tendency to roll left is due to the torque of the engine and P-factor from the prop. I have been experimenting with 4-bladed props which I think would help to eliminate the P-factor. It will work, but the engine has to run slower so it will not overheat. Also, you should use only a castor oil base fuel of at least 28% castor oil since this also cuts engine heat. Getting back to the left hand roll on take-off, this should be corrected by using the rudder. We all have a normal reaction of using right aileron when the left wing tip starts to drop, but this only adds to the roll instead of counteracting it.

Why, you ask? Well, with the wing at approximately a 10 degree attitude at lift off, the ship is just about at stall speed and drag is very critical at this point. This is especially true when flying off of grass runways as our club does. Now the wing starts to drop to the left and you add more and more right aileron. This puts the left aileron down farther into the air stream which only adds to the drag on the left wing. But, then, why doesn't the right aileron equalize the drag? If you look at your model from the rear and tilt it to about a 10 degree attitude, you will see that the right aileron is not flying. By this I mean it is almost 90% out of the airstream and is not helping you at this particular time. The only time ailerons work equally is when the ship is at a horizontal attitude with Mother Earth. So build it straight, keep it light, and stay off those ailerons during take-off.

(3) Power: This was a determining factor in the crash of one of the Mustangs. Jerry's Mustang was lost due to an engine which had to be sent back to the factory twice before it would run through a complete tank of fuel. Jerry was a great help in working out a lot of the construction bugs such as flap hook-up and setting up the Rom-Air retracts.

Trimming and Flying: Since I'm far from the world's greatest pilot, I though it would be wise to let someone else make the first flight with my Mustang. This unrewarding task fell upon my old friend, Herman Cholewinski. Herman is Vice President of our club and one of the most competitive pattern flyers in the Indianapolis area (also, his wife, Angie, is the beautiful young lady holding Miss Kat Brat). The only trim necessary was the addition of 3 ounces of lead to the nose. The ship seemed to track straight through loops and rolls. This is why I stress the alignment factor.

**CONSTRUCTION**

Start by choosing only the lightest wood available. I used Sig 4-6 lb. contest grade balsa and used glue sparingly. I recommend Wilhold Aliphatic Resin instead of epoxy whenever possible. For the fuselage, begin by cutting two 1/4" x 4" x 48" sheets for the fuselage sides. The motor mounts are made from hardwood spars which can be purchased at any cabinet shop, or glue one 3/8" x 1/2" and one 3/8" x 3/4" hardwood spars together, making the correct size mount. Zero-zero alignment is very important. Use the top of the fuselage side for a reference point from which all center lines are drawn. Motor mounts are laid 11/16" below the top of the fuselage sides and the plywood formers can be put in place at this time. Locate the position of the wing on the fuselage. The center line of the trailing edge and leading edge are the same distance from the top of the fuselage side. Draw the shape of the wing airfoil and cut out this section. A quick check for alignment can be made by placing the fuselage upside down on a flat table. If you are correct, all center lines will be an equal distance from the table. Now cut the rest of your fuselage formers from 1/8" balsa, cutting out the centers to allow for the pushrods. At this point I should say that the fuselage sides can be made from either 1/8" or 1/4" balsa. I used 1/4" but 1/8" could be wrapped around the formers easier. If you use 1/4" fuselage sides, be sure to wet them

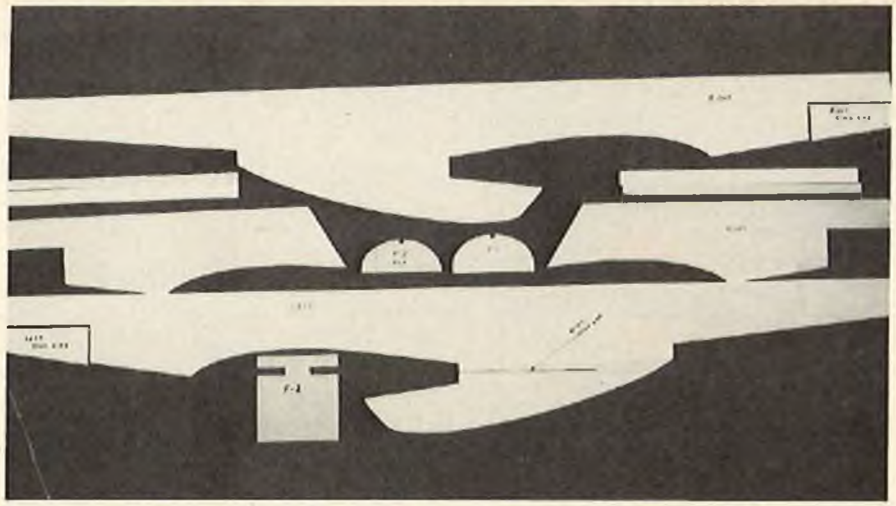
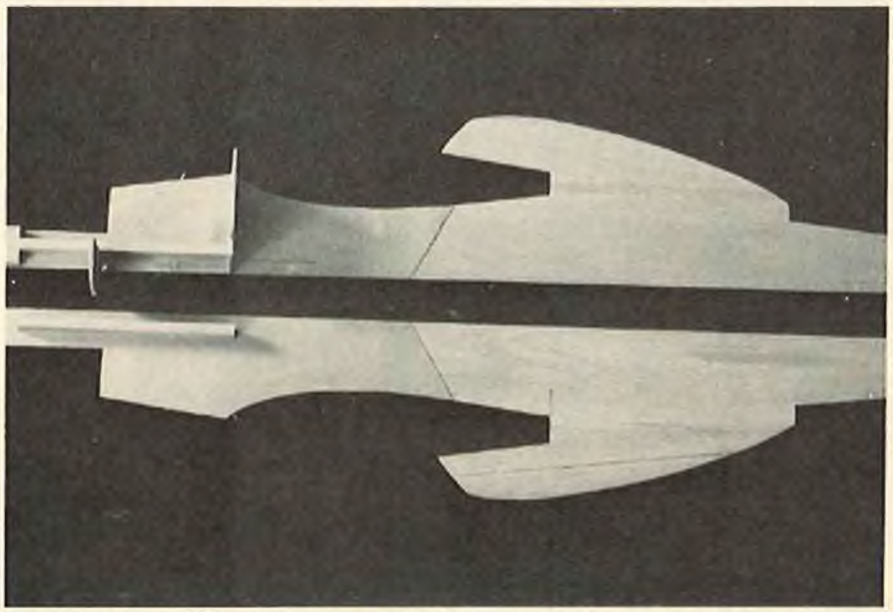
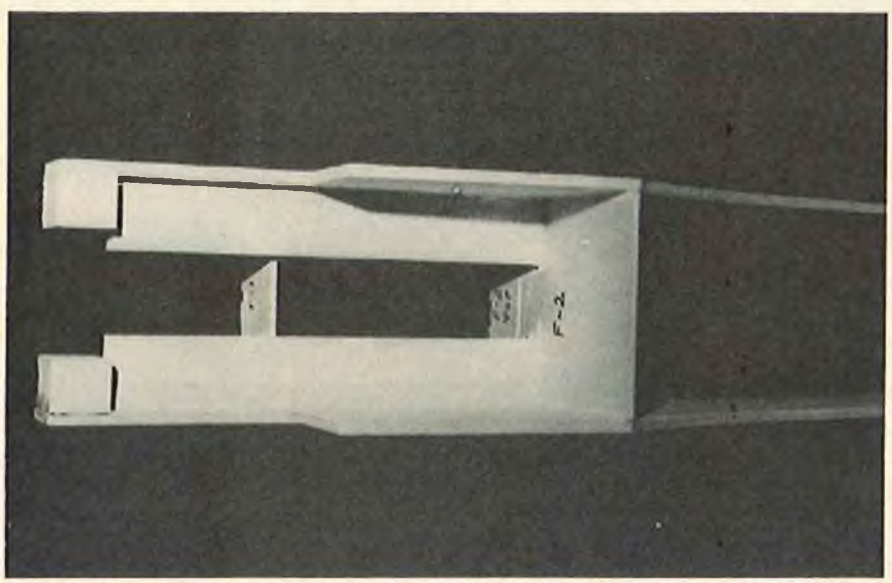


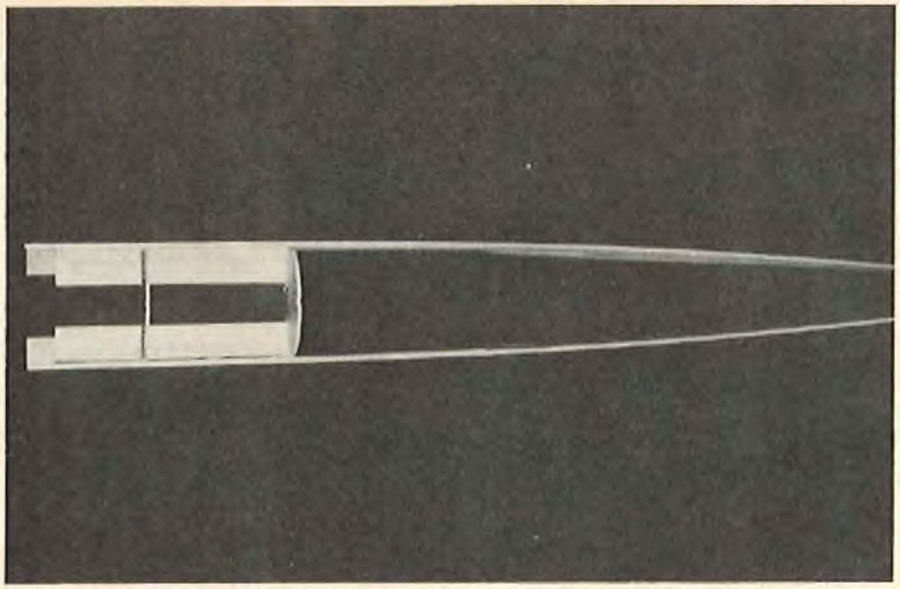
*Photo of parts necessary to frame up fuselage. Doublers are 1/16" plywood. Motor mounts made from 3/8" x 3/4" and 3/8" x 1/2" glued together. Scoop is attached to fuselage sides which is cut from 4" or 6" wide stock.*



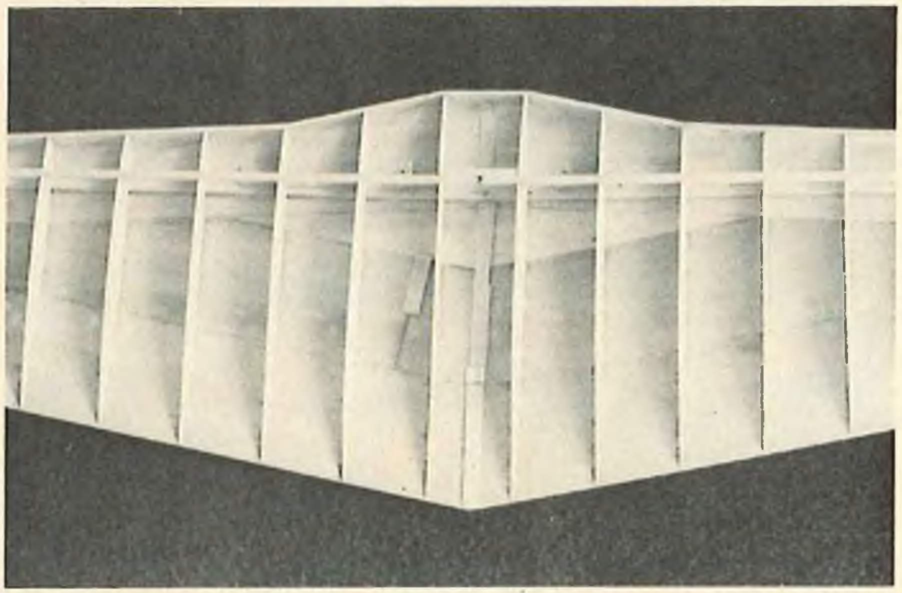
*Fuselage sides with mounts, F-1, F-2, 1/16" ply doublers, and balsa nose block in place.*



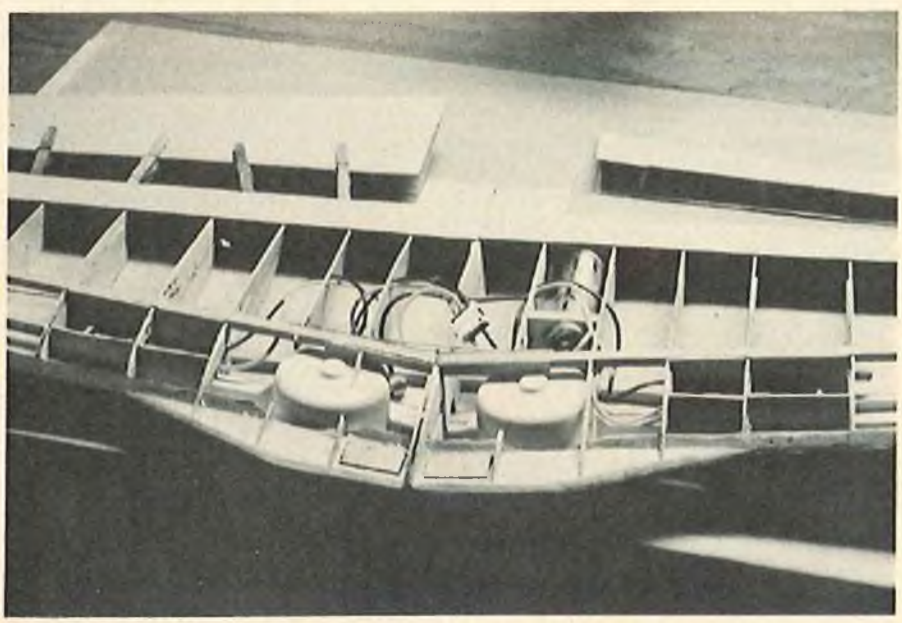

*In this view of Miss Kat Brat, the second fuselage side has been added.*



***Another view of basic fuselage assembly.***



***A view of wing before gear and bellcranks installed.***



***Rom-Air retract installation. Flaps cut off, ready for capping and hinging.***

when you are ready to install your rear formers numbers F-3 through F-11. Now, at this point, put the fuselage aside and start on the wing.

I recommend, and use, an RCM Wing Jig for wing construction. Cut each rib individually to assure the proper airfoil from the root to the tip chord. With all ribs in place on the jig, add the leading edge and the 1/4" x 1/4" spars. Plank the top of the wing and remove from the jig. There is no trailing edge spar since the top and bottom planking come together

**Fuselage & Wing Wood**

1 — 3½" Midwest P-51 spinner.
1 — 1/32" x 12" x 24" ply — double sides.
2 — 3/8" x 1/2" x 12" hardwood motor mounts.
2 — 3/8" x 3/4" x 12" hardwood motor mounts.
1 — 3/8" x 3/4" x 12" hardwood wing holdown — front & back.
1 — 3/8" x 1/2" x 12" hardwood — servo mounts.
1 — 1/8" x 12" x 24" plywood — formers F-1, F-2, nose ring, bellcrank floors, wing hold-down plates, front & back.
1 — 1/16" x 6" x 12" ply — L.G. doors, wing rib doubles.
1 — 1/4" x 6" x 12" ply — landing gear floors.
2 — 1/4" x 6" x 48" sheet balsa — fuse. sides.
1 — 4" x 48" x 1/8" sheet balsa — formers F-3 thru F-11.
2 — 1/2" x 36" triangle leading edge stock.
6 — 1/8" x 4" x 48" sheet — wing ribs.
1 — 1/2" x 3" x 48" sheet — stab & rudder.
2 — 1/8" x 4" x 36" sheet — stab & rudder planking.
13 — 1/16" x 1/2" x 36" fuse. cap strips.
2 — 1/8" x 1/4" x 36" fuse. cap strips — bottom rear.
12 — 1/16" x 4" x 36" sheet — wing planking.
1 — 1/8" x 3" x 36" caps. for flaps & ailerons.
4 — 1/4" x 1/4" x 36" wing spars.
1 — 3/16" x 3/16" x 36" fuse. stringer.
2 — 1½" x 1½" x 7" balsa block wing tips
1 — 1½" x 4"W x 4"L soft balsa nose blocks.
1 — 1½" x 4"W x 4"L soft balsa — cowl blocks.
1 — 1/4" x 36" dowel rod — pushrods.

**HARDWARE**

2 — nylon wing bolts.
5 — nylon horn — rudder, ailerons, flaps.
1 — large Top Flite elevator control horn.
1 — Top Flite P-51 canopy.
1 — pair 3½" Robart wheels.
1 — 12 ounce fuel tank.
23 — large nylon Du-Bro hinges.
1 — 5/32" x 36" music wire or Rom-Air landing gear.
1 — Du-Bro tail wheel steering arm.
1 — small tail wheel collar.
1 — 1½" tail wheel.
2 — 5/32" wheel collars.
4 — 6-32 blind mounting nuts.
4 — 6-32 engine bolts.
4 — nylon bellcranks.
4 — solder links — wing bellcrank.
12 — Kwik-Links.
1 — small bottle Wilhold Aliphatic Resin.
2 — bottles Zap or Hot Stuff.

to form the trailing edge. Place the 1/16" plywood bellcrank mounts in position for the flaps and ailerons. Place the 1/16" plywood half doublers on the ribs for extra strength to support the landing gear floor. Install the Rom-Air landing gear if you intend to use them. This is quite a job and will take a couple of nights work to get the wheels to fit into the wing and still be straight when they are down. There is no miracle answer to this problem other than time and patience. Now install the Rom-Air tank and hoses.

Next, measure on the plans the size of the ailerons and flaps. I might add that there was a third Mustang built which used strip ailerons which are very effective and a little easier to install. If you use strip ailerons, just cut off 1¼" from the trailing edge, cap the cut-off section, and add your ailerons. With strip ailerons, torque rods were used which eliminated the bellcranks in the wing. If you want the scale ailerons, this is the time to draw them on to the top planking. Now cut out and cap the wing ends and ailerons. Hook up the bellcranks and add the rod to the servo. Now, with the ailerons hinged, plank the bottom of the wing. Don't forget to install the wing hold-down blocks.

Now, we go back to the fuselage. Bolt the wing on the fuselage, making sure the wing centerline is exactly square with the center line of the fuselage. With the wing bolted in place, add the stabilizer. Before gluing, measure from the hinge line of the stabilizer to the outside corner of the wing tip on each side. If each side is of equal length, then the stab is in alignment and can be glued at this time. Install the elevator pushrod and capstrip the fuselage with 1/8" x 1/2"strips.I used Hot Stuff for this job and it seemed to go very quickly. Just remember to start at the center of the fuselage former and work down on both sides. If you work from one side over the top to the other side you can very easily warp the fuselage. Jerry Caldwell can testify to this because he did it, and had to build a completely new fuselage!

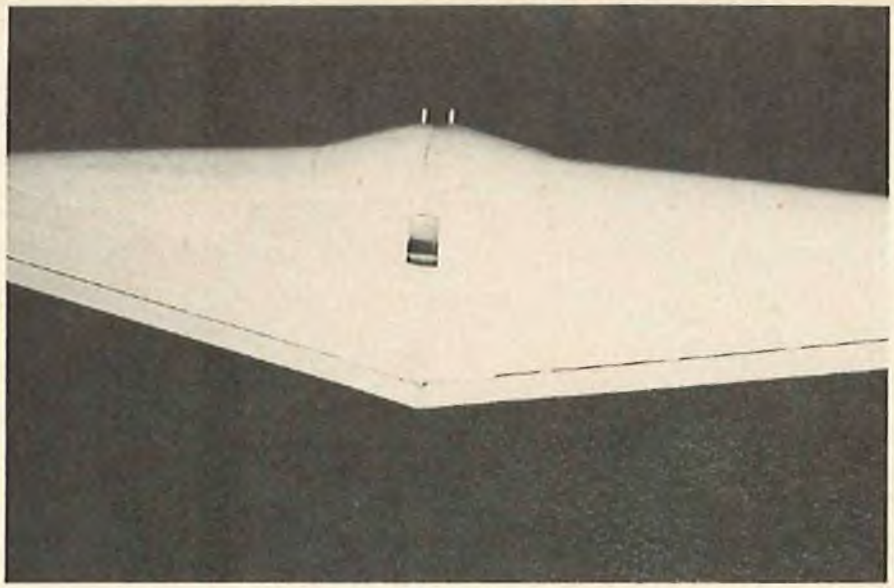
At this point, add the nose block and 1/8" plywood nose ring and, finally, shape the fuselage. The scoop is made from either 1/8" or 1/4", depending on what you used for the fuselage sides. It's a one piece scoop and is attached to the fuselage. The wing slides under the scoop and the 1/4" dowel pins hold the rear of the wing in place.

I forgot to mention that if you use flaps, hinge them at the top and cut the angle as shown on the plans. I used the bellcrank system, but torque rods could be substituted. Now, add the fin and rudder, making sure they are straight. Mount the engine and build the cowl from 1/8" or 1/4" balsa side pieces and a soft balsa block. Sand to shape and cut all holes for the air intake, exhaust, and needle valves. By now you should have something that resembles a Mustang, if not, refer to the plans and start over!

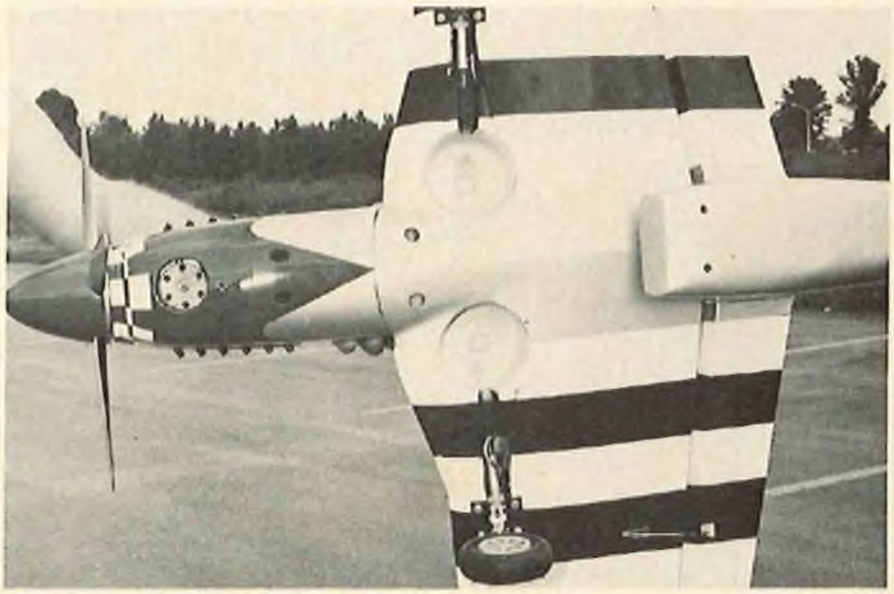
Finally, sand the entire model and fill all cracks with some type of putty. I used Dap, which you can get at any hardware store. At this point, my Mustang model weighed 55 ounces including the Super Coverite, Rom-Air tank and gear. Now you see why I recommend Sig 4-6 pound contest balsa!

**Finish:** First install your cockpit detail and then glue the canopy in place.

text to page 146

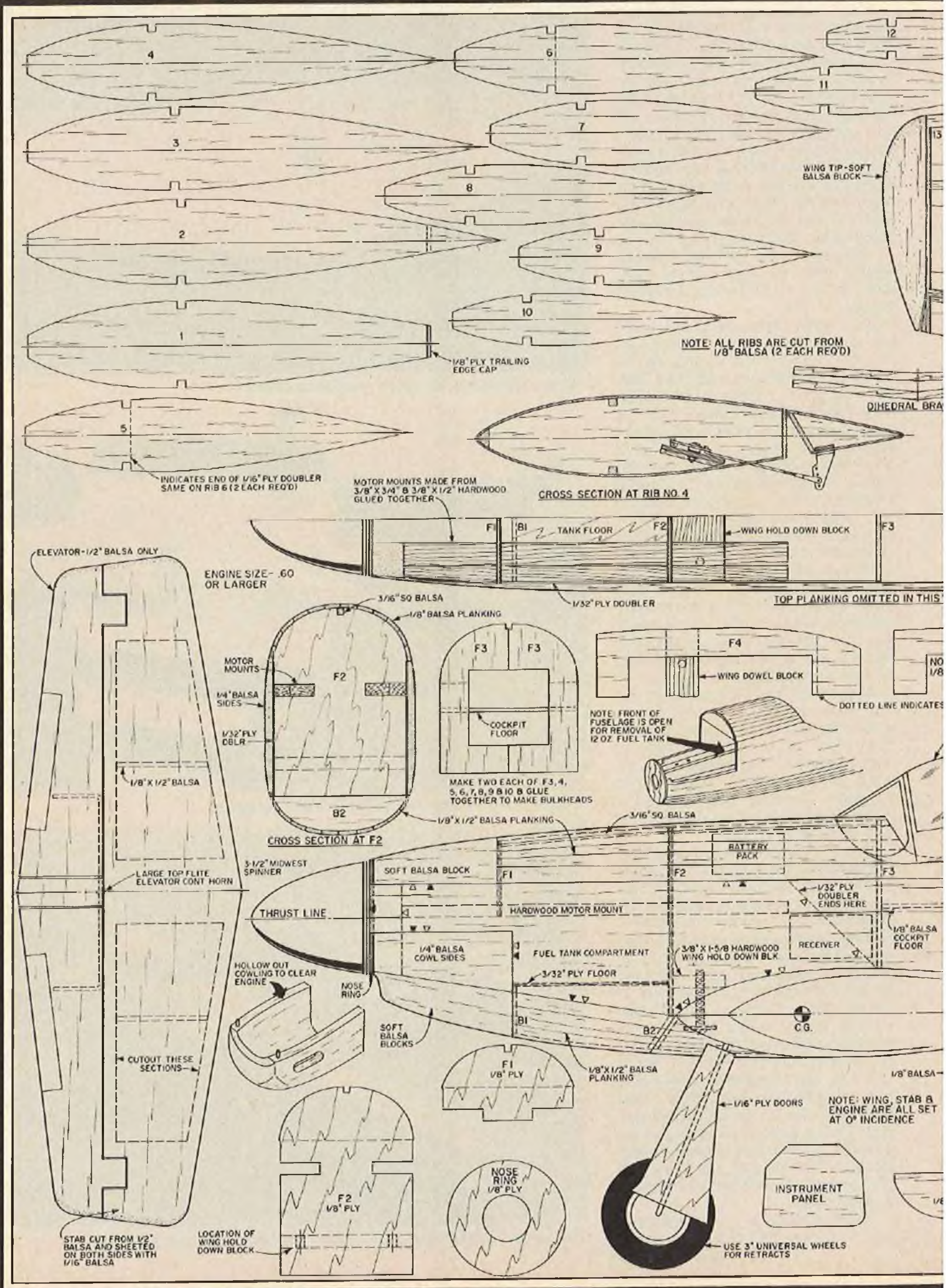


*Wing of Mustang #3 which used strip ailerons.*



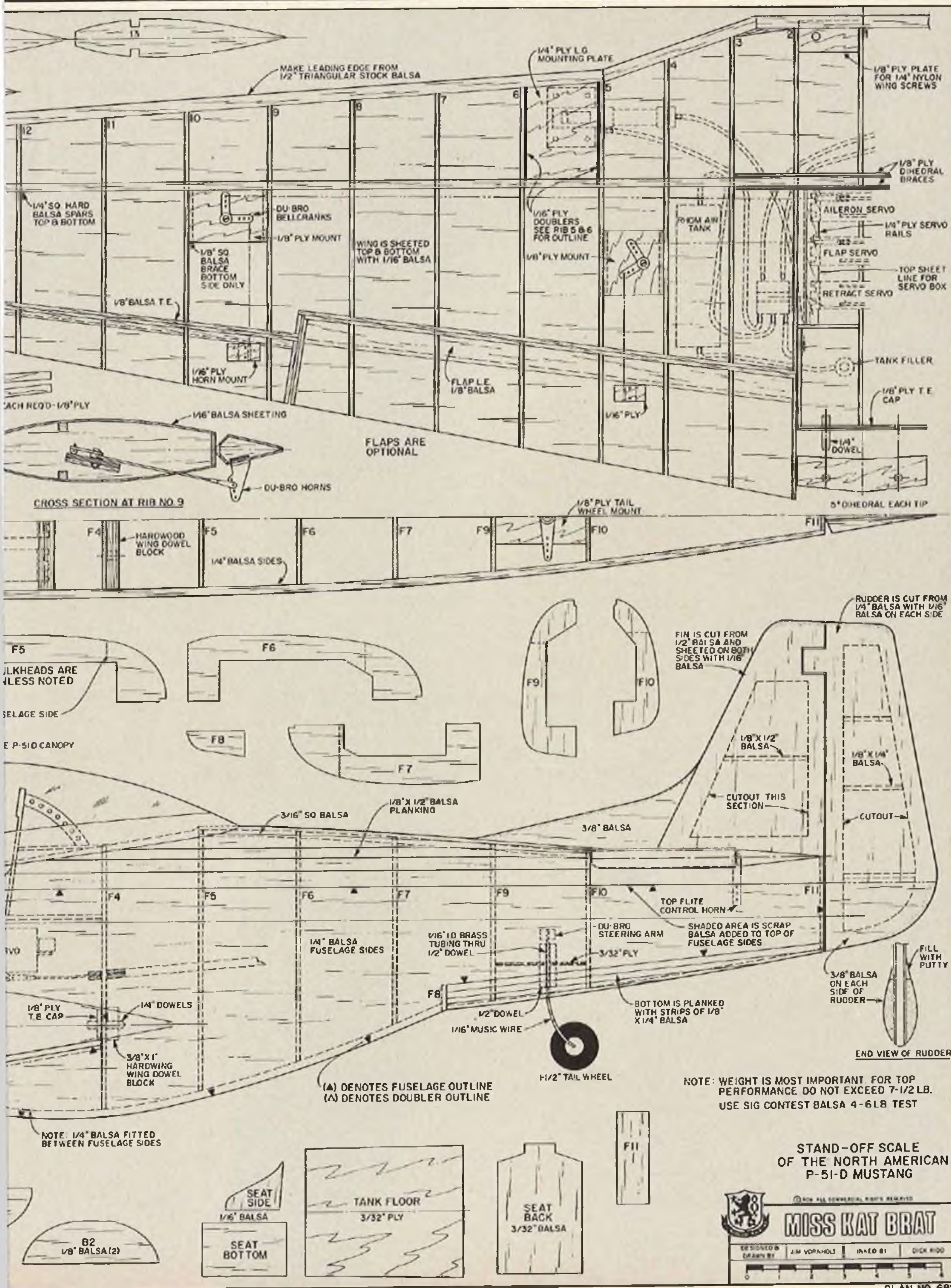
*Bottom view of Mustang with Rom-Airs extended.*


*This is one pattern ship that doesn't look like a pregnant Guppy!*



NOTE: ALL RIBS ARE CUT FROM 1/8" BALSA (2 EACH REQ'D)
WING TIP-SOFT BALSA BLOCK
1/8" PLY TRAILING EDGE CAP
INDICATES END OF 1/16" PLY DOUBLER SAME ON RIB 6 (2 EACH REQ'D)
DIHEDRAL BRA
CROSS SECTION AT RIB NO. 4
MOTOR MOUNTS MADE FROM 3/8" X 3/4" & 3/8" X 1/2" HARDWOOD GLUED TOGETHER
TANK FLOOR
WING HOLD DOWN BLOCK
1/32" PLY DOUBLER
TOP PLANKING OMITTED IN THIS
ELEVATOR-1/2" BALSA ONLY
ENGINE SIZE- .60 OR LARGER
3/16" SQ BALSA
1/8" BALSA PLANKING
MOTOR MOUNTS
1/4" BALSA SIDES
1/32" PLY DBLR
CROSS SECTION AT F2
COCKPIT FLOOR
MAKE TWO EACH OF F3, 4, 5, 6, 7, 8, 9 & 10 & GLUE TOGETHER TO MAKE BULKHEADS
WING DOWEL BLOCK
DOTTED LINE INDICATES
NOTE: FRONT OF FUSELAGE IS OPEN FOR REMOVAL OF 12 OZ. FUEL TANK
1/8" X 1/2" BALSA
1/8" X 1/2" BALSA PLANKING
3/16" SQ BALSA
3-1/2" MIDWEST SPINNER
LARGE TOP FLITE ELEVATOR CONT HORN
SOFT BALSA BLOCK
BATTERY PACK
THRUST LINE
HARDWOOD MOTOR MOUNT
1/32" PLY DOUBLER ENDS HERE
1/4" BALSA COWL SIDES
FUEL TANK COMPARTMENT
3/8" X 1-5/8 HARDWOOD WING HOLD DOWN BLK
RECEIVER
1/8" BALSA COCKPIT FLOOR
3/32" PLY FLOOR
HOLLOW OUT COWLING TO CLEAR ENGINE
NOSE RING
SOFT BALSA BLOCKS
C.G.
CUTOUT THESE SECTIONS
F1 1/8" PLY
1/8" X 1/2" BALSA PLANKING
1/8" BALSA
1/16" PLY DOORS
NOTE: WING, STAB & ENGINE ARE ALL SET AT 0° INCIDENCE
F2 1/8" PLY
NOSE RING 1/8" PLY
INSTRUMENT PANEL
STAB CUT FROM 1/2" BALSA AND SHEETED ON BOTH SIDES WITH 1/16" BALSA
LOCATION OF WING HOLD DOWN BLOCK
USE 3" UNIVERSAL WHEELS FOR RETRACTS

FULL SIZE PLANS AND TEMPLATES AVAILABLE — SEE PAGE 190



# NUTCRACKER

## RC VERSION OF GRUMMAN VSTOL USED FOR DEVELOPING VERTICAL FLIGHT TECHNOLOGY FOR FULL SCALE MOHAWK OV-1

**BY NICHOLAS ZIROLI**

● Models have been used for many years, to some extent, in the aviation industry for research and development. Most of these have been highly engineered, quite complex and therefore expensive. There is a definite place for these specialized models such as spin studies and free-flight wind tunnel testing. A great deal of valuable information is learned from this type model.

In recent years, our hobby type model airplanes have been put to use in development, as well as a tool in themselves. The high reliability radio equipment and powerful engines available has helped make this possible. As a tool, models have been used for atmosphere sample gathering, running lines across valleys and rivers, crime control and on the other side, smuggling.

Scale models have been used to develop larger Mini-RPV (Remote Piloted Vehicle) aircraft that are used by the military for surveillance and target spotting. NASA has used scale models similar to ours to do spin tests on private aircraft. Wing tip Vartex patterns have been studied with RC models equipped with smoke generators at the tips.

The list of tasks performed by RC models of one sort or another would be quite extensive if researched to any degree.

I feel one very valuable function an RC model can perform is to prove the feasability of a new concept. This approach was taken with the "Nutcracker" described here and has proved to be a wonderful aid to the entire program.

The Nutcracker concept was conceived by aeronautical engineer and fellow modeler Robert Kress at Grumman Aerospace Corporation, Bethpage, N.Y.

It was felt that the simplicity of the Nutcracker would easily lend itself to be made into a successful radio control hover model. I doubt that there is any other VTOL aircraft, other than a helicopter, that could be built and flown on hobby type radio control equipment.

The Nutcracker uses a new way of obtaining VTOL performance. It does not require any air ducting or auxiliary left fans. Conventional stabilizers and rudders used for forward flight also serve as hover control vanes. The control surfaces are in the exhaust slip stream so that even when the aircraft is not moving, they provide effective control.

To accomplish this, the engines are mounted on the sides of the aft fuselage with the control surfaces behind them. The fuselage is hinged so the aft section and engines can be pointed down. Then the aircraft literally flies on its engines. At all times, the pilot and wing are in the horizontal position.

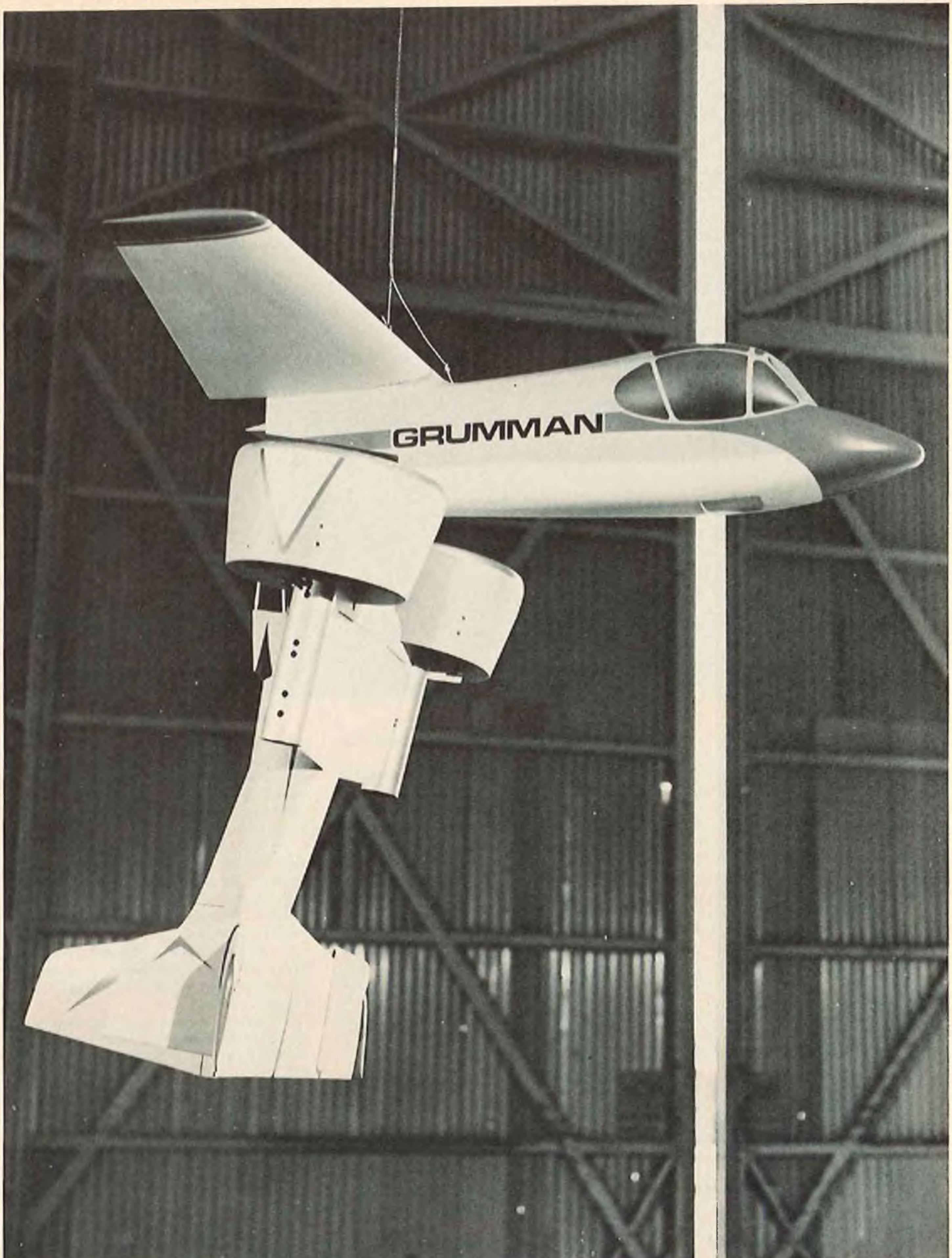
To transition from hover to forward flight, the aircraft is lifted off vertically. As it climbs, it starts to move forward at the same time the fuselage is straightened out until it is flying on the wing with the fuselage straight.

In landing vertically, the sequence is reversed. The Nutcracker can take-off and land on a conventional tricycle landing gear, as well.

Grumman approached me here at Major Model & Mfg. to see if we would be interested in building these new models. How could we turn down a challenge like this? We had built some spin test models for them, as well as a number of RPV's for other companies, so we felt we could supply them with what they required.

To date, three radio controlled models have been built. The first was a conventional flying model and the other two were hover models.

The primary reason for the first conventional model was to serve as an engine test bed and gather photos and


GRUMMAN

movies to use in technical presentations. This model had a wing span of 84" and 1440 square inches of wing area. The fuselage is 86" long. It weighs 33 pounds and is powered by two rear rotor O.S. Max .60's. Many flights have been made with this model. Loops, rolls, Immelmans and even inverted flight have been performed.

Shrouded props have been used on all the Nutcracker models to increase static thrust and simulate a high bypass fan jet that would be used on the real plane. A number of different size shrouds have been made and tested. A 10" inside diameter has been proven to be the best size. Thrust in excess of 10 pounds is developed by each rear rotor Max .60 on K & B 100 fuel. This is about 20% better than the 8 pounds obtained with an 11/7 or 12/6 prop without a shroud.

Counter rotating propellers are required in the hover models to eliminate torque. This required machining a new intake rotor for one engine. The new rotor, a mirror image of the stock part, was machined by John Tenke, also a modeler, in Grumman's model shop. John has done all the metal work required in the way of motor mounts, servo mixers and other small parts. I carved reverse pitch props to match the conventional ones.

The same power units have been used on all the models and have proved to be fantastically reliable. In fact, other than running out of fuel, we have never had an engine fail during many hours of operating time.

Fox "Missile Mist" fuel, 25% nitro, has been used in both the hover models I have built and flown. It was necessary to use the hotter fuel to obtain added thrust to lift the 20 pound models vertically.

Standard Kraft radio systems have been used in the Nutcracker models. The Kraft radio, like O.S. Max engines, have proven to be completely trouble-free. All movable surfaces use KPS-15H servos. A KPS-14 is used for the throttles. Three rate gyros are connected to each KPS-15H servo to help stabilize the model in each axis, pitch, roll and yaw.

Typical model airplane construction techniques have been used to build all the models. Foam and balsa wing and tail surfaces have proved to be ideal. Sheet balsa over formers have produced light, yet rugged, fuselages. Urethane foam has been used for engine mount fairings and shroud leading edge rings. Light fiberglass cloth and surfacing resin is used over all foam parts, as well as most of the fuselage. Where fiberglass is not used, silkspan and dope is used to seal the wood. Superpoxy, or urethane paint, have been used to finish the models.

Flying the Nutcracker is similar to flying a model helicopter. The model is flown suspended by a tether approximately 30' long. When the model is in flight, the cable is slack, allowing it to maneuver in an area about 50' in diameter. In case of loss of control or an engine failure, the tether keeps the model from getting away or hitting the floor. Along with the tether is a power line that supplies the three gyros with 26 volt, 400 cycle power.

The model is quite easy to fly, if you are proficient with a helicopter. It is more stable than it looks like it would be. We have performed many docking and landing experiments to demonstrate different possible methods. The most interesting has been flying a probe on the nose of the model into an 8" diameter funnel on the end of a docking boom. This is similar to a mid-air refueling operation.

Observers are always impressed by the performance of the Nutcracker, especially those who fully understand what they are seeing. Modelers, especially, seem to enjoy it, as would be expected.

The entire Nutcracker demonstration models project has been a complete success. With them, Grumman has been able to easily and clearly demonstrate a new concept. Major Model & Mfg. has been pleased to have had the opportunity to be able to contribute our knowledge to the program.

●

***The Nutcracker uses typical model airplane construction techniques. Foam and balsa wing and tail surfaces have proved to be ideal. Sheet balsa over formers have produced light, rugged fuselages. Light fiberglass cloth and resin is used over most of model.***

***Nick Ziroli flying the Nutcracker in the vertical mode. The model is flown suspended by a tether approximately 30 feet long. In case of loss of control, or an engine failure, the tether keeps the model from getting away or hitting the floor.***

# RCM TWIN SCOOTER

BY DICK TICHENOR

| | | |
|---|---|---|
| **TYPE AIRCRAFT** Twin 1/2A Sport | **O.A. FUSELAGE LENGTH** 26½ Inches | **REC. ENGINE SIZE** .049 QRC (2 req'd.) |
| **WINGSPAN** 40 Inches | **RADIO COMPARTMENT AREA** (L) 10" X (W) 2-3/16" X (H) 3" | **FUEL TANK SIZE** Cox Engine Tank |
| **WING CHORD** 6¼ Inches | **STABILIZER SPAN** 16 Inches | **LANDING GEAR** Tricycle |
| **TOTAL WING AREA** 240 Square Inches | **STABILIZER CHORD (Incl. elev.)** 3⅞" (Avg.) | **REC. NO. OF CHANNELS** 2 |
| **WING LOCATION** High Wing | **STABILIZER AREA** 62.8 Square Inches | **CONTROL FUNCTIONS** Rudder and Elevator |
| **AIRFOIL** Flat Bottom | **STAB AIRFOIL SECTION** Flat | **BASIC MATERIALS USED IN CONSTRUCTION** |
| **WING PLANFORM** Constant Chord | **STABILIZER LOCATION** Top of Tail Boom | Fuselage ........ Balsa and Ply; Wing ........ Balsa and Ply; Empennage ........ Balsa |
| **DIHEDRAL, EACH TIP** 1½ Inches | **VERTICAL FIN HEIGHT** 5⅞ Inches | Weight Ready-To-Fly ........ 26 Oz.; Wing Loading ........ 15.66 Oz./Sq. Ft. |

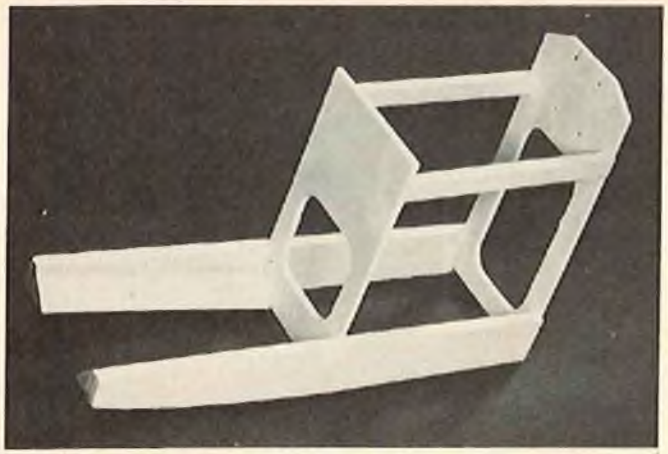
***One of the most popular airplanes ever presented by RCM, The Scooter, reappears as a poor man's twin engine aircraft that is rich in enjoyment.***

● A one hour drive twice a day on Southern California's freeways provides too much time for day dreaming. Those day dreams get me in trouble because I'm continually dreaming up projects. The Twin Scooter is one of those projects. I am in the dog house with my Fearless Leader because I built it and didn't bother to shoot construction photos.

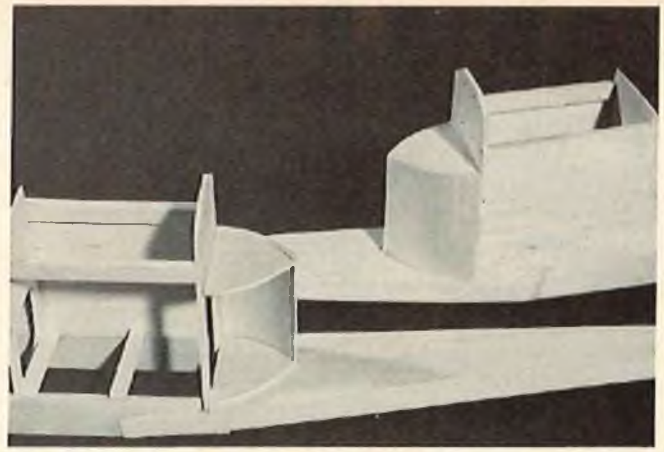
We ran a construction article on the RCM Scooter Mk .049 in our December 1975 issue. The plan sales for that design were one of the largest in RCM's history. For the original construction photos, I built one model to completion and partially completed a second. That second one is the source of my problems because I wondered how it would work if I mounted an engine in the nose, in addition to the pusher installation.

Changing the fuselage nose to accept an engine was a simple task. The only other change was to add a 1/16" x 2" balsa sheet to the upper leading edge of each wing panel. The sheeting was for extra strength that might be needed with the use of the second engine.

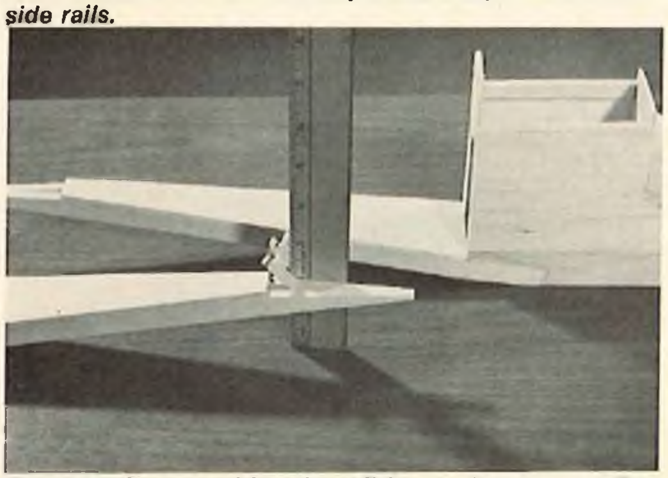
I used a pair of Cox .049 QRC engines that feature really effective silencers. This was a good choice as the noise level is very low while retaining the fascinating beat associated with multi-engined models. The push-pull arrangement eliminates the asymmetrical thrust problems of single engine operation usually found in twins - - - in fact, it flies just about as well with either engine running as it does on both.



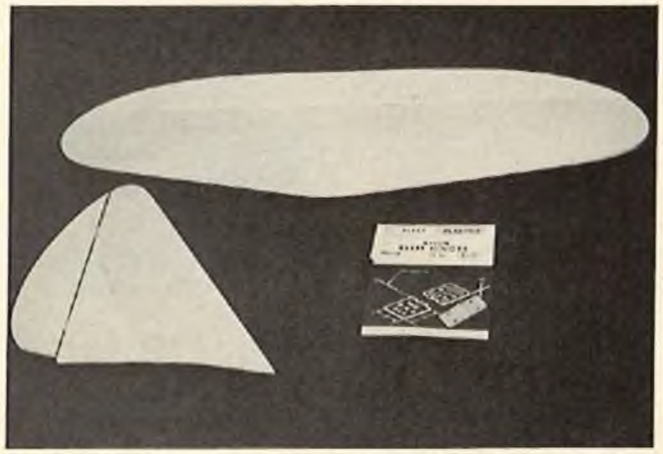
*Fuselage assembly is started by gluing the triangular strips to the sheet beams followed by the beams, bulkheads and side rails.*



*The 3/32" sheet sides are then added. The remaining structure is a series of simple cut-and-glue operations.*

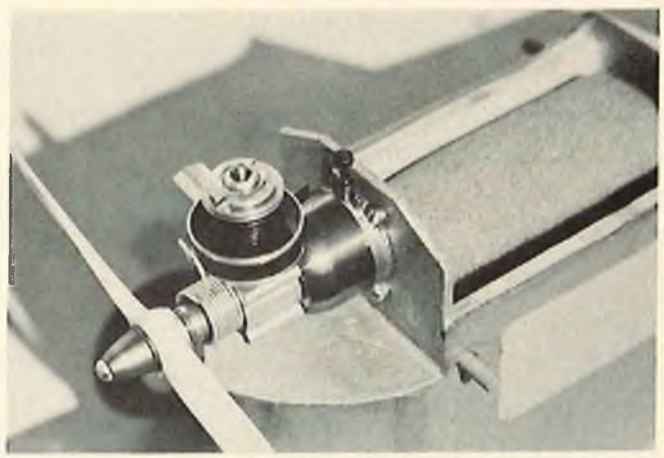


*Be sure when attaching the tail boom that the stabilizer mount surface is parallel to the fuselage bottom below the wing.*



*The tail surfaces are cut and sanded from soft 1/8" sheet balsa. Small Klett hinges were used on our prototypes.*

*This is a view of the muffled Cox .049 installed in the nose. The spring starters are a big help in getting the engines started.*



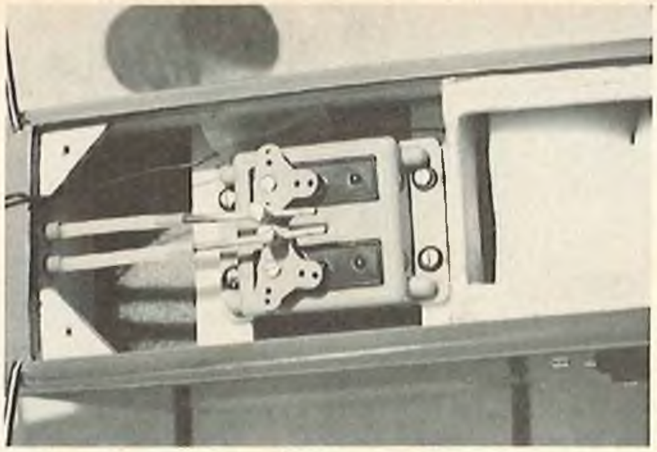
*The rear engine is mounted in the conventional tank mount manner. The Twin Scooter simply slows down when either engine quits.*

This little twin probably has well over a hundred flights on it. Dick Kidd and I wrung it out thoroughly in the beginning. Our soaring columnist, Al Kindrick, borrowed it and for six weekends he and his friends were continually refuelling and getting it back in the air. Many of the flights found people who had never flown before operating the transmitter and several of them are now into RC. While this speaks well of its gentleness, it is also very maneuverable.

Since I didn't photograph the construction sequence, I will make reference to the December 1975 issue of RCM. Except for the front engine, shape of the nose and wing leading edge sheeting, the construction is the same as the single engine machine. The drawings should be self-explanatory, but if additional information is desired, the December 1975 issue can be ordered from RCM.

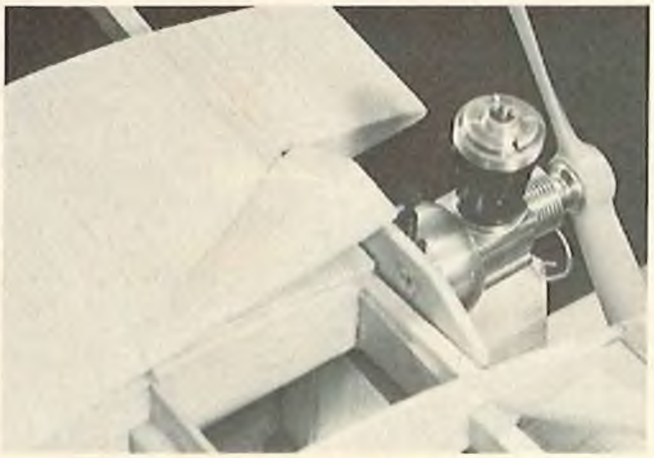
Fuselage assembly is started by gluing the 1/2" triangular strips to the 1/4" sheet beams. Next, assemble the beams, bulkheads and side rails. The 3/32" sheet sides are then added. The remaining structure is a series of simple cut-and-glue operations. A couple of words of caution - - - when attaching the tail boom, make sure the stabilizer mount surface is parallel to the fuselage bottom below the wing. Also, use an ample amount of white glue or epoxy to

**text to page 144**



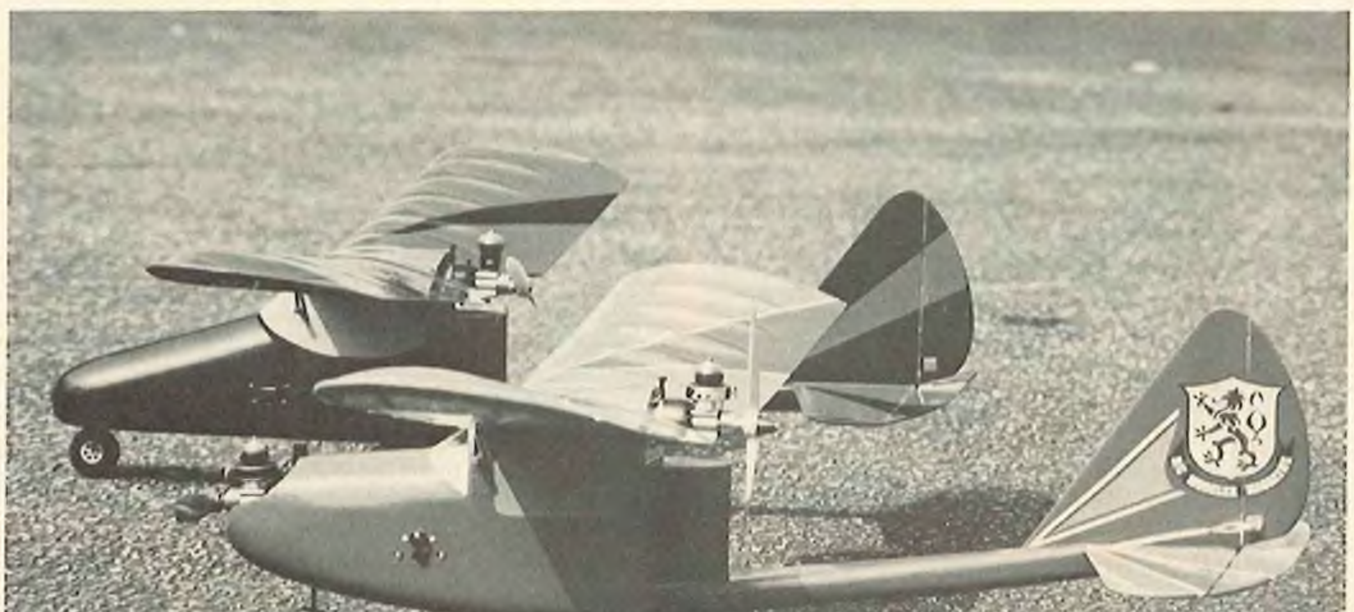
*A close-up of the two channel radio installation. An RS Systems propo used. Note Gold'N-Rod installation.*


*The other end of the Gold'N-Rod pushrods showing the rudder and elevator linkages.*



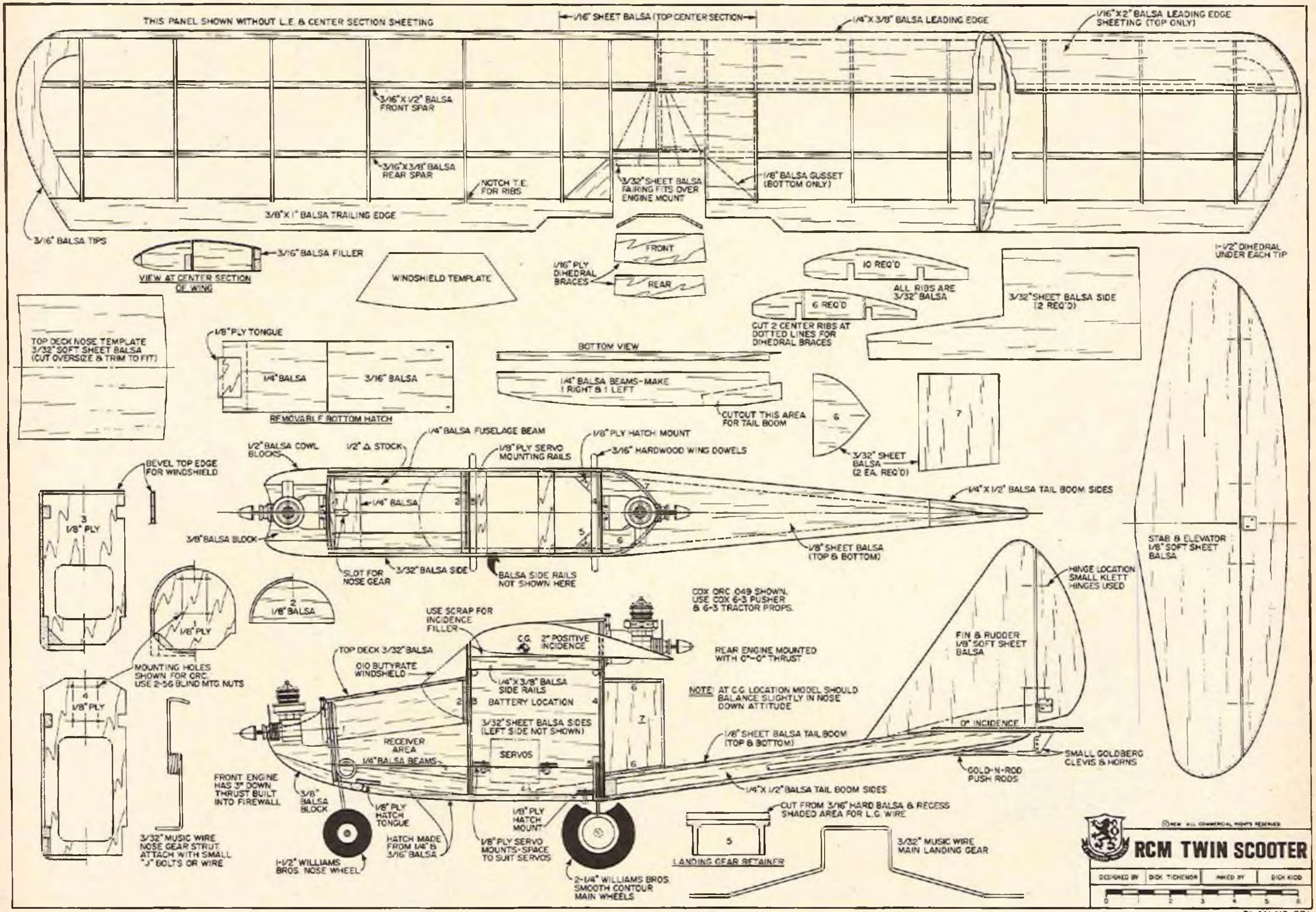
*A construction view of the pusher motor illustrating Cox tank mount and blind mounting nuts.*

*The Twin Scooter is sheer pleasure to fly - - - and, there's no problems at all if either engine quits.*



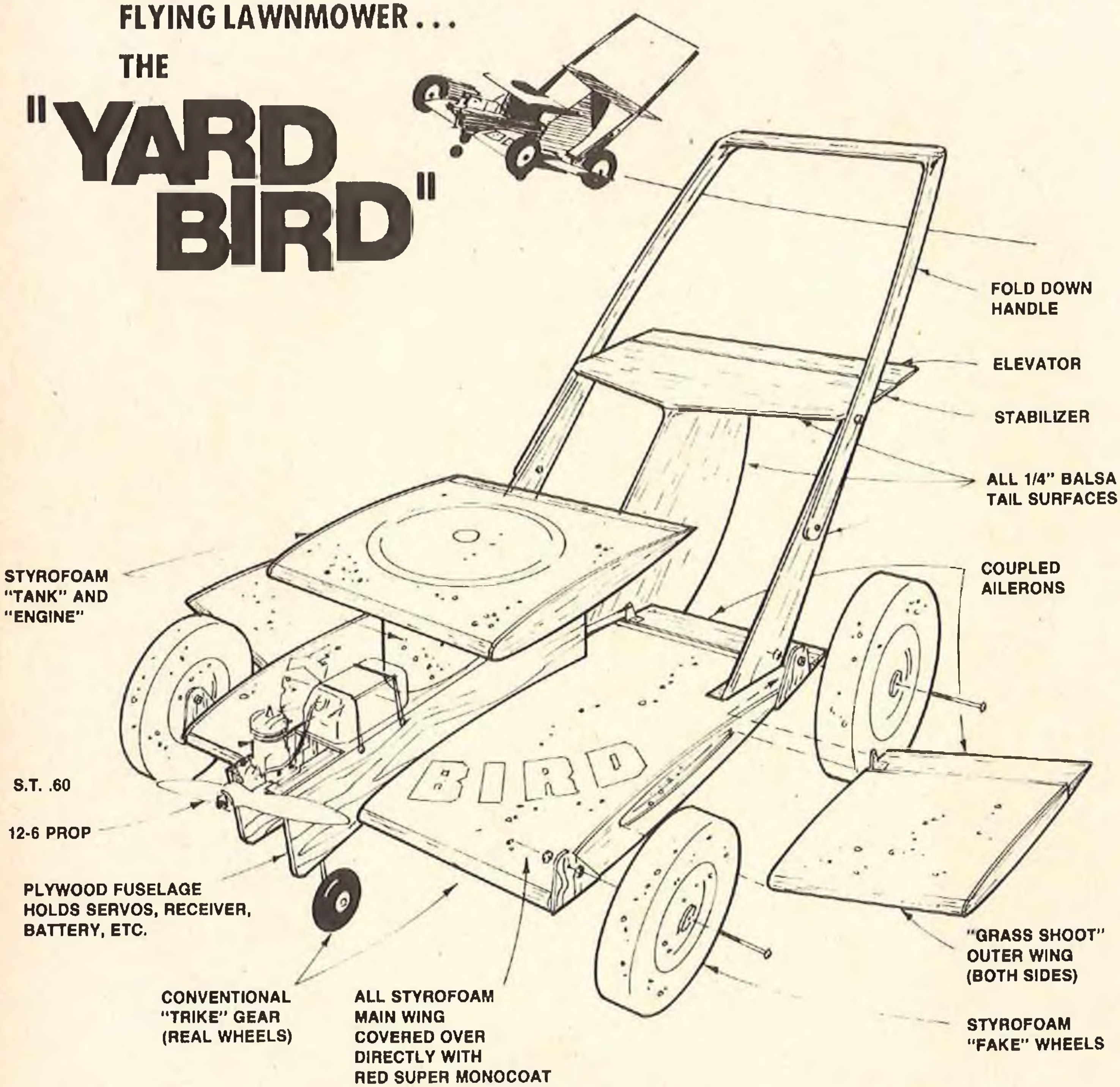
*The original RCM Scooter in the background with one of the RCM Twin Scooter prototypes in the foreground.*

FULL SIZE PLANS AVAILABLE — SEE PAGE 190




PLAN NO. 681

# TED TEISLER'S AMAZING FLYING LAWNMOWER . . . THE "YARD BIRD"




| | |
|---|---|
| WING SPAN | 43 INCHES |
| WING AREA | 760 SQ. INCHES |
| WEIGHT (DRY) | 6.5 LBS. |
| POWER | .60 CU. INCHES |

**TEXT BY ROBERT A. VAUGHN**

**PHOTOS BY ROBERT A VAUGHN, JIM LIPKING, AND TED TEISLER**


*Ted Teisler's "Yardbird". And, if a flying RC lawnmower isn't different enough for you, there's no hope!*

**Prologue**

● The flying lawnmower? Now here is an aircraft that gets more attention than most. I was always one to be conventional, choosing to remain anonymous, quietly flying my Goldberg Falcon 56 while all the hot dogs in my club got all the publicity with their 10 foot span sailplanes, supersonic pattern jobs, and scale airplanes with worn-looking instruments and millions of rivet heads. Nobody ever came over and asked, "How did you fit in that O.S. Max .19 so neatly?" But I didn't care - - - I knew that someday I would get even. It finally happened a few months back, while dreaming in my fantasy world and reading through the "little" ads in the back pages of RCM. I showed one ad to my wife Bev, valiantly hoping it would arouse more than the usual, "Umm, that's nice" comment that she keeps on hand for situations of that sort. But she said, "Does it cut grass, too?" That should have been my clue - - - she actually looked at the ad! I took it as a slam, assuming she was implying neglect on my part towards the care of our yard. Figuring that was the end of the evening's discussion, I said no more and drifted back into my dreams of flying doghouses, flat-irons, and outbuildings.

Then at Christmas, a surprise, for what to my wondering eyes did appear, but full-size plans and instructions too, all gotten by my wife, what a dear!

This is no two-week project, but then, again, since it took me almost 6 months to put together a Contender, advertised as an 8 hour building job, I guess I'm not as fast as everyone. It's been easy keeping it a secret, nobody ever suspects anything when I'm out of sight all day and I explain, "I've been working on the lawnmower"! Although I did get a couple of funny looks at work when a little oversprayed red paint remained on my thumb and I told those that asked that I'd been painting my lawnmower and the ailerons were kind of difficult to hold properly! One smart-aleck wondered why I was painting my lawnmower and sarcastically said, "What did you do, put racing stripes on it?"

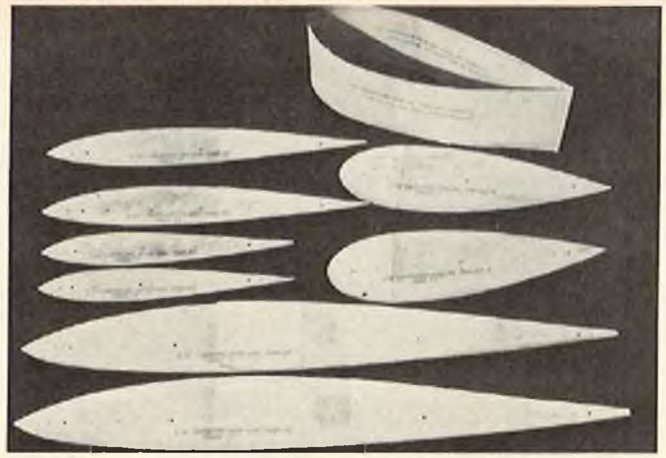
*Ted Teisler, "doing his chores."*

**General Description**

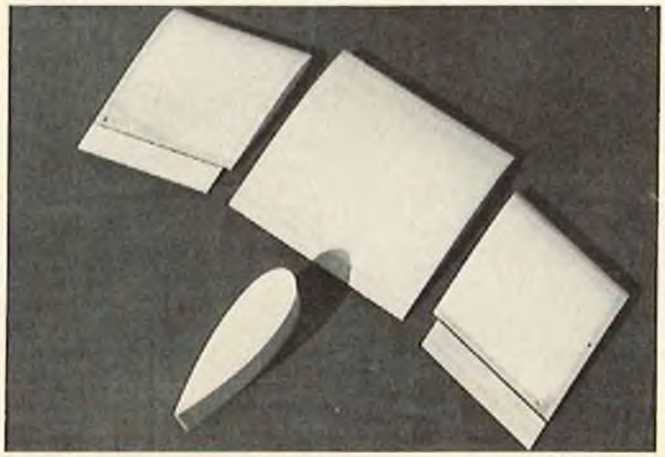
The Yardbird is an entirely unconventional flying machine. It is mainly constructed of foam, with sheet balsa stabilizing and control surfaces. From any range, it appears to be a standard looking push-type rotary lawnmower. As a lawnmower it has four hefty rubber tired wheels, one on each corner, an upper gas tank with cap, a grass exhaust chute (on each side, no less), a rope starter pull handle and a fold down chrome handle. As a flying machine, it has a .60 size engine turning an 11" tractor propeller, tricycle landing gear with steerable nose wheel, pitch (elevator) control, roll (aileron) control and throttle control. It will take-off, do loops and rolls, fly inverted with ease and make spot landings. What it won't do is cut grass!

The package from Ted Teisler (941 Sherwood Drive, LaGrange Park, Illinois 60525) for $10.50 contained, in addition to two full size plan sheets, five pages of detailed instructions that are thorough and clearly written. Included with the instructions are two 8½" x 11" copies of the plan sheets which come in very handy when studying the directions. A separate note, received from Ted Teisler somewhat later advised that

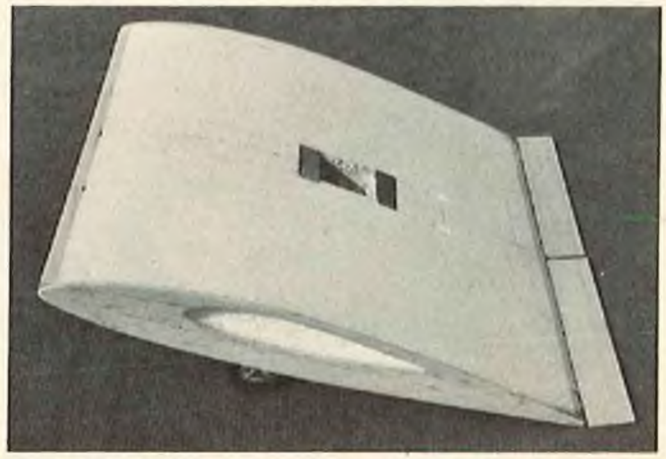

*Vacuum formed wheels and plywood brackets.*



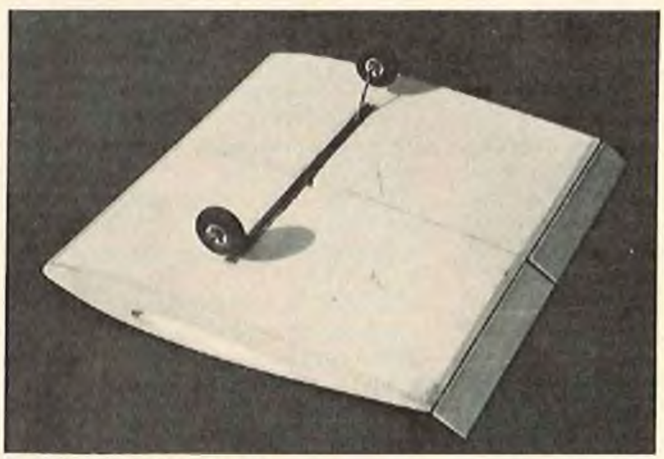
*Foam core cutting templates.*



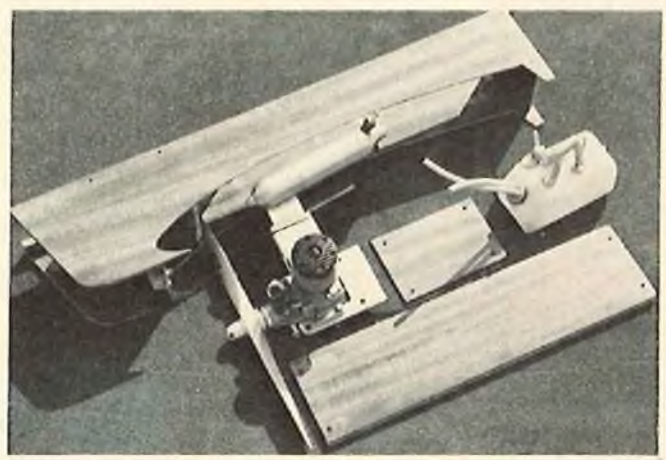
*Top wing, pylon, and 'grass chute' cores with edging.*



*Main wing core sub-assembly.*



*Main wing core sub-assembly showing main gear.*



*Plywood fuselage parts and engine assembly.*

foam cores and a set of vacuum formed wheels could be obtained from Arion Enterprises, 111 Elizabeth Drive, Elk Grove Village, Illinois 60005. In my case I had already completed the foam parts, but I did send for and subsequently received, a package of eight, vacuum formed wheel halves which made a set of four very realistic, rubber tired wheels.

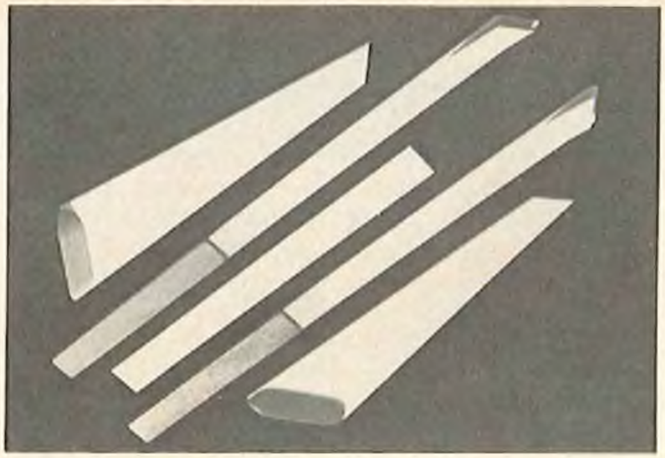
**CONSTRUCTION NOTES**

**Foam Parts:**

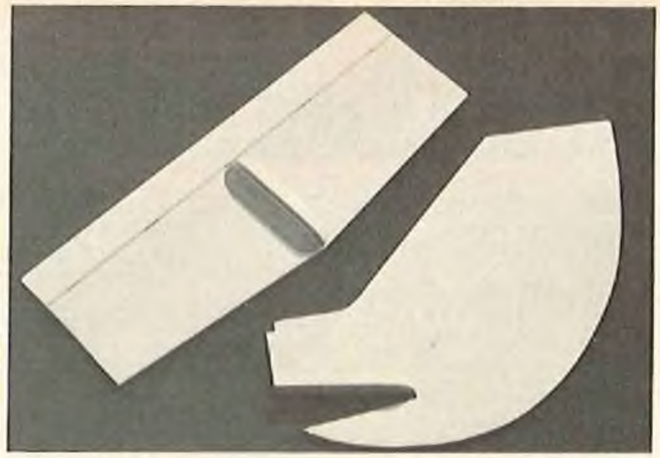
All foam parts can be cut from two blocks of styrofoam (1 lb./cu. ft., lightweight, closed grain) 12" x 4" x 36". Since I have access to a copying machine, I made copies of portions of the plan showing templates. These were pasted directly on thin sheet aluminum and cut out for durable, smooth wire cutting templates. No tapered cuts were required, although the pylon needed a seat shaped for the top wing. Using the template shape provided, a no gap fit was obtained on the first try. Balsa sections are epoxied on both leading and trailing edges of each of the wing surfaces, a top wing, the main wing and two outer wings (grass chutes). In addition, tip closing ribs were added at each exposed end to assist in attaching the skins as described later. The plans describe how to make mower wheels from styrofoam, but I put off this chore until saved by the arrival of the formed plastic sheet wheels from Arion Enterprises.

**Plywood Parts:**

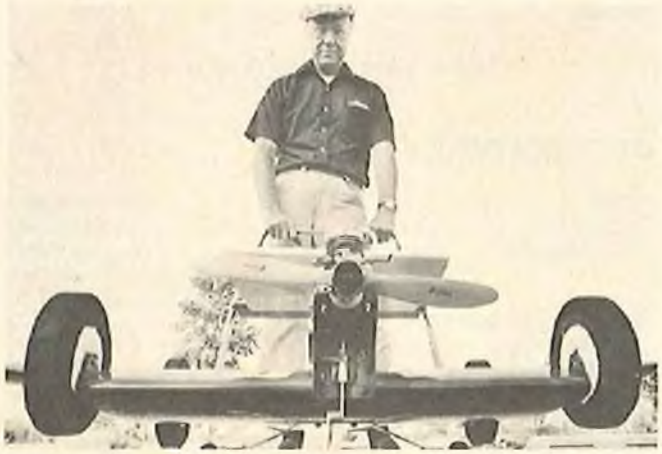
The fuselage, wheel brackets and a couple of handle parts are cut from 1/8" and 1/16" plywood. The fuselage, as in a conventional model, mounts the engine, its fuel supply, nose wheel, and all radio components. A removable top hatch holds the pylon and top wing, intended to resemble the mower engine and gas tank. I mounted my engine on an



*Balsa sheet handle parts.*



*Vertical and horizontal stabilizers.*



*Ted Teisler and worms-eye view.*

*"Lawnmower out of control!"*

*First flight of the prototype.*

*Ted makes a low pass with the Yardbird.*

aluminum plate, 1/8" thick which is screwed to the 3/8" x 3/4" hardwood rails. The fuel tank is external, directly behind the engine, secured with rubber bands. A small hatch below the fuel tank is removable for access to the battery area and receiver compartment.

**Balsa Parts:**

The vertical stabilizer (no rudder), horizontal stabilizer (T-tail) and handle are cut from 1/4" sheet balsa. The plans show an economical way to cut all pieces from three, 4" wide sheets. 3/4" triangular stock is used for bracing at stress points in handle and stabilizer locations. The upper handle pivots around its lower end and is retained in the extended (flying) position by pressure on dowel detents located on the ends of the horizontal stabilizer.

**Controls:**

Three KPS-15 servos are used. Throttle and nose steering control are Sullivan Gold'N-Rod cables. The elevator is flexible Gold'N-Rod and all aileron surfaces are connected with Sig 12" RC Links. The nose wheel steering is connected to the aileron servo output wheel and is not difficult to get used to for ground handling. Control surfaces are all made from 2" wide trailing edge balsa stock, MonoKote covered, and hinged with a total of 17 Du-Bro large nylon steel pin hinges. Four aileron surfaces are used, one on each side of the main wing, linked on the outboard end to a surface on each grass chute.

**Landing Gear:**

The main landing gear utilizes 5/32" struts installed in a hardwood piece which functions also as a lower wing spar. 2½" diameter wheels are used, placing the mower wheels about 2" from the ground except when on grass and

to page 140

# RCM PRODUCT TEST

## TOP FLITE MODELS P-47 THUNDERBOLT


● Top Flite's P-47 Thunderbolt represents a welcome addition to the variety and number of Sport or Stand-Off Scale models now on the market. The popularity of this aspect of the hobby has increased rapidly in recent years perhaps in large part because of the superb flight performance of these models. Thunderbolt, or "Jug", is no exception. Its large elliptical wing and hefty cross-section makes this model capable of most pattern maneuvers. In addition to its fine flight characteristics, the Thunderbolt (unlike many scale models) has more than ample airflow for engine cooling. One can even get a Du-Bro, or similar, muffler inside the cowling by removing a half inch or less of the muffler body. The kit itself represents Top Flite's best efforts to date. The fuselage has a simple crutch construction which is nearly impossible to misalign. Once the crutch is completed, four pre-molded balsa skins are attached to complete the fuselage. Most noteworthy is the excellent two-piece heavy duty plastic cowl. Once assembled, it is attached internally to the firewall with four screws. Other construction is standard and will present no problems to the builder. Plans are clear and there is a comprehensive construction manual provided. Although the model pictured is finished in the camouflage pattern of Col. Francis Gobreski, Top Flite provides 3-views and mylar markings of Major G.T. Eagleston's aircraft. Here is our only criticism — the markings are complete and of excellent quality, however, no information is provided regarding placement of all those little "goodies" like *tie down, batt. location, etc.* Additionally, if you plan to use the stars and bars over dark (or camouflage), you should provide a white background as your colors will show through these markings. While no modifications are essential, there are a couple which might help: (1) Trim engine mounts to fit before completing step #2 in the construction manual. Most .60's will need considerably more width than provided. (2) Attach four 1/8" ply doublers (approximately 3/8" square) behind firewall at cowl attachment points, otherwise time and vibration are likely to

to page 140

| 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 | | | NA | | | Ease of Assembly | | ● | | | |
| Quality of Fiberglass | | | NA | | | Fidelity to Scale | | ● | | | |
| Other Materials | | ● | | | | Flight Performance | ● | | | | |
| Accessories | ● | | | | | Overall Appeal | ● | | | | |
| Die-Cutting | | ● | | | | | | | | | |

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

## SPECIFICATIONS

Name .......... P-47 Thunderbolt
Aircraft Type .......... Sport Scale
Manufactured By .......... Top Flite Models
2635-47 Wabash Ave.
Chicago, Illinois 60616
Mfg. Suggested Retail Price .......... $79.95
Available From .......... Both Mfg. & Retail Outlets
Mfg. Recommended Usage .......... Sport, Stand-Off Scale
Wing Span .......... 60 Inches
Wing Chord .......... 12" (Avg.)
Total Wing Area .......... 720 Square Inches
Fuselage Length .......... 45 Inches
Radio Compartment Dimensions .......... (L) 14" x (W) 4.75" x (H) 2.50"
Wing Location .......... Low Wing
Airfoil .......... Symmetrical
Wing Planform .......... Elliptical
Dihedral .......... 2.25 Inches
Stabilizer Span .......... 23 Inches
Stabilizer Chord (incl. elev.) .......... 6" (Avg.)
Total Stab Area .......... 138 Square Inches
Stab Airfoil Section .......... Flat
Stabilizer Location .......... Top of Fuselage
Vertical Fin Height .......... 7.75 Inches
Vertical Fin Width (incl. rud.) .......... 6.5" (Avg.)
Mfg. Rec. Engine Range .......... .45-.60
Mfg. Rec. Fuel Tank Size .......... 12 Oz.
Landing Gear .......... Conventional
Recommended No. Of Channels .......... 4-6
Recommended Control Functions .......... Rud., Elev., Throt., Ail. Flaps & Retracts
Basic Materials Used In Construction:
Fuselage .......... Balsa
Wing .......... Balsa
Tail Surfaces .......... Balsa
Hardware Included In Kit .......... Very Complete
Plan Size .......... 35" x 45" (2 sheets)
Building Instructions on Plan Sheets .......... Yes
Instruction Manual .......... Yes (14 pages)
Construction Photos .......... Drawings
Kit Includes .......... Die Cut Parts
Mfg. Rec. Flying Weight .......... 88-112 Oz.
Wing loading based on rec. flying wt. .......... 17.6-22.4 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly .......... 134 Ounces
Wing Loading .......... 27 oz./sq. ft.
Covering & finishing materials used .......... Superpoxy
Engine Make & Disp. .......... Ross .61
Muffler Used .......... Du-Bro
Radio Used .......... Pro-Line
Tank Size Used .......... 12 Oz.

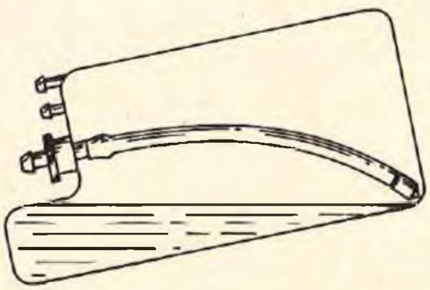
# HERE'S HOW

BY JERRY SMITH

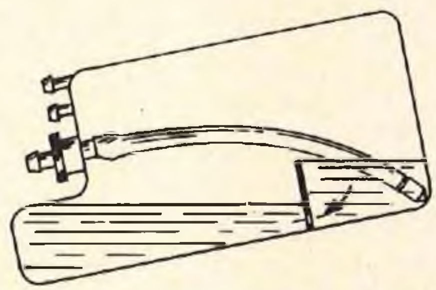
*WHILE MAKING A LONG LANDING APPROACH ONE DAY I EXPERIENCED AN ENGINE FAILURE. FIGURING THAT THERE WAS ENOUGH FUEL TO GO AROUND THE FIELD ONE MORE TIME, I WAS CAUGHT COMPLETELY BY SURPRISE! AFTER RETRIEVING THE AIRPLANE FROM A BEAN PATCH, (DISGUSTFUL) I MADE A QUICK CHECK ON THE FUEL LEVEL AND FOUND APPROX. 1/4" IN THE TANK. WHY HAD THE ENGINE STOPPED? AFTER SEVERAL MINUTES OF REASONING THE WHY SUDDENLY OCCURRED TO ME. ON THE LONG APPROACH, WITH THE NOSE PITCHED DOWN, ALL OF THE FUEL HAD RUN TO THE FRONT OF THE TANK LEAVING THE PICKUP TUBE HIGH AND DRY! SOME ENGINES WILL TOLERATE THIS CONDITION FOR A WHILE. AS AN EXAMPLE, PULL OFF THE FUEL LINE, WITH THE ENGINE IDLING, AND SEE HOW LONG IT RUNS. WHEN THE FUEL IS LOW IN THE TANK THE ENGINE TENDS TO RUN LEANER AND WHEN IDLING HAS LESS FUEL DRAW.*

*AFTER GIVING CONSIDERABLE THOUGHT TO THE PROBLEM I REASONED THE BEST APPROACH WOULD BE TO PROVIDE A BAFFLE TO TRAP SOME OF THE FUEL AT THE AFT END OF THE TANK AS THE NOSE OF THE AIRPLANE IS PITCHED DOWN. HOLES IN THE BAFFLE WILL ALLOW THE FUEL LEVEL TO EQUALIZE IN BOTH COMPARTMENTS DURING LEVEL FLIGHT. AFTER MODIFYING SEVERAL TANKS, THE METHOD SHOWN BELOW WORKED OUT BEST.*

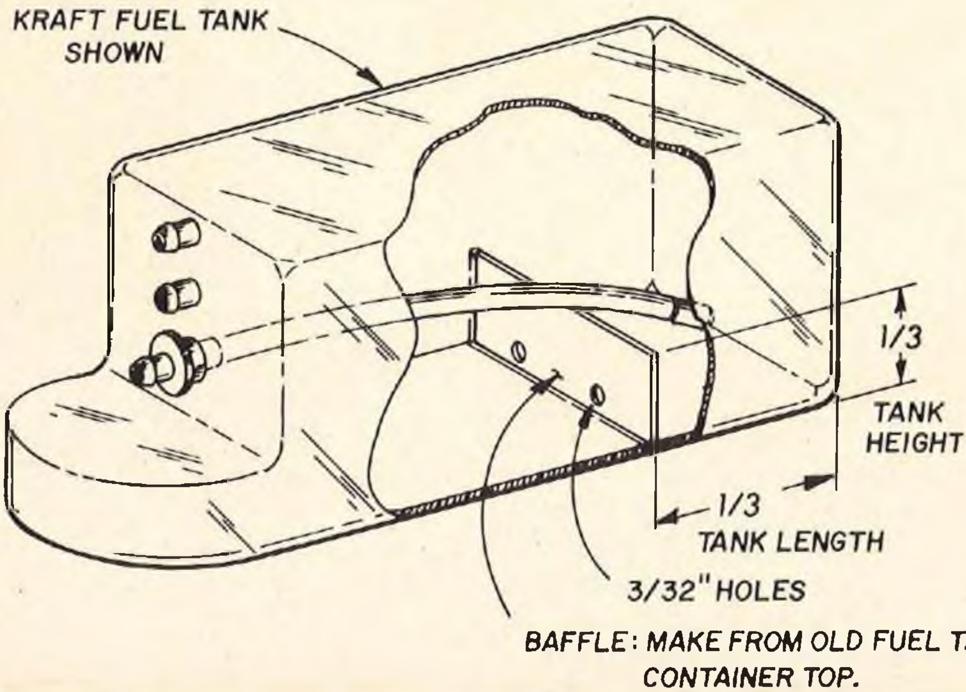
*MAYBE SOME SHARP ENTERPRISING MANUFACTURER WILL FIND A WAY TO PRODUCE A BAFFLED FUEL TANK. COME TO THINK OF IT, OUR FUEL TANKS HAVE'NT CHANGED MUCH EXCEPT FOR OUTSIDE CONFIGURATION. IT'S TIME FOR A CHANGE INSIDE AS WELL!*



*Typical fuel tank position with aircraft nose pitched down. Pickup tube is out of fuel. Engine would stop running in short time.*



*Fuel tank with baffle installed. Held in this position fuel will slowly drain through small holes in baffle. Fuel level is supportive to engine longer.*




*Cut 1/32" slot in fuel tank with zona saw or thin bandsaw blade. Cut baffle slightly larger than tank. Locate holes in baffle as shown. Install baffle in slot. It should fit snug. With a hot soldering iron carefully melt edge of baffle flush with fuel tank. Do not breath fumes from melting process. Roughen joint with 220 garnet paper and apply Hobsco Goo all purpose adhesive or Wilhold R/C 56. Let cure completely before use.*

# NRCHA

**DON DEWEY (N1A)**

● The following is a report by John Burkam N-177F, representing the U.S., to the N.R.C.H.A. on the Plenary meeting of the C.I.A.M. of the F.A.I., held in Paris, France on December 2 and 3, 1976.

Not much more needs to be said beyond what is written in the report to the A.M.A., included herewith. I think the reason the proposal by the RC Helicopter Subcommittee was passed unanimously was that no one there knew enough about helicopters to challenge any part of it, and also they had confidence in what I wrote. I don't think that anyone else there, except our own Jim Simpson, had even flown a model helicopter.

In the general definition of helicopters in the present FAI Sporting Code it says, "During power-off flight, the rotor(s) shall continue to rotate and provide for lift." That would eliminate practically all RC helicopters flying today. I deleted that sentence. Even among those with controllable collective pitch, I have never heard of anyone making a safe dead stick landing. That's why I included that maneuver among the optional ones. It should be part of every pilot's trainig who flies a collective pitch helicopter. Transmissions may have to be modified slightly to reduce drag on the autorotating rotor. The engine displacement, maximum weight, and maximum lifting rotor area, are kept the same. For coaxial helicopters or others with overlapping rotors, the area of overlap is counted only once, because the area of the column of air acted upon by the rotors is what determines the ideal or momentum horsepower required to hover. How close the helicopter comes to the theoretically perfect rotor is then determined by blade planform, twist, airfoil, surface finish, number of blades, blade area, etc.

The maneuvers in section 5.4 were chosen mostly from Bernard Maeterlinck's European N.R.C.H.A. rules, with a few thrown in from our own helicopter Nats, and a couple of my own. Tony Bray of England was very helpful, too, in selecting maneuvers and setting K factors. Yoshihiro Ikejiri kindly furnished an English translation of the Japanese helicopter rules for consideration. The German rules, Italian rules, and practically all U.S. helicopter rules from 1972 on, were also considered. The final results are not for novices, yet you don't have to be an Ernie Huber or a Mike Bosch to fly the five required and four optional maneuvers. It will be a long time before someone has to think up more difficult maneuvers to hold the interest!

While in the FAI office, I had a chance to look at RC helicopter world record dossiers. Some of them must have been missing from the drawer because, when I checked with Frank Ehling, he had some new ones and some tentative ones. Duration is still 1 hour, 45 minutes, and Altitude is 3471 feet, both by Heinz Pallman of Germany. The Closed Course Distance is 9.33 miles (tentative), by Jolker Bitterer of Germany. Straight Line Distance is 35.72 miles, by Dieter Zeigler of Germany. Speed is tentatively 34.3 mph, by Hubert Bitner of the U.S.A. Speed is by far the most difficult, not only because of the task of flying through a 200 meter trap with a 100 meter entry corridor, but also for the organization required to conduct the trials. I know many helicopter models can fly faster than 34 mph, but Hubert had the gumption to go out there and do it. Here's hoping they make if official.

In free-flight helicopters, an outstanding speed record is 89.619 mph, done in Russia by a rubber powered helicopter. Some rubber they have over there! I think the rubber must have been used in the catapult that launched the model! With Tony Aarts in as Technical Secretary of the C.I.A.M., and with the new definition for helicopters, maybe this kind of nonsense will cease. I'm going to write to Tony and urge more exposure to the public by these record dossiers.

By the way, I was again elected Chairman of the RC Helicopter Subcommittee. As best I can see it, our task this year is to promote RC helicopters, keep them as safe as possible, try out the new rules and maneuvers, and think of any changes or additions that should be made to the rules.

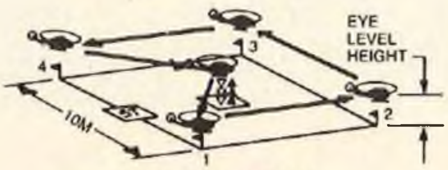
■ ■ ■

It boggles the mind yet! The CIAM delegates from 27 countries voted unanimously to accept the rules and definition for R/C helicopter competition and world records which the subcommittee put together during the past year! Last year, the Germans proposed a definition which would have increased the maximum weight to 10 kp. (22 pounds) and which repeated the unfair and outdated definition which exists in the 1975 FAI Sporting Code. Also, the German contest rules were a series of very simple and uninteresting hovering maneuvers, one stall turn, and then a time consuming and dangerous (to the helicopter) slalom course. Fortunately, this proposal was referred to the subcommittee (and I was elected its chairman). The new definition preserves th 5 kp. weight limit. This is very important because a radio controlled helicopter is the most dangerous type of flying model ever invented. The definition is changed to put all configurations of pure helicopters on as nearly equal footing as possible and to legalize scale models of modern helicopters such as the Sikorsky S-67 and the Boeing Vertol YUH-61A (UTTAS). The new contest maneuvers feature four safe required maneuvers of medium difficulty which serve to expose or weed out fliers who would be a hazard if allowed to fly the next four optional maneuvers. These are chosen from a list of nine maneuvers varying from difficult to impossible. After all, the competitors are supposed to be the experts from their countries. The only point questioned in the whole package was the difficulty of performing the Slow Roll and the Cuban 8. I agreed that present helicopters (models) could not perform a Slow Roll, but at least it provided a standard by which to judge the maneuver. As for the Cuban 8, I averred that Ernie Huber and the French flier, Jean-Claude Amacher, had already performed it. What's more, the pilot may choose only as many (up to four) of the easier, non-aerobatic maneuvers as he wishes.

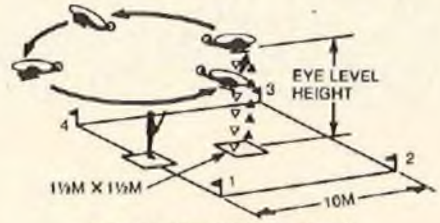
Last year the subcommittee chairman was absent and that proposal did not pass. This year the s/c chairman was present and the committee's proposal was accepted. The proposal was written with compromise in mind. For instance, there was a temporary (2 year) allowance of 5 kp. maximum weight *without* fuel for contest purposes only, to give time and incentive for manufacturers to bring out lighter helicopter kits, and to allow owners of overweight helicopters to use their present machines a little longer. Similarly, those with yaw rate gyros are allowed to use them, but if they do, they must keep them on for all maneuvers. So there was nothing very controversial to defend. But I was there to

**to page 118**

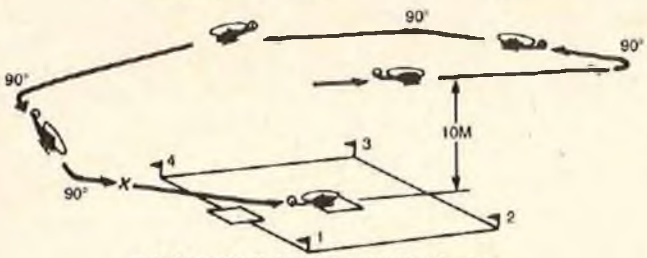
## REQUIRED MANEUVERS — 5 MIN.




HOVERING M K=10

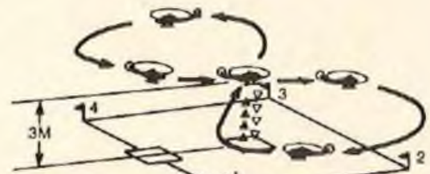



HOVERING CIRCLE K=10



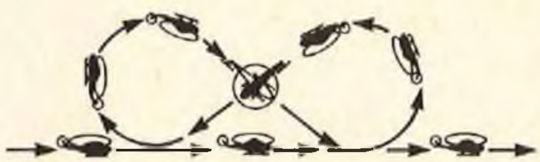

RECTANGULAR APPROACH K=10

FLARE AND LANDING K=10

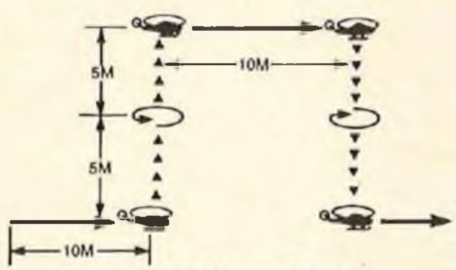



HORIZONTAL EIGHT K=10

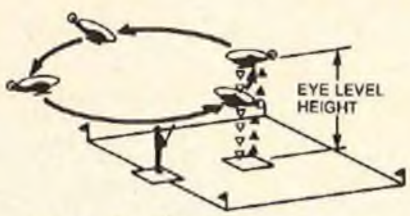
## OPTIONAL MANEUVERS
## CHOOSE UP TO FOUR — 3 MIN.



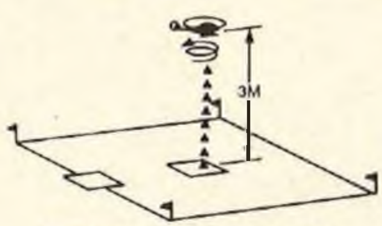
CUBAN EIGHT K=25



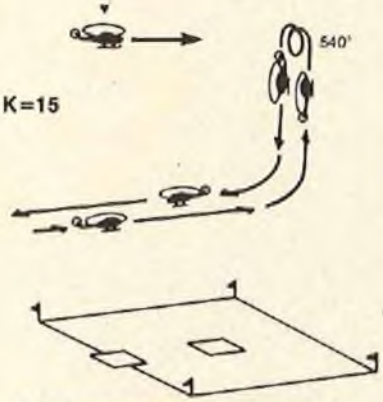

TOP HAT K=15



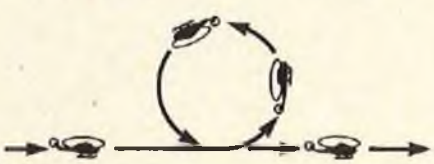

SWISS HOVERING CIRCLE K=20



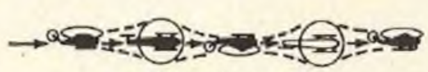

DOUBLE PIROUETTE K=10



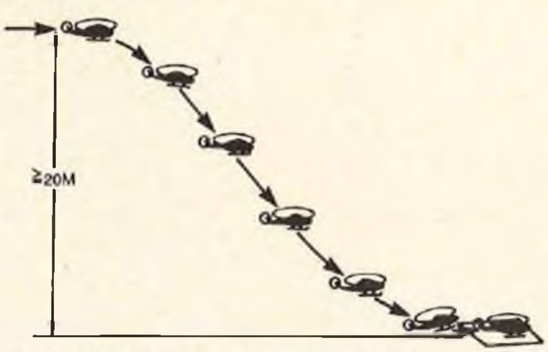

540 DEGREE STALL TURN K=15



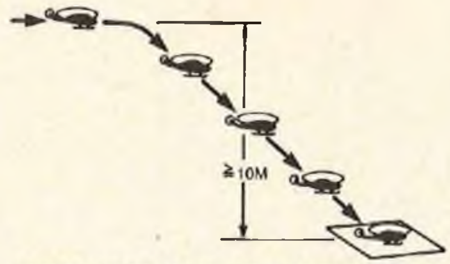
LOOP K=20



SLOW ROLL K=20




AUTO-ROTATIVE DESCENT AND LANDING K=20




STEEP APPROACH AND LANDING K=10

**FOR A RELIABLE IDLE, TRY AN** **BY JOHN TAYLOR**

# ON-BOARD BATTERY

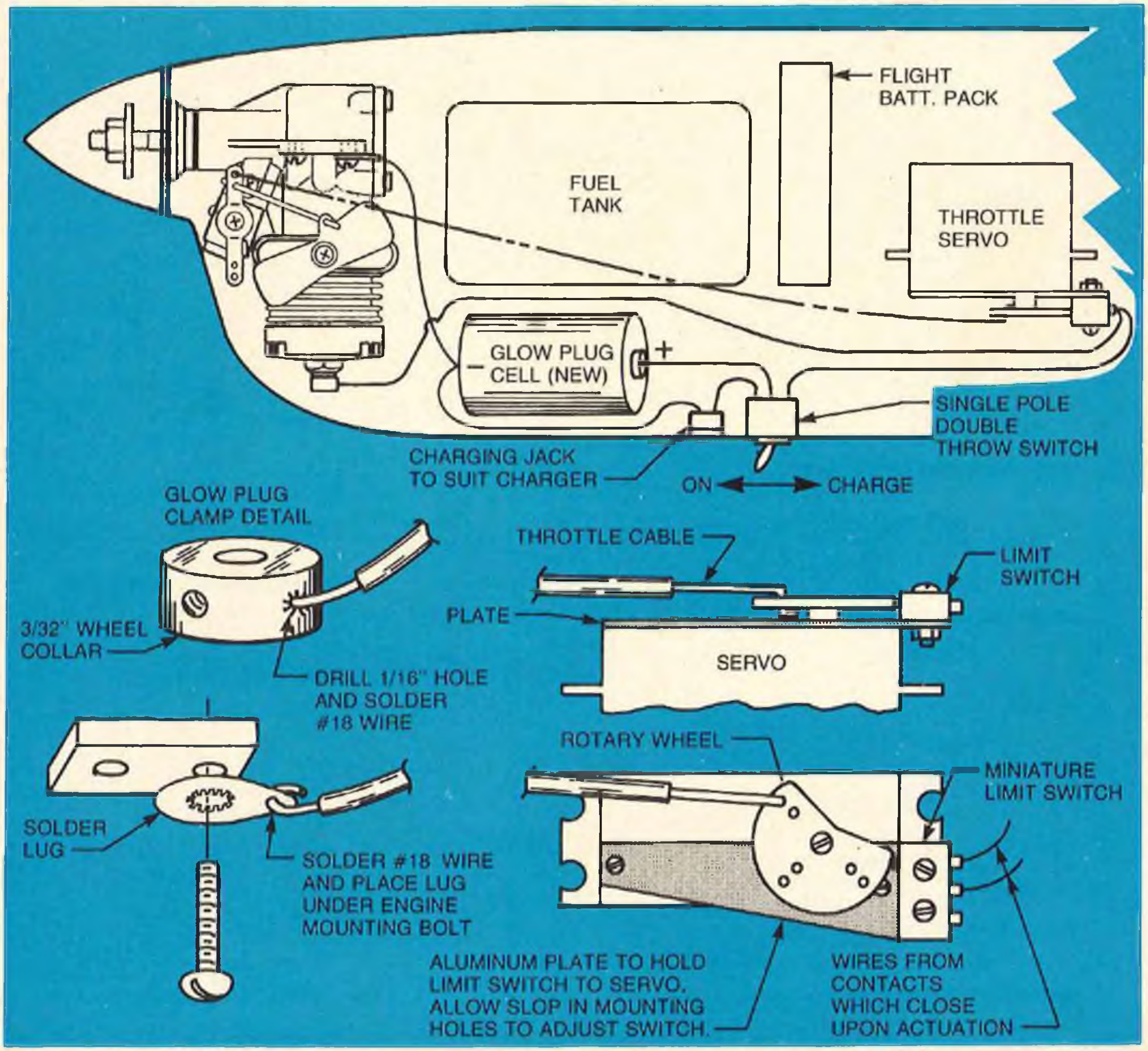
**(REPRINTED FROM THE MASSACHUSETTS 495TH RC SQUADRON NEWSLETTER)**

● Have you ever been flying on a cold day — or any day, for that matter — and throttled down for a landing, or other intricate maneuver, only to have the engine die at a critical moment? (For me, any time in the air is a critical moment!) If you have, you know how annoying it can be, as well as detrimental to the aircraft.

Relax, friends — here is a little gadget you can install on your favorite flying machine to increase its survival rate. It is an on-board battery supply for your glow plug.

This little gizmo attaches easily inside any medium-to-large size aircraft. The system consists of a battery, a limit switch, an external switch, and a charging jack. The extra odds and ends required are probably available in most modeler's parts bins. The sketch shows the basic installation in a typical aircraft. The glow plug cell, either a 1.2 amp hour or a 4.0 amp hour nicad, is mounted in the nose, under or near the flight pack battery. The switch and charging jack can be mounted at any convenient place on the fuselage — preferably away from the exhaust stream. The limit switch, which activates the circuit, is mounted on the throttle servo in a manner similar to that shown in the sketch. The throttle servo wheel is trimmed so that, on low throttle, the wheel depresses the plunger on the limit switch. If the main switch is on, the glow plug will light, and stay on, until either the throttle is moved from the low speed position or the main switch is thrown to the *charge* position.

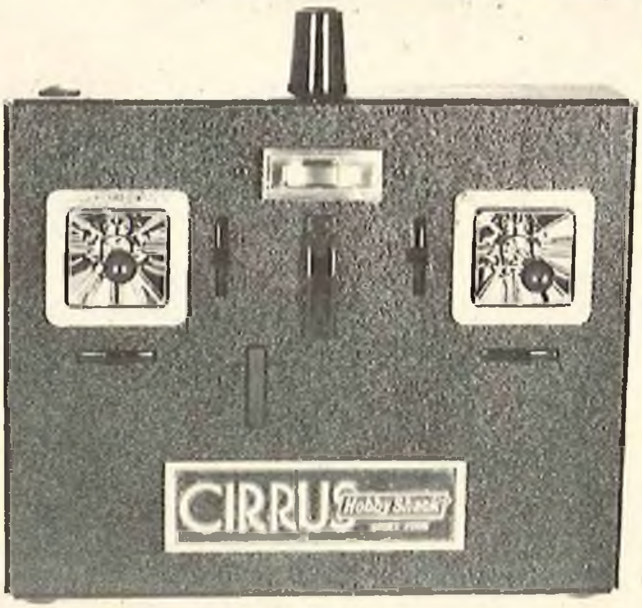
In this position, the battery can be charged from a conventional glow plug battery charger. For more realistic starts, your plane can be started at low throttle with the *charge-on* switch *on*. Just walk up to your plane, switch on the "ignition", and yell "contact . . ." □



# RADIO SPECS

R/C MODELER MAGAZINE

## HOBBY SHACK CIRRUS SPORT FOUR




### SPECIAL RECEIVER FEATURES

- Crystal uses fiberglass internal padding to reduce shock damage.
- RF, Antenna and OSC Coils are housed in shielded cases.
- Crystal filter in IF strip.
- Special linear AMP in decoder pulse AMP and regulator

**CIRRUS SPORT FOUR**
**MARKETED BY**
**HOBBY SHACK**
**18480 BANDILIER CIRCLE**
**FOUNTAIN VALLEY, CALIF. 92708**

## FEATURES

### TRANSMITTER

- Number Channels: 4.
- Case Material: Black textured vinyl covering aluminum case.
- Type Gimbals: Ball bearing closed gimbal for ultra smooth operation surrounded by chromed bezel.
- Type Pots: Highly reliable deposited carbon double wiper sealed.
- Power Supply: 8-AA Nickle Cadmium Pencells 450ma high charge rate type in sealed plastic holder.
- Type Meter: Expanded Scale Voltmeter.
- Modes Available: Mode I or Mode II.
- Frequencies Available: All 72 and 27 MHz.
- Weight: 2 lbs., 4 oz.
- Size: 7⅜ x 6 x 2.
- Unique Features: Special aluminum interior mounting bracket eliminating unsightly exterior screws.

### RECEIVER

- Case Material: Light high impact plastic molded.
- Size: 3/4" x 1-9/16" x 1-23/32".
- Weight: 2.2 oz.
- Type Decoder: 8-Bit Decoder, 2 low power IC's (TTL).
- Front End: Double Tuned.

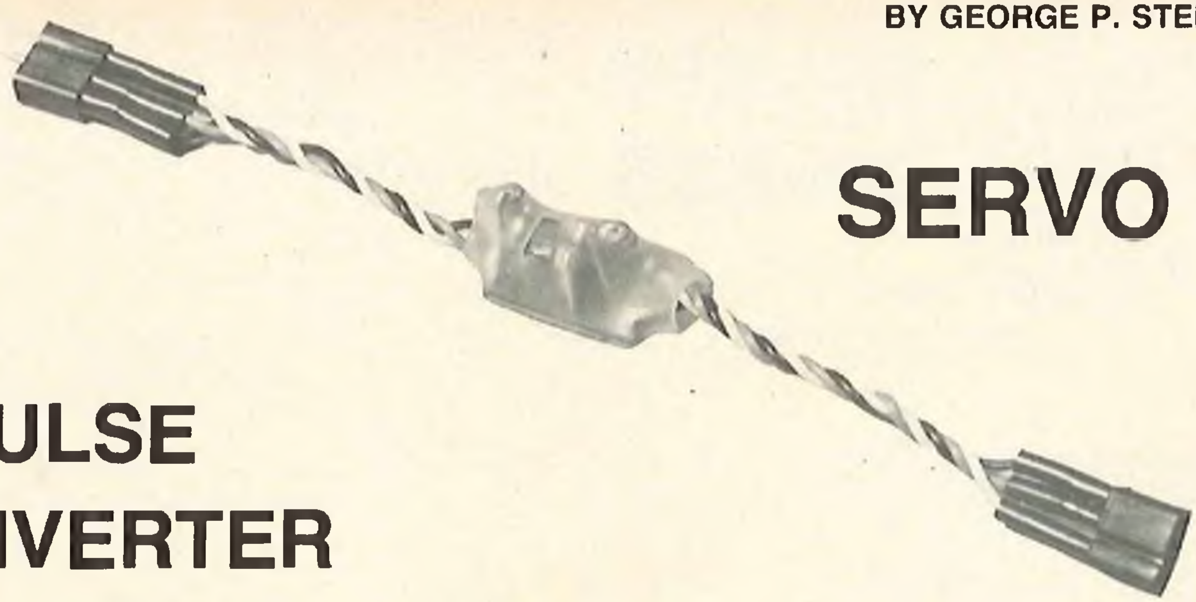
### SERVOS

- Case Material: Light high impact plastic molded.
- Size: 3/4" x 1-15/32" x 1-17/32".
- Weight: 1.4 oz.
- Output: Rotary ±45°.
- Output Controls: Wheels, blank wheel, arms.
- Type Amplifier: Monolithic packaged plus separate monolithic driver package.
- Motor Size: 16mm 10 ohm nominal impedance.
- Servo Options: CS-ICR right hand rotation and CS-ICL left hand rotation.

### SYSTEM

- Airborne Power: 4AA Nickle Cadmium Pencells 450mah high charge rate type.
- Type Connectors: Hobby Shack special "slanted" three pin type.
- Type Charger: Fused dual LED charger with independent circuit for receiver or transmitter or both charging.
- Servo Trays: 2 x 1; single stand up; single wing type.
- Shipping Container: Molded foam with individual component compartments.

BY GEORGE P. STEINER



# SERVO PULSE INVERTER

● Positive out going pulse — negative going pulse RC systems! Confused? I hear a lot of grumbling out on the field by RC'ers who would like to use a small Ace servo with an older EK or Pro-Line RC system. No problem! Just read on.

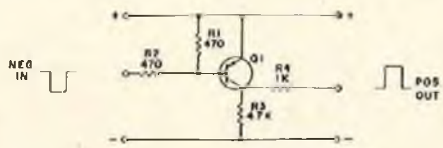
This last year, I have had several requests asking what could be done about it. How come a Heathkit servo cannot be made to work on a Pro-Line radio or similar negative pulse RC system?

I somewhat shied away from this request. Not because it was such a big problem, knowing it only took a simple one stage transistor to invert the signal, but I didn't care to ad lib something in the crowded confines of a servo. A manufacturers "no-no."

In looking into it further, one has to be somewhat sympathetic for an RC'er with an older negative pulse system (Controlaire, EK, O.S., etc.), and wants to use one of the new small positive pulse servos that are available like Ace, Cannon or Cox Sanwa. You, the RC'er might have two or more systems of different makes and, on occasion, will need a servo from one system to be used with the other. You don't want, at the time, to go out and purchase a new servo to fill your need for a one time thing. Would you like to make your RC system more flexible so servos from one system could be used with the other?

This can be solved with a neat little insertion of a device between receiver and servo. It is so flexible that hard wired modification can be avoided and the servo can be used on either a positive or negative pulse system.

The construction cost of the pulse inverter is nothing compared to the cost of purchasing one new servo, that might or might not be what you want. All it takes is four resistors, one transistor and a PC board to hold it together. You will also need two servo plugs that fit your RC system. The cost at the most will be about three dollars, plus plugs.




Q1 = PNP TRANSISTOR 2N3906 - HEP S0019

FIGURE 1

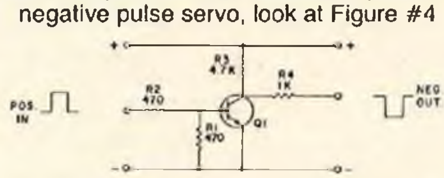
To see how this is done, refer to Figure #1 for a negative out pulse receiver to a positive in pulse servo.

The negative going pulse is received at R2. R1 keeps the base of Q1 transistor at cut off till the negative pulse through R2 drives the base negative. This, then, turns on Q1 and lets the collector at the junction of R3 and R4 become positive. This remains positive for the length of time the input negative remains on. The positive pulse then will appear at the output of R4.

It's just that simple, making the pulse change by 180 degrees and giving you a little lesson in basic electronics.

You should be able to interface EK-logictrol 11, EK MM3, EK Super Pro, F & M, Controlaire, MAN, O.S. and Pro-Line receivers by using the servo pulse inverter to Ace, Heath, Blue Max, Kraft, EK 73 or later, MRC, Micro Avionics, Royal, Orbit and World Engines midget servos.

Basic construction can go in two ways. Those of you who want to interface the other way, by coming out of a positive pulse receiver and looking into a negative pulse servo, look at Figure #4 for construction schematic, using Figure #2 for the basic layout of NPN transistor and resistors. Negative receiver to positive pulse servo construction will start by referring to Figures #2 and #3 for placement of parts and wiring.




Q1 = NPN TRANSISTOR 2N3904 - HEP S0015

FIGURE 4

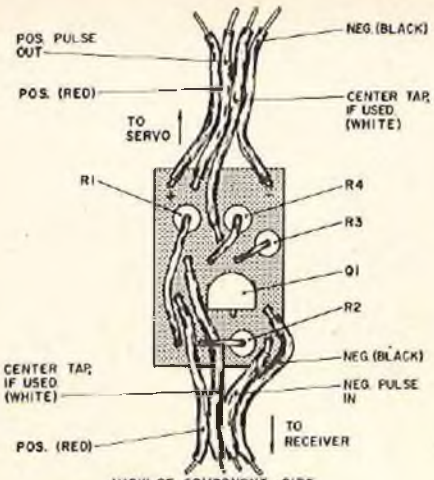
The size of the PC board is quite small, measuring less than 1/2" x 3/4". Figure #5 gives the PC board layout in the positive form. A place in the middle of the PC board can be used for a tie point of the center tap of the battery if used.

The Q1 transistor is a general purpose silicone type. Radio Shack #2034, HEP S0019 or 2N3906 can be used for the PNP in Figure #2. (Negative to positive pulse.) Radio Shack 276-2013, HEP S0015 or 2N3904 can be used for the NPN in Figure #4. (Positive to negative pulse.) The placement of Q1 transistor should be observed. Don't get the emitter, base, or collector in the wrong place. Some transistors could be reversed as far as the flat side is concerned, and that is shown in Figure #2.

Resistors R1 470 Ohm, R2 470 Ohm, R3 4.7K Ohm and R4 1000 Ohm are 1/4 Watt value. The circuit is not critical and 10% value resistors will work fine.

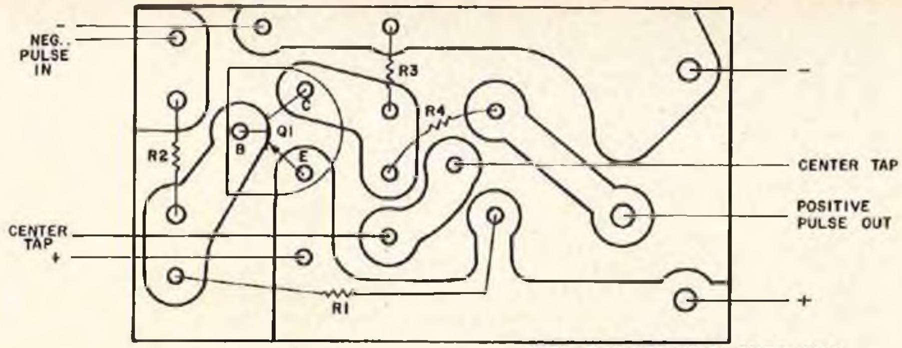
Your wire length for receiver to servo plugs should be kept short. There is no need to have them any longer than 2" in either direction from the inverter board. When you go to encase and package the pulse inverter, a short length of heat shrink tubing about 1¼" long does it up in real fine order. The size of heat shrink should be 5/8" to 3/4" O.D. to fit over the components and PC board. The MonoKote heat gun will shrink it up to almost water tight. Don't do this, though, until you have tested the inverter just in case you have trouble.

Now that I have led you down the garden path and you are all set to go out and get with it, here's a word of caution. Although this device has been tested with a few sets in my area with good results, I




VIEW OF COMPONENT SIDE

FIG. 2

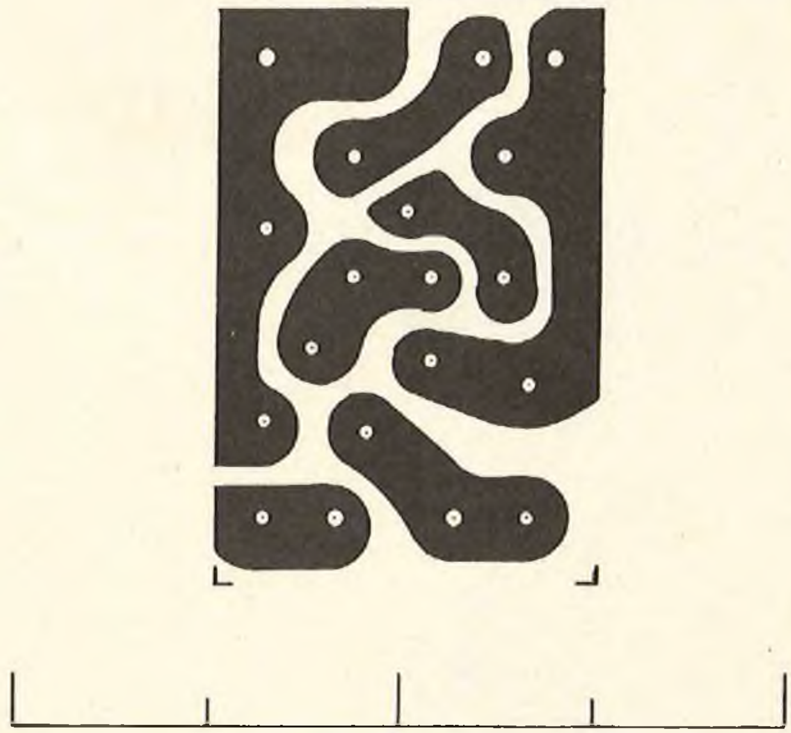



NOTE: FLAT SIDE OF Q1 COULD FACE OTHER WAY DEPENDING ON TYPE OF TRANSISTOR USED.

FIGURE 3

COMPONENTS FROM FOIL SIDE

**FIGURE 5**
**ACTUAL SIZE P.C. BOARD**
**(1/2" x 3/4")**



ONE INCH

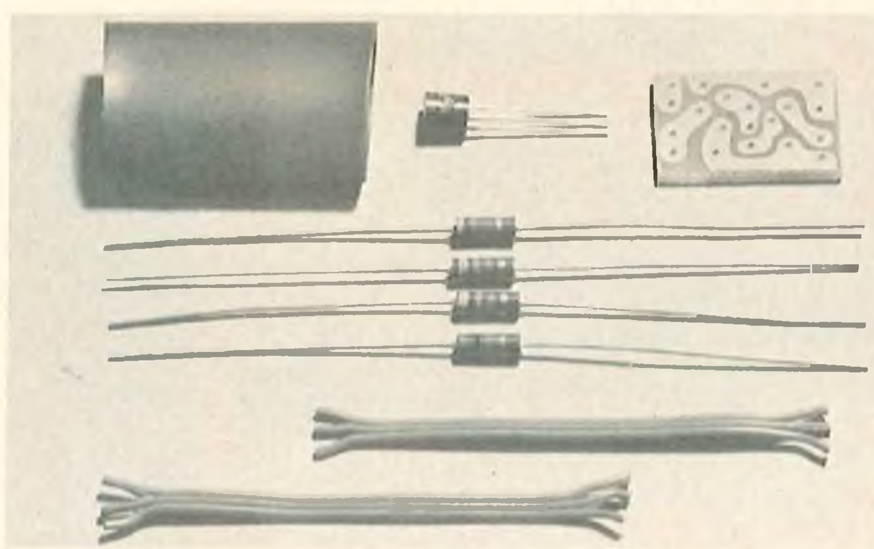
FIGURE 5

cannot guarantee complete compatibility with all radios to other manufacturers servos. Some older systems using 4 wire servos, become a little nervous when using a 3 wire type IC servo. Use it with discretion.

A suggestion: if you are not sure if your system would tolerate a new IC servo, would be to go ahead and build this little cheapie. What have you got to lose? Get one of your RC buddies who has the kind of servo you would like and plug it in and try it. It just might work and no harm will come of it. The pulse inverter is straightforward and cannot cause any damage to your RC system if properly built.

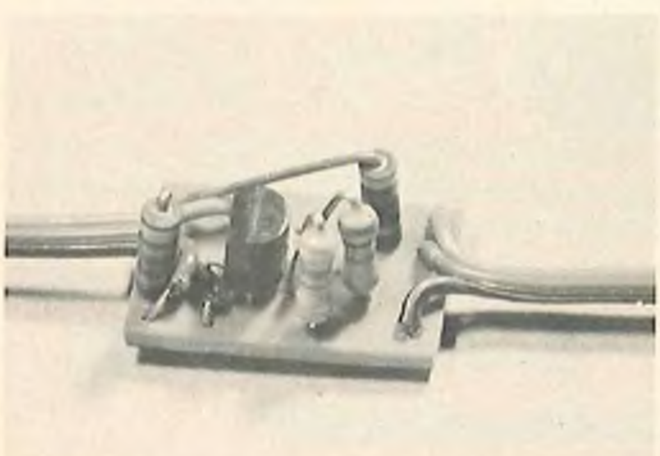
If you have any questions, I will be pleased to answer them for you. Those of you who would like a kit of parts that includes the PC board, can purchase them from me for $3.00. Please enclose a self-addressed stamped envelope with your request. My Address is as follows: George Steiner, 2238 Rogue River Drive, Sacramento, California 95826.

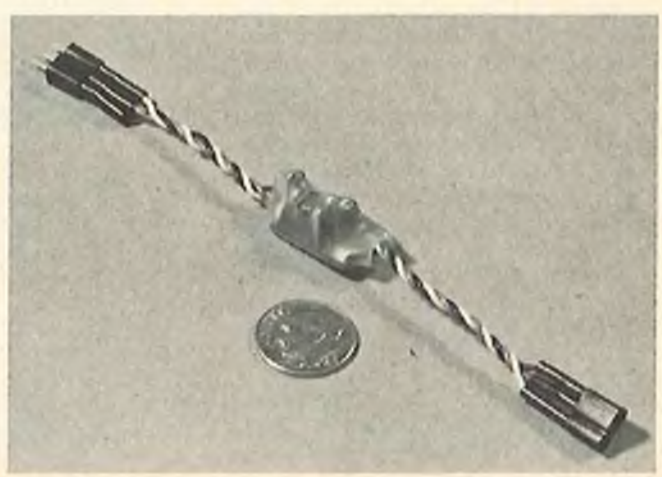
I would like to give credits to Norm Champ and Steve Pelandini for their help in assembling this project. Without them, I wouldn't be able to present this article in the form that it is. □



***The components needed to build the servo pulse inverter. Heat shrink tubing in upper left. Connectors not shown.***

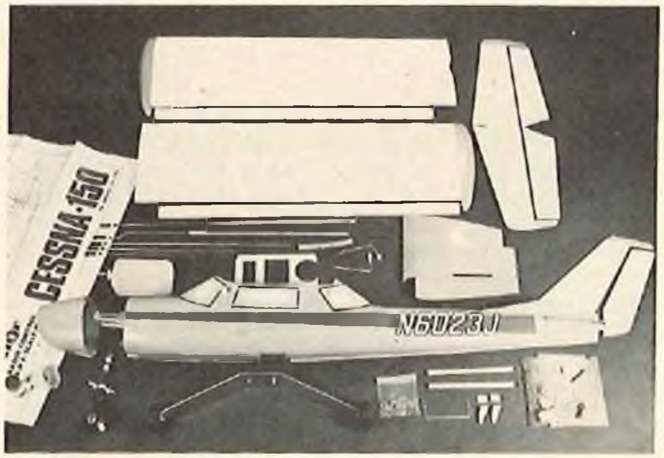
RIGHT: Q1 transistor in place. SECOND ROW, LEFT: R2 in place with Q1. RIGHT: R1, R2, and Q1 mounted on the PC board. THIRD ROW, LEFT: R1, R2, R3, and Q1 in place on the PC board. RIGHT: The completed board components. FOURTH ROW, LEFT: Completed board with components and wiring. RIGHT: Completed pulse inverter showing heat shrink tubing over components and Dean plugs. Note the small size.





# RCM PRODUCT TEST

## PILOT-HOBBY SHACK CESSNA 150




| 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 | | | NA | | | 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

● The Cessna 150, manufactured by Pilot Models of Japan and imported in the United States by Hobby Shack, is a Stand-Off Scale sport aircraft designed for engines in the .19 to .25 cubic inch range. This is a prefabricated, almost ready to fly aircraft. The wing span is 52" with a wing area of 420 square inches. A 15% symmetrical airfoil is used on the constant chord wing. A tricycle geared aircraft, the Cessna 150 requires 4 channels of control. The components of the model are prefabricated, requiring only final assembly. Our prototype required slightly less than 3 hours to assemble including radio and engine installations. The fuselage is vacuum formed from colored sheet plastic similar to ABS material and is completely finished with decals and the appropriate plywood reinforcement structures factory installed. The wing panels are built-up with balsa ribs and spars, and are covered with a heat shrinkable plastic covering material. The wing panels are joined with two dowels being epoxied into pre-drilled holes and the center joint is reinforced with pre-formed cover plates. The tail surfaces are sheet balsa, covered and capped with formed plastic tips. The one plan sheet has numerous exploded view drawings which completely explain all the assembly details. Japanese characters are used as legends and are backed up with English sub-titles, some of which can cause a slight chuckle. The kit is one of the most complete that we have seen and the quality of parts is second to none. The only items to be supplied by the modeler are engine, fuel line, radio, and plastic cement. The wheels, motor mount, finished pushrods, and all hardware itmes are included in the kit. A Fuji .19 Schneurle ported ball bearing R/C engine with muffler was used for power while a Hobby Shack/Cirrus 4 channel radio provided guidance control. The finished model is most attractive — in fact ARF Cessna 150 is a model that anyone will be proud to park on the flight strip along with the scratch-built ships. It is a very stable, easy-to-fly aircraft and is also highly maneuver-

to page 118

## SPECIFICATIONS

Name ............ CESSNA 150
Aircraft Type ............ Sport (ARF)
Manufactured By ............ Pilot/Hobby Shack
18480 Bandilier Circle
Fountain Valley, California 92708
Mfg. Suggested Retail Price ............ $52.99
Available From ............ Direct from Mfg.
Mfg. Recommended Usage ............ Sport/Trainer
Wing Span ............ 52 Inches
Wing Chord ............ 8¼ Inches
Total Wing Area ............ 420 Square Inches
Fuselage Length ............ 35 Inches
Radio Compartment Dimensions ............ (L) 10" x (W) 2¾" x (H) 4"
Wing Location ............ High Wing
Airfoil ............ Symmetrical
Wing Planform ............ Constant Chord
Dihedral ............ 2 Inches
Polyhedral ............ DNA
Stabilizer Span ............ 20 Inches
Stabilizer Chord (Incl. elev.) ............ 5" (Avg.)
Total Stab Area ............ 100 Square Inches
Stab Airfoil Section ............ Flat
Stabilizer Location ............ Mid Fuselage
Vertical Fin Height ............ 7¾ Inches
Vertical Fin Width (Incl. rud.) ............ 5" (Avg.)
Mfg. Rec. Engine Range ............ .19-.25
Recommended Fuel Tank Size ............ 200cc
Landing Gear ............ Tricycle
Recommended No. Of Channels ............ 4
Recommended Control Functions ............ Rud., Elev., Throt., Ail.
Basic Materials Used In Construction:
Fuselage ............ Plastic & Plywood
Wing ............ Balsa
Tail Surfaces ............ Sheet Balsa
Hardware Included In Kit ............ Very complete
Plan Size ............ 30" x 42" (1 sheet)
Building Instructions on Plan Sheets ............ Yes
Instruction Manual ............ No
Construction Photos ............ No
Kit Includes ............ Finished Parts
Mfg. Rec. Flying Weight ............ 60 Ounces
Wing loading based on rec. flying wt. ............ 20.7 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly ............ 60 Ounces
Wing Loading ............ 20.7 oz./sq. ft.
Covering & finishing materials used ............ Heat shrink Plastic
Wing & Tail covered by Mfg.
Engine Make & Disp. ............ Fuji .19
Muffler Used ............ Fuji
Radio Used ............ Cirrus 4 channel
Tank Size Used ............ 200cc

# TACH-TRON HELICOPTER CONTROL SYSTEM

**THIS MODEL HELICOPTER GOVERNOR-COLLECTIVE PITCH CONTROL SYSTEM IS A REVOLUTIONARY BREAK-THROUGH IN RC HELICOPTER FLYING AND ONE THAT HAS BEEN THOROUGHLY FIELD TESTED BY SEVERAL OF THE COUNTRY'S TOP CHOPPER PILOTS.**

**PART THREE**

## BY AL IRWIN (N61E)

● The form shown below is on the first page of the Tach-Tron instructions. It is filled in by Royal Electronics as the unit is shipped. It may be referred to, if in the future, the modeler wishes to change his radio or helicopter.

**____Kit ____Governor 6TTTTT ____Positive Pulse ____Negative Pulse**
**Timings ____1-2 ____2-1**
**It has________ (Brand) connectors, and is for 3 wire type servos.**
**The read head is connected for ______CW, ______CCW shaft rotation. See pictorials for correct lead connections.**
**______Timing wheel included ______Diameter hole.**
**______Purple servo wire with contact mounted, for Kraft or similar plugs.**
**______Purple servo wire without contact mounted, for World Engines or Deans, solder type connectors.**

The general information section contains some very important data about your throttle servo, with a feedback lead installed. Do not overlook this section.

When flying with a governor, the ideal mixture setting is a four cycle running of the engine without load, and it should *just* break into a two cycle at lift off pitch loading. This condition should exist after the engine is up to temperature and should be checked *after* a couple minutes of hover at two or three feet.

In flight, if the engine is lean and sags, you should reduce the pitch, which will, in turn, allow the governor to decrease the throttle. This is the same basic practice as is used with coupled pitch/throttle machines to protect your engine. The use of muffler or pump pressure on your fuel system is *highly recommended.* It will give you a *very even run,* from high to low fuel levels.

With new engines, get some break-in time on the engine, before trying actual flight. Be sure it will sustain a hover without over-heating, before you try horizontal flight.

If you have been flying fixed pitch, or coupled throttle/collective, you will not be accustomed to having the throttle on an alternate transmitter control. Running and testing the engine will help you get used to this, so that if you have a tip over, you will be able to quickly cut the throttle.

Figure 1 shows the location of the three adjustments in the Tach-Tron. The one labeled RPM is used to set the rotor speed when the system is in operation. The one labeled Sense, is a sensitivity adjustment. This is used to set the amount of throttle applied for a given rotor speed change. The last adjustment which is called Cal, is used to calibrate the servo control portion of the Tach-Tron to match the channel timings of the transmitter being used.

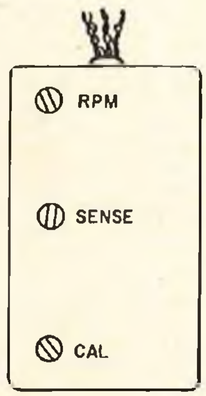



FIGURE I

With these forethoughts in mind, you can now proceed with the installation.

The instructions in this section are used with the Tach-Tron kits when assembly is completed. They are also used with the factory wired units, and are divided into three sections. They are: Installation, Calibration and Flight. *Read each section completely, before proceeding!*

### Installation
### Governor Versions

(1) Compatibility check — Select the receiver auxiliary channel which will be used for throttle control. (Pitch will be on the main stick or lever.) Plug the Tach-Tron 3 pin connector into this channel. Plug the intended throttle servo into the Tach-Tron 4 pin connector. Turn on the system and operate the channel control to test for servo operation. If there is no movement, check to see that you are using the correct receiver channel. If there is servo movement, it should be normal as if the servo were plugged directly into the receiver. Move the control to the position for full throttle. Be sure that when this is done, the servo selected has the correct rotation for throttle advancement in this direction. When this has been verified (control still full throttle position), insert a 1/8" screwdriver into the Tach-Tron case hole marked Cal and slowly turn the pot in the CCW direction. As this is done, you should reach a point at which the servo begins to *retard* from its full throttle position. If this occurs, the Tach-Tron

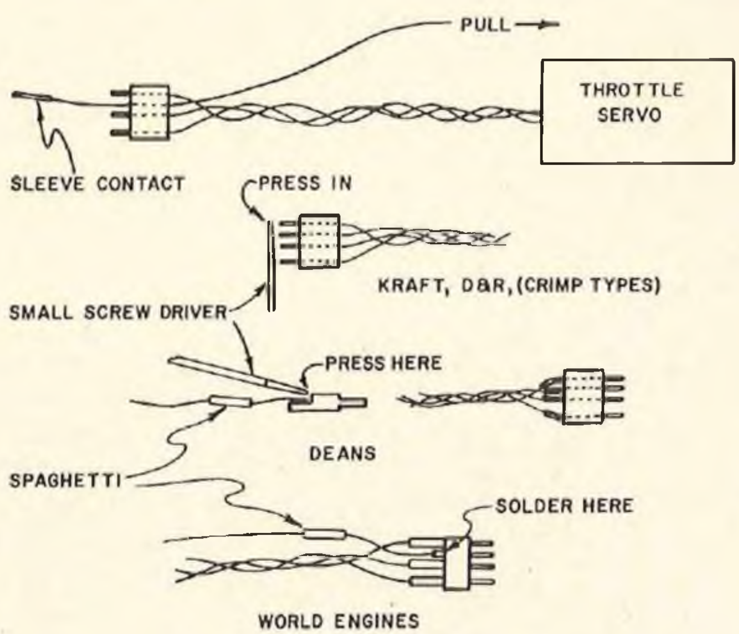



FIGURE 2

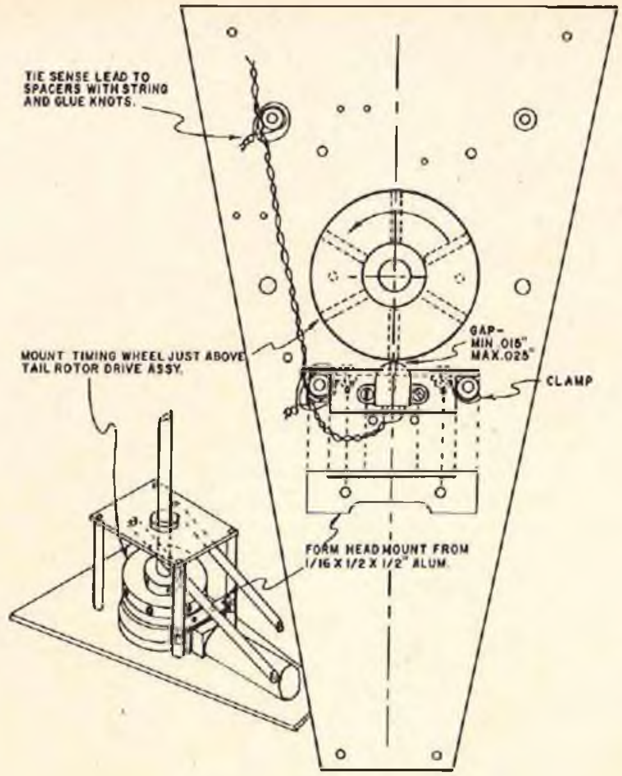



FIGURE 3

DUBRO SHARK

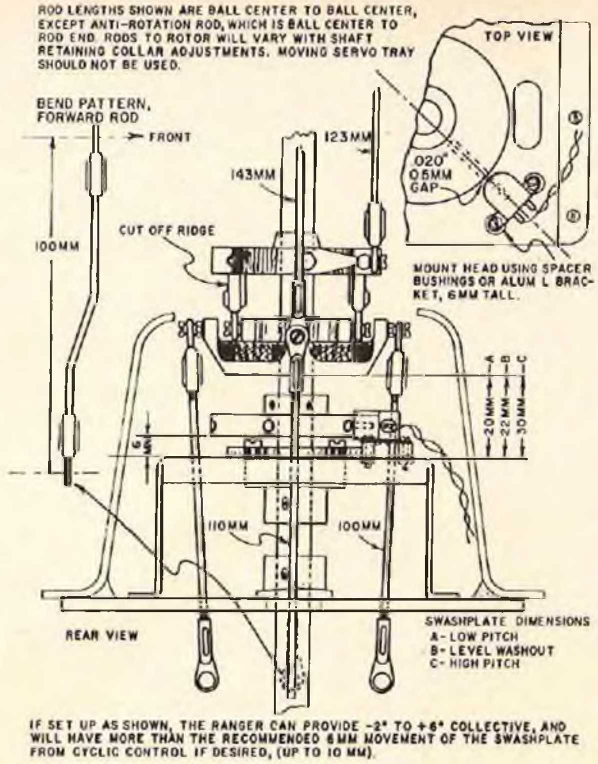



FIGURE 4

KAVAN-BELL JET RANGER

matches your system and you may proceed with the next step. If this does not occur, return the pot to the original setting and set the transmitter control to the idle position. Now repeat the above test, again turning the pot CCW. If this *advances* the servo from its idle position, the Tach-Tron and your system are not compatible. Should this occur, the Tach-Tron should be returned so that it can be changed to match your system, unless your transmitter has reversible channels.

(2) If the tests performed in Step 1 did not move the servo, it is possible that the channel timings are slightly beyond the range of the Tach-Tron Cal adjustment. Should this be the case, the system

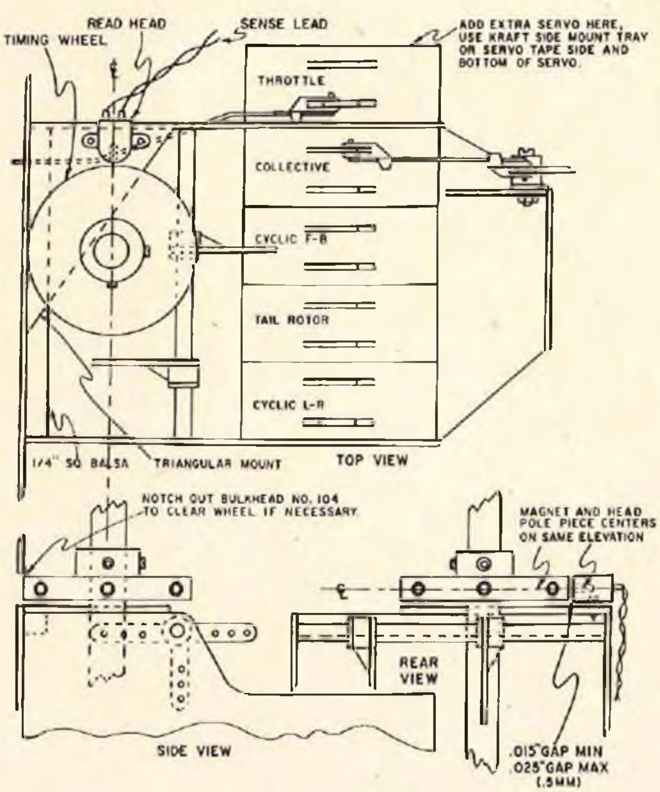



FIGURE 5

GRAUPNER 212 TWIN-JET

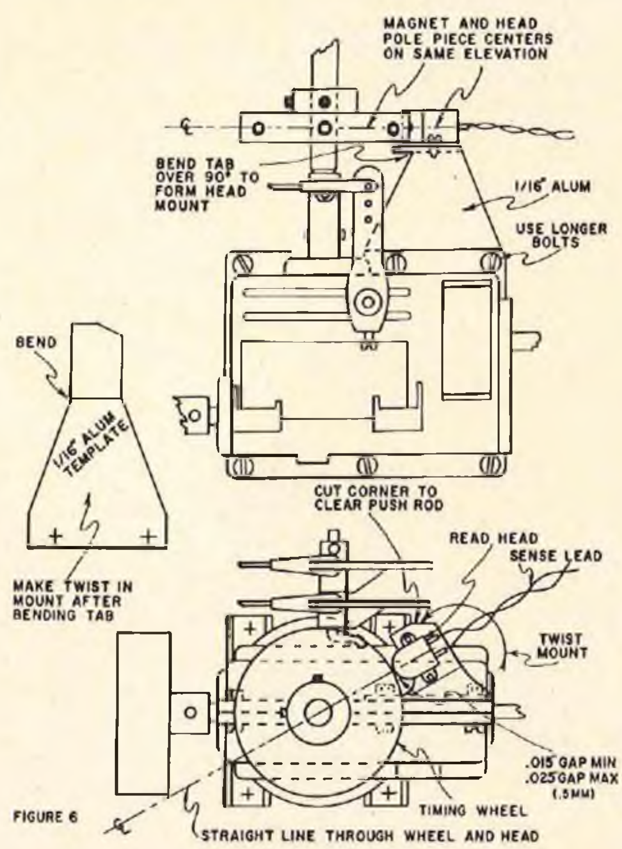



FIGURE 6

GAZELLE-COBRA-DS22-BIO5-(SCHLUTER MECH)

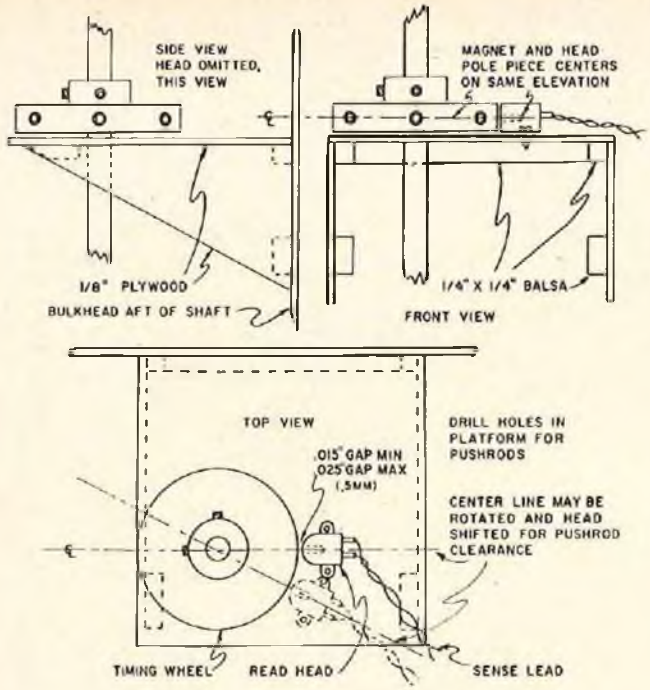



FIGURE 7

ALTERNATE DS22

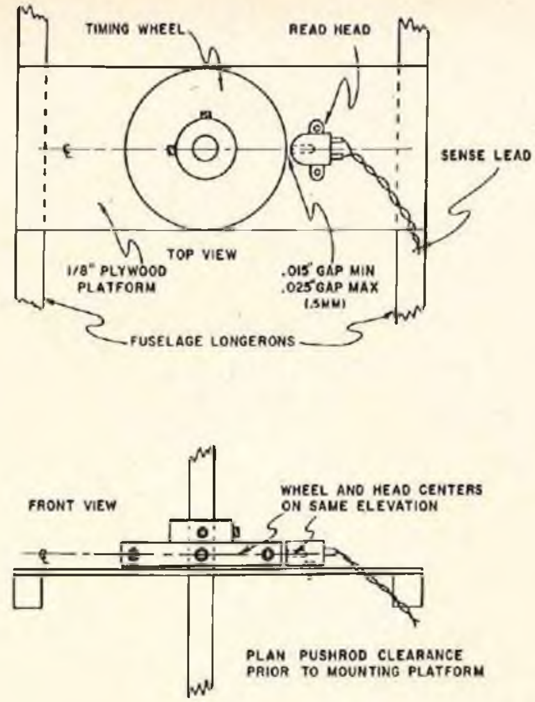



FIGURE 8

ALTERNATE SCHLUTER COBRA-(HUEY)

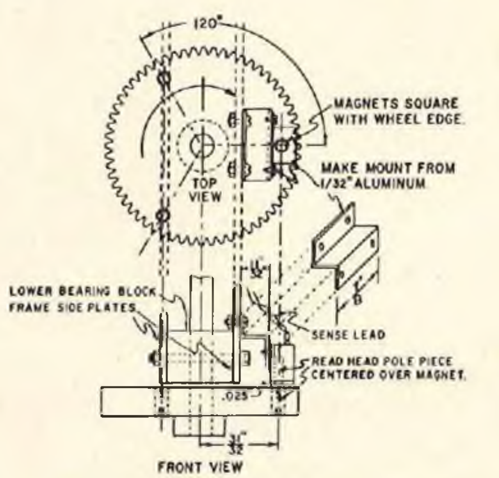
usually functions correctly following feedback installation. In this event, leave the Cal adjust set to its full CCW end of travel and proceed with the next steps. Step 13 describes the correct final adjustment. Servo "slow travel" mentioned in that step should occur at the high throttle end of servo travel. If it does, the Tach-Tron is compatible with your system, and it is functioning correctly.

(3) If your servo feedback lead *has not* been factory installed, you may proceed with the installation as described in Step 4. If the lead has been factory installed, you can omit Steps 4 through 12 and proceed to Step 13.

(4) Turn the system on and advance the throttle control to its full throttle position. Using the Cal adjust pot, retard the throttle servo slightly from its full throttle position. To do this, you should turn the pot CCW. Since the timings vary with different systems, the amount that the Cal retards the servo will vary also. Set Cal to where the servo is retarded, shut the system off, and unplug the servo. If the servo does not retard, leave Cal adjust at the CCW end of travel and proceed to the next step.

(5) Remove the servo case bottom. Note that there are two *insulated* terminals on the motor which have leads connected coming from the servo amplifier. One of these will be used to obtain feedback for the governor. (Refer to Figure 2.) If your system uses Multi-Con type plugs such as Kraft or similar types, check to see if there are 4 pins in it. The unused one must be removed. This can be done by inserting the end of a small pin or straightened paper clip into the

**to page 105**




INSTALLATION ON 40 POWERED MACHINES USING A 3 MAGNET SYSTEM IS SHOWN ON THE SUPER BABY IN THE ABOVE DRAWING. THE ADJUSTABLE RANGE OF THE TACH-TRON WITH 3 MAGNETS IS 1500 TO 3000 RPM. SENSE LEAD POLARITY MUST BE REVERSED FROM THE NORMAL CW ROTATION CONNECTIONS, AS THE MAGNETS APPROACH THE HEAD FROM THE OPPOSITE DIRECTION WHEN MOUNTED AS SHOWN ABOVE. MAGNETS ARE CUT FROM 1/8" X 1/8" X 3/4" 1200 GAUSS MAGNETS SEE TEXT

FIGURE 9

SUPER BABY

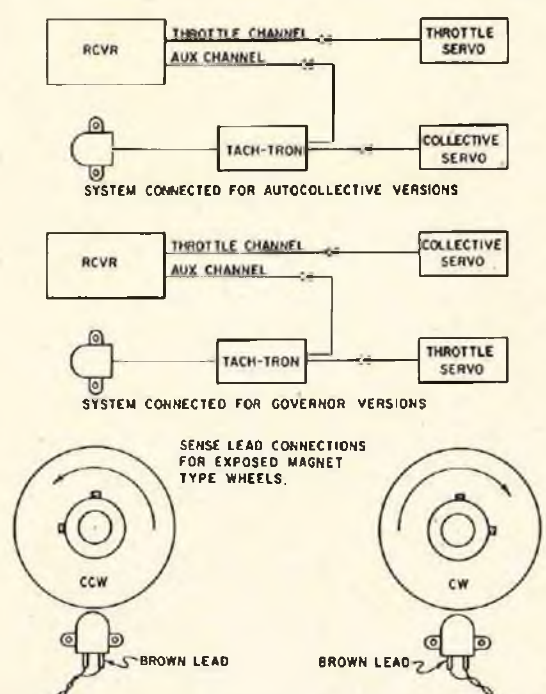
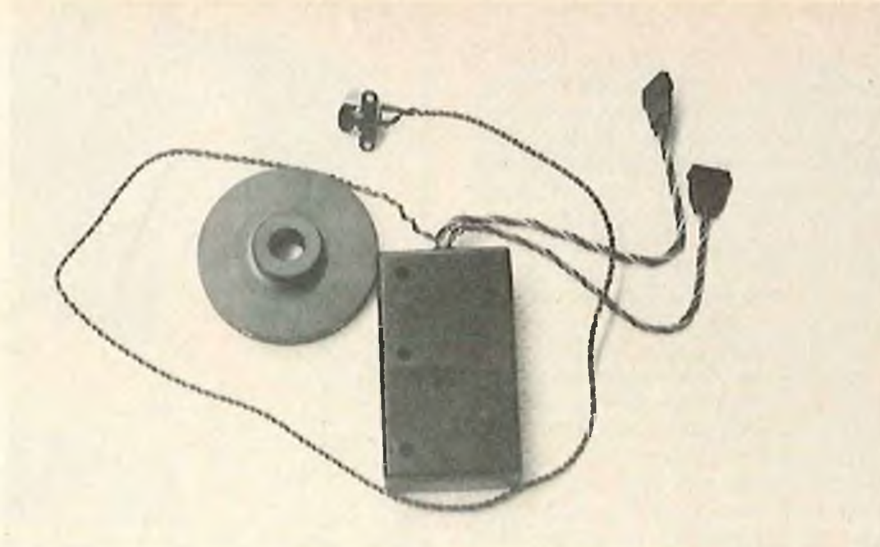


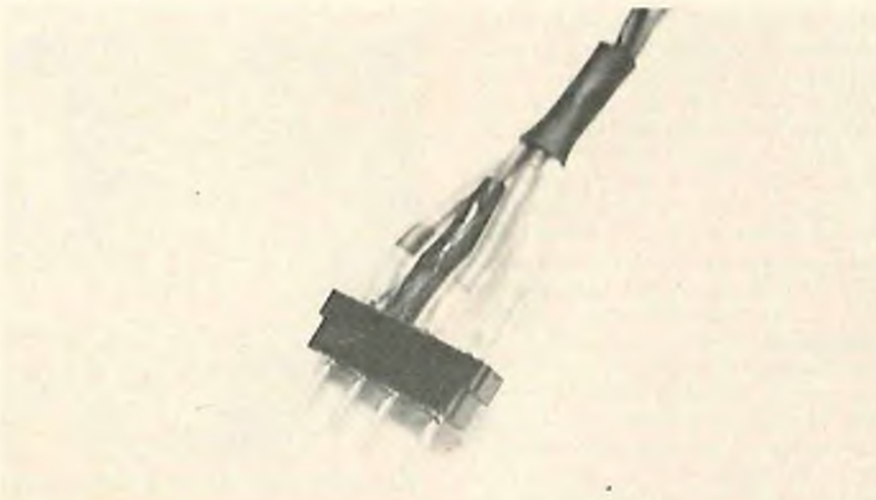

FIGURE 10

# INSTALLING THE TACH-TRON IN THE DU-BRO SHARK EQUIPPED WITH THE DU-BRO EXPERT COLLECTIVE PITCH HEAD

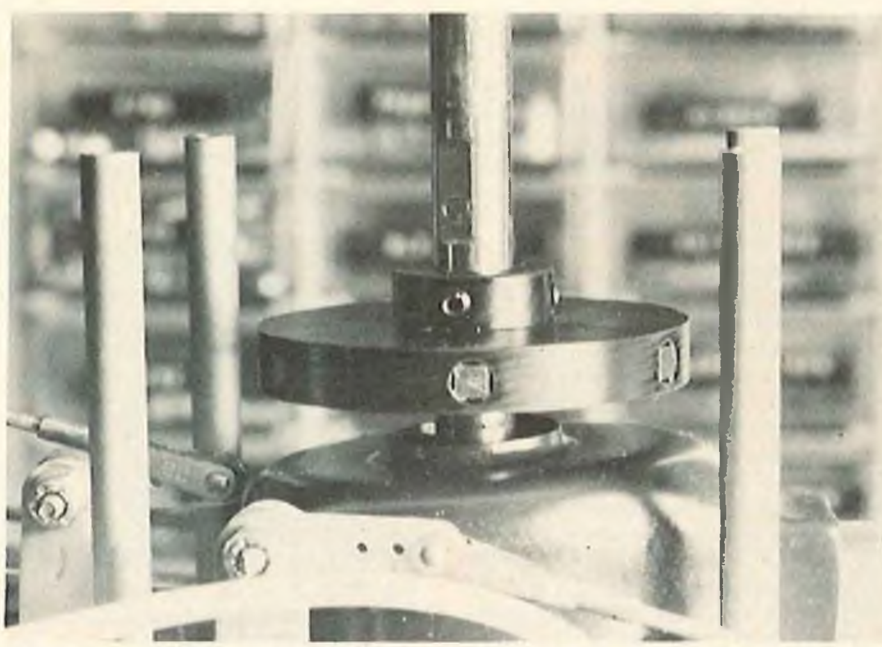
## BY GRADY HOWARD



*The Tach-Tron as it came from the factory with plugs installed to match your radio system. The magnetic wheel is 2" in diameter.*



*Feedback wire is the dark wire that is added to your servo.*



*The timing wheel is placed just above the bevel gear cover on the main shaft.*

● Installation of the Tach-Tron is quite easy and very simple. Even adding the feed-back wire to the throttle servo proved to be a simple task.

After tying the Shark to the top of a picnic table, I started the final adjustments with the engine running. I first set my rpm's at 4200 on the tail rotor by checking them with a Heath Thumb-Tach. When everything was working as described in the instructions, I decided to unleash the snarling beast and see what would happen. I rubber banded a 20" piece of 2" x 4" wood across the front of the skids to balance the Shark without the fuselage. This allows for easy access to the control links and the tail rotor to collective mixing arm. To my surprise, the Shark lifted off of the ground much smoother than I had ever been able to do before. I had to do some adjusting on the collective tail rotor mix because of the constant high rpm's.

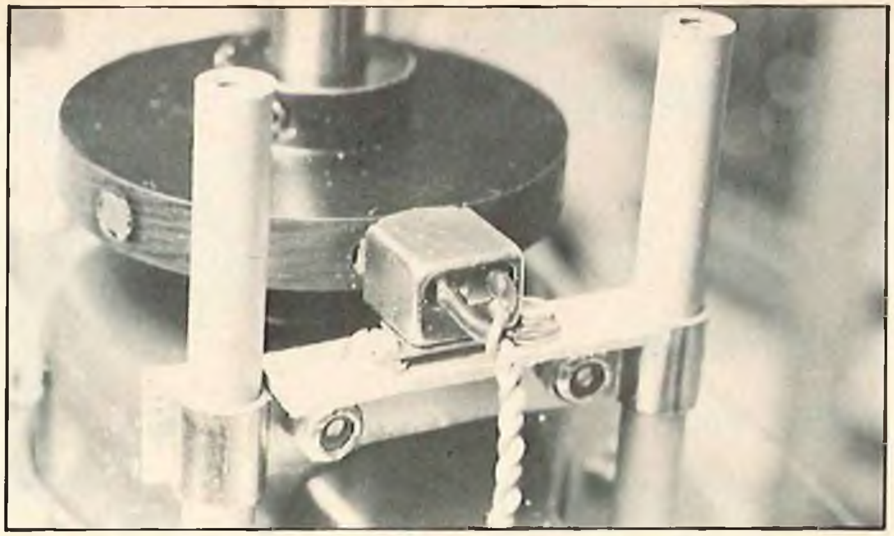
After about 5 minutes of lift-offs and slow flying, my engine began to run hot. I tied the Shark back to the table and re-adjusted the rpm's. The 4200 on the tail rotor that I had previously set was just too much for the engine to handle at a constant rpm. This setting was putting the main rotor at 1050 rpm. I adjusted the rpm adjust on the Tach-Tron so that I tached 4000 on the tail rotor to give me 1000 on the mains. After adjusting the pitch on the main rotor blades for about 4 degrees negative to a high of about 4 degrees positive, I went back to try more flying. This setting proved to be very satisfactory. The engine ran cooler and the pitch was enough to give me about 10 ft. per second of climb from a hover at full pitch. This is a very realistic rate of climb.

I used the World Engines Expert 7 channel radio, and I connected the throttle to the lower left auxiliary channel and the pitch control to the throttle stick. I wanted a trim on the throttle so a little wiring change was in order. I called World Engines and talked to Jim Lanterman about moving the trim function from the throttle stick to the auxiliary channel. This was accomplished very easily; and, if I can do it from a phone call description, then it must be easy!

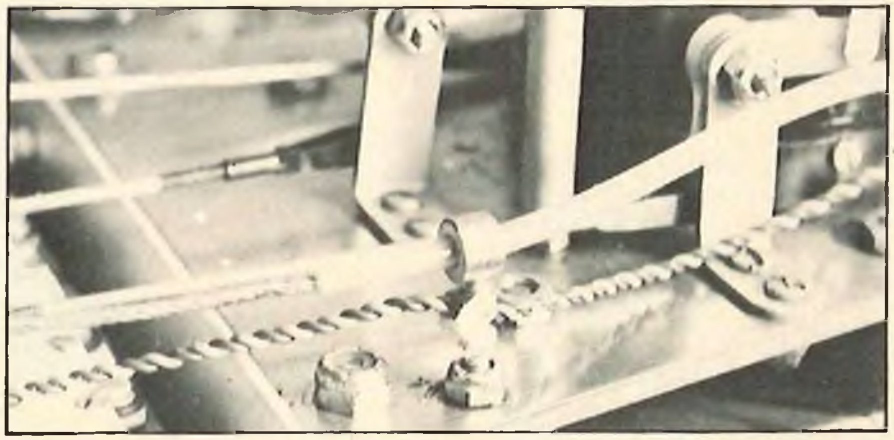
Remove the trim lever from the transmitter by taking the two screws out of the front of the case. Remove the two wires from this pot and solder them together. This is a white wire and a purple and white wire. Now wrap the solder joint with tape to insulate it. Now remove the white wire from the auxiliary channel and re-solder this wire to the center post on the trim pot. Now using an additional wire, solder this wire to the center post on the auxiliary channel and route it up to the trim pot and solder it to the back post on this pot. You now have no trim on the throttle stick assembly, but you now have trim on the auxiliary channel. Set all levers in neutral and turn on your radio. If your servos are not centered, then you will have to center the pots on the transmitter. For the stick assembly, you move the stick toward the ouside of the case and you will see a brass screw slot in the stick assembly. Using a screwdriver, turn this adjustment, and hold the stick in center. You will see the servo move. If it goes away from center, then reverse the direction that you are turning the screw. When the collective servo is centered, then stop turning. Now to adjust the auxiliary channel, you must loosen the screw on the lever. Now with a small screwdriver, turn the slot inside the brass collar. When your throttle servo is centered, then tighten the locking screw.

Next, you must set your controls so that at low throttle and high trim you have an idling motor, but at low trim the motor stops. Next adjust the collective so that at full pitch and low pitch there is no binding as you do not have a trim to relieve the bind.

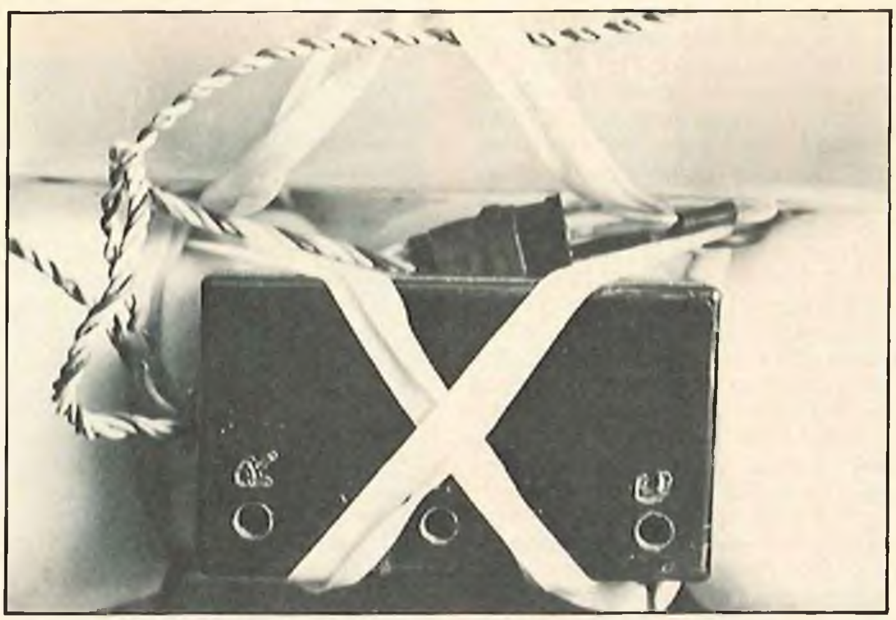
After everything was set up like I wanted it, I did more flying and, believe me, it is sheer pleasure. The constant rpm's will let you fly at 1" of altitude and never vary as the pitch will stay put and the rpm's stay constant. I can see great possibilities with this system of rpm control. I have even dreamed of inverted flight as the Tach-Tron will hold rpm's and a negative pitch will create a positive pitch when inverted. However, it would seem that the control on cyclic would be reversed. (Must give more thought to this!) As for now, I am just enjoying the Du-Bro Expert Collective Head with the Royal Electronics Tach-Tron designed by Al Irwin. ☐



*If you cannot find a piece of angle aluminum, then one can be made from flat 1/16" stock as shown here. This is then clamped to the stand-offs at a height where the pick-up head is in line with the magnetics on the timing wheel. Note the .025 gap between the head and wheel. Flat washers can be used under the head to allow for a true alignment with the wheel.*



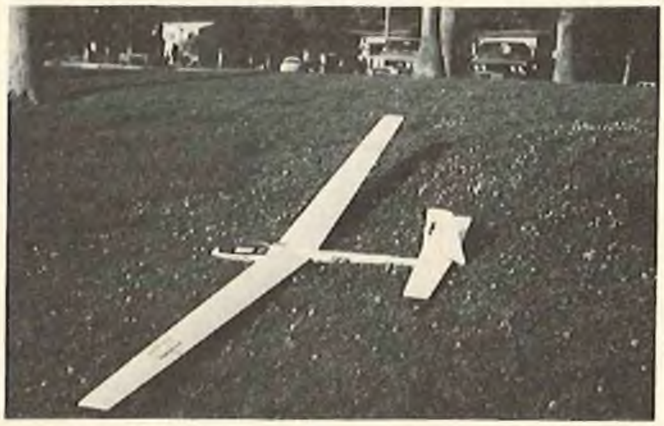
*Twist-ties from your bread bag work fine to secure the head wires into place.*



*The Tach-Tron unit fits snugly under the rubber bands that hold the radio receiver and battery pack with the Shark body off; the Tach-Tron can be adjusted very easily in this position.*

# RCM PRODUCT TEST

## PEERLESS CORP.
## LIBELLE 2700



● The Libelle 2700 sailplane is imported by Peerless Corporation and priced at $84.95. This Open Class sailplane has a wing span of 106" and a total wing area of 709.9 square inches. The fuselage is formed of ABS plastic while the wing and tail surfaces utilize balsa, plywood, and ABS plastic. The hardware included in the kit consists of four pre-bent wing rods, two stabilizer wires, two ABS wing roots, two ABS stab roots, two ABS stabilizer half ribs, stabilator horn, two eye screws, a rudder horn, tow hook, two wing joining tabs, ballast, ballast compartment plug, six brass wing tubes, five brass stabilizer tubes, two eyelets for the stabilizer bearing, the canopy, pushrod dowels, spring loaded canopy latch, rudder hinge and decals. There are two sheets of plans, and a five page instruction manual. Since this is an import from Japan, we felt that more detailed and carefully translated instructions would be beneficial to the builder. In addition, vertical grained webbing for the wing spars are definitely a must although the kit instructions suggest horizontal webbing. We would also like to see aligning jigs for the fuselage so that it can be built absolutely true. We found that the die-cutting in some portions of the wing, stab, and rudder ribs were of poor quality. On the other hand, the ABS fuselage is easily assembled and works up to a beautiful finish. Our prototype weighed 48 ounces ready-to-fly for a wing loading of 9.7 oz./sq. ft. We used K & B Superpoxy paint on the fuselage with Super MonoKote on the wing, rudder and stabilizer. An Ace RC system was used for guidance. The recommended Center of Gravity and tow hook location worked perfectly. The Libelle 2700 is very maneuverable and handles well in thermals. It also handles beautifully on the slopes with a slight bit more down trim than that used for thermal flying. □

| 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 | | | | ● | | | | | | | |

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

## SPECIFICATIONS

Name .......... Libelle 2700
Aircraft Type .......... Sailplane
Manufactured By .......... Peerless Corporation
3919 M Street
Philadelphia, Penn. 19124
Mfg. Suggested Retail Price .......... $84.95
Available From .......... Retail Outlets
Mfg. Recommended Usage .......... Competition Sailplane
Wing Span .......... 106 Inches
Wing Chord .......... 6½" (Avg.)
Total Wing Area .......... 709.9 Square Inches
Fuselage Length .......... 46.5 Inches
Radio Compartment Dimensions .......... (L) 10" x (W) 2½" x (H) 2½"
Wing Location .......... Shoulder Wing
Airfoil .......... Flat Bottom
Wing Planform .......... Double Taper
Dihedral .......... 6⅜ Inches
Polyhedral .......... NA
Stabilizer Span .......... 27 Inches
Stabilizer Chord (incl. elev.) .......... 4¾" (Avg.)
Total Stab Area .......... 129 Square Inches
Stab Airfoil Section .......... Symmetrical
Stabilizer Location .......... 1¼" Above Fuselage
Vertical Fin Height .......... 10 Inches
Vertical Fin Width (incl. rud.) .......... 5½ "
Mfg. Rec. Engine Range .......... NA
Recommended Fuel Tank Size .......... NA
Landing Gear .......... Skid
Recommended No. Of Channels .......... 2
Recommended Control Functions .......... Rudder and Elevator
Basic Materials Used In Construction:
Fuselage .......... ABS Plastic
Wing .......... Balsa, Ply, ABS Plastic
Tail Surfaces .......... Balsa & ABS Plastic
Hardware Included In Kit .......... Very complete
Plan Size .......... 33" x 49" (2 sheets)
Building Instructions on Plan Sheets .......... No
Instruction Manual .......... Yes (5 pages)
Construction Photos .......... No
Kit Includes .......... Die Cut Parts
Mfg. Rec. Flying Weight .......... 45 Ounces
Wing loading based on rec. flying wt. .......... 9.1 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly .......... 48 Ounces
Wing Loading .......... 9.7 oz./sq. ft.
Covering & finishing materials used .......... Superpoxy, MonoKote
Engine Make & Disp. .......... NA
Muffler Used .......... No
Radio Used .......... Ace
Tank Size Used .......... NA

# Power Boating

**DAVID THOMAS**

● This month I have a pretty mixed bag for you, as you can see; but then, as the old saying has it, "variety is the spice of life." Before we start, a quick word about the World Endurance Racing Championships. I do not, at this time, have any photos, due to a most unfortunate mix-up, so I will keep the bulk of the report until next time. However, you will no doubt be pleased to know that an American, Ed Fisher of Seattle, IMPBA, won the B Class Championship by nearly 30 laps, from Johnny Freund of the Canadian Golden Triangle Marine Modellers. Ed also came second in C Class, by only 4 laps, to Daniel Guestyn of South Africa. I feel it only fair to point out that Ed would have won this too, if he had not had some mechanical trouble. The A Class was won by Mohl of West Germany, with that popular Italian, Virgilio Moro, second. Congratulations, fellows, that was some fine racing!

I didn't exactly shine, taking a 4th in C, a 4th in B, and an absolutely catastrophic 11th in A. Don't ask me what happened — when I find out, I'll let you all know!

**Hughey Propeller Pitch Gauge.**

◆ ◆

Before my trip to South Africa, I received a very useful device from Ed Hughey of Hughey Boats. This is a propeller pitch gauge, and a very clever item it is, too. As you can see from the photo, it consists of a plastic beaker — which serves as a container for all the bits and pieces — with a scale in degrees on the side of it. The prop to be checked is fitted onto the vertical shaft — there are two, of differing diameters, provided — and the vertical arm on the cam is set to touch the blade surface at its lowest point. The arm is then moved over the surface of the blade, and the reading taken off the scale on the beaker. This reading is then checked on a chart provided which gives you the exact pitch of your propeller, without giving you a headache! A chart showing theoretical boat speeds for different pitches is also provided.

This product will appeal to a lot of modelers who are interested in accurate checking of their prop pitch, since it enables them to calculate modifications needed to achieve a desired result, instead of the old method of "suck-it-and-see." It is also good for checking that both blades of a prop have the same pitch; and you'd be surprised how many of them don't. It is excellent, also, for those who make their own props, and here I am thinking of scale enthusiasts, using electric and steam power, since they will be able, with this gauge, to build a prop to give the boat an exact scale speed. And needless to say, the hydro experimenters amongst you will be delighted with this one.

Ed also sent me a Hughey 50 Hydro to try out; thanks Ed, that's a clever kit concept.

While on the subject, you will be glad to know that the Octura Wildcat is, at last, well under way. One thing I can state at this time — the die-cutting of the wood used for the construction of this model is among the best I have ever seen. The whole thing goes together like a construction game; all you have to do is run epoxy onto all the joints. I assembled the whole boat, with the exception of the skins of course, dry, on the kitchen table, and it is so designed that everything interlocks, and stays together without glue. This makes for a solid and robust model.

◆ ◆

Now on to another subject — electric boats. There is a growing movement in England towards this form of propulsion, due no doubt to the stringent noise laws and also to the cost of glo-fuel in Europe. We just received a very interesting letter from Dave Wooley, one of the top British electric boys, and I propose to reproduce it here:

**Dave Wooley's electric 'Bullet 30'. 500 watts, speed around 30 mph with hydro type hull, speed of over 40 mph possible.**

**British Performance Electrics**

*My name is Dave Wooley and I would like to introduce myself as an ardent follower of Fast Electrics. In the U.K., performance electric boating is growing in popularity owing, perhaps, to that old bogey, noise. This, unfortunately, has started to restrict the use of I.C. boats whereas electrics have come along in leaps and bounds over the past five years with no restrictions.*

*The European governing body, Naviga, adopted the weight limit some four years ago for electric events, those being up to 1 kilogram (FIE 1 kilo) and over 1 kilogram up to 15 kilogram (FIE + 1 kilo), but in the U.K., we saw the need for alternative class to the very small 1 kilo, and bigger 15 kilo, so we introduced a 2½ kilogram class which so far has proved immensely successful.*

*The 1 kilogram class generally means that one has to have ultra light equipment in order to gain the really fast speeds that are required. We use the very small 45 amp/hr 1.2 volts Nicad which is very light and small, providing just sufficient power for two runs on the Naviga triangle. This type of hull is generally used for speed work where running times are not the criterion.*

*Motors can vary from Sea Wasps to almost any small powerful electric motor.*

*Hulls are from about 18" to 20" long, and designs vary from country to country but, generally, they are all mono hulls with the addition of spray rails for extra lift.*

*The 2½ kilogram class allows for the use of the readily available 1.2 amp/hr 1.2 volt Nicad which provides a good source of power at low cost; cells can cost as little as $2.00 each.*

*Motors are, again, more readily available than, say, three years ago. Now you can pick up a very powerful motor for as little as $18.00. Motors vary from the Sea Wasp 6 and 12 volt to the Bullet 30 24 volt, these two being the most popular for this class.*

*In this class, the most popular event is the multi racing followed closely by speed.*

*The European speed event follows the principle that a boat has to be able to turn through 180° while remaining flat out. This, of course, reduces the speed on the straight. By the time one has completed one corner of the speed triangle, you're into the next corner. All-in-all it works well, but time on the speed triangle for I.C. boats has remained pretty static for some four years now, whereas electric boats, run over the same course, have been getting closer to the I.C. times and, in one particular case, beating a very fast Italian O.P.S.*

*into second place; but that particular boat was competing in the Unlimited FIE over 1 kilo class.*

*However, most 2½ kilogram boats can very easily beat a standard 3½cc boat powered by a Veco .19 or O.S. for example.*

*Following the European trend, Multi Boat Racing is the most popular form of RC boating in Britain and electric multi is also the most popular form of electric boating. Unknown outside Britain, we have pioneered Fast Duration Electric Multi with the 2½ kilogram class, and now feel confident enough to extend the meager "4 minute per heat" to "10 minute per heat" at the speed of a Veco .19. It may seem slow to American readers, but 20 mph with an electric for 10 minutes was almost impossible two years ago.*

*The next and final class is the really fast Unlimited. Although it can be expensive, it's also very challenging in a European contest, i.e., the Soviet Union, East and West Germany and Britain are all challengers for this very prestigious event.*

*As I said before, speeds of these machines are getting faster and faster and, by the next European Championships, the electrics will have passed the I.C. boats.*

*These vary from Ray Kroker's 800 watt Sea Horse to Holder's fantastic 2000 watts, while in-between you get motors like the Bosh, popular in Germany and the Soviet Union. To power these powerful motors, Nicads still prove very useful sources of energy, although the rather expensive Silver Zinc cells are still used in Continental Europe.*

*Hulls are once again mono, since there seems to be very little development in any other form of hull; for example, Stepped or Hydro. Perhaps it's because of the need to turn through this 180°. However, with the immensely powerful motors now available, I fear mono hulls will prove to be unable to stay on the water even on the straight.*

*Well I hope my very condensed summary of British Electrics will be of interest to American boaters and perhaps, one day, we may be competing alongside electric racing teams from the U.S.A. in, say, a future World Boating Championships.*

*Sincerely,*
*Dave Wooley*

For those of you who are not in the know, there are two triangles used by Naviga, the speed and the steering/scale triangles. A look at the diagrams will show you just what is involved.

Figure 1 — Naviga Speed Triangle.

Figure 2 — Naviga Steering Triangle.

The speed triangle involves six 120° turns and a 180° turn, all taken flat out — and believe me, this is not easy. Dave didn't say anything about the steering course, but I have put it in for interest. There are two steering categories, electric and internal combustion engines, with no limitations on power in either case. The boat has to pass between the buoys without touching them at all. If it does, penalties are awarded. The course is timed, and the scoring is a mixture of pts. awarded for clean passes between the buoys, and total time taken. This is a relatively new course, since the old one had two-meter gaps at the three points of the triangle, and was much easier — the record on the old course being 34 seconds. The hardest part of the current triangle is the top gate, farthest away from the pilot, and directly in line with him. Here it is almost imperative to slow down. And, even then, he has to be good to get through there.

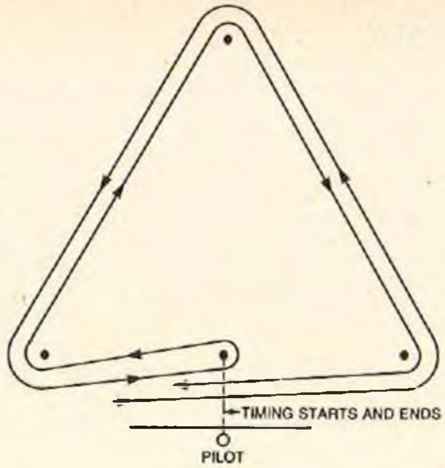



**FIGURE 1**
**NAVIGA SPEED COURSE**
**30M EQUILATERAL TRIANGLE**

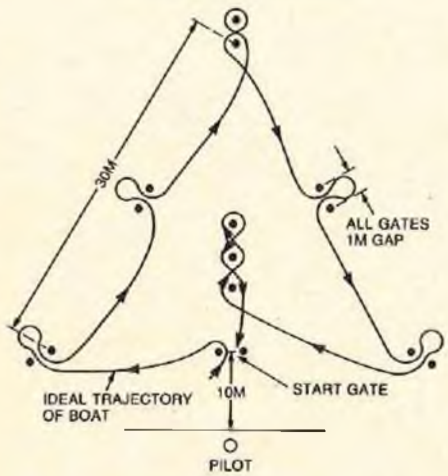
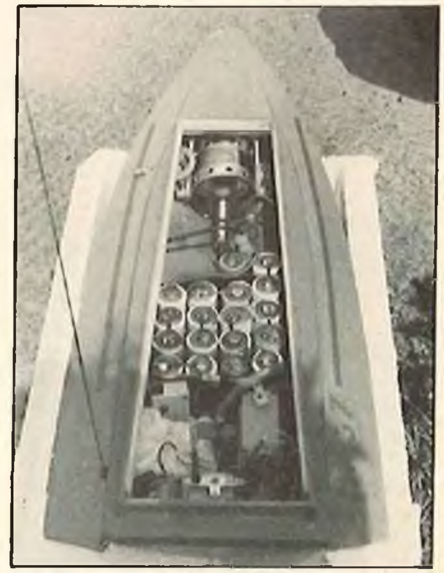
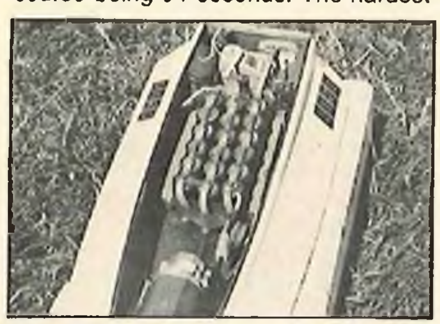



**FIGURE 2**
**NAVIGA STEERING COURSE**
**EQUILATERAL TRIANGLE WITH 30M SIDES**



***2½K multi-hull Sea Wasp 12. Will run for eight minutes.***



**American 'Sea Ram' on 2:1 gear mount. Water cooled nicad cells. 22" length, runs at around 600 watts.**

The European record in the Unlimited Speed Class is in the region of 20 seconds for electric boats, and 16 seconds for internal combustion power. This demands a boat which will turn equally well in both directions, which will hold the rev's in the turns, which have a general radius of about one meter at full speed, and which, of course, will go very fast. An additional problem for the i/c boat is, that as of 1977, it must not run at more than 80 dbs, and no nitro is allowed.

While I cannot quite agree with Dave that the electric boats will do better than their i/c counterparts in Kiev in 1977, it is certainly true that they will be very close to them, in all but one aspect. This is the autonomy. Whereas an i/c boat will run for a length of time, depending on the capacity of its tank — currently, with endurance boats, up to 45 minutes on a full tank — the electric boat is limited by the capacity of the cells powering it. One obvious solution is to use bigger cells, but this doesn't really work because speed is a function of weight and wetted area and, normally, as you increase the weight, you also increase the wetted area. You then get to the point where speed drops off a lot, and even to the point where the extra weight changes the comportment of the hull from planing to almost displacement, and then you are using too much power for the speed achieved, and you either cook the motor, or get back to the original autonomy. A vicious circle!

Dave and a few other really keen enthusiasts are working on this and, at this time, they are producing boats that will run for nearly fifteen minutes at about

**to page 104**

# Racing At Random

FRED REESE & DON DOMBROWSKI

● Tonight, while watching Baa Baa Black Sheep, I couldn't help but feel the desire to build a Corsair. I know this same feeling is going on in the minds of many others watching those graceful aircraft. Unfortunately, when we scale one down to QM size, it appears to be fat, losing the appeal of the long slender nose, especially if we are considering the Corsair for a racer. "Slenderizing" the airplane would enhance the appearance and possibly make an effective racer. At one inch to the foot, the wing span would be roughly 41", the length 34", and the wing area 276 square inches. The scale cowl would be about 4" wide and 4½" deep as it is not round. Reducing these dimensions to 2¾" wide and 3¼" deep, the front begins to approach the frontal area of Formula One style racers. The cowl is rounded in the front which would leave an opening of only 2" in diameter, which when plugged with a 1½" spinner, is really quite streamlined. Corsairs were raced with spinners.

The inverted gull wing would permit a very short landing gear which would reduce drag. The wing would need to be enlarged to at least 300 square inches. By increasing the chord by 3/4", the area would be 306 square inches, which is sufficient since the span is 41". The Corsair wing would then be very close in size to the DS Rickey Rat, which turned the fastest time at last year's Nats when flown by Tom Christopher. The Corsair, and many other designs, can and would, be competitive provided they are built light, flown well, and have competitive engines. The engine and prop are still the most important part of the prop-engine-airplane package.

☆

Dan Kane and Joe Zdankiewicz and Don did some prop testing on both a Rossi and a new Cox Conquest .15 during the Thanksgiving weekend. Joe started the Championship race with a Cox but changed back to his Rossi later in the day as it would turn better with the props he had. The next day they set out to find out what it would take to make the Cox competitive. After trying several props it was evident the Cox was not unloading in the air as well as the Rossi when propped at 19,000 on the ground. By gradually reducing the pitch and diameter of a 7 x 5 Rev Up the ground rpm began to rise and the engine began to unload better in the air. Both engines needed to be backed off slightly from peak ground rpm by about 500 rpm for maximum performance in the air. When ground rpm peaked at 21,000, and then backed off 500, the Cox would unload faster out of the turns and would stay unloaded longer on the course than the Rossi on the same prop. Since it was not under racing conditions, we don't know how fast either was moving, but it was fast. The new Cox Conquest .15 will take some experimenting, but it will be competitive.

Some notes on the new Cox .15 which, if known, should not cause problems. On some engines the crankpin can touch the backplate and rub. If the crankpin touches, or the backplate is scored, there is a spacer ring on the front of the craftshaft which must be shortened slightly to move the crankshaft forward in the case. Also a portion of the crankshaft, larger than the threaded protion, protrudes past the thrust washer a few thousandths which may cause spinners with metal backplates not to come in full contact with the thrust washer. This will cause the spinner to spin off when the starter is applied or, possibly, cause the engine to throw a prop. This is not a problem, if you know about it, and relieve the back of the hole in the spinner backplate to allow it to seat properly.

☆

Modified props are not currently legal for Quarter Midget racing by the AMA rules but this may change next year. Meanwhile many groups are allowing prop modification in local competition. The following is an article by Bob Root on QM props from the QMRC newsletter from Southern California. Incidentally, Bob Root is the 1976 QMRC high point winner.

### Modified 1/4 Midget Props

The purpose for going to the trouble of modifying a prop is not so much to improve the maximum achievable performance but to allow this performance with every prop. Although there is a psychological barrier amoung new racers against using modified props there shouldn't be. The fact is I currently test run as many as a dozen stock props to find one that is capable of keeping up with Tom Christopher (sort of a reference point). I imagine that he and the other top competitors are doing the same thing. With prop modifications allowed it should be possible to use maybe 80% of the props we buy rather than 10%.

**FIGURE 1**
TYPICAL AIRFOIL

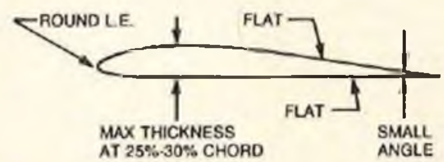
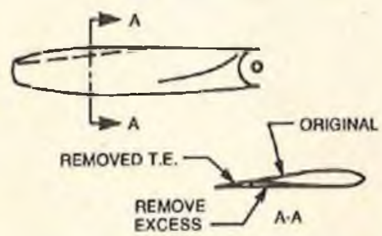



**FIGURE 2**
EXAMPLE OF PITCH REDUCTION




Because of the large amount of prop breakage which occurs in 1/4 Midget racing, I think it will be important to find a good prop which doesn't require too much work. My prop re-work will be more concerned with improving the poor running props than finding some exotic prop shape that takes two hours to carve.

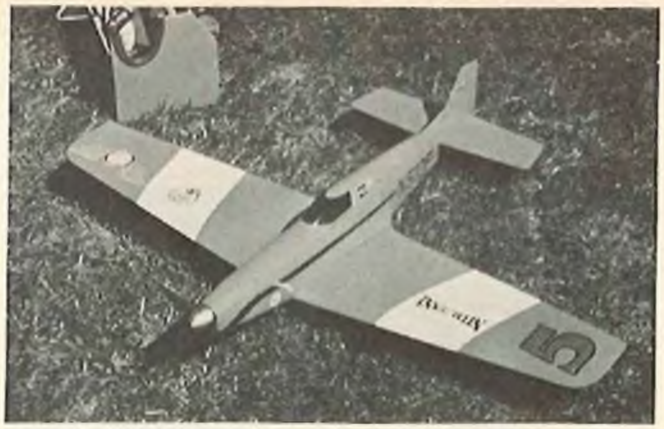
Since no prop re-work has been allowed in this area in the past, it will be sometime before most of us settle on the prop which works best. This discussion will, therefore, have to be more concerned with (A) what prop parameters are important, (B) how they can be improved, and (C) the types of props I think may work well, rather than the hypothetical world beating "optimum" prop.

#### A. Important Characteristics

The following is a list of things to look for when modifying props:

1. Airfoil shape: Based on Formula I experience, the blade shouldn't be too thick (maybe 10% thickness) with a flat bottom except near the leading edge and a thin trailing edge. (See Figure 1.)
2. Blade width: Time will tell! I feel the racing shapes will work best such as the narrow Rev-Up or Top Flite pylon shapes. Too wide = low RPM. Too narrow = slow (inefficient) top speed

*Lynn Stevens holds up team mate Denis Bielick's (NMPRA-QM AVP NCE) aircraft for identification.*




*John Fotiu's Miss Paranoia with a green fiberglass prop photographed at Rough River.*


*LEFT: Wayne Yeager poses with his "Proud Bird". It's one of the family of Rivets. Check the tail configuration. ABOVE: Winner, Bob Reuther accepts First Place Trophy from George Zink (President, NMPRA-QM) as CD "Shorty" Holsclaw and Louisville RCC President Jack Steyn approve. Rough River 1976 Races a total success.*

*Dave Latshas aircraft compliments his van's color scheme.*

*Jim Gager and a Toni. Note those special wing tips.*

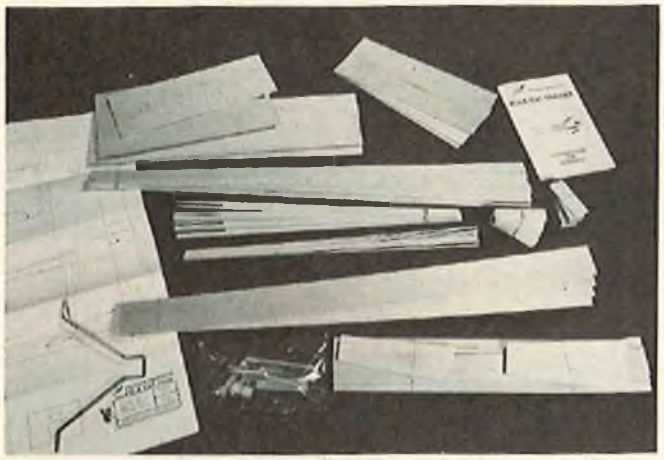
and acceleration. I don't feel that the tip shape is important, but a raked tip is rumored to reduce flutter if this is a problem.

3. Pitch and Diameter: This will also require experimentation, but the 7-5 props seem to be close (they measure approximately 7 diameter, 4.5 pitch). A pitch gauge is a necessity if any correlation between prop performance and actual size is to be achieved. I have seen 7-5N Rev-Up props with a measured pitch as low as 4.2 and as high as 4.9. The optimum prop is found in the air but I shoot for a ground RPM of 21,000 to 21,500 for my Rossi (using my Tach readings). I think a constant pitch along the entire blade is best, but the tip pitch can be reduced to increase

**to page 103**

# RCM PRODUCT TEST

## PRATHER PRODUCTS POLE CAT



● The Pole Cat is a trainer type aircraft manufactured by Prather Products and is priced at $29.95. The Pole Cat has a wing span of 56" and a total wing area of 420 square inches. The fuselage length is 32". Designed for .10 to .19 cubic inch displacement engines, it is designed for rudder, elevator, and throttle operations. The fuselage is built of light weight plywood while the wing and tail surfaces are of conventional balsa construction. The hardware package included in the kit consists of control horns, all screws, landing gear wire, and bracket. A 21 page instruction manual with construction photos is included in the kit. This is an extremely easy kit to build and the plane will assemble in 10 to 15 hours. All hardware is supplied with a very complete parts list and instruction manual. There is no doubt in the builder's mind as to the construction sequence if he follows the manual. In fact, the latter even lists the tools needed to build the aircraft as well as the parts needed to complete the finished project. It is extremely easy to build and, with a solid plywood fuselage, can take any hard landings a beginner can give it. We found no modifications to be necessary, however the manufacturer recommends that the entire kit be assembled with epoxy while we feel that standard aliphatic resins or other adhesives can be used for general construction. Our prototype weighed 47 ounces ready-to-fly for a 15 oz./sq. ft. wing loading. It was covered with white Solarfilm on the fuselage, stab, fin, and rudder; with midnight blue Solarfilm on the wing trimmed with DJ's gold Pin Stripe. The engine used on our prototype was a Profi .20 with Profi muffler. An EK-logictrol radio was used for guidance. The Pole Cat is available from retail outlets. □

| 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 | | ● | | | | | | | | | |

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

## SPECIFICATIONS

Name ........ Pole Cat
Aircraft Type ........ Trainer
Manufactured By ........ Prather Products
1660 Ravenna Avenue
Wilmington, California 90744
Mfg. Suggested Retail Price ........ $29.95
Available From ........ Both Mfg. and Retail Outlets
Mfg. Recommended Usage ........ Basic Powered Trainer
Wing Span ........ 56 Inches
Wing Chord ........ 7 Inches
Total Wing Area ........ 420 Square Inches
Fuselage Length ........ 32 Inches
Radio Compartment Dimensions ........ (L) 7" x (W) 3" x (H) 4"
Wing Location ........ High Wing
Airfoil ........ Flat Bottom
Wing Planform ........ Constant Chord
Dihedral (each tip) ........ 2½ Inches
Stabilizer Span ........ 18 Inches
Stabilizer Chord (incl. elev.) ........ 4¾"
Total Stab Area ........ 85 Square Inches
Stab Airfoil Section ........ Flat
Stabilizer Location ........ Mid-Fuselage
Vertical Fin Height ........ 6½ Inches
Vertical Fin Width (incl. rud.) ........ 4¾ Inches
Mfg. Rec. Engine Range ........ .10-.19
Mfg. Rec. Fuel Tank Size ........ 4 Oz.
Landing Gear ........ Conventional
Recommended No. Of Channels ........ 2-3
Recommended Control Functions ........ Rudder, Elevator, Throttle
Basic Materials Used In Construction:
Fuselage ........ Plywood
Wing ........ Balsa
Tail Surfaces ........ Balsa
Hardware Included In Kit ........ All hardware supplies
Plan Size ........ 1 sheet, 24" x 38"
Building Instructions on Plan Sheets ........ No
Instruction Manual ........ Yes (21 pages)
Construction Photos ........ Yes
Kit Includes ........ Die Cut Parts
Mfg. Rec. Flying Weight ........ 40-48 Oz.
Wing loading based on rec. flying wt. ........ 15 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly ........ 47 Ounces
Wing Loading ........ 15 oz./sq. ft.
Covering & finishing materials used ........ Solarfilm, Pin Stripe
Engine Make & Disp. ........ Profi .20
Muffler Used ........ Profi
Radio Used ........ EK Logictrol
Tank Size Used ........ 4 Oz.

# MORANE SAULNIER
## TYPE 'L' PARASOL

### A SEMI-SCALE SPORT THREE CHANNEL AIRCRAFT FOR .19-.25 ENGINES

BY MIKE HOLLISON

● This model grew out of a desire to fly a semi-scale WW I plane that was quick to build, easy to fly, and would pass as a 'scale' model at a distance of twenty feet and traveling at a speed of about 15 mph!

The Morane-Saulnier Type 'L' filled the bill perfectly — there is only one wing to build; the fuselage is little more than a box; and, unlike its full-sized counterpart, the model is easy to fly. The full-sized machine, a French observation plane, was tricky on the controls, relatively fast for its time (about 70 mph), and carried no offensive armament, save for a light carbine and whatever other make-shift devices the pilot cared to add.

The fame of this little craft owed much to one such device; six small bombs dropped by Sub-Lieutenant R.A.J. Warneford on the massive German Zeppelin, LZ.37. The Zeppelin crashed in flames, and Warneford was awarded the Victoria Cross for his action.

Construction of the model should present no problem to anyone who has built a couple of R/C planes before. The stabilizers have been increased in size, and the all-moving tail surfaces of the full-size aircraft replaced by conventional rudder and elevator. Bracing wires have been ommitted and the centersection struts simplified.

**ABOUT THE AUTHOR**

**Mike Hollison, designer of the Type 'L' Parasol Morane Saulnier, began modeling at the age of 26 in 1973. Beginning with control line, he advanced to radio control in 1974. A resident of Canada, his main interests are in Sport RC aircraft. His first magazine article was published in 1974.**

**Fuselage**

Begin by cutting two fuselage sides from 3/32" hard balsa and gluing 1/32" ply doublers fore and aft. Glue the 3/16" square balsa stringers and spacers to the fuselage sides and cut slots for the horizontal stabilizer. Cut the engine bulkhead from 1/8" ply and drill for the fuel feed outlets and throttle pushrod. If an engine mount is to be used, drill the ply for the mounting bolts; otherwise, cut out the holes for the spruce engine bearers and epoxy these in place.

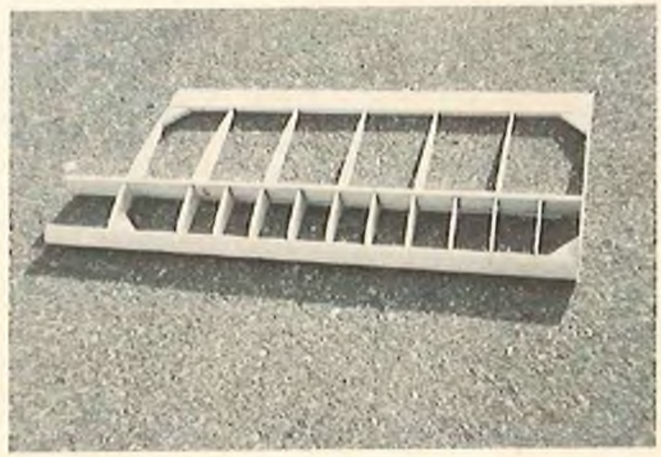
Epoxy the bulkhead and 3/16" square balsa spacers to the fuselage sides, ensuring that all is square. When dry, epoxy the balsa tail block to the bottom of the fuselage.

Bend the centersection struts from 3/32" diameter wire; then sew and epoxy to the 3/16" sheet panels as shown. Bind and solder the wing support wire to the struts, and epoxy each panel to the inside of the fuselage. The 4 ounce tank should be installed at this point. Carve and sand the top decking forward of the cockpit and glue in place. Add the top and bottom fuselage sheeting from 3/32" soft balsa, and 1/4" sheet immediately ahead of the landing gear area.

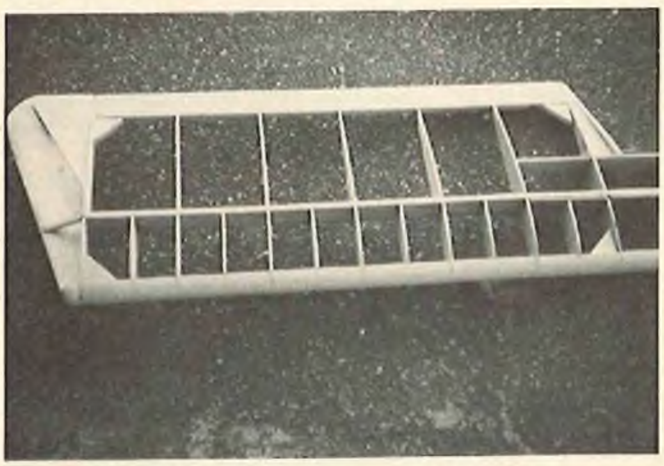
Bend the landing gear from 1/8" diameter wire; bind and solder as shown; cut the landing gear mount from 1/4" ply; and epoxy in position.

text to page 103

The basic fuselage assembly.



One wing panel, minus tip.



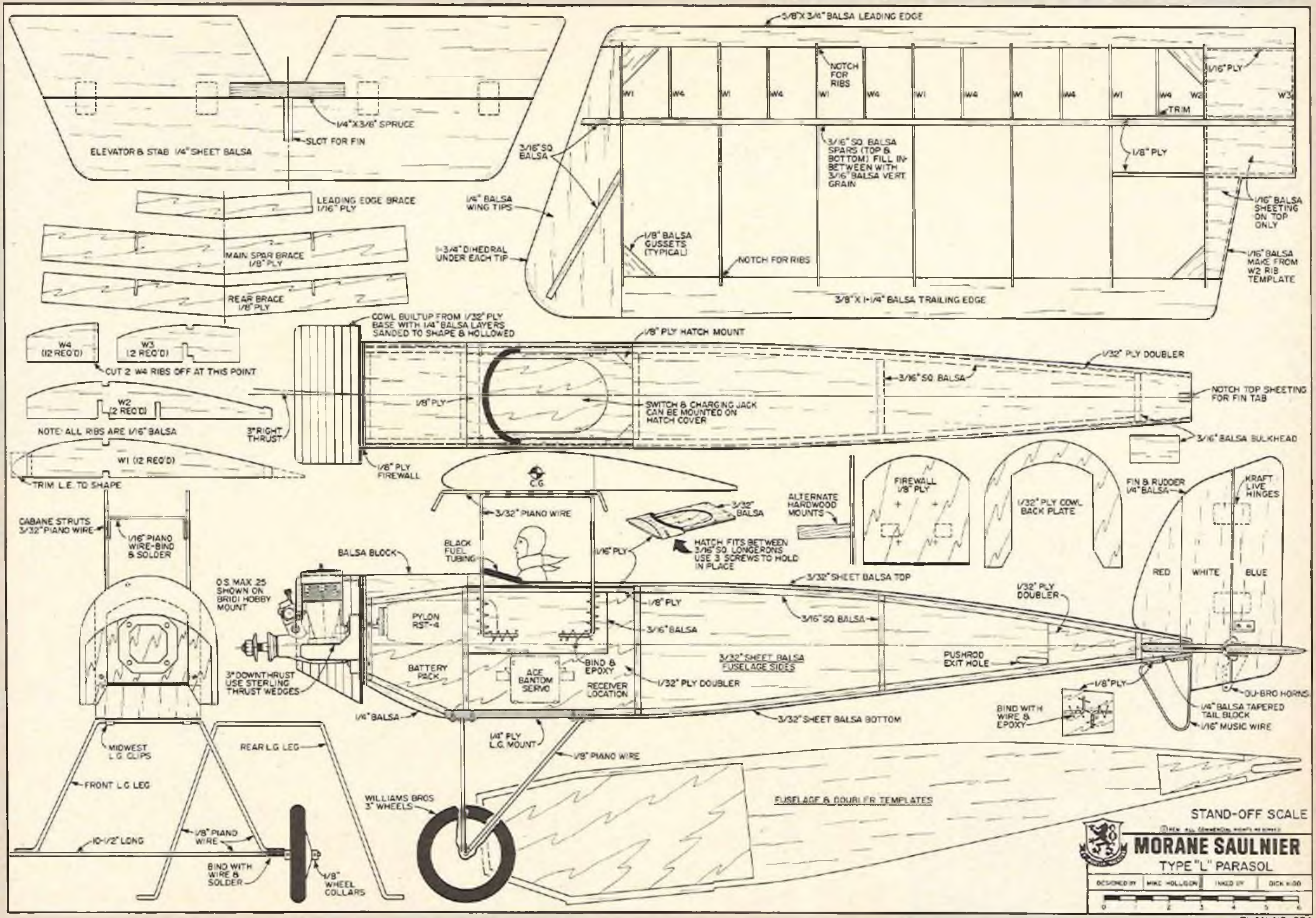
View of wingtip on finished wing.

Cabane, gear, cowl, and muffler details.

The completed aircraft, ready to fly.

Mike Hollison and his Parasol Morane.

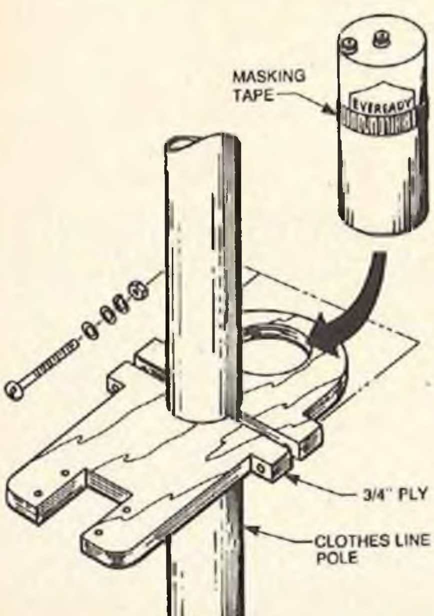
FULL SIZE PLANS AVAILABLE — SEE PAGE 190



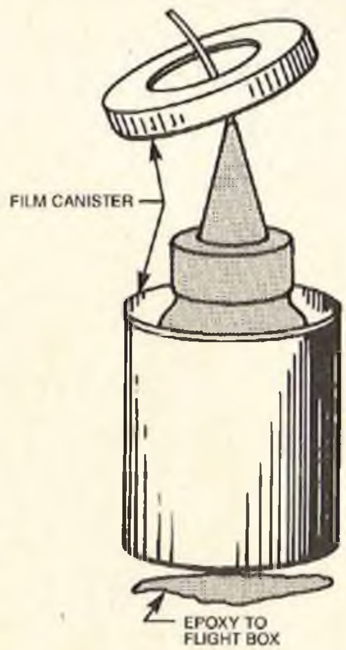
# FOR WHAT IT'S WORTH

Bending brass tubing without a special tool has always been a problem, at least if you want nice and neat non-kinked bends. As suggested by Dick Phillips of Prince George, British Columbia, an inexpensive and easy method of bending nice smooth curves of practically any radius in brass tubing, is to obtain a few short lengths of braided wire cable in the appropriate diameters. Slip the cable inside the tubing, make the bend and pull out the cable. It works like a charm and you will end up with no kinks in your tubing. Cables in various diameters can be found in many places such as auto supply stores, bike shops, hardware stores, aircraft supply houses and cable suppliers. If you need a bend that is going to be at such an angle that it will be impossible to remove the cable, a length of the correct size solder can be placed inside the tubing and then melted out with a torch or soldering iron. For larger sizes of tubing, pack the tube with sand, sealing the end with your fingers or a bit of melted wax, make the bend, and then dump the sand. In either of the latter two methods, make sure the tube is clean before using it in a fuel system.

If you've had trouble locating a test stand high enough and solid enough for those big engines, you may find a different use for your garden variety clothespole. Several size motor slots can be cut in different boards for different engines. A fuel tank is strapped to the front board with large rubber bands. And, when not in use, this test stand slides to the top of the pole and re-tightened. A piece of cardboard at the base of the pole catches the fuel and exhaust splatter and keeps it off the grass and walk. This idea was submitted by Al Linge of Arvada, Colorado.



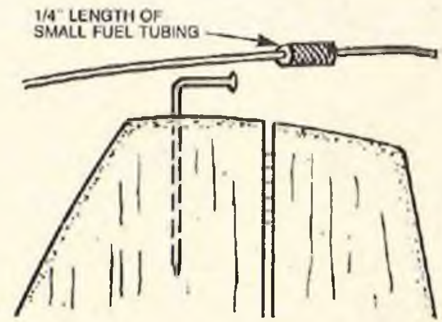

To keep your Hot Stuff or Zap handy and upright in your flight box, Gary Bursol of Lawton, Oklahoma, uses a GAF plastic film canister of the 35mm type. Cut a hole in the top so the bottle neck will fit through. With the cap snapped in place, the shoulder of the bottle will hold it in the canister. Epoxy or Hot Stuff the canister bottom to the flight box. The aluminum 35mm canister with screw top will also work as well.

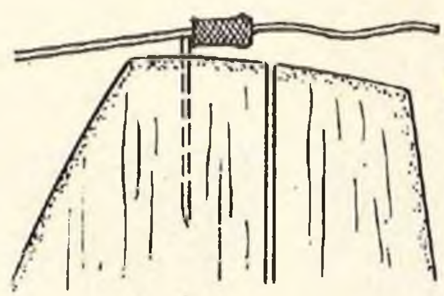



If you want to improve on the realism of your WW II scale military pilot, try this suggestion from James Johnson of Ft. Bragg, North Carolina. Take a nipple from a baby bottle and cut to shape on your pilot's face then Zap in place as an oxygen mask. Then, for the oxygen hose, use as many sections as needed from flexible drinking straws and Zap them together and paint the mask and hose flat black. You will find that it looks extremely realistic.

When drilling a hole through the firewall, or other bulkheads, and you find that you don't have a drill long enough, it is common practice to use a piece of metal tubing of the proper length and diameter for drilling the hole. However, as Earl Burnett of Sanderson, Florida, points out, a guide of sorts is needed to keep the tubing from wandering when starting the hole. A sheet metal screw thats head diameter fits inside the tubing can be screwed into the center of the desired hole to be cut out. Then, when the tube slips over the head of the screw, the head acts as a centering guide. All that remains is to drill out and save the screw. Earl has used this method for some time and finds that it works perfectly.

The conventional method of holding the end of the antenna wire to the vertical or horizontal stabilizer by threading it through a button, or tying a knot in it to hold the rubber band tensioner can kink, and perhaps, eventually break the antenna wire, writes Darrel Stebbins of Spokane, Washington. A much simpler method is to use a bent pin epoxied into the vertical or horizontal stab (or the tail end of the fuselage), then slip a 1/4" length of small fuel tubing over the antenna wire and then slide the tubing over the pin. You end up with no kinks, adjustable tension, and crash release without breaking the antenna wire. In addition, it looks a lot neater.



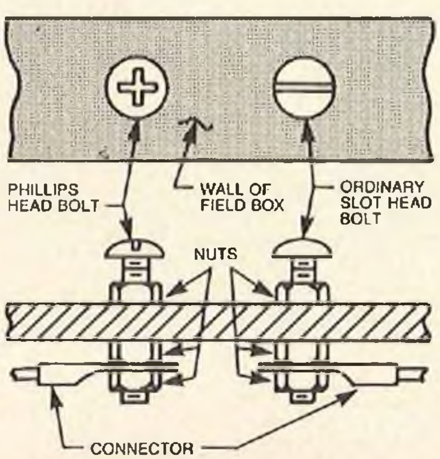
A crash recently tore the ailerons off of one of Allan Scidmore's of Madison, Wisconsin, ships and the hinge-points needed replacement. The problem was how to get them out of the wing and ailerons. As Allan writes, it turned out to be quite easy. First, select a piece of thin wall brass tubing that will just slip over a hinge point of the size to be removed. Use a drill bit to sharpen one end of the tubing. With a thin file, or razor saw, make four notches on the sharpened end. Now chuck the tubing piece into an electric drill and just drill the hinge point out. Be sure to push the plug you drilled out of the brass tubing. To repair, fill the hole with a mixture of micro-balloons and epoxy, mark for the new hinge points, and drill the new holes. You will find that it will be just like new, except much stronger.

If you have a plan, either in a kit or from a magazine that only shows one wing panel, here is a suggestion from

Loren Blinde of Ceresco, Nebraska, for obtaining exact duplicate plans for the opposite wing panel. After one wing section is drawn to satisfaction, staple or tape a similar sized blank plan paper to the back of the one already drawn. Now place a piece of carbon paper (inked side up) on the drawing board and place the two attached plan sheets over it. Trace over the original plan with a fine-tip pen and you will have an exact duplicate opposite panel drawn on the bottom side of the blank sheet. Continuous carbon sheets, such as used in data processing paper are helpful, but not necessary. With smaller sheets, the plan can be traced in increments.

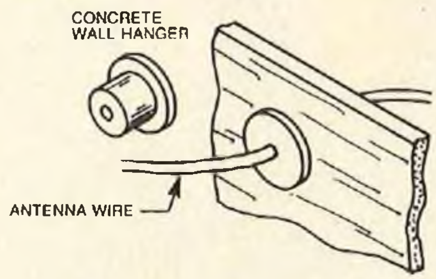
If you're looking for an extensive line of Dremel tools for your Dremel Moto-Tool, and can't find them in your local hobby shop or hardware store, check your local lapidary and gem shop. Virtually all of them carry a complete line of Dremel tools, as well as other rock cutting and faceting equipment, some of which are excellent for our usage. One such example is the thick Dremel circular saw blade for the Dremel Moto-Tool which is excellent for hinge slots and which, normally, is not obtainable in hobby shops. Yet another tool is a miniature belt sander used for rock sanding and which is absolutely ideal from a size and power standpoint for model usage. This idea was submitted by Bill O'Brien of Covina, California.

If you have a 12 volt supply for your starter mounted in the side of your fuel box, you can use simple bolts and nuts and still have a identifiable polarized supply. Simply use one Philips head bolt for the positive lead and one ordinary bolt for the negative lead, and mount it as shown. You will know at a glance which is positive, and which is negative. The sketch is self-explanatory and was sent in by Suren Dhal of Calcutta, India.



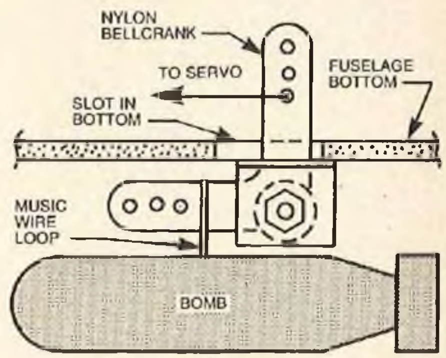

Terry Terrenoire of Endicott, New York, suggests that, for those of you using sanding blocks such as the T-Bar, there is a very easy way to clean off the glue left behind when you remove the used sticky-backed sandpaper. Simply dampen a rag with acetone and wipe. The glue comes right off and you are ready to attach new paper with no lumps underneath it.

J.A. Plaja Bosch of Rio Piedras, Puerto Rico, uses plastic hangers designed for concrete walls as bushings or insulators for receiver antenna cables where it exits the R/C aircraft fuselage. Using a 1/16" drill completes the hole in the concrete hanger. Make a 3/16" hole in the fuselage using copper tubing, or by drilling. Epoxy the plastic hanger to the fuselage. Different colors of plastic hangers are available and can come fairly close to matching your color scheme.

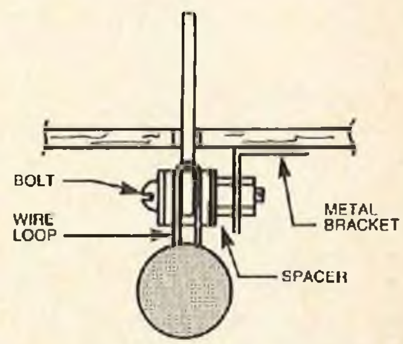



R/C sailboats require the use of a sail winch for sail control. Many winches are of the type that have a long arm with a 160 to 180 degree throw. Full throw actuation time of 4 to 8 seconds and output torques of several inch-pounds are obtained with a powerful DC motor driving through a high reduction gear train. The motor is switched to a battery power source for sail positioning by a conventional R/C servo actuating on-off reversing switches. Positionable sail servos of this type are very costly when purchased commercially. A good home-built servo can be made for only a few dollars by using a battery operated rotisserie spit drive unit that is available at your local picnic supply store. If you don't need the charcoal brazier for your back yard, purchase a replacement spit drive unit from the manufacturer. H.W. Plohr of North Olmsted, Ohio, did exactly that and found that his motor, gear train, and battery holder is a small compact unit that cost him $3.50 postpaid. The author modified the electrical wiring between the battery box and motor to include two R/C servo actuated micro switches for bi-directional operation and two more limit switches. The addition of a provision for mounting and a mechanical output arm in place of the rotisserie spit completed the modifications.

Stephen Pendo of Barre, Vermont, submitted this sketch for a simple and cheap bomb dropping mechanism. Steve has used this on a modified Tri-Squire and found it to work quite well. The bellcrank should be given as much throw as possible to allow the bomb to slide forward and off.

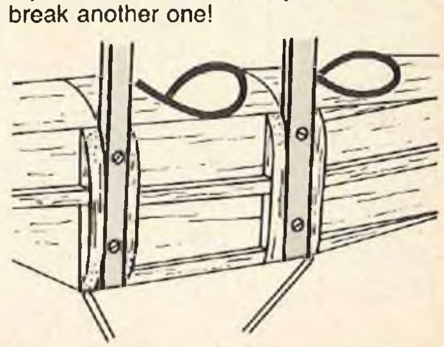


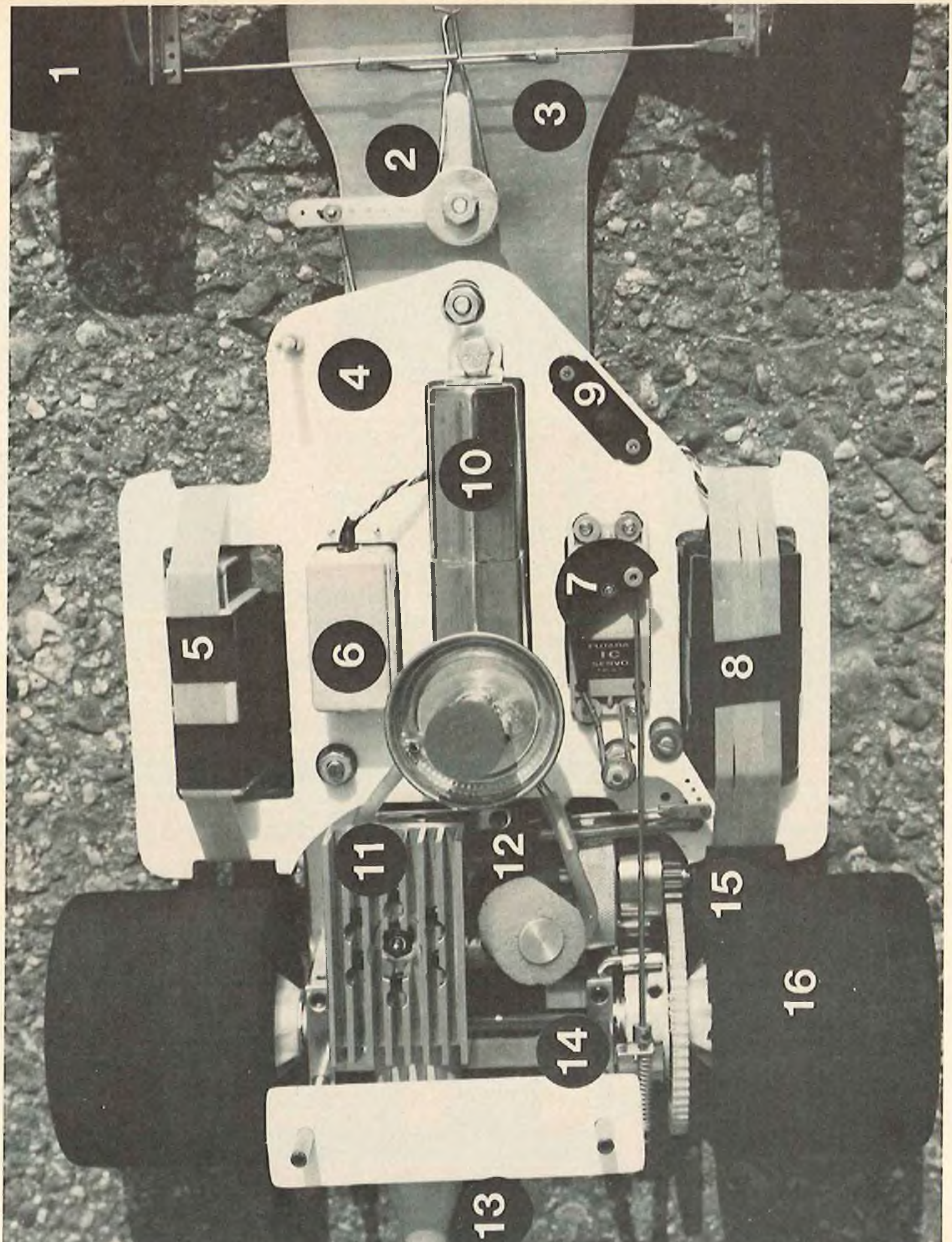

SIDE VIEW




-FRONT VIEW-

Another suggestion for the House of Balsa's Pietenpol was sent in by D.F. Hipperson of Adelaide, South Australia. Powered by an O.S. Max .35 and 3 channel Futaba radio, Mr. Hipperson's Pietenpol scored well in static points at the Australian Nationals in the Stand-Off Scale event. Hipperson made one modification only to the Pietenpol and that is, since it is possible to break a cabane strut if you crash, he bolts the cabanes on the outside as shown in the accompanying sketch. Now if you break one, you can unbolt it and replace it. You will probably find that once you are able to replace a broken cabane, you will never break another one!




1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

# Pit Stop

GENE HUSTING

● There are many good 1/8 scale R/C car kits available to choose from. The kits produced by the major manufacturers now, are all high quality, well engineered cars, made to take the rough treatment that is part of R/C car racing.

THE VECO-McCOY .19

Most people seeing R/C car racing for the first time are amazed at the amount of pounding the cars can take, without any damage. The handling in these cars is also so good that it makes it much easier and, therefore, a lot more fun to learn to drive.

The very first R/C car kit was called Ra-Car and was designed by Norb Meyer. Norb is the person we must thank for our R/C car hobby, because he is also the one who did all the development work on the first prototype, along with the assistance of George Siposs. The most interesting feature of the Ra-Car was that it had a 2 speed transmission which was shifted by a 3rd servo. Unfortunately, it took about one second each time it was shifted and this hurt the car's performance.

Bill and Ken Campbell then designed a truly well engineered Delta car. A lot of thought was put into its design and it became an immediate success. This car featured a horizontally mounted engine to lower the C.G. and cut down on engine vibration. Dynamic Models then came out with their kit, which featured 4 wheel independent suspension and a torque converter type transmission. This was easily the best looking R/C car kit ever made, but it was too fragile to be competitive in racing. Kyosho, Heathkit and Wencar all made R/C cars, but lack of handling hurt their performances. Associated then used their knowledge gained in slot car racing, to design a car that did not use any suspension for the wheels, as was used in the other cars. The chassis plate did all the flexing. This eliminated springs which were continually hanging up and, together with Associated's upright mounted engine, this car became very popular and this concept is now used by most other manufacturers. Thorp produced a very competitive car featuring a belt drive and, later, added a differential which improves handling on slippery tracks. Marker Machine made their car using mostly machined aluminum parts, including wheels and is the most beautifully machined car available. Taurus came out with a new car that had a few problems. It was then re-designed into a real race winning car but the added expense encountered from extra tooling forced the company out of business. HRE and MRP are the latest R/C car kits out, incorporating all of the proven principles learned over the past seven years.

Let's take the mystery out of R/C cars and go over a car piece by piece so you'll know exactly what everything is and what it does. Please refer to the photo with the chassis that has all the parts numbered.

#1. Front tires are mostly made from sponge rubber with many types to choose from to give you the ideal traction for the particular track you run on. Generally, the type that come in the kits are the best all-around type. Most of the front wheels are plastic or aluminum with Oilite bushings, although some also have ball bearings.

#2. All of the cars incorporate some type of spring loaded device called "steering servo savers", which do exactly as the name implies. The front wheels are being continually forced out of their normal attitude from track irregularities, course markers, or other cars, and rather than transmit this sudden jolt to the servo gears, it's absorbed in the servo saver before it can damage any gears.

#3. Even though this is an Associated RC100 car, most of the other cars also use the chassis plate, which is generally .080 aluminum, as their suspension. The front axles are made from aluminum, stamped steel, or plastic. There have been many scratch-built cars made using independent suspensions but none have worked as well as the conventional type R/C cars.

#4. The white area is called a "radio tray" or "shaker plate" and is made of plastic and has been popular to mount the radio gear and tank on. It absorbs a lot of the engine vibration and the front mount is used like a shock absorber for the chassis. It can be adjusted to varying track conditions.

#5. The receiver is mounted on rubber bands to further prevent any shocks. Any good radio will work in the R/C cars, but the most popular one being used is the Futaba, because the transmitter has a steering wheel and the servos are the strongest and smoothest made, with extremely large gears.

#6. R/C cars only require 2 servos. This is the steering servo which controls left and right steering. Steering adjustments can be made by changing linkage location in the steering servo saver. The radios are proportional, meaning that if you turn the steering wheel full right, the wheels turn full right or if you turn the steering wheel any given amount, the wheels will turn the same given amount, so that you have complete control of the steering amount.

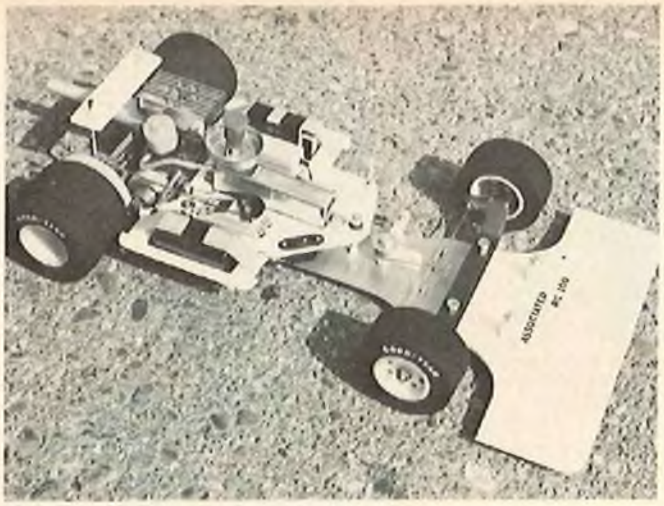
#7. The throttle servo controls both throttle and brakes. The cars will stand still idling and as the throttle is increased, the speed increases up to 50 mph. When the throttle is released the brakes come on automatically.

#8. The battery is mounted on the R.H. side for tracks that run clockwise and on the L.H. side for tracks that run counterclockwise to improve handling.

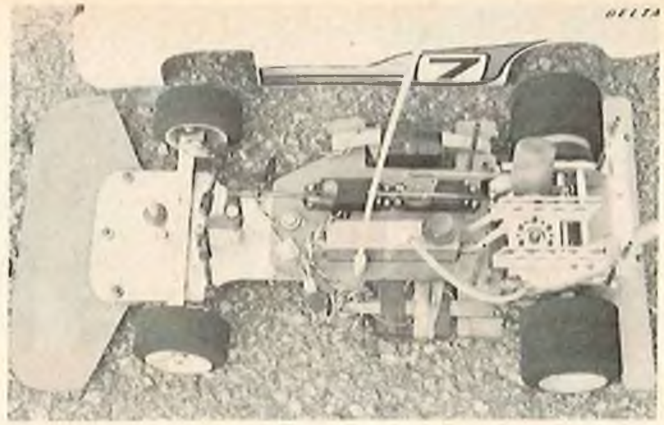
#9. The radio switch is mounted up high to prevent damage.

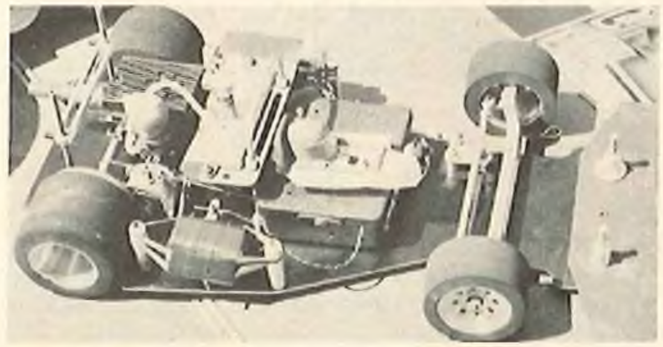
#10. Fuel tanks are limited to 4 oz.

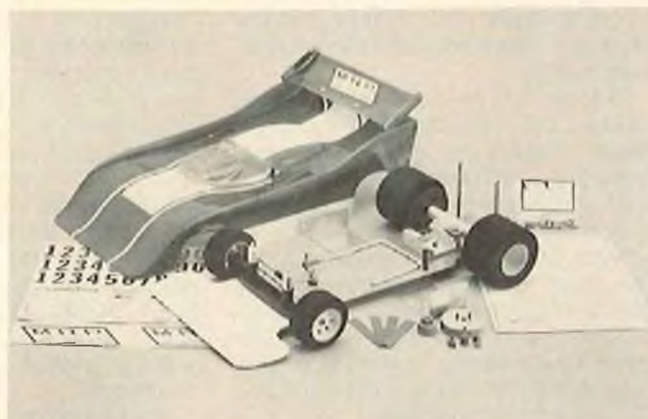
text to page 103



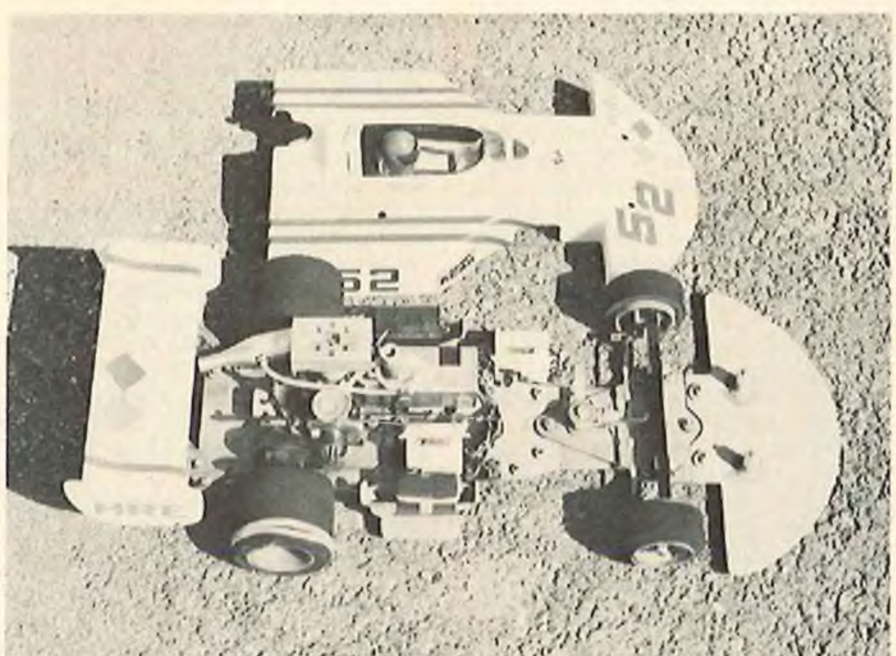
*ABOVE: Associated cars have been National Road Racing Champion 3 times, and have been National Oval Champion 3 times as well as being the first ever National G.T. Champion last year. This RC100 car features ball bearings in clutch and rear end and all parts are engineered to give race winning performance and reliability. UPPER RIGHT: This is Arturo Carbonell's Delta car. Arturo won the National Road Racing Championship in 1974 with a Delta car and has dominated racing in the mid-west over the last 3 years. The Delta car is a very well race engineered car and is designed for easy assembly. RIGHT: The most beautiful machined RC car is the Marker car, which also won the National Oval Championship in 1973. Most parts, including wheels, are machined aluminum and this car handles as well as any.*







*ABOVE: The Thorp car is rather unusual, in that it uses a belt drive and has a differential. The car handles very well and generally has its best showing on slippery tracks. UPPER RIGHT: The MRP car features a plastic front end assembly, with a solid one piece aluminum rear pod engine mount/rear end assembly. RIGHT: The HRE car was designed by Chuck Hallum. It is a high quality, good handling car and enabled Chuck to win the 1975 National Oval Race.*



# RCM PRODUCT TEST

## HOUSE OF BALSA P-51 MUSTANG


| 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 | ● | | | | | | | | | | |

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

● The House of Balsa P-51D is the first real Stand-Off Scale entry in the 1/2A kit field. Up until now, the 1/2A buff had his choice of beefing up a scale rubber kit to take radio or settle for one of the kits designed strictly as a model. The P-51 kit contains a well packaged assortment of sharply die-cut sheets, smoothly machined balsa and hardwood parts, decals, plans, transfers, hardware, and instruction booklet that is truly outstanding. The wood used is of high quality and, because of the accuracy of the parts fit and the explicit instructions, fabrication of the model is a real joy. Also included is a complete list (except for three clevises) of the additional material required. As is our practice in reviewing a kit, we follow the instructions, just to see if they work. Believe it or not, they did, to a disgusting degree. We could find only two items with which to hassle the responsible know-it-all. First, he chose not to drill the fire wall for the fuel line until it almost required the services of our local dentist and, second, we felt that the 1/8 square balsa reinforcing strips inside the bottom of the fuselage doubler (step 10a) should be full length, rather than 1", to give more support to the fuse when shaping the bottom hatch block. This is one 1/2A model that does not require the dexterity of a pickpocket to stuff the tank and battery through a too small hole into the nose section. In fact, with the hatch and wing off the whole bottom of the fuselage back to the TE of the wing is wide open. The fuselage sides are machined from 3/32" sheet with a sheet rear fuse bottom, while two pre-shaped blocks complete the top and bottom of the nose. An innovative touch is the one piece pre-fromed plastic canopy and rear cockpit top which covers the separately assembled instrument panel, headrest and pilot. This not only gives the proper shape to the rear of the fuselage, but also gives the pattern for sanding of the upper nose block and solves the problem of fastening a separate canopy to the fuselage. The

to page 102

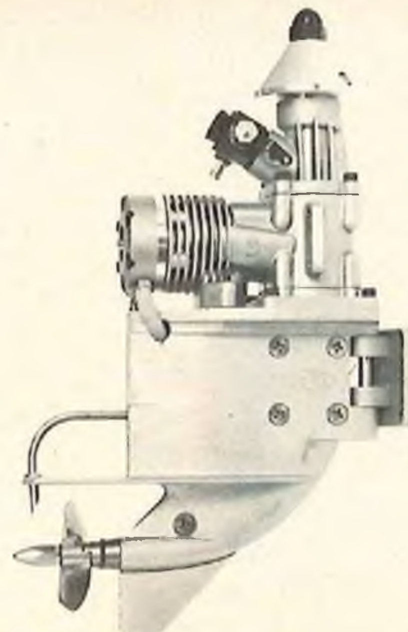
## SPECIFICATIONS

Name ........ P-51D Mustang
Aircraft Type ........ 1/2A Sport
Manufactured By ........ House of Balsa
2814 E. 56th Way
Long Beach, California 90805
Mfg. Suggested Retail Price ........ $24.95
Available From ........ Both Mfg. and Retail Outlets
Mfg. Recommended Usage ........ General Sport
Wing Span ........ 36 Inches
Wing Chord ........ 6¾" (Avg.)
Total Wing Area ........ 216 Square Inches
Fuselage Length ........ 28.5 Inches
Radio Compartment Dimensions ........ (L) 8" x (W) 2" x (H) 2¼"
Wing Location ........ Low Wing
Airfoil ........ Semi-Symmetrical
Wing Planform ........ Double Taper
Dihedral ........ 1¼"
Stabilizer Span ........ 13¼ Inches
Stabilizer Chord (incl. elev.) ........ 3¾" (Avg.)
Total Stab Area ........ 17⅔ Square Inches
Stab Airfoil Section ........ Flat
Stabilizer Location ........ Top of Fuselage
Vertical Fin Height ........ 4-1/16"
Vertical Fin Width (incl. rud.) ........ 3⅛" (Avg.)
Mfg. Rec. Engine Range ........ .049-.051
Recommended Fuel Tank Size ........ 2 Oz.
Landing Gear ........ Conventional
Recommended No. Of Channels ........ 2
Recommended Control Functions ........ Elevator & Ailerons
Basic Materials Used In Construction:
Fuselage ........ Balsa, Ply, Plastic
Wing ........ Balsa & Hardwood
Tail Surfaces ........ Balsa
Hardware Included In Kit ........ Formed L.G. & clips, all. linkages
Plan Size ........ 25" x 38" (1 sheet)
Building Instructions on Plan Sheets ........ No
Instruction Manual ........ Yes (23 pages)
Construction Photos ........ Yes
Kit Includes ........ Shaped & Die Cut Parts
Mfg. Rec. Flying Weight ........ 22-28 Ounces
Wing loading based on rec. flying wt. ........ 14.6-18.6 oz./sq. ft.

## RCM PROTOTYPE

Weight, Ready To Fly ........ 24 Ounces
Wing Loading ........ 15.6 oz./sq. ft.
Covering & finishing materials used ........ Mylar & Perfect paints
Engine Make & Disp. ........ TD .049
Muffler Used ........ No
Radio Used ........ Kraft Series 71
Tank Size Used ........ 1 Ounce

# FIRST ANNUAL GOLDEN GATE OUTBOARD REGATTA



The K & B 3.5cc outboard engine.

**BY JAY SELBY**

*Deep appreciation is expressed to Flying Models Magazine and Jerry Dunlap for the candid shots at race time. The author was struck by an interference – plagued hull the day before the meet that required 22 stitches above the ankle, but competed the next day from a lounge. Jay Selby shown below with his Concours winning 'Eliminator'.*

● Sunday, November 7, 1976, started out as a slightly overcast, foggy day at Spreckles Lake in Golden Gate Park in San Francisco. Soon the seagulls and other water-fowl who frequent the lake had to vacate their favorite haunt to make way for a really new kind of water creature, snarling impatiently to welcome the rays of sunlight that finally set the stage for the first such contest outside of the North American Model Boat Association Nationals in past years - - - The First Annual Golden Gate Outboard Regatta.

For seven years, I have been vitally interested in model outboard gas engines and the perfect type hull for such a "spanker" . . . a tunnel. Basically, the tunnel, or catamaran, utilizes two outboard sponsons connected in the middle, forming a "tunnel" that catches and traps the air, forming an air cushion. The whole hull literally "rides" on the top of this cushion, and you have a "flying" type animal that is controlled by a two channel radio giving rudder and throttle control. Renato Molinari was the man responsible for really popularizing this new conception on the full size craft which has dominated outboard racing circuits throughout the world. O.B.'s have never really caught the interest of the boating fraternity until John E. Brodbeck of the well-known and respected K & B Marine Division of Aurora, Downey, California, marketed his new 3.5 cc outboard engine. As soon as the engine became available to the public, plans were set into motion to sponsor a regatta for Class A, O.B.'s only. Spreckels Lake, where I regularly run, was just the right size and was an excellent location lying approximately half way through Golden Gate Park, close to everything and Commodore Ray Hernandez of the San Francisco Model Yacht Club agreed to sponsor the event and also act as contest director. Flyers were sent out and final entries totalled nineteen. On the day of the race, there were sixteen hulls ready to snort.

On the previous day, many of the drivers showed up to test run, check out the course, and make necessary trim adjustments. There were eleven tunnels, four hydros, and one mono entered, most scratch-built by the driver, that made up the six lap, sixteen heat field.

We had decided on a NAVIGA, or "M" type, course which would allow not only "heavy footing" it down the shoot, but would require some good technique, as the driver would also have to be as quick in left turns as he was on the usual right ones. Courses are always run in a clock-wise direction in model boat competition. This made the race not only a challenge to the pilots, but added a lot more appeal to the crowd.

After the driver's meeting at 9:45 a.m. on Sunday morning, the first event on the printed program was a timed lap go-around. It was not compulsory, but all drivers took part. Running alphabetically, each driver was given two timed laps using the outer portions of the NAVIGA course in what amounted to a "square" run. The fastest time was recorded by Dick Norsikian of Arleta, who pushed his own designed pickle-forked tunnel around the course in seventeen seconds, and received an engraved plaque for his efforts. He was followed by Jack Garcia of Santa Ana, and District Nine Director Russ Kominitski, Bakersfield, both steering their own very stable tunnels.

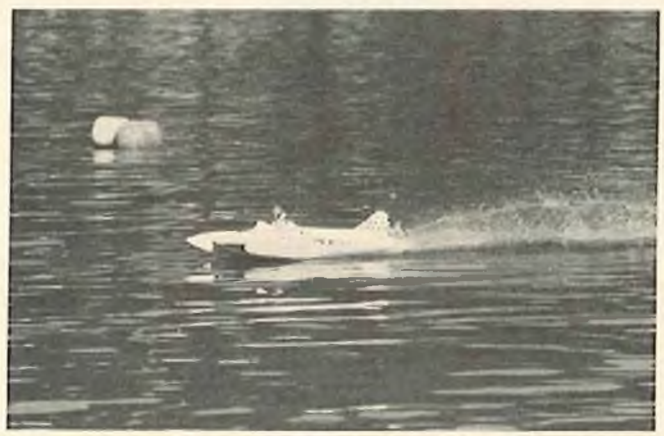
By 1:00 p.m., half of the heat racing had been concluded, racing was halted and the S.F.M.Y.C. put on a demonstration for the crowd covering the whole model boat spectrum - - - sailboats, live steam, electric and gas powered scale craft plyed the quiet waters. We were lucky because the wind gods had indeed smiled benevolently upon our efforts the whole day. Then it was time for the Concours d'Elegance. All sixteen of the K & B 3.5 cc powered hulls were lined up at the water's edge in the pit area. What a sight to all the puddle pounders present! Three impartial non-competing judges, using a simple points system, carefully surveyed the whole line-up and decided that the engraved plaque should go to the author's own self-designed and built scale-like Molinari Tunnel, the "Eliminator." The over-all high quality of the workmanship made their decision difficult. Dick Norsikian took the second spot, followed by John Brodbeck and his "Streaker" designed and built by the author.

The final heats followed and, when it was all tallied up, it was a day for the

to page 102

*A view of Spreckels Lake, the pit area, and part of the crowd.*

*Charlie Pottol around #5 buoy with Dick Norsikian and Leonard Feeback closing.*



*The author's 'Eliminator' during the timed lap event.*

*Dick Norsikian's quick tunnel showed its transom to all.*

*Dick Norsikian (3rd), Judy Prigley (1st), and Pat Pottol (2nd).*

## OUTBOARD REGATTA

from page 94

ladies. Indeed it was, as the only two entered in the contest took the first two spots. Judy Prigley, Fremont, California, a member of The Saratoga Over the Hill Race Team, running a Charlie Pottol designed and built outrigger type hull, won it all showing excellent consistency and a quickness on the buoys. Another member of the S.O.H.R.T and one of the moving forces behind Marine Specialties, Saratoga, California, Pat Pottol, piloting one of the few commercially available hulls, a British Miles Master tunnel donated by Bob Agnew of A.M.P.S, England, sewed up second. In third place was the ever present Dick Norsikian followed by Jerry Dunlap, pushing a Hughey Hydro (all the way from Tacoma, Washington) and Steve Hamilton of Santa Cruz, with the only mono entered.

The entry list was very encouraging considering the infancy of the class and the lack of marketed hulls. Besides the aforementioned drivers, the other entrants were: George Campbell, Sylmar; Frank Clark, the only junior entered, Arleta; Leonard Feeback, Cucamonga; Charlie Pottol, Saratoga (Marine Specialties); Bill Prigley, Fremont; Don Reutlinger, Cupertino, driving a new JVS Hydro and Al Wayne, Novato, California.

There was $350.00 in merchandise and heat awards given plus two raffles. An A.M.P.S. Miles Master tunnel hull was won by Dan Jones and John Brodbeck contributed a new 3.5 cc O.B won by Steve Hawkins. John also donated the G.G.O.R. Perpetual Trophy that will be inscribed with the winner's name and remain in the S.F.M.Y.C.'s boat house on permanent display. Heat winners drew a number and received the merchandise award that corresponded to that number donated by: Marine Specialties, Saratoga; J & M Hobby House, San Carlos; Hobbies Galore, Santa Clara; Sheldon's Hobby Shop, San Jose; Hobbyville, Burlingame; and Pat's House of Hobbies, Franciscan Hobbies and the Hobby Co., all of San Francisco.

From 4:00 to 5:00 p.m. was the awards program, as the whole meet was concluded well within the time limits imposed by the San Francisco Recreation and Parks Department. The concensus from the drivers and on-lookers alike was that it was a great kick-off for the beginning of outboard racing, a fun-like approach to the day, the convenience of Spreckel Lake, the fact that there were no collisions or blown-over hulls and everyone got out of the pits and at least began the race, made it all worthwhile.

Some trends seem to be apparent - - - if that is possible after one race - - - to me as an entrant and observer of the O.B. scene. Tunnels of the Molinari, pickle-fork type are the most popular and seem to lend themselves excellently to the sport. The average length seems to be around 26" and about 12" wide. Tunnel widths run close to 6". Most of the hulls had a driver and some a wheel and instrumentation. Weight varied from 3 pounds to 6½, showing that this does not seem to be overly critical. The 3.5 has plenty of torque power to push hulls up to 6½ pounds and, as drivers become more experienced with the Perry carburetor and design hulls that are capable of stability on both left and right hand turns, and understand the forces that come into play with the engine depth and angle tilt, plus the correct diameter and pitch of the prop, speeds will increase and so will consistency. The author has established a N.A.M.B.A. 1/16 mile speed record for outboards at 37.66 mph, though not official as the class has not been officially recognized by N.A.M.B.A. (Rules are now being considered by N.A.M.B.A.)

Other ideas I hope to see develop are the use of various courses that stress the ability to maneuver or "drive" the hull through something other than an oval course. With the acceptable DB rating and the small area of water needed, suitable sites will not be so hard to retain. Secondly, I hope the class will eventually be separated into three distinct classes, if it grows the way it indicates: Mono, Hydro and Tunnel, the reason being that each hull has separate characteristics and weight and thrust differences that will make it imperative. After O.B.'s have gained numbers, a scale event would be very possible, much like the new unlimited class that is enjoying such popularity in its infancy for the inboard lead-foots. We will also see sprint races, enduros of half hour duration with two required pit stops, time trials, and all sorts of courses calling for the ability of the contestant to drive . . . why not Le Mans type starts? The variety is only restricted by a contest director's ingenuity. Also, perhaps of most importance to the success of O.B.'s as a growing model sport, is the insistance that engines be kept "stock." That is, they should not be altered in any way from the way a customer receives it from the manufacturer. This will allow the average aqua-nut to be competitive in O.B.'s to the tune of about $250 to $275 ready to run — about the cost of a good set of golf clubs or a camera!

Last, I see that those of us who have been in model boats for any length of time must really take a crusader's attitude in sharing our ideas and help for the many newcomers that the O.B. class certainly appeals to and if indeed we do want to expand the numbers of model boaters of all kinds, we must share all the wealth through the pages of the model magazine world much as the RC flyers have done with the help of such magazines as R/C Modeler.

It is hoped that the G.G.O.R will become an annual affair and in the next few months before the N.A.M.B.A Nats in Reno, August 6 to 13, take advantage of upcoming meets in your area. Hook up one of Ole' John's egg-beaters to the transom and . . . "Lets Go Outboard!"

Note: Any correspondence or questions regarding the G.G.O.R. or outboards in general, please contact; Jay Selby, 682 Emerald Hill Rd., Redwood City, CA 94061. □

**1ST ANNUAL GOLDEN GATE OUTBOARD REGATTA**
**Sponsored By**
**San Francisco Model Yacht Club**
**Spreckles Lake, Golden Gate Park**
**November 7, 1976**

1. Judy Prigley
2. Pat Pottol
3. Dick Norsikian
4. Jerry Dunlap
5. Steve Hamilton

**TIMED LAP TRIALS**

1. Dick Norsikian
2. Jack Garcia
3. Russ Kominitski

**CONCOURS d'ELEGANCE**

1. Jay Selby
2. Dick Norsiklan
3. John Brodbeck

## P-51D MUSTANG

from page 93

..... tail surfaces are die-cut sheets which key into the plastic top for strength. The wing is built flat on the board despite the semi-symmetrical airfoil and the compound progressive taper to the solid balsa tip. Two landing gear configurations are shown, one the normal P-51 type with die-cut plywood doors and the other a clever drop tank arrangement which serves not only to add to the in-flight appearance, but also acts as landing skids. We covered the wings on both models with Crystal Cover and then, despite the complete step-by-step finishing instructions given using resin and dope, experimented a bit. On the solid surfaces we first applied two coats of Perfect Paints new sealer primer. This is one part substance which not only fills the pores but also acts as a primer for the later application of two coats of Perfect Paints aluminum. After inking in the panel lines we spray-canned two coats of Perfect Paints clear gloss. Our tests prior to use showed that this finish not only looked good, but was fuel proof, even with Cox Red Label and even over the usual unpaintable mylar. Another innovation is the use of two of the dummy exhaust ports as fuel tank fill and vent pipes. Although this is a little tricky to install, it works well and is easy to use when fueling the model. Even with a Sullivan two ounce tank the nose area had enough room for padding and a 450 ma battery pack installed behind the tank. When completed as described, this little bird was so sharp and pretty that we could almost understand the mentality of the display model builder. This model is one of the most stable, rock solid, groovy, yet responsive, I've flown and fully lived up to the article in RCM, both in appearance and flying ability. Succeeding flights have confirmed this. From what we could see, the average builder should have no trouble at all and with a little more care, even a beginner can turn out a very creditable job. We were also very impressed with the ease and results achieved with the Perfect Paints method of finishing. In our opinion, it is one of the simplest and easiest ways to get a professional type finish, by the average brush wielder. In summary, we were extremely impressed with the House of Balsa P-51D kit and the appearance and flying characteristics of the finished model. □

## PIT STOP

from page 91

Most use muffler pressure with chicken hopper design. Pit stops can be made in 1 to 2 seconds.

#11. Engines are limited to .21 cu. in. - 3.5 cc. The most popular engine has been the Veco-McCoy and last year the K & B .21 was used. This year we'll also have new 3.5 Super Tigre and OPS Schneurle engines.

#12. The most widely used carbs have been the Perry carbs with sizes from .19 to .60 being used. Delta and Thorp also have custom slide valve carbs.

#13. Our rules require the use of mufflers which have really helped us to get some tracks in ideal locations such as shopping center parking lots. McCoy and Thorp make the most popular mufflers.

#14. All cars are required to have brakes. Some brakes are mounted on the rear axle and some on the clutch bell. Even disc brakes are being used. The brakes are adjusted so that they come on automatically, as soon as the throttle is released.

#15. All cars have a clutch assembly which allows the cars to sit still while the engine is idling. When the engine rpm is increased, the centrifugal clutch engages and the car moves forward. Most common gear ratios are between 4.5 and 6 to 1.

#16. Most rear wheels are plastic, although there are also some made from aluminum. Tires are sponge rubber with a particular type chosen to give the best possible traction. □

## MORANE SAULNIER

from page 81

**TYPE AIRCRAFT**
Semi-Scale Sport
**WINGSPAN**
47 Inches
**WING CHORD**
9 Inches
**TOTAL WING AREA**
385 Square Inches
**WING LOCATION**
Parasol Wing
**AIRFOIL**
Clark-Y
**WING PLANFORM**
Constant Chord
**DIHEDRAL, EACH TIP**
1¾ Inch
**O.A. FUSELAGE LENGTH**
30¼ Inches
**RADIO COMPARTMENT AREA**
(L) 10" X (W) 2¾" X (H) 3½"
**STABILIZER SPAN**
17 Inches
**STABILIZER CHORD (Incl. elev.)**
5 Inches
**STABILIZER AREA**
73 Square Inches
**STAB AIRFOIL SECTION**
Flat
**STABILIZER LOCATION**
Mid-Fuselage
**VERTICAL FIN HEIGHT**
6¾ Inches
**VERTICAL FIN WIDTH (Incl. rudder)**
4" (Avg.)
**REC. ENGINE SIZE**
.19-.25 Cu. In.
**FUEL TANK SIZE**
4 Ounce
**LANDING GEAR**
Conventional
**REC. NO. OF CHANNELS**
3
**CONTROL FUNCTIONS**
Rudder, Elevator & Throttle
**BASIC MATERIALS USED IN CONSTRUCTION**

| | |
|---|---|
| Fuselage | Balsa and Ply |
| Wing | Balsa and Ply |
| Empennage | Balsa and Spruce |
| **Weight Ready-To-Fly** | 52 Oz. |
| **Wing Loading** | 19.4 Oz/Sq. Ft. |

The cowl can be made from either balsa, plastic or fiberglass, depending on your preference. The original was made from 1/4" balsa half circles, glued together, carved, sanded, and epoxied to a half circle of ply, which was drilled to take the three mounting screws.

Cut the fin, rudder, stab, and elevator from 1/4" soft balsa; hinge and slot and epoxy into the fuselage, adding the top scrap balsa blocks to the tail. Bend the tail skid from 1/16" diameter wire; bind and epoxy to the 1/8" ply mount; and epoxy into position beneath the fuselage.

The cockpit is made from scrap balsa and cemented to a 1/16" ply 'floor', which should be spot glued in place so that it can be removed for access to the radio. The switch harness and battery charge socket are fastened to this 'floor', a length of black rubber tubing glued around the cockpit, and a small pilot added for effect!

Install the radio, pushrods, rudder and elevator control horns; then solder the 1/16" diameter bracing wire between the wing struts. Attach the landing gear, and bolt the motor in place, remembering to offset the thrust line as shown in the plan. Add the cowl and wheels and set aside.

### Wings

Making one wing panel at a time, cut out all ribs and sub-ribs; slot the leading and trailing edges, and glue in position. Add the top and bottom wing spars, plywood braces, and balsa wing tips. Fill in the spaces between the spars with 3/16" scrap balsa, and strengthen the corners with 1/8" balsa triangles. Epoxy the wing panels together, ensuring that there is 1¾" dihedral at each tip. Sheet the centersection with 1/16" balsa as far as rib W2, and reinforce the joint with fiberglass tape.

### Finishing

The wings, fuselage and horizontal stab were covered with yellow transparent Solarfilm, while the fin and rudder were painted with red, white and blue stripes. The cowl and nose section were painted silver. Red, white and blue roundels were applied to the upper surfaces of the wing, with the blue circle innermost.

### Flying

Before taking the 'Parasol' to the field, balance the plane as shown on the plan. With an O.S. .25 up front, the original needed a large nut and bolt secured under the engine mounts to bring the weight forward.

Out at the flying field, there should be no problems. The plane flew straight and level on its very first flight, and handled like a high wing trainer. Throttled back, the Morane-Saulnier cruises lazily around the sky, and is a fun machine for those early morning milk runs and evening 'reconnaissance' flights in the summer sunsets. □

## RACING AT RANDOM

from page 79/78

RPM. Too small diameter = slow (inefficient) acceleration. Too low pitch = reduced top speed but good acceleration.

### B. Modification Steps

1. First sand the back of the hub to get equal pitch on both blades.
2. Next, flatten and smooth the back of the blades. If a pitch change is needed, start with a wider blade and narrow it so there is material available for changing the pitch. (See Figure 2.) Remove material from the leading edge to increase pitch or from the trailing edge to reduce pitch. A little material removal goes a long way so check with a pitch gauge as

you go. A half round wood rasp works best. Because of the twist in the blade a sanding block tends to round the airfoil rather than produce the desired flat bottom.

3. Once the back is smooth with equal pitch in both blades, then form the airfoil. Thin and smooth the top, and form the leading edge. A sharp L.E. is **not** good. Round it somewhat. Figure 1 shows a typical airfoil.
4. If span is to be reduced do it first or now. Thin and shape the tips now.
5. Next balance the prop by removing material from the front of one blade. This will preserve the pitch you so carefully formed on the back side.
6. Run the prop on your engine and note the RPM. If it's in the ball park, fly it and see how it works. If it is too low cut the span or put washout (reduce pitch) in the tip. Use the Figure 2 method to get washout in the outer 1/2" of span. If the prop flutters give it to your worst enemy and start over. A funny noise and an RPM lower than expected = flutter. Not only will your plane go slower but you stand the chance of having it come apart while running.

**C. Recommendations**

Until someone comes up with the optimum prop (or I find a major breakthrough), I will be trying the following props:

1. 7-5N Rev-Up: Thin T.E. a little and clean up. Cut span a little if necessary. This may be the best prop when running with a muffler. (This is the prop I am currently using unmodified.)
2. 7-5N Top Flite: This has a little more pitch than (1). Clean up and form good airfoil (bad airfoil out of box). If RPM is still low trim span slightly.
3. 7-6N Rev-Up: This has higher pitch than (2). Thin, clean up, cut span and maybe washout tips to get RPM up. RPM is low out of box.
4. 7-5 Rev-Up: This has more blade area so it will allow bigger pitch changes if anyone learns how to take advantage of it. Ditto on the 7-5W Top Flite. □

## POWER BOATING

from page 77/76

the speed of a similar hull with a .19 engine. So progress is being made and electric endurance, even if it is not going to happen tomorrow, is not all that far off. I shall be keeping in close contact with the guys in England, and we'll talk about all the new developments they come up with, in the hope that some of you out there will be drawn by the idea of high-performance electrics. I've already started building mine!

I can hear someone out there muttering about cost. Well figure it out. You can now get a good quality motor and a set of nickel cadmium cells for about $80.00, with a power output equivalent to a .19 engine. With a bit of care, those cells will last for about three years, on the average, and running costs are literally nil, since they can be easily recharged on the car battery — and recharged in 15-20 minutes, what's more. Now consider a good .19 engine anywhere around $40-$50. But added to this, how much will the running costs, in fuel and replacement parts, come to over three years? It depends, of course, on how much you use the outfit, but in the long run, costs should about balance themselves out.

Let's take other considerations. On the plus side, an electric motor starts as easily as flipping a switch; there is no nasty, corrosive liquid running around loose in the bottom of the hull, to spoil your beautiful paint job; and, something which is becoming more and more important, there is practically no noise. The motor has only one moving part, and wear is almost negligible. Speed, as we have already seen, can be practically as good as a .19 engine. Coming back again to the lack of noise, this can, in many cases, mean that you can use your model in the lake in the local park, where power boats are prohibited because the noise would bother other users of the park. This, in turn, may mean you have less distance to travel to run your boat, so you save on gas.

On the debit side, the electric boat, in the immediately forseeable future, cannot have the same autonomy as the i/c model. It is much more difficult to tune an electric motor to go faster. And, above all, for those true addicts of power, there is not that wonderful tang of burnt castor oil hanging over the lake at the end of a run!

*'High Lift' electric 5 kilo multi-hull. An experimental boat from Gundart - Ruess of West Germany.*

There are obviously a lot of other things that space precludes me from mentioning, on both sides, but this small expose does show that, over the past few years, electrics have made a lot of progress, and are now worthy of serious consideration. Personally, I am a hard nose "put some more nitro in and see if it will go a bit faster" type boater; but I am not biased, and I am going to have a good go at this new "flip the switch and whisper away" scene. If any of you guys out there are experienced electric buffs, how about writing in with information that we can use to help the less experienced along a bit?


*Ken Foster's 1 kilogram speed mono hull, Sea Wasp 12. 18 .45AH 1.2V nicad cells, Kraft servos.*

◆ ◆

It seems an awful long time ago, but I left you, as I remember, with a new boat, started and all ready to go. I stuck my neck out a bit, and said that the best way of starting was with an electric starter. Well, practicing what I preach, I used that starter for the World Champs, and the photos I saw showed that I was the first boat away in all three races, even if I wasn't the first boat home!

Okay, so you have the boat held in the water, engine at half-throttle, and you have checked that the cooling circuit is working, and that the radio is switched on. A quick look around to make sure that there is nothing in the way and you can let her go. The probability is that the boat will not run straight, but go in an arc — you can trim this out on the transmitter trim, and worry about it later on. Now try turning the boat, left and then right. Watch the wake to see if the radius of the turn is bigger one way than another. If it is, make a mental note of it and we'll sort that one out further on.

Now you can start progressively opening that throttle. Go up to about three-quarters speed, and if all is well, open it right up. You will probably find two things happen. First of all, at top speed, the rudder trim you were using earlier, will no longer give you a straight line. This is because, with variations in speed, the helical jet of water thrown rearwards by the prop will hit the rudder blade in different ways. The only thing to do is to re-trim the rudder. Most conventional boats run with a bit of left rudder, seen from the rear, to achieve a straight line, though there are, of course, exceptions.

The second thing you will be likely to see, is that the boat runs with the right, or starboard, side of the boat, lower in the water than the port side. While this is not terribly important, except at very high speeds, the boat does look rather ridiculous, running along lop-sided. The reason for this strange behavior is one of the model boater's biggest bogeys — propeller torque. Let's take a look at that.

I guess you all learned Newton's law at school — you know, the one about every action having an equal and opposite reaction? Well, that holds true for our models. If you hold the boat up so that you can see the underside of it, you will notice that the prop turns in an anti-clockwise direction. This is Newton's action. Consider the prop blade that is moving through the water. It is experiencing a resistance, generated by the water itself. This resistance is transmitted to the hull, which will try to turn in the opposite direction to the prop — and there we have Newton's reaction. (An analogy is winding an alarm clock. Take the clock in the left hand, and wind up the key with your right. You are exerting an effort on the key, which is the action. But if you think about it, you are also exerting pressure on the clock itself, with your left hand, to stop it turning. There's your reaction. The clock can be likened to the boat hull & your left hand to the water.)

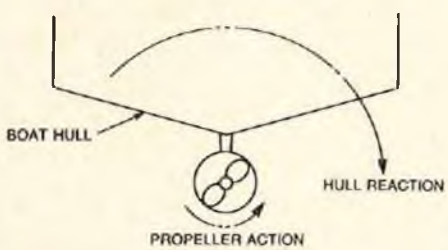



**FIGURE 3**
**DIAGRAM SHOWING ACTION OF PROP AND REACTION OF HULL, SEEN FROM REAR**

There are several ways of overcoming this annoying habit. The easiest is to glue a small wedge of wood on to the bottom of the hull, at the back of the starboard side. This will have the effect of lifting that side of the hull at a given speed. But be careful! It is impossible to give a thickness for this wedge, so fit one that gives an angle of about 5-7°, and then open that throttle *gently*. Because, if you blast off at top speed, and you have too much angle on the wedge, you are at least going to flip the boat and, at worst, play submarines! I know, I've done it. The only trouble with the fixed wedge is that it works at one speed, and is not adjustable. Thus, it is suitable more for scale models than for pure speed boats.

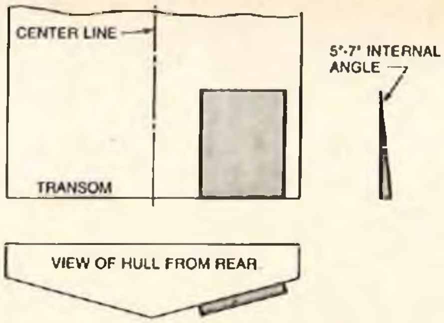



**FIGURE 4**
**DIAGRAM SHOWING INSTALLATION OF FIXED WEDGE TRIM TAB**

Well, I guess that's it for this month, I have about run out of space. Next time around, we'll take a look at adjustable trim tabs, hollowed hulls, rudder tuning and balancing, and a couple of other tricks to get that hull to run true. And don't forget, all you club secretaries, let us have all that information about yourselves, so that the loners can contact you, It's hard work doing it all by oneself.

See you all next month!! □

## TACH-TRON

from page 72/70

unused hole on the wire side of the shell. Apply moderate pressure and it will snap out. Take the purple lead provided with the Tach-Tron and insert it in the hole on the pin side of the shell. Pull the wire through until the sleeve contact starts into the shell. Take the flat side of a small screwdriver and apply pressure on the end of the contact and snap it home so that it is even with the other contacts in the plug. If your system uses solder rather than crimp type contacts, the pin need not be removed. The purple feedback lead is soldered to the unused pin. With systems which use a 3 pin plug, and no spare pin is available, the plugs will have to be changed to a 4 pin type such as World Engines or Deans.

(6) Partially untwist the servo lead an inch or two at a time and wind the purple lead into the cable along with the other wires. When done, it will appear to be a 4 wire servo. Feed the wire through the grommet. Route it through with the other wires in the servo so that it can continue along to one of the motor terminals. You are now ready to determine which terminal to use. The servo will have to be run with the case bottom off.

(7) Strip 1/8" from the end of the purple wire and tin with solder. Plug the servo into the Tach-Tron. Check that the end of the purple wire is in the clear and turn the system on. Hold the servo in one hand and the end of the purple lead in the other. The servo should be at retarded throttle, but the transmitter control is full open. Touch the purple lead to one of the two motor terminals. If the servo runs back and forth, remove from terminal. This is positive feedback.

(8) Touch it to the other motor terminal, the servo may move slightly, but will not run back and forth. This will be negative feedback. Turn the system off.

(9) Since it is possible that you may select the motor terminals in the opposite sequence to which they are listed in Step 7 and 8, both tests should still be made. After you have determined which terminal *does not* cause the servo to run back and forth, the system should be shut off and the purple wire lightly tacked to that terminal with a soldering iron. If the Cal adjust would not retard your servo in previous steps, the correct terminal can be determined by going through Step 10 *two* times, first with the feedback lead tacked to one motor terminal, and then again with the feedback lead tacked to the opposite motor terminal. The correct terminal will be the one that causes the slow travel. Be sure that Cal is set at its CCW end of travel while testing.

(10) Turn the system on. Take the screwdriver and adjust the Cal pot to where the servo is again at its full throttle position (do not move Cal if servo did not retard). This should be done by turning in the CW direction. Now move the transmitter control to the idle position, and then again advance it to the full throttle position. As the servo travels toward full throttle position, the first portion of its travel should be at normal speed, the last portion of travel should be at a *reduced* rate of speed. If slow travel occurs when going toward idle rather than full throttle, the Tach-Tron timings are opposite from your channel timings. Some manufacturers provide a channel reversing feature in their transmitters. If yours is of this type, you can reverse the channel to correct the situation. If this cannot be done, the Tach-Tron must be exchanged for one with the opposite timings.

(11) If the servo reacts in this manner, you have determined the correct terminal. Turn the system off and unplug the servo. Untack the purple lead with the soldering iron and cut the lead to the correct length for permanent installation on the selected terminal. Strip 3/16" of the insulation from the end of the wire and tin with solder. Now solder the lead to the selected motor terminal. Use caution not to burn insulation on other wires. Be sure solder does not spill over and short the terminal to the motor case.

(12) The servo may now be closed up, replacing the case and screws. Plug the servo back into the Tach-Tron and again test. Each time the throttle control is advanced from idle to full, the servo should fast travel for a portion of its movement and slow travel for the remainder of its movement. Do not worry about the slow travel. It will be adjusted out during the next step.

(13) The final setting of the Cal pot is as follows: Set the aux. control to idle and turn on the system, open and close

the throttle several times while slowly turning the Cal adjustment CW. As you do this, you will note that the slow run portion of the servo travel will get shorter until it disappears. When the Cal adjust has been turned far enough to the point of removing all slow travel, this will be the correct setting. Any further settings beyond this point will needlessly subtract from governor sensitivity, and should be avoided.

(14) The adjustment of the Sense and RPM are dynamic adjustments, with machine running. This will be done under the heading of Calibration after the system has been installed in the machine.

(15) Consult the drawings showing wheel and head installation for the various machines. Select the one for the type machine you have and install the timing wheel on the output shaft as illustrated. Also mount the read head as indicated in the drawings. If you have a machine which is not covered by these drawings, scan through the various illustrations and select a drawing which closely resembles your machine mechanics and modify the suggested methods to best suit your needs. The end requirements are:

A.) On CW rotation machines, the read head must be mounted right side up (head above its mounting tabs). The wheel may be mounted with the set screw portion either below or above the wheel, whichever gives the best access to the set screws.

B.) For CCW rotation machines, the read head must be mounted upside down, or the sense leads must be reversed on the read head terminals. This can be accomplished by sliding the spaghetti away from the head terminals, unsolder the wires and resolder to the opposite terminal. Replace the spaghetti to its proper position. **Note:** The head inversion or lead reversal is necessary to obtain the correct trigger pulse polarity for the Tach-Tron. Erratic timings may result if this rule is not observed.

C.) The air gap between the face of the head and the wheel should be a minimum of .015" with a maximum of not over .025". A standard sheet of typing paper is approximately .003" thick. Six 1/2" wide by 2" long shims of paper will provide a gauge with which to set the head gap. A matchbook cover may also be used. Using metal feeler gauges is not advised. They will become magnetized from the wheel magnets, will pick up metal particles from your work bench, which, in turn, would be transferred from the gauges to the surface of the timing wheel. When making this setting, use an area on the side of the wheel where there is no magnet next to the head, for the best results.

D.) The vertical elevation of the wheel on the shaft in relation to the head, must be such that the center line of the magnets projected through the head, would pass through the vertical center of the read head pole piece. The pole piece is visible on the read surface of the head.

E.) When viewed from above or below the wheel, an imaginary straight line should pass through the wheel center, shaft center and head pole piece center. The head should not be canted, but should be true to this line for maximum read sensitivity.

F.) Head mounting techniques must be rigid such that finger pressure on the head does not move it up and down. Thread lock should be used on the head mount screws.

G.) The set screws retaining the timing wheel on the shaft must not be overtightened. This will distort the wheel, causing wobble. Poor timings could result. It will also dent your output shaft. There is very little torque on the wheel. One eighth to one fourth turn of the screw after it contacts the shaft is ample.

H.) The Sense lead to the read head should be spot glued an inch or so from the head and then on 4" intervals securing it to the air frame. This will prevent lead breakage.

(16) Mount the Tach-Tron in the radio compartment. Locate it such that you will have access for adjustment with the compartment hatch open. Double sided servo tape on the case bottom can secure it to a bulkhead or fuselage side.

(17) Make the final connection between the Tach-Tron, receiver and servo. Re-check all of your installation and prepare for your dynamic calibration.

### Installation
### Auto Collective Versions

A feedback lead is not required with the collective pitch Tach-Trons; therefore, less steps are required to accomplish installation of these types. Compatibility of your auto collective Tach-Tron can only be verified however, by providing either a simulated RPM input or by actual testing of the system on your machine. If one wishes to verify timing compatibility with the intended transmitter aux. channel, he can refer to a previous section of this article which covered kit construction and testing. If the decision is made to verify correct operation using machine testing, you can proceed with the following steps:

(1) Plug the Tach-Tron into the selected aux. channel. Plug the collective pitch servo into the Tach-Tron output plug, which will be a 3 lead cable without feedback.

(2) Turn the system on and operate the transmitter aux. control. Servo operation should be normal, as if the servo were plugged directly into the receiver.

(3) When correct servo operation is attained using aux. control lever, you may install the Tach-Tron in your machine. The installation will be identical to the governor versions, starting with Step 15 under the heading "Installation, Governor Versions." Proceed to that step and follow those instructions for the installation. Machine compatibility testing will be covered under "Calibration, Auto Collective Versions."

### Calibration
### Governor Versions

(1) The machine should be secured down during the calibration procedure. The easiest way is to pass a 1" x 4" or 1" x 6" board through the skids and place weights on the board. Flight box, starting battery or blocks may be used. On a bottom start helicopter (Kavan), do this after you start the engine.

(2) Set the aux. throttle control to a high idle position and start the engine. Remove the starting battery and release the rotor. Increase the throttle setting to about 1/3 throttle so that the clutch is engaged and allow the engine to warm up.

(3) Set the collective pitch to an approximate zero pitch setting. **Note:** There will be no load on the engine with this pitch setting. If for some reason, the governor does not limit engine RPM, you could throw tail rotor blades if you allow the RPM to become excessive. When opening the throttle for the first time, do not advance the throttle to the full position until you are sure that the governor is *limiting* the engine.

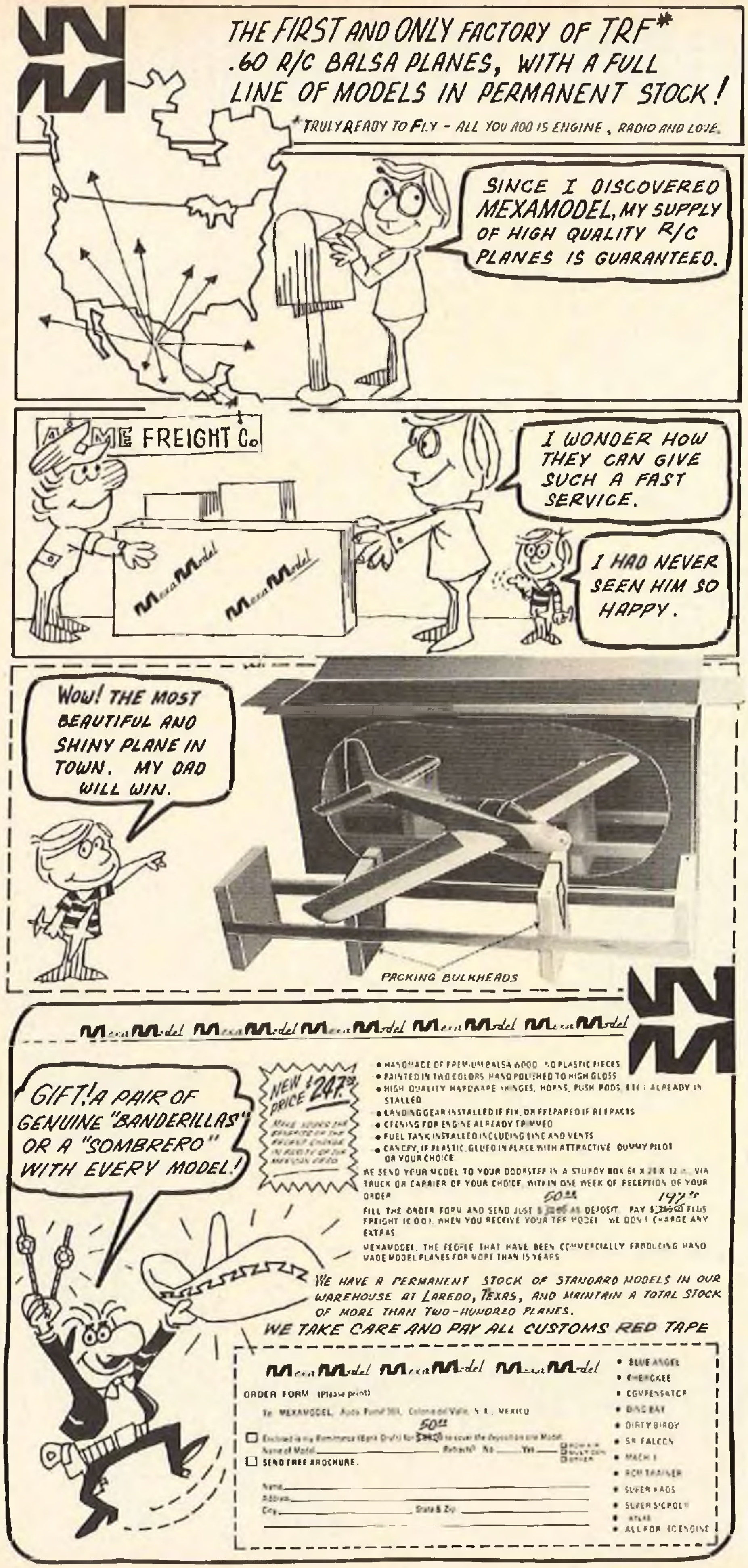
(4) Slowly open the throttle and observe for RPM limiting by governor action. If RPM is limited (approximately half throttle), and no RPM "hunting" exists, continue to open the throttle control to its maximum setting. Note your engine RPM by ear. Is it low, as desired, or is it high? It may be decreased by turning the RPM pot CCW or it may be increased by turning the RPM pot CW.

(5) If upon opening the throttle, RPM limits, but goes into a "hunting" condition, come back to an idle and decrease the sensitivity by turning the Sense adjust pot CCW. *Do not* disturb the Cal adjust from your previous pre-installation setting.

(6) The initial desired results is to have governor action *without* "hunting". After you have achieved this condition, you will proceed to a final setting. Set your RPM adjust to an approximate desired engine pitch by ear. The end setting will be the Sense adjust first, and RPM adjust last. (Sense adjustments interact with RPM settings, RPM adjustments *do not* interact with sensitivity adjustments.)

(7) After an approximate RPM setting has been achieved without "hunting", you may set your throttle lever to full and slowly increase the pitch. While doing this, observe the throttle servo to see that power is being added. (RPM will

**to page 108**






from page 106/70

change slightly, the exact amount dependent upon where your sensitivity happens to be set.) Return the pitch setting to zero degrees. You will now adjust for a deliberate "hunting" with no pitch. With the engine at idle, quickly open the throttle to full, (no pitch). Did the system break into a "hunting" condition? If not, come back to an idle, increase sensitivity and try again. Once you have a "hunting" condition, you will have exceeded the maximum possible setting with your system, and will back off from this slightly.

(8) The end desired sensitivity setting is when you can quickly go from idle to full throttle and have the RPM stabilize after one overshoot. Try this several times from 0 to full throttle with no pitch to get the desired results. After you achieve this setting, set the throttle full and load by adding pitch. Set pitch to where the throttle servo is at the high end of travel, or the pitch is at its high end, whichever occurs first. Now abruptly unload to 0 pitch to see if the system breaks into a "hunting" condition when unloaded abruptly. It should again stabilize in approximately one overshoot.

(9) Once the desired sensitivity level has been found, no further adjustments of this control will be necessary. You may now adjust your RPM pot up or down slightly to give the best results during flight tests. You should note while you have the machine weighted, by observing the throttle servo to see if you are getting full throttle servo *before* you get full pitch applied. If so, your engine is not capable of maintaining the RPM you have selected with the pitch capabilities you have. (Recommended pitch settings are covered in "Flight" section.) Should this be the case, a non-constant RPM at high pitch settings will be due to engine under-power, not governor inefficiency.

(10) Should the condition in Step 9 exist, it can be corrected in one of two ways. The RPM adjustment can be set lower, or lower maximum pitch settings should be provided. One should bear in mind that as RPM settings are increased, maximum pitch angles must be decreased to prevent full throttle before full pitch.

### CALIBRATION AUTO-COLLECTIVE VERSIONS

(1) The instruction in this section assume that the servo travel limits, which are controlled by Sense and Cal adjustments have been pre-calibrated. This will have been done on factory wired units; these adjustments for kits are covered in the kit instructions. Field ad-

to page 112

## TACH-TRON

from page 108/70

justment of Sense and Cal on any of the collective versions is not recommended.

(2) The machine should be secured down as is described in Step 1 of Calibration, Governor Types. Turn on the radio and operate the pitch control lever to check for normal operation. After testing, leave the control set at the low pitch position.

(3) Set the throttle at high idle and start the engine. Release the rotor and increase the throttle to about one-third and allow the engine to warm with clutch engaged. Starting battery can be removed. Check to see if the RPM present has caused the collective pitch servo to advance automatically from the low pitch position. If it has, pitch is being added as a function of RPM and the Tach-Tron is compatible with your channel timing.

(4) If pitch was not being applied at one third throttle, increase the throttle to a one half throttle setting. Again check to see if pitch is being added. *Do not* exceed one half throttle if pitch is *not* being added. If you do, you will obtain excessive RPM with higher throttle settings, which could possibly cause your machine to throw tail rotor blades.

(5) If automatic pitch was not obtained with Steps 3 or 4, it is possible that the Tach-Tron and your collective pitch channel timings are opposite. To prove if this is the case, come back to an idle and apply full pitch with the aux. pitch control lever. Now advance the throttle to a one third position, check the collective pitch servo to see if RPM is automatically *decreasing* pitch. If it is, the Tach-Tron and channel timings are opposite. If this is the case, a collective pitch servo of the opposite rotation can cure the problem. The aux. pitch lever is rarely moved during flight, so it is not important what its position is on the transmitter while flying. If a servo of opposite rotation is not available, switch the pitch linkage to the opposite end of the servo output arm. Low pitch on the aux. lever will be at the opposite end of lever travel.

(6) If pitch was applied with the pitch lever at the low pitch setting, as throttle was added, the system is normal. When this condition is achieved, you can slowly open the throttle to a full throttle position. As the RPM is increased, the pitch will continue to increase until full pitch is applied, if the engine can push the load. If the engine is loaded too heavily, and is not obtaining the desired RPM, the pitch slope may be lengthened. This will give you full pitch at a higher RPM. This can be done by turning the RPM adjust pot CW slightly.

(7) Using the RPM adjust, set your final engine loading to obtain the proper

to page 114

## TACH-TRON

from page 112/70

or best flight characteristics. To make the engine work harder, turn the pot CCW; to ease its load, turn the pot CW. **Note:** The reason that Cal and Sense adjustments on the auto-collective versions should not be attempted in the field is that these two controls set your servo travel limits. If you did this, you may run your servo past its limit to a stall condition.

### FLIGHT (GOVERNOR)

(1) The recommended pitch angles for symmetrical blades are 2° in the minus direction and 5°, 6°, or 7° in the plus direction, depending on the available power. The recommended pitch angles for flat bottomed blades are 3° in the minus direction and 3° or 4° in the plus direction. Flight tests have proven that the flat bottomed blades (Clark-Y), provide more lift than the symmetrical blades at equal pitch angles.

(2) Try a few lift offs to 2 or 3 feet and get the feel. When this is mastered, increase them to about 10 feet. Learn how much pitch it takes to break descent when you start to decrease altitude.

(3) When you touch down and you want it to *stay down*, it can be held down with negative pitch or the throttle can be decreased to a sub-flight RPM. A high RPM blade at zero or 1° plus pitch will gain considerable lift from wind gusts which could cause a tip over.

(4) Always fly with the throttle (aux.) full open so that it will not limit the governor on high end.

(5) In forward flight, you will find yourself *forgetting* to come off of the pitch, once you are moving. It takes very little (less than 1/2 pitch), in forward flight. As is the case on a machine flown by throttle, you must back off after you get going, the difference is, you will hear no RPM change. Once in forward flight, a machine will actually maintain altitude with forward cyclic and a zero degree collective pitch setting. Using low pitch angles in forward flight reduces the engine work load and keeps heat to a minimum.

(6) In the transition from horizontal flight into a nice forward descent, it takes a very low pitch setting because RPM is not decreasing (it increases slightly as you unload). A minus 1½ to minus 2° is recommended. If you are in forward flight and want to make a quick descent, you can go all the way to minus 2° pitch. The *nose* of the helicopter will drop, so you must apply *back* swash plate. You will also note that under these conditions the RPM will increase slightly. This is because the auto-rotating rotor is pushing the engine. After a fast descent in this manner, you can make a very quick stop by adding pitch as you have energy stored in the rotor.

(7) Exotic jump take-offs can be accomplished with a governor controlled machine. The pitch can be pre-loaded to a zero or 1° point, in readiness for a take-off. Full pitch can be abruptly applied from that point. The machine will climb out at a rate somewhere between 10 to 20 feet a second, depending on how well the machine has been set up. This refers to optimized pitch angles and RPM settings for given blade types and machine weights.

(8) If specially ordered, the RPM setting for you, when the Tach-Tron was shipped, was selected knowing the weight of your machine. This should be close to what you will need. You may, however, move this up or down with slight adjustments of the RPM adjustment to what you desire. Changing this will not affect the Sense or Cal, but if you change the Sense, it *will* affect the RPM setting.

**FLIGHT (AUTO-COLLECTIVE)**

(1) Flight with an automatic pitch system is very similar to a fixed pitch throttle control machine. The notable difference is that smaller throttle adjustments provide the same lift change. Smaller throttle adjustments will give you less torque effect.

(2) Adjust and fly your machine as you would a fixed pitch machine with one exception, which is pitch adjustment. You will do this with the RPM adjustment on the Tach-Tron.

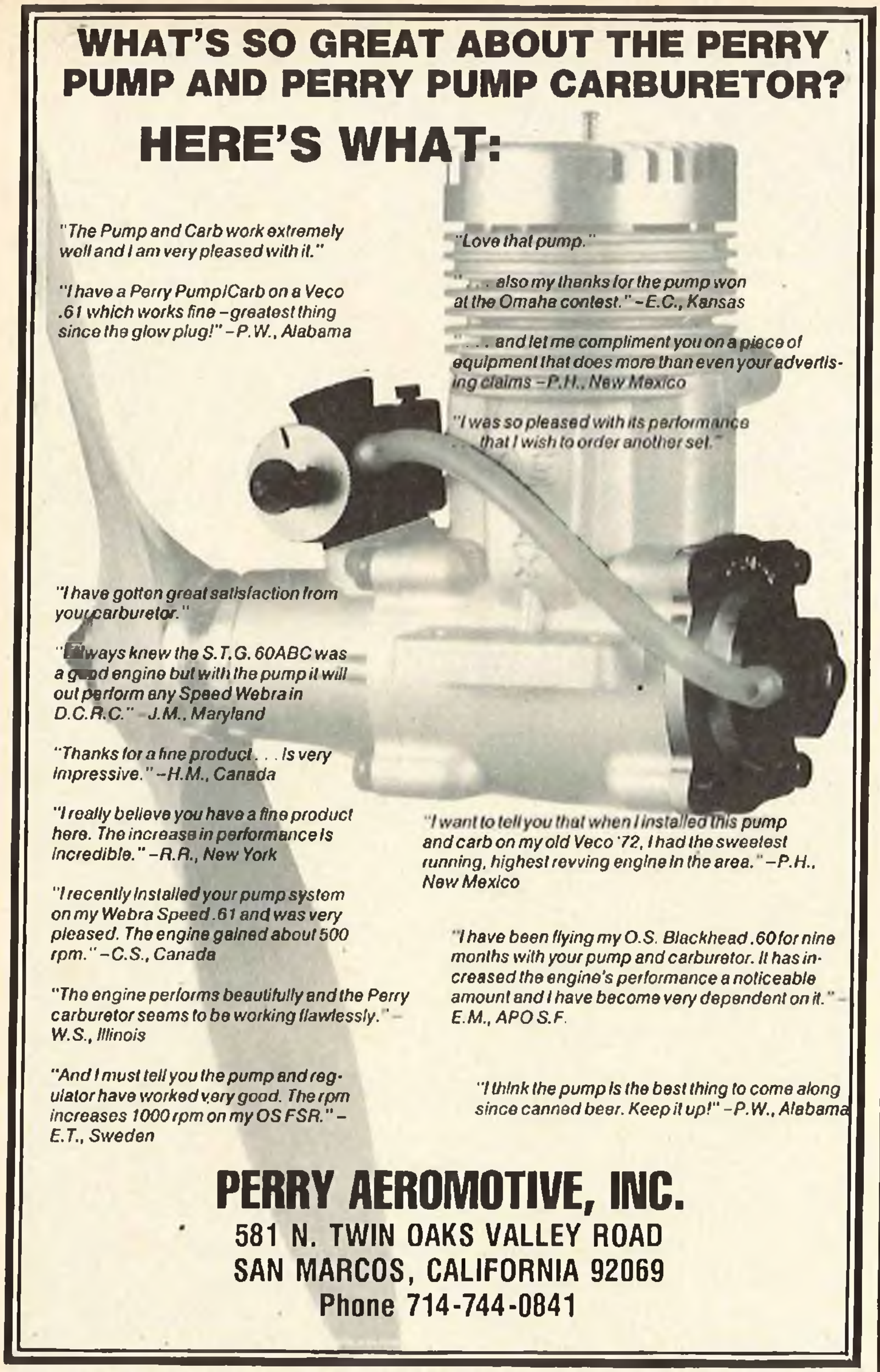
(3) If an in-flight lean run develops, you will not need to reduce the throttle as much, to improve the condition. The lower RPM's will reduce pitch, which lowers the engine's work load.

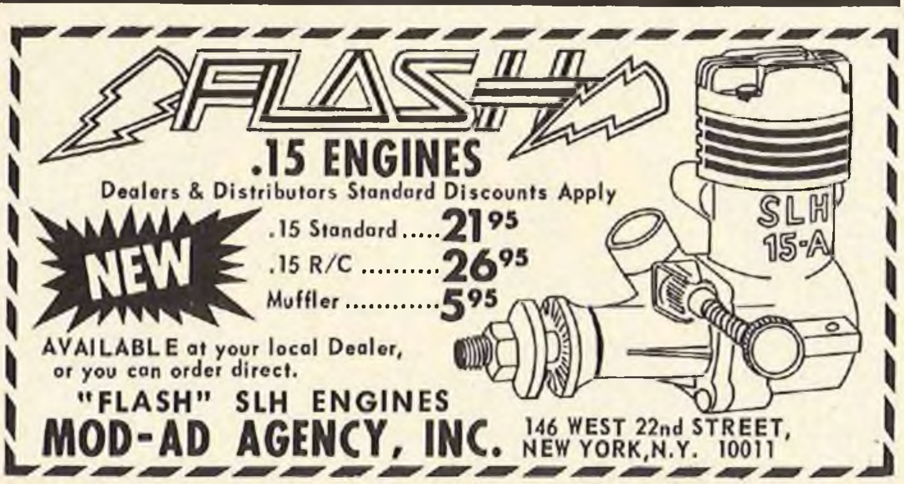
(4) An auto-collective system can provide you with the best possibility of a good auto-rotation landing. If the engine fails completely, the lower RPM provides a low pitch angle, which will cause the rotor to continue to turn, if forward speed is maintained. It will adjust automatically to develop maximum possible RPM. Should this happen, hold a lot of forward while the machine drops, and pull back to flare the machine using the rotor energy to soften the landing.

**GENERAL INFORMATION**

(1) Since the throttle servo has a fourth wire installed for feedback, it cannot be plugged directly into a flight pack which has a battery with the center tap lead, (white). If in future installations, the servo is used in this fashion, it must be

to page 116




## TACH-TRON

from page 115/70

isolated from the 2.5 volt wire with a 3 wire extension cable, or the 4th lead removed from the servo; servo amplifier damage will result if this is not done.

(2) Maintenance on the Tach-Tron system consists of periodically checking the timing wheel for metal particles clinging to the magnets. These can be removed with a piece of masking tape. Press the tape to the edge surface of the wheel, over the end of the magnets, and then pull off. The particles will stick to the tape and will be removed. The Sense lead dress and head mount can be checked, also the clearance, which should be the same at any side of the wheel as it is rotated to the head. Tight and loose points would indicate a bent shaft. This could cause erratic timing pulses.

(3) The adjustable range of the Tach-Tron is approximately 750 to 1500 RPM, on .60 powered machines, and 1500 to 3000 on .40 powered machines. CW increases, CCW decreases RPM. The pre-calibrated RPM settings are based on the following:

| Machine Wt. (lbs) | RPM Setting |
|---|---|
| 9-10 | 1050 |
| 10-11 | 1100 |
| 11-12 | 1150 |
| 12-13 | 1200 |
| 4-5 | 1900 |
| 5-6 | 2000 |
| 6-7 | 2100 |
| 7-8 | 2200 |

This table of weight and rotor speeds should be used as a guide in adjusting your system. You should not find it necessary to deviate more than 100 RPM from those listed, to obtain optimum setting. Settings above this should be avoided as the higher the setting, the lower the reserve for RPM control. Heavier machines should be equipped with more power, so that higher pitch angles may be used.

(4) Should you inadvertently set the sensitivity slightly on the high side, and as a result, should the engine break into a RPM "hunting" during flight, the tail of the machine will "wag" back and forth. This can be stoped by slightly decreasing the throttle from its full setting. You may then land and correct the setting.

This concludes the three part Tach-Tron series. Questions pertaining to this three part series or questions pertaining to the use of the Tach-Tron can be directed to the author. They will be answered if a self-addressed, stamped envelope is included. They should be mailed to: Al Irwin, 1312 W. Hill St., Champaign, Illinois 61820.

to page 118

## TACH-TRON

from page 116/70

I thank my lovely wife, Audrey, for the typing of this manuscript, and my good friend, Wayne Craig N10E, for his endless hours of both moral and physical support during the Tach-Tron development.

I also want to thank Lloyd Wheeler N6E for being my first "guinea pig" to try one of the Tach-Trons.

Good flying from Al Irwin and Royal Electronics! □

## CESSNA 150

from page 69

. . . . . able. Due to its stability, we can recommend this model as an excellent trainer. It is certainly an unbeatable approach to a flyable model with a minimum of building time and a superb value at $52.99. □

## NRCHA

from page 62

explain and defend each and every rule and maneuver which no one without a background of theory and experience with model helicopters could have done.

A word about some of the other maneuvers: The Constant Heading M combines diagonal, forward, sideward and rearward hovering and landing in a single, easy-to-remember maneuver. The Hovering Circle, one of the novice maneuvers in the Greenville N.R.C.H.A. Nats, can be difficult in a high wind. The Horizontal 8 weeds out the boys who can't do a right turn, and is also difficult in a strong breeze. The rectangular approach and landing (scored as two maneuvers) requires careful coordination of throttle and cyclic pitch and planning of the flight path. With non-collective pitch helicopters, it is not a good idea to reduce throttle to descent, but rather to point the nose down and keep up rotor speed, until time to flare. Now in the optional maneuvers, for the Swiss Hovering Circle, you must be, figuratively speaking "in the cockpit" to succeed. The Double Pirouette, 540° Stall Turn, True Loop, Cuban 8 and Top Hat need no further explanation. The steep approach and landing are used by airline helicopters at passenger terminals. The dead stick autorotational landing was given a high K factor as an incentive to practice it. Then the flier knows what to do if he has a flame-out at altitude, and he does it automatically. A true Axial Roll may be impossible in a pure model helicopter. However, one can come close to it with a multi-bladed (more than two) rotor which is either rigid or spring loaded in flapping. Here is where scratch builders can contribute significantly to the state of the art. All these rules are printed elsewhere in the minutes of the meeting. Let's get out there and practice them and build better helicopters which can do all these maneuvers!

### SUBCOMMITTEE PROPOSAL FOR REVISED RC HELICOPTER RULES

*(This first section, 1.4.15, replaces the corresponding section already in the FAI Sporting Code.)*

**1.4.15 Helicopters, Free Flight or Radio Controlled:**

A helicopter is a heavier-than air aeromodel which derives all of its lift and horizontal propulsion from a power driven rotor system(s) rotating about a nominally vertical axis (or axes). Fixed horizontal supporting surfaces up to 4% of the swept area of the lifting rotor(s) are permitted. A fixed or controllable horizontal stabilizer up to 2% of the swept area of the lifting rotor(s) is permitted. Ground effect machines (hovercraft), convertiplanes or aircraft which hover by means of propeller slipstream(s) deflected downward are not considered to be helicopters.

**Specifications:**

**Area:** Maximum swept area of the lifting rotor(s), counting only once any area of superimposition, 300 $dm^2$, except for coaxial helicopters whose rotors are farther than one rotor radius apart, in which case the total area of both rotors is counted.

**Weight:** Maximum weight with fuel, 5 kg. For competition only, not for world record purposes, for a period of two years following provisional adoption of these rules the maximum weight without fuel may be 5 kg.

**Piston Motor Displacement:** Maximum 10 $cm^3$.

**Rubber Motor:** No restrictions.

N.B.: Metal bladed rotors are forbidden.

**5.4 CLASS F3C HELICOPTER (Provisional Rules)**

**GENERAL RULES (See also 1.4.15)**

**5.4.1 Definition of a Radio Controlled Helicopter:**

A helicopter is a heavier-than air aeromodel which derives all of its lift and horizontal propulsion from a power driven rotor system(s) rotating about a nominally vertical axis (or axes), and which performs maneuvers controlled by the pilot on the ground using radio control connection. Ground effect machines (hovercraft), convertiplanes or aircraft which hover by means of propeller slipstream(s) deflected downard are not considered to be helicopters.

**5.4.2 Prefabrication of the Model:**

**Permitted:** A helicopter which is assembled by the builder from prefabricated parts and in which the builder installs the equipment.

**Not Permitted:** Models which are completely prefabricated and require only a few minutes of unskilled effort for their completion or complete ready to fly models which have been built by a person other than the pilot.

**5.4.3 General Characteristics of Radio Controlled Helicopters:**

**Area:** Maximum swept area of the lifting rotor(s), counting only once any area of superimposition, 300 $dm^2$.

**Weight:** Maximum weight with fuel, 5 Kg. For competition but not for world record purposes, for a period of not more than two years following provisional adoption of these rules, the maximum weight **without** fuel may be 5 Kg.

**Piston Motor Displacement:** Maximum 10 cm³.

**Fixed Horizontal Supporting Surfaces:** Maximum 4% of the swept area of the lifting rotor(s).

**Fixed or Controllable Horizontal Stabilizer:** Maximum 2% of the swept area of the lifting rotor(s).

**N.B.:** Metal bladed rotors are forbidden.

The engine must be fitted with an effective silencer.

**N.B.:** If a yaw rate gyro is used, it shall be kept on during all the maneuvers.

**5.4.4 Number of Helpers:**

Each pilot is permitted one helper.

**5.4.5 Number of Flights:**

The competitor has the right to four official flights.

**5.4.6 Definition of an Attempt:**

There is an attempt:

(a) When the pilot announces the start of the first maneuver.

(b) If the motor stops after the pilot has announced the start of first maneuver and before the model is airborne, it may be restarted (with the time being taken from his allotted flight time).

**5.4.7 Number of Attempts:**

Each competitor is entitled to one attempt for each official flight. **N.B.** An attempt can be repeated at the judge's discretion only when for any unforeseen reason outside the control of the competitor, the model fails to make a start.

**5.4.8 Definition of an Official Flight:**

There is an official flight when an attempt is made, whatever the result. Note: When jettisoning occurs, the flight is cancelled.

**5.4.9 Marking:**

Each maneuver may be awarded marks between 0 and 10 by each of the judges during the flight. These marks are multiplied by a coefficient which varies with difficulty of the maneuvers. Any maneuver not completed shall be scored zero (0). The maneuvers must be performed in an airspace which will allow them to be seen clearly by the judges, approximately 60 degrees vertically and 90 degrees horizontally. The non-observance of this rule will be penalized by loss of points. There shall be an official located in a position where any flight over spectators can be observed, and a visual and audible signal shall be given to indicate such over-flights. If this happens before a maneuver is completed, no points shall be given this maneuver. The official will keep a record of all disqualified maneuvers. The judges shall score all the maneuvers. If an infringement has been made, the scores will be deleted on all cards.

**5.4.10 Classification:**

The final classification will be determined by the aggregate sum of the best three flights. The marks allocated by the judges will be multiplied by their appropriate coefficient, and added together. In case of a tie for the first place, the final result will be established by a fly-off. Any fly-off must take place within one hour of the normal finishing time of the contest. No attempts are permitted. The results of a fly-off shall count only for the establishment of a title (such as World Champion) and any prizes affected.

**5.4.11 Judging:**

(a) The organizer must appoint a panel of at least three judges for each flight. The

to page 122

from page 120/62


judges shall preferably be of different nationalities and be elected from a list of persons who are approved by the National Aero Clubs and the CIAM. A rotation system or equivalent system may be used provided that each judge will score each contestant and equal number of times. The specific system to be employed at a World Championship must be stated in advance by the organizers and must have prior approval by the CIAM or CIAM Bureau.

(b) There shall be training flights for judges with a briefing before and after to be held immediately before every W/CH.

**5.4.12 Organization for Radio Controlled Helicopter Contests:**

All transmitters to be used during the contest must be checked and placed in a compound kept under observation. During the contest a Steward must be in control of the transmitter compound and he will issue the transmitter to the competitor when his name is called to stand by the ready box. As soon as the attempt has ended, the competitor must immediately return his transmitter to the transmitter compound. All unauthorized transmissions during the contest will result in automatic disqualification of the offender from the entire contest, and render him liable to further penalties.

The order of starting of the competitors will be established by means of a drawing before the start of the contest. No two flyers in succession may use the same radio frequency. If this situation turns up as a result of the drawing, the second person drawn on a given frequency shall be placed later in the starting order.

A competitor must be called at least five minutes before he is required to enter the ready box. Once he is in the ready box, he is given at least five minutes to start his engine and make any last minute adjustments. When the flight in progress is completed, the competitor in the ready box carries his helicopter, with engine running, to the take-off square or helipad and awaits the signal from the judges to begin his flight. At this time, the next competitor moves to the ready box and another competitor is called to stand by.

If the competitor in the ready box fails to get ready within five minutes, or by the time the flight in progress is finished, whichever is longer, the timer will start the watch measuring the allotted time for the first set of maneuvers.

**5.4.13 Schedule of Maneuvers for Radio Controlled Helicopters:**

The maneuvers are in two groups: required and pilot's choice. The pilot is given five minutes to complete the required group of maneuvers. If both aircraft and pilot perform these maneuvers in a safe and controlled manner he is allowed three minutes to perform up to four of the optional maneuvers. If the allotted time expires before a maneuver is completed that maneuver will be scored zero and the pilot is required to land as soon as possible. A landing is not required to be one of the chosen maneuvers.

The maneuvers must be executed in the order they are listed on the score sheet, with the chosen optional maneuvers underlined by the contestant. A new score sheet is is-


to page 128

## NRCHA

from page 122/62

sued for each contestant for each round. Only the contestant's number, not his name or nationality, will appear on the score sheet. The required maneuvers are executed as described with landings performed only where listed. The optional maneuvers should be performed in a smooth flowing sequence with an interval of at least five seconds between maneuvers. Preferably one maneuver should be performed on each pass before the judges.

The name of each maneuver must be announced by the pilot. Unannounced maneuvers will not be scored. It is recommended that the end of each maneuver also be announced. The competitor may make only one attempt to execute each maneuver during any one flight.

**Required Maneuvers Maximum Points:** 500. Pilot stands in square midway between flags 1 and 4 of the 10 meter square, except for rectangular approach and landing.

**5.4.13.1 Hovering M:**
K=10

Model starts from helipad in center of square which is 10m on a side, takes off and ascends vertically to eye level and hovers briefly (2 or 3 seconds). While heading constantly into the wind, model moves along a diagonal line to flag 1 at the near right corner, hovers briefly, then moves forward to flag 2, hovers briefly and so on to flags 3 and 4 and then to a point over the helipad, hovers briefly and descends smoothly to the helipad. Points will be subtracted for the following reasons:

1. Model tilts, turns or moves horizontally during take-off and climb.
2. Model changes altitude, heading or speed during horizontal flight.
3. Model goes off course or fails to hover directly over flags.
4. Take-off or landing is rough or sudden.
5. Model does not land completely on the helipad.

**5.4.13.2 Hovering Circle:**
K=10

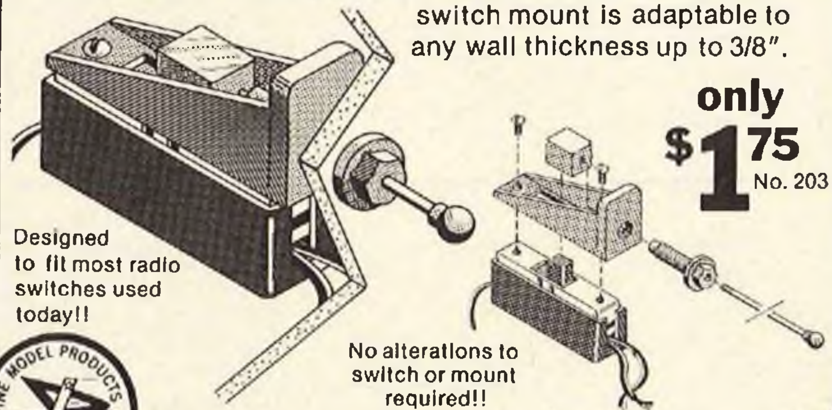
Model takes off from helipad, ascends vertically to eye level and hovers briefly. Then model flies sideways to left or right, holding constant altitude, keeping constant distance from the pilot and keeping tail always pointed toward pilot, until it returns to starting point directly over the helipad. After a brief hover, it descends to the helipad. The score will be lowered for the following reasons:

1. Take-off and landing rough and with heading changes.
2. Altitude changes during flight, radius of circle not constant, or tail does not always point towards pilot.
3. Model does not land completely on helipad.
4. Speed changes during flight.

**5.4.13.3 Horizontal Eight:**
K=10

Model takes off from helipad, ascends smoothly to approximately 3 meters, hovers briefly, then begins a circle starting forward and turning either right or left. The circle passes over the two flags on one side of the square and ends over the helipad. Without slowing down, the model continues into a circle to the other direction, flies over the other two flags and returns to a point over the helipad and hovers at 3 meters. (Do not land.)

to page 130






**NRCHA**

from page 128/62

Maneuvers will be downgraded for the following reasons:
1. Take-off not smooth and climb to 3 meters is not vertical.
2. Model changes heading during climb.
3. Model does not maintain constant speed and altitude during circles.
4. Model's logitudinal axis is not aligned with the flight path.
5. Circles are not round and do not pass directly over the flags.

**5.4.13.4 Rectangular Approach:**
**K=10**

Pilot moves away from starting square. Model ascends to a point 10 meters above the helipad. Model flies forward (upwind) at medium speed and constant altitude approximately 20 meters, makes a 90° left turn, flies crosswind straight and level another 20 meters, turns left 90° and flies straight and level downwind to a point even with the helipad. (All turns have a two to three meter radius.) At this point, model begins a uniform descent rate and flies forward (downwind) another 20 meters and makes a 90° left turn for his base leg. Continuing constant rate of descent, pilot makes a 90° left turn which will line the helicopter up with the starting circle and the helipad. Maneuver will be downgraded for:
1. Deviation from straight flight path between turns.
2. For sudden or too wide turns.
3. Changing altitude during first half of maneuver.
4. Not constant rate of descent during last half of maneuver.
5. Model changes speed during maneuver.
6. Flight paths not parallel to sides of square.

**5.4.13.5 Flare and Landing:**
**K=10**

After turning on final leg of approach, model gradually loses speed as it approaches helipad and comes to a smooth hover within one rotor radius of the ground. Model gently settles to the ground and lands smoothly on the helipad. Maneuver is downgraded for:
1. Erratic flight path.
2. Yawing motion of model.
3. Coming to a hover too high above the helipad.
4. Overshooting the helipad.
5. Landing roughly or not completely on the helipad.

**Optional Maneuvers:** (Maximum possible points — 850.) Pilot chooses up to four of these maneuvers and flies them in order indicated by numbers on his score sheet. Pilot should allow at least five seconds between maneuvers for scoring. Pilot may stand anywhere in the 10m square, unless otherwise specified.

**5.4.13.6 Swiss Hovering Circle:**
**K=20**

Pilot stands in starting circle, model takes off from helipad with nose pointing toward pilot and rises to eye level. After brief hover, model begins hovering circle in either direction about the pilot. Circle complete, model comes to a brief hover over the helipad and descends vertically and smoothly to the pad, with nose still pointing towards the pilot. Maneuver is downgraded for:

to page 135

## NRCHA

from page 130/62

1. Deviation from flight path described above.
2. Not holding constant speed, altitude and distance from the pilot.
3. Not holding nose directly toward pilot at all times, except while model is on the ground.

**5.4.13.7 Double Pirouette:**
**K=10**

Model faces into the wind, takes-off and ascends vertically to 3 meters, hovers briefly, then performes a 720° slow rotation in either direction about the yaw axis. Then the model stops on its original heading and hovers briefly. Do not land. Maneuver will be downgraded for the following:

1. Take-off and climb are not smooth and straight.
2. Model turns more or less than two revolutions or hunts in direction.
3. Model turns fast rather than slowly.
4. Model drifts away from its position directly over the helipad.
5. Model changes altitude while turning or hovering.

**5.4.13.8 Stall Turn with 540° Rotation:**
**K=15**

Model flies fast straight and level then pulls up smoothly until it is flying straight up. Just as it stops, model pivots on its yaw axis 540° or one and a half revolutions so that nose points down. Then the model recovers from the dive along the same path on which it entered the maneuver. Points will be deducted for the following:

1. Model does not achieve vertical flight.
2. Model drifts upwind or downwind during the vertical flight and turn.
3. Model turns more or less than 540°.
4. Model comes out of maneuver on different heading, altitude or path than that on which it entered the maneuver.

**5.4.13.9 True Loop:**
**K=20**

Model flies straight and level at moderate to high speed, pulls up into an inside loop, keeping the nose pointed in the direction of flight. Model recovers from the loop and flies straight and level along the same heading and altitude at which it entered the maneuver. Maneuver is downgraded for the following:

1. Loop is not round.
2. Model rolls or deviates from the vertical plane in which the loop was started.
3. Loop ends at different altitude than it started.

**5.4.13.10 Slow Roll:**
**K=20**

Model flies straight and level and slowly rolls in either direction about an axis coincident with the flight path and continues rolling the same direction until it is again flying straight and level. Maneuver will be downgraded for the following reasons:

1. Roll is too fast, i.e., more of snap roll.
2. Model loses altitude during the roll.
3. Model finishes the maneuver on a different heading from that on which it entered.

**5.4.13.11 Cuban Eight:**
**K=25**

Model flies straight and level and pulls up into an inside loop, continues until heading downward at 45°, does a half roll followed by another inside loop. At 45° downward model does another half roll and recovers on the

## MARCH PUZZLE ANSWERS

| | ACROSS | DOWN |
|---|---|---|
| (1) | DOWN | WIND |
| (2) | FAIL | SAFE |
| (3) | SCRATCH | BUILT |
| (4) | SPRAY | BAR |
| (5) | HIGH | WING |
| (6) | THREE | VIEW |
| (7) | FREQUENCY | FLAG |
| (8) | SERVO | TRAY |
| (9) | ENGINE | CLINIC |
| (10) | FLYING | FIELD |
| (11) | FULL | HOUSE |
| (12) | GLOW | PLUG |
| (13) | BASIC | TRAINER |
| (14) | FIXED GEAR | LANDING |

## FEBRUARY PUZZLE WINNERS

**In the February puzzle, MEN could have been found in two places — they were both accepted**

William Aberle
Mark Bednar
Ford Benbow
Stephen Bird
Wayne Blanchard
Dana Blix
Bob Brantley
Ron Brownell
Marge Brust
Leon Cheeka
Bob Coleman
George Crowther
Chris Curry
Richard Daoust
Vincent DeGiacomo
Bill Eberlein
David England
Michael Famolare
Mike Finningan
Richard Fox
Emilio Fuente
Seiji Furuya
Jeff Garver
John Gatchett
Robert Goddard Jr.
Ray Ketchum
James Lafer Jr.
Keith Lentz
Donald Lestage
David LeTourneau
Robert Light
Robert McDonald
Mahoney
James Manning
Mike Mansfield
Gary Mester
Don Melcher
George Miller
Thomas Miller
Karen Mitchell
Don Newcomb
Rick Phelan
Carlos Prieto
Mike Rushanski
C.J. Salber
Leroy Schlinkert
Edward Schutt
Barre Sereno
William Stoothoff
Patrick Soukup
P. de Torcy
Charles Tucker

same altitude and heading as entry. Maneuver is downgraded for the following reasons:

1. Model not level at start.
2. Loops not round.
3. Model deviates right or left.
4. Model not at 45° down when rolls commenced.
5. Second loop not same diameter as first.
6. Model not level and at same altitude and heading as entry.
7. Rolls not centered about crossover point.

**5.4.13.12 Top Hat:**
**K=15**

Model flies ten meters forward, straight and level, comes to a hover, then ascends vertically for five meters and comes to a hover. Model makes a 360° pivot turn, hovers, ascends another five meters and comes to a hover. Then model moves forward ten meters, hovers briefly and descends vertically five meters. After a brief hover, it makes another 360° pivot turn, hovers and descends vertically five more meters. Another brief hover and the model flies straight forward ten meters to complete the maneuver. Maneuver will be downgraded for the following:

1. Not flying level in level places or vertically in the vertical places.
2. Changing altitude or drifting horizontally during the 360° turns.
3. Deviating to the right or left of the vertical plane of the maneuver.
4. Not hovering briefly between each part of the maneuver.
5. Not placing both 360° turns at the same altitude.
6. Finishing the maneuver at a different altitude from the start.
7. Turning more or less than 360°.

**5.4.13.13 Steep Approach and Landing:**
**K=10**

Model approaches helipad from downwind at an altitude of at least ten meters. When model approaches a 45° glide path to the helipad, model reduces power and descends along the 45° glide path while keeping an approximately level altitude. When model is approximately two rotor diameters above the ground, more power is applied and the model slows its rate of descent and forward speed smoothly so as to reach zero forward speed and rate of descent just as it touches down on the helipad. Maneuver will be downgraded for the following:

1. Deviation from the 45 degree flight path to the helipad.
2. Yawing motion of the model.
3. Rate of descent and forward speed down to the flare are not constant.
4. Motion of the model is not smooth.
5. Model does not land entirely on the helipad.
6. Landing is rough or model comes to a hover above the helipad.

**5.4.13.14 True Autorotative Descent and Landing:**
**K=20**

Model approaches helipad from downwind at an altitude of at least 20 meters, and flying at a speed which requires less power than hovering. When it reaches the position where it autorotative descent path will bring it approximately to the helipad, considering the prevailing wind, the model will reduce collective pitch to best autorotative setting. The engine may or may not be shut off, but will be

to page 140

### NRCHA

from page 136/62

downgraded slightly if it remains running. The flare to land must be done entirely without power, as in a true dead stick landing. Land as near to the center of the helipad as possible. Maneuvers will be downgraded for the following reasons:

1. Landing is not smooth.
2. Model lands away from the helipad.
3. Model lands with forward speed remaining.
4. Model deviates from a straight line while descending, except during the flare.
5. Model yaws or performs sudden motions.
6. Engine left running during maneuver.

### P-47 THUNDERBOLT

from page 60

. . . . . strip threads from the firewall. In conclusion, in spite of its size, the Thunderbolt will weigh about 8½ pounds with retracts and flaps. With 720 square inches of wing area you can expect a fine flying machine. □

### YARD BIRD

from page 59/56

where else would you expect to find a flying lawnmower.

The four mower wheels, made from vacuum formed plastic, deserve a little explanation. Hex nuts about 9/16" are formed into each half of the sheet material which is only about .010 thick. On the inboard side of each wheel a short (3/8" long) section of 3/4" dowel was epoxied. The axle centerline was carefully drilled for a 6-32 screw axle that uses two nuts and secures the wheel to the ply bracket at each corner of the main wing. To join the wheel halves, small tabs of plastic, approximately 1/4" square, were cemented (using M.E.K. solvent) about every inch around the tire joint line on the interior before joining. When dry, these tabs interlocked between tabs on the mating half and made a very secure, gap-free joint. The 9/16" nuts, and the tire portion of each wheel, were painted dull black and really look good. All four wheels with axles and nuts add only 8 ounces to the total.

**Finishing:**

The basic color of the machine is red. Superpoxy red is an exact color match to opaque red MonoKote and is used on all plywood formed structure. The wood fuselage, hatches and wheel brackets were sealed with polyester resin, then given two coats of K & B Superpoxy primer and color coated with red Superpoxy. All finishing and MonoKote covering was done with the model in subassembly form. MonoKote is applied directly over the foam structure, attaching at leading and trailing edges and tip ribs only. Careful use of a hair dryer smoothed out residual wrinkles and did not distort the styrofoam, although only a very narrow temperature band exists between that required to shrink MonoKote and that which will melt styrofoam. The gas tank is white, the pylon is gray, and the upper handle is chrome MonoKote. After all components were either MonoKoted or painted, they were carefully assembled with epoxy, trimming away the MonoKote, as required, to provide wood-to-wood or wood-to-foam joints. After initial assembly, all remaining cracks between the parts were masked and a small fillet of epoxy applied with a disposable plastic hypodermic syringe and "wet-finger smoothed". Trim "Yard Bird" letters were cut from white Trim MonoKote and applied over black Trim MonoKote. Careful cut-outs gave a neat 1/16" black outline that is very distinctive. Other lettering was applied to Trim MonoKote with rub-on transfers.

**Flying Adventures:**

Taxi testing at low speeds showed no problems although there is a caution in the instructions about lack of steering control in winds due to the large vertical surfaces needed for stability in the air.

One significant problem came up during high speed taxi runs. When at about one-half the speed required to fly, the nose begins to lift and, since there is no rudder, the mower cannot be steered. Engine torque causes a definite left turn which twice aimed that monstrosity right at me during aborted take-off runs. With ailerons and nose steering on the same servo, ground control feels odd anyway, but when you have to hold the nose down with full forward pitch control in order to steer, the take-off begins to approach the complexity of a slow roll maneuver, which is nearing the limit of my piloting ability! On the third run, the speed became sufficient. Lift-off could better be described as a tumbling, rolling jump. Once airborne, this frog of an airplane became unbelievably smooth, outstanding, considering that I was shaking enough to cause my transmitter antenna tip to oscillate in an erratic 5-foot square pattern.

Determining the flight attitude of a rotary lawn mower doing 70 mph takes a little more than casual glances, but thanks to its stability and in-trim surface setting, it wasn't difficult at all. The mower wheels are functional in a way. The two white spots on that red blur in the sky help a lot to identify the pitch attitude! After a fairly comfortable 10 minute flight with maneuvers limited to tight level turns and one straight ahead stall, the Yard Bird was brought down out of its element for a smooth slow landing.

Later flights with less pressure on the pilot and no significant changes to the lawnmower showed the original take-off problems were largely due to the loose nut holding the right hand stick on the transmitter. Loops and rolling maneuvers are easy and cause even the most hardened fellow modeler to look upon the builder and flyer of a Yard Bird Flying Lawnmower with a new respect.

**SPECIFICATIONS**

| | |
|---|---|
| Grass Chute Span | 43" |
| Gas Tank (top wing) Span | 12" |
| Length (incl. handle) | 47⅛" |
| Height (incl. handle) | 28" |
| Total Area | 976 sq. inches |
| Weight | 7 pounds |
| Wing Loading | 16.5 oz./sq. ft. |
| Engine | O.S. Max .60 |
| Fuel Tank | 8 oz. |

# 1976 NRCHA NATIONALS


Now, a word for our sponsors. Being a Contest Director of this year's NRCHA NATIONALS, I feel it is only right that I take time to thank the many fine sponsors who donated prizes for this contest. So, here is a super thanks to the following companies: R/C Modeler Magazine, Kavan, World Engines, MRC, American R/C Helicopters, Du-Bro Products, EK-logictrol, Kraft Great Lakes, R.S. Systems, State Kavan Distributors, Air Hobby, Midwest Model Supply, Sullivan Products, S.C. Modeler, and Nitrotane.

Again, thanks to these fine companies for their support. I hope that all of you chopper pilots take a close look at all of the companies listed, then, when you need something for your hobby, remember who supported you at the NRCHA NATIONALS. I will.

BILL CURTIS

**RCM TWIN SCOOTER**

**from page 53/52**

secure the landing gear retainer.

The nose gear strut was made of 3/32" diameter music wire. Two loops were bent around a 1/4" diameter rod held in a vise and then the bends were formed for the axle and for mounting.

The tail surfaces are cut and sanded from soft 1/8" sheet balsa. I used small Klett hinges, but any of the other popular hinging methods will work as well.

The wing panels were assembled on a flat board. After sheeting the top leading edge and center section, join the panels with the 1/16" plywood spar splices. With one panel flat on the building board, block up the opposite panel tip 3" for dihedral. This will give 1½" dihedral under each tip when installed on the fuselage. The 3/32" sheet balsa fairing is most easily assembled with the wing in position on the fuselage. Be careful not to glue the fairing to the bulkhead.

I used an RS Systems 2 channel radio in this bird. The battery pack was installed in the cabin above the servos and the receiver was placed in the nose section to obtain the proper CG location. Both the battery and receiver were wrapped in foam. The Goldberg pushrod connectors on the servo arms made adjustments quick and easy. Gold'N-Rod pushrods were used with small Goldberg clevis and horns at the control surface.

As with any 1/2A model, watch the weight very carefully. Use lightweight balsa and accessories. Any of the heat shrink plastic covering material will work very well.

The spring starters on the Cox QRC are a big help in getting the engines started. If you have an Astro Flite Mini-Starter, you are really in business.

Our Twin Scooter has given a lot of flying pleasure to a lot of people. Give it a try and ENJOY!! □

## MISS KAT BRAT

from page 45/42

(Canopies can be purchased from Top Flite Models for $2.85 each.) Now glue 1/32" balsa around the bottom edge of the canopy, and fill in with putty for that built-in look. Cover your model with Silk-span or Super Coverite. I prefer Super Coverite because it is strong, and easier to work with. Make sure your iron is as hot as possible and press hard, forcing the Coverite into the wood. I used acrylic lacquer in place of dope for several reasons: (1) It fills better and has more color pigment. (2) It is thicker, so you thin more and is fuel proof up to 25% nitro. (3) Most important is the fact that it is about one-half the price of dope, and can be purchased at any auto paint and body supply house.

**Step 1:** Brush or spray three coats of clear acrylic, thinned 50%, over the Coverite. Make sure not to sand the Coverite until you have built-up your base coat. Be sure to add some type of plasticizer. (Southern Products, Route 3, Box 47, Nims Lane, Pensacola, Florida 32503, makes an excellent plasticizer.)

**Step 2:** Apply one coat of Ditzler or R & M acrylic auto body primer. When dry, wet sand with 320 wet-or-dry, using wet. Now your finish should be taking shape and feeling as smooth as glass. If necessary, add a second coat of primer and wet sand with 320 wet-or-dry paper, then repeat the job using 500 paper, wet.

**Step 3:** Spray on one coat of color thinned 50% and wet sand with 400 paper, using wet. On this coat, really sand hard, taking about 50% of the first color coat off. Apply the second coat of color and sand with 600 wet-or-dry paper, using wet. At this time, apply your trim coats and decals.

Now you are ready for the most important step of all. Apply one heavy coat of clear over the color coats, thinning your

to page 150

## MISS KAT BRAT

from page 146/42

clear 60%. Then, wet sand the clear coat with 500 paper. The clear should become dull when sanded. Any shiny places mean a low spot and should be sanded until the model is dull all over. Now apply one coat of clear thinned 60% and wait about 10 minutes. Then spray one more coat of clear, but this time thin the clear 75%. This means that in a 32 ounce jar, you would mix 8 ounces of clear with 24 ounces of thinner. I used Ditzler's DDL-105, a very slow drying thinner. I sprayed Miss Kat Brat when the temperature was 82 degrees and humidity 97% and had no problems with blushing. Try that with dope! When your last coat is dry, your model should have a very high gloss, but for perfection, use an electric buffer and rubbing compound. Miss Kat Brat was not rubbed, but you can see from the pictures the type of shine that can be obtained, without rubbing.

Good flying - - - and good luck building Miss Kat Brat, your P-51 Mustang Pattern contender. ☐

## WOODY'S PUSHER

from page 32

The bottom sheeting is applied cross-grain. Cut the turtle-back from 1/16" soft sheet and add to the fuselage. Add the three 1/16" ply doublers for the cabane struts. Drill 3/32" holes through the fuselage and insert the aluminum tubing. Put a 6" piece of 1/16" piano wire through each piece of tubing. With the fuselage flat on the workbench, sight to see that each piece of tubing is horizontal. Epoxy or Hot Stuff the tubing in place. Sand carefully and make your cabane struts.

**Cabane Struts:** If you have facilities for silver soldering, it will have sufficient strength alone, otherwise a binding of small copper wire will have to be applied before soldering the joints. The struts are made exactly to the side view as they do not taper in or out. The struts do have a right angle bend at the bottom which allows them to enter the tubing about 3/4". Finally, prepare two diagonal cross braces, one for the front of the cabane assembly and one for the rear. Viewed from the front, these two diagonal braces will appear as an "X". Do not solder these two braces in until you are absolutely sure you will not need to remove the cabane struts. I waited until the plane was MonoKoted and all the radio gear was installed.

**Wing:** The wing is more or less straightforward, however, a jig makes the construction much easier (note the drawing). The jig is nothing but two strips

to page 154

## WOODY'S PUSHER

**from page 150/32**

of 1/16" x 1/4" scrap which helps form the undercamber.

Build the wing in two pieces. Bevel the inner ribs for the dihedral which is held in place by the 3/32" ply dihedral brace cemented between the top and bottom spars. After sheeting the top and bottom of the center section of the wing with 1/16" balsa, run a 1" strip of fiberglass completely around the center joint. This will give it more than sufficient strength. Cover the tip plates with your favorite plastic covering and apply after you have covered the wing.

If you are going to use a throttle, it will be necessary to put a servo in the wing and, if you want super long flights, it will also be necessary to put an auxiliary tank in the wing. If you don't use a throttle, it is almost impossible to get her down without doing it dead stick. Even with the engine at low throttle, she just glides the whole length of the runway. The servo in the wing is a Citzen-Ship CD150. It is exactly the size drawn on the plans and it is the largest servo that will fit in the space designated.

The tank is a 1 ounce Perfect which has been modified as shown on the plans. The tank works on a siphon principle. For it to work, it will be necessary to connect a piece of plastic tubing (K & S small clear) between the vent of the 049 tank and the intake of the 1 ounce tank. To fill the auxiliary tank, you must first fill the 049 tank, when it is full, the fuel runs out the overflow and into the 1 ounce tank. When the engine is running, the filler tube of the 049 tank must be closed off or the siphon won't work. A small sheet metal screw in a 3/4" piece of the tubing is applied to the filler tube. As the fuel is drawn from the 049 tank, fuel is automatically siphoned from the auxiliary tank, air to replace the fuel comes in through the vent. When the 1 ounce tank is empty, the engine will continue to draw fuel from its own tank until it is empty, the fuel being replaced by air drawn in the vent of the auxiliary tank. Yep! It does work. Put in the auxiliary tank - - - it is an experience. After all, this is modeling and things that tax your ingenuity are fun. Drill your holes for the throttle rod and the motor mounts in the firewall before you install it, since it is much easier to do at this point, and you don't take chances of drilling holes in your fuel tank.

**Tail:** The stab and rudder are standard and made from 1/8" soft balsa. Don't forget the cross grain strips, since they give the soft balsa strength.

**Landing Gear:** It is imperative that the landing gear be made as light as possible. My Woody had two sets of wheels, the first were Du-Bro which are

**to page 156**

## WOODY'S PUSHER

from page 154/32

excellent wheels but are just too heavy for this plane. I replaced them with Trexler #6's which are free-flight wheels, two of which do not equal the weight of one of the Du-Bro wheels. I also made cutouts in the aluminum landing gear. The tail wheel is the first spring loaded one I had ever seen and it does make tail dragging much easier. The rear end swings around when you apply rudder for a turn and the prop blowing a breeze on that big rudder brings her around smartly. If you are careful about weight you can put a steerable tail wheel on and this makes the taxiing even easier.

Do not try and get the battery in the front cockpit. There is room between bulkheads 2 and 3 — put it there. The Woody has such a long nose moment that it is difficult to keep it from being nose heavy. With the battery in that location, it was not necessary to use any trim to get her to fly perfectly level.

**Flying:** You have heard, and I have written, about those planes that flew right off the drawing board — well, honestly, this one didn't. I almost lost her on the first flight. The first engine was assembled from a couple of old ones I had previously. I had forgotten that it was necessary to have a gasket under the glow head and I couldn't understand why the engine vibrated so much while running. Make absolutely sure your engine is functioning to its peak. In this plane the extra power furnished by a double ported engine cylinder is helpful. The .049 engine is just perfect, she is not an overpowered bomb or an underpowered weakling, and you can throttle back after she gets up there and is flying level. She will putt around until the fuel runs out. It is important that you have as little elevator throw as possible. The first

to page 158

## WOODY'S PUSHER

from page 156/32

launch was by hand and it was too steep and I gave it a little down elevator to counteract the stall. "A little" was too much and she was almost into the adobe before I could give any up, then it was up and down until I could get her back safely to Mother Earth. Use long elevator horns and put the pushrod out in the last hole - - - at least for the first flight.

Is a mess like this worth building? *Absolutely.* When trimmed, she flies beautifully. After the launch, she runs way out kinda' just putting along, gaining altitude a little bit at a time, no climb-out like a homesick angel — she flies scale. I have built many planes of all types and I find the Woody a fun type of plane.

A hard landing caused by not flaring out soon enough divested my Woody of her landing gear proving those nylon bolts do shear off like they are supposed to. The extra bolts were at home. I had some double sticky tape in the flight box and a piece of Formica I used as a place to mix epoxy. I stuck the Formica on the bottom of the plane for protection. She finished the day of flying without wheels. Looked kinda' cute up there — much like an amphibian. Who will be the first to try her out on water? Bill and I discussed this during a recent telephone conversation and we decided that there was no .049 that would give it enough power to ROW. There was absolutely no difference in trim with or without wheels; they must be pretty close to the C.G. Have fun with your Woody. Let me know how your experiments with engine, tank, wheels, and amphibian come out and do have *fun*.

A kinda' P.S.: Bill informed me that his favorite sport with the Woody was to play limbo under his own antenna. He is an expert pilot. I don't do it and I don't recommend you do it either but this is an indication of the fun you experts can have with your Woody.

### WOODLY PULLER

The tractor version of the Woody Pusher was done simply as an experiment. The discussion has gone back and forth between Indiana and California a number of times as to the merits of making an amphibian out of the Woody. ROW is one step closer to reality with the Woodly Puller. It is felt that the OS .10 will have enough strength to get her up on a step and out of the water. Tests with the Woodly indicate that, under full power, she will climb almost straight up and she will still fly when the engine is throttled back almost to idle. As it is, the Woody has to land at almost dead stick, even throttling the .049 all the way back she will take the whole field to land, so it really doesn't take too much engine to

to page 160

**WOODY'S PUSHER**

from page 158/32

keep her flying.

The Woody and Woodly weigh exactly the same, there is a slight difference if you add the muffler to the OS .10. But the power difference between the two engines is remarkable.

If you construct the Woodly exactly as the plans show, you will have to cut 1/8" off the forward end of each cabane wire. The prop wouldn't hit, but it is more comforting if you have 1/4" clearance rather than 1/8".

It isn't very often that a builder encourages experimentation to his plane. According to most, he has gotten all there is out of the design and he is presenting the finished product to you, the reader. I would like to leave this open-ended and would feel honored if you would respond, through RCM, with pictures or sketches of your experiments and modifications to the Woody Pusher. After all, this is my third plane since my brother first sent me the drawings from 'Back Home in Indiana', and I intend to continue experimentation.

After all, isn't that what the word "modeling" means? □

**CUNNINGHAM ON RC**

from page 30/28

mean that it has the same power as another engine of the same size. There is a tremendous difference in power output of engines of the same size in all classes. You must consider just what engine that you wish to install in your aircraft prior to designing it. Generally speaking, if you design for a less powerful engine, and then change your mind and install a more powerful, or larger

to page 162

## CUNNINGHAM ON RC

from page 160/28

engine, then you won't run into difficulty; but if you go in the reverse direction, then watch out! An aircraft that flies just super with a medium power .40 engine, will be very marginal with a powerful .19 engine.

The overall weight of the model that you have constructed will also have a very large effect upon the engine chosen to power the bird. Everything is tied together. Twenty coats of dope may give you a super finish, but a poor flying aircraft, while a one-coat spray job of auto paint may give you a marginal to crummy finish, but a great flying airplane. A powerful .19 engine and twenty coats of dope will give you a beautiful airplane that flies like a barn door, yet the same aircraft may fly just great with a .40. You have to balance everything out to achieve a degree of success, both when designing your own, or when selecting a kit.

The selection of the best airfoil for your particular design is really a complex problem, but if you understand just what the four basic types of airfoils are, and why each one is used, your selection problem is narrowed down a bit. And, as I have said before, don't hesitate to borrow an airfoil from an existing successful design.

At least now you won't be tempted to use a Kaos wing section on your next glider, nor will you use an Olympic airfoil on your next pattern bird! □

## SOARING

from page 27/22

pivot bearing to the latch face, forming a right angle at the latch face. This is where the latch end of the hook should be in the latched position. Now install the latch and pivot on the assembly using the 1/16" pivot rod and making sure that the latch end of the hook is in the correct position. Also make sure that the latch hole has plenty of clearance each way when looking through the latch hole. Use Zap.

**NOTE:** The latch should now hold the hook in the latched position. When the latch is pulled, the hook should rotate downward with little or no pressure. Also the latch itself should move easily. Bend the spring from very small music wire to hold the latch closed. The latch should now snap shut when the hook is reset. Install a clevis connector to the latch and you should be done.

At this stage in the development, the design is permanently mounted only. Once installed it is not an adjustable tow hook. Know where you want your hook

to page 164

from page 162/22

before you install this one, since there will be no experimenting after this hook is installed.

Install the hook flush to the bottom and make provisions for solid support for both sides. Attach the linkage to a servo and adjust it so that the hook unlatches at about half servo throw. To insure that the hook doesn't pre-release, make a stop similar to the one in the sketch to keep the tow ring from sliding back off the hook at high angles of attack.

•

Dan Pruss announced that the 1977 L.S.F. Tournament will be regional and will be held in at least 8 states: Alabama, Florida, Michigan, Pennsylvania, Texas, Washington, North and South Carolina. Tentatively, the tasks will be three 8 minute Durations and three 2 minute Precision rounds and, after launching, you will have one minute to decide which to fly. In addition, there will be a seventh Wild Card round. At this time, there will be two classes of aircraft: Stand-Off Scale and Open. All contests will be held on the same weekend, the traditional last weekend in August.

•

Glider and Soaring clubs are putting on membership drives. Get involved in club management and functions. Promote contests and fly-ins, help the novice and have winch days at your field. Promote field etiquette and procedures. All this takes so little time out of our busy life schedule, and goes a long way toward promoting this fine sport of ours. Don't leave it to the other guy.

•

Many of the club newsletters are including an application form for the individual to apply for his or her own F.C.C. license. This is a good deal - - - get out from under a club license and let the F.C.C. know we exist.

•

Good lift! □

from page 20

one that stands.

Neil and Joan Nolte of the Cordova Model Masters, have tested a concept for thermal contests which, in my opinion, has a great deal of promise for the future. Also, the idea for improving the quality of landing is even better than one that I suggested following the LSF tournament. My plan involved the use of judges, which is always controversial to contestants; their plan gets the same result without the need for a human judge, except in the borderline case where a part of the fuselage may be on the boundary line, or over it, depending on the eyesight of the viewer. Here's the "Nolte Plan" for thermal contests:

*Dear Ken,*

*Here is some info that might interest you in light of several of your recent columns, particularly "flying contests" and spear landings.*

*This past summer, Bob Clarke and I devised and ran two contests consisting of five rounds each of 7 minute precision (w/bonus spot). The catch to the five-rounders was that we scratched each flyer's highest and lowest round, totalling the remaining three. This technique was favorably received by the contestants and it also got at several variables that constantly show up at contests. From the flyer's standpoint: 1) He gets a lot of flying for his entry fee*

*(35 minutes possible for $3.00!); 2) if he catches bad air, radio problems, etc., on a round, he still has a chance of placing since that round may be thrown out if it's his lowest. From our viewpoint (that of one who competes regularly), it gave us the following: 1) Flying consistency will usually win out; 2) the chances of a single flight by a contestant putting him out so far in front of the competition that no one can catch him, is reduced significantly, if not altogether eliminated, because if he's the only one to blunder into the only lift on the field that day, he's going to lose it since it will be his highest round. In other words, we've used the five-rounders, hi-lo throw out to attack the same effects we've tried to get at with the man-on-man contests, namely, the chance effects of air variation – our competitive philosophy being that consistency should better reflect the "best" pilot rather than luck at a competition event.*

*Not only can contestants get more air time, but the contest can be run conventionally with much less manpower and frequency problems than a man-on-man contest. Out of four man-on-man contests I've participated in, only the last N-S Challenge ran relatively smooth.*

*Several more points about such a contest: 1) By using a single task, we reduce a lot of manpower requirements*

**to page 170**

## SUNDAY FLIER

from page 167/20

*and setting up special equipment for a single round; 2) scoring is simplified for the scorekeepers who are able to work off of one score table, rather than several conversions being necessary; 3) contestants and timers are less confused about what they are to do each round; 4) in the two such contests CMM put on, we had 35-40 contestants leading to approximately 200 tows each contest, but using 4 winches and foot retrieval (paying 5¢ each retrieve), we put up those 200 flights, handed out trophies and cleared the field in less than 3½ hours! Out of both contests, 30% of the flights were over 6½ minutes (600-650' tow lines), but 16% of them were high flights for individuals and subsequently thrown out, leaving a 14% max flight figure for each day. Interestingly, the winners of both contests has one lousy round, but by flying as best they could in all the other rounds, were able to come out on top.*

*We've also found we can get more flights into the air by setting up frequency flight group orders to run off, rather than a single flight order composed of all the frequencies. In this manner, we are able to bypass a frequency that's maxing out and get off someone in another group as their respective clips become available. We have been able to constantly have 4-8 planes aloft throughout the contest, never getting held up waiting until a frequency clip gets down or jumping 5-8 places down the line-up trying to find a clear frequency and pilot to launch. Another number we've found to work for us is the Pearson-Williams technique of having timers come to the scorekeeper with watch and landing score, rather than fooling with handing out scorecards. It saves chasing down pencils for timers, scorecards forgotten in a pocket, times entered in the wrong place, and generally speeds up the whole process.*

*Another area that concerns a lot of us is the spear landing. As an out and out competitor, I admit I use it when necessary because we both know that is where most of the contests are won today and if you watch those winning frequently, you'll note none are above dorking their plane if need be. You've posed the question of what to do about it, so let me submit the following alternatives:*

*1. Cut out landings altogether – I don't like this one because I feel landings are, and should be, and integral part of our sport.*

*2. Reduce points involved – still won't stop dorking.*

*3. Subjective judging of landing – biggest reason I enjoy soaring com-*

to page 174

**SUNDAY FLIER**

from page 170/20

*petition is that it's almost purely objective, i.e., up against the clock rather than someone who doesn't like the plane I fly, the color MonoKote I've used, the fancy trimming on it (or lack thereof!), or the way I part my hair! If you've ever fooled around pattern R/C, you know that who you are, the plane you fly and who's judging can and does have an effect on your score.*

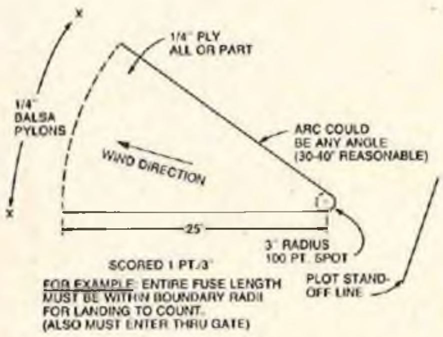
*4. Entry gate pylons – okay for emphasing into the wind, scale-like landings, but still doesn't stop the dork.*

*5. Hard Surface Landing Zone – to me this is the only answer. Think back to LSF 74 & 75 at Mile Square (I'd love to have film of all those landings); even if a flier was hot on approach, he still landed his plane level, touched down and hoped for the best. And if he tried stopping by dorking, what happened? - - - he broke his toy!*

*So, I'd like to suggest the following: If a pilot wants to dork his plane, let's make it highly probable he breaks it! I've not had the chance to try the following landing area, but hope to shortly. A pie shaped wedge (such as used at last N-S) of 30-40 deg. arc out to our common 25' radius, all or part of the area laid out on plywood, edges beveled, padded, buried, whathaveyou, so no abrupt edges are exposed to rip wings or noses. At a projected distance out from the edge radii, are pylons made from two 1/4" square balsa pieces taped end for end giving 5-6' height after being pushed into the ground an inch or so. These pylons shear easily at ground level if hit and don't disrupt the flight path even if they don't shear off. A 10 mph wind may be too much for the balsa, but I recently took part in a contest put on by Merced R/C who used them, and I was very impressed by their effectiveness (threading a 12' wing through a 15' pylon gate was rather fun, too!). To gain landing points, then I'd propose a pilot must enter through the pylon gate without touching them and then land on a hard surface so that the entire fuselage comes to rest within the wedge boundaries! To me, this cuts out the approach from any angle situation we have now, the pylons demanding a restricted approach line. The hard surface will foster smoother, scale-like touch-downs, rather than a crash dive. Requiring the entire fuselage to be inside the wedge will force pilots to maximize their chances at scoring by landing farther out in the wedge and trying to slide farther into the point of the wedge (I'd think we'd start seeing belly wheels and brakes just like our big brothers use!). Finally, while a dork* *landing now pays off as long as you don't shed parts or break something off, a dork at the point of my wedge isn't very likely to produce a score since the dork usually is a result of too much approach speed and tends to produce cartwheels/ground loops etc., which should, in most cases, put some part of the fuselage outside the boundary radii.*

*More than enough for now – try the 5-rounder down your way and see if the fliers don't enjoy the idea. Also try the balsa pylons, they'll not damage a plane if hit and are rather inexpensive to replace if necessary. Hope my landing zone ideas are of some help, maybe we'll get something new or more true to scale for competition landings - - - I'm for it as long as it's kept as objective as can be.*

*Respectfully,*
*Neil Nolte & Joan Nolte*
*Carmichael, California*




To me, the biggest difference between the Nolte Plan and others is that it not only lets you recover from your worst flight, but lets the other contestants recover from your best flight. Yet you don't dare hang back. Consistent flying, with this system, tends to nullify both good luck and bad luck. I like the idea in principal, and hope to see some contests run that way when I'm entered. Should be fun.

★

Another great source of material for argument, "Which is harder to fly, a hot little airplane or a hot big one?" In this case, I'm talking about power planes. My personal opinion is that little airplanes are harder to handle than big ones. They don't have the inertia and can change direction faster, roll faster, respond more rapidly to the elevator, and thus are a lot more touchy. But you can tame them down, too, by reducing the control surface movement. I have three little biplanes — a 24" Guillow SE-4, my 16" Cannonshot, and the Peanut scale 13" SE-5 — and they are all good flying machines, but I wouldn't recommend them for beginners, even though the top speed of the fastest one (the Cannonshot) is only about 25 miles an hour.

In contrast to the little bipes, I have a seven foot racing glider which I converted to power. It weighs 9½ pounds, is powered by a K & B front rotor BB .40.

Wing loading is 1½ pounds per square foot, but with the Eppler high speed wing section, it goes like a scalded cat. I have clocked it on a measured course at 102 mph yet, at that speed, it doesn't look like it is flying as fast as the Peanut SE-5! The size makes the difference. And, it is a lot easier to handle. The full span ailerons and the big rudder make it very maneuverable — fast roll rate, tight spins, yet any reasonably proficient sport flier could handle it. I think a lot of the feeling that big planes take more skill comes from the fact that there's a lot of work in them, and you really hate to bust one up. Little jobs are a lot easier to repair. Do you agree?

★

And now, for the greatest single source of argument ever presented to fliers, both full scale and R/C. And this time is the last that I plan to discuss it in this column. Well - - - unless somebody comes up with a better clincher.

The downwind turn. Even the term is misunderstood by many. Item: I have a letter defining a downwind turn as one that is made while flying the model downwind of the pilot's spot on the ground. Item: Another letter talks about the turns as being made while flying with the wind, turning left or right, but not coming back around into the wind. To make it perfectly clear, a downwind turn (the one that people argue about as to whether your plane loses altitude when the turn occurs) is when a plane is flying against the wind, and makes a turn of 180° and winds up flying with the wind. If the airspeed is held constant, say 50 mph, and the wind is blowing 20 mph, then ground speed into the wind is 30 mph, and when the turn is completed, ground speed is 70 mph. Okay?

Last month I received a letter — and published it — which, in effect, said, "Look, dum-dum; any *knowledgeable* person *knows* the answer. If you don't believe me, read Len Salter's article in the September RCM!"

Well, I had already read it — and noted that Len talked about intertia, but didn't get into linear and angular accelerations. Since I had already given up trying to convince anyone, one way or the other, I just figured I'd go right on being a dum-dum to some and a genius to the rest.

Then, along comes this letter from Richard Martin of Blackfoot, Idaho:

*Dear Ken,*

*This whole business of up-wind and down-wind turns and inertia effect, etc., etc., has gotten out of hand. It has become apparent that people who do not really understand the physics of flight are expressing ignorant opinions on the subject. Mr. Len Salter's article should not have been published because it contains many incorrect statements. It is a well-known and well-accepted fact that inertial mass has a fixed reference*

**to page 178**

## SUNDAY FLIER

from page 176/20

*point, otherwise it is not definable. A moving fluid such as wind is not a fixed reference point. The earth is, approximately. Even the movement of the earth is a reference point of the second order. But for all practical purposes, ground can be considered a valid reference point – the wind cannot. Therefore, the movement of an inertial mass such as an airplane can only be referenced to ground, no matter what the wind is doing. True, airspeed is what makes an airplane fly, but as soon as the airspeed is perturbed, then the resulting accelerations and decelerations can only be referenced to ground, the fixed point.*

*There need not be any more controversy. The laws of physics are such as they are and are not subject to interpretation. Any object with mass, experiences inertia by the simple Newtonian F=ma. That is fact 1. Fact 2 is that airflow of a certain velocity over a wing causes flight. The two facts are not in conflict as so many have argued, but operate together. The example given in my letter to Mr. Salter points this out. Errant individuals should be enlightened and the subject dropped.*

*Part of the problem, I think, lies in full-scale flight instruction, where flight students learn, for the purposes of simplicity and to avoid confusion, that TAS never changes for a given power and trim setting. Any experienced pilot worth his salt will testify that this is not so. Turbulence and wind shears will cause the IAS, and therefore the TAS, to jump around because inertial mass laws dictate that any mass cannot undergo instantaneous changes in velocity without destruction, say, of plane and pilot.*

*There simply is no denying "inertia effect." A plane flying in moving air does not react to that air as though it were still,* *as countless people have argued, even in RCM.*

*With my education and experience, both model and full-scale, I feel qualified to argue intelligently on the subject, when, in fact, there really need be no argument. However, I feel that my arguments will fall on deaf ears. I would suggest that RCM solicit a volunteer effort by a non-flying physicist to analyze the problem of airspeed and inertial velocity in a moving fluid medium, including turbulence, wind shear, and theoretical "low increased induced drag" quick turns in a wind. I can predict his report.*

*Richard Martin*
*Blackfoot, Idaho*

Now that really lays it on the line. Looks like Len Salter and Richard Martin have thrown down the glove. However, I don't plan to make this column the arena for such a duel. No — there's no need to, because I'm going to end the argument about downwind turns right here and now. Forever.

It's so simple it's a wonder nobody ever thought of it before. But I've checked it over and over and over, with many observations.

Some airplanes lose altitude when they make downwind turns.

Other airplanes don't.

It all depends on who's flying the plane. □

## RADIO SPECTRUM

from page 19/16

I hadn't had to much feedback on the Christie Mixer until fellow worker Paul Geisel decided to build one for his Saracen glider. The circuit, as presented does what it is supposed to do but it is not as stable and linear as Paul had hoped, so he put in some mods. I haven't priced these parts, but for those looking for performance, they're probably worth it. The simple zener diode regulator Mr. Christie used is notoriously poor and un-

to page 180

## RADIO SPECTRUM

from page 179/16

fortunately the circuit is very sensitive to voltage changes. Paul replaced the zener with three LM113's for a rock solid 3.66 volts. He also replaced the 100K resistors that charge the .47$\mu$f capacitors with 1N 5285 constant current regulators to give linear slope charging.

My main reason for mentioning these devices is for you experimenters out there trying to solve a voltage or current regulation problem. There are some pretty neat devices available these days.

★

The following letter is one of many that I have received on this subject:

*Dear Mr. Kauffman:*

*I read with great interest your offer in Mr. Oddino's column to do a feature article on a very sophisticated transmitter, however, as of this date I haven't seen the article. I was wondering if you would be able to send me any info relative to this construction project as I am getting ready to build 2 new transmitters for next year's flying season. I have been reading and accumulating information on R/C systems for some time now, and would like to tackle the transmitter project. Thank you in advance for the consideration you will give this matter.*

*Respectfully,*
*Charles P. Clark*
*Columbia, Penn.*

I talked to Sid Gates at Royal Electronics the other day and he said they are just about ready to go with the Omega transmitter. By the time you read this they should be available in kit form. I hope to check one out myself and report on it in future columns. □

## FOR OLD TIME'S SAKE

from page 13

An official flight is defined as a flight greater than 20 seconds.

The Antique event has also had a slight revision; glow engines will be given 5 seconds per pound of airplane and ignition engines will be allowed 10 seconds per pound of airplane.

We noted that safety precautions were listed for the free flight events and trust that these will also hold true for the R/C events. Flying will not be permitted within 200 feet of parked cars, nor will "exhibition motorcycle hot-dogging" be allowed. First-aid facilities will be at the "remote" flying field (how remote is it?).

The planners have gone so far as to choose a Miss SAM Champs for 1977.

to page 182

## FOR OLD TIME'S SAKE

from page 180/13

They don't want to leave anything for the last minute! Pretty, perky Tricia Webster of Manchester, Tennessee, was asked by John Pond (the dirty old man's dirty old man) to assume the title and honors of Miss SAM Champs. Needless to say, Tricia has accepted. You may remember her from last year's Champs in Dayton - - - she was pit crew and "gopher" for her Dad, Lee. She's a twenty year old junior at the University of Tennessee at Knoxville, where whe's majoring in public relations. (John, you couldn't have made a better choice — Tricia will really get some good experience in her chosen "field".)

Tricia enjoys disco dancing, tennis, fraternity men, and model airplane contests. Why can't more gals be like this? We applaud Daddy Warbucks for his excellent taste and wish Tricia loads of luck — she's going to need it to fend off all those drooling guys!

Al Hellman has made arrangements for SAM to headquarter at the Stardust Hotel. If you desire a contest kit, contact Al at 22607 Hatteras Street, Woodland Hills, California 91364. We feel that much credit should go to Al and his coordinators for all the advanced planning they've done. With so much pre-organization, this SAM Champs should be *the* best ever!

•

### Contest Calendar

Contests are being planned for the coming season. We know of two as of this writing. If your club is planning an old timer meet this season, please let us know; we'd be happy to let the rest of the old timers know about it. Please let us know at least three and a half months in advance. At any rate, the two meets scheduled thus far are:

May 15, 1977, Lakehurst Naval Air Station, New Jersey, Old Time Eagles (SAM 11) Second Old Timer Bash following the Beshar rules (Phase I). For further information, contact Joe Beshar, 198 Merritt Drive, Oradell, New Jersey 07649. (201) 261-1281.

August 28, 1977, North Branch Park, Somerset County, New Jersey, Soc. for the Preservation of Old Timers (S.P.O.T.) Third Annual Free Flight with R/C Contest. For further information, contact Howard Carman, 20 Maple Avenue, Hightstown, New Jersey 08520. (609) 443-3595.

We would really appreciate more input from all of you. Helpful hints, anecdotes, contest dates, news of any sort! We want to know what you would like to read about. So take pen in hand and keep us informed of what's happening out there!

'Til next time - - - Happy Landings!□

## ENGINE CLINIC

from page 10

*Dear Mr. Lee:*

*I know you must be tired of muffler questions, but here's one with a different twist.*

*Just today I sold my Du-Bro Hughes 300 in good flying condition for only one reason . . . it was too darn loud to fly in my driveway, and had to be diassembled to be taken elsewhere – a real chore. I sold it, by the way, through a classified ad in R/C Modeler.*

*Now the tough questions . . . I am receiving a Schluter Heli-Baby for Christmas, and want to get an engine/muffler combination that is as quiet as possible. I realize that this will involve some real compromises. RCM's October 1975 article on the copter suggested the Max .40 with its muffler – a combination I know to be quieter than most, but I'd like to do even better. Hence, is it profitable to use a really fine Schneurle ported engine with a quiet muffler and wind up with as much power as a normal engine and muffler in a helicopter, i.e., balance a powerful engine with the expected heat and back pressure power losses expected from such a muffler?*

*You have often given us well researched reviews of mufflers as they came on the market with emphasis upon achieving normal quieting with a minimum of power loss – a laudable goal. However, in your experience, do you remember a muffler that was really quiet that wouldn't ruin the engine, i.e., one suitable for my purposes? If so, please let me know of it and, if possible, an engine which would do well with it and the copter.*

*I do think my questions are timely; plenty of us could fly in parks, etc., if we had a truly quiet engine –even if we had to suffer a ~20% power loss to get it.*

*Yours very truly,*
*George M. Love*
*Mountainside, New Jersey*

Your problem is one shared by many, George, and one for which there is no

to page 185

## ENGINE CLINIC

from page 183/10

real answer at present. Most of the muffler manufacturers are concerned with power loss as well as quieting efficiency of their product and sacrifice some of the noise reducing quality of the muffler in lieu of power loss. If a muffler manufacturer were to market a muffler that was extremely quiet, but also caused excessive power loss, he would soon be out of business. Unfortunately, modelers want to have their cake and eat it too. A muffler with a high power loss means excess heat, wear, etc. As I have mentioned many times in the past, the problem involved is one of size, weight, and price. A large, quiet muffler could be made but it would be rejected by the modelers because of size and weight. So trying to develop a small, lightweight muffler that is very quiet is the problem. You can go to a larger engine to compensate for the power loss but nobody manufactures the muffler you would require. You would have to fabricate something in this line on your own. The HB (formerly German Veco) shares the same muffler as the K & B .61. This muffler will fit the Webra Blackhead and several other en-

to page 186

gines. A separate tail pipe attachment for this muffler is available through HB. This attachment is, actually, an additional muffler. This unit is extremely quiet — but at the expense of considerable power loss. You would be limited to the above mentioned makes of engines if you wished to use this unit, or the extension unit could be adapted to other makes of mufflers.

*Dear Sir:*

*I'm aware of safety, but being retired on a fixed income and rough flying field, props are costly.*

*Royal and Kavan have fiberglass filled props. Will they stay together?*

*I have switched to all K & B .40's and Veco .19's. They are doing a fine job.*

*Thank You.*
*Gerald Hess*
*Versallles, Ohio*

The fiber-filled props are fine in the smaller diameters, but when you get into the larger diameters you begin to run into weight problems. The same is true for glass filled nylon. The heavier props induce more vibration. The glass filled and carbon filled props will often be in static balance, but out dynamically. In other words, one of the blades may be heavier towards the leading edge than the other. This doesn't have too much effect with the smaller diameters with less weight, but when you get into the 11" diameters, it becomes a real problem. The extra stiffness also makes them more susceptible to fractures from less-than-smooth landings, i.e., you bounce the aircraft off the ground with the prop taking a good shock load. If cracked, it would let go at a later date. The same thing naturally happens to wood props but the cracks are, in most cases, more obvious. You are okay with your .19, but I wouldn't use anything but wood props on anything larger than a .19 myself.

*Dear Mr. Lee:*

*My problem is one common to many modelers – fuel draw. I have a scratch-built helicopter powered by an Enya .45 engine and the fuel tank position is such that the fuel has to be raised about 3 inches and drawn about 8 to 9 inches.*

*My question is, would it be possible to adapt one of the new Perry fuel pumps to operate with this engine? The Enya .45, has no removable backplate; would it be possible to drill and tap the crankcase for a pressure fitting to operate the pump located in a remote location? Using the fuel pump it would be possible to locate the fuel tank directly under the C.G.; which would be the ideal location. Also, would I have to use a Perry carburetor with the fuel pump?*

*I would appreciate any help you can give me with this problem. Thank You.*

*Respectfully Yours,*
*John R. Cosco*
*Palmyra, New York*

The Perry pump has to be installed in place of the backplate on an engine in order to work. The principle of the pump is a diaphram that negative and positive pressure variations in the crankcase causes to operate. There is no way a line from the pressure fitting could do this. There are two ways you you can go here. The Enya Crankcase can be machined to accept one of the .40 size pumps if you have access to a lathe. If not, the Robart Super Pumper can be used and this can be operated with the pressure fitting as you propose.

*Dear Mr. Lee:*

*I enjoy reading your column every month! I have two questions I hope you can answer. (1) On a lapped engine, how much difference should there be between O.D. of the piston and I.D. of the sleeve – say for an engine never run in and one that is worn out? (2) I have a Super Tigre .15 with a Semco muffler swinging an 8/4 Rev-Up prop using K & B 100 fuel. The top end is just over 10,000 rpm as measured on a Royal Tach. Is there something wrong with this engine or is it the muffler and 8" prop that is keeping this engine from winding up? I have an O.S. on the same plane now, same fuel, but Du-Bro muffler with S plates that turns 13,500 rpm. Since Semco doesn't make an adapter for a Super Tigre .15, I had to use one for a Veco .19, but it seems to do the job.*

*Any help and info you offer will be greatly appreciated.*

*Sincerely,*
*John T. Murphy*
*Acton, Mass.*

John, it is pretty hard to give exact numbers when it comes to piston/sleeve fits in a lapped engine. A lot depends on the materials the piston and sleeve are made of, the size of the engine, whether the engine is intended for sport or racing use, etc. Assuming that you have a cast iron piston (Meehanite) running in a steel sleeve, which is a combination most often used, the piston should be .0002"-.0003" smaller than the sleeve. That is ten thousandths, not thousandths. Anything over .0005" would be getting loose for a sport engine but about right for racing if a lot of nitro were to be used. These figures are for .19 through .40 displacement engines. Smaller displacement engines would require less clearance. Larger displacement engines use rings or, of more recent development, the ABC set up, — a lapped aluminum piston running in a chromed brass liner. These are fit very tight.

Your S.T. .15 should turn in the same neighborhood as your O.S. With a 3500 rpm spread, there is obviously something wrong with your S.T. Worn out, too many lean runs, digested too much dirt, etc. It would be best to send it back to World Engines for an over-haul.

to page 188

*Dear Clarence:*

*Greetings from the bone-chilling North East. I'm currently working on my entry for next year's Rhinebeck Jamboree – A Fokker D-VIII, which is a parasol type plane with a high lift, flat bottom airfoil. Since we are determined to make a big impression with this beauty, (hopefully not in the ground!), the wingspan will be in the neighborhood of 96" with a chord of 12"-14", and will have a cowl diameter of 12". Construction will be foam wings with foam core board fuselage to keep the weight to a minimum – hopefully less than 8 pounds, though we may be overly optimistic. We want realistic flight speed, but with reserve power to get us out of tight spots during mission and combat events. We also want to swing as large a prop as possible, slowly for scale effect.*

*The question is this (at last) – what is the minimum size prop I can swing with a 12" cowl and what is the size you would recommend? What size engine would you recommend? I have a Super Tigre .71 and would be willing to buy a Perry pump if it would fill the bill. By the way, which of the following engines will best swing 18"-22" props? Speed Webra .61, Super Tigre .71 w/Perry Pump, O.S. Max. 80, other?*

*Last question – who, besides A.H.M., distributes 18"-24" props? Again, as in the past, thanks again for your help.*

*Sincerely,*
*Steve Richman*
*Dobbs Ferry, New York*

An 18" prop is going to be a heck of a load even for the S.T. .71 or O.S. .80. You wouldn't want to go any larger, although with the 12" cowl a larger diameter would be desirable. To swing a larger dia. you would need a lot more horsepower. The O.S. .80 does have the edge over the Super Tigre .71, but as you already have the S.T. .71, you should give it a try. Be very careful about running the engine too lean. Don't try to get a little extra power by tweaking it in a little more than you should. With an 18" prop it is going to be working extremely hard and, if a hair lean, you can total the engine in one flight. Also, be sure that your cowl has an adequate air exit. Don't block off the back of the cowl so that the air goes around the cowl rather than through it — this is a mistake many scale modelers make.

Bill's Mail Order Hobby, 503 West Astor, Lee's Summit, Missouri 64063, manufactures the old Y & O line of propellers. Bill has props through 18" dia. Write for one of his brochures.

•

That wraps it up for another month, gang. Next month we'll give you a review on one of the old time lesser known engines. I have intended to do so the last two columns, but new products, etc., got in the way. Always like to get the new items to you as soon as possible after they become available. □