# SPECIAL 10TH YEAR ANNIVERSARY ISSUE

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RC MODELER
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# RC MODELER

## FEATURES



## DEPARTMENTS



OCTOBER 1963 — OCTOBER 1973

10TH ANNIVERSARY ISSUE




VOLUME 10 1973 NUMBER 10

OCTOBER



**THIS MONTHS COVER**
is a magnificent Ektachrome by Lou Toman of Spitfires Mk. XXI, Mk. IIc and Mk. XVI. Models built from upcoming Stand-Off Scale kits by Dave Platt Models.


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# FROM THE SHOP

DON DEWEY

Ten Years.

Back in 1963, sitting on my front porch trying to manually set the body copy of the first issue of R/C Modeler Magazine on an IBM typewriter, it would have seemed impossible to project the new publication even a month or two into the future. Ten years would have been inconceivable.

Now, in retrospect, one hundred and twenty issues later, that time has seemed to slip by almost unnoticed.

A lot of changes have taken place in our sport and hobby. We've gone from single channel superregen receivers and escapements, to single channel proportional, to analog and finally, to today's ultimate, the digital proportional system.

We've gone from attempting to achieve one successful flight in an entire weekend without crashing, to a point where we can perform the most intricate maneuvers and eventually retire an aircraft from old age.

We learned to walk with a "toy airplane" image, then learned over the past decade that we can stand tall and proud with a sport and hobby that has gradually captured the interest, admiration, and recognition of that segment of the population who would have laughed at "grown men playing with model airplanes" just a few years ago. We have seen the R/C industry grow, in one decade, from a few dedicated individuals operating from their garages to a multi-million dollar industry complex.

We have seen a lot of changes. But one thing has never changed – the type of person for whom this magazine was named – the R/C Modeler. He is a person who is unique – an individualist in a conformist society. The sportsman who strives for perfection in craftsmanship during an era when quantity is more important than quality.

The R/C modeler - - - a pioneer in a day when there are few frontiers left to conquer. The pilot who flies from the ground and finds a kinship with the romatic era of aviation that has been all but forgotten except by a few.

Hopefully, these things will never change. And we have been proud to have been a part of the last decade of growth in radio control. But most of all we have been proud of our association with you - - - the finest group of people, individuals all, who it has ever been our pleasure to know.

To you this tenth anniversary issue is dedicated. You made it possible.

*

We have tried to put together a rather unique issue this month. You will find a JU-88 twin engine semi-scale bomber utilizing two .049 engines and retract gear - - - all operating from a two channel system! So, if you think it has all been done before "try Jerry Holcomb's JU-88" and watch the crowds gather at the local flying field.

*

Since, over the years, we have tried to present new ideas and concepts in R/C events, such as the introduction of Formula I racing, the creation and introduction of Quarter Midget racing and the Half-A Midgets, we are pleased to present the RCM 15-500 event, a front rotor .40 class of pylon racers designed for the sport flyer and club participation events. The RCM 15-500 racer is presented in this issue and is designed so that the sport flyer or novice can learn to fly it with a .19 to .35 engine and graduating to a front rotor .40 as his skill increases. You will find that this aircraft, as those that will come along behind it, are quick and easy to build and even easier to fly. If you've had a latent interest in racing but have been scared off by the Formula I's and quick Quarter Midgets, the RCM 15-500 is for you.

*

Our old friend, Wagger, the hyper-active Basset who, years ago, gave up burying bones in favor of scratching on balsa wood, has returned with the Mini-Stik, a 36" span version of the ever-popular Ugly Stik. What is different about this particular shrunken version of Phil Kraft's popular sport aircraft is that it is designed for four channel operation and powered by a .19 engine! This crate is so fast and maneuverable it will do things that even the experts won't believe! If you think you are a good flyer, here's the ultimate in miniature multi's to test your flying ability. We'll warn you right now – it's a bomb, and it is not intended for the beginner. If you're a novice sport flyer don't be misled by the fact that it's a "cute little airplane." It's designed strictly for the guy who can handle a handful of dynamite!

*

We're also pleased to present the first in a ten part series of articles on the RCM-World Digital proportional system authored by John Maloney of World Engines, Inc. This is a do-it-yourself series of construction articles on building a state-of-the-art digital system for those readers who have a basic knowledge of how a radio system works as well as how to put a radio kit together. We hope you'll build this system and get many years of flying pleasure from it. But, even if you have no interest in building your own radio, we hope you will read the articles since we have invited John to not only provide step-by-step construction details but, also, to tell us how a company like World Engines develops a radio and some of the problems encountered in manufacturing up to a thousand radio systems per month. We hope you will enjoy this series.

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# VENT THAT FUSE

BY BEN STRASSER

It was a nice day for flying and I had arranged to take the day off to do just that. Up early and down to the flying field. A few wisps of clouds in the sky made the planes up there a beautiful sight.

A few flights, several conversations, and three hours later it began to warm up – as we normally expect on a sunny day in September in Southern California. By 12:00 it felt as though the thermometer had moved past the 90 degree mark. One of the guys flying yelled that he had lost control of his plane. A puff of dust and pieces of balsa and dope coated silk drifted over the end of the runway. A few minutes later another plane chopped down some weeds in the field.

By the time 1:00 has passed a third plane went in. Three in one hour. In two of the crashes – in which there was no physical damage to the radios – the radios worked O.K. Because all three were on different frequencies, it seemed improbable that there was some interference. And, all of the pilots were fellows who had some time on their planes and could usually make the runway with ease. With that kind of a record for the day, the rest of us who still had our ships in one piece decided that discretion was the better part of flying. It was getting too warm, anyway. We packed up and got ready to leave for home.

As I got into my very hot car (I had left closed up tight to keep my beer cold) an experiment I used to do in my science teaching days came to mind: The one we called the "greenhouse effect." That's the one in which you compare the air temperature outside with the air temperature inside an inverted aquarium – with the sun shining on it. The air inside the aquarium gets many degrees hotter than the air outside. They say it's because the radiant energy from the sun passes through the glass. But the radiant energy reflected from the surface inside the glass aquarium won't pass back out as it came in. So the heat gets trapped and builds up. Boy, this car gets warm!

As I pulled my Monterey glider from the car in my driveway, I noticed that the canopy was a beautiful greenhouse – with my radio inside! Time for another greenhouse experiment. By the time I got the planes cleaned up from the day's flying, I decided to postpone the experimenting until tomorrow. That would be better anyway because the planes would cool off overnight.

It was about 10:00 Saturday morning by the time I got out the Monterey glider. The bottom of the canopy is open into the radio/servo compartment to make room for the equipment. (So, I noticed, the sun can shine directly onto the foam covered receiver. Good thinking!) And the plane is covered with blue Solarfilm. I put a thermometer into the fuselage in a position so it would be shaded from the sun's rays – to get the temperature of the air inside the buttoned up fuselage.

While I was experimenting, I also got out my Kaos pattern ship and set it up with a thermometer inside the fuselage. While this one also has a canopy, the inside of the canopy is completely sealed off from the fuselage. And the fuselage is white. In this case my experiment would be checking out the conduction of heat from the outside of the sun-warmed white Solarfilm balsa fuselage to the air trapped inside.

Trying to do it right, I also set up a thermometer to monitor the outside air temperature. (All three thermometers were calibrated.) Then I put the Monterey and the Kaos out into the late morning sun. Thirty minutes later the outside air temperature was 85°F. When I opened up the canopy of the Monterey and uncovered the thermometer, it read 126°F! The air temperature inside the Kaos was somewhat less spectacular – it was only 97°F.

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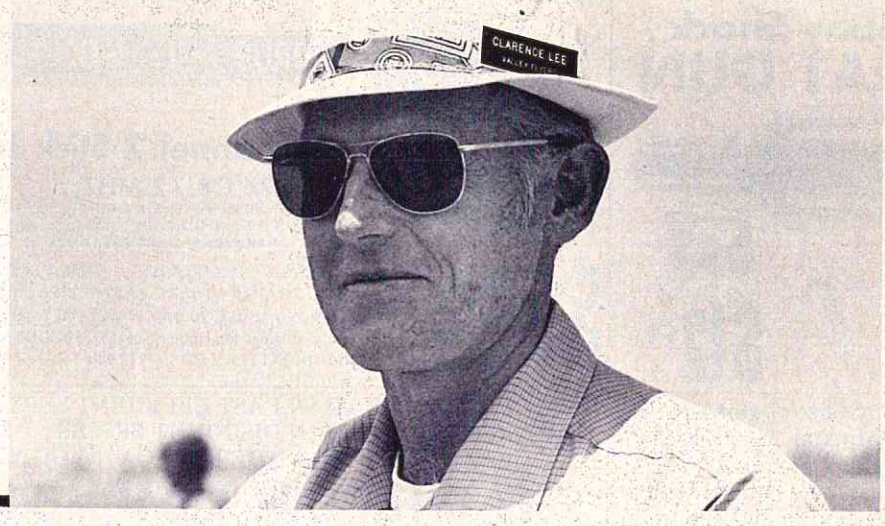
# engine clinic

By Clarence Lee




**Dear Mr. Lee:**

**I am having a problem with my Fox .40 R/C. The motor will not run in the mid range unless the starting battery is attached to the glow plug. The engine will start in the mid range, as per starting directions, but the throttle must be advanced to either the high or idle before removing the starting battery. Once at either high or idle with starting battery removed, the engine will run nicely, and the throttle can be advanced with no problems. But, if the throttle is stopped in the half open position, mid range, the engine will not run. As to the age and fuel: Motor, Fox .40 R/C, about 2 years old, well run and broken-in; Prop, Wood 10-6; Mount, Tatone Side Mount; Plug, Fox R/C long; Tank, Sullivan SS-6. Center line of tank is ¼" below center line of motor.**

**I enjoy your comments in RCM.**

**Very truly yours,**
**Harvey Hensley**
**Iowa City, Iowa**

Harvey, you did not say what you are using for fuel. Many times low nitro or home brew fuels will be on the cold side and cause acceleration problems. The first thing to do if you are not already doing so is to use a fuel in the medium nitro range such as Duke's, K & B 500, or Cox Blue Can. All of these contain 15% nitro.

Your earlier Fox .40's had a three jet carburetor with adjustable high speed, intermediate, and idle mixture. Your engine would seem to be cooling in the intermediate range and the fire going out. Leaning the intermediate range mixture should help. However, there is a slight interaction between the intermediate and idle mixture adjustments. It is possible to have the intermediate mixture set correctly but the idle mixture too rich. The engine will idle well with the rich mixture due to the exhaust baffle being closed and keeping the glow plug hot. As you open the throttle the baffle opens allowing the plug to cool off and the engine dies. Try setting your idle mixture a little leaner. Also, check the exhaust baffle for wear. The Fox has the 'wiper' type baffle and after many hours of use the bushing that holds it on the engine wears which, in turn, increases the clearance between the baffle and exhaust stack. Get a piece of feeler gauge stock and check the clearance. You want this to be .005" – .006". Chances are pretty good that wear will have increased the clearance considerably. Tightening the baffle up will help to keep the plug hotter and improve acceleration. One of the main functions of the exhaust baffle is acceleration.

**Dear Mr. Lee:**

**Your column is my favorite. I particularly appreciate the logic you include since it can be applied to situations not specifically covered.**

**Here is a case in point. My Fox .40 R/C, after running beautifully through a dozen gallons or so of fuel, developed an inability to richen at all and a fast idle. Suspecting a carburetor blockage, I cleaned the carburetor thoroughly. No help from that. Knowing that a lean mixture has to be caused by either a fuel stoppage or something interferring with suction I suspected an air leak around the carburetor so I re-cemented it; still no help. Finally, I removed the head and lower fin sections – and found the problem.**

**The lower gasket between crankcase and fin section had deteriorated – apparently letting air in. I replaced the gasket and the Fox .40 now runs better than ever. Thank you for your "tips."**

**Sincerely,**
**C.H. Copeland**
**Culpeper, Virginia**

Thanks for sending in the solution to your own problem. Any of you that have had problems that you have worked out yourselves, let us know as Mr. Copeland did.

**Dear Mr. Lee:**

**Being fairly new in R/C I try to go by the book and stay out of trouble.**

**Starting out with a Senior Falcon at 6¼ lbs., and a McCoy .40 Series 21 seemed to be a safe bet.**

**Then the fun started. The book called for a 10/5 break-in prop and a 12/5 RC flying prop. Believing this to be a lot of lumber out front for flying, I wrote to McCoy to find out if this was a misprint and the numbers were backwards (10/5 fly), but no misprint, they assured me I should fly on the 12 incher.**

**When I got myself in trouble with set-up, the "experts" in my club tell me it's underpowered due to a big prop. I was advised to use an 11/4 or 10/6.**

**So there's my plight. Who do I believe, the guy who made it or the ones who fly them? Is there any rule of thumb for propping an engine?**

**Thanks a lot, your column is one thing our sport really needs. Keep up the good work.**

**Yours truly,**
**George Moyer, Jr.**
**Wilmington, Delaware**

You are right. A 12-5 is a pretty good hunk of wood to hang on a .40. I do not know what make of 12-5 prop the Testor's people have in mind but some of your 12-5's such as the Top Flite is a bit much even for a .60. I would guess that Testors/McCoy people are still thinking of R/C as back in the days of escapement when we flew 6' models with .35's turning large props slow. A 10-6 or 11-5 Top Flite would be a better prop for your engine.

**Dear Clarence:**

**I have 2 Veco engines – a 71 series and a 72 series and neither one will pull a full tank of fuel out of my Kaos'. On level flight they both perform nicely. In maneuvers both do not want to keep running when pointed upwards. I took both engines and carburetors apart and cleaned them twice. I've tried 11 oz. and 13 oz. Kraft Hayes and 10 oz. and 12 oz. pylon tanks and two different types of fuel tubing. The clunks are free, the tubing isn't pinched and the tanks are as high as possible.**

**I'm hoping you can help me solve my problem. I'm ready to give up.**

**John A. Holveck**
**Center Valley, Pennsylvania**

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# TURN

# Jim Simpson

● It seems that the intent of what I have been trying to say and do regarding the NMPRA is beginning to sink in. Sometimes it is unfortunate that people have to get "riled up" to see what is happening but that is the way it is! Kind of like war, I guess. They say if it is successful it was a revolution and, if unsuccessful, it was rebellion!

So let's go back and review for a minute. In the beginning I told about asking flyers **why** they didn't fly Formula I racing. When they offered their reasons I asked them what they thought should be done and then relayed that information to the NMPRA through the newsletter and to all of you through this column. Unfortunately, several of the top bananas from Southern California misunderstood this so, to clarify the point, I related the content of a short talk that I gave at a Fort Worth Thunderbird meeting. Now, one more time I'm going to reiterate the main points and some ideas relating thereto:

1. The NMPRA is smaller than it should be.
   a. Racing is fun no matter if it be paper airplanes or half million dollar cars.
   b. Why do we have so many different kinds of R/C model aircraft racing such as 1/2A, Quarter Midget, Ugly Stik, Toad, Top Dawg, Falcon 56, .09 only, Formula I, II, FAI, etc.?

Because perhaps - - - just perhaps - - - maybe there is need for change in Formula I, that's why! (Note the fact: Whether this is a problem or not can only be determined by NMPRA President, Ed Rankin, through his Vice Presidents and their constituants – the NMPRA is a fine tuned, responsive organization that didn't 'just happen.' It was built by years of hard work and officially represents Quarter Midget, Formula I, II, and FAI interests, exclusively. It is my intention to support fully this organization, the manufacturers who support it, and those with special interests in it such as George Aldrich and Clarence Lee.)

2. There are two alternatives to number one above:
   a. The first is to leave it like it is in which case it becomes relatively static or degenerates.
   b. The other is to change it into a vibrant, dynamic, growing organization with active national competition for everyone. Why shouldn't anybody, anywhere in the U.S.A., be able to go to his nearest hobby shop and buy a racer kit and engine; then fly it in races close to his home town that occur several times a year? A stock, standard, novice (call it what you want to) class Formula I will allow all this. Look how many manufacturers make Formula I kits; look how easy stock .40's are to obtain. See how easy a four and a half pound racer flies with a throttled, muffled .40. Who else is better equipped to handle such an event than the NMPRA? This is what the originators had in mind when it all started. (NOTE: I didn't say that the hot shots had to throw all their stuff away and start all over, did I? What I am saying is there ought to be two classes – one for stock, like street drags, and one for all-out, like the Indianapolis 500.)

**What this country needs is one racing event in which anyone, anywhere, has a chance to win with any Formula I kit and any stock, unmodified .40, period!**

   c. Don't tell me that's what we are already doing (because we don't admit it) and don't tell me that's what the Quarter Midgets are for because the Quarter Midgets are already well on the way to being what Formula I is now; besides which – if we had kept Formula I honest there wouldn't be any Quarter Midgets. (And I fly Quarter Midgets too so I'm not talking out of my hat.) Finally what you have to have is a place to start and a place to go. Simple!
3. Now, let's suppose we had held the line in racing and there were only two classes of Formula I. (No Formula II, which is a spin-off of Formula I, no FAI, which shouldn't be allowed to spin-off, and no any-other kind of racing as there would be no need as outlined below.)
   a. The Stock/Standard/Novice or what-have-you class would be composed of anybody who wanted to race using (4.5 to 5.0 lb.) Formula I airplanes, of which there is a large variety, and any stock .40. This guy could race on any course in any town, anytime races were held because NMPRA has standardized the course and procedures and, simply put – first one to finish 10 laps without cuts wins! Sure beats the alternative.
   b. The Hopped-up/Unlimited Expert Class would be composed of everyone else.
   c. This proposal was put to a vote "within" the NMPRA and, not surprisingly, it was rejected mainly because it was, and is, misunderstood. In the interim several races have been run wherein there were Novice/Expert categories and the line was supposedly drawn on "experience," that is, those who never won anything in Novice class – others in Expert. Right off the bat you find the "Novice" class winners running engines so modified that it is ridiculous. So here we go for another ride on the same old merry-go-round!
4. **WHAT THIS COUNTRY NEEDS IS ONE RACING EVENT IN WHICH ANYONE, ANYWHERE, HAS A CHANCE TO WIN WITH ANY FORMULA ONE KIT AND ANY STOCK, UNMODIFIED .40, PERIOD!**

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# SCALE IN HAND

BY DAVE PLATT

● In this, our concluding segment of the finishing-processes series, we are going to examine various methods of applying markings onto an otherwise finished and painted scale model. Some of the ideas presented here may well be new to many modelers, but be assured that all work and work well.

We're going to break down this task into three distinct and separate phases:

1) Planning
2) Transference
3) Execution

In order to fully explain the entire process, and cover the many different possibilities of markings which can exist on various models, we are going to make an example subject of one particular ship. We chose Harold Krier's *Great Lakes Special* which ranks among the most marked airplanes we know of. Those who are able should refer to the 9/61 copy of "Aeromodeller." For those who don't have this copy, we should explain briefly that the Special is basically white, with red dicing (checkerboard) on its lower wing and stabilizer surfaces, sunburst on wing and stabilizer upper surfaces; and with small lettering liberally scattered on fuselage and fin.

With our model finished in white overall, we put it aside for a while to correctly plan the markings out.

**1) Planning:** The procedure we use here never varies and has proven to work well. First we spread out the full-size plan of the model and using a soft pencil draw out the markings carefully. For the moment, ignore the small lettering but include all large shapes including the civilian registration number on wings, etc. We have found that not infrequently some problem arises in getting the markings to fit correctly on the plan. When this happens, it is a simple matter to erase the wrong lines and make corrections, and the value of doing the mark-out on the plan instead of the model itself becomes apparent!

Having made all major shapes fit correctly on the plan, we go over the lines with an extra-fine-point nylon tipped pen, usually red. This contrasts well against the black ink on the plan (or the pencil, if you're a scratch-builder) and renders everything very easy to see and pick out.

Now for that lettering. If you are a whiz at hand lettering any help we could offer here would be superfluous. But let's say that you're one of the other 99 out of every 100 people who finds this stuff about as simple as training camels in etiquette; what then? If you do not have the lettering drawn full-size on your model plans but you do have a scale drawing at maybe 1/72 or 1/48 scale, you're home free. **Very** carefully cut out the appropriate parts of the plan and lightly paste them down on a clean white piece of card, grouping them together as much as possible.

Now figure out a scale-up factor or mark a given line to the new larger dimension. Take the card into your local small print shop and ask for a photostat copy to the new size. Photostats are charged on the basis of the final size of the print, so you can see why we grouped the stuff together.

The resulting print will have all the lettering the exact size we want, but don't be disappointed in the poor sharpness of the lettering; this is inevitable when scaling **up** and won't hurt anything in the final analysis.

**2) Transference:** We now have to transfer the markings from the plan to the model. We've tried just about everything for making guidelines on models, from ball point pen (dissolves and spreads when overpainted), felt-tip pens (too dense and often shows through paint), wax pencils (ugh), even chalk – but still the best tool seems to be a 3B regular lead pencil. The problem with pencils, and the reason we searched for an acceptable alternative is that if hard they scratch the paint job already applied, and if soft they forever need sharpening to retain the excellent point necessary for the job. We've learned to live with this last problem due to everything else being worse.

The pencil lines on the model should be very light, and this being so, they will be easily rubbed off if handled too much. Therefore, it will be best to only mark out a small amount at a time and proceed with the "execution" stage as you go.

The method we use to mark out any complicated shapes is to make a tracing, on transparent paper, of the design or lettering involved. By the age old child's trick of reversing the paper and going over the lines on the inside, then positioning the tracing on the model with tape and rubbing over the outside, we can get an acceptable transference of the design onto the model.

We earlier referred to the poor sharpness of photographically scaled-up lettering. This is easily corrected by cleaning up the image while tracing it.

**3) Execution:** The fundamentals of masking off a marked out shape, then painting over the shape and partly onto the tape, then removing the tape for a sharp clean and accurate shape are well known. However, in actual practice, there are a number of possible problems to be overcome in this seemingly simple idea.

**Problem 1** and by far the worst when encountered, is that sometimes the tape, when removed, pulls up chunks of the base color paint with it. Obviously the answer to this is to use a paint with excellent bonding power to the basic covering/finishing system, and we already covered this ground in our segment on paints. Let us just repeat here one thing – the butyrate dopes have extremely poor bonding qualities and even great care is often not enough to prevent trouble.

The other way to solve this problem and one we advise as a preventative measure **in all cases** is to use only low-tack materials for the masking or, alternatively, use of high-tack materials which have been suitably "killed." For example, Scotch Tape has a fearsome tack as purchased, but by drawing it through the thumb and forefinger once or twice this can be lessened to a tolerable level. Yet another way to reduce the tape's power is to cut it down in width to, for example, 1/8" or so. Great care is naturally needed when painting over narrow tape if using a brush which, as we see next, is not recommended anyway. By the way, the correct time to remove the mask is **as soon as**

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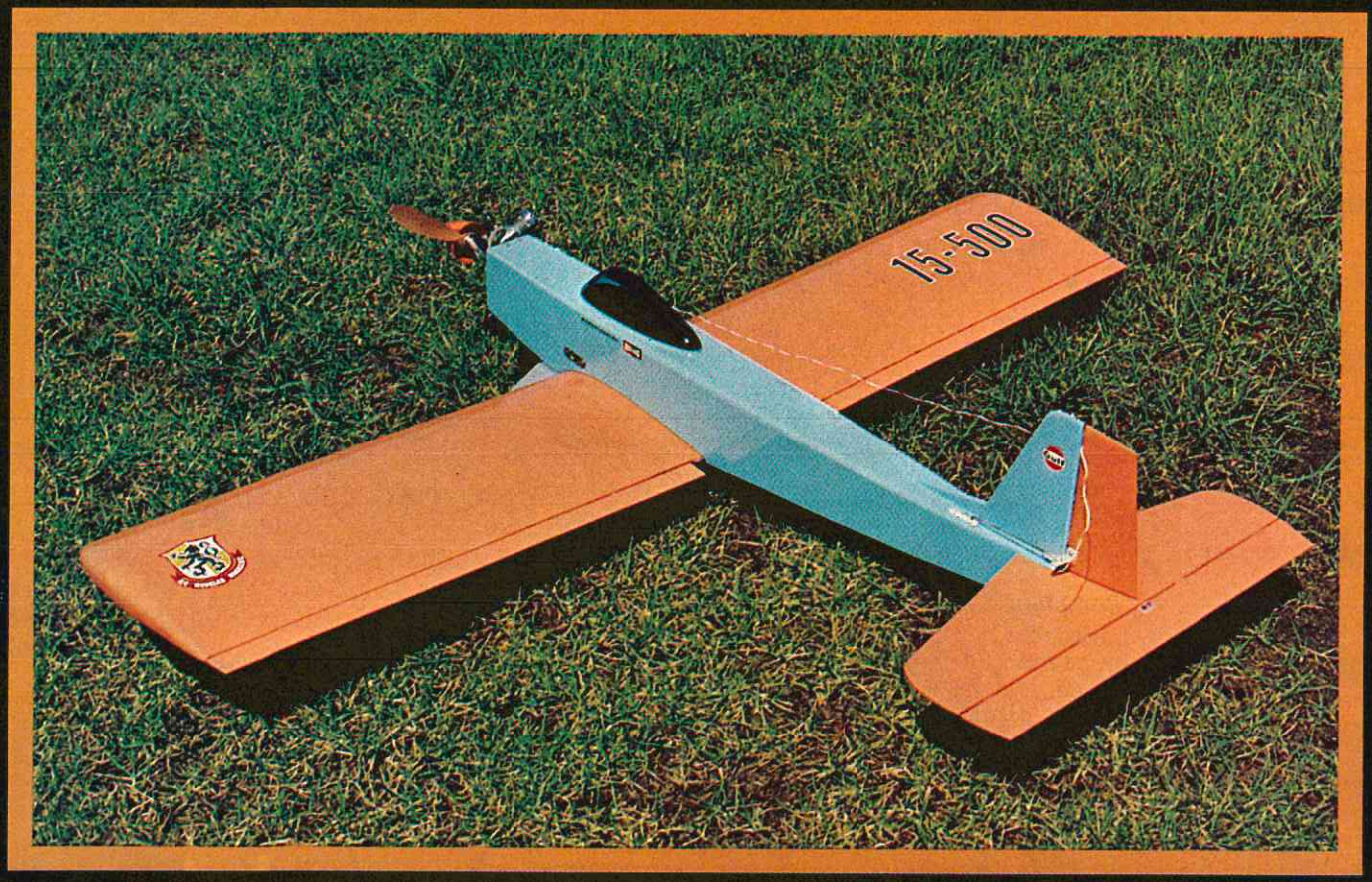
# RCM 15-500 Front Rotor .40: The New Breed of Club Racer




**Clean, honest, and fast, the RCM 15-500 is tailored to the emerging class of very simple sport or club racers using front rotor .40 engines. A one weekend project by Larry Maynard.**

● The 15-500 is an outgrowth of a series of similar designs dating from 1969 all of which have been easy to build and fun to fly. This latest version is tailored to the emerging class of very simple sport or club racers using front rotor .40 engines. With a wing just over 15 percent thickness and 500 square inches of area it meets all requirements under AMA sport racing rules while retaining the honest characteristics of a fine Sunday flier. With a smaller engine, i.e., a .19 to .35 it becomes as docile as all but the very basic trainers.

The prototype was designed, engineered, and fully framed up over a weekend in which I also attended the B.I.R.D.S. annual Pattern contest. Insofar as practical the design has been tailored to standard material sizes and a materials list is provided to permit the builder to survey his supplies and scrap bin for necessary purchases. The structure has more than adequate strength so that any desired finishing technique may be used. For basic construction I strongly recommend using regular model cement in other than high stress areas in order to keep the weight at a minimum. At the same time the builder is cautioned to spend the few extra minutes it takes to double-glue each joint. For attaching the wing sheeting it is a very simple matter to put the glue on the mating structure, lay the sheet on to transfer the glue, and then set it aside for a few minutes before re-gluing and pinning it in place. This method substantially increases joint strength and will save several ounces in airframe weight which can be the difference between winning and losing in a closely matched contest. A foam wing was also considered but fell by the wayside from weight considerations.

The construction notes have been layed out for minimum building time, so let's get with it.

## CONSTRUCTION

Cut the fuselage sides from matched 3/16" x 4" x 36" balsa to the outline shown making sure to cut for the 2 degrees downthrust and the stabilizer inset. Draw lines on the inside of the fuselage sides to locate F3 and F4, and cement the ¼" x 1/8" stiffeners in place. Epoxy the trailing edge stock, firewall gussets, and wing nut blocks to the sides as indicated and set these assemblies aside to dry. Cut out F1, F2, F3, F4, and F5, and drill pilot holes in F1 for your motor mount, throttle control, and fuel lines. These are set aside for now.

Cut out and shape the horizontal stabilizer and, while you're at it, do the elevator, fins, and rudder, too. Since it will be a while before you can proceed with the fuselage assembly you might as well go grab a snack or a brew while contemplating the wing structure.

**RCM 15-500 PROPOSED RULES**

**WING**

Area ≥ 500 square inches

Thickness ≥ 15% of chord

Planform: Constant chord and thickness from the centerline to 24 inches on each side. Wing tips may be any shape or kind as long as the owner can prove that the total wing area is equal to or greater than 500 square inches.

Airfoil: Airfoil section and construction are up to the builder.

**TAIL**

Area of the horizontal stabilizer and elevator must be no less than 90 square inches when projected on a horizontal surface. Vertical fin and rudder may be any size depending on stability requirements.

**FUSELAGE**

Fuselage to have a rectangular cross section nose to tail. The maximum width and height of the rectangular cross section must be at least 2-15/16 inches and 3¾ inches respectively with the wing removed. These dimensions need not occur at the same cross section. A maximum radius at the edges of 3/8 inch is permissible. No wing fillets are permitted and only structural filleting of the tail will be allowed. No engine cowling may be used. Addition of a pilot's canopy to the above requirements shall not be cause for disqualification.

**ENGINE**

Front rotor 0.40 cubic inch or less, standard production engine generally available in local hobby shops. Full idle must be demonstrated; however, zero motion on a smooth runway is not required. Idle will be considered adequate when aircraft lands under power and taxies back to pit (or pit area) under full control.

**PROPELLER**

A wooden, commercial 10 inch diameter, 6 inch pitch propeller shall be used. One blade may be modified for balance purposes only.

**LANDING GEAR**

Landing gear shall be fixed, non-retracting and may be either taildragger or tricycle configuration in the usual sense. Ground steering shall be provided and demonstrated at the request of the C.D. or by the taxi maneuver after landing. Main wheels shall have a minimum diameter of 2¼".

**FUEL**

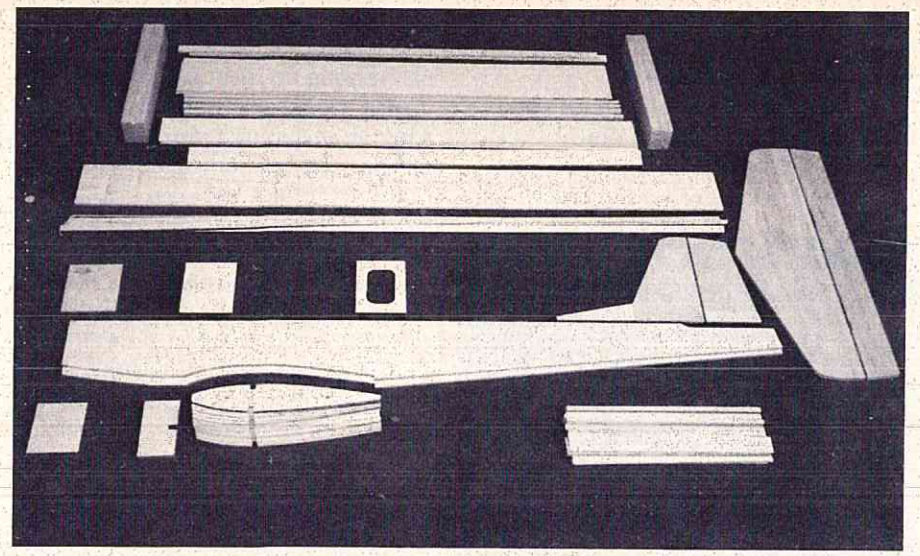
Fuel shall be a standard commercial mix and will be provided by the contest management.

The race course and conduct are to follow Formula I rules and procedures.

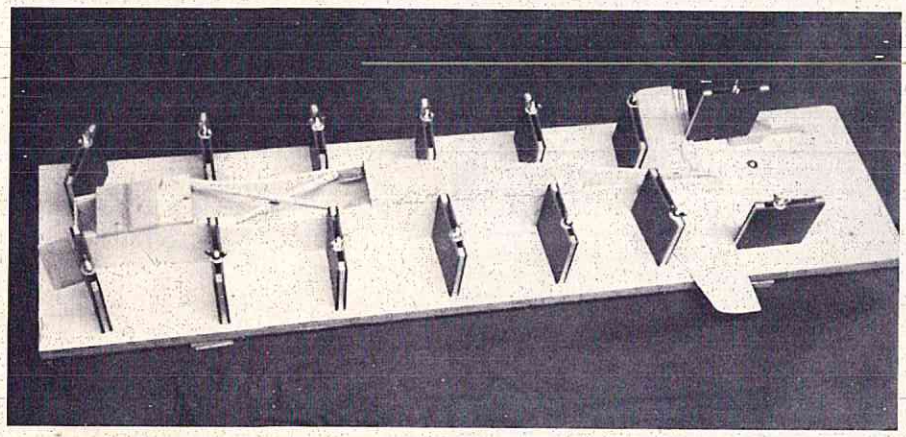
Properly fortified now, cut 20 ribs from 3/32" sheet and one from ¼". Cut the spars, leading edge strip, trailing edge, and the wing sheeting to approximate size as shown and cement the 1/16" x 3/16" trailing edge strips to the trailing edge sheeting. (A tracing of the wing on shelf paper can be used if you would rather build the whole wing at one time.) Add the ¼" diameter wing hold-down dowel to the center ¼" thick rib and add 1/16" sheet vertical grained webs to each side. Pin the lower spars over the plan on an absolutely flat work surface and locate the ½" thick jig block parallel to them at the location shown. Using model cement, glue all but the center ¼" rib in place. Use a small square or triangle to assure accuracy. Bevel the 3/32" strip leading edge and add it and the trailing edge sheeting with its attached 1/16" x 3/16" strip using the double-gluing method. Add the upper leading edge sheeting and the upper 1/16" x 3/16" capstrips.

By this time the assembled parts for the fuselage and tail feathers should be dry. To assemble the parts, pin the stabilizer to a flat work board on the plan top view. Fit and glue the tail end of the fuselage sides together and then glue them to the stabilizer. Immediately insert F4 making sure that the top of the fuselage sides lies flat on the work surface. Next, get some 8-10 inch lengths of 2" x 4" (house construction type) and, using weights or clamps to hold them in place, bring the fuselage sides in to meet the B3 bulkhead. (To really make this simple use an RCM Fuselage Jig – see the February 1972 issue.) Dampen the fuselage sides in the area of F4 to make it easier to form the sides. Add ¼" x 1/8" cross members to the existing stiffeners and add short triangular pieces between the fuselage and stabilizer as structural fillets if desired, then install the tail wheel bracket. Note that the tail wheel bracket has to line up with the back of the vertical fin if it is to be controlled by the rudder. Draw the nose together and epoxy F2 and F5 (the landing gear block) in place. Add the lower front nose sheeting and add temporary "X" bracing of scrap in the wing cutout area to assure fuselage alignment when the assembly is removed from the work surface. Add the bottom 1/16th sheeting cross-grain.

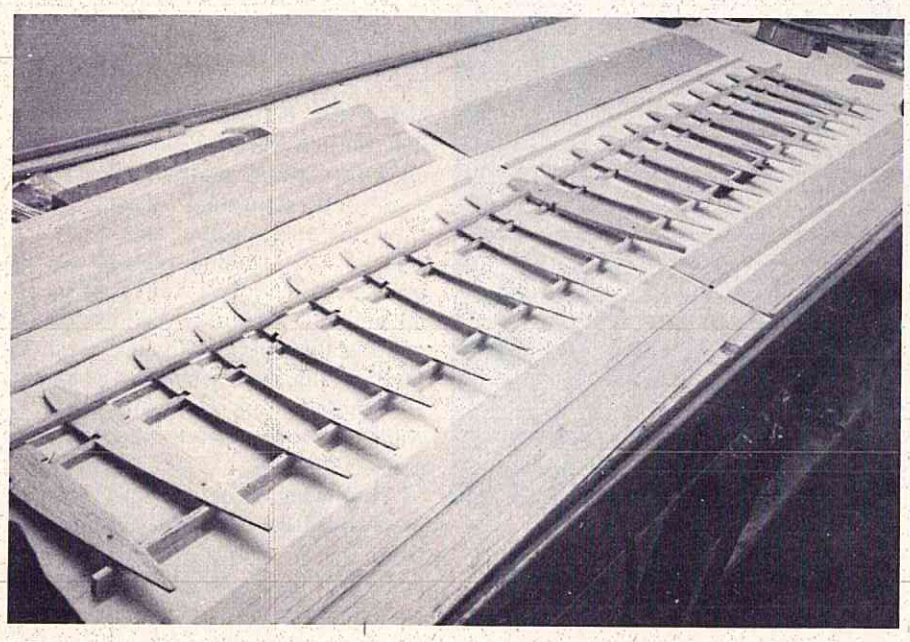
The wing structure has set up pretty well by this time so remove it from the work surface, turn it over, and pin it back in place. Now, add the lower leading and trailing edge sheeting using the double-glue method and add the capstrips to the ribs. Since both the wing and fuselage assemblies should be left overnight to assure



**All wood parts for the RCM 15-500 cut out and ready to assemble.**



**Fuselage assembly in the RCM Fuselage Jig.**



**RCM 15-500 wing layout using the 3/16" x 1/2" leading edge cap as the wing jig block. The 1/16" x 3/16" T.E. strips are pre-glued to the T.E. sheeting.**

complete setting up of the adhesives you might as well set the whole works aside, return to the refrigerator for sustenance, watch the late news, and go to bed.

When both wing halves are complete, carefully sand the 2 degree dihedral angle at the center section. Epoxy the ¼" center rib in one wing half so that half of it is exposed. Clean off any excess epoxy on the exposed surfaces and allow it to set up. Sand the leading edge flat and then add the 3/16" x 1/2" leading edge cap to both halves and spot glue the wing tips in place. After this has cured, put epoxy on the mating surfaces of the ¼" rib and slide the two wing halves together so that each wing half has 1/2 of the center rib keying it in place. Even if you use 5 minute epoxy for this, give it an hour or so to set up completely. After this is set-up, finish shaping the leading edge and the wing tips then remove the tips, hollow them out, and re-cement them in place permanently. Add the center section sheeting and the 1/16th plywood stiffener for the wing hold-down bolts and fiberglass the center section as shown. Add the strip aileron horns after fiberglassing. When everything has set up give the wing a final sanding, cut out the center rib and sheeting for the aileron servo and cover with your favorite material.

Now that the wing is essentially complete let's finish up the fuselage and tail assembly. Remove these parts from the board and pin the top sheeting in place. Draw trim lines for the sheeting and locate the slot for the vertical fin. Remove the top and trim it to outline. Cut the slot for the fin and finish trim the portion of the top that fits over the stabilizer. Install your control guides and rods in place before adding the fuselage top. Epoxy the F1 firewall to F2.

Separate the hatch from the fuselage top and add its stiffeners. Carefully cement (double) the fuselage top in place and allow it to dry completely. Do not add the vertical fin until it and the fuselage are otherwise complete and the tailwheel is installed. The bend for tailwheel control should be made before the fin is installed. The control surfaces can now be sanded and finished as desired, the hinges added, and the ailerons installed to the wing.

By the time this operation is complete the fuselage should be ready for final shaping. With the hatch in place sand the fuselage edges, fairing them

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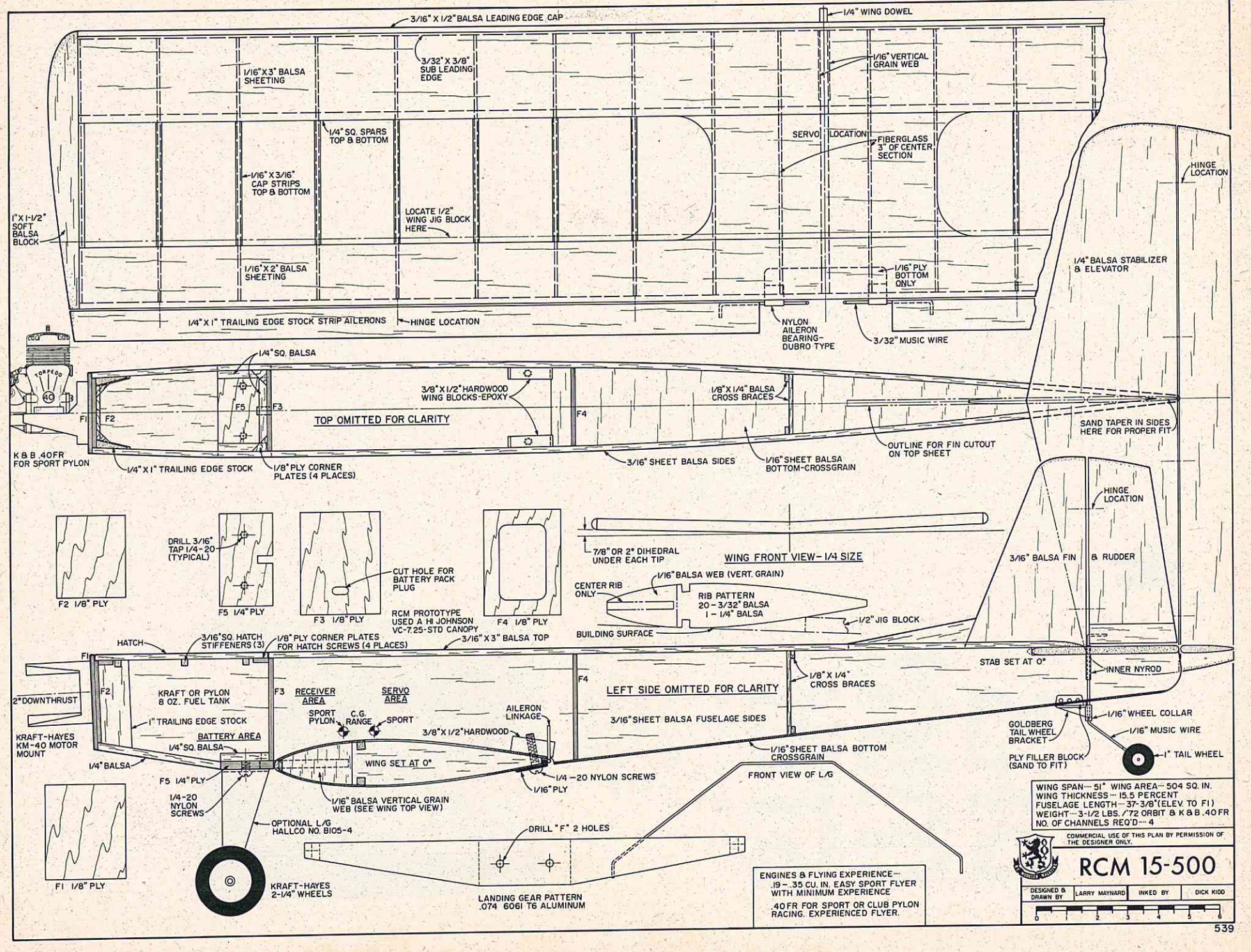
FULL SIZE PLANS AVAILABLE – PAGE 116



# DAS MINI STIK

**If you think you're a hot pilot, try this 36" span, .19 powered son of Ugly Stik and Liddle Stik!**

Wagger, the peripatetic Basset, and the better half of Walt and Wagger, comes out of retirement to bring you the ultimate in mini-multi's.

Walt's old Chevvy clanked to a stop just one hundred feet before he reached the airport runway where he and Wagger held their Sunday flying sessions. This particular Sunday, Wagger had decided to make the journey on his Christmas Mini-Bike rather than entrust his hide to Walt's clunker. Now, as Walt puffed the last few yards on foot, he was inclined to agree with the feisty Basset's judgment.

"Fine time for the old bolt wagon to poop out," grunted Walt. "Cold Winter day, big mosquitos and all. Man, just look at that orange mosquito coming at me now. Must have a three foot wingspan . . . Hm'm'm. Orange mosquitos with three foot wings? Oh, no! That daffy dog has done it again!"

Walt's last words descended in pitch in neat accordance with the Doppler effect as he dived for a ditch to avoid that buzzing orange streak. Luckily, his expanded waistline caused him to roll gently to a stop just in time to see the little orange object execute a neat Immelman and then drop neatly to the runway. As Walt stared in amazement, it issued a series of burps and then returned to the parking area which contained only a dog and a Mini-Bike. The dog made a quick motion, then all was silent.

"Wagger," groaned Walt as he hoofed the last distance to the pit area, "one of these days . . . what in the . . . aha! You finally shrank your MonoKote too tight. Look at your 'Liddle Stik'; it's all squeezed out of shape!" Walt turned to the dog with a triumphant gleam, only to wither before Wagger's disgusted glare.

"Look, muddled master," the talking dog snorted, "stretch your memory back to 1966 when Phil Kraft came out with the 63" 'Das Ugly Stik.' It was a boxy aircraft with a few scalloped edges on it to make it resemble an Eindecker. It became so popular that the advent of small propo radios inspired Larry Leonard to publish a 46" version called 'Das Liddle Stik' in 1968. Well, the small size of the modern radio has inspired Wagger to try a 36" version. Voila! Your three foot orange mosquito!" Wagger executed a low bow, scraped his hose and then sneezed. Hurriedly padding over to his Mini-Bike , he extracted a monogrammed handkerchief from his rally kit and gave his nose a tremendous honk.

"Well, boss," he sniffed, "you wanna build one? I have a detailed plan right here."

"Right!" enthused Walt. "Hey, it looks pretty simple; do I have to wait for detailed building instructions? I'm not exactly a beginner, you know."

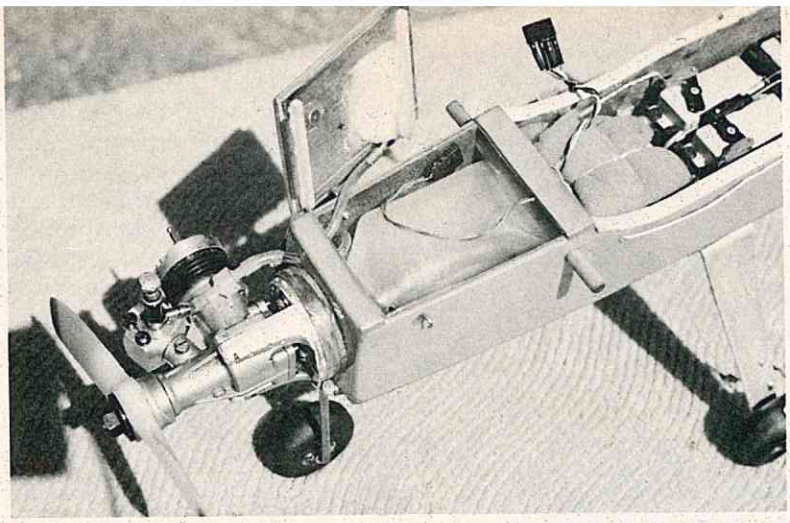
Wagger tossed his head. "If you were inexperienced, I'd say stay away from this little bomb for awhile. It doesn't have a single bad habit, but it's responsive as a new bride and it greases-in pretty fast. How about spending a little time going over some of the features and its flight characteristics instead?"

Walt nodded. "I'm all ears," he said.

"I think you're being nasty," Wagger retorted, "but I'll proceed anyway."

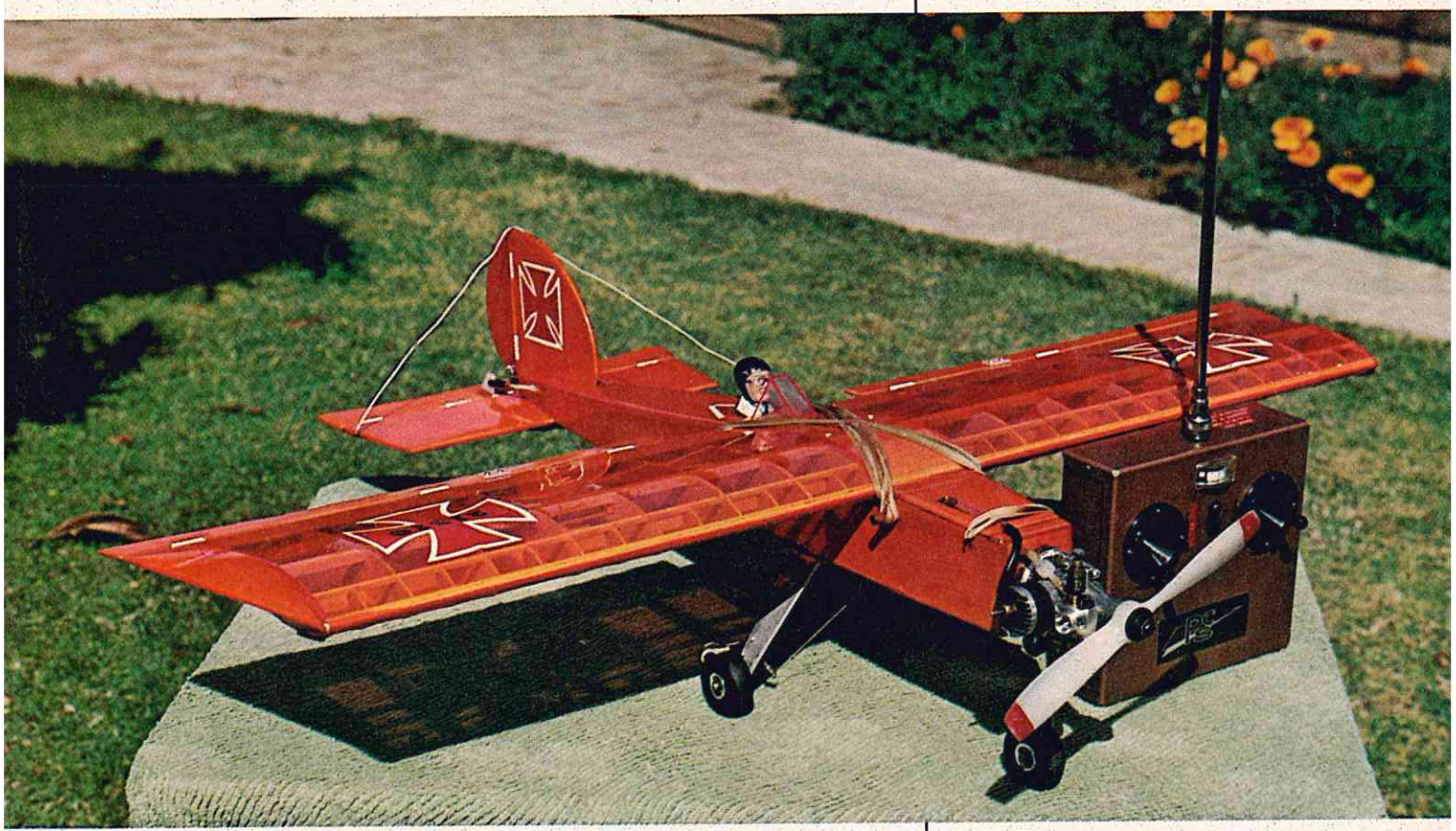
First of all (Wagger pointed out, as he settled his haunches onto his transmitter) you'll notice that the construction is almost identical to the 'Liddle Stik.' I did move the battery pack to the rear and the nose wheel to the front of the firewall; that was necessary to keep the C.G. in position and to make room for a tank to feed that O.S. Max .19. Install the battery pack with foam during the construction, then glue in a couple of scraps to hold it in place. I used the small 250 mah pack, but I'm sure the 500 mah pack would be fine. Incidentally, the location of the battery plug makes a harness extension necessary for charging. I think Kraft has them made up, but I made one. I soldered a male and a female plug together, back to back, then ran 8" of red and black wire to another female plug. The "back to back" plugs go between the battery pack and switch; the female plug extends forward into the tank compartment. All you have to do for charging is remove the tank hatch for access to this plug.

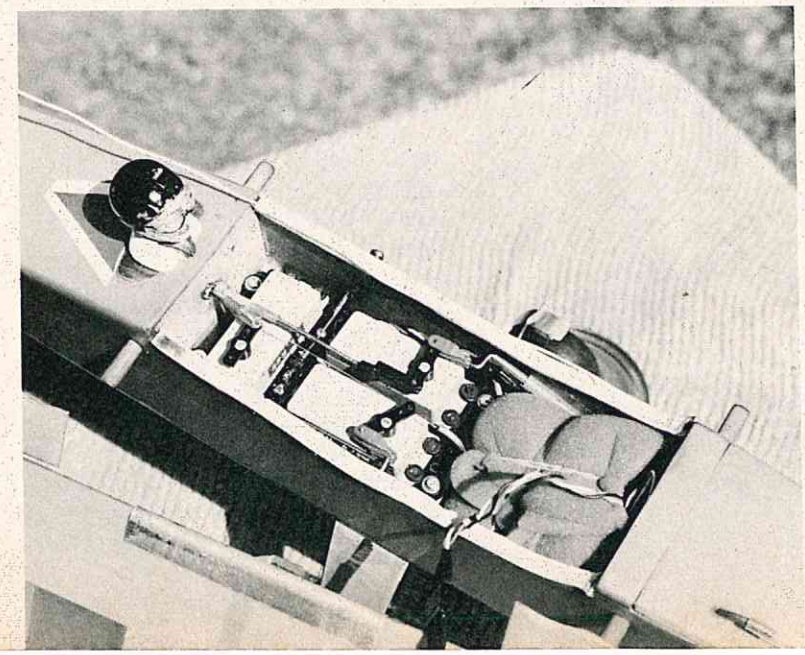
The nose wheel assembly, you'll notice, is external for simplicity and cheapness as well as tank volume. If you fit the plywood pads carefully, you'll find it as durable as any you've used. Originally, I used a Nylink to fasten the NyRod to the piano wire tiller. However, after shearing the pin out of several, I did this: take a sheared Nylink and drill another hole right where the pin sheared out. Bend up an "L" from piano wire and pass it through the Nylink and tiller; then slide a piece of fuel tubing over the Nylink and piano wire leg. It takes the punishment, but doesn't cause metal-to-metal noise. An accident usually only bends the tiller slightly, and it can be straightened and re-soldered easily.



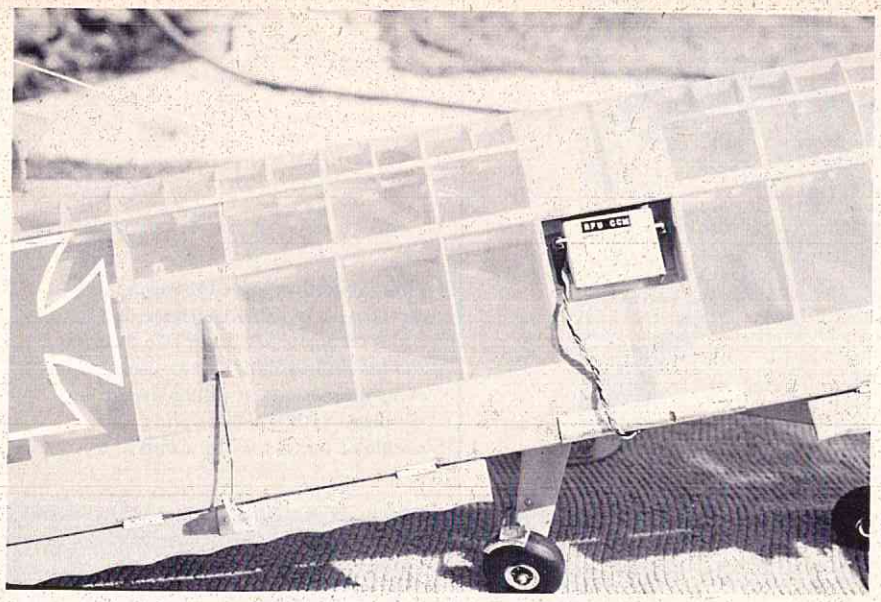
By Loren Dietrich

This diminuitive three foot span multi can take up to KPS-10 size servos and is complete with steerable nosegear and brakes in addition to all usual control functions. It will do everything the bigger 'Stik's' will do and a couple of things they're scared to try.

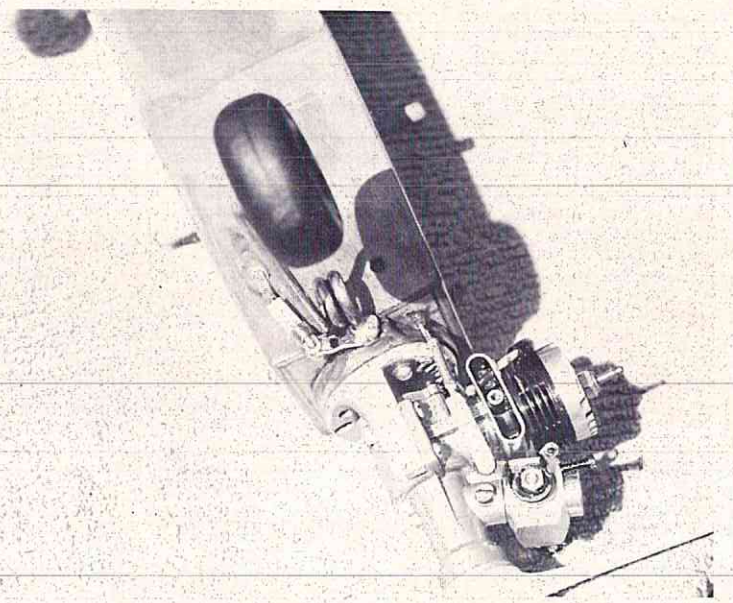




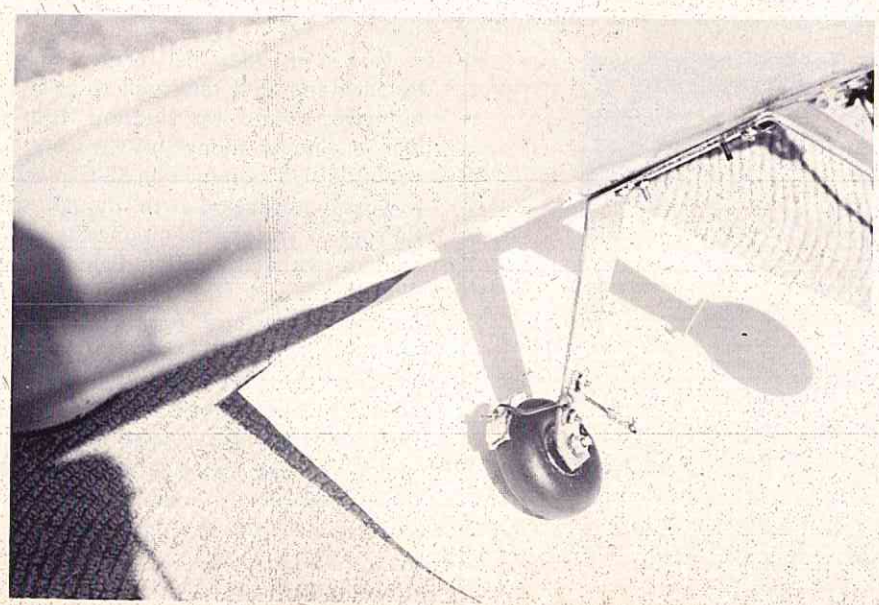
Now, for the fuel system. The Pylon brand SS-4 tank will fit easily, but gives a little less duration than I like for Sunday flying. Just to see if I could do it, I crammed an SS-6 in and it works! Looks god-awful though, so I'd suggest you use the 4 ounce and be content with reasonable flight time. With either tank, I'd suggest you use the Mickey Mouse pressure system mentioned in RCM a couple of years ago. For those of you who missed it, do this: Take a small piece of brass fuel tubing and drill a small hole right smack through **one** side of it. Then drill a couple of holes though the exhaust stack of the engine that will be a snug fit on the tubing. Slide the tubing into these holes, being careful



ABOVE: Close-up of aileron servo and linkage. Transparent orange MonoKote used on entire aircraft for visibility.



ABOVE: View of throttle linkage and steerable nosegear. BELOW: Wheel brake set-up.



to align the hole in the side of the tube to point **directly** at the piston. Pinch off the bottom end of the tube, then deform the other end slightly to keep it from working out. Then, run a piece of black neoprene tubing from the top end of the tube to the single vent of the tank. The idea is to put the pressure of the exhaust directly into the tank to supply a more positive flow during maneuvers. A fringe benefit of the method is that pressure is proportional to engine speed, giving oomph during maneuvers but no flooding at idle. It's so darn simple it shouldn't work but it does! I recommend it anytime, but it's quite necessary if you are going to try to run a 6 ounce tank on a .19. Give it a try.

In case you think the brakes are a luxury, forget your thinking and put them on anyway. They operate with down elevator, and give complete ground control. They give time to collect the courage before take-off and are also used to bring it to a smoking halt after landing. The only change from Kraft drag brakes is the addition of a small shoe with rubber brake lining, since the wheels are small. The ideal lining for them is sections from a rubber leg pad for metal folding chairs. Ten cents gives enough brake lining for a year.

The construction of the "Mini Stik" is not particularly light, so the covering must be. If you're careful, four feet of transparent MonoKote will do the whole job with less weight than any comparable technique. In addition, it's easy to patch and you can see the thing against the grey winter skies! So help me, that transparent orange is like flying a flashing spotlight. Don't consider anything else for this bomb.

The radio presents no real problems on installation, although it is tight. Servos must be Kraft KPS-10's or smaller, of course. My receiver did not allow loose foam packing, so I just laid it gently in place between the two nylon pushrod housings. I then put a small piece of foam between it and the servos. **DON'T** wedge it in place with **tightly packed** foam which will transmit vibration horribly. I've had no problem in over a hundred flights.

On the power end, I use a Kavan carburetor because I like its idle and full power. Straight Supersonic 100 is adequate and gives long life. Either a wood or nylon prop is fine; I use a 9-4 cut down to 8¼ and then carefully balanced. Power could be reduced to a

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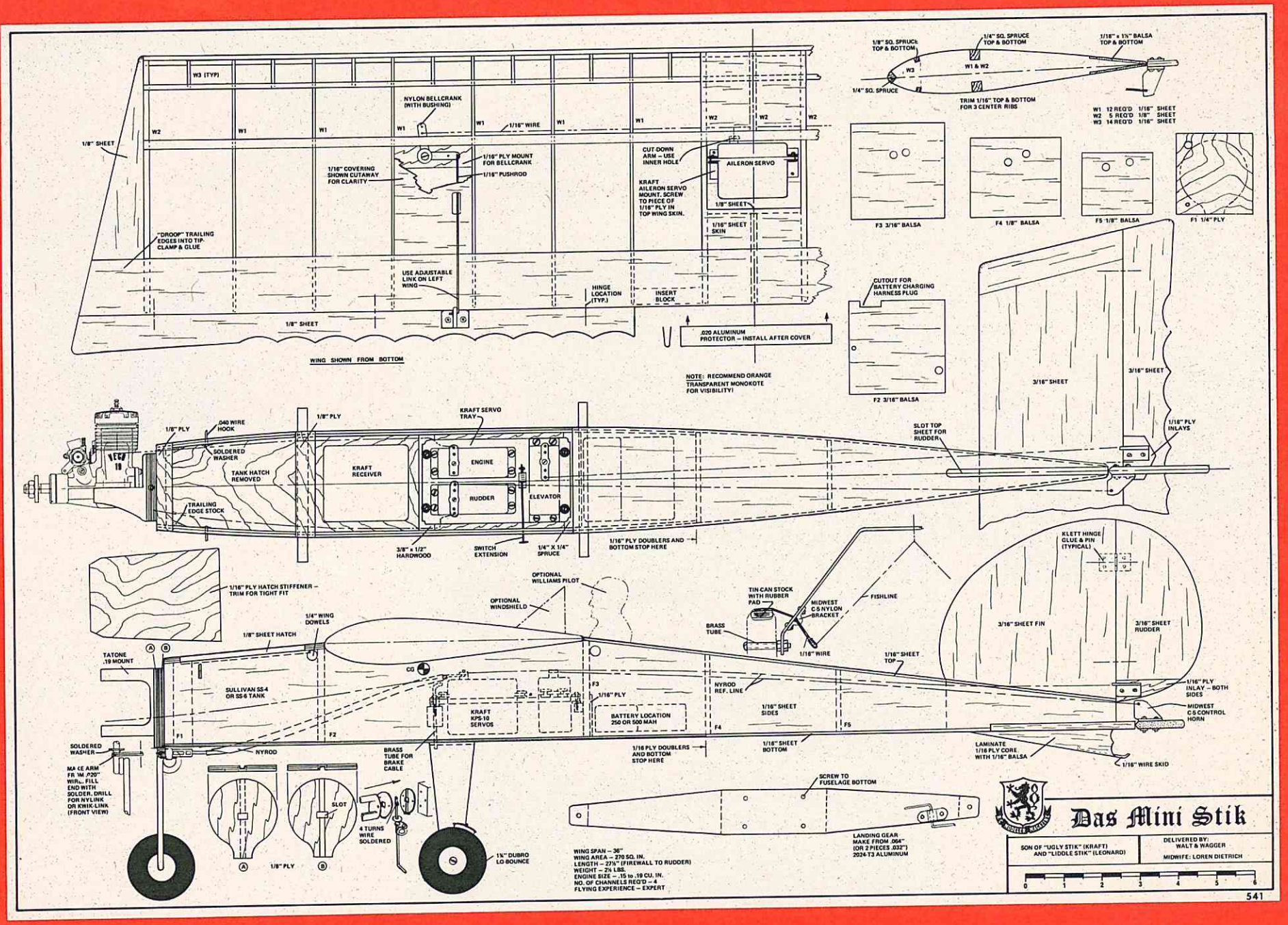
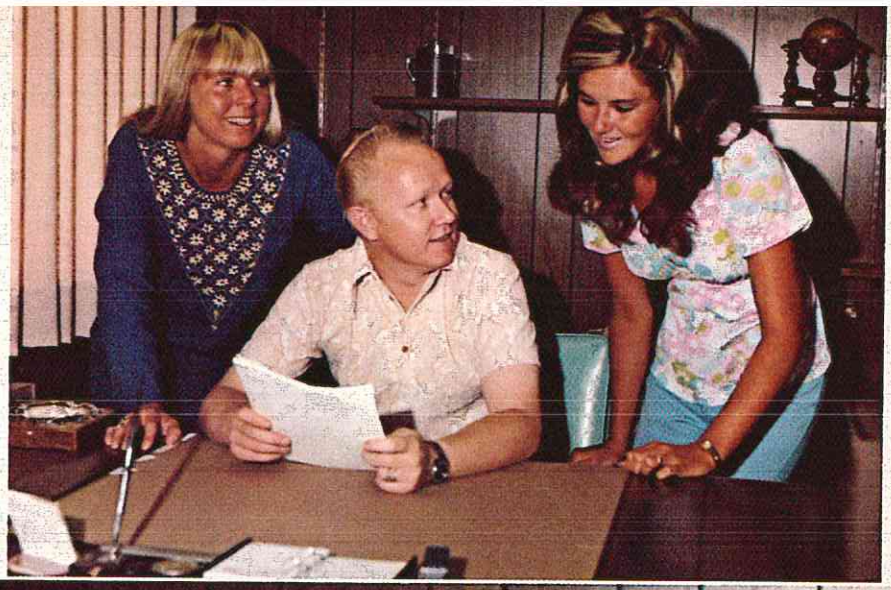
FULL SIZE PLANS AVAILABLE – PAGE 118



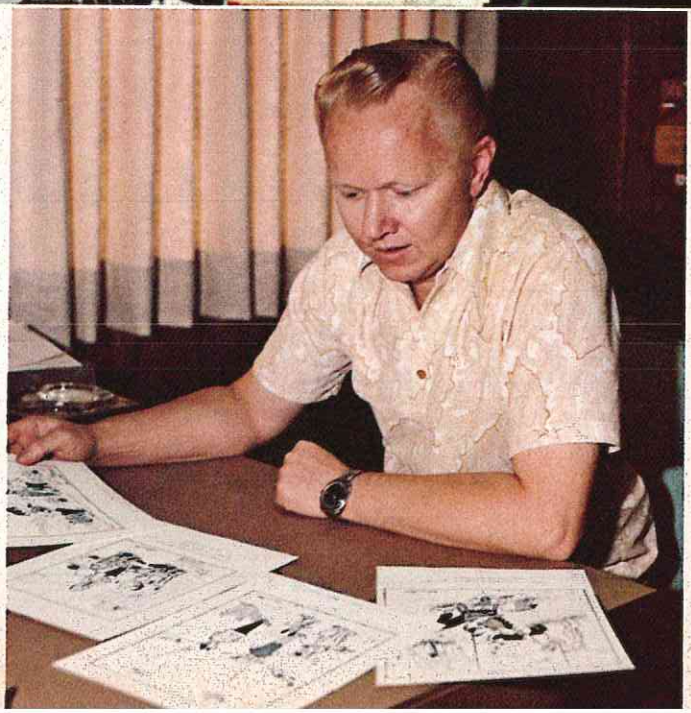
RIGHT: Susan Steele, Art Editor, and Jane Wall, Subscriptions, confer with RCM's Editor. BELOW, CENTER: Pat Crews, Executive Editor, and Dick Kidd, Technical Art Editor. BELOW, RIGHT: Don Dewey, RCM's Editor and Publisher.



**OCTOBER 1963 • OCTOBER 1973**

**10TH ANNIVERSARY**

RC MODELER MAGAZINE




**The front portion of RCM's new 6000 square foot home office facility in Sierra Madre, California.**

**photos by dick tichenor** **text by don dewey**

# anniversary pictoria

● On this, the 10th anniversary of R/C Modeler Magazine, we're going to take you on a brief tour of the brand new RCM building and introduce you to the magazine's home office and field staff. As with all RCM Visits features, the purpose of this article is to better acquaint you with the members of our staff - - - particularly our many readers who have never had the opportunity of stopping by our offices at 120 West Sierra Madre Blvd., Sierra Madre, California.

The first issue of RCM was dated October 1963, and appeared in hobby shops on September 1st of that year. As with all model publications of the period, it was printed on "pulp" paper, was completely black and white inside, and contained 40 pages with a total of 25 advertisers. Seven thousand copies of that issue were printed and the body text was manually set on an IBM typewriter since we "capitalized" the magazine with $500.00 and couldn't afford typesetting! The first issue contained the Stagger-Bi R/C biplane by Phil Kraft as well as a one month "scoop" on the 1963 Nationals. At that time RCM was the first publication out with the Nationals coverage and continued that precedent every year since by being the first publication out with both Nationals and Internationals events. In addition, that first issue of RCM introduced the Reader Service feature wherein you, the reader, could obtain additional information direct from our advertisers – a feature that is still unique to R/C Modeler Magazine in

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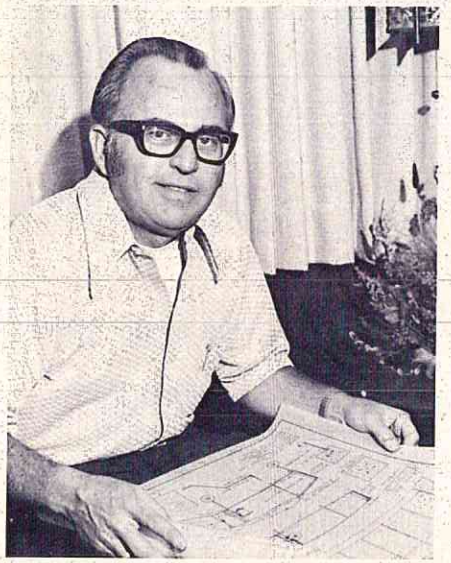
ABOVE: RCM's reception office. ABOVE, RIGHT: Pat Crews, Executive Editor. BELOW: Dick Kidd, Technical Editor. BELOW, RIGHT: A part of the RCM family.



Barbara Richardson, Graphic Arts Editor.

Susan Steele, Art Editor.

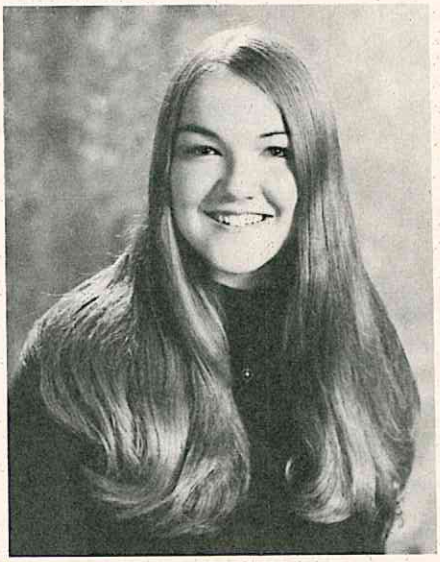
Sheila Pierce, Subscription Department.

Pat Johnson, RCM's bookkeeper.

Rita Lord, Assistant to the Editor.

Jane Wall, Subscription Department.

Beverly Calhoun, Secretary.

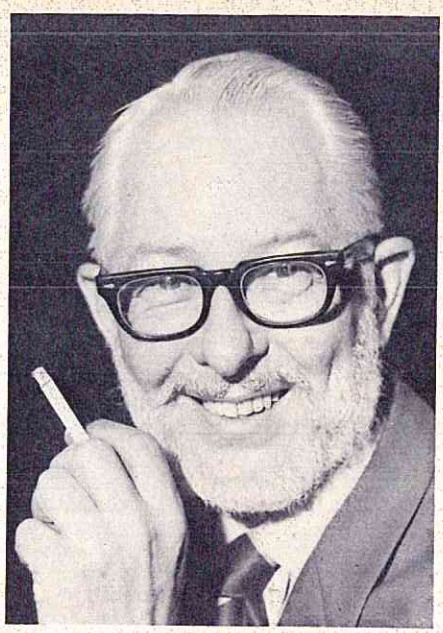


Linda Whitaker, Mail Department.

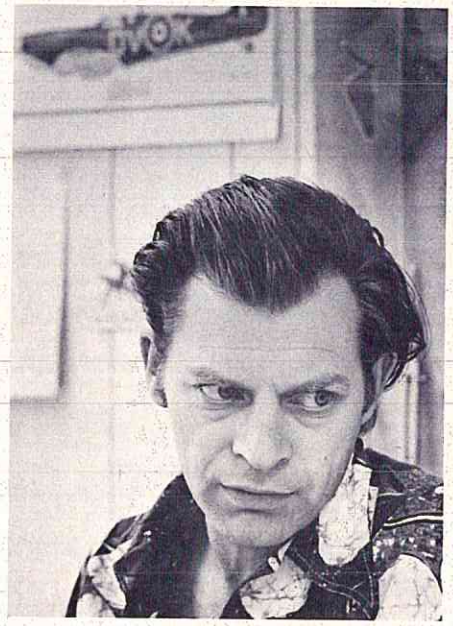
Johnny Noah, Subscription Department.

Andy Heller, Plans Service.

Bernie Murphy, Photography Editor.



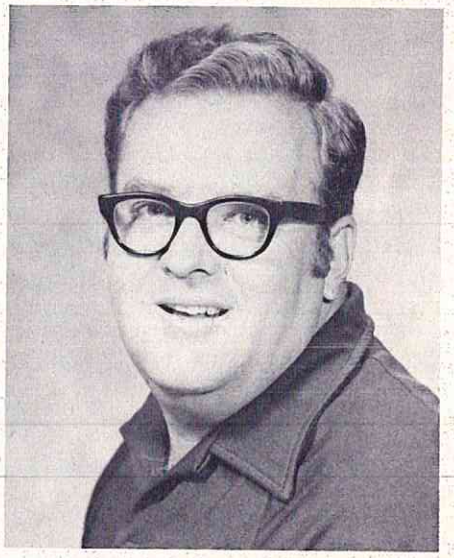
LEFT: RCM's Senior Photographer, Dick Tichenor. CENTER: Ken Willard, Associate Editor. RIGHT: Joe Bridi, Contributing Editor.



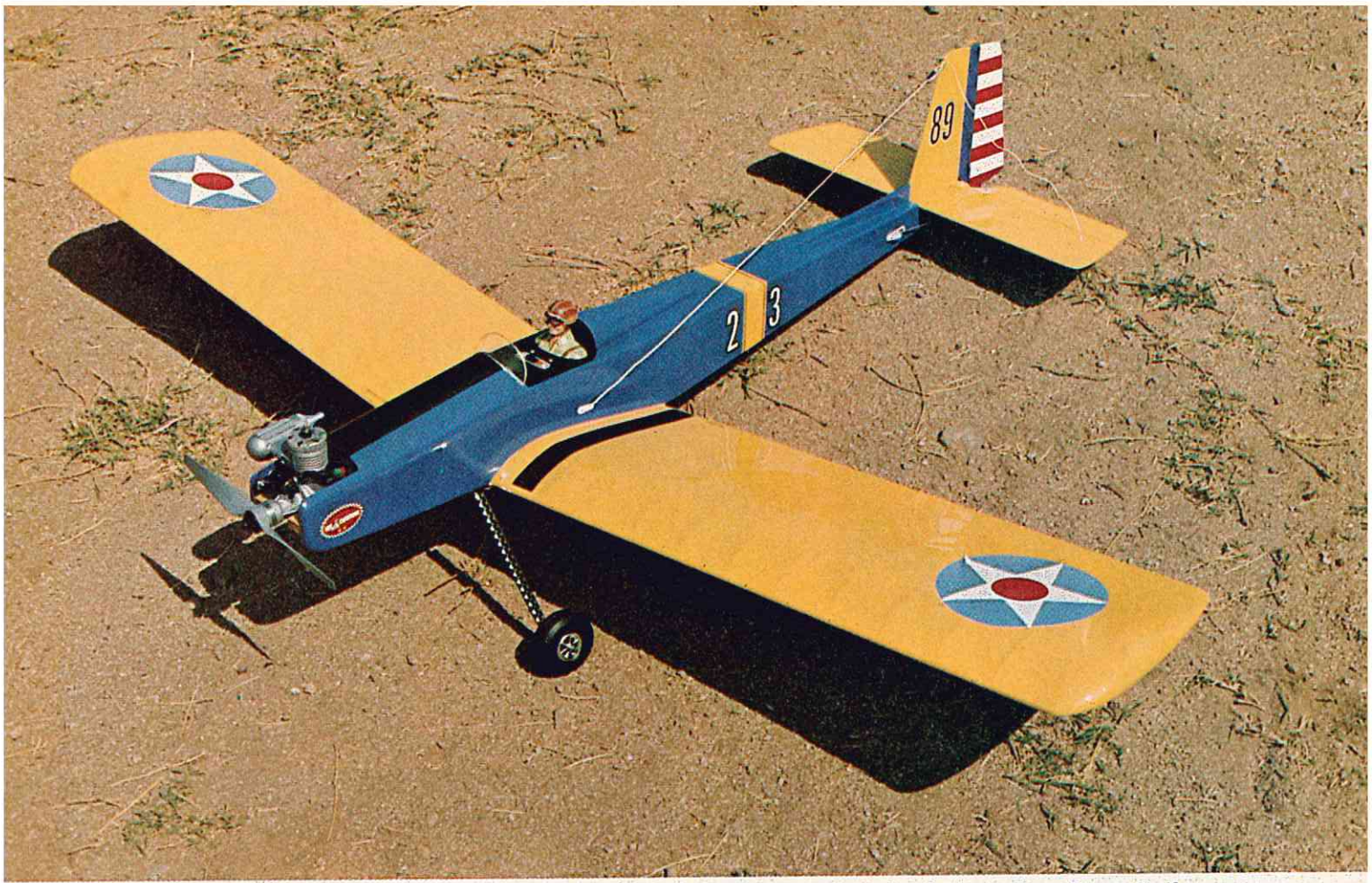
LEFT: Clarence Lee, 'Engine Clinic.' CENTER: Chuck Cunningham, 'Cunningham on R/C.' RIGHT: Dave Platt, 'Scale In Hand.'

Dick Sonheim, RCM Associate Editor.

Bill O'Brien, Special Projects Editor.



Jim Simpson, Associate Editor.




**RCM's prototype of Mac's modified Pronto is covered with Solarfilm and trim MonoKote. Insignia and wing walks are Contac Shelf paper.**

## Minnesota, No! Mexico, Si! Building A Portable

# PRONTO

**BY C.W. McCRACKEN**

**PHOTOS BY DON DEWEY**

*The following article by C.W. McCracken of MAC'S Models, 645 Pineview Court, St. Paul, Minnesota, concerns some rather ingenious methods for modifying the popular Pronto for complete portability while traveling. Since the Pronto, a low wing, three channel, .15 powered kit design from Tidewater Hobby Enterprises, 103 Banister Drive, Hampton, Virginia 23366, has been one of our favorite sport models here at RCM, I wanted to add a few of the modifications we make to this design as a preface to this article.*

*First of all, we duplicated all of Mac's "portability" features and found that it not only made an easily transportable model, but also added substantial strength in the tail areas. Insofar as the modifications are concerned, we utilized a Lee-Veco Custom .19 engine with a Taipan glass-filled 8/6 prop for maximum performance from this small aircraft. The O.S. Max .15 is ideal for all around sport flying, but the Pronto will balk a bit in medium wind conditions with less than a .19 engine.*

*In addition, while Mac specifies deepening the fuselage by ½" in order to accommodate a square battery pack and tank in the low profile nose section of the Pronto, we utilized a Hi Johnson Model Products Flexiscope Fuel Tank which is a metal unit that is designed to be telescoped together and can be shrunk to one ounce or one inch in length and up to four ounces or four inches in length. Due to the fact that it is an extremely flat tank the four ounce version easily fits into the Pronto fuel compartment with more than adquate space underneath for a conventional square battery pack. The Flexiscope Fuel Tank is available at most hobby shops and priced at $2.00 each. The tank can be telescoped within itself so that one ounce of fuel is contained in each inch of length. In other words, if you telescoped the tank to a length of 2½", you would have a fuel capacity*

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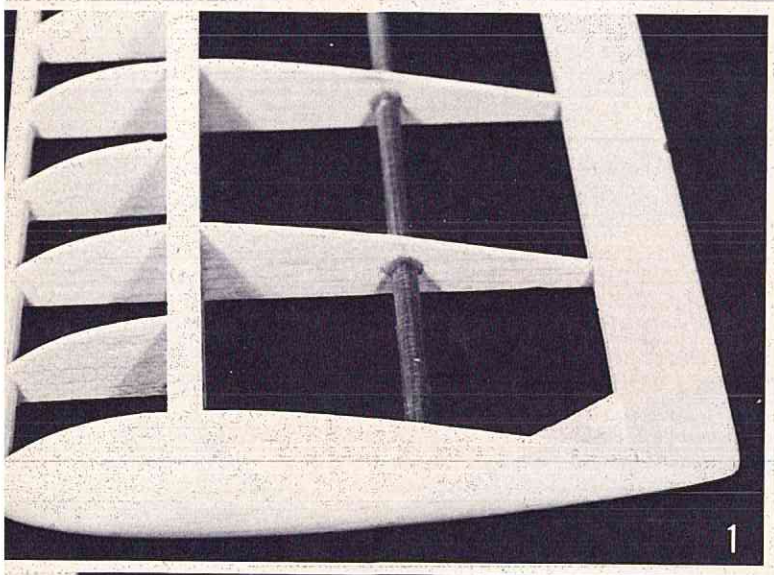
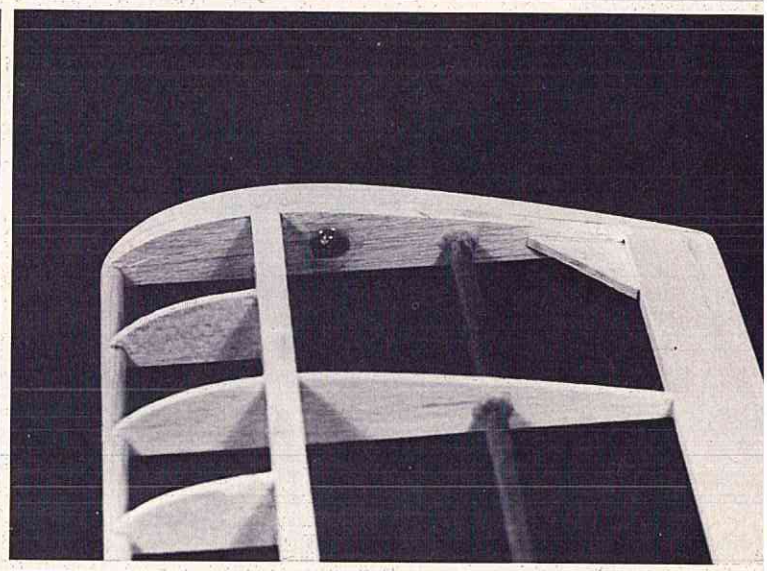
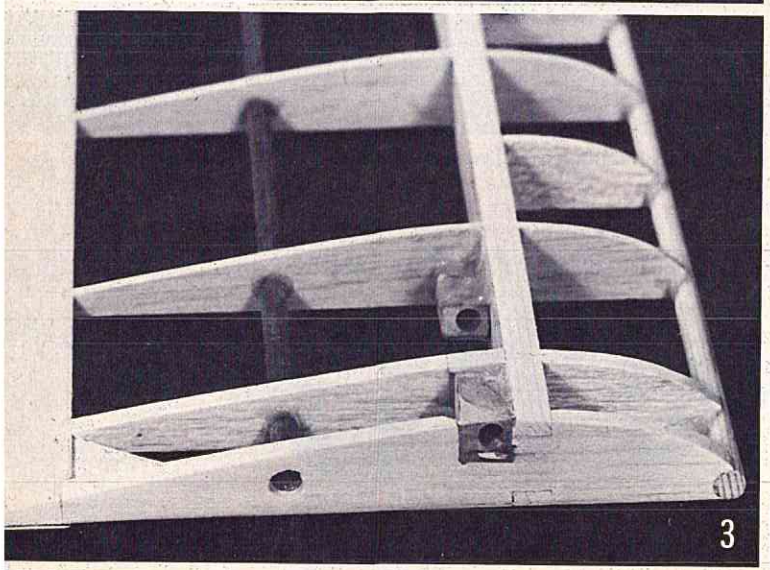
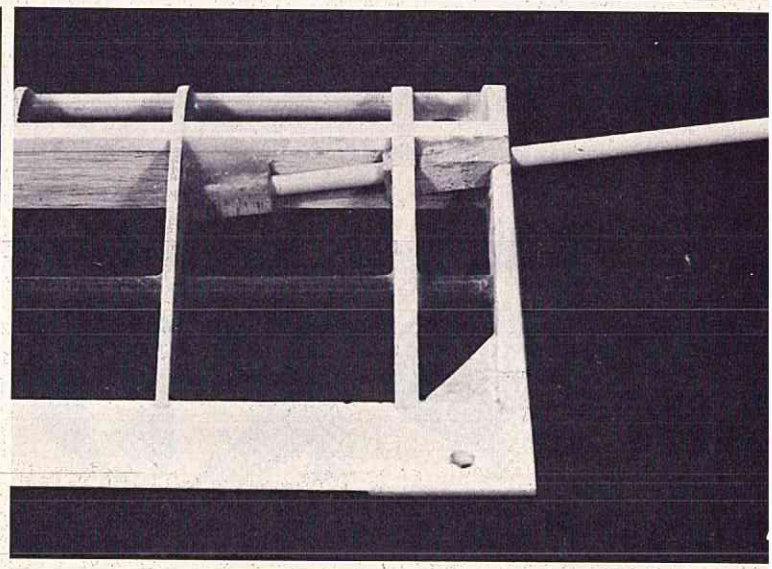
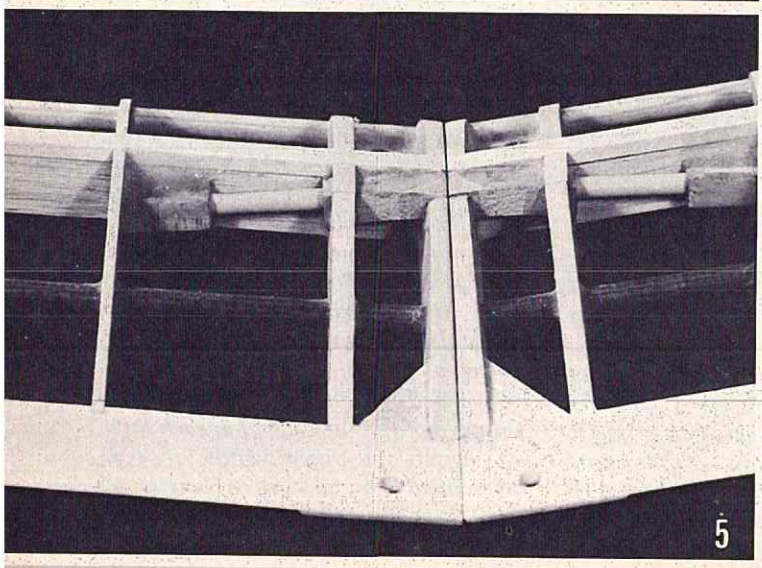
(1) Modifications to Pronto wing include adding a fiberglass arrowshaft pushrod and false ribs. (2) When wing is completed be sure it is balanced. Screw in end rib for ballast. (3) Plug-in blocks for arrowshaft joiner. (4) Arrowshaft wing joiner in place on one panel. (5) Both panels joined together. "Bent" arrowshaft is an optical illusion. Note rear hold-down bolt holes in trailing edge. (6) Blind mounting nuts in 1/8" ply plates in leading edge of wing allows wing front hold-down plate to be secured to wing.

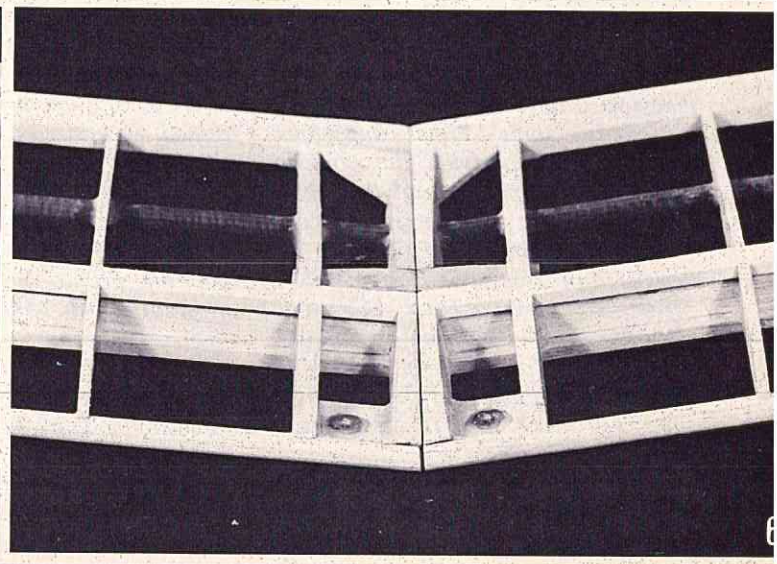


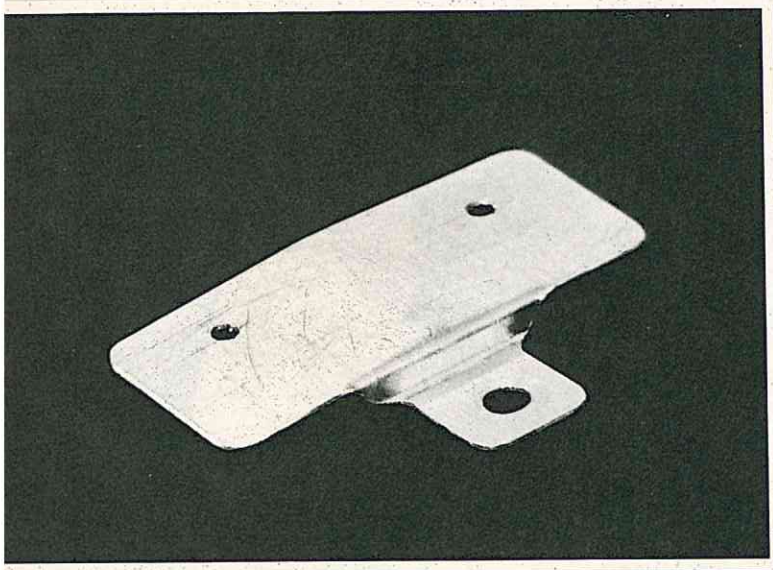


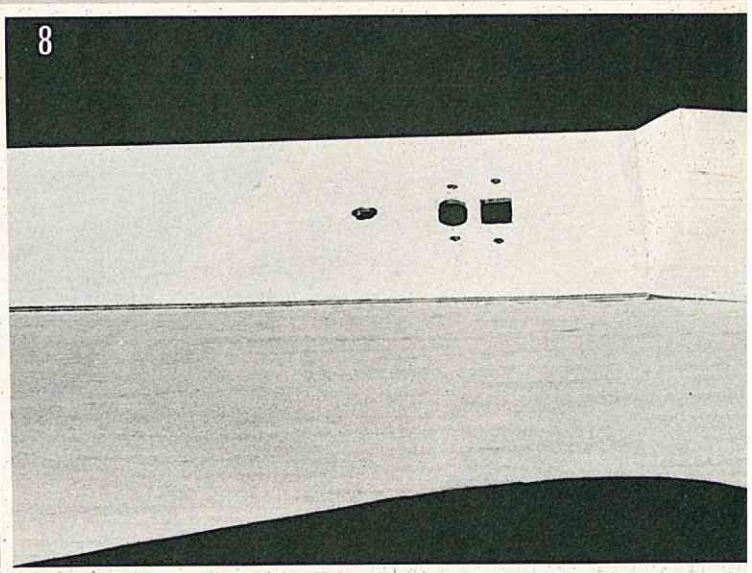



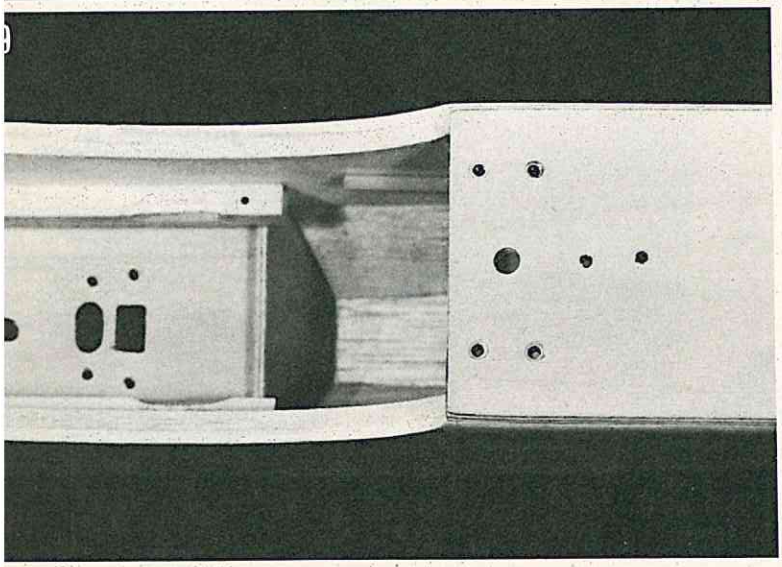


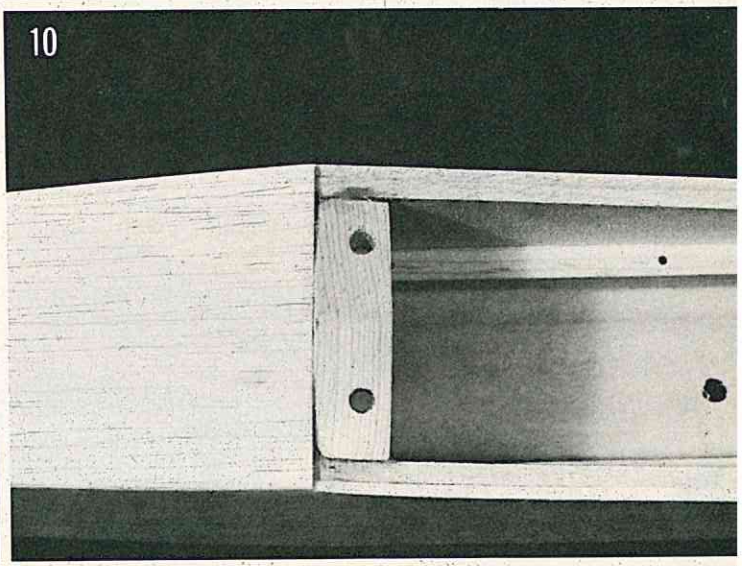



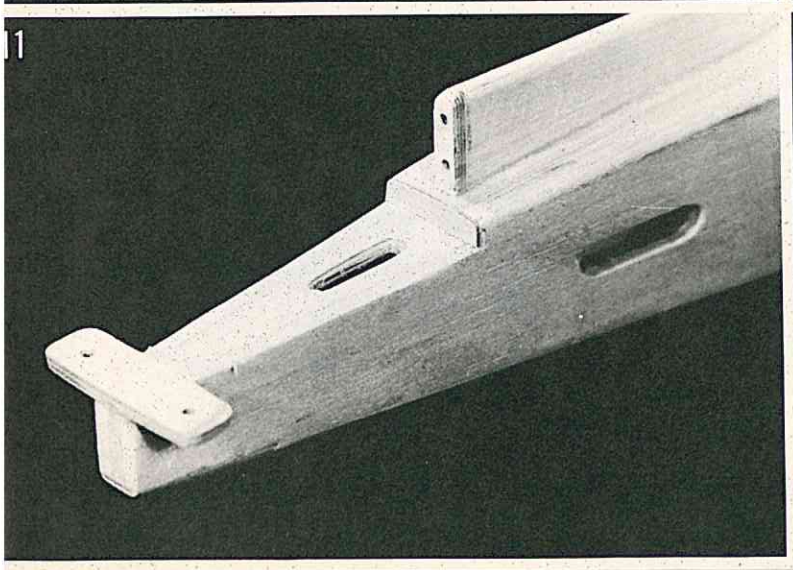
(7) Front wing hold-down plate. This one of aluminum - - - reinforced plastic can also be used. (8) Switch and charging jack holes in cockpit area. Rear hole is to accept protruding end of a small dowel which has been glued into a Williams Brothers pilot for easy mounting. (9) Large hole ahead of wing is tapped to accept nylon mounting screw from aluminum hold-down plate. Smaller holes for landing gear clips. (10) Hardwood block for rear nylon hold-down bolts. (11) Plywood tab with blind mounting nuts for mounting stab. Slot in stab seat is for stab alignment "key." Note ply facing on dorsal, drilled to accept 1/16" diameter wire "pins" in vertical fin. (12) Blind mounting nuts on bottom of plywood stab "tab."

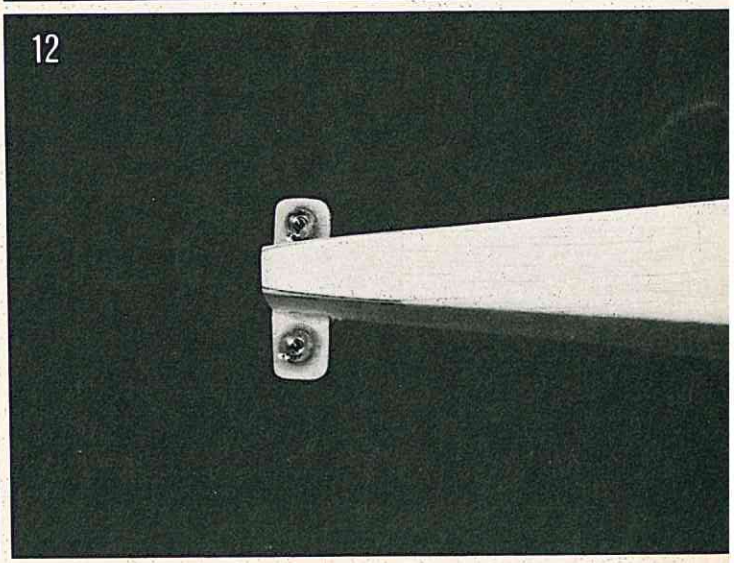




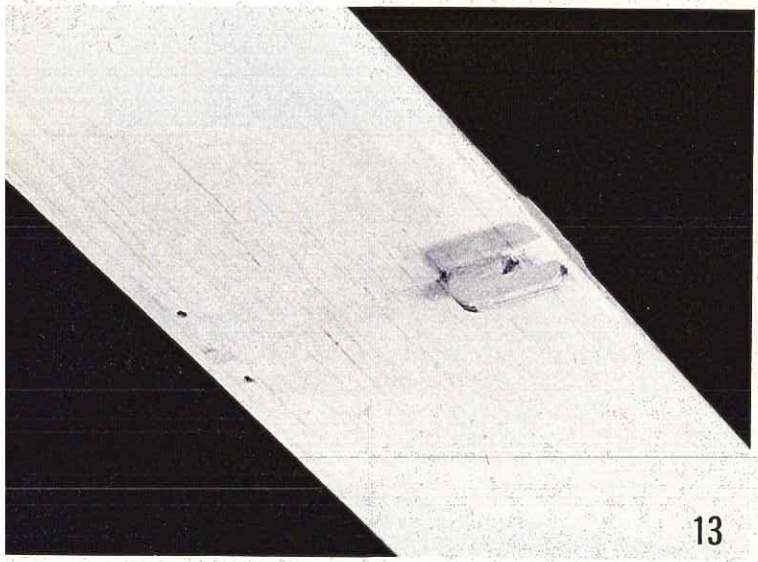







(13) Plywood "key" on bottom of stab. Note hold-down holes at rear of stab. (14) Vertical fin with matching ply mount tabs and 1/16" wire keying pins epoxied in place. (15) Stab and vertical fin sliding into place for trial fit. (16) Note tight fit of stab and vertical fin. Ply tab on vertical matches the ply tab on stab seat. (17) 1/32" ply reinforcing doublers on rudder for mounting control horn and tail wheel bracket. (18) Hi Johnson Model Products Flexiscope 4 ounce tank before assembling.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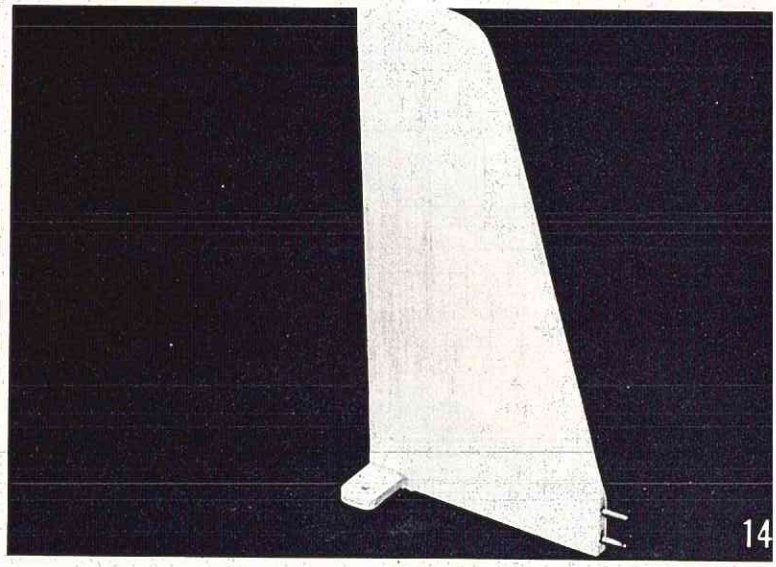
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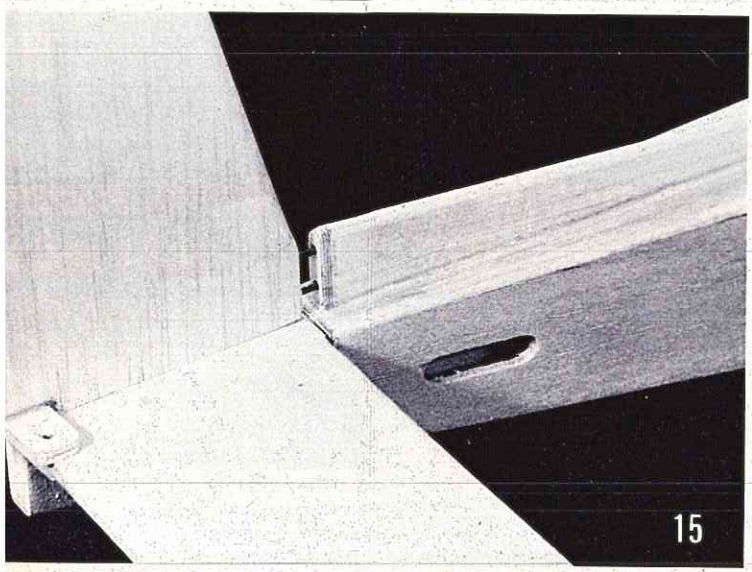
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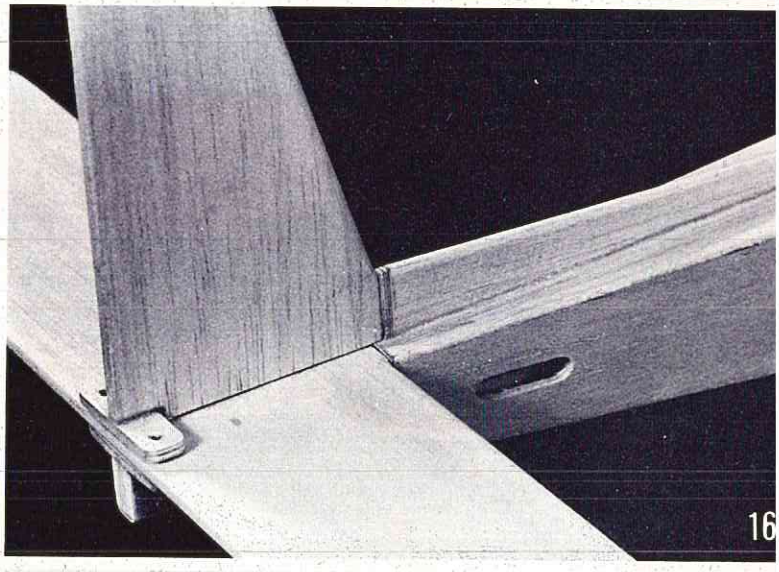
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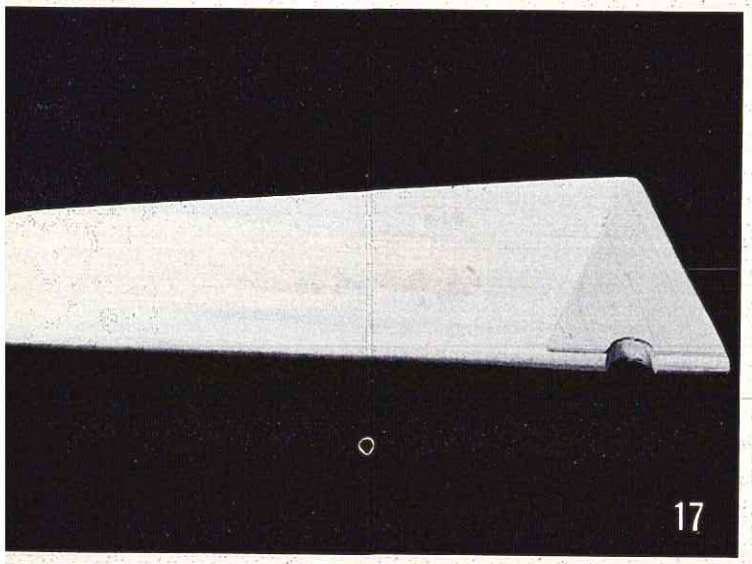
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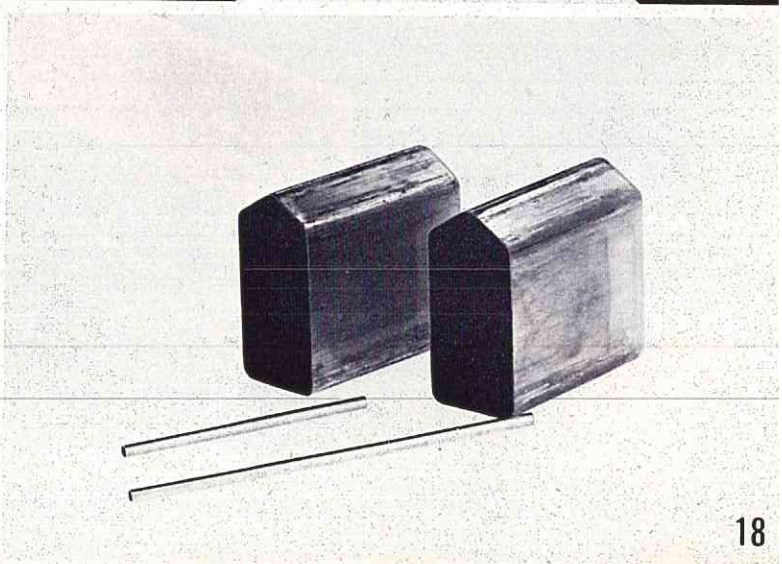
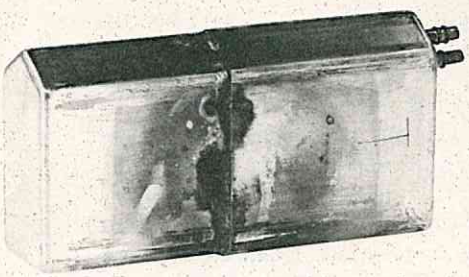
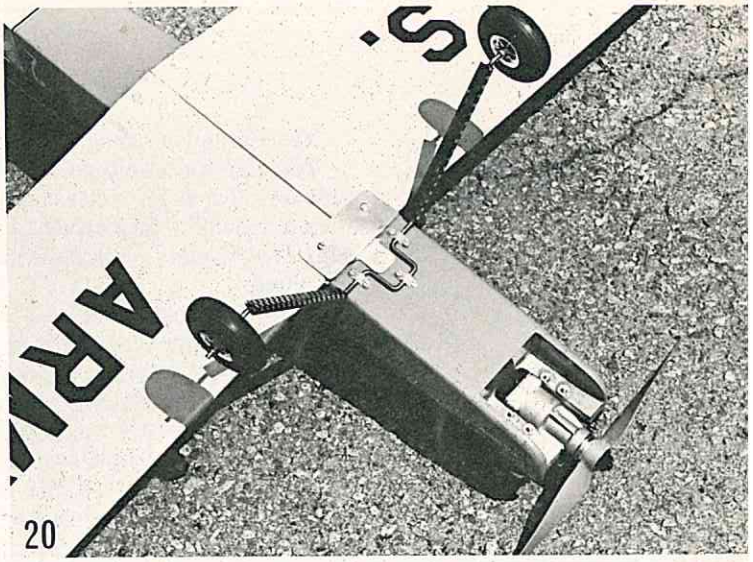

18

(19) Flexiscope tank soldered together. Size allows use of 4 ounce tank in narrow fuel-battery compartments. (20) Wing mounted to fuselage with rear hold-down bolts and front aluminum plate. (21) Stab and fin mounted. Note use of Hi Johnson Rod Ends for precise, no-slop control transfer. (22) Radio installation in RCM prototype is new Kraft three channel "Brick." Note use of Du-Bro Throttle Override and E-Z Connectors on servo arms. (23) Completed Pronto is an excellent aircraft to fly – and one that is now completely portable. (24) Author's corrugated "travel box" contains aircraft, radio and accessories. Principles illustrated in this article can be applied to almost any aircraft.

19





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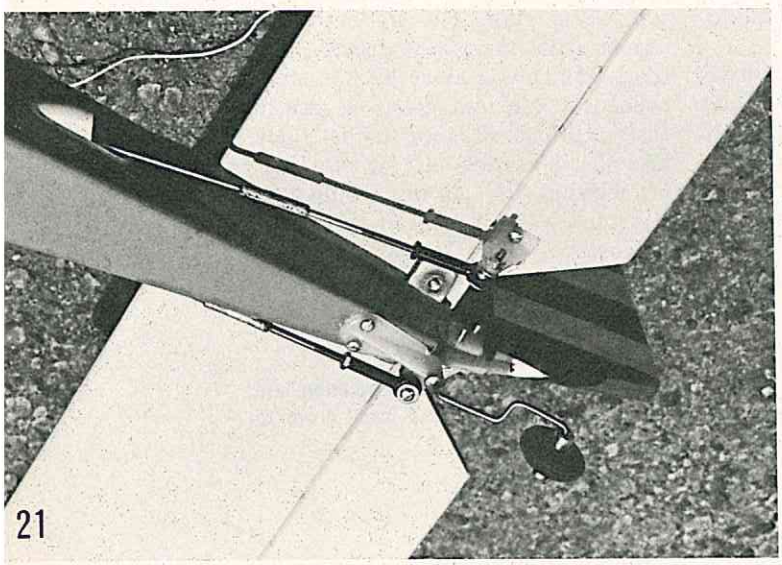

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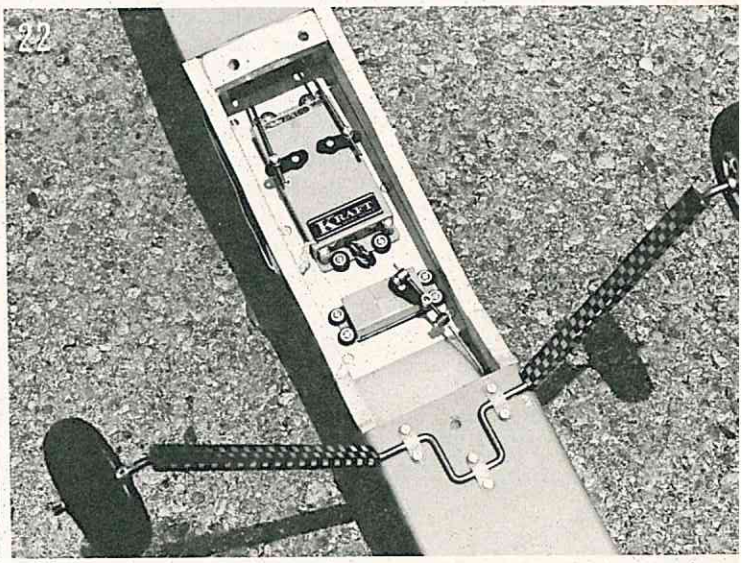

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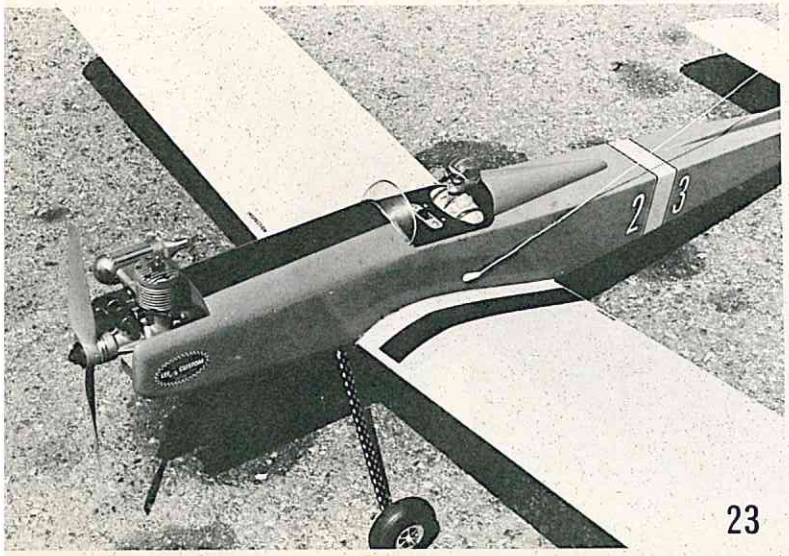

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24

# ANOTHER LOOK AT FORMULA I

## By Dick Tichenor

Yes, Formula I racing is too fast!

Too fast for an old goat with slow reflexes, such as me, for example. But then I wouldn't race even if I was a capable R/C pilot - - - Scale is more to my liking.

Does that make Formula I bad? Should I use my voice to try to kill it, or even restrict it? Why does the event with the smallest percentage of participation within the R/C modeling world have to be the most controversial?

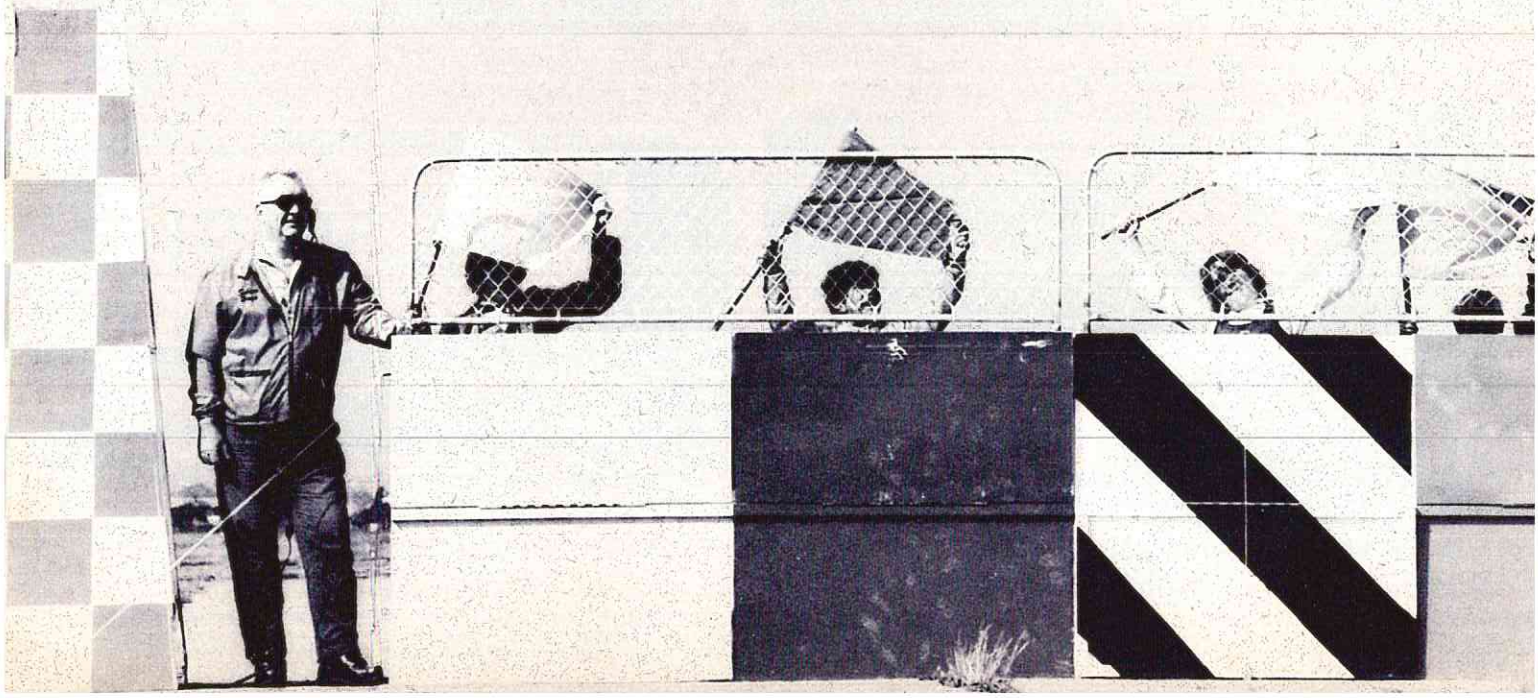
I think I've heard all the accusations such as the danger, the expense, the politics of the favored few, and on and on. Let's look at these danger charges one more time.

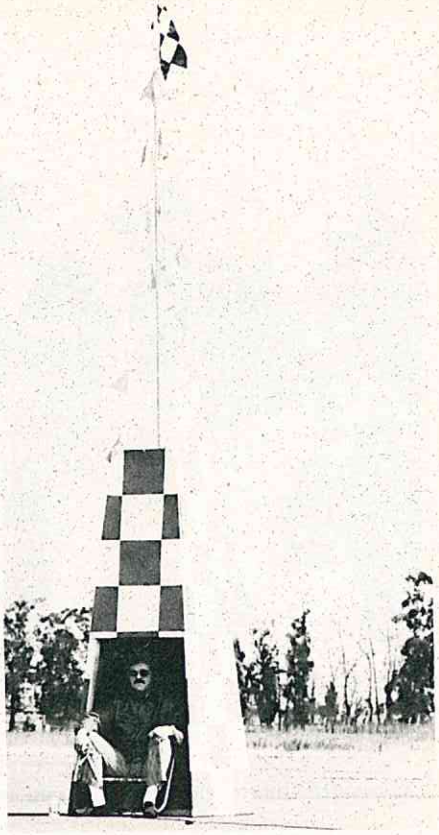
To begin with, there's potential danger in almost everything. You had better buckle up your seat belt and practice defensive driving every time you crank up your automobile or you might not survive that short trip to your local hobby shop.

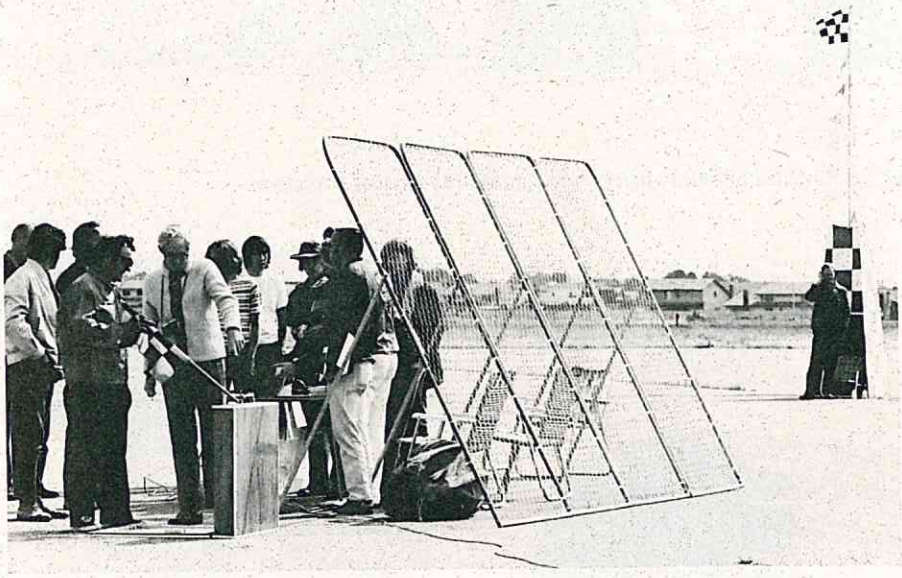
During the past few years of my association with RCM, I have had the pleasure of knowing some of the fastest Formula I pilots in the world and know how much they love racing and how safety conscious they really are. The subject of safety is not just lip service, either, and the accompanying photographs illustrate some of the safety precautions taken by NMPRA District X members to minimize the dangers. Mel Santmyers, 1972 District X Safety Chairman kicked off a vigorous safety campaign last year and has been succeeded in 1973 by Kent Nogy. These gentlemen are not only top racing pilots but are extremely serious about the safety aspects of the sport. Either you abide by the safety code or you're not going to race in District X! In addition to that, they have the full support of the District X membership and all that equipment represents a lot of work to prove their seriousness.

**text to page 93**

**N.M.P.R.A. District X number one pylon set-up has barrier for flagman protection and telephone lines to judges table. Panels and flags are color coded. Striped panel drops to indicate a cut pylon.**







TOP, LEFT: The Contest Director tells about the no-no's at pilot briefing before the races. ABOVE: Number two and three pylons offer the judges protection on three sides. Each equipped with telephone and air horn. LEFT: A barrier protects officials near number two pylon.

Jeff Bertken and Ed Hotelling with their choice of head protection. Another aspect of safety conscious District X Formula I racing is evidenced by the continuing concern for the safety of participants, officials, and spectators.


Lap counters, timers, and communications center are protected by sturdy barrier and approach to number two pylon.

ABOVE: Each District X race imposes safety inspection on all racers. Safety Chairman Kent Nogy shown checking Jack Lee's engine and fuel system installation. TOP, RIGHT: Ear protection is essential for engine checkout on the ground. Sharon Allen holds on to hubby, Ed's, ship with no pain. RIGHT: Not yet mandatory, but the big boys wear them. Bob Smith and Ron Schorn with hard hats.

# Building The Kavan JET RANGER

**BY BERNIE MURPHY**

**PART III: CONCLUSION**

If you own a Kavan Jet Ranger, or are contemplating purchasing one, we think that you will find this conclusion of our Jet Ranger series to be a valuable assistance.

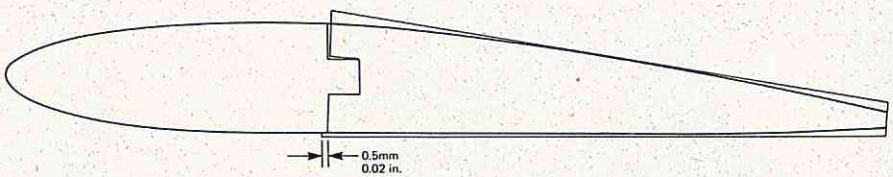
Until now, we have concentrated on the basics of assembly. This month we will give you a few pointers on trimming and adjusting for successful flight. These tips include **modifications** to the kit which will help to insure success.

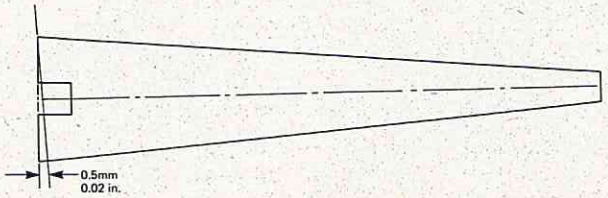
We should point out that the modifications suggested here are a combination of our findings and those of Franz Kavan and his technicians, and have **all** been approved by Kavan. If you own a Kavan Jet Ranger, and have returned your registration card, you will probably have already received notice of these modifications. If you have not returned the card, we urge you to do so, as only in this way can you be kept up to date. If you are just beginning to build your Jet Ranger kit, the following assembly notes should be helpful.

After cutting out the plywood parts, do not paint them until after the transmission box and forward floor sections have been glued together. Even at this point, all surfaces which will be glued to the fuselage should be left unpainted for a better bond. The forward floor plate (8) should not be glued to its sub-framework, until after the transmission housing has been positioned in the fuselage. This allows the floor to be located tightly against the front of the transmission.

Before installing the bearing bracket onto former No. 9, be sure to securely install the two angle brackets

**to page 84**



# RCM-WORLD

## SIX CHANNEL DIGITAL PROPORTIONAL SYSTEM

### PART I: BUILDING THE SERVOS

BY JOHN MALONEY

## INTRODUCTION

The purpose of these articles is to enable you to build your own digital proportional system. This first article in on constructing the servo and to tell you a little bit about how servos are made in one of the largest R/C system manufacturing plants in the United States. No attempt is being made by the author to keep this from sounding like a World Engines commercial. It is impossible to talk about how you are doing something in your factory without talking about your factory. We are also going to discuss why we designed this radio the way we did and the justification for why we think it is a better way to do it. Obviously, other manufacturers design their radios the way they do for equally valid reasons. Quite frankly, it is very difficult for the beginner or layman to know which radio is the best or, let us say, the best buy for the amount of money he has to spend. Frankly, I really appreciate Don Dewey giving me this opportunity to get my nickel's worth in as to why we, at World Engines, are proud of this system. In doing this, we think you will be better able to evaluate our system regardless of whether you build a kit or purchase an assembled unit. In addition, it is our hope you will become more familiar with some of the so-called "mysteries" of the digital proportional system and will have some insight as to how and why your system works and some of the problems encountered by all manufacturers in producing RC systems. In addition, in this first article we intend to give you some of the behind-the-scene pictures of the tooling that we generate to make this servo.

If you read RCM regularly, you will know that, from time to time, Don Dewey likes to come up with a gag cover. Last month Don utilized a cover shot of three lovely young ladies who work at World Engines. Their function, here, is to re-wire kits and semi-kits that are improperly assembled in the field. If you decide to build the RCM World System and it does not work, it is very possible that one of these girls will re-wire your system. They are Jane Knueven, Toni Wurtzler and Mary Jo Adkins. These girls work as assistants to technicians who actually tune the equipment to make sure everything is working satisfactorily.

Since, as you are reading this article, you are probably trying to decide whether or not you would like to build this system. We would hesitate to tell you whether you should buy a factory assembled radio or a kit system. If you are a beginner and you do not know anything about radio control, I could easily tell you that you should get a factory assembled radio. There are a lot of people in the hobby, however, who like to put together kits. Some of these people have put together almost every kit that has appeared recently in magazines or from professional kit builders like Heathkit.

This series of articles are not being written for the rank beginner. In fact, they do require some fundamental electronic knowledge on the part of the builder as well as the techniques of good craftsmanship. This is a 72 mHz system and must be tuned by a properly licensed technician or it can be returned to World Engines for tuning when you have it completed. A good signal generator and oscilloscope are required to tune this radio to get the most out of the system from the standpoint of good range and "glitch-free" operation.

## A FEW FACTS ABOUT THE WORLD ENGINES S-9 SERVO

The servo designed for use with the RCM-World Proportional System is a brand new servo for which the molds were finished in May 1973. The S-9 has the same mounting dimensions as the D & R Bantam servo. The gear reduction in the S-9 is 164:1 – about the same as the D & R Bantam. This servo has a very rugged wall construction and it dovetails into the center section which strengthens the side of the servo. We are currently using Delrin plastic in the 64 pitch gear train.

You may wonder how plastic gear cavities are made in the molding machines. There is a man on the West Coast named Denton Stockton, 9006 Yvonne, Bakersfield, California 93307, who makes the gear cavities for many of the West Coast radio manufacturers. According to him, he uses a shaper with which to shape the teeth. In fact, Stockton makes his own shaper cutter. At World Engines we do exactly the same thing although we generate the gear tooth cutters a little bit differently than the method employed by Stockton. Since there are other ways to make gear cavities, one of these is to make a male model and cast Beryllium copper against it. When the Beryllium is pulled off it is set into the mold. Still another way is to grow a chrome female against a male brass

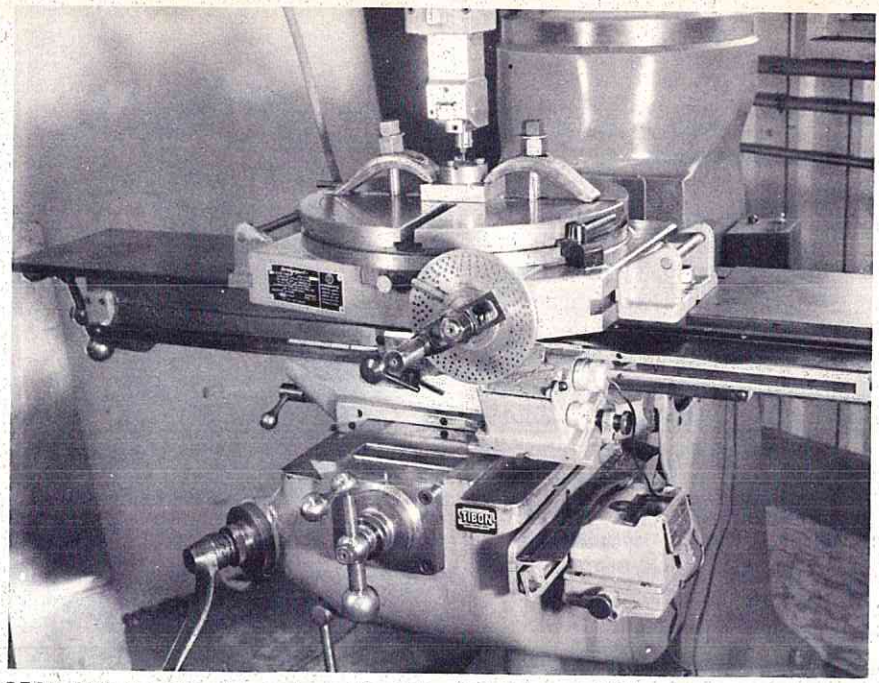
John Maloney, the author of this series of articles on the RCM-World Proportional System, is President of World Engines, Inc., one of the R/C industries largest manufacturers of proportional control systems and importer and distributor of the famous OS Max and Super Tigre engines. John was born in El Paso, Texas, in 1923, and operated a small retail hobby business at the age of 13.

Maloney was trained as a Mechanical Engineer at Purdue University and spent 12 years in the design and sale of automated resistance welding equipment during the years from 1947 to 1960. During 1948-1949 John, once again, operated a part-time retail operation and started a mail order business in 1952. World Engines was started as a spare time operation in 1954.

Maloney's first exposure to radio control was with an OS tube type single channel system which he imported in 1955. In attempting to provide service for the OS radio, John met the late Jack Port and went into business with Jack in 1957, absorbing Controlaire into World Engines in 1962. At that time they manufactured single channel escapement type systems at World Engines in Cincinnati as well as Galloping Ghosts, reed systems, single channel analog proportional systems, and multi channel digital systems.

During those years World Engines offered some of their original receivers in kit form as well as some complete reed equipment that was designed to be assembled by the modeler. Their first experience with a complete proportional kit was when World Engines acted as the agent to kit RCM's Digitrio system – the first complete digital proportional system ever to be published by a model magazine. Several thousand of these famous radio, designed by Ed Thompson, were built by RC'ers throughout the world. Many are still flying today. Since that time, World Engines has offered a kit on the MAN System and on the Blue Max System which appeared in Model Airplane News about two years ago.

RCM is proud to mark its tenth anniversary by presenting this series of articles on the RCM-World Proportional System which is authored by John Maloney and whose company, World Engines, Inc., will have kits available for the scratch-builder concurrent with this series of articles. ---- Don Dewey



**GEAR MOLD – This picture shows the table of a Bridgeport Milling Machine with shaper attachment. Note the dividing head. This is the arrangement that is made to shape a gear mold cavity.**

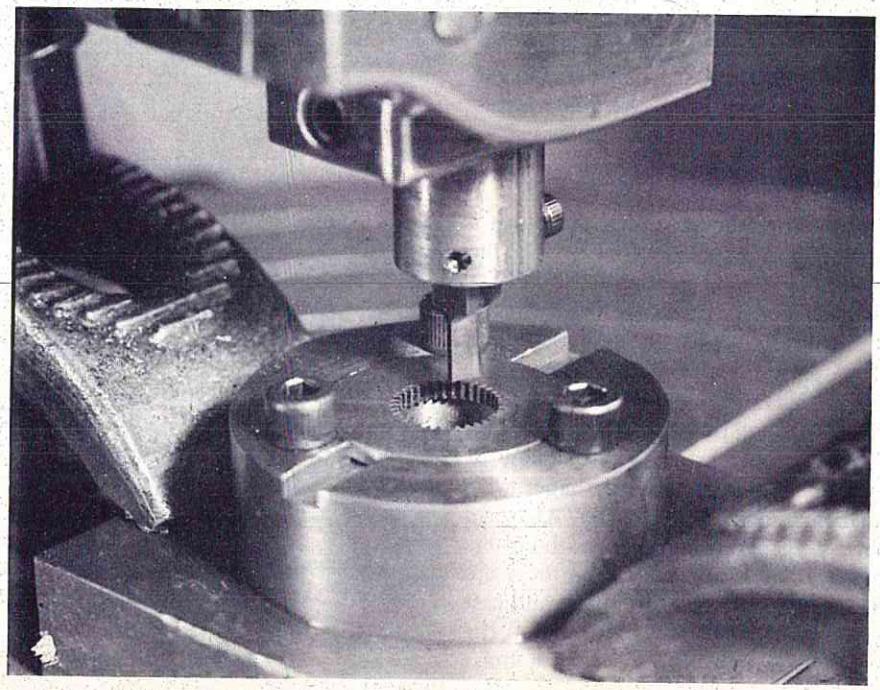
model and to eliminate the brass with acid. It could take 3 or 4 months by electrolysis to grow the chrome against such a model. These brass models are made on a gear hob. When Herb Abrams made the Rand actuators some years ago, he used the Beryllium casting system to generate his gear teeth with excellent results. The photographs accompanying this article show the table of a Bridgeport Milling Machine with shaper attachment and dividing head – the arrangement that is made to shape a gear mold cavity. The latter is also shown in the photograph illustrating the tooth cutter and the gear mold in position on the dividing head.

### THE SERVO CASE

Someone in our industry came up with an idea to use inserts to make servo case molds. These inserts are divided in such a way that they can be stacked together like a deck of cards and ground all at the same time. The important point is that they can be **polished** all at the same time. A great deal of time is spent in polishing servo case molds and this can be substantially reduced by gang polishing which greatly eases the manufacture of such molds. Some manufacturers of servo cases use aluminum molds but, at World Engines, we use tool steel because we think it provides a better life and is somewhat more maintenance free.

There are a few things we also want to tell you about printed circuit board manufacturing and some of the sheet metal work that we do here in our plant. Comments on these processes will be covered in later installments with the receiver and transmitter articles.

**GEAR MOLD CAVITY – This is a close-up of the tooth cutter and the gear mold in position on the dividing head.**



### THE I.C.

The basic concept for the WE-3141 integrated circuit design was originally breadboarded by Jim Lanterman, Vice President of World Engines. This I.C. was tooled for us by Signetics, a company well known for their work in linear amplifiers. This also makes Signetics a good source for the digital linear servo amplifier I.C. The unique features about the WE-3141 I.C. is that it is not voltage sensitive; uses only two wires to the pot; and has all four bridge power transistors inside the device. In other words, it is totally self-contained except for timing and pulse stretching components. The external elements in the amplifier were purposely left out of the I.C. so that variation in motor impedence, gear speeds, etc., can be compensated for. Also, our I.C. is in a high heat dissipation metal can and can tolerate very high temperatures. Original tests on I.C.'s were run at 100% overload at 200 degree Centrigrade for eight hours at Signetics. At one time or another we have supplied Royal, Cannon, Ace, RS Systems, Citizen-Ship, Brand (Germany), Multi Plex (Germany), and Springbrook (England), plus other smaller firms with this I.C. In fact, over 100,000 of these I.C.'s have already gone into servos.

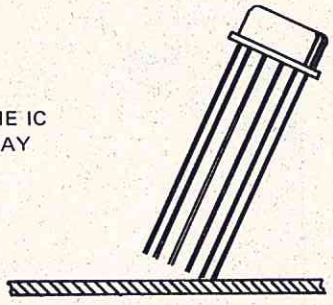
### DO PRODUCTION QUANTITIES MEAN ANYTHING TO THE KIT BUILDER?

There have been a great number of articles on do-it-yourself kit type R/C projects in the various model maga-

## BEGIN

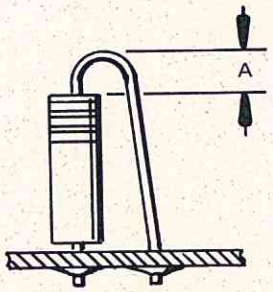
[ ] Note 1. Install IC, Part No. WE3141. The sketch shows the recommended procedure for getting one lead started and then progressively the balance of the leads into the holes. Press the IC down gently until it is in contact with the board. After you have pressed the IC down, recheck the tab to see that it is in the right position. Solder the IC and clip the leads.

START THE IC
IN THIS WAY

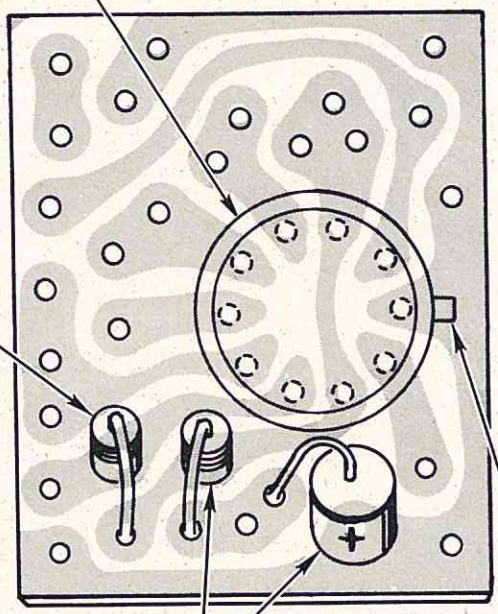


ALL RESISTORS ARE 1/4 WATT

[ ] 33K (orange, orange, orange)



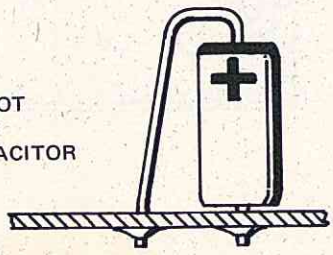

Dimension "A" about .050" – Bend wire over by hand – no pliers.



[ ] 4.7K (yellow, violet, red)

[ ] 15 mfd 15v. Tantalum + end up (red end is plus; also marked +).

LEAD SHOULD NOT
TOUCH BODY OF
TANTALUM CAPACITOR



POSITION OF ORIENTATION TAB

[ ] .22 mfd blue capacitor

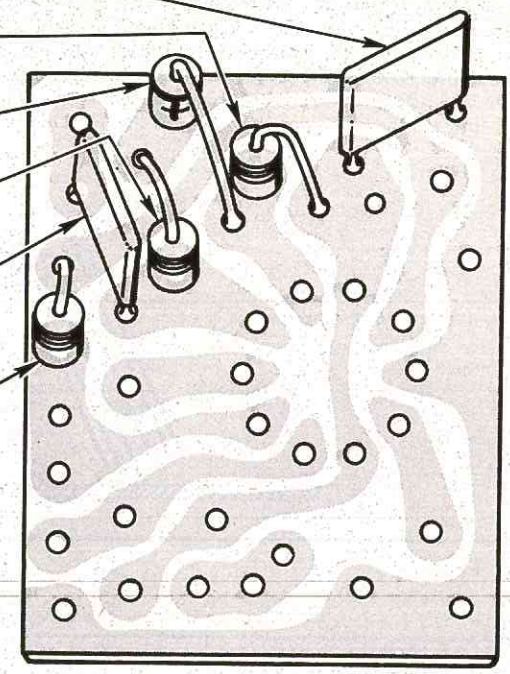
[ ] 33K (orange, orange, orange)

[ ] 4.7 mfd tantalum cap. plus end up

[ ] 100K (brown, black, yellow)

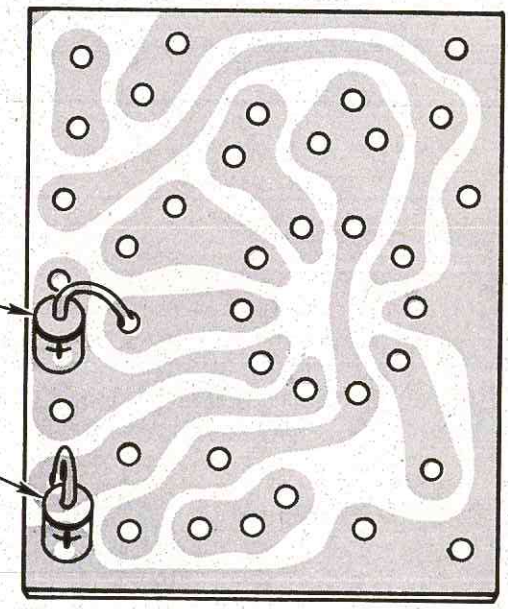
[ ] .22 Disc capacitor blue

[ ] 100K (brown, black, yellow)

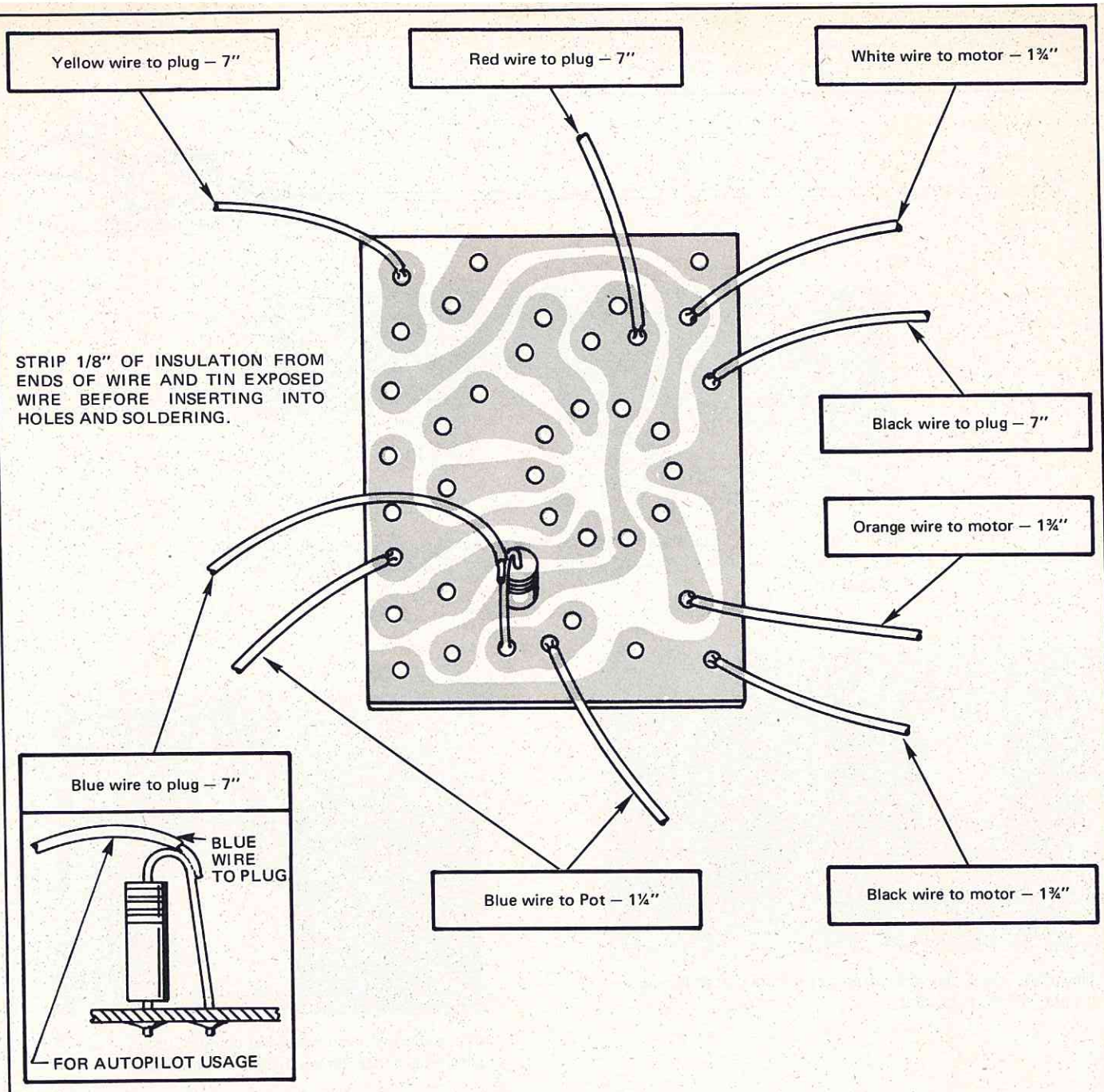


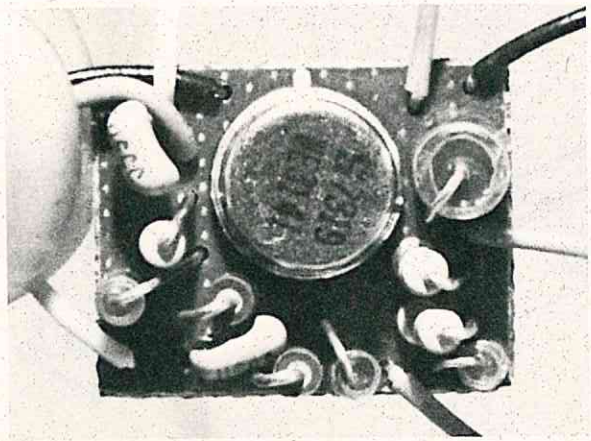
[ ] .56 mfd tantalum cap. plus end up

[ ] 4.7 mfd tantalum cap. plus end up

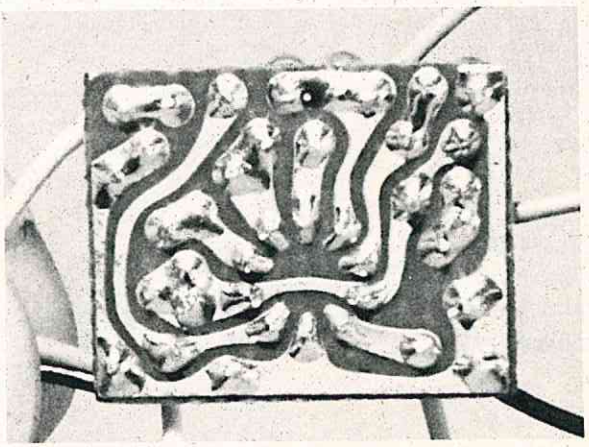


**This finishes the board for components. See next page for wiring location and color.**



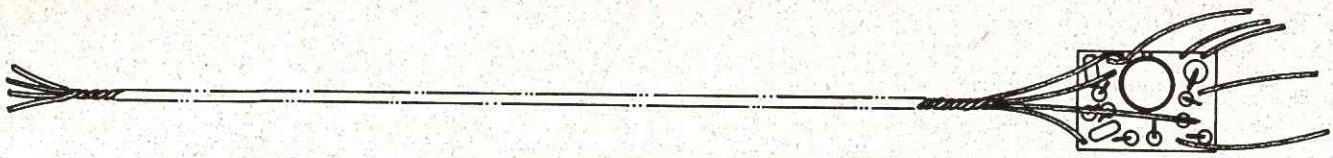



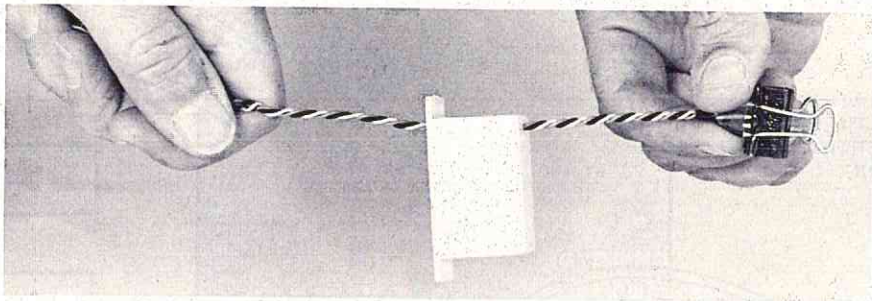
**Top view of S-9 servo amplifier board.**



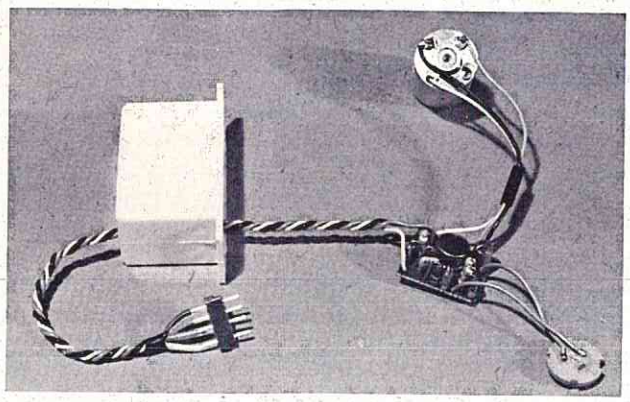
**This photo shows the copper side of the board. Also, note the amount of solder deposited where the various parts are retained to the board.**

[ ] Gather these wires together and twist into a braided wire rope. You can use a hand drill and hook. See photo.

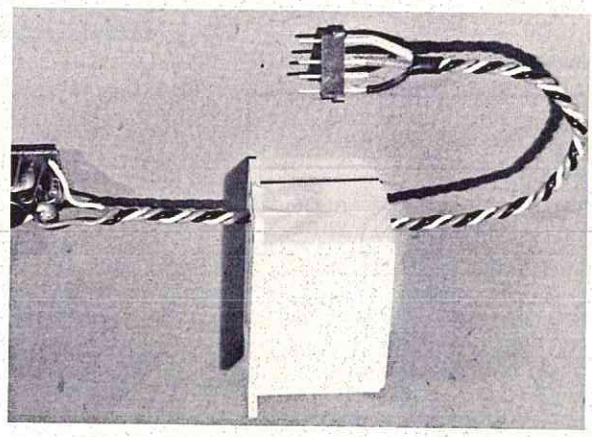




**This photo shows the twisting of the wires from the board to the connector. The paper clip on the right is soldered to a shaft which is held in a hand drill. This step can be done manually.**

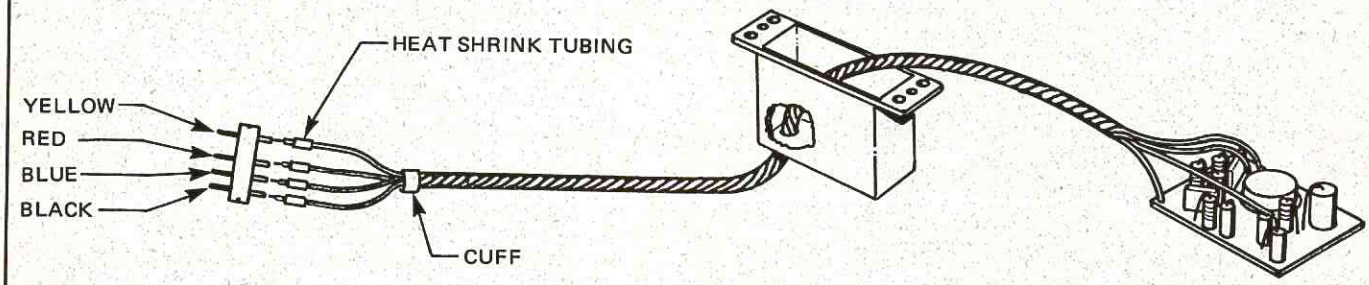


**This photo shows the wiring from the servo board to the motor, the pot, and the connector.**

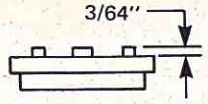


**The servo case bottom must be threaded onto the wire rope before the connector is soldered to the wires.**

[ ] Pass cable through servo bottom. Then, pass cuff and heat shrink tubing over wires. Strip tin and solder wires to male plug. Run tubing over soldered connections for insulation and shrink in place over small flame.

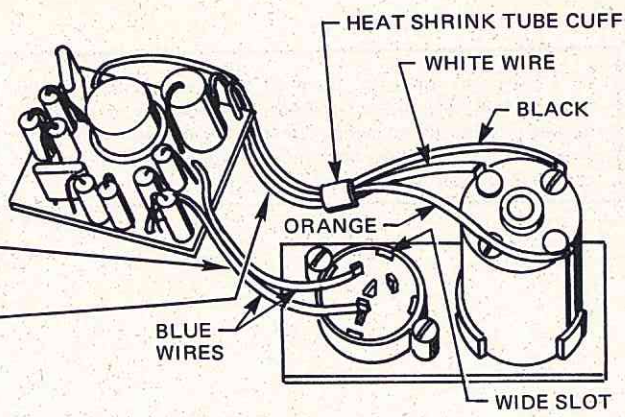


[ ] Cut Pot Lugs

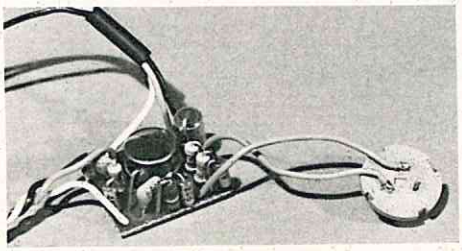



[ ] Strip and tin the 2 blue wires from the board and solder to the pot. Position the connection with respect to wide slot.

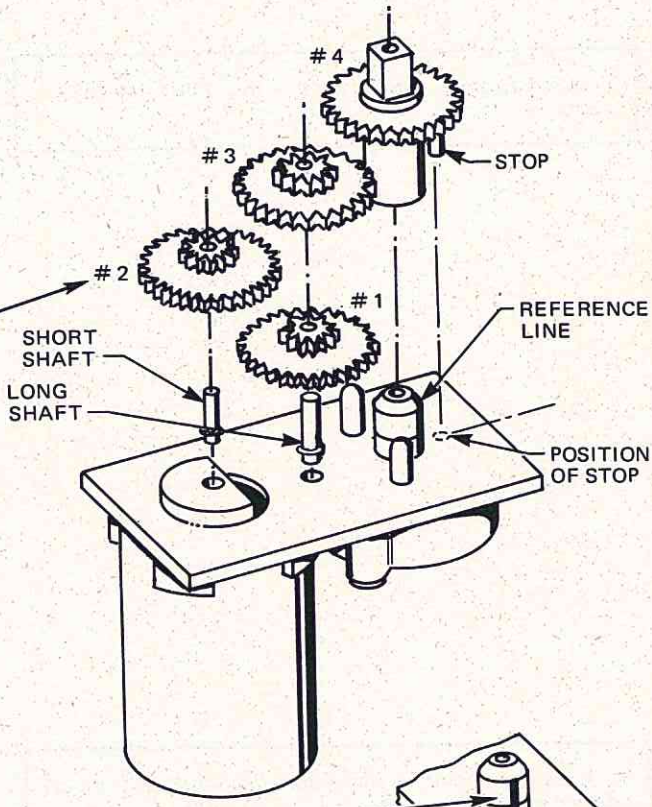
[ ] Pass the heat shrink tubing cuff over the motor wires black, white, and orange and solder these to the motor as follows:
The black goes to ground. This is the solder tab that is under a screw head. The orange wire goes to the staked terminal marked with red dye. The white wire goes to the other staked lug.



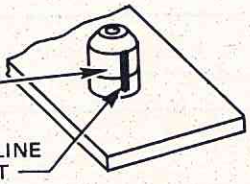

**Wiring to the motor. Notice that the black wire is connected to the motor, to the solder terminal which is held down by one of the motor screws. This is the ground wire. The orange wire is the lower wire in the photo and the white wire is the top wire in the photo.**

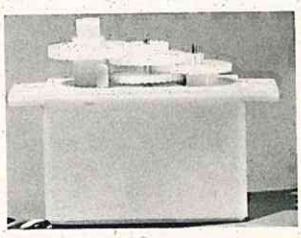


**This photo shows the wiring from the board to the pot element.**



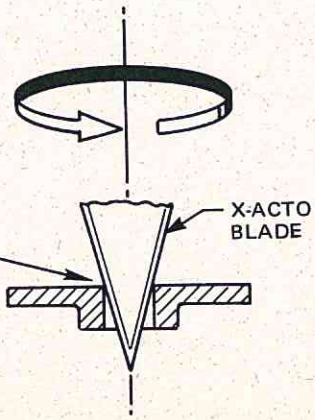

[ ] Carefully remove gears from tree. Trim off sprue entry point. Note number tags. Assemble as shown. Note there is a reference line or paint dot on the brass bushing and the plastic post. Make sure these are lined up when you press on the No. 4 gear. This lines the brush up with the stop pin.



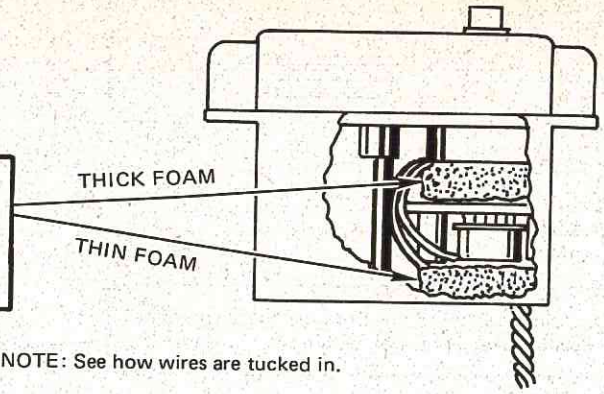



**Gear train and idler shafts in place before cover is added to assembly.**

[ ] It may be necessary to deburr gear pin hole. Light pressure — do not remove too much.

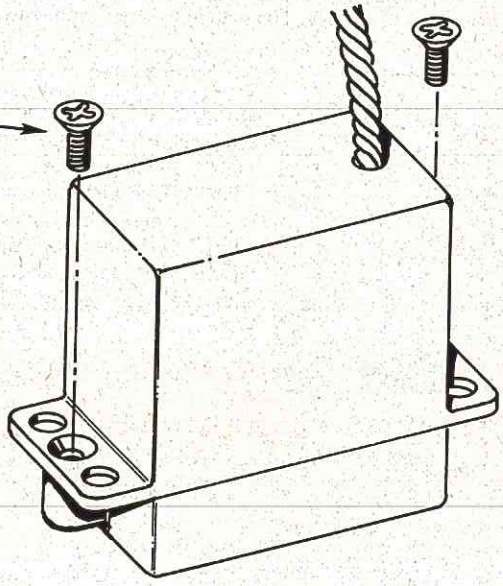


[ ] Stick one piece of foam to bottom of case and the other to the back side of the pot. The board is sandwiched between these foam layers. When inserting assembly into servo case, do not allow lead on capacitor C2 to be bent over so that it touches the lead on resistor R4.

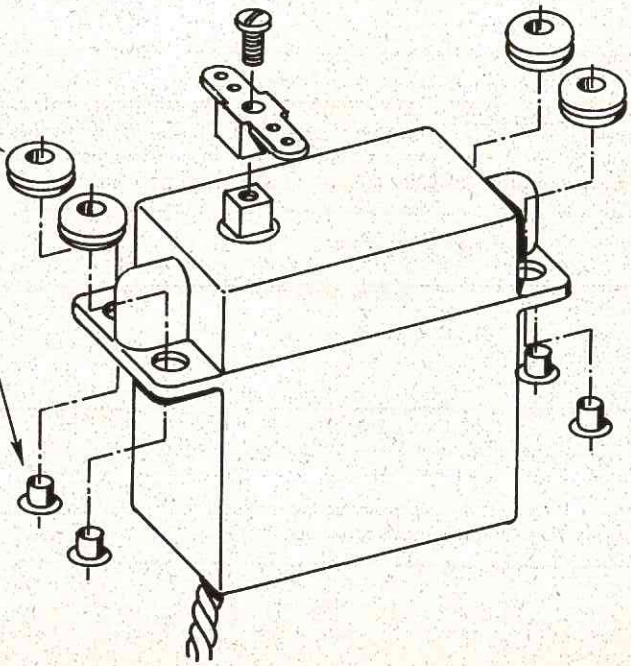


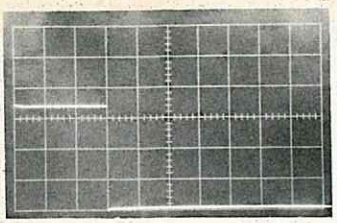

NOTE: See how wires are tucked in.

[ ] Servo case is assembled with two 2-56 x 1/4 Phillips screws.

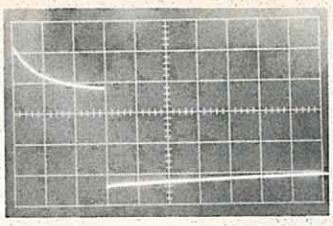


[ ] Assemble grommets and eyelets as shown. Select output arm and assemble as shown.

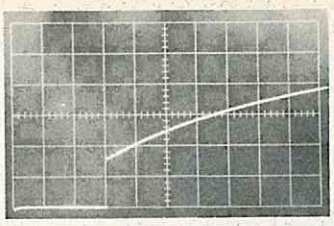




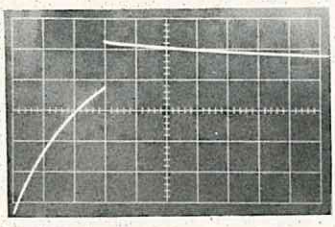
A
Input pulse from decoder.



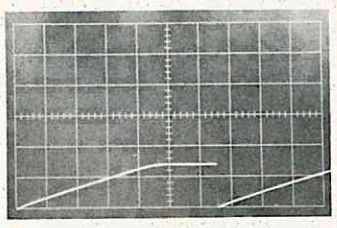
B
Input to WE3141



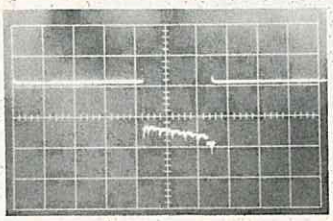
C
Wave form out of one shot multivibrator at terminal "C".



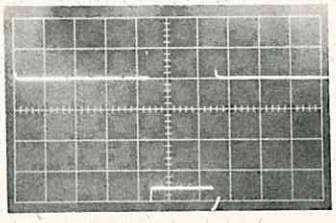
D
Wave form out of one shot multivibrator at terminal "D".



E & F
Output of the pulse stretchers with the motor removed from the servo and motor free running.



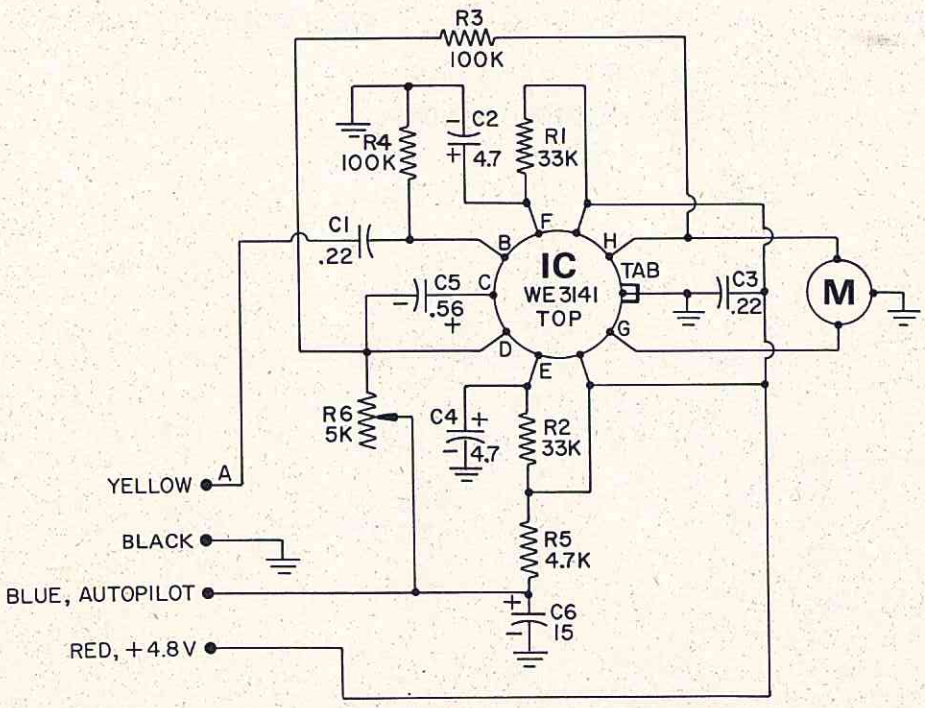
G & H
Input from IC to motor — motor running.



G & H
Input from IC to motor — motor stalled.

Scope settings used for photographs A thru H.
Scope used to get these pictures Tektronics No. 454.
All measurements were made from negative 4.8 volts.

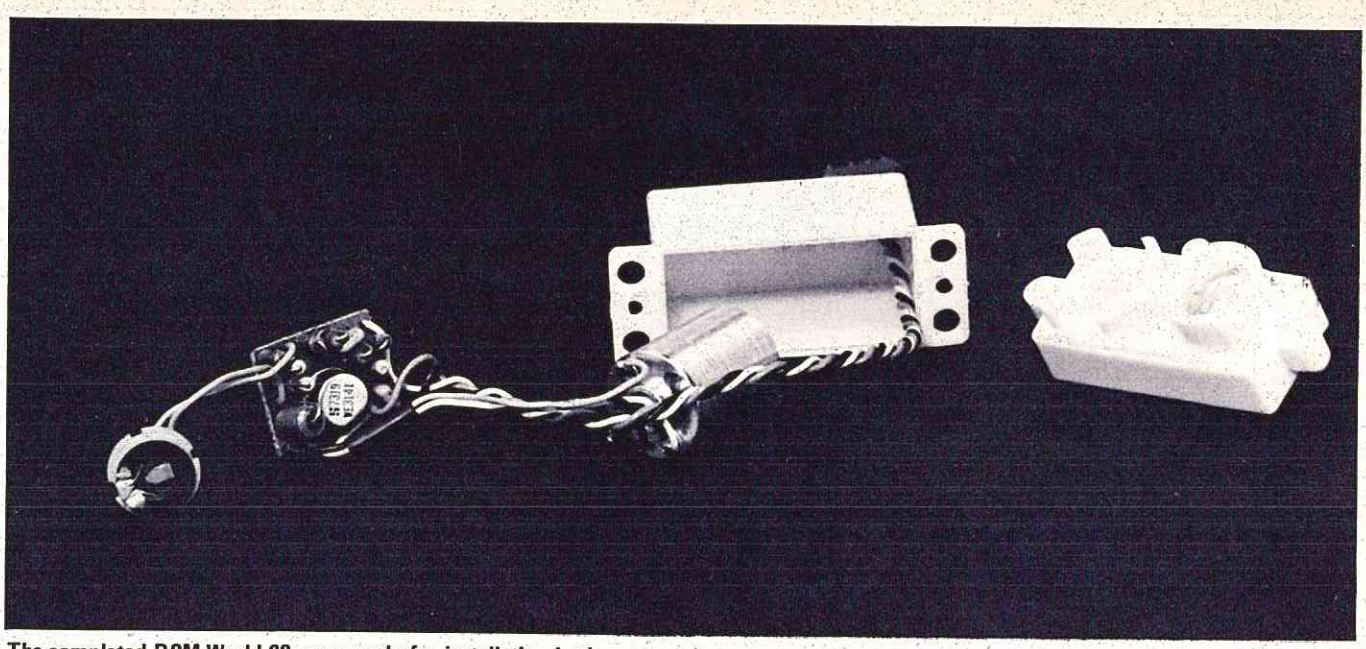
| | VERTICAL | HORIZONTAL | NOTES |
|---|---|---|---|
| A B C D | 1 volt per div | .5 ms per div | |
| E F | .5 volt per div | 5 ms per div | Motor removed |
| G H | 1 volt per div | 5 ms per div | |




**World Engines S-9 Servo**

**All capacitors in mfd's**
**All resistors in ohms**

| | | | |
|---|---|---|---|
| R1 | 33K | C1 | .22 |
| R2 | 33K | C2 | 4.7 |
| R3 | 100K | C3 | .22 |
| R4 | 100K | C4 | 4.7 |
| R5 | 4.7K | C5 | .56 |
| R6 | 5K | C6 | 15 |



**The completed RCM-World S9 servo ready for installation in the case.**

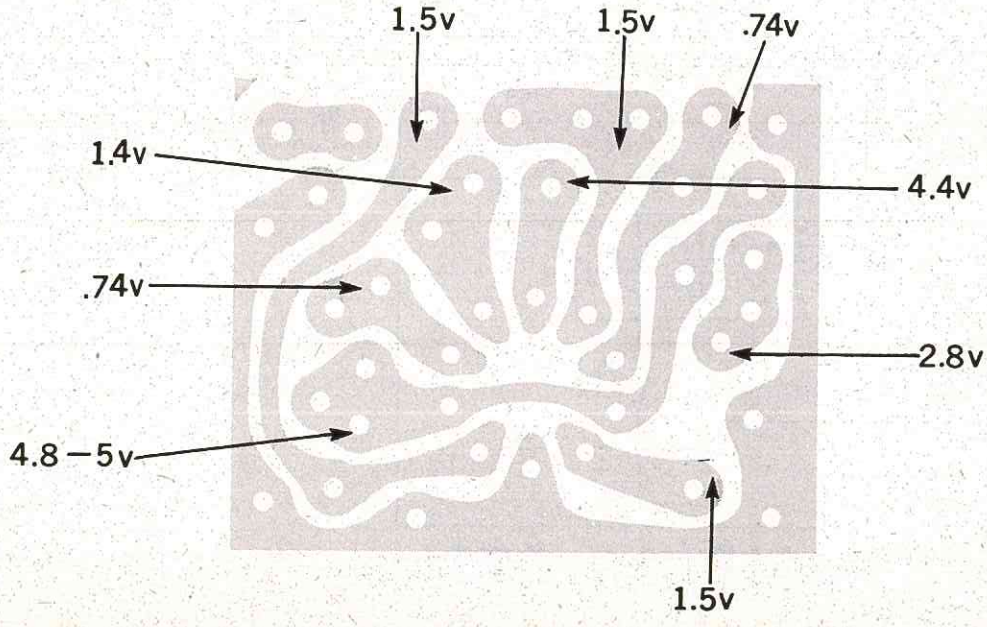
zines. As we mentioned before, we are responsible for some of them. We would like to point out, however, that when we get ready to put a system into production we have air tested many more than one or two systems. Actually, a radio manufacturer gets a certain yield out of his production in the same way an integrated circuit manufacturer does. When you are producing about 1,000 systems a month, or more, the weak points in your system, from a production standpoint, become very obvious and there is considerable pain and attention given to correcting these things so that they will go together with the maximum ease. The things that independent contributors do for magazines are interesting and often enlightening, and we are not knocking these efforts, but we are pointing out that we are offering something that has had a substantial amount of thought given to its produceability, whether it be by the kit builder or by our own assembly people.

## COMPLETION OF THE SERVO P.C. BOARD

After all the parts and wires are soldered onto the printed circuit board, the board should be inspected very carefully for bridging between printed circuit board islands on the copper side of the board. A magnifying glass or eye magnifier is helpful in looking for these situations. On the component side of the board near the yellow wire terminal there is a 4.7 tantalum and a 100K resistor. It may pay to check and see that the leads from these components are not touching. This is the only situation on the board that might produce any trouble of this kind. Incidentally, if these two leads touch, your servo would be inoperative in one direction and would not blow out the I.C.

**NEXT MONTH: TX ELECTRONICS**

**ALL VOLTAGES MEASURED FROM (–) 4.8v. WITH INPUT FROM DECODER**



**A Half-A Twin Fighter-Bomber With Retracts. For Two-Channel Systems.**

# JU-88

BY JERRY L. HOLCOMB

photos by mark freeman

This VSOS (very Stand-Off Scale) JU-88 Fighter bomber was designed around the Kraft 2 channel brick and two TD .049's. The starboard engine is modified for left hand rotation by installing Cox part No. 1715 LH crankshaft. With the gear up and both TD's leaned out, thrust about equals weight (32 ounces) and the ship simply flies out of your hand on launch. With the gear down, ROG's are over so fast nothing can go wrong. Just hold a little up elevator until the model breaks ground (a matter of two or three feet!), and then climb out as steep as you want.

With both fans turning, the model displays no vices except for a slight fish-tailing at high speeds. Addition of the non-scale dorsal fin shown on the plans will cure this though. Under **no** circumstances should the outboard side thrust be deleted unless you have a positive (and quick) method of killing both engines. If an engine should quit below the single-engine Vmc (Velocity minimum control) the ship can snap roll so quickly it's frightening – should this happen at low altitude there will just not be enough room to regain speed before the ground rises to smite thee! However, all is not bad. The outboard side-thrust coupled with counter-rotating props eliminates having a torque-critical engine and you will be able to fly out of most engine-out situations if you just remember to go easy on the up elevator until you are above Vmc. Incidentally, you will recognize Vmc right off – the rudder can no longer over power the ship's tendency to turn into the dead engine!

In practice, unless one quits from a bad setting or from dirt in the needle valve, there is no good reason to fly the ship on just one engine. Set up the fuel vents on both tanks so that inverting the ship will kill the engines. Now, after about 5 minutes of flying, simply do a half loop or roll to inverted, wait until the engines stop, tap in enough additional down elevator to put the gear down, and then split-S out to glide in for a beautiful landing.

## CONSTRUCTION

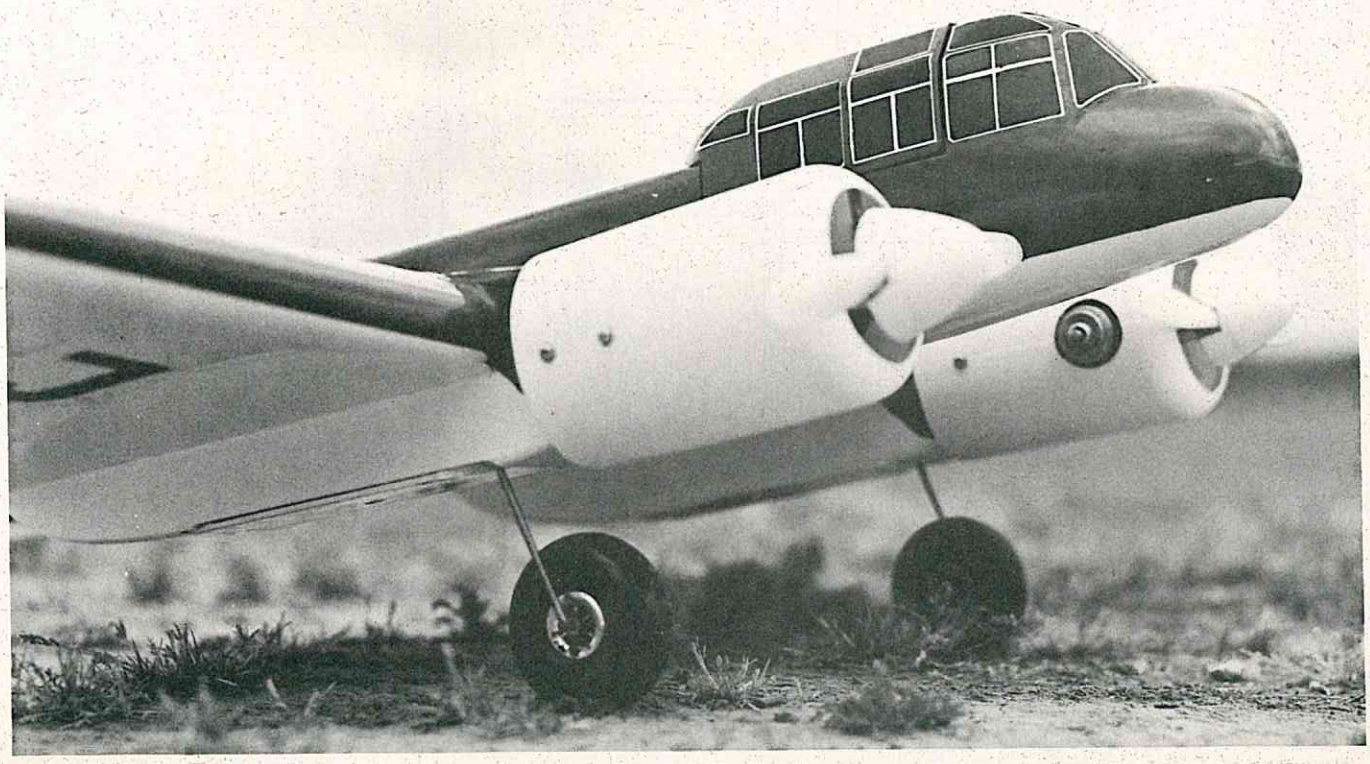
### LANDING GEAR:

Begin assembly of the retractable landing gear unit by cutting to size the necessary hardwood blocks. I used maple motor mount stock. Making the torsion blocks in one long piece and cutting out the middle after the other blocks are epoxied to them will help ensure that both halves are aligned. Be sure to drill the two axle bearer holes in the ½" x 1-3/16" blocks before epoxying – again to ensure alignment. Now carefully bend the 3/32" O.D. steel landing gear legs to the pattern shown. Baking the bent legs in an oven at about 250 degrees F. for 30 minutes or so will help relieve any bending stresses. Now very carefully bend up the two 1/16" O.D. brass brazing rod yokes. There should be a smooth bind-free fit between the 3/32" O.D. steel slider-pin and the yokes. It will probably take several tries to get a matching set. Work slowly. Use some soft copper wire to bind both yokes to the middle of the landing gear legs. Allow enough space between the

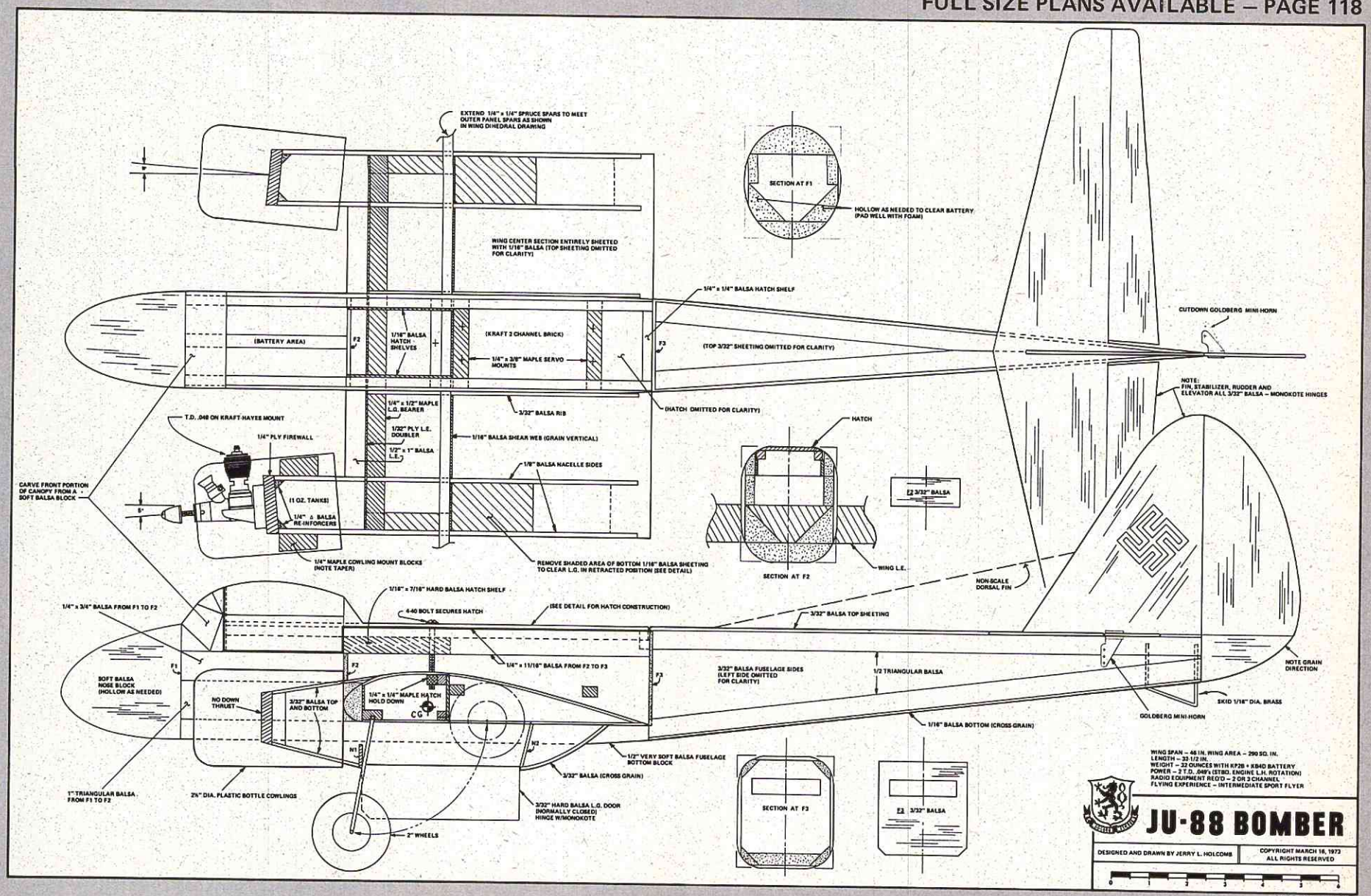
text to page 77

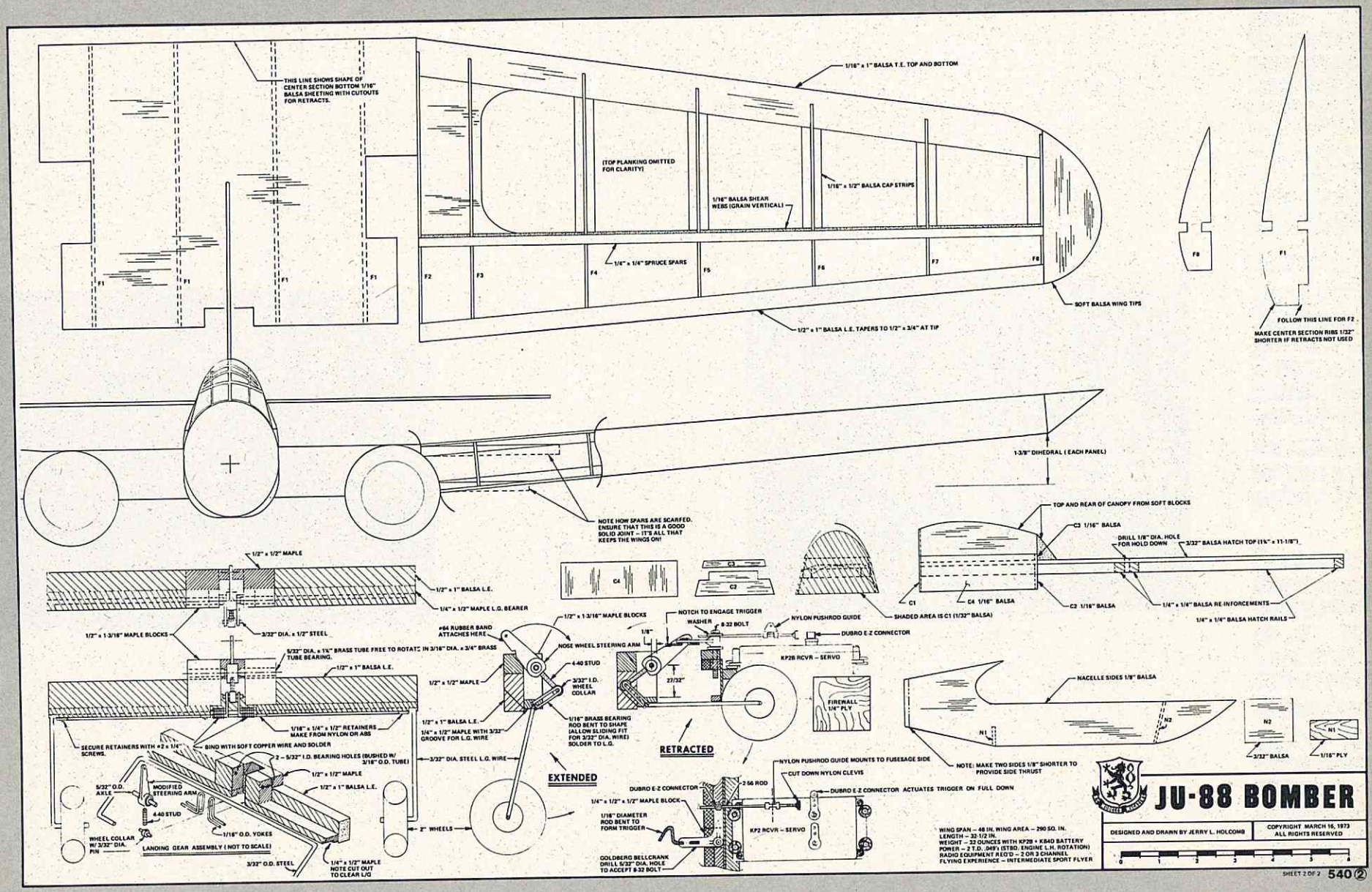

Internal view of Kraft two-channel "brick" operating rudder and elevator as well as retract gear mechanism.

**The author displays his JU-88 with wheels retracted and in the extended position.**



FULL SIZE PLANS AVAILABLE – PAGE 118




THIS LINE SHOWS SHAPE OF CENTER SECTION BOTTOM 1/16" BALSA SHEETING WITH CUTOUTS FOR RETRACTS.
1/16" x 1" BALSA T.E. TOP AND BOTTOM
(TOP PLANKING OMITTED FOR CLARITY)
1/16" x 1/2" BALSA CAP STRIPS
1/16" BALSA SHEAR WEBS (GRAIN VERTICAL)
1/4" x 1/4" SPRUCE SPARS
F1
F2
F3
F4
F5
F6
F7
F8
SOFT BALSA WING TIPS
1/2" x 1" BALSA L.E. TAPERS TO 1/2" x 3/4" AT TIP
FOLLOW THIS LINE FOR F2
MAKE CENTER SECTION RIBS 1/32" SHORTER IF RETRACTS NOT USED
1-3/8" DIHEDRAL ( EACH PANEL)
NOTE HOW SPARS ARE SCARFED. ENSURE THAT THIS IS A GOOD SOLID JOINT – IT'S ALL THAT KEEPS THE WINGS ON!
TOP AND REAR OF CANOPY FROM SOFT BLOCKS
C3 1/16" BALSA
DRILL 1/8" DIA. HOLE FOR HOLD DOWN
3/32" BALSA HATCH TOP (1¾" x 11-1/8")
C1
C4 1/16" BALSA
C2 1/16" BALSA
1/4" x 1/4" BALSA RE INFORCEMENTS
1/4" x 1/4" BALSA HATCH RAILS
SHADED AREA IS C1 (1/32" BALSA)
1/2" x 1/2" MAPLE
1/2" x 1" BALSA L.E.
1/4" x 1/2" MAPLE L.G. BEARER
1/2" x 1-3/16" MAPLE BLOCKS
3/32" DIA. x 1/2" STEEL
5/32" DIA. x 1½" BRASS TUBE FREE TO ROTATE IN 3/16" DIA. x 3/4" BRASS TUBE BEARING.
1/2" x 1" BALSA L.E.
1/16" x 1/4" x 1/2" RETAINERS MAKE FROM NYLON OR ABS
SECURE RETAINERS WITH #2 x 1/4" SCREWS.
BIND WITH SOFT COPPER WIRE AND SOLDER
2 – 5/32" I.D. BEARING HOLES (BUSHED W/ 3/16" O.D. TUBE)
1/2" x 1/2" MAPLE
1/2" x 1" BALSA L.E.
5/32" O.D. AXLE
MODIFIED STEERING ARM
4-40 STUD
1/16" O.D. YOKES
WHEEL COLLAR W/ 3/32" DIA. PIN
LANDING GEAR ASSEMBLY ( NOT TO SCALE)
3/32" O.D. STEEL
1/4" x 1/2" MAPLE NOTE CUT OUT TO CLEAR L/G
#64 RUBBER BAND ATTACHES HERE
1/2" x 1-3/16" MAPLE BLOCKS
NOSE WHEEL STEERING ARM
4-40 STUD
3/32" I.D. WHEEL COLLAR
1/2" x 1/2" MAPLE
1/2" x 1" BALSA L.E.
1/4" x 1/2" MAPLE WITH 3/32" GROOVE FOR L.G. WIRE
1/16" BRASS BEARING ROD BENT TO SHAPE (ALLOW SLIDING FIT FOR 3/32" DIA. WIRE) SOLDER TO L.G.
3/32" DIA. STEEL L.G. WIRE
2" WHEELS
EXTENDED
RETRACTED
NOTCH TO ENGAGE TRIGGER
WASHER
8-32 BOLT
NYLON PUSHROD GUIDE
DUBRO E-Z CONNECTOR
1/8"
KP2B RCVR – SERVO
27/32"
FIREWALL 1/4" PLY
NACELLE SIDES 1/8" BALSA
N1
N2
NOTE: MAKE TWO SIDES 1/8" SHORTER TO PROVIDE SIDE THRUST
3/32" BALSA
1/16" PLY
NYLON PUSHROD GUIDE MOUNTS TO FUSELAGE SIDE
CUT DOWN NYLON CLEVIS
DUBRO E-Z CONNECTOR
2-56 ROD
DUBRO E-Z CONNECTOR ACTUATES TRIGGER ON FULL DOWN
1/4" x 1/2" x 1/2" MAPLE BLOCK
1/16" DIAMETER ROD BENT TO FORM TRIGGER
KP2 RCVR – SERVO
GOLDBERG BELLCRANK DRILL 5/32" DIA. HOLE TO ACCEPT 8-32 BOLT
JU-88 BOMBER
WING SPAN – 48 IN. WING AREA – 290 SQ. IN.
LENGTH – 33 1/2 IN.
WEIGHT – 32 OUNCES WITH KP2B + K84D BATTERY
POWER – 2 T.D. .049's (ETRO. ENGINE L.H. ROTATION)
RADIO EQUIPMENT REQ'D – 2 OR 3 CHANNEL
FLYING EXPERIENCE – INTERMEDIATE SPORT FLYER
DESIGNED AND DRAWN BY JERRY L. HOLCOMB
COPYRIGHT MARCH 16, 1973 ALL RIGHTS RESERVED
0 1 2 3 4 5 6
SHEET 2 OF 2
540②

# PRACTICAL AERODYNAMICS

BY MIKE ILYIN

PART IV

This month we will discuss one of our secondary flight controls. The engine/propeller combination. This is one of the most misunderstood controls on a model and, hopefully, we can uncover some of the mystery surrounding it.

One of the most controversial factors in model flying is the cause of an airplane's tendency to turn to the left during take-off run and climb-out. This is sometimes explained as the effect of "torque" and is sometimes said to result from "P Factor." Since both contribute to the same result in a take-off situation, both should be thoroughly understood by the modeler.

Torque is a force which tends to produce a rotating or twisting motion. In the case of propeller driven airplanes, the most significant torque force is that produced by the engine in rotating the propeller. This force causes the propeller to rotate to the right, as seen from behind, and at the same time tries to rotate the airplane to the left because the engine is mounted on the airplane structure.

To counter this force, which is constantly exerting a rolling movement on the airplane in flight, it is common practice to trim a slight amount of down aileron in the left wing. In the event the engine is arranged in a pusher configuration, the effect is reversed and the down aileron is trimmed into the right wing.

The higher angle of incidence, or "wash in," to compensate for the torque originating in the engine can provide the exact amount of force necessary to counter the torque only at a specific power setting and airspeed. To provide maximum benefit to the modeler, the power and airspeed values for which the wings are trimmed are those used for cruising flight in the airplane concerned.

The rolling effect of torque is greatest at the maximum power setting used for take-off and climb. Accordingly, during flight operations with high-power settings it is neccesary to use some force on the aileron controls to maintain laterally level flight. This

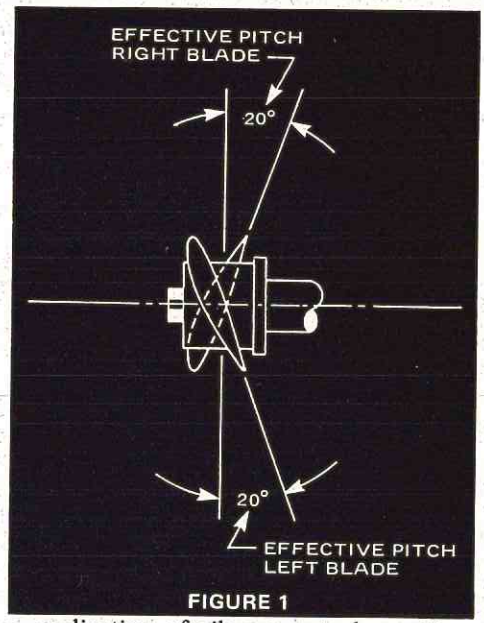


FIGURE 1

application of aileron control, usually to the right, adds to the drag on the left wing (adverse yaw), and the tendency of the airplane to turn left during take-off and climb.

It has been customary to explain to modelers that they must hold right rudder during take-off and climb "to take care of torque." This seems a bit confusing since torque is a roll problem and the rudder is a yaw control device. Obviously there are other factors which also contribute to the tendency of an airplane to turn on take-off. These should be understood by the modeler.

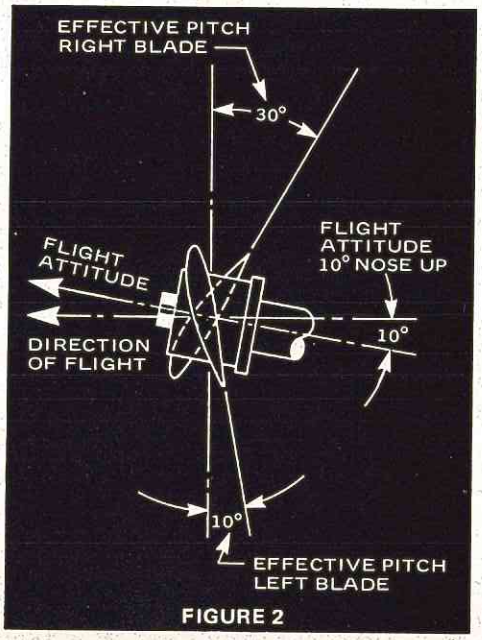


FIGURE 2

The asymmetrical thrust delivered by the propeller, sometimes called "P Factor," is an important factor, especially in single engine airplanes. So long as a propeller screws its way through the air in a direction absolutely parallel to the shaft on which it is mounted (Figure 1), the thrust it produces is uniform all around its plane of rotation. If, however, it is held at an angle to the direction in which it is moving through the air, as in a nose high climb, significantly greater thrust is produced at one side of its plane of rotation. (Figure 2.)

In the case of a conventional single engine airplane in a steep climbing attitude, as on lift-off, this is caused by the fact that each propeller blade, as it descends on the right side of its plane of rotation, has a much higher angle of attack to the air it penetrates than it has on the left side as it ascends. Because most conventional model airplanes turn their propellers to the right, as seen from behind, the extra thrust from each blade, as it descends at the right of the centerline of the airplane, tends to turn it to the left.

The greater the angle between the shaft on which the propeller is mounted and the actual climb path of the airplane, the greater will be the turning effect caused by "P Factor." This situation is characteristic of tailwheel-type airplanes during take-off run, and with all airplanes upon lift-off.

The effect of asymmetrical thrust from the propeller is especially significant when the airplane is rolling on the ground in a tail-low attitude with take-off power, or in flight when operating at high angles of attack.

The effect of asymmetrical thrust is also important in multi-engine airplanes. All multi-engine propeller driven airplanes have a "critical" engine. With normally rotating propellers the critical engine is the left engine. Looking at Figures 3 and 4, notice that the asymmetrical thrust caused by 'P Factor,' on the left engine causes the center of thrust to

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# PLASTICS: SHOW AND TELL

CONCLUSION

BY RAY HANISCO

One of the greatest satisfactions one can get out of life is giving a friend a helping hand. I feel that through this nine month series, I have gained many friends and if it has helped one guy (or girl), it was worth the effort. Let's recap these a bit.

Through the articles you have learned of seven of the many types of thermo plastics available today. The seven that we covered are probably the ones you will come into contact with for several years to come.

You have achieved a plus by learning to bear with my – humor (?) – many times.

You have learned how to pronounce the names of these plastics and to recognize their nicknames.

The knowledge of being able to recognize what type a plastic is, by the simple testing method we used, can be invaluable to you and your friends.

The things you have learned of the toxicity of the solvents used with plastics may save you some grief in the future. Also, maybe some of the tips on cementing of joints may be of some use.

In an effort to help you retain this invaluable information, I have prepared a series of charts for your shop wall so you may have a quick and handy reference. Don't try to remember all that is on the charts – use the charts.

I have decided to breakdown the charts into the following categories:

a. **Materials Chart**
This contains the basic thermo plastic materials, and the reactions that will result from the Sliver, Flame, Odor and Specific Gravity

to page 74

| MATERIAL | SLIVER | | | FLAME COLOR | Odor | SPECIFIC GRAVITY | | SOLVENTS | | | | ADHESIVE | | | | | PAINTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hard (Chips) | Soft | Tough | | | PART FLOATS | PART SINKS | M.E.K. | Acetone | Benzene | Toluene | Aqueous Phenol | Epoxy | Contact Cement | Sig Bond | Eastman 910 | RTV | Dopes (Lacquers) | Enamel | Epoxy | Urethane |
| Polystyrene (Styrene) | X | – | – | Yellow, Black Smoke, Carbon Clumps | Illum. Gas | – | X | X | X | X | X | – | X | – | Try | Try | X | – | X | X | X |
| Acrylonitrile Butadiene Styrene (ABS) | – | X | X | Yellow, Black Smoke, Carbon Clumps | Illum. Gas and Rubber | – | X | X | X | X | X | – | X | – | Try | – | X | – | X | X | X |
| Acrylic | X | – | – | Blue, Yellow Top | Fruit | – | X | – | X | X | X | – | X | X | X | – | X | Try | X | X | X |
| Nylon | – | – | X | Blue, Yellow Top | Burned Wool | – | X | – | – | – | – | X | X | X | – | – | X | X | X | X | X |
| Polypropylene (P.P.) | – | – | X | Blue, Yellow Top (Swells & Drips) | Sweet | X | – | – | – | – | – | – | – | – | Try | – | – | – | – | – | – |
| Polyethylene (P.E.) | – | – | X | Blue, Yellow Top. Drippings Burn | Paraffin | X | – | – | – | – | – | – | – | – | Try | – | – | – | – | – | – |
| Polycarbonate (P.C.) | – | – | X | Material Decomposes | | – | X | – | – | – | – | – | X | X | X | X | X | X | X | X | X |

# BASIC SAILPLANE DESIGN

## BY PRESTON ESTEP JR.

## PART VIII: MORE ON STABILITY

In general, it is more relaxing and more rewarding, from a performance viewpoint, to fly a sailplane which is not forever stalling or diving. A nice bonus is a stable attitude during turns. Just how to achieve this happy state of affairs is our topic for this month.

Let's begin with a conventional empennage assembly, a horizontal stab with fin/rudder sticking up vertically. It seems evident that the size of the stab should be somehow related to the C.G. location, the length of the tailboom, and whether or not the stab is expected to contribute any lift. A formula which I have derived from some wonderful research done by Bill Bogart is as in Figure 1.

FIGURE 1

$$\text{C.G. position} = .25 + (.4)\left(\frac{\text{Tail moment}}{\text{wing mean chord}}\right)\left(\frac{\text{Stab area}}{\text{wing area}}\right)$$

This so-called "tail volume" relationship will give you a dandy method of finding out the rearmost C.G. position which the airplane can stand. There is an important footnote, however: If you are using a symmetrical all-flying stab (cf. the Cirrus), you must move the C.G. forward of the calculated amount by 10% or so, since the tail cannot generate a very high $C_L$.

The more rearward C.G. positions, coupled with some lift from the stab, will improve still air times by raising the effective overall $C_L$, but will somewhat degrade maximum L/D ratio. Also, high-speed performance will suffer due to the increase in induced drag at the stab when you crank in down-trim.

Thus, we can compare for an Olympic 99 with C.G. at 30% (no lift from stab) and at 50% (stab assumed to be at $C_L$ of .6).

As you can see from Table 1 the plane has a slower glide and slower rate of sink, but a poorer L/D ratio. The effect of shifting the C.G. back is quite striking in practice, and you should always make an effort to go back as far as you dare, based on the preceeding calculation.

The natural implication of these observations is that a small stab with a long tail moment will produce the best compromise between stability and drag, and it is true. A decently high AR stab with a thin, sharp-nosed flat-bottom airfoil is the logical choice. I have observed that a flying stab is substantially superior to the conventional stab/elevator configuration, but if you have the latter, at least seal the hinge gap with MonoKote or something similar.

The foregoing comments about C.G. location are bound to be anathema to some, especially ex-power flyers and those who wrestle the high speed slope bombs. However, it is perfectly true that if you are seeking maximum soaring efficiency, the rearward C.G. location will do it, and it does not have to be at the expense of stability. I need hardly point out that models are perfectly capable of free flight without interference from radio waves emitted by Dr. Strangethumbs, with a C.G. as far back as 85%.

In any event, let's suppose that you have achieved longitudinal stability and you are trying to get your bird to turn smoothly and cleanly. We discussed, last month, the relationship between turn radius, bank angle, and speed. But it still seems that some element is missing – why can plane A always turn inside plane B? Why can a fast diving hawk turn inside both of 'em? The answer is in that mysterious factor known as **roll rate.**

The roll rate determines how long it takes for a plane to get to a given angle of bank, and the difference from plane to plane is great enough so that it is an essential element in considering the factors treated in the last installment. The variable affecting roll rate are based on the forces causing roll, viz. sideslip (caused by rudder) and dihedral effect (caused by dihedral, wing location, airfoil, planform, etc.); and the forces opposing roll, viz. inertia and aerodynamic resistance caused by drag in the roll axis. The formulas which describe such things involve mostly unmeasurable quantities, but you can plainly see that the advantage lies with the lower aspect ratio, lightweight, high dihedral, large rudder

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**TABLE I**

C.G. At 33%, STAB $C_L = 0$

SPAN 96.00 AREA 765 WEIGHT 45.00 EST. Ddp = .022 AR 12.05 OZ./SQ. FT. 8.47

1.00 .030 .030 .082 12.151 22.114 1.819 2: 44

C.G. At 50%, STAB $C_L = .6$

ADDING STAB AREA OF 23% AT $C_L$ OF .6 ADDS .14 TO EFFECTIVE $C_L$, .004 TO DRAG (DUE TO INDUCED DRAG OF STAB)

1.14 .034 .039 .095 11.953 20.711 1.732 2: 53

SCRATCH BUILDING

BY MEIDAD ABIR

# MODEL SAIL YACHTS

## CONCLUSION: SAILS

Sails are the power plant of your yacht. The better they are, the better your boat will sail! For that reason, you should try to get the best. However, sails can be made quite easily using some common materials and some un-orthodox methods.

The best sail material to use is dacron which is available through any sail making outfit. For your R/C yacht you should obtain the 2.25 oz./sq. yd. sometimes known as Dingy Cloth. The stuff is not cheap but neither is Mono-Kote! Sailcloth comes in many colors as well as weights and sometimes in the future you might try using the super-light .75 oz./sq. yard for your boat. Avoid cotton if you can because it scratches too much and also will rot if not handled properly.

Dacron, as well as many other synthetic fabrics, can be cut by the use of a hot soldering iron. The advantage of this is that the fibers along the cut edge are melted together and will not unravel. Sail making requires a large cutting surface and a sewing machine – but don't go away if you don't have one!

Lay the cloth on the table and mark your sail outline on it. It is best to cut a paper pattern but you can plot it directly on the material. Don't mark too heavily as pencil marks are almost impossible to remove. The things to watch for while marking out is that the cloth is not sketched and that the leach of both the main and jib is parallel to the selvage of the material. Figure 7.

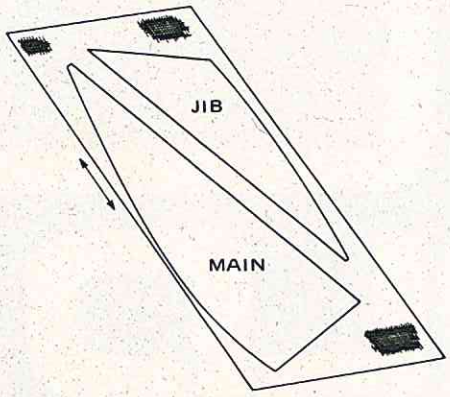


**FIGURE 7. LAYING THE SAILS FOR CUTTING. NOTE THE WEAVE DIRECTION**

Only a small soldering iron is required for cutting (mine is an Ungar with a 1/8" tip ).Using a strip of wood as a guide, run the hot iron tip around the edges. The speed should be such as to just separate the material without melting too much of it. This may sound very difficult but in reality cutting the two sails should not take more than 10 minutes. While cutting, you will also need strips of 1" wide material to be used as tape.

Do you have a sewing machine? Good! Do you know how to sew? Let me talk to your wife!

The luff and foot of the sail are taped and sewn as are the small triangular gussets at the corners. The tape is folded in half and creased using a warm iron. It is then sewn using two rows of stitches. Figure 8 shows the

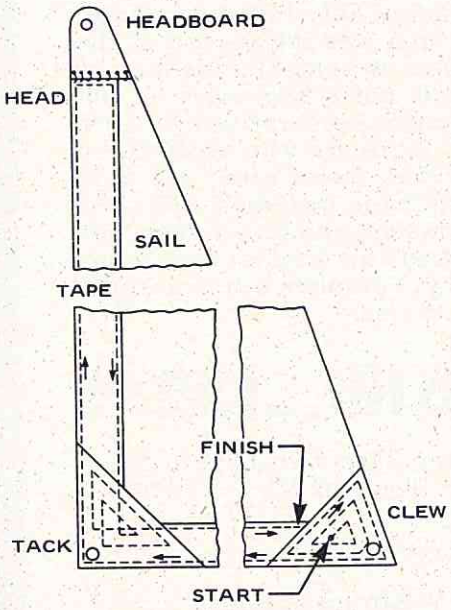


**FIGURE 8. SEWING THE SAILS**

method used which enables you to complete the stitching in one pass. A small amount of rubber cement can be used to hold the gussets in place while sewing. Avoid stretching the tape while sewing as this will cause wrinkles in the finished sail, also use snythetic thread to prevent shrinkage and deformation. If you have your own ideas how to sew – use them!

If you don't have a sewing machine, you can still make sails, using any kind of iron-on tape. Cut a length of tape slightly longer than the luff. The tape should be 1 – 1¼ inches wide. Place the tape on the ironing board sticky side up! Place the edge of the sail so it will cover half the width of the tape and using your MonoKote iron "spot-weld" every 3" – 4" along the edge. Fold the tape over and run your iron (use the setting recommended by the tape manufacturer) along, bonding it to the cloth. Make sure the iron surface touches only the tape and avoid too high a temperature setting that will cause deformation to your sail. Do the foot of the sail next, overlapping the luff tape at the tack (the front lower corner of the sail). Cut the triangular gussets for the tack and clew (you guessed! – the rear corner of the sail) and iron them in place.

Most sails require battens. These are strips of stiff plastic or 1/32" plywood. Their function is to prevent the leach of the sail from collapsing. If the roach is more than 1" they should be used. The battens are fitted in pockets sewn into the sails. If you use the iron-on method, cut strips of tape approximately ½" wide and iron them on both sides of the sail. It is better to have the battens too soft than too stiff as they control, to a certain degree, the curvature or airfoil of the sails. On most jibs, they should be eliminated or kept to an absolute minimum.

The luff hooks are next. Use medium size dress hooks and either sew them in place or use small rivets or eyelets. Space them at 4" – 5" intervals and alternate the sides. The hooks should be positioned so that the inside of their hook is in line with the sail luff. Make sure that they are located so there is no interference with the jack line fasteners.

The headboard can be made from thin aluminum, printed circuit boards (epoxy or polyester), or even 1/16" plywood. Drill a series of small holes at the base and sew it to the head of the sail. Punch holes at the clew and tack for an 1/8" or larger eyelet. Leave

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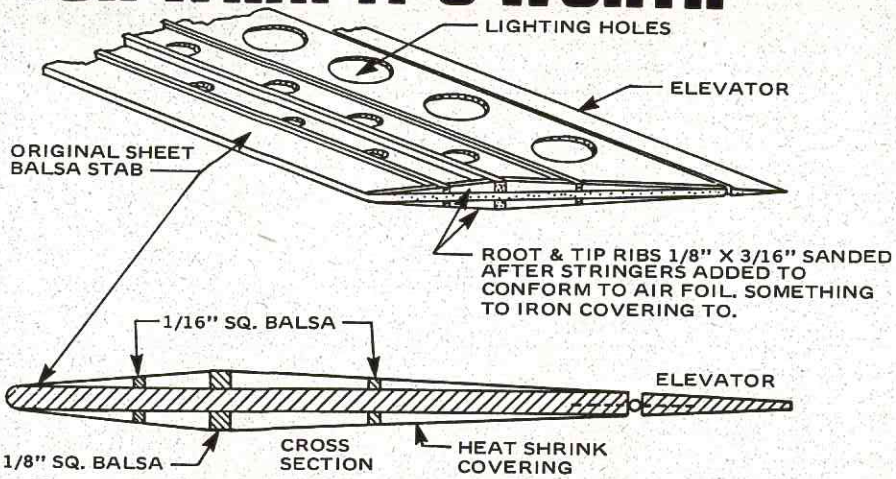
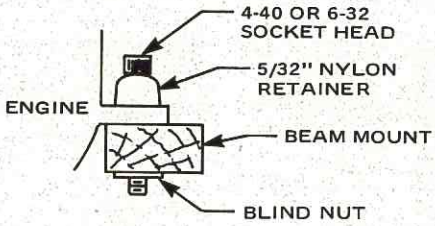
# FOR WHAT IT'S WORTH



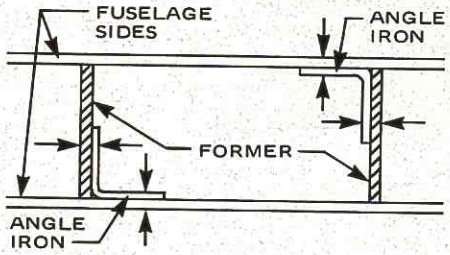

If you want to greatly improve the performance of your sailplane which may utilize the flat sheet balsa stabs, such as the Windward, Monterey, Ace High, and others, use this quick and easy method from Kenneth Cottle of Columbia, Missouri, and add a 3/8" or 1/4" airfoil to the stabilizer. Glue or epoxy balsa stringers as illustrated and cut lightening holes in the sheet to compensate for the added material before covering with your favorite heat shrink covering material. The thickness and airfoil can be adapted to one's own desire. Ken has found 35% to 40% works quite well.

Properly prepared glue sticks are the key to neater, lighter assemblies, and it's worth a few minutes needed to make a batch from scrap lengths of spruce or balsa; 1/4" x 1/8" is ideal. The secret is not only to taper the end to a slender chisel shape but to rake the working edge so as to get into corners and to sand a slight radius on all corners and edges. When you join and align your components, "chisel" off all the wet glue outside the joint (wiping off the stick at intervals), and finish the job by "wiping" a tiny fillet along the joint. It's the glue you can't see that does the real work in making the wood-to-wood joint. This idea was submitted by Fred Deudney of Devonshire, England.

John R. Agnew, M.D., of Fort Myers, Florida, has been using Midwest nylon wheel retainers (5/32") for lock nuts in mounting engines. According to John they are far superior to regular steel lock washers and almost as good as using nylon or glass-filled mounts without the additional cost.



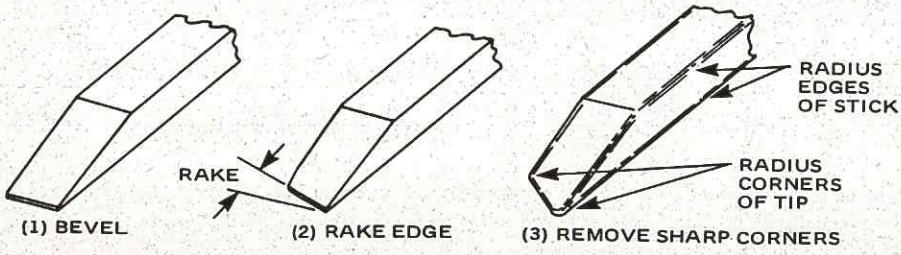

Have you ever glued the formers onto your fuselage sides and set the whole thing aside to dry only to find out the next morning that the whole mess has slipped and your nice square fuselage looks like the Leaning Tower of Pisa? If so, here is a hint that will give you square joints each time, as reprinted from the Suffolk Wings "Wing Tips." Using clothes-pins at the arrow marks, clamp a couple of angle irons (the kind you get at the hardware store for about 15 cents as shown in the sketch. For a tapering fuselage, a little discreet adjusting of the bend on the angle iron will solve the problem very neatly. It is usually best if you glue the two center formers first allowing the joints to dry thoroughly, then glue the nose and tail formers at a later sitting.




When fitting your wheels to the IM Products landing gear, such as commonly sold by most hobby shops and as supplied in many kits such as the Aero Precision Touchdown, you may find that you can't get one of the semi-circular retaining nuts to tighten up without the wheel binding. Bob Martin of Kirkland, Washington, was reluctant to epoxy or solder until flight testing was complete. So he took some plumbers wool, stuffed it in the retaining nut and tightened it down to, subsequently, discover that it had no tendency to vibrate loose. If you try it for a really large plane, a fast touch with a propane torch would give you a good seal in a hurry.

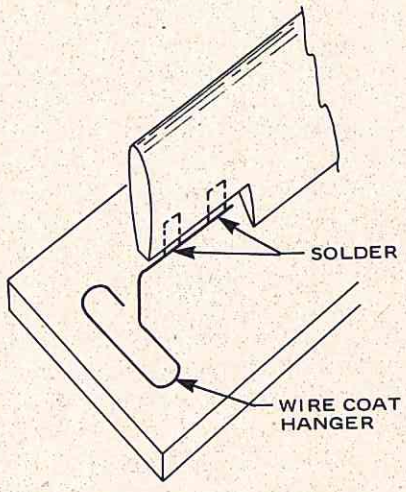
Lee Taylor of Roseville, California, recently had to make several wing skins for some foam wings and went looking for a long straight-edge to trim the edges of the balsa. A look at the prices of the commercial straight-edges convinced him of the extreme inflation of the economy and he didn't wish to lay out the cost of a new engine just to be able to cut a straight line. As a solution, Lee went to the local air conditioning shop and had the man cut him a couple of strips of .032 galvanized metal, 3" wide and 48" long on his metal shear. A few seconds of smoothing the cut edges with a piece of sandpaper yielded two beautiful straight-edges, flexible enough so that they would lie flat on the wood, yet heavy enough so that they would not allow the wood to shift while the cut was being made. The width of the strips also made them more resistant to warping along the straight-edge, which a lot of the metal rulers will do when force is applied to their edges. Total cost was 50 cents.

Wing support fixtures for use when spraying wings can be made quickly,

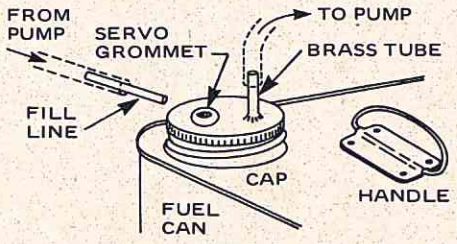


# FOR WHAT IT'S WORTH

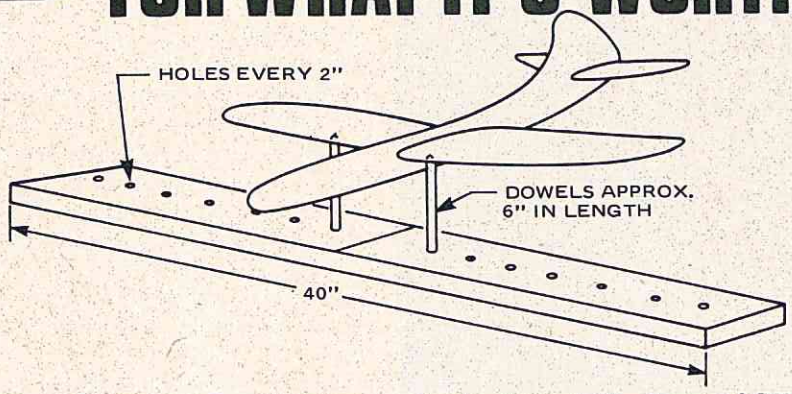
easily, and, best of all, at no cost except for a dab of solder. The materials, wire coat hangers and tin cans, are available in just about every home. The wire hanger is re-shaped to form a base, a short vertical rise, and then a horizontal arm six or eight inches long. The tabs are cut out from a tin plated can. The tabs should be about ½" square and soldered to the horizontal arm spaced out to pick up the aileron hinge slots. Two wire hangers are required to make a set of supports. The arrangement shown in the sketch allows the wing to be painted on both sides without having to wait for the first surface to dry. This idea was submitted by Charles Palermo of Houston, Texas.




Dean Everrets of Souix Falls, South Dakota, has come up with a nifty way of sealing up his fueling system. When Dean is done getting "gassed," he simply pokes the fill line back into the cap and the servo mounting grommet makes a perfect airtight seal.

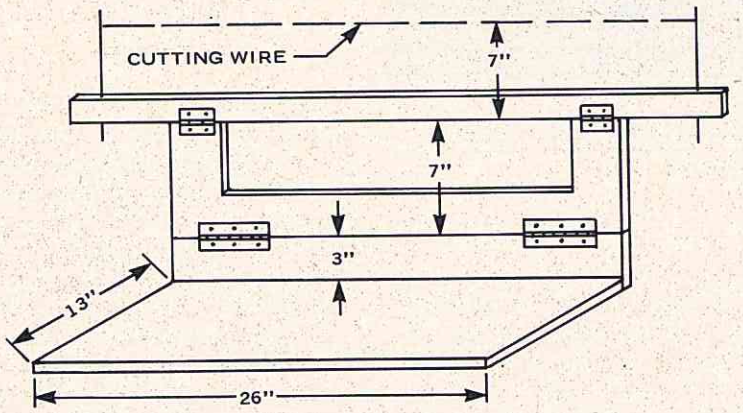


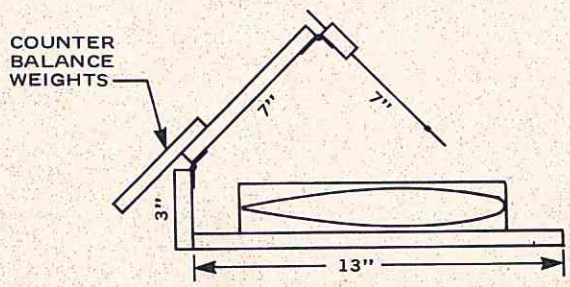

Cutting foam wings has always been a two-man job which is fine but, if you are ever caught understaffed, then this foam wing cutter designed by Bert van Barneveld, as presented in the MARS "Pulse" of Quebec, Canada, will let you do the job alone. It is suitable only for constant chord wings, but it works like a charm. Make it any size you like. Piano hinges are ideal here.




Robert L. Therkelsen of Vashon, Washington, writes that he has always checked a models balance point by the conventional method of placing his index finger at the C.G. under the wings and observing that the model balanced level. However, it is easy to influence the attitude with your fingers, particularly if you have big hands. By simply drilling holes at approximately 2" intervals along a 1" x 4" board and inserting 2 dowels sharpened in a pencil sharpener in holes far enough apart you can insert these dowels and maintain a good degree of accuracy in checking your Center of Gravity. As long as the wing/dowel contact point is above the C.G. the model will remain level when properly balanced, thus high and mid-wing models can be balanced with the dowels close to the fuselage and low wing models can be balanced at the wing tips using the outer holes so that the dihedral puts the Center of Gravity below the contact point. Dimensions for this balancing fixture are not at all critical. You may want to glue a small piece of hardwood in each wing with a dimple for the dowel point so you don't poke holes through your covering material.

To keep Du-Bro collars on axles simple, place a small drop of Hobbypoxy clear paint on the end of the shaft. Slip on and tighten the set screw. When the Hobbypoxy dries it takes a pair of pliers to get the collar off. Testors type airplane glue can be used in light duty applications. The inside collar does not need to be glued and only a small amount of Hobbypoxy clear is needed at the end of the axle. Be careful not to glue the wheel to the axle collar. This idea was submitted by Howard Lalonde of Jamestown, New York. □



**WE'RE SORRY**

that some regular monthly columns had to be omitted this month due to the space requirements required for the feature articles presented in this Tenth Anniversary issue. With apologies to you and our columnists, we hope you'll look forward next month to:

- ★ Cunningham on R/C
  by Chuck Cunningham
- ★ Sunday Flier
  by Ken Willard
- ★ Showcase '73
  New Products Section
- ★ Model Yachting
  by Rod Carr
- ★ A Page from Dick Tichenors Photo Album
  by Dick Tichenor

In addition, don't miss the following features:

- ★ THE KWIK-STIK – A $5.00 airplane for .049 to .60's utilizing material from your local building supply house.
- ★ THE RCM SPORTSTER – a beautiful .19 powered low wing aircraft designed by Joe Bridi, renowned Pattern pilot.
- ★ THE PHANTOM – an all-out high-performance Pattern aircraft.
- ★ PLUS MUCH, MUCH MORE!

Don't Miss the November issue of

R/C MODELER MAGAZINE

## BASIC SAILPLANE DESIGN

**from page 58**

design. Thus a Lil-T with a 10 oz./sq. ft. loading can turn much more sharply than a Cirrus with 9 oz./sq. ft. loading; more dihedral and smaller moments of inertia enable the 'T' to quickly reach a steep bank angle. From which it can describe a sharp turn even though it may be moving faster than the larger plane.

We have touched lightly on the usual fin/rudder proportions of 5% – 8% of wing area. When used with the commonly employed range of tail moments, this will give a decent amount of control. If the plane weaves on the Hi-Start, you have too much dihedral or too little fin (usually a problem with polyhedral ships). If it won't **roll** rapidly enough (usually interpreted by the pilot as **"won't turn"**) it needs dihedral. A critical lack of dihedral is evidenced by a tendency to spiral dive once a turn has been initiated. This usually also goes along with some kind of other swell problem like stab stall. If you save the plane from such a fate, make sure your stab is adjusted so that it is producing some lift, increase dihedral, increase rudder throw somewhat, and hope for the best.

Many designers have found it convenient to provide a little automatic up-elevator when the plane is turning. This is simply done by sweeping the rudder hinge line. Then when the rudder flaps out into the breeze, a little down moment is created which "holds up the nose" in the turn. More properly, it increases the $C_L$ of the wing to keep the plane on the best part of its polar curve (see last issue). I might point out in passing that the one and only function performed by the horizontal tail is to set the $C_L$ at which the wing will operate.

This effect can also be achieved with a V tail by differential hinging of the surfaces (hinge 'em at the top – see Figure 2) or by a mixer such as the Vector Director.

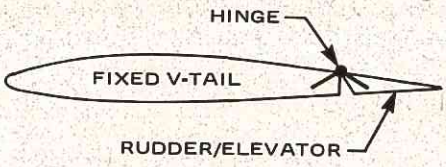



**FIGURE 2**

Personally, I have found the control interaction inherent in V tails to be a bit of a nuisance which can really only be perfectly tuned out through the use of some sort of device such as the Airtronics Vector Director which allows a wide range of adjustments for such niceties as differential throw, etc.

My final comments about tails are: The least drag will come from the V configuration; the best combination of control and lift/drag will come from an all-flying stab on top of the fin in a T configuration; if you have a symmetrical stab and a forward C.G., the all-flying configuration with a 9% symmetrical section gives nice smooth control; and finally, the conventional flat-plate stab/fin combination with hinged surfaces may be less efficient, but it sure is a lot easier to build. □

## SCRATCH BUILDING MODEL SAIL YACHTS

**from page 59**

about 1/8" distance to the nearest edge. Drill and mount an eyelet in the headboard and the head of the jib, and the sails are done!

Sail numbers and class designation are best applied using trim MonoKote. Cut the numbers and apply without ironing! The Soling insignia is shown full size on the plans. You can obtain a sail number a yacht registration certificate by joining the A.M.Y.A. (American Model Yachting Association).

Time now to put everything together! For running rigging, I use dacron or nylon braided fishing line known as squidline. This line has a breaking strength of 45 lbs. and should be sufficient. As a rule, apply a drop of cement to all knots you make to ensure that they will stay tied. You will also need those cute tensioning gizmos known as bowsies. All they are is a narrow (3/16") strip of plastic with 2 or 3 holes drilled in them. The holes are only slightly larger than the line you are using. Bowsies are self-locking and are used to adjust the length and tensions of the running rigging. Figure 9. Starting with the jib,

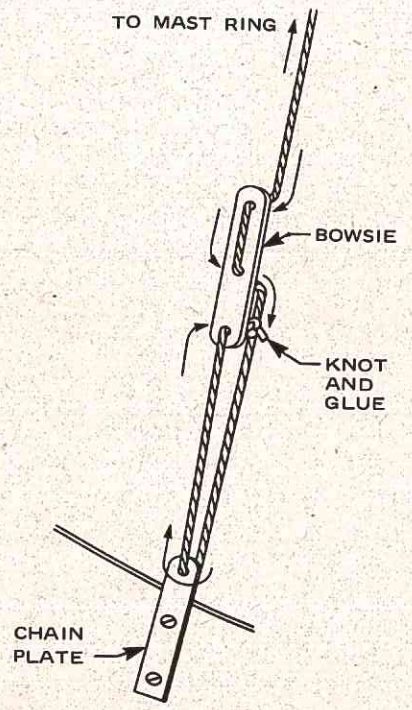



**FIGURE 9. RIGGING OF CORD SHROUDS USING A BOWSIE**

attach the tack (front corner – re-

member?) to the same spot the jib stay is attached. Tie a length of line to the head and thread through the hole at the triangle. Use the inside hole. Use a bowsie and pull the luff tight. Attach a line to the clew of the jib and feed it through the clew outhaul fitting or screw eye. The jib stay should now be tight as will be the leach. When satisfied with appearance, tie the clew outhaul. Some modelers like to be able to adjust the tension on the outhaul. This is of benefit on the main sail but hardly worth it on jib this size. However, if you wish you can fit another bowsie and thread the line through a small eye some 4" from the outhaul fitting.

The tack of the main sail is not attached to the gooseneck ring and all luff hooks are engaged with the jack line. Tie a length of line to the headboard and thread it through the tube near the top of the mast. Bring it down through the screw eye or the fitting at the tip of the main boom. The other end is then attached to a screw eye, again, using a bowsie. The sails should be slightly stretched but not so tight as to cause wrinkles to form.

The next item is the vang or kicking strap. It plays an important part in controlling the shape of the main sail and will help you to obtain the best results from your sails in various weather conditions. All the vang does is prevent the main boom from lifting when the sheets – the lines controlling the position of the sail – are loose. Using the aerodynamics equivalent, it prevents stalls! Now, don't you wish you had one in your airplane?

In our yachts the vang is elastic. By using rubber bands you can control the tension on the sail leach to suit the wind conditions, tight for windy days and loose for light wind – more on that later. Use a small wire hook and, threading the rubber bands through the screw eye in the boom double them up and hook them to the mast. The rubber bands should be tight enough to keep the leach of the sail slightly stretched – but no more!

R/C yachts can be sailed "rudder only" and still be a lot of fun. So, if you think sail-control is for the birds (?) you can tie the sheets to an eye on the deck so that both booms will be at approximately 40 degrees to the center line of the boat. Using this set-up, you can sail on most points of sailing using your rudder to turn and to compensate for the boat tendency to point or come off the wind.

Going the "rudder only" way, all that is remaining is to mount your rudder servo, wrap your receiver, batteries, and all plugs, in foam and throw them in plastics bags or a small plastic box. Care taken here really pays off when sailing or racing in a stiff breeze as water somehow finds its way inside. The antenna can be threaded through a small hole in the deck and led up the mast or a shroud, the end being held by a piece of tape. Pour a little wax in the hole to seal or use some grease. Since yachts seldom have a range problem you can leave the antenna inside the hull and eliminate the hole in the deck. (Don't do it if your equipment is marginal on range, though!) I leave the on-off switch inside the hull to minimize the danger of water getting into the contacts, which means that I have to remove the hatch to turn the receiver on and off – a small price to pay for safety!

Well you are ready for the test flight! Select a calm day and hand launch the model over tall grass . . . ? Test sailing should be done in a moderate, steady wind, and in the water!

Turn the radio on, making sure right is right and that the rudder is at dead center! Close the hatch and use tape to keep it shut. Put your boat in the water heading approximately 90 degrees to the wind and give it a gentle push and observe! Your little yacht will do one of three things. If it keeps going straight without changing directions your mast is in the right position and you can start wiggling your control stick to test the rudder action and sensitivity. You will learn many things in a very short period of time. You will find out that the sails are much more powerful than the rudder, you will learn that you have to apply a certain amount of rudder to hold the boat on course and you will notice, and this is important, that you cannot go through a luff unless you have sufficient forward speed!

If your boat does not keep a straight course and, instead, has a tendency to come up to the wind, and lose all its speed in a series of "horizontal" stalls your mast is too far back. Using your rudder, bring the boat back and move the mast forward about ¼". Try again, until the boat holds a course.

If, on the other hand, the boat tends to "fall-off" the wind, your mast is too far forward and should be backed-up. For those who will not accept anything without scientific explanation, here is a short one.

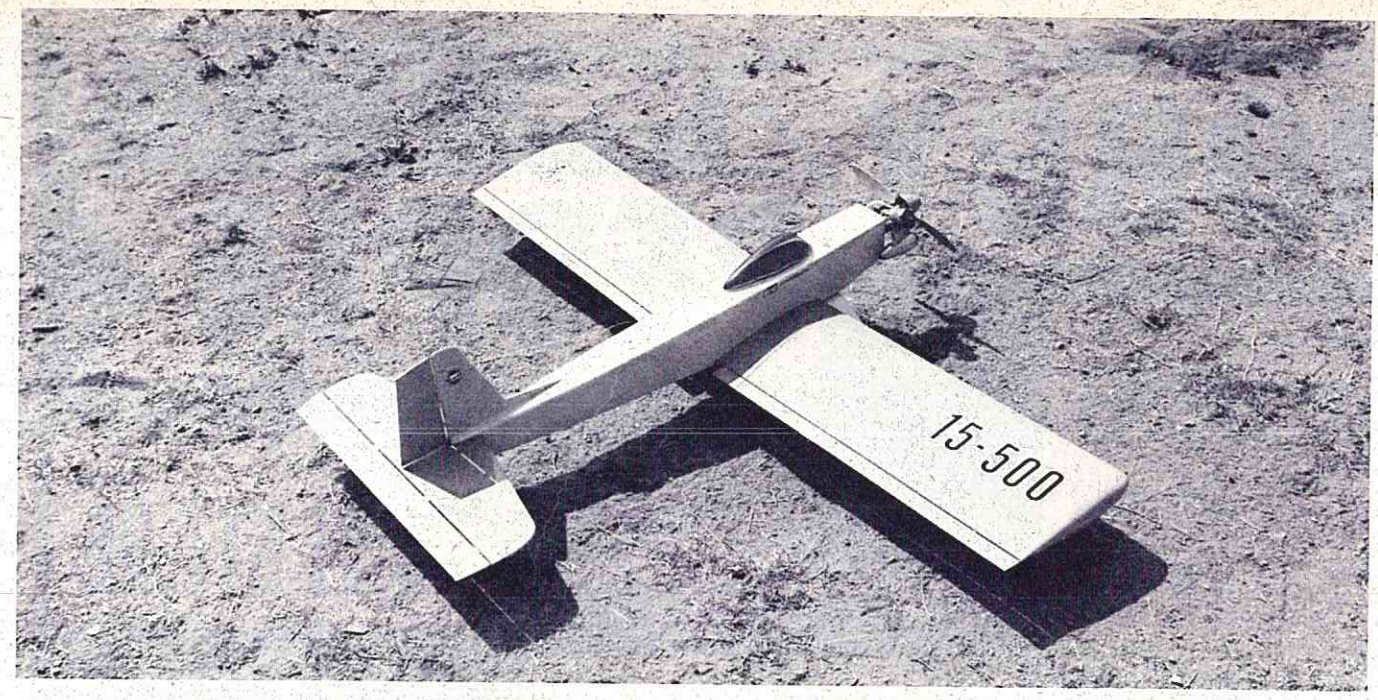
The resultant force of the water is acting on the boat at a point known as the center of pressure Cp. The resultant force of wind acts on the sails at a point called center of effort – $C_E$. When the mast is properly located these two forces are balanced. When, however, the mast is too far forward, for example, the $C_E$ will also move forward and the wind pressure will force the boat to turn about the vertical axis through the Cp – O.K.?

When moving the mast gives too coarse an adjustment you can vary the rake forward or backward or change the setting of the jib. Pulling the jib in will have the effect of moving the mast forward but remember that the jib should always be set at a slightly bigger angle than the main!

In order to realize the full potential of your yacht or if you want to participate in racing, sail control is necessary. Sail control units do exist on the market, but are more suitable for larger boats. Those who built the 36/600 need a lightweight unit, but powerful enough to pull the sails in when the wind is blowing. Until some RC manufacturer comes up with such a unit that will plug directly into the receiver we'll have to scratch-build the sail control unit.

The simplest form of sail control is a sail winch. The sheets are wrapped around a drum so they are both pulled in one direction and payed-off in the opposite. A small motor is geared down to give approximately 1 rev. per second (60 rpm). The total travel of the sheets is about 8" for the 36/600 and 12" for the 50/800. The motor is switched via a DPDT-center-off switch or a pair of micro-switches actuated by the servo. Limit switches can be used to limit the number of turns of the drum, or if you know something about your servo electronics and mechanism you can convert your servo to a winch for the ultimate in weight saving!

The sail winch can be mounted to the hatch so that the drum is on top horizontal. The sheets are fed through screw eyes, to the booms, or it can be mounted on the equipment floor, passing the sheets through guides. If you buy a commercial unit, follow their instructions and you should not encounter any difficulty. All of this is really beyond the scope of this article. I do hope, in the near future, to present an article devoted entirely to sail control units and their construction. If you do have a specific problem and need some help, write me c/o RCM. In the meantime, happy sailing!




## RCM 15-500

from page 20

into the previously finished portion over the stabilizer. Remove the temporary "X" bracing from the wing cutout and finish sand the whole assembly. Locate the wing in the saddle and drill and tap for the hold down bolts. The assembly can now be finished as desired and the vertical fin permanently affixed. Fuel-proof all exposed edges then install the rudder and elevators.

The landing gear is cut from .064" or .071" 6061 T6 aluminum or equivalent and bent to the shape shown. Axles used on the prototypes were Williams Bros., which were shortened to fit the Kraft-Hayes 2¼" streamlined wheels.

About all that's left now is to install your favorite radio and power plant and have a go at it.

I won't make any claims for zero-trim flying "off-the-board" since this is all a matter of the individual's care in building, the weight of the materials used, and a whole host of other factors. Suffice to say that the prototype is clean, honest, and fast. With a small (.19 – .35) light engine it is a real pussy cat to fly and could well be used as an interim trainer. It will do the complete AMA and FAI pattern.

See you at the races or just out for some fine Sunday flying . . . . □

### BILL OF MATERIALS

#### FUSELAGE

| QUANTITY | SIZE | MATERIAL | PURPOSE |
|---|---|---|---|
| 2 | 3/16" x 4" x 36" | Balsa | Sides |
| 1 | 1/8" x 1/4" x 36" | Balsa | Stiffeners |
| 1 | 3/16" x 3" x 36" | Balsa | Top |
| 1 | 1/8" x 3" x 8" | Birch Ply | F3, F4 |
| 1 | 1/8" x 3" x 6" | Birch Ply | F1, F2 |
| 1 | 1/4" x 2" x 3" | Birch Ply | F5 |
| 2 | 3/8" x 1/2" x 1½" | Hardwood | Wing Nut Blocks. |

#### WING

| | | | |
|---|---|---|---|
| 3 | 3/32" x 3" x 36" | Balsa | Wing Ribs |
| 1 | 1/4" x 1½" x 9" | Balsa | Center Rib |
| 4 | 1/16" x 3" x 36" | Balsa | Leading Edge Sheet and Fuselage Bottom |
| 4 | 1/16" x 2" x 36" | Balsa | Trailing Edge and Center Section Sheeting |
| 1 | 1" x 1½" x 18" | Balsa | Wing Tips |
| 4 | 1/4" x 1/4" x 36" | Balsa | Spars |
| 2 | 3/32" x 3/8" x 36" | Balsa | Sub-Leading Edge |
| 2 | 3/16" x 1/2" x 36" | Balsa | Leading Edge |
| 7 | 1/16" x 3/16" x 36" | Balsa | Cap Strips and Trailing Edge |
| 2 | 1/4" x 1" x 36" | Balsa | Trailing Edge Stock for Ailerons and Firewall Gussets |
| 1 | 1/4" dia. x 3" | Birch Dowel | Wing Hold-Down |
| 1 | 1/16" x 1" x 4" | Birch Ply | Doubler for Wing Bolts |

#### EMPENNAGE

| | | | | |
|---|---|---|---|---|
| 1 | | 1/4" x 4" x 18" | Balsa | Stabilizer |
| 1 | | 1/4" x 2" x 18" | Balsa | Elevator |
| 1 | OR | 3/16" x 3" x 18" | Balsa | Fin and Rudder |
| 1 | | 3/16" x 4" x 12" | | |

#### MISCELLANEOUS

2 Yards Covering Material
1 Strip Aileron Set
1 Set of 2¼" Wheels
1 Motor Mount
1 Fuel Tank (80Z Kraft-Hayes Fits Beautifully)
1 1" Tail Wheel
1 Tail Wheel Bracket
1/16th Music Wire
2 1/16th Wheel Collars
2 5/32" Wheel Collars
12 Hinges
4 1/4-20 Nylon Bolts
2 Control Horns
1 .071 x 1½" x 15 6061 T6 Aluminum (or equivalent) for Landing Gear
1 Pair 5/32" dia. Axles
Pushrod Material and Clevises
Fiberglass and Resin
Short Length (1-1½") of Inner NyRod

## ENGINE CLINIC

**from page 10**

You didn't say what you are using for a propeller or fuel, John. Too much prop on an engine will load it down causing the engine to run hot and sag. A home brew fuel that lacks lubrication or some of your commercial brands for that matter, can also cause the engine to run hot and sag. You should be using an 11-7½ or 11-8 on your Veco's. If you already are, and are also using one of the more popular commercial fuels such as K & B 100 or 500, Dukes, or Cox Blue Can, then I would guess that your problem is more than likely due to trying to run the engine too lean. Try setting the mixture while holding the nose of the airplane upward. If, after setting in this position, the engine runs far too rich in level flight, then you definitely have a fuel feed problem. You say that your clunks are free. What are you using for clunks? If one of the sintered bronze type, replace it. These plug up after being in use for awhile and will not allow the fuel to pass through. If you are using an in-line filter be sure it is not clogged and is not leaking air. I have seen many fliers with the same problem as yours being caused by a leaking filter. How far is your tank from the engine? It is most important that all excess fuel line be eliminated. You want the tank as close to the engine as you can get it which means right against the firewall.

**Dear Clarence:**

**Here's one I can't figure out! I have a Webra .61 Blackhead that has broken two con rods in less than one hours running between breaks. The first time, the engine had about 20-30 hours on it and when the rod let go it was running normally in flight. The crank pin hit the piece of the rod still attached to the piston and bent the liner, so I replaced that, the piston, ring, and piston pin, and rod bearing, too.**

**The second time was less than one hour of running time later, in the air, during a rich two cycle. The engine turned over normally before both of the breaks.**

**Any theories?**

**G.B. Nelson**
**Los Altos, California**

How much nitro are you using in your fuel? Seems like the trend lately is to run higher nitro in the stunt engines — particularly the competition fliers. Quite a few are using fuels with the nitro in the 25%-30% range. This is, in turn, a good way to break rods. The engine is being subjected to stress-

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es that it cannot take. High nitro and a lean run can damage an engine real fast. If this is not the case in your instance, and you are using a milder fuel, then I would guess that, after having broken two con rods, there is something internally wrong with the engine. Possibly the piston is hitting the head although this is doubtful in the Webra as those I have checked had ample clearance. Most likely there is a mis-alignment between the crankshaft and cylinder. If you break another con rod you should consider replacing the crankcase providing, of course, that the remaining parts are still usable. If you wipe out the piston and sleeve as well then the cost of replacing all of the parts would be a little rough and would not justify the expense. If you do break another con rod I would send the engine back to MRC and explain the situation.

**Dear Mr. Lee:**

**I have two questions which I think you may be able to help me with. The first concerns using a self-cleaning electric oven to clean my varnished engines. I seem to recall reading somewhere that this may be done, but I have been chicken to try it. Is it safe to do this? Should I disassemble the engine and put only the case and head in?**

**My second question is whether or not K & B is going to come out with a muffler for their new rear rotor .15. If not, do you know of any commercial muffler that will fit it? Here on Long Island, the Quarter Midgets are becoming more popular, but the flying sites are getting scarce. Anything that resembles a snarl will have to be toned down. Any suggestions you have will be appreciated.**

**Very truly yours,**
**Bob Larson**
**Miller Place, New York.**

Forget about the self-cleaning cycle of your oven, Bob. The temperature is too high and you could damage your engine. Aluminum grows when it gets hot and doesn't quite contract back to original size. The higher the temperature the more it grows and the less it contracts. This means that the sleeve bore and bearing bores could expand and then not contract back to original size resulting in the sleeve being too loose in the case, bearings too loose, etc. There is also the possibility of warping parts, etc.

As far as I know K & B has no intention of marketing a muffler for the new .15. Most parts of the country do not require mufflers on the .15 size engines. It costs a manufacturer many thousands of dollars to tool up and produce a muffler. In order to keep the cost reasonable, a minimum of several thousand would have to be made. It is doubltful that there would be enough sales for the .15 to justify the tooling and production costs. Du-Bro will soon be releasing a smaller version of their popular Universal muffler designed for .15-.29 size engines.

**Dear Mr. Lee:**

**As a model builder and a machinist I have been wanting to build a model of a radial aircraft engine. I have come across part of a set of drawings of an engine put out in kit form (castings) in 1944 by the Morton Aircraft Corp. of Omaha, Nebraska, which is a five cylinder job. Could you tell me if this engine is the old Burgess engine, and if you know anyone with a complete set of drawings?**

**I have tried to obtain drawings from P & W and Wright with my letters going unanswered. If I could get drawings of the cam and oil pump I could come up with a J-5 or J-6 with the Pratt "Wasp Jr." It would be more difficult with only those two drawings. If you know of anyone with Pratt and Whitney (United Aircraft) or Curtiss Wright who might help, I would like his name.**

**This engine will be built to scale, 2½" = 1'-0" which would give me about an eleven inch diameter engine. I have all the necessary equipment for making the**

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## PLASTICS: SHOW AND TELL

from page 57

Tests previously covered.

**b. Solvent and Adhesive Chart**
This, too, relates to the basic thermo plastics and to the Solvents and/or Adhesives that may be used with the particular plastics involved.

**c. Paints**
This also indicates the specific thermo plastics and the paints that can be used with each.

As is the case with the plastics manufacturers, I too will hedge by making the statement that due to the variations that can and do occur in plastics, R/C Modeler Magazine and I assume no responsibility for the aforesaid information, but do believe that, through the best of the information available from other sources and my personal use, it is correct.

"Let me make this perfectly clear" - - - try it on scrap, so you do not make scrap.

Again, I would like to express my thanks to the many readers of this series. □

## PRACTICAL AERODYNAMICS

from page 56

move inward toward the airplane's centerline. The opposite is true when the right engine only is operating. The center of thrust is moved further from the centerline. It can be easily seen that loss of the left engine is more critical than loss of the right one.

Two factors which have lesser effects on the tendency of an airplane to turn left on take-off are gyroscopic precession, and the spiral nature of the propeller blast at slow speeds.

The propeller is, itself, an excellent gyroscope when turning. Like all gyroscopes, it tends to turn abruptly in a direction 90 degrees from any force applied to change its plane of rotation. This means that when the propeller is turning rapidly on an airplane at rest

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or rolling on the ground, raising the tail rapidly will tend to make the airplane turn right or left, depending on the direction of the rotation of the propeller. This effect is especially important in tailwheel-type airplanes with short fuselages.

The effect of the spiral characteristic of the propeller blast is another factor which causes a yawing movement to the left. When turning rapidly at slow flight or take-off speed, the propeller thrust air aft with considerable velocity. This blast of air does not flow smoothly aft from the propeller, but tends to spiral in the direction the propeller turns as it blows back past the fuselage or an airplane with a tractor engine arrangement.

With normal right hand propeller rotation, as seen from behind, the propeller blast above the fuselage is crossing from left to right at an angle as it moves aft. Since the vertical fin on most airplanes extends above, rather than below the centerline of the fuselage, it tends to be pushed to the right by the spiraling propeller blast. This force acts in the same direction as the other forces which tend to turn the airplane to the left on take-off.

It can be seen that the biggest problem a modeler has concerning the engine/propeller combination, is a yaw to the left. This problem can be easily controlled by the **correct** application of the rudder. The incorrect use of ailerons to control a yaw problem has caused many incidents of "re-kitting." The problem usually encountered on take-off arises when the modeler, trying to maintain directional control with the ailerons, just breaks ground. At this time torque, "P Factor," gyroscopic precession, and spiral charac-

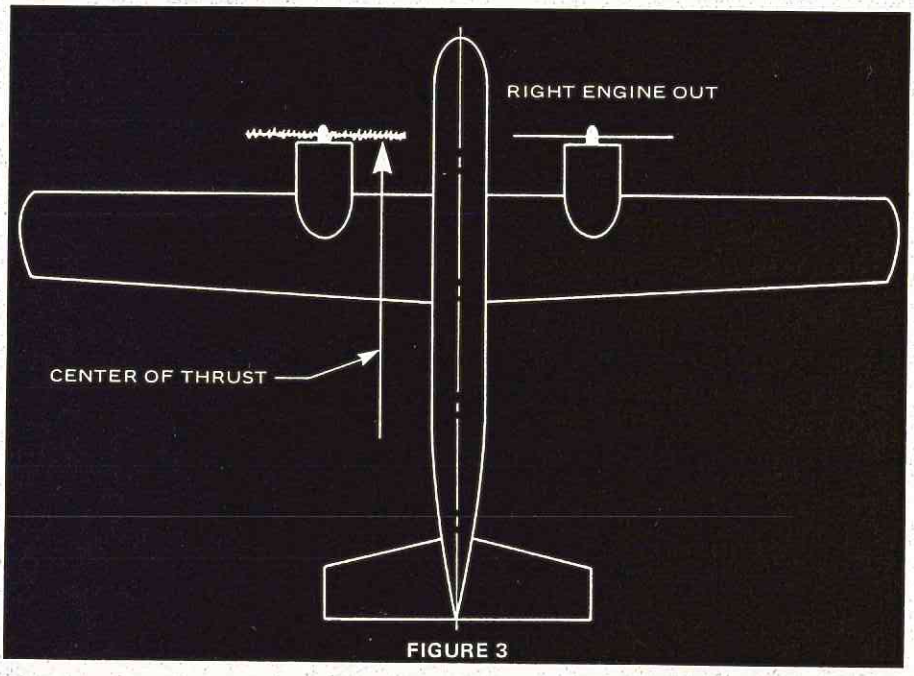


FIGURE 3

teristic of the propeller blast, are all trying to make the airplane yaw and roll to the left. Also at lift-off the model is operating near the stall angle of attack so - - - we now deflect a large amount of right aileron control. Remember adverse yaw?? Adverse yaw: A yaw in the opposite direction of the applied aileron, most pronounced at high angles of attack. So the intrepid modeler applies full right aileron and the airplane rolls to the left. The no good radio is stomped into the ground because quote, "I had full right in it and it rolled left."

Use the rudder to control yaw problems and this won't happen to you. □

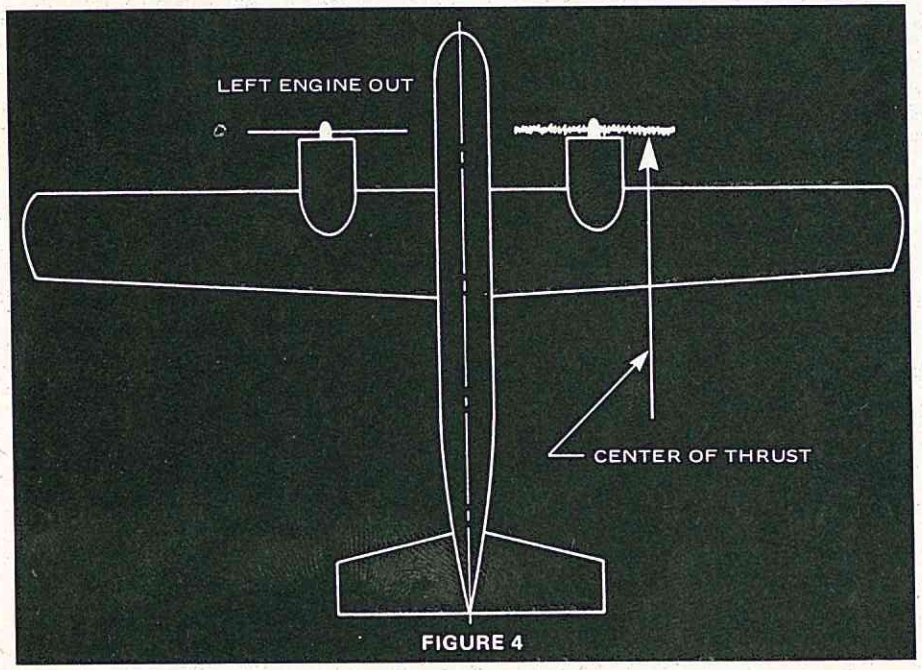

FIGURE 4

## JU-88

from page 51

yokes to allow the wheel collar and 3/32" O.D. slider-pin to ride freely but not sloppily. Jig the yokes to the angle shown on the plans and solder well with 50/50 solder and a good flux. Silver soldering has not proven necessary. Now make up the 5/32" O.D. brass tubing axle for the modified steering arm, and mount the 4-40 stud between the wheel collar/pin assembly and the arm as shown in the exploded view. Ensure that you have adequate clearances throughout the mechanism and that everything works smoothly

(no sticking permitted). If everything is made exactly as shown on the plans the gear will lock over-center in both the up and down position. Add a drop of oil to the yoke/slider interface and set the whole mess aside while you proceed to the next step.

**WING:**

A quick look at the plans will reveal that the wing center section is built on the bottom sheeting with the landing gear torsion block lying on top with the ½" x 1" balsa L.E. butting up against both these pieces. Note that you have to relieve the L.E. slightly to clear the landing gear mechanism. Install the bottom ¼" square spruce spar (note that it extends slightly on each side of the bottom sheeting). Add the 1/16" balsa ribs and then the top spar. Do not delete the 1/16" balsa shear webs between ribs – they add considerable rigidity to the structure. Sheet over the left and right halves of the center section leaving the fuselage slot open on top. Now build the outboard wing panels – make sure to build a left and a right one! Each panel is completed – including capstrips – before it is removed from the board. Now you can join the three wing panels together by carefully scarfing the spars to the angle shown on the plans. Re-inforce this joint very thoroughly. Use lots of glue and make certain the vertical shear webs are firmly in place. With the proper amount of dihedral, the bottom of the tip ribs will be 1-3/8" higher than the bottom of the center section. Now add the engine nacelle sides, install the 1 ounce fuel tanks, and epoxy on the ¼" plywood firewalls. Be sure to include the side-thrust off-set. Ensure that your tank plumbing will be trouble-free and then sheet over the nacelle tops and bottoms. Install the N1 and N2 parts at the same time. Install the landing gear retaining clips – I used some 1/16" ABS sheet cut to ¼" x ½". Now, provided you didn't get sloppy with the glue when you installed the maple torsion block on the center section sheeting, the landing gear should work just as freely now as it did before you built it into the wing. Mount the 2" wheels on the axles with soldered washers, wheel collars, or what-have-you. In any event, be sure that everything clears everything else when the gear cycles up and down.

**FUSELAGE:**

Cut both fuselage sides from equal density medium balsa. Now install the triangular stock along the top and

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bottom of each fuselage side – be sure there is a left and a right side – and also glue on the ¼" x 11/16" balsa doublers over the radio compartment. Install F2, F3, and the necessary blocks, sheet over the aft fuselage (note grain directions) and set aside to dry. Glue up the hatch and canopy blocks and fit in place on the fuselage. Note how the hatch is inset on the fuselage so that it cannot shift about when retained by the single 4-40 bolt that threads into the maple block adjacent to the wing spar. Once everything has dried sufficiently, carefully carve and sand away everything that isn't JU-88. Refer to the fuselage cross sections for the correct contours. When the fuselage is shaped and smoothed to your satisfaction, glue it to the wing. Make sure it's on squarely. Re-install the bottom block you removed to fit the wing in place and fillet the joints between the fuselage and wing to suit your fancy – remember that MonoKote type coverings don't like to stick to concave surfaces.

**TAIL SURFACES:**

Both the vertical and horizontal fins and control surfaces are made from straight grained medium density 3/32" balsa. These are only rounded on all edges with no attempt at an airfoil shape. It is best to cover these parts before they are glued into place on the model. I hinged all surfaces with MonoKote hinges. They are more than strong enough on a model this size.

**COVERING:**

I used Super MonoKote on my original – glossy Olive Drab on the upper surfaces and glossy White on the lower surfaces. The new mat finish OD and Dove Grey might look nice though. The German markings are cut from Super MonoKote and then carefully ironed on with a warm iron or, alternatively, could be cut from regular (sticky) MonoKote. I added a red band around the aft fuselage as well as red lower wing tips. The two cowlings were made from some 2½" diameter plastic bottles from the local pharmacy. (Thanks to Fred Reese's "Little Mulligan" RCM March, 1972, for this great idea.) The ones I used had Flowers of Sulphur in them, but they can be obtained with a variety of products. Just keep looking and suddenly you will see potential cowlings everwhere! Any printing on the bottles comes off with a little acetone. The cowlings mount to the nacelle sides with No. 2 x ¼" sheet metal screws in to the ¼" maple blocks shown on the plans. I used 1-3/8" Williams spinners. Relieve the prop slots on the spinners to clear the propeller blades, otherwise the backs of the spinners will distort when the prop is tightened down.

**EQUIPMENT INSTALLATION:**

If you use the Kraft "brick" just mount it in place on the bearers shown on the plans. Other equipment may need a different arrangement. The original JU-88 required no additional ballast to get the C.G. shown – please don't try to fly with a farther aft C.G. If you haven't done so yet, fabricate the trigger from a bellcrank (90 degrees) and some steel wire from a Kwik-Link – it's a tad over a 1/16" O.D. and has sufficient strength yet isn't too hard to form to the shape shown. Note the use of the Du-Bro E-Z Connectors and the cut down plastic clevis in the landing gear actuation pushrod. Adjust the pushrod so

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that extreme down elevator releases the trigger and allows the gear to be pulled down by a No. 64 rubber band that stretches to the nose block. (See photographs.)

**STARTING SEQUENCE:**

First, fill both tanks and connect both fuel lines after checking the filters for cleanliness (you will usually find the most amazing assortment of crud there). Now make sure your battery is good and hot, and prime both engines in the intake and exhaust ports. Turn the props until the pistons come up against compression and connect the battery to one engine. Remember that the starboard engine is L.H. As soon as the first engine starts, disconnect the glow leads and get the other one fired up too. Now, go back and tweak the needle valves until they both are running good – not necessarily equal and never too lean. The important thing is that they keep running until you are ready for them to stop – preferably at altitude. I have lost an engine on take-off and, except for a slight turn toward the dead engine while climbing, I had no trouble reaching a safe altitude. Just remember that the model definitely has a Vmc and you will be all right.

**FLYING:**

So far, the protoytpe has logged some 40 flights with no malfunctions other than an occasional gear-up landing when the flight batteries get too low to push the retract trigger free. Normally the gear works perfectly and is a real crowd pleaser. I would urge you to use Kirn Kraft needle valves on your TD's. They have an extra fine thread that lets you really sneak up on a setting. You can also order an entire TD .049 already set up with a L.H. crank and needle valve from Kirn Kraft, P.O. Box 224, Anaheim, California 92805. If you do use a L.H. starboard engine to eliminate having a critical engine-out situation because of torque (or P-factor) you will be limited to two propeller choices – Tornado yellow plastic 6/3's or 6/4's. That is all that is available in matching L.H./R.H. sets. Cox does make several L.H. props for their RTF control-line ships, but I have not been able to find R.H. props to match. Lots of luck to you, and just think how exciting (frightening?) a B-24 with **four** TD's would be! □

## KAVAN JET RANGER

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that hold the servo tray, and also the two ball links which tie into the collective pitch bellcranks. These are nearly impossible to install later!

Former No. 14 should be fitted to the rear of the fuselage, before gluing it onto the tail cone block. This former (14) should also be notched to allow the aluminum attaching strip to fit flush with its outside contour. After assembly and shaping of the tail cone, the balsa cone block **must** be hollowed to allow the tail rotor bell-crank to swing.

Unless you are a proficient helicopter pilot, we suggest adding 1/16" plywood reinforcement plates to the inside of the fuselage where the landing gear attaches. This will help to prevent puncturing the fiberglass on a hard landing.

Regardless of your construction stage, the following change is **important** and must be made. The two small bronze bearings, which support the stabilizer see-saw **must be soldered** to the rotor hub – Stabilit Express will not adequately hold onto the bronze bearing.

In balancing the main rotor blades, it should be noted that the actual position of the blade C.G. along the blade length is unimportant. It is important that the C.G. of each blade falls at the same point. By adding weight to the **lighter** blade, it is usually possible to move its C.G. to correspond to the C.G. location of the heavier blade, and simultaneously bring the blade weights into balance.

When balancing and adjusting the main rotor head, be sure to also balance the damping blades until the damper see-saw will set horizontal. This is easily accomplished by loosening the lock nut on the lighter (higher) side, and carefully unscrewing the paddle until balance is achieved. At this point, re-tighten the lock nut, and loosen the set-screws in the see-saw. Rotate the paddle until it is again at 0° incidence and lock the set-screws securely.

Once the rotor head and blades have been adjusted and balanced, it is a good idea to code mark each piece with a file mark, or paint mark, so that it can be reassembled with each piece in the same position. This also applies to the installation of the rotor head on the rotor shaft, orientation of the

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swash plate and the pitch control pushrods. The idea is, that once you have your ship accurately trimmed, you should be able to partially disassemble and reassemble without the need for re-trimming. Being able to re-install the parts in their original positions will help to insure repeatable adjustments.

The three pushrods that connect the swash plate to the bellcranks on the servo mounting plate should be 85mm, measured between ball centers. The two pushrods that connect the swash plate to the blade mixing levers should be 155mm, nominally, between centers. The tie rod, which keeps the swash plate from rotating, should be 90mm long, however, it may be necessary to add a small block to the top of the hatch former (9) in order to insure that the rod does not pull out when full forward cyclic pitch and maximum collective pitch are operated simultaneously. Further, full reverse cyclic and minimum collective pitch controls should not allow the tie rod to interfere with the tail rotor mixing bar.

The rubber damper which is installed in the main rotor see-saw must be cut in half, making it only one half as high. The upper portion only is used, and the lower half is discarded. This change will soften the head considerably, allowing a quicker response.

The actual trim and adjustment of the controls will take a considerable amount of care to complete correctly. Take the time to do it right, and do not attempt to fly unless **everything** checks out. Since the set-up of the throttle control requires a non-linear type servo output, the rotary (wheel) servo is a natural. We used Kraft KPS 14's in our system and have found them to work out quite well. We would recommend shimming the Kavan output wheels, supplied with the Jet Ranger, so that they will fit onto your servos regardless of manufacturer. Use of Kavan's wheels will make throw set-up easier. By using the servo arm lengths as shown on the **plans**, throws should be close to correct.

With the control sticks in neutral, and with full reverse cyclic **trim**, and neutral left and right cyclic trim, the swash plate **must** be exactly perpen-

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## KAVAN JET RANGER

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dicular to the main rotor shaft. Full stick movement, full left to full right, or full forward to full reverse, should produce a total of 6mm deflection in the swash plate as measured at the ball joints.

The control arm length on the collective pitch servo must be adjusted so that movement of the control stick from low throttle, high trim, to high throttle, high trim, moves the swash plate up the rotor shaft a total of 8mm. This dimension is critical, as it ties directly to the blade pitch and corresponds to a change in collective pitch from 0° to +6°.

The throttle servo, which is electrically connected to parallel the collective pitch servo, must have its linkage connected in a non-linear manner. At low throttle, low trim, the linkage connection should be about 90° to the servo (normal neutral). As the throttle is advanced, the carburetor should open quickly giving about 3/4 open at the half stick position. Advancing the throttle stick still farther, to 2/3-3/4 position, should produce full throttle. Any further stick advancement should not cause throttle change, but just increase collective pitch. It is important that the throttle control operate in this manner in order to effectively control the power of the main rotor. Briefly, the throttle servo and collective pitch servos should track as follows: Low throttle stick, low trim = engine off; Low throttle, high trim = engine idle, collective 0°; throttle 1/2 position, high trim = engine 3/4 power, collective pitch +3°; high throttle, high trim = engine full power, collective pitch +6°.

The tail rotor contol rod is connected to a mixing lever between the tail rotor servo and the collective pitch servo. The output arms on each of these servos should have a radius of 13.5mm, in order to obtain the proper throw. The control rod is positioned 40% (.4x) of the distance between the two servo connections, from the collective pitch servo. (If the distance between take-off points is 3", the rod would be .4 x 3, or 1.2" from the pitch servo.) This should give a tail rotor pitch change from +25° at maximum to −5° at minimum. Maximum and minimum position include total inputs from tail rotor and collective controls.

If these adjustments are all carefully made, your Kavan "Baby Bell" should be about ready for flight. Don't let the excitement of the moment cause you to hurry. There have probably been more helicopters crashed due to haste than from any other cause! Take the time to double check. Make certain that all hardware is securely in place. It is awfully easy to overlook a part that was "temporarily" installed while you were "hangar flying". Parts so installed are fine for indoor practice, without running the engine, but they part company pretty quickly when power is applied, so **be sure.**

Double check all control functions, both for amount of control and direction of control. Believe me, re-adjusting now sure beats re-building! A lubricator is supplied with the kit, use it to lubricate **all** moving parts.

You should now be ready to test "hop" your Jet Ranger. It is best to make the first tests without spectators, since they add both confusion and a hazard. Turn on the radio system **first.** Set the throttle at idle. This is **very** important and should be double checked before the starter is engaged. Starting in high throttle would be a disaster! We know!! The engine is started by engaging an electric starter (Kavan, of course!) onto the cooling fan spinner. Always hold the rotor head when starting, since this will keep the blades from turning due to creep in the clutch. The helicopter must be restrained, either by placing weighted boards across the skids, or by holding the tail boom from the right rear, just in front of the rudder, while adjusting the needle valve. The needle valve should be adjusted so that the engine just breaks into a two-cycle at the half throttle, or lift-off, position.

Using a photo eye tachometer (Royal Products has a good one), check the tail rotor speed at the half throttle setting. It should be 4600 rpm ±5%. A slower reading indicates too much collective pitch thus loading down the engine. A faster read-out indicates insufficient collective.

Kavan's drawings show how to build a blade tracking checker. We made a simpler unit by stretching a piece of masking tape across the ends of a small wooden slat, making a bow. Apply red chalk to one blade tip, and blue chalk to the other, then bring the throttle to the mid-position. The

masking tape is then carefully tilted in toward the rotating blade tips, until they just nick it, leaving two chalk line traces. The blade pitch angles are carefully adjusted until the traces coincide, indicating perfect blade tracking.

Cyclic pitch trimming can be accomplished slowly advancing the throttle, while holding the model by the tail boom. (A face mask and/or safety glasses are recommended.) As the ship lifts, any roll or pitch tendencies can be trimmed out using the trim levers.

The model must be allowed to lift unrestrained in order to adjust the tail rotor. Ideally trimmed, the model should lift straight up, with no tendency for the tail to rotate. As you become more familiar with your new ship, you will probably find that increasing collective pitch will cause the tail to try to rotate (since collective has an input to the tail rotor). If the tail turns to the left as collective is increased, then the control ball on the mixing lever must be moved closer to the collective pitch servo. Obviously, if it goes to the right, it would be moved away. The ball should only be moved about 1mm at a time, until a steady control results.

With the model properly adjusted, all that remains is the adjustment of the pilot (also referred to as the "nut on the stick"). Getting this adjustment is a matter of time and patience. Progress slowly and you **will** progress. Progress rapidly and you will crash!

If you can obtain personal assistance from an experienced helicopter pilot, by all means do so. If, as is more likely the case, you are on your own, proceed with caution. Try to decide in advance how you will approach learning to fly. There are many conflicting articles, some advise tethers, some don't; some advise dead calm, others a breeze, etc. There is just no one set method.

It has been our experience that flying with tether lines is both confusing and dangerous. Use of a wide landing gear has been a far better approach. A **light, steady** wind seems to make the task easier since, with the addition of a slight amount of forward cyclic control, the chopper has something to "lean" against. In a dead calm you must expect it to move in any direction! The Kavan Jet Ranger gear sets at a slight forward tilt (as does the full-size Bell), therefore, if properly trimmed, the ship will lift with a forward motion. If you are just beginning to fly helicopters, it would probably be wise to trim off the rear gear legs so that the main rotor shaft sits vertical, and the ship will lift straight up.

**Always** keep the nose of your chopper pointed directly into any existing wind. Try to advance the cyclic pitch so that the ship rises quickly to 2-3 feet and hold this altitude. Concentrate on keeping the tail from rotating. You must also keep

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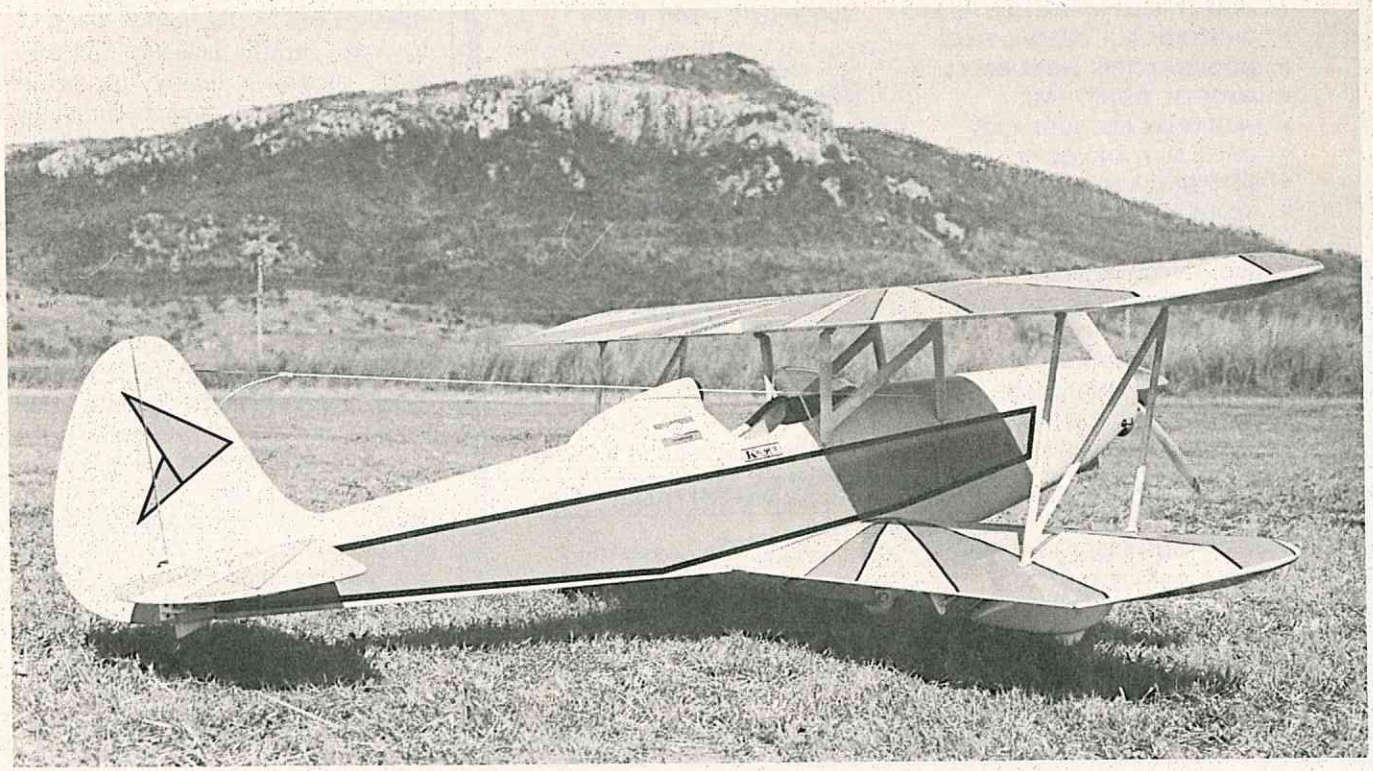
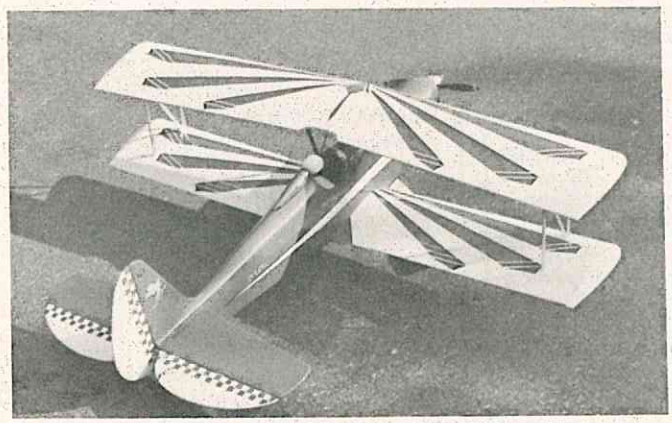
R/C MODELER MAGAZINE'S

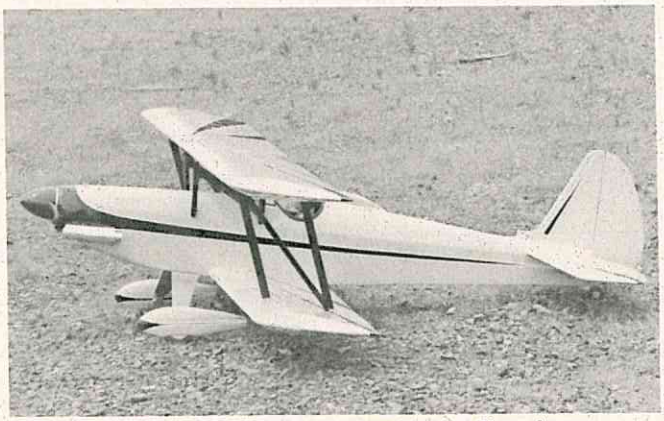
# ACRO-STAR CONTEST



1st Place: Peter Foxton, Queensland, Australia



2nd Place: L.G. Deitz, Jr., Charlotte, North Carolina



3rd Place: Edmond Slegers, Hackettstown, New Jersey

**PETER FOXTON**, 87 Bergin Road, Cranbrook, Townsville, Queensland, Australia, won **FIRST PLACE** in RCM's Acro-Star Contest with his H.P. .61 powered, 7 pound Acro-Star. Radio used was a Kraft 72 six channel. Pete's purple and yellow biplane featured a fuselage and tail surfaces covered with silk and ten coats of clear dope, followed by one coat of auto primer and four coats of acrylic lacquer. The finish was then hand rubbed and polished with Turtle Auto Body Wax. Wing covering and all trim is KwikCote. The **SECOND PLACE** winner, **L.G. DEITZ, JR.**, 6704 Woodstock Drive, Charlotte, North Carolina 28210, entered a 6.4 pound Acro-Star powered by an inverted Fox Eagle .60. Radio used was a Kraft 4 channel, Series 71. Finish was red MonoKote with white and black trim on the fuselage and white Solarfilm with red and black stripes on the wing. **THIRD PLACE** winner, **ED SLEGERS,** 25 Mitchell Road, Hackettstown, New Jersey 07840, powered his Acro-Star with a Fox Eagle .60. All-up weight was 7 pounds, 2 ounces. Radio used was a World Engines Blue Max. Ed covered his airframe with Coverite followed by K & B Primer, followed by yellow and black K & B Superpoxy. Pinstriping was DJ's Trim Tape. Entrants description of flying characteristics were virtually identical - - - all pattern maneuvers done with ease along with exceptional slow flight characteristics.

## KAVAN JET RANGER

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the ship from moving fore and aft, or sideways with cyclic control. Set down by very slightly reducing collective pitch, increasing briefly just **before** touchdown. Early attempts during this period will most likely be very frustrating, but each **small success** will be a **triumph**. During training, we have found a smooth surface to be best, since it is less apt to catch the skids and tip the ship over. Do not attempt to hover an inch or two above the ground, as this increases the risk of tipping. At this point you are also in a turbulent ground effect from the blade down wash. Just as you don't fly too low, don't let the machine get above your height. There is something hypnotic about those whirly blades, and once the ship is climbing above you, you will most likely stand there and just watch it go up! Stick to the 2'-6' range until **you** feel you have it mastered. As you become more relaxed, try adding a little forward cyclic and begin forward flight. Follow the ship, staying about 10 feet behind it.

If you have gotten this far, you are flying! Continue to practice, gradually increasing hovering height, until you have completely mastered it to 25'-30'. Forward flight should be rather easy by comparison, and you can work into it gradually.

Franz Kavan has, in the past few months, sent his representatives on an around-the-world tour. The purpose of this tour was to demonstrate the Kavan Jet Ranger and to talk with Jet Ranger owners. Where problems were encountered, they helped with solutions. We had the pleasure of meeting with Franz Kavan, Adrian Nagy, and Dieter Ziegler, just prior to their departure for home. During their tour, they encountered numerous cases where the Jet Ranger seemed to lack enough power to fly correctly. Kavan immediately enlisted the aid of one of his countrymen, an expert on rotor blade design. All available information was fed to Professor Wortman, who has incidentally done work for Bell. The data was fed into computers, and an optimum rotor blade designed. The results were quite close to the blade supplied in the kit. So close, in fact, that by merely angling the front of the trailing edge section as shown, and thinning the trailing edge, the

optimum blade is achieved. If your blades have not been assembled, we suggest that they be modified as shown. If your blades are completed, and you have no problem, forget it until the next set. On the other hand, if you are having power problems, we would suggest cutting the blades and reassembling them. If your ship is grossly overweight, it would be wise to increase the angle on the front of the trailing edge so that the blade resembles a flat bottom Clark Y airfoil. It seems that the blades, as supplied, are adequate under most conditions, but extremely high altitudes and/or hot weather require the added lift potential of the modified blade.

We have thoroughly enjoyed working on the Kavan "Baby Bell" Jet Ranger. It has been an interesting and satisfying project. A mechanically and aerodynamically intriguing machine which has been well designed and beautifully manufactured. There were a few "bugs" in the instructions, but these have been corrected. We feel that the "Baby Bell" is an unusually well done kit, worthy of the effort required to build and fly it.

The Kavan Jet Rangers are flying! They are available at your local hobby shop, so why not join in the fun? If you do purchase one, please remember to ruturn the registration card! It's there to help you.

During our visit with Kavan, we managed to uncover some of his plans for the future, and even to obtain some of his new "goodies." In the near future, we will bring you these latest advancements.

Till then, land softly! □

## ANOTHER LOOK AT FORMULA I

**from page 36**

Safety equipment, personnel control and procedures are vital, but they are not enough. There is a mandatory aircraft inspection to validate its structural integrity. If the model does not pass inspection, the discrepancy must be corrected before the aircraft can participate in a race.

So far so good, and now we come to the human element. Fortunately the racing fraternity is small enough that when anyone in Southern California builds and test flies a racer it becomes common knowledge and the racing group is aware of his piloting ability before he ever enters a race. If he is unknown, he must demonstrate his ability to the Contest Director

before the race. This is rare because, usually, an experienced racing pilot has already coached him prior to his entering his first race.

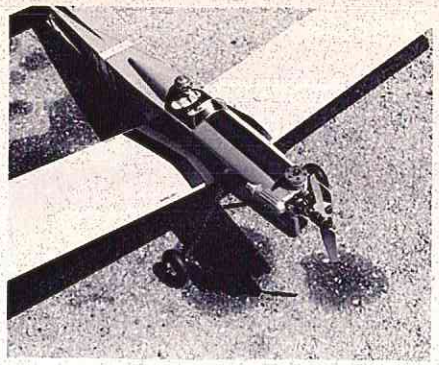
My opening paragraph said that my reflexes are too slow to race. Just because I'm slow doesn't mean that everyone is in the same league! Every sport has its championship athletes who excell because they have it all together. In Formula I, you will find Jeff Bertken, Larry Leonard, Dan McCan, Kent Nogy, Terry Prather, Ron Schorr, Bob and Charlie Smith, Jack Stafford, Whit Stockwell, Cliff Weirick (these are only a few of many excellent racing pilots) who have the championship talent to not only fly Formula I by their natural instincts, but to properly attend to the dozens of details that result in consistency and the additional few mph necessary to win in a Formula I event.

I have covered my share of model events for publication in RCM and I have, indeed, seen pylon races that were dangerous. Dangerous simply because the contest management and the pilots seemed more concerned with various problems other than safety. I must also add that I have been horrified at far too many Pattern and Scale contests that were so dangerous that I was glad when the event was over. Scale R/C ships turn me on but Scale contests are notorious for being run in an unsafe manner with too many incompetent pilots flying aircraft that never should have been allowed outside the builder's workshop. I'm not intentionally knocking anything – only relating what I have seen.

So what is the point of this article? Sound common sense applied by both the racing pilots and the critics appears to be the answer. The excitement of getting to the finish line first is universal, so why try to kill it? Rather, do it safely. District X does.

The NMPRA District X leaders have done a remarkable job in their concept of safety regulations and equipment that offers the utmost protection while not inhibiting the progress towards faster races. Anyone fortunate enough to visit Southern California over the Thanksgiving weekend will have the opportunity to see all this at the NMPRA National Championship Pylon Races co-sponsored by R/C Modeler Magazine. If you plan to enter, be prepared to conform to these sensible safety regulations and enjoy racing against the world's fastest Formula I flying machines.

Turn! □



## PORTABLE PRONTO

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*of 2½ ounces.*

*Another modification that we have made to all of our Prontos is to add a false rib from the main spar to the leading edge dowel between each of the main ribs for the full span on each wing panel. This prevents the Solarfilm from sagging between the main ribs due to the distance between each. Another wing modification was to drill each rib ¼" O.D. and install a fiberglass arrow shaft in each panel using Formula I Hobbypoxy glue. This strengthens the wing immeasureably for high-G maneuvers and prevents the wing from warping during the application of plastic film coverings. Even with the addition of the fiberglass arrow shafts, the false ribs, the wing joining blocks, arrow shaft joiner, and other modifications including the soft balsa block wing tips illustrated in Mac's article, the total weight of the Pronto wing is only 9 ounces!*

*With respect to the control system, our first Prontos utilized standard individual component servos and separate receiver and the overall radio compartment was rather tightly packed. In the prototype shown in the accompanying photographs, we used the new Kraft 3 channel "brick," consisting of a receiver and two servo "brick" units with a separate servo for throttle. As you will see from the photos, the "brick" system with its individual plywood servo tray takes far less space in the radio compartment.*

*For the control linkages, we utilized Hi Johnson Model Products pushrod plugs in fiberglass arrow shaft pushrods. These plastic pushrod plugs fit snugly inside a fiberglass arrow shaft and are threaded 2-56 for Johnson stainless steel pushrods. We used Hi Johnson Rod Ends to conventional control horns at the control surfaces which completely eliminates all binding and provides 40 degree spherical movement to insure smooth control as well as total control response with no slop. These stainless steel Rod Ends are a ball-and-socket arrangement which are, in effect, miniature aircraft fittings and just about the finest control fittings of their type we have ever seen.*

*From this point on we will turn the podium over to Mac McCracken so that he can describe the techniques he uses to make the Tidewater Hobby Enterprises "Pronto" a truly portable machine. - - - Don Dewey*

Those living in warmer climates probably do not consider how a Minnesota resident appreciates the opportunity to fly in January! Normally, we are recycling our batteries once a month and waiting for April or May to come along. This year, however, I decided to take a plane along to Mexico on vacation to a small fishing village on the Pacific Coast southwest

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## PORTABLE PRONTO

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of Mexico City. There is a small beach approximately 100 yards long with the ocean on the left, cliffs on the right, and rocks approximately 10'-12' high on either end. The width of usable runway varies between 6'-20' depending upon the tide.

Having been impressed with the maneuverability of Tidewater Hobby Enterprises Pronto, I felt it would be ideal if it was modified so that it was more portable. The following changes were made:

The fuselage, forward of the wing, is ½" deeper to accomodate a 4 ounce tank and a 4AA battery pack. All flying surface tips were rounded for a different appearance. A piece of 1/8" plywood was mounted at the rear of and parallel to the top of the fuselage to form a stabilizer mount. It contains a slot which accepts a tongue lock in the stabilizer and two 3-48 blind mounting nuts to attach the rear of the vertical fin and the horizontal stabilizer to the fuselage. Hardwood inserts at the rear of the dorsal fin and bottom of the rudder accept 1/16" wire pins to position the vertical fin and secure the 1/16" tail wheel wire.

The wing was constructed in one piece according to the plans. A space was then cut from the center ribs, aft of the spar, and a hardwood block drilled to accept a section of 5/16" diameter fiberglass arrow shaft was epoxied to the rear of the spar filler blocks. Two additional drilled blocks were mounted adjacent to the number 3 wing ribs at the spar junction. (These blocks were mounted with the arrow shaft in place.) After the epoxy set up, the wing (with the arrow shaft in place) was sawed in half at the center line. The original pieces of arrow shaft were discarded and a new piece inserted. The procedure guaranteed perfect alignment and fit.

To mount the wing, a hardwood block is mounted in the fuselage above the trailing edge with the proper dihedral angle. 1/16" plywood doublers are mounted on the bottom of the wing and holes drilled through and threaded into the hardwood block to

accept two nylon bolts. At the front of the wing small pieces of 1/8" plywood were epoxied to the center rib and leading edges. A piece of Scotch Ply reinforced plastic *(we used aluminum – Ed.)* was made into a plate to extend from the rear of the landing gear over the pieces of 1/8" plywood in the front portion of the wing. Two sheet metal screws attach the plate to the wing and one nylon screw to attach the plate to the fuselage. With this system, the wing can be removed in one piece with the three nylon screws and still maintain alignment. To reduce overall height for shipping, the pilot is attached with a mechanical fastener.

The shipping carton is made from corrogated box material. It is larger than necessary, but has plenty of room for plane, transmitter, spare parts and tools, plus lots of plastic foam. Its size is well within airline requirements which allows it to be shipped as baggage (total weight, 14 lbs.).

Twenty-four flights were made in 10 days with good results and all landings were made on the beach! Spare parts were taken, but not required. Two quarts of fuel were consumed with the original glow plug and prop. A Perry carburetor provided good response and idle on the O.S. .15. The LRB 3 channel proved very reliable.

If anyone wants a plane that will travel, this is a simple and proven system and can be utilized on virtually any plane of any size. □

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the model aviation industry.

In November 1963, Ken Willard, former Nationals winner and world renowned RC modeler, wrote his first column for RCM and has appeared monthly ever since that time. Ken's column is one of the most popular among RCM readers and, from the beginning, Ken has been known as the Chief Sunday Flyer - - - his monthly columns and his aircraft designs geared to the sport flyer who constitutes 95% of our readership. Ken, by the way, is the Manager of Administration, Missile Systems Division, at Lockheed Aircraft in Sunnyvale, California.

The sixth issue of our publication was an issue that combined 2 months in one – simply because the publica-

tion was growing faster than we could grow necessitating borrowing close to a quarter of a million dollars in order to keep the publication on its feet! That issue marked our first full color cover and set a precedent in model aviation publications by being the first to use "slick" paper. Shortly thereafter, RCM set another modern-day precedent by incorporating the use of full color inside the magazine.

1964 also marked the first article by Chuck Cunningham who reached instant popularity with our readers with his money saving construction tips and "quickie-built" aircraft. Chuck, Comptroller for Thornton Steel Industries in Fort Worth, Texas, is also Vice President of R/C Modeler Corporation.

1964 also marked the first contributions by Dick Tichenor, RCM's senior staff photographer and one of the finest model aviation photographers in the world today. Dick is also a Project Engineer for Rockwell International Corporation in Southern California.



In 1965 Dick Kidd joined the staff of RCM on a part-time basis and has been doing the drafting and technical illustrations for RCM ever since. Dick, Executive Vice President of R/C Modeler Corporation, joined the staff on a full time basis in January 1973.

In 1965, Jerry Nelson and R/C Modeler Magazine suggested the forming of the National Miniature Pylon Racing Association and, shortly thereafter, RCM agreed to subsidize the new organization and handle the administrative details for that group until it was self-supporting. This was the first introduction of Formula I racing to the R/C modeling fraternity.

Also in 1965, RCM introduced Bernie Murphy and his Kits and Pieces column with RCM's totally different approach to kit reviews and product evaluation. Today, Bernie is our Photography Editor and is responsible, not only for his own photographic efforts, but for processing and printing all of the black and white and some of the color work used in the pages of RCM. Bernie is an Engineering Designer with Tcom Corp., a subsidiary of Westinghouse.

In August of 1965 RCM presented the first of a series of articles on the Digitrio proportional system designed by Ed Thompson – the first complete construction article for a digital proportional system ever presented by a model aviation publication. Well over 3000 of these digital proportional systems were built by RCM readers and many of them are still flying today. In the following year, we presented our first coverage of the Weak Signals Toledo Conference which was attended by 3300 people. This year, in 1973, over 10,000 people attended the Toledo Conference, the world's largest RC trade show.

RCM presented its first Reader Interest Survey in 1967. This comprehensive survey was another landmark among model aviation publications and gave the reader a chance to clearly express his likes and dislikes concerning RCM, and enabled us to add or delete from our publication according to the wishes of our readers. This survey has been conducted on an every-other-year basis since that time.

In October of 1967 RCM presented the first article on RC helicopter aerodynamics although, at that time, R/C helicopters were considered to be an "impossible dream."

In April 1968, Dick Sonheim, Vice President of Transo Envelope Co., joined the staff of RCM on a part time

basis and has acted as one of our field representatives and test pilots since that time.

1968 was the year in which RCM introduced biplane racing and created and introduced the Quarter Midget event which, today, has reached an all time high in popularity. 1968 also marked the first Winter Nationals, the nation's largest all-RC event which was created and sponsored by R/C Modeler Magazine at Marana Air Park in Tucson, Arizona, each Thanksgiving weekend. Hosted by the Tucson RC Club, the Winter Nationals draws contestants from every part of the United States to compete in this three day RC extravaganza.

In its early days RCM first predicted that the digital proportional system would eventually replace the then popular analog system – a prediction that drew criticism from virtually every part of the industry. Also, the new Pattern rules were presented first in their original concept in these pages.

In 1969, Clarence Lee, considered to be the world's foremost model aircraft engine authority as well as designer of the famous Veco engines, joined the staff of RCM with his column Engine Clinic – a column that has consistently rated number one on the Reader Interest Survey since it first appeared. Also, during the same year, Dave Platt, one of the nation's best scale modelers, added his Scale In Hand column to the publication. During the next two years, the staff of RCM added the Anthology Library Series in order to offer our readers a comprehensive series of books on the many highly specialized facets of our sport and hobby. Half-A racing was presented in 1971 in the pages of RCM and, in 1972, the Falcon Tournament Rules were presented as the first National Contest for the beginner and sport flyer in RC. It was also during this period that the publication pioneered the Stand-Off Scale event which is so popular today.

Ten years later, RCM consists of 124 pages, including covers, and is supported by approximately 110 advertisers per month. Its combined primary and secondary circulation is 125,000 copies per month, distributed in the United States plus 25 foreign countries. Since 1963, R/C Modeler Corporation has been a California Corporation with its home offices in Sierra Madre, California. The Board of Directors consists of Don Dewey, Chairman of the Board and President; Dick Kidd, Executive Vice President; Chuck Cunningham, Vice President; and Pat Crews, Secretary-Treasurer. RCM is a closely held corporation with controlling interest owned by Don Dewey and the balance of the stock owned by Patricia Crews, Dick Kidd, Chuck Cunningham, and Ken Willard.

In December of 1972, R/C Modeler Magazine purchased its own building, a 6000 square foot facility that was originally a Ford dealership. After completely remodeling the building to house its executive offices, and landscaping the exterior, the home office is now open to modelers visiting in Southern California.

Heading up RCM's home office staff is Don Dewey, Editor and Publisher, whose primary function is to assign staff written articles, purchase free lance material, test and evaluate new kits and related products, and test fly various commercial and free lance designs. In addition he is responsible for the design and layout of each monthly issue.

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## ANNIVERSARY PICTORIAL

**from page 103**

Patricia Crews, who has been with the magazine since its inception in 1963, is the Executive and Managing Editor and, in that capacity, is responsible for all business matters pertaining to the Corporation. Her assistant is Pat Johnson, RCM's bookkeeper. Beverly Calhoun is RCM's Receptionist and is in charge of billing as well as processing plan orders. Beverly also serves as Secretary to the Editors.

Sheila Pierce is in charge of the Subscription Department and is capably assisted by Johnny Noah and Jane Wall. These girls are responsible for the new and renewal subscriptions as well as the many changes of address that come in on a day-to-day basis.

Linda Whitaker handles the Mail Department while Andy Heller fills the plan orders ordered by RCM readers and processed by Beverly.

In the Editorial and Graphic Arts Department, Susan Steele lays out and prepares the final artwork and mechanical for each issue of RCM. In addition, she is RCM's direct liaison with all advertisers and coordinates advertising space and final art.

Barbara Richardson is our Graphics Editor and sets all body type which appears on the pages of RCM on our IBM Composer, a computerized high speed typesetting machine.

Rita Lord is an Assistant to the Editor and is responsible for "in-house" photography as well as photographing local flying events and flight test evaluations.

Bill O'Brien, member of the Los Angeles County Fire Department, has been the chief Test Pilot for RCM since 1963. Bill is a competent pilot with all forms of RC aircraft, and not only tests and evaluates new designs, but travels to various flying fields throughout California so that modelers in those areas can see some of the newest product releases.

Joe Bridi, internationally known Scale, Pattern, and Formula I pilot is an Associate Editor for RCM and is our direct link with the contest circuit. Joe serves in an advisory capacity on all contest matters.

Other members of RCM's Field Staff include Tony Estep, a securities analyst with Bache & Co., whose monthly column, Basic Sailplane Design, originates from his home in St. Louis, Missouri. Mike Ilyin, currently authoring the series entitled, Practical Aerodynamics, is a Captain and pilot with Delta Airlines who makes his home in Aurora, Illinois. As previously mentioned, Bernie Murphy is our Photography Editor and, since his home is located in Linthicum, Maryland, serves as our Press Representative in the Eastern part of the U.S.

In the Midwest, Jim Simpson, an Air Force Captain and Strategic Weapons Officer serving with the Strategic Air Command, is a special assignment representative and has been active for many years in both pylon racing and Pattern contests. Jim was one of the creators of the RCM-sponsored National Falcon Tournament.

Harold Osborne is a renowned draftsman who has been contributing his talents to the pages of RCM with the RCM Scale Plans of full-sized aircraft.

In addition to the above, there are numerous foreign correspondents including those behind the Iron Curtain, who keep us posted on R/C events throughout the world.

Whatever success RCM has achieved

SOLARFILM 3/$14.75, 4/$18.50; Trans. 3/$16.00; CARL GOLDBERG Hinges small 3/$4.20, large 3/$4.95, steerable nosegear $2.00, RETRACTS nosegear $8.00, main $11.00, trike $18.00, Sr. Falcon, Skylane 62 $27.00, Ranger 42, Falcon 56 $15.50, Skylark $18.50, Major fittings No. 1 or 2 $3.00, 3/$8.40; ACE WARBIRDS $13.50 ; DU-BRO AL-295 $2.25, 3/$6.30, 15 hinges 3 for $5.25, 505 Whirlybird Helicopter $82.50, Prop Balancer $2.42, KL-12 12/$4.35; DUMAS Mod-Pod $12.00, Evolution or Sport Evolution $15.00, Evolution II $11.20, HiLo $18.50, HiPro $28.50, HYDRO PLANES Miss Unlimited $12.00, Dragonfly 60 $34.50, 40 $26.00, 20 $17.50, PT-109 $19.50, Swamp Buggy $13.00; PILOT Cardinal, Cherokee, Olympia, $28.00, Shellfly (B), Skywagon, Skynight $40.00, Cavalier $56.50; REUTHER'S Fiberglass 1/4 Minnow $30.00; PERRY CARBS (state engine) large $10.00, small $8.00, micro $7.75; T-PINS $1.20; Francis Products Surfacing Resin 3/$11.85, 6/$22.00; Devcon $1.75, 3/$4.80, STERLING Lancer SL-62 $28.00, Piper Super Cruiser $27.25, Mighty Mambo $23.00, PT-17 $39.00, Fokker D-7 $35.00, Lancer 1-34 Schweizer $22.00, Schweizer 1-26D $16.50, Fledgling $20.00; ANDREWS A-Ray $22.00, Trainermaster $27.00, Sportmaster, Aeromaster $32.00, H-Ray $16.50, S-Ray $14.00, Minimaster $22.75; Maco Jet Star $35.00, Vega $37.50; LANIER Jester $39.50, Comet II $35.00, Maverick $31.50, Cessna $27.50, P-51 $35.00, Invader $39.50; ROYAL Corsair, Focke Wulfe 190 $56.50, Little Stinker P-38 $52.00, Cessna 310G $60.00, Spirit Of St. Louis, $40.00, Aquarius $49.00, Cessna 182 Sr., Hein Sr. $44.00, Hein Jr., Zero Jr. $28.00; SULLIVAN tank parts 3/$2.00, TANKS R-1, 2, C-4, SS-2, 3/$1.00; R-6, 8, C-8, RST-4, SS-4 $1.15; R-10, 12, 16, RST-6, 8, SS-6, 8, $1.30; RST-10, 12, SS-10, 12 $1.40; FOAM CELL TANKS CR-4 $1.30, CR-6, 8, CRST-4 $1.40, CSS-4 $1.40, CR-10, 12, CRST-8, CSS-6, 8 $1.60, CRST-10, 12, CSS-10, 12 $1.75, PARTS Kit 3/$2.25; WILLIAMS SPINNERS 1½ $.75, 1¾ $.90, 2 $1.20, 2¼ $1.25, 2½ $1.50, 2¾ $1.65, 3 $2.90, 3½ $4.00; MINI-FLITE T-Tail Rivets $22.00, Jungemeister $35.00; RC ENGINES: Fox .15 $12.00, .19, .25 $14.75, .29, .36 $17.50, .40 $19.00, .60 Falcon $26.60, .60 Eagle $37.75, .78 $49.00, Conv. Spinners 1¾ $4.50, 2 $4.80, 2¼ $5.10, Slim Jim Spinners 1½ $4.50, 1¾ $4.80, 2 $5.10, 2¼ $5.60, 2½ $5.95; VECO .61 $52.00 (includes muffler); K & B .40 (front and rear) $25.90, .15 RC $25.90, .15 C/L $24.50; MERCO BLACKSTREAK .29 $22.00, .35 $23.50, .49 $45.00, .61 $49.00; COX CL Tee Dee .010-.051 $9.10, TD .09 $10.50; ENYA .09 $13.00, .15 $15.00, .19 $16.50, .60 $52.00; WEBRA .20 $25.50, .40 $56.00, .61 $74.00; HP .40 front $40.00, .40 rear $54.00, .61 $56.50; ST Engines .23 $29.00, .51 $27.50, G.60 Bluehead $49.00, ST Mufflers .15-.23, .29-.46, .51-.56, G60 $8.50 2/$16.00; OS MAX .09 $11.50, .10 $13.00, .15 $16.10, .20 $16.50, .25 $17.50, .30 or .35 $19.25, .40 $31.50, .50 $42.00, .60 $49.00, .31 Wankel $70.00, OS MUFFLERS No. 701 $3.25, No. 702 $5.50, No. 703 $7.00, No. 704 $7.50; JACK'S Scooter II $15.50, Du-Bro Hughes $295.00; Bell Huey $300.00.

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during the past 10 years is due in large part to the untiring efforts and devotion of these people to produce a magazine that is unique among model aviation publications – one that is written exclusively for the radio control sportsman. And, to all of you, our readers, who have made these 10 years possible, we would like to say "thank you." In addition, we would like to extend an invitation to each and every one of you to stop by and say hello when you're in Southern California. □

## MINI STIK

from page 24

.15, but no further with full-house multi.

Now, for flight. It will do everything its mommy and daddy will do and maybe a couple of things that they're scared to try. Take-offs are simple, just steer and hold some "up." If your engine is running well, pull up to sixty degrees and climb out of sight. When flying the pattern, be sure to use rudder, as necessary, for tracking during loops since it is short coupled and has fair torque. Rolls are so fast that you lose count after three. Spins can be recovered after three by releasing controls. After **more** than three spin turns, give a little down for recovery. Snap rolls are recovered by releasing controls, this wing is not prone to sudden "cut-off" or unintentional snaps, so don't worry about it.

Landings take the same technique as any hot aircraft. For the record, I **have** landed it without power a number of times when making tank experiments. Just **keep the speed up** right down to the ground, then flare and you're in. Ordinarily, I trim in some up and then use the throttle for altitude control. Better land "over your shoulder" the first few times until you've received your fighter wings. After landing, slam on the brakes with full down until it comes to a stop. Then taxi back and park it by the tool box; pull the throttle trim back to kill the engine, then casually saunter over to turn off the switch while you hide your delight at being the first kid on your block to have one.

"Well, Wagger," mused Walt, "this must just about **end** your search for the small multi airplane. Where do you go from here?" □

from page 16

**possible**. The paint, if allowed to dry before removing the mask, often forms a hard skin which tears on mask removal, giving a ragged edge.

**Problem 2** is the annoying "lip," or change of level, where the color division occurs. This "lip" is probably entirely acceptable when we are making a regular sport job, but cannot be tolerated on a scale model. The things which exaggerate this effect are a) a paint with poor hiding (covering) power causing 2 coats to be necessary, and b) brush application, which inevitably results in a thicker coating of paint. When the trim colors are applied by airbrush, using a densely pigmented paint, it needs only a very fine coat (really just a fine mist) to give solid coloring and "lipping" will not be a problem.

The last problem, **number 3** is the easiest to beat. This is that tapes are invariably too narrow for any kind of large design. Imagine, if you dare, the hundreds of separate little pieces of 1/2" Scotch Tape it would take to mask a large registration number or even a small military serial number, or such an item as a swastika.

What we need, evidently, is a large sheet of clear sticky-backed material. Just to be exact this is made by the Fas-Cal people and this material is sold very cheaply by the yard (26" wide) in some model shops. We can't give you a list here but we know that Al's Hobby Shop in Elmhurst, Illinois, stocks the material.

This is precisely the material we use for all of the markings on our own models and the procedure is utterly simple: Cut a piece of Fas-Cal large enough to cover the entire design to be painted. Lay down on the model, smoothing out the large wrinkles only. With a **sharp, new** X-Acto or single-edge razor blade, cut around the design required over the pencil lines visible underneath and lift out the piece. Press down the edges well. Don't bother about air bubbles or wrinkles elsewhere, they won't hurt anything. Next, spray in the design, and remove the mask. Some tips on using this method:

1. If you make an error while cutting out the mask, start over with a new piece. Do not make patches. The glory of this method lies in the one-level application. Two levels of material will (as with tape) cause paint runs **under** any overlapped corners in spite of vigorous pushing down.
2. Don't try to use a mask twice. It's false economy. Use a new piece each time if you have the same design appearing more than once on a model.

Using the Fas-Cal, we have been able to successfully paint the most intricate designs, such as squadron crests, fine lettering, etc., when the task appeared all but impossible at first sight.

Finally, let us mention a couple of obvious, but nonetheless important, reminders on general paint-trimming techniques:

Apply lightest colors first, darkest colors last.

If you make a mistake, let the paint dry and overpaint it. Any attempt to scratch away at it at the time will get you in a worse mess.

Let paints dry **thoroughly** before laying masking materials over them.

When spraying or airbrushing the markings, place additional newspaper masks over the parts of the model adjacent to the masked area. Paint spray gets **everywhere!**

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## SCALE IN HAND

from page 108

Well gang, this ends a somewhat lengthy, but much requested, in-depth study of finishing techniques. We hope you found some help here. If so, tell the editor. If not, we hope that our next series, concerning Stand-Off Scale design, will be to your interest.

Letters, etc., to Scale in Hand may be sent directly to: Dave Platt, 6940 N.W. 15th Street, Plantation, Florida 33313. □

## TURN!

from page 12

Again, no one is better equipped to run such an event than the NMPRA. It doesn't require any changes from anyone except the membership themselves. ALL other provisions are already there including KITS, ENGINES, AND LOTS OF INTERESTED BYSTANDERS. What is missing is the guarantee that the event would stay that way and not evolve into the problem we have before us now. I have only heard of three suggestions for this which are:

a. The previously discussed claiming clause, which should be set at $60.00 if the new rear rotor engines are to be allowed, otherwise it should be limited to $36.00.
b. Automatically disqualify anyone who completes the 10 lap race in less than two minutes.
c. The new RCM 15-500-FR event wherein the wings of our planes would have to be modified up to 15% minimum thickness, 500 square inch minimum area and restricted to FR .40's only.

Besides what I have written above, I want to leave you with some items to ponder. Just this very afternoon I finished flying in sport pylon races which were part of the National Multi-Wing Championships. Of 23 airplanes present at this contest, only 11 flew the racing event. I asked some of these flyers why they didn't fly Formula I because it was obvious that they were ENJOYING themselves! The most common reply was that they didn't have the TIME to build them. Now, for any of you who don't understand, I'll give you a clue. TIME EQUALS MONEY (to us working stiffs) and the guy with the most CUBIC MONEY OR TIME IS THE CURRENT WINNER.

To close out this article I am including a letter from one of my oldest, dearest friends, Gil Horstman. He is, and has been, the Secretary of the NMPRA and for you new guys let me assure you he knows what he is talking about. Gil and I, and a few others, have been with the NMPRA since the beginning and we really love racing and, therefore, are dedicated to making it work. Here is what he has to say:

*I have a few comments regarding pylon racing that may be of interest. First off though, let me say that I (my comments) represent ME only, no one else.*

*What's happened to racing? This would be a good lead-in. NMPRA's first real organized year had nearly 500 members – 7 years later we have 420 (as of July 1st) with prospects of reaching 450 - - - maybe! Folks tell me that racing is growing by leaps and*

*bounds, more new people out every race. Let's look – seems to me that Bakersfield 1972 had over 100 contestants – Bakersfield 1973 had 85. A quick percentage check shows a 15% reduction in contestants. Now, tell me we are growing!!*

*NMPRA has lost sight of real aspects of Formula I racing. Believe it or not, R/C modeling is a HOBBY and the biggest percentage of the 45,000+ A.M.A. members are hobbyists. Formula I was originated as a Hobby event that would place 4 scale-like aircraft in head-to-head competition. Competition breeds technical advances and machines go faster every year – this is natural and expected – but there comes a time when changes need to be made to keep the event in perspective. It has been no secret that I feel Formula I is going too fast. Too fast? – yes, too fast – when new safety rules will require 450' of separation from race course to the crowd. The rule is fine but look at the effect – only one flying site qualifies in Southern California under this rule! You folks out in the sticks – how many of your fields qualify?? It's bad enough to get people, shy of Formula I, to even let you use their (club) field, let alone help, but now you have to find another site that will meet the safety rule.*

*Formula I and NMPRA cannot grow with the poor public relations we now have. "Too Fast" – "Too Costly" – how many times have you heard these excuses? "I'd race but I don't have a Schneurle" – "I'm not one of the chosen few." It's all a bunch of garbage! Formula I is not any more expensive than Pattern and is certainly less demanding of practice – all you have to do is take-off, turn left a few times and land. Formula I racing is a ball and probably one of the most exciting things a person could ever do in modeling. If that's true, why don't most people do it? Why all the crying? Most important, why all the different racing events? Let me give you my thoughts – it's no simple answer.*

1. *The male ego will not allow most modelers the privilege of flying in a heat race with a Bob Smith, etc., and being beaten – they have to say something about "trick plane" or "super hop-up engine" or the like.*
2. *When the chance of winning is all but gone, it takes real dedication to stay with racing. An example, NMPRA has a whole lot of folks that have been with it years and they have never broken 1:40. How many of you guys who turn in the 1:40's feel good about racing people who turn in the 1:20's? Obviously, a few do, but by the fact that NMPRA has not come up to last years membership roll indicates that a lot of folks don't.*

*One solution is to divide Formula I into 2 groups, Standard and Expert. This works great where there are enough people to divide, but how about the N.W. where Bob Root gets out between 6 and 8 or sometimes 10 planes, how do you divide them? What about Montana? Nebraska? Mississippi? These people all like to race, too. Why can't we get one racing event set up in a manner that is more acceptable to more modelers? If we were trying to make a living selling Formula I – such a welfare case we'd all make. To get people into our event we have to make it attractive, challenging, rewarding and, most important, attainable.*

to page 112

*Some Southern California people have expressed concern over improving the event to attract more people. I have two comments about that – First, if we aren't growing, we are dying – for when you are growing you're green, when you are ripe, you're one step from Rotten. Second, more people mean more races - - - if we hadn't ruled out most of the flying sites.*

*One comment – NASCAR makes changes in its rules governing speed – USAC has very recently made changes to slow down the Indy cars – the Unser brothers thought the speeds were O.K. but USAC leaders decided for the good of the event to make some changes. I know Formula I is different than Indy cars, but the principle is the same – do we save the event by making some changes – OR - - - ?*

*Gil*

## ENGINE CLINIC

from page 72

**patterns, castings, and to do the machine work.**

**Yours very truly,**
**Sidney H. Watts**
**P.O. Box 3946**
**Jackson, Georgia 30233**

The Morton M-5 first appeared on the market in kit form in 1944. Due to many modelers not finishing the kits up properly and having trouble with the engines running properly, if at all, the company, after several months, put the engine out in assembled form. Later, Morton sold production rights to Burgess and they, in turn, manufactured the engine until about 1950. Burgess then sold their remaining inventory and tooling to a third company and several hundred more engines were assembled from the remaining parts and known as the M & S. A complete set of machine drawings for this engine may be had from Tim Dannels, 1265 Yates Street, Denver, Colorado 80204, for $5.00. Incidentally, the Morton M-5 was an almost exact replica of the full-size LeBlond aircraft engine and the original dies were financed by the U.S. Government during WW II. The engine was to be used to train aircraft mechanics.

As for any drawings of the Pratt & Whitney or Curtiss Wright, I can't help. If any reader might be able to supply same, let Mr. Watts know. □

## VENT THAT FUSE

from page 6

I wondered what difference it would make if the bottom of the canopy on the Monterey were sealed off from the inside of the fuselage. I took the plane into the house and blew it out to cool it down. Then the whole bottom of the canopy was sealed with a piece of white typing paper to isolate the air inside the canopy section from the radio compartment. Before the canopy was buttoned up this time we noted that the air temperature was back down to the outside temperature – now 86°F. Buttoned it up and out into the sun again.

Thirty minutes later the canopy was again unbuttoned. The inside temperature was 111°F. Outside was 87°F. Some difference with only a bit of white typing paper!

So what does all of this messing around mean? If you're flying a plane with a canopy open to the inside of your radio compartment on a warm day, it can get much warmer inside. Perhaps warm enough to exceed the high side of the operating temperature range of your receiver! Some of the better radios on the market report an operating temperature maximum of 135°F. Do you know what the operating temperature maximum of yours is?

The Monterey was 126°F and the outside air temperature was only 85°F. I've been out flying at 95°, 100°, and even 105°F on occasion. (When I take time off to fly, I fly!) At that air temperature out in the sun, even the white fuselage of the Kaos would get a bit warm inside. Who knows what the temperature inside the Monterey would have been under those conditions. Another mysterious radio failure? Pick up the pieces after the crash has ventilated the fuselage and the radio works fine. Black magic or just The Greenhouse?

If you're like I am, no matter what the high temperature maximum of my radios, I don't like to take any chances. Here are a couple of things you can do to keep the temperature inside your fuselage down somewhat on those warm days. (Other than staying home and drinking cold beer!) First of all, if your plane has a canopy that's open to your radio compart-

ment, seal it off. A sheet of balsa will work best (or white typing paper?). Or you might paint the inside of your canopy with some opaque paint. Another easy remedy is to build an airscoop or two into the front of your fuselage. If you have pushrod exit holes in the rear of the fuselage, you won't need any exhaust holes. Naturally, a slower moving glider will need larger airscoops than the faster moving pattern ships. I just built my airscoops out of some glass cloth and resin and set them up so they could be removed for less drag when I have no concern about the heat. Tom Cone fabricated two neat and simple airscoops for his Aeromaster out of aluminum. Remember, the opening of the airscoop should point to the nose of the plane – set up to scoop air through a hole at the base of the airscoop into the inside of the fuselage to keep the temperature from building up. The Greenhouse won't work if the wind blows through it.

If you're in the building stage and live in a warmer climate, consider white for your fuselage. Especially if you're a glider nut. That's good for several degrees cooler inside. And every degree below that maximum operating temperature of your receiver is a good degree!

There are other things you might do – probably lots. The main thing is to get tuned into the possibility of the heat problem getting to your radio. Because the breeze is helping to keep you cool doesn't mean your radio feels the same after it's been buttoned up and sitting on the ground or up there flying about for awhile. You may want to begin by repeating my experiment with your plane to see if you have anything to worry about in the first place.

Something to think about. Keep it cool. □

## FROM THE SHOP

**from page 2**

There are a number of other features in this issue which we hope you will find to your liking. One that is slightly different is the Visit to RCM. On the occasion of this tenth anniversary, we're going to introduce you to our entire staff and take you on a brief tour of our new home office building in Sierra Madre, California. All in all, we hope you like the issue and, although we have not completed tallying the thousands of Reader

Interest Surveys which you have been kind enough to mail back to us, this issue does reflect some of the additions and changes which have been most noticeable on that survey. As we have said before, it's your magazine, and we're going to do everything within our power to make it exactly the way you want it.

*

The Central Jersey Radio Control Club is once again planning their annual Eastern States R/C Championship which has traditionally been held the first Sunday of October since the mid-1950's. With the tremendous interest and following this meet has enjoyed through the years the peak number of contestants was 122 and the average for each year has always exceeded the 100 figure. And, would you believe that this is a **one day meet** with five different events? The record that this club has established through the years has been phenomenal considering the number of contestants as well as the fact that with five events each year every contestant could fly three rounds in Pattern events and two rounds in the Scale events. This comes off successfully because of the planning and firm execution of all the plans and full cooperation of the Central Jersey R/C Club members. The "Shulman-System" was developed three years ago after one of the assistant C.D.'s walked off the field mumbling to himself. It was then decided by Leon Shulman, the Contest Director, that some organized system HAD to be developed to eliminate the major work and effort normally required in conducting such a large meet. Comment on this system appeared a couple of years ago in our column.

In 1972 the turnout at the meet was such that Class A had 44 entries, Class B with 24 entries, Class C Novice with 9 entries, Class C Expert with 6 entries, and Scale with 21 entries. After going through the list of winners and noticing the proficiency of most of the flyers in the Class A and B categories, it was obvious that many had capabilities to put them into a higher level as per the A.M.A. rules. However, since the A.M.A. rules requiring that a C.D. sign an A.M.A. member's card when he wins a Pattern contest is not generally adhered to, it becomes very difficult to police this. When a flyer flies in a contest at a lower level than his actual capabilities it then becomes unfair for the true Class A or Class B flyer who then is

"out-classed."

It has been decided that for this year's contest, instead of Class A & B events there will be two substitute events. One event will be a **Loop Event** and the second event will be a **Spin Event** with two flights allowed each contestant. It is felt that the true A and B flyer is capable of and will be satisfied in flying these events. The true Pattern flyer may then upgrade himself and fly the Class C Novice or Expert category if he truly belongs there. Discussions held with many flyers and several C.D.'s indicate that this may be the route to go for a large contest to sort out the different type of flyers and yet satisfy each group. The Loop and Spin Events will allow two flights each including spot-landing. Class C Novice and Expert will be permitted three or more flights with a shortened flight pattern. However, in each successive flight, maneuvers will become more difficult. All present A.M.A. maneuvers will be specified within the three or more flights flown. There also will be an A.M.A. Scale event and a Stand-Off Scale event so contestants can enter either one of the Scale events plus either of the Class C **or** both of the Fly for Fun events. This, therefore, should satisfy the different levels and abilities of all contestants. Likewise, since the C.J.R.C. Club has almost 200 members, and several would like to fly in this meet, we will allow those who want to compete to do so **only** in the Fly for Fun Events (which requires no judging – which naturally could be biased). Previously no club members could fly in this contest.

To encourage the younger flyers a special award will be awarded to the Jr.-Sr. flyer with the highest score. With $5,000.00 worth of merchandise and trophies and the marvelous facilities of the Lakehurst N.A.S., the Central Jersey R/C Club plans to be working very hard from 8:00 A.M. to 5:30 P.M. to take care of the more than one hundred contestants expected and the awarding of prizes down to the last place in each event. It has always been a policy to give an award to every flyer who competes with trophies down to 15th place and merchandise awards to the last place.

For further information, contact Leon Schulman, Contest Director, 1114 Raritan Road, Clark, New Jersey 08876. Telephone (201) 381-1440.

*

Hope we'll all be around for the next ten years. Good flying! □