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RC MODELER

FEATURES

PRODUCT REPORTS

DEPARTMENTS

VOLUME 10 1973 NUMBER 12

DECEMBER

THIS MONTHS COVER

Terrie Clifford's admiring glances are for the popular Windspiel Soarcraft Kestrel 19. Photo taken within the city limits of Albuquerque, New Mexico. The photographer, Max Mills, has the privilege of RC soaring in this area where 30 minute thermal flights are an every day occurrence.

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

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

SUBSCRIPTION RATES: The United States $10.00 per year, $19.00 two years. Single copies $1.00 each. Add .50 cents per year for postage to Canada and $1.00 per year for postage outside of the U.S. (except APO's). Change of address notices, undelivered copies and orders for subscriptions are to be sent to P.O. Box 487, Sierra Madre, California 91024.

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

FROM THE SHOP

DON DEWEY

This month we would like to start off with a letter from Ed Eggert, a member of the Queen City RC Club of Allentown, Pennsylvania:

Don:

The October issue of American Aircraft Modeler carried a guest editorial by Stew Vance, V.P. of the DC Radio Control Club.

Stew put forth the argument that RC clubs are becoming sport/recreation clubs rather than electronic/aeronautic clubs. Based on the information contained in club newsletters, Stew feels that this is degrading to the RC hobby.

This same doomsday message was argued heatedly in the early 60's in all the ham radio journals. At that time ham radio was entering the age of single side band which could be compared to the RC jump from reeds to proportional systems.

The majority of hams purchase commercial single side band equipment rather than building their own. The prophets of gloom called the commercial equipment users appliance operators. They cited the fact that hams had been the backbone of communication technology and this would be lost. What was also occurring and they failed to recognize was that this new technology brought forth the need for expensive laboratory instruments for alignment purposes. Secondly, the local electronics parts distributor was no longer making a profit selling to the low volume ham population and refused to do business with them.

From an electronics technology standpoint, the RC'er is in the same boat. Even if he wished to design and build his own equipment, he would have need for access to expensive instruments and would be confronted with a part availability situation which is very frustrating.

Recently I built a very simple device requiring one transistor and less the 10 other components. To acquire these few parts I had to buy a lot of 10 transistors and it required orders to three (3) mail order houses to fill my bill of materials.

I, personally, have 19 years of amateur radio experience and have built my own RC equipment back in the 50's. Proportional based upon digital logic is a whole new ballgame which I am still learning. With all my experience, I still get stumped and have to ship my gear back to the factory.

If a club is concerned about the lack of electronic knowledge, workshops could be held to educate the members. Projects such as servo simulators, battery chargers, or even receivers are feasible on a club level since parts procurement can now be done on a bulk level, which distributors will handle. Test equipment from one's place of employment, or personal ownership, also would be more obtainable.

From an aeronautical engineering aspect, let's face it, very few have it. On a commercial level, this is done by staffs numbering in the 1000's so why should we criticize the RC'er because he cannot design his own pattern ship or sailplane.

There is also a time element. Some men are forced to fly ARF's or someone elses handiwork because of the nature of their employment. These are in the minority. The bulk of us still build our own aircraft either from kits or plans. Each aircraft we build, whether it be a quick and dirty sport ship or super scale effort, allows us a certain creative self-expression lacking in most hobbies.

RC, for the majority, is a break from our day to day jobs, i.e., a time for us to relax. The majority of us are Sunday fliers, not contest oriented, and we place our emphasis on having fun and social contact at the field and club meetings.

Our own AMA compares it to golf. Maybe we are headed toward a country club type atmosphere. If it means more fun and more comfortable field conditions than most of us experience, I'm sure the majority would be for it.

When the model aviation press no longer has new designs or gadgets to publish, then maybe I will be on Mr. Vance's side. Until then, I'm going to have fun and recreation through the medium of RC modeling.

Ed Eggert

Before we get into a few questions from RCM readers we would like to bring to your attention that the Goodyear Model Aircraft Club of Cuyahoga Falls, Ohio, will soon be holding their Seventh Annual Model Aircraft Contest and Display. This event will be held on February 1-3, in Akron, Ohio, at the Chapel Hill Mall, located on Brittain Road, Akron, Ohio. AMA sanctioned and open to the public, trophies will be awarded in all classifications of the following: RC aircraft, U-control planes, pylon, RC boats, RC cars, free flight gas, free flight rubber power, best of show (peoples choice), best junior model, best finish. Registration will be held Friday and Saturday and will close at 5:00 P.M. Saturday February 2nd. Trophies will be awarded on Sunday, February 3rd at 5:00 P.M. Last year the show drew a spectator crowd of between 60,000 and 70,000 people and it is predicted that this years show which will run for 3 days should have a total spectator attendance of over 100,000. Ray Habyan, Secretary of the Goodyear Model Aircraft Club invites you to this annual event. For further information contact Ray at 1228 Grant Avenue, Cuyahoga Falls, Ohio. Telephone number is (216) 923-1592.

•

Don:

Could you tell me what kind of sailplane that is on your September issue of R/C Modeler.

Steven Tillman

For all of those who have written for details on the sailplane pictured on the September issue of RCM, this is the new Medallion sailplane which World Engines is importing from Pilot Models in Japan. The Medallion features a fiberglass fuselage and veneer covered foam wing and stab. The prototype on our cover had its wings and stab covered with red Solarfilm while the fuselage was painted with black enamel. The Pilot Medallion will be in the $150.00 price range.

Don:

I own a Bonner Digimite, 4RS Radio Control System, which I, purchased in March 1969. Since the Bonner Company is no longer in business, I do not know where to purchase servo parts, case halves, driving gears, etc. I would like to purchase a set of schematics for the transmitter, receiver, decoder, and servos.

Could you possibly help me by telling me where I may make these purchases. Thank you for your help.

William N. Biggs

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YEAR END SALE!

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The Hobby Lobby 3 is manufactured for Hobby Lobby by the same company that makes the unusually reliable Hobby Lobby 5 proportional system. Many items are common to both systems: the servos...HL 3 uses the same servos as the HL 5 Series III 5th Channel servos; and the optional airborne nickle-cadmium battery packs are interchangeable between both systems.

With its optional 225 mah. nickle cadmium airborne battery pack, the Hobby Lobby 3 is one of the true ultra lightweight systems.

The precision of the control stick-to-servo, the 3½ pound servo thrust, the out-of-sight range, and the proven reliability record of the circuits used in the system combine to make the HOBBY LOBBY 3 the finest 3 channel system available regardless of price.

HOBBY LOBBY 3 3 Channel Digital Proportional $89.00 (27 mhz, 2 servos) **$99** (72 mhz, 2 servos)

27 mhz. HOBBY LOBBY 3 available November 1, 1973.
72-75 mhz. HOBBY LOBBY 3 available January 1, 1974.

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Our Volume 2 catalog has more items, more pictures, and better pictures and descriptions of R/C and control-line stuff than we've seen in any other catalog.

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CUNNINGHAM ON R/C

BY CHUCK CUNNINGHAM

The world of Radio Control building and flying has been mushrooming like never before. For a long time now it has been a fast growing sport, but in the past two years the increase in interest in R/C has been fantastic. Some time ago the hobby sucked up most of the model builders from other phases of activity, and now those coming into the sport are men, and women, with little or no background in model building and flying.

Today we have a class of beginners who are really beginners in every sense of the word. This series of articles will be aimed at this category of person - - - the beginner to radio control with almost no background in model building, and none at all in model flying. I would guess that most of you have built some plastic models during your growing up years, and perhaps had a plastic U-control or two, but the feel, and thrill, of gluing balsa wood together to form a model has long escaped you. If you are in this group, then I hope that the following will be of some help to you. This is ground that has been covered before, but since you weren't buying RCM, you missed it. For other readers, please bear with me one more time. Perhaps you will gain some information along the way and, if you don't, then content yourself with remembering that you, too, were once a beginner and had to learn all of the lessons that you now know.

When I decided to get my feet into this sport I went back to all of the model magazines that I had, to build a background of information. Of course, RCM didn't exist then – if it had the chore would have been very easy. But, then, very little was written about R/C each month and the models and the information was pretty crude by today's standard. Since the beginner does not have a magazine file to fall back on, I shall try to pick up from this point and progress with you through the hard spots of getting started.

First of all, let me put to rest the one biggest thing that continues to bug all who wish to get into this sport. You do **not** need to know anything about electronics. That's right, you don't need to know a microfared from an ohm, or a watt from a jule. If you can plug a male mini-plug into a female mini-plug, you can build, fly, and enjoy radio control model aircraft, boats, or cars. You need to know nothing about electronics, or how or why electricity works. All you really need is a good dose of common sense. This you need to keep working all of the time. The second thing that you are going to need is the ability to bounce back from a disaster, a hard knock, or a mistake. This is a demanding hobby/sport, and one that rewards the fan with some of the greatest thrills that he can have, but one that also keeps him on his toes. If you crash your pride and joy and, always keep in mind that sooner or later you are going to, you have to have enough guts to go out and try again. This is the beautiful thing about this game - - - it will teach you to keep on trying.

The third thing that you are going to need is a pride that will allow you to accept help when it is offered from those with more know-how and experience than you have. Too many times I have seen a fledgling pilot wander out to the field, set up his pit area over in a corner, and then resist all offers of help. He gets his engine started, usually with a lot of effort and, then, if he attempts to fly it himself, spends the next several hours picking up all of the pieces of his once pride and joy. Do NOT be too proud to accept help. We have all been through it before and you will find that if you want it you will have gobs of help.

Now, something to keep in mind; be careful of the help that you get. All too often an offer of help is forthcoming from a modeler/flier who is not very far removed from the beginners ranks himself. What you need is good solid help. You don't need to learn to fly from this year's Nationals champ, but try to be sure that the guy who is offering to help you knows a little more about flying than you do. This is hard to determine, but the best method is to sit back and watch a while at the flying field. Watch the guys who seem to know what they are doing, and watch what the ready-helpers are doing. Don't repulse the help, just take the time to be sure that it is the **right** help.

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engine clinic

By Clarence Lee

Dear Mr. Lee,

Due to an unavoidable crash (someone turned on my frequency), I found it necessary to disassemble my H.P. .61 for cleaning. Upon reassembly I had difficulty getting the ring compressed enough to slip back into the liner. Somehow I managed to break the ring. Is there any special tool available, or how does one go about assembling a ringed engine without damaging the ring?

Sincerely,
Alex Johnson
Fort Worth, Texas

Quite a few fellows have shared your problems, Alex. Both in having crashed due to someone not checking frequencies before turning on their transmitter and breaking rings while trying to reassemble a ringed engine. Most manufacturers have a special tool for this purpose but nothing of this nature is available commercially for the small size pistons used in model engines. Actually, a special tool is not necessary if you are careful. In the case of the H.P., the ring is 'pinned.' This means there is a small retaining pin pressed into the ring groove and a corresponding notch in the ring itself. This keeps the ring from rotating and the ends of the ring at the ring gap from catching in an exhaust or bypass port. So the first thing to do is be sure the notch in the ring is positioned over the pin. If not, the ring will break if you try to compress it. The next thing to look for is a bevel on the inside edge of the sleeve either at the top or bottom of the sleeve. Depending on the particular make of engine, sometimes the bevel will be at the top of the sleeve; on others, the bottom, or even both. Always insert the piston and ring from the end that has the bevel. While applying light pressure with your finger, run your fingernail around the ring, compressing it. If you are the nervous type and don't have any fingernails you can use an X-Acto knife, pocket knife, etc. When using a knife be very careful not to scratch the ring. You will actually find insertion very simple if you follow this method.

Dear Mr. Lee,

I just finished reading the last 3 years of Engine Clinic articles and they brought up several questions and comments from me.

First the comments:

1) Several of your answers to reader's questions mentioned the strong probability of a large quantity of fine dirt, etc., on paved flying surfaces. I would like to second that most wholeheartedly! I fly from an asphalt parking lot which has recently been swept by a street sweeper and, yet, when I disassemble the air filter on either of my Perry carbs, (on a Veco .61 and K & B .40), I always find a large quantity of dirt and other F.O.D. I certainly would not like this material to be inside the engine causing any unnecessary wear and tear.

2) You also advise against using nylon props, especially on large engines. Again, you couldn't be more correct. I normally use TF wood props, (11/7¾ or 11/8) on my Veco .61, but in one instance I used an 11/8 nylon prop when I broke my last wood prop and yet still wanted to fly some more. I ran the engine up to full throttle to check the needle setting and that nylon prop disintegrated! Luckily, I was standing behind the propeller arc. One piece of the prop struck the asphalt beside the engine and made a gouge approximately 1/16" to 1/8" deep and then went "singing off" through the air like a richocheting bullet. That definitely convinced me to stick with wood props!

Now for some questions:

1) You mentioned in a couple of articles that it is not a good practice to use over 1.5V for a glow plug starter battery. Is there some reason for this statement other than the possibility of burning out the glow plug? I usually use 2.0 volts tapped off of the 12 volt starter battery on Fox 1.5V idle bar glow plugs. I very rarely need to replace plugs and have not noticed any other detrimental results.

2) My next question concerns the modification to expansion chamber type mufflers such as are now supplied with most OS Max engines. I would like to drill out a hole about 1/4" in diameter at the front of the muffler and drill out the exhaust hole to 3/8". I am hoping that this procedure will reduce the power loss due to making the muffler closer to the venturi or flow-through type. I realize that this will also probably cause some noise increase. Do you know of any other reason that I should not drill out the muffler?

3) I recently purchased a McCoy .35 series 21 engine. When I put the air filter on the Perry carb I noticed that the back of the prop strikes the air filter. Do you have any solution for this?

Thank you very much for taking the time and trouble to answer my questions. Your column is the most informative and interesting column in any of the R/C magazines.

Sincerely,
Darwin L. Evelsizer
Beale AFB, Calif.

The only reason for not using a 2 volt power source for a 1½ volt glow plug is because of the danger of burning out the glow plug. If it doesn't burn out with the battery connected, the element is weakened so that it will burn out later in the air. Then the modeler wonders why he has so much trouble with his engine blowing plugs, so to speak. Many of your 1½ volt plugs will take 2 volts with no difficulty. If you check your Fox plug you will note that it glows pretty darn hot on two volts. As you are getting away with 2 volts I'm guessing that you also are using a pretty long wire lead which, in turn, drops the voltage.

Drilling out the tail pipe and adding a hole to the front of the muffler will not hurt a thing other than increase the noise level. It will make a big difference in the performance of the engine. Less heat, more power, etc.

The McCoy .35 (and .40) is one engine equipped with the Perry carburetor that cannot use the Perry air filter. The back of the prop is just too close to the carburetor. K & B makes a small foam filter than can be used but you will have to cut the top of the filter off slightly. There is one solution that would allow you to use the Perry filter or just gain space between the back of the prop and carburetor. Both Veco and Fox make propeller extension units which are aluminum spools that slip over the crankshaft and become the new propeller drive unit.

Dear Mr. Lee:

I recently installed an OS Max .15RC in a Falcon 56 and am having a difficult time getting my engine to run properly.

The engine is very difficult to start and when it does start to run, comes to a dead stop when the plane is held in a "climb" attitude (nose up).

Because of the fuselage construction, the clunk tank weight is approximately 5 inches aft of the needle valve. Could this be my problem? Also, the needle valve hole is at

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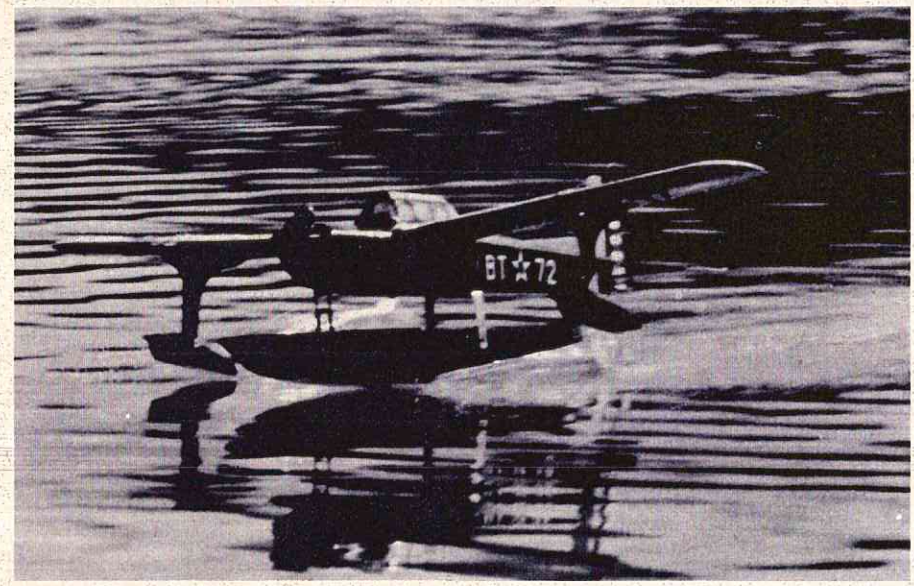
SUNDAY FLIER

KEN WILLARD



Bob Owens single float conversion of the BT-70 - - - in the Fiji Islands!

This month I've got a couple of totally unrelated subjects I'd like to talk about. Well, not totally unrelated. They both have to do with airplanes, even though one is about sailplanes and the other about seaplanes.

In the August issue of RCM I described some features of seaplanes, such as float design, hull shapes, etc. Shortly after the article appeared, I began receiving some interesting letters that cleared up some of the questions I raised.

Then, in the September issue, I talked about the RCM Trophy Races and the then upcoming LSF Tournament. At the time of this writing, the RCM races are still coming up, and the LSF Tournament is over, and I'd like to make a few observations about the event.

But first, let's talk seaplanes, and how to make them work as some of you readers have found various answers.

Bob Owens, a member of the Valley Flyers, sent me a very interesting letter telling about his experiences with a single float conversion of the BT-70 – and in the Fiji Islands! He also answered one of the prime questions which all seaplane flyers ask – how do you protect your radio equipment from salt water? Here are some excerpts from his letter:

Dear Ken,

A couple of years ago I wrote asking about making a single float plane from your BT-70 and about my plans to take it to Fiji Islands on vacation in August '72.

Well, I just put down the new R/C Modeler after having read of your recent interest in float jobs. This inspired me to continue with my task of reporting to you on my BT-70 project which I call BT-72 because it was meant to fly in 1972 and that it was slightly altered from yours.

I scaled-up your plans from the RCM article then added to the design both tail-dragger and single float conversions. The tri-gear was built-up first. I used an ST .23, a full symmetrical airfoil, and bolt-on horizontal stab. After 25 flights I converted to tail-dragger. After a few minor adjustments of the main gear position, toe-in camber, etc., she was very nice. It always attracted a lot of spectator attention at the basin on Sunday afternoon.

When August rolled around I had put in 25 flights as a tail-dragger, so I put it in a soft garment bag. The wings were wrapped in cardboard and stuck up about a foot above the handle as I walked on board the PAA 747. The Stu helped me find a stowage compartment suitable for a model. The rest of my R/C stuff was in a small hard suitcase. Fiji Island customs officials expressed interest, but they gave up as I muttered something about a "plastic toy."

Winter season resulted in much wind and rain in Fiji for the most part of our month. No matter for it was tropical – 75 to 80 degrees. What with being on a private island with wonderful hosts, sail boats (Hobie Cat 14), Regata 14 jet drive ski boat, reef scooter for shark-looking, Royal Gull Twin Amphib for frequent trips into Suva - - - (memories). Anyhow, my aviation oriented host forced me into R/C activity against my better judgement. Well, after 8 or 10 attempts and adding surfboard-type fin on the hull, reducing area of the water rudder, and adding ventral fins on the horizontal stab she flew beautifully. T/O and landings were as easy as with a tri-gear. All this time I had no radio trouble from the salt water. I had done my homework!

All electronic circuit boards had been dip-coated with urethane varnish per US

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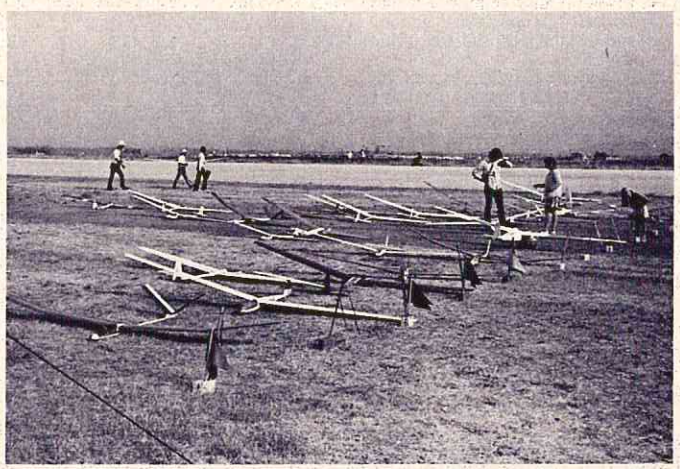
BELOW, LT: LSF '73 frequency flight lines. Open order of flight permitted you to put your plane in line and progress to "Flight Position." You could, then, fly or, scratch and go back to the end of the line. BELOW, RT: Typical scene on flight line - - - repairing towline, flyer waiting, towline retriever on cycle ready, and in background, another flyer guiding his sailplane to the "Decision Point," where, within a minute from launch, he must select the event, Precision or Distance, he will attempt.



SCALE IN HAND

BY DAVE PLATT

Outstanding Percival Provost by Brian Mercer, Australia. BELOW: Eric Fearnley, England, long-time scale fan with very interesting and offbeat subject. His Fiat G.50 bis uses S.T. 46 for its 62" span and 6½ lb. all-up-weight including retract gear. Quite an achievement in light building.

This month's column is the first of a new series in which we are going to study the Stand-Off Scale model. In this, and the next few columns, we are going to examine this breed of cat in considerable detail, from the very foundation of its existence right through choice of subject, design and construction methods, to final flying and contest-flying techniques.

In order to fully understand the nature of the Stand-Off Scale model, a little history might prove interesting. During the early years of commercially-available radio control equipment, roughly 1948 through 1958, a *scale* RC model was a great rarity. Early radio equipment was heavy, costly, and unreliable in the extreme. Such is the natural order of things; excellence is not born overnight. It's easy to see that this period would, and did, give RC's first followers quite enough exasperation even with simple models. While the ultimate goal of building scale radio controlled models was never far from the minds of the RC fans, the deficiencies of their equipment, most importantly the reliability problem, dictated a more discreet approach.

The breakthrough of the tone-modulated carrier wave system proved the key to reliability in single-channel equipment, and allowed the development of the multi-channel reed system. By 1958, such rigs were available to the modeler – still costly; still heavy by today's standards, but at least with enough controls and reliability to give a few brave souls the

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TALL

TEXAN

A few minutes with a photocopy machine and you'll have full size plans for a quickly built .10 powered aircraft that will bore small holes in the big sky. Quick and responsive, but easy to fly.

BY JOHN CHAPIS

● The "Tall Texan" was designed as a simpler and smaller counterpart to Bryce Peterson's high performance AT-6. And, by using Ace mini foam wings and box type sheet construction, the "Tall Texan" took form.

When the ship was finished, I decided to use a Kraft KP3S system and OS Max .10 power. The whole time I was finishing the installation, I was thinking of how nice and easily this bird would drift through the sky. Boy did I miss! With KPS 12's and a 500 MAH pack, she weighed in at 2½ pounds and was quite a bit hotter than the average .10 powered bird. But what a thrill it is to have this ship boring tiny holes in the sky.

Some time later, while reading RCM, an opinion was voiced by Ronald Shean about .10 powered pylon racing for sport flyers only. The "better idea" light lit. Create a pylon racer that isn't a P-51! This is my contribution to those of you who want to race for just pure pleasure. There are some publications that will give you some ideas on how to paint your bird like the great AT-6 air racers that please crowds from reno to Cape May every year.

Since we can't paint it until it is built, let's get started. Start construc-

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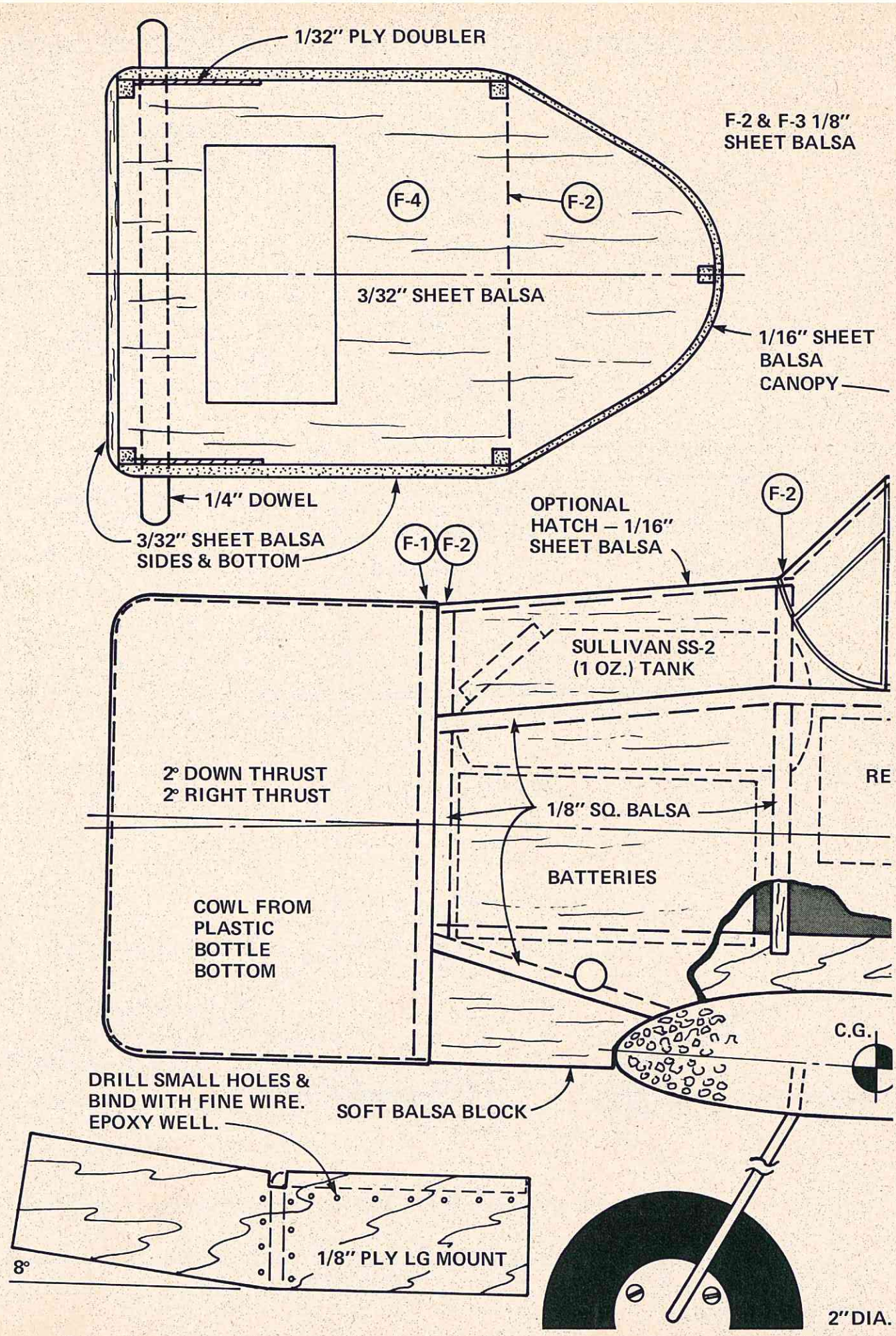
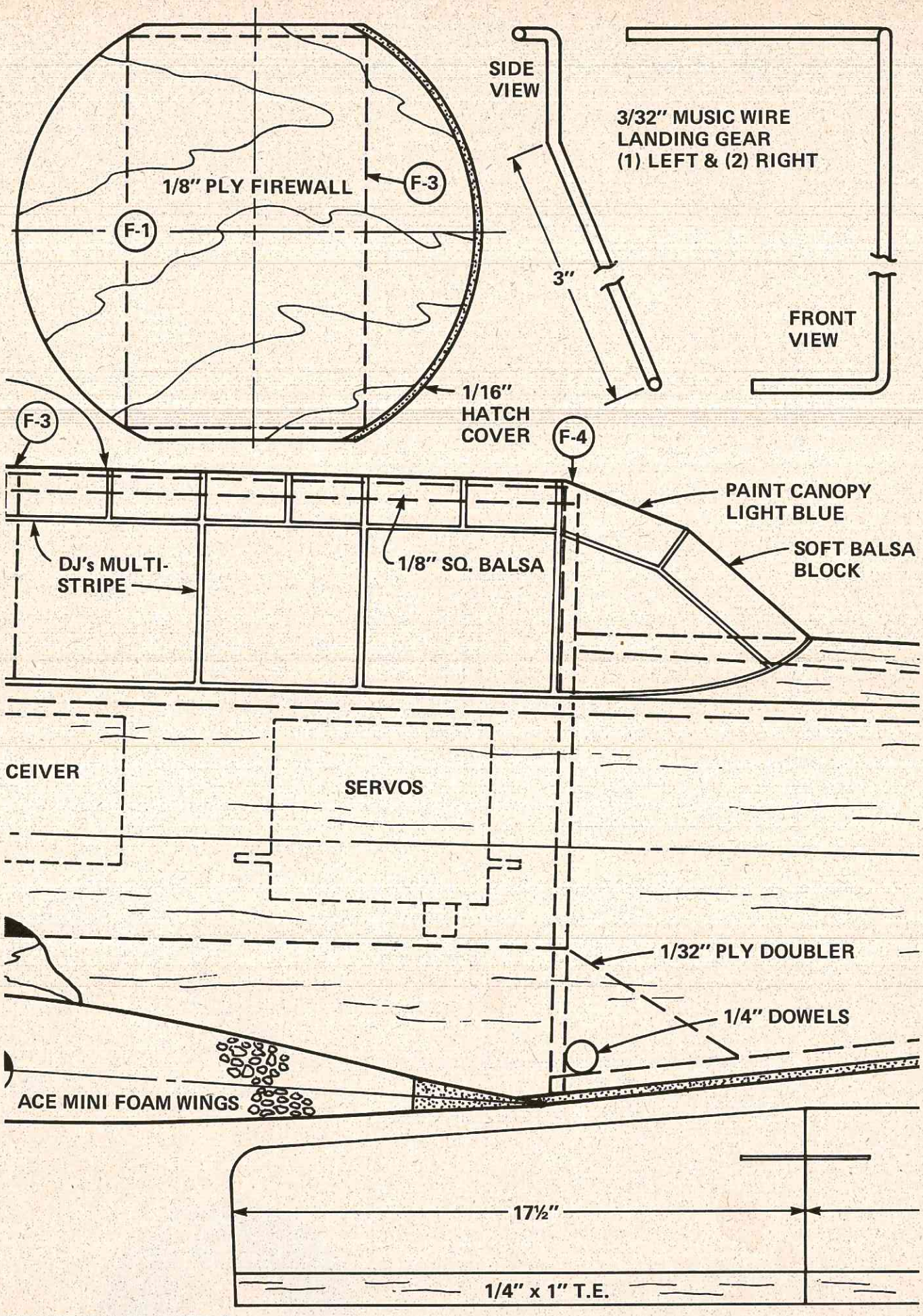
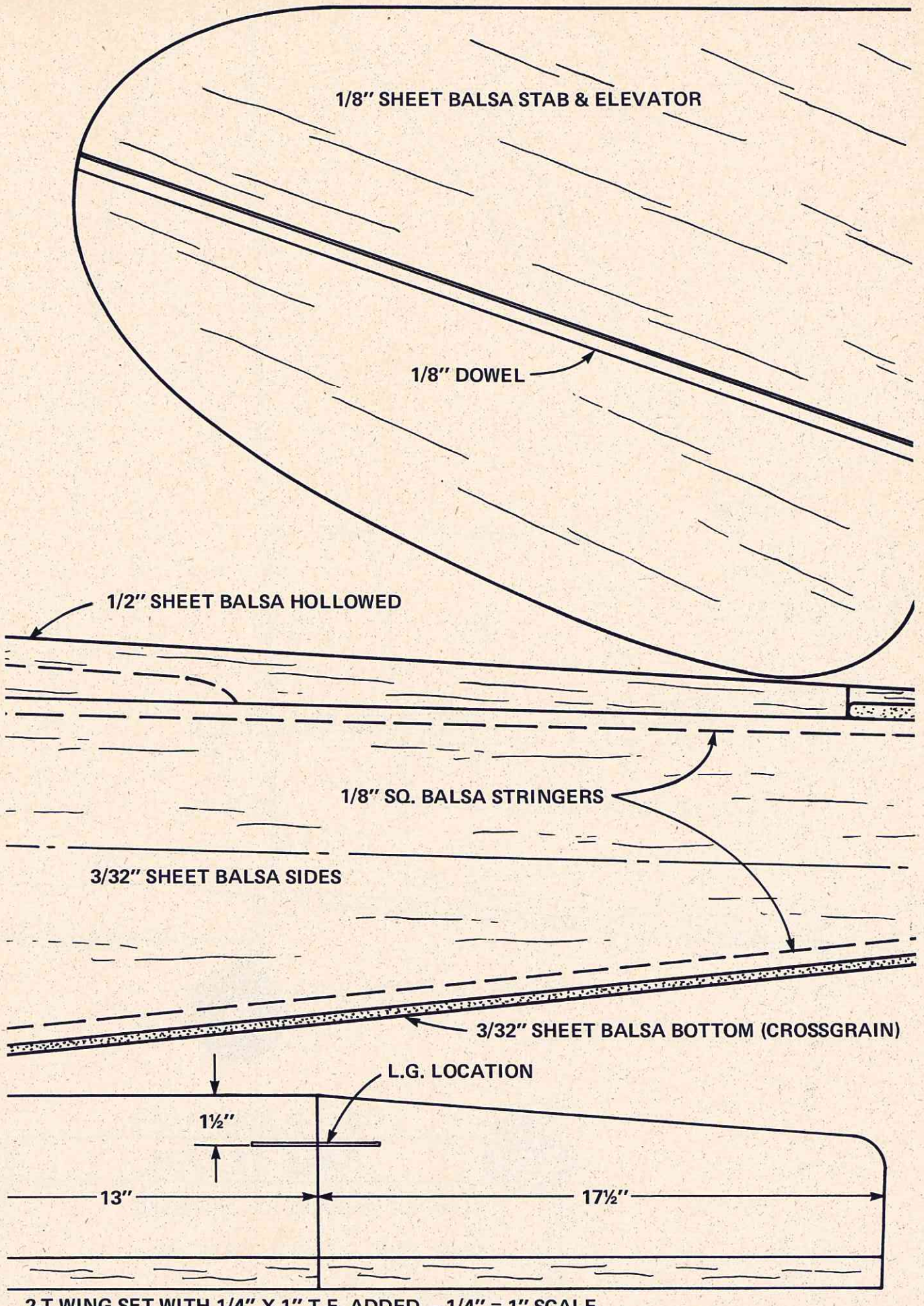
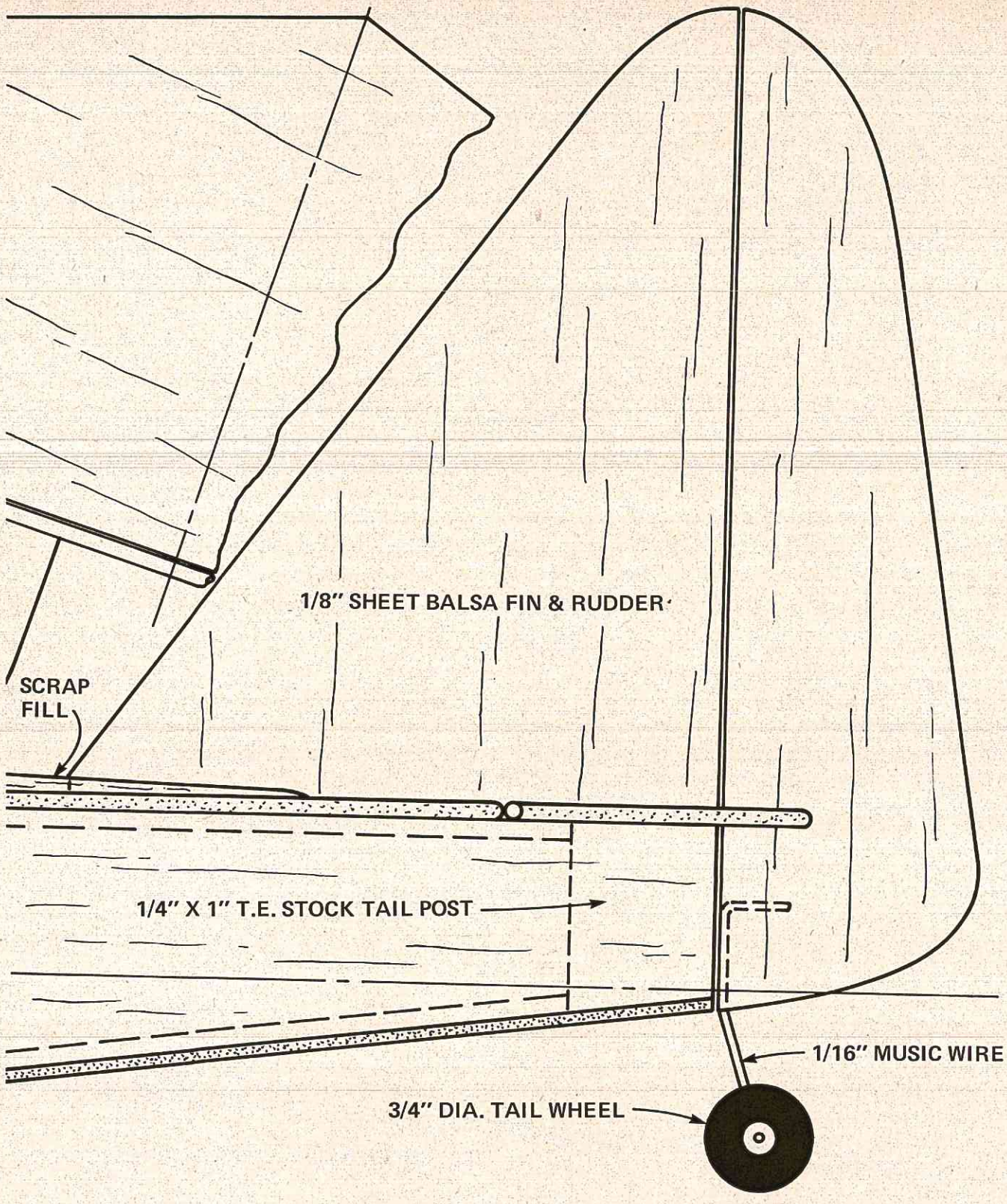

1/32" PLY DOUBLER
F-2 & F-3 1/8"
SHEET BALSA
F-4
F-2
3/32" SHEET BALSA
1/16" SHEET
BALSA
CANOPY
1/4" DOWEL
3/32" SHEET BALSA
SIDES & BOTTOM
F-1
F-2
OPTIONAL
HATCH – 1/16"
SHEET BALSA
F-2
SULLIVAN SS-2
(1 OZ.) TANK
2° DOWN THRUST
2° RIGHT THRUST
1/8" SQ. BALSA
BATTERIES
COWL FROM
PLASTIC
BOTTLE
BOTTOM
C.G.
DRILL SMALL HOLES &
BIND WITH FINE WIRE.
EPOXY WELL.
SOFT BALSA BLOCK
1/8" PLY LG MOUNT
8°
2"DIA.


SIDE VIEW
3/32" MUSIC WIRE LANDING GEAR (1) LEFT & (2) RIGHT
1/8" PLY FIREWALL
F-3
F-1
3"
FRONT VIEW
1/16" HATCH COVER
F-3
F-4
PAINT CANOPY LIGHT BLUE
SOFT BALSA BLOCK
DJ's MULTI-STRIPE
1/8" SQ. BALSA
CEIVER
SERVOS
1/32" PLY DOUBLER
1/4" DOWELS
ACE MINI FOAM WINGS
17½"
1/4" x 1" T.E.
KRAFT-HAYES WHEELS



2-T WING SET WITH 1/4" X 1" T.E. ADDED — 1/4" = 1" SCALE



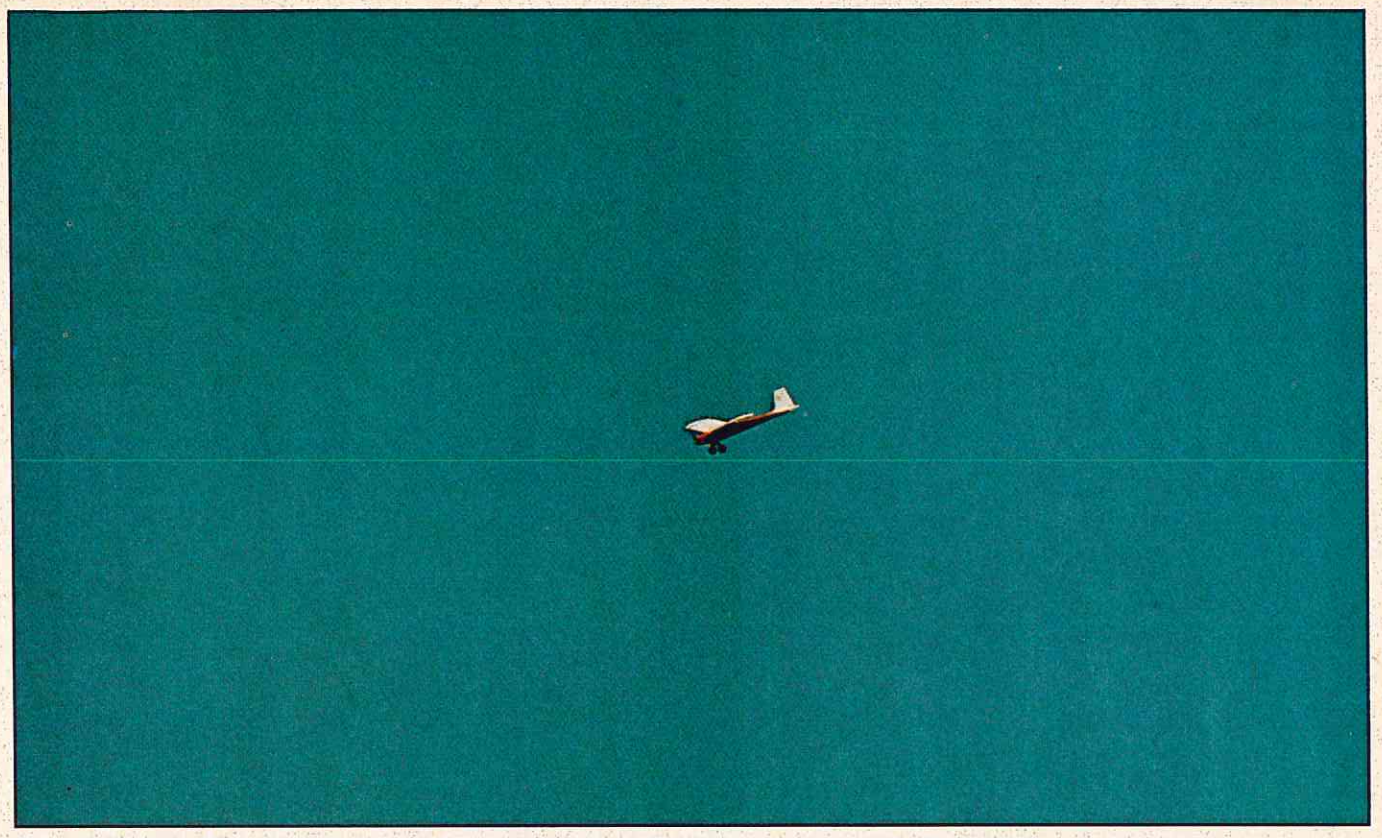
GENERAL SPORT FLYING

TALL TEXAN

DESIGNED & DRAWN BY: J.G. CHAPIS

SPAN: 48 IN. AREA: 273 SQ. IN.

ENGINE: .09 – .15 WEIGHT: 24 – 36 OZ.



The author's Astro-10 powered electric aircraft completing a loop. Ektachrome transparency by Randy Kidd.

A QUIET REVOLUTION

ELECTRIC POWERED R/C.... THE CONCEPT OF TOMORROW.... IS HERE NOW! ITS FUTURE IS UP TO YOU. BY DON DEWEY.

PART ONE

Since radio control became a reality, it has been the dream of a great many RC'ers to design and perfect an aircraft that they could fly from the local schoolyard or from a good sized vacant field that would be an every day ship, trouble-free, and above all - - - quiet.

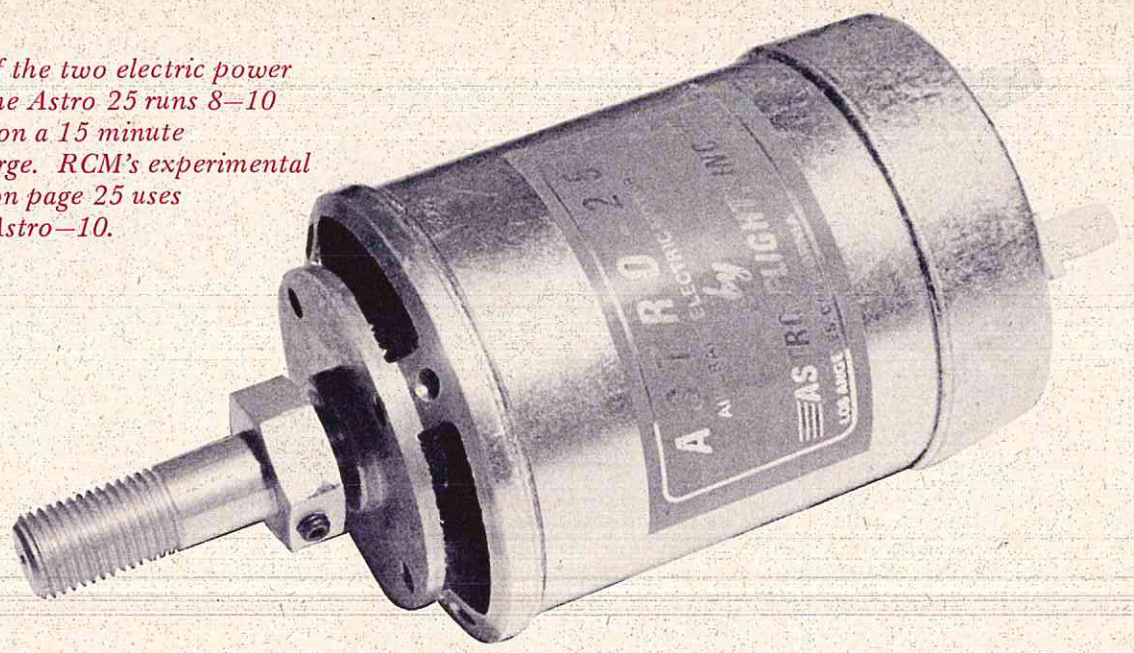
As we look back over the history of lost flying sites, it has not been the hazards of RC aircraft that have led to the loss of these sites – rather, it has been one factor alone . . . **noise.**

Think for a moment, if you will, about being able to go to a vacant field a few blocks from your house and put in two or three flights right after dinner before darkness settles in. Think, too, of doing this in a completely noise-free way with no clean-up problems, very little field equipment, and none of the associated problems attendant to todays present fuel-gulping two-cycle engines.

What we're talking about, of course, is electric power plants for RC. While there have been sporadic attempts during the past few years to develop a practical electric engine for RC aircraft, most of these efforts have been centered around the use of a geared, re-worked toy, or slot car motor. The results were, for the most part, definitely unsucessful and quite impractical. One company, Mattel Inc., even produced a ready-to-fly electric aircraft using this concept, and, in our opinion, the results were something far less than successful. Word of these attempts soon spread, and the idea of electric propulsion for RC has been, more often than not, dismissed with pure disdain.

It wasn't until Bob and Roland Boucher of Astro Flight Inc., 13377 Beach Ave., Venice, California 90291, began to develop their Astro-10 and Astro-25 electric propulsion systems that a breakthrough in this field seemed possible. The Boucher brothers gave their first demonstration flight of electric powered RC in April of 1971. In November of that same year they entered an electric powered pylon racer in a Quarter Midget race using their Astro-10 system. Their development of the electric power plant continued until they made a twenty mile world record flight for electric powered aircraft in February of 1972. Five months later they introduced the Astro-10 and 25 at the MAC's show in

Larger of the two electric power plants, the Astro 25 runs 8–10 minutes on a 15 minute field charge. RCM's experimental aircraft on page 25 uses smaller Astro–10.



California as a commercial product. The first delivery of these motors were made to the public in November 1972. In January 1973, Astro Flight was awarded an RPV contract for a twin electric powered drone. In May of this year, the Boucher brothers completed their first one hour flight using electric power.

During this two year period of development of their electric motors, both Bob and Roland were met at virtually every turn with disbelief and virtual indifference on the part of the model press as well as those RC'ers who witnessed the early development flights. When the model press did report on the electric power plants and its development, it was either presented in an erroneous or unknowledgeable fashion. As an example of this, Astro Flight recently sent one of their electric power plants to an American model aviation publication and, without contacting either Roland or Bob as to a proper size prop, etc., they presented a test report that showed overheating of the batteries and short flight duration due to using a prop that was way oversize for the Astro-10 motor. Their test report was something akin to testing a .15 glow engine with a 12" prop and wondering why you can't get the proper rpm!

What we're driving at is that electric propulsion – the quiet revolution – is here and it **is practical**. But, if you decide that electric RC is for you, you must know its design parameters, its advantages, and its limitations. A suitable analogy would be the modeler who has always silked and doped his aircraft prior to the introduction of the plastic film coverings such as MonoKote or Solarfilm. New techniques had to be learned in using these plastic covering materials and, once learned, the procedure became quite easy. But, it did require a **different** technique than that which was used in covering with silk and dope. And, to expect your first attempt to be perfect would be asking the impossible.

And, thus, it is with electric propulsion. While we will make comparisons in this article to the glow engine, this is somewhat akin to comparing a motorcycle to a car. If you want a motorcycle you buy one, while, alternatively, if you want a car you will buy that mode of vehicle. Yet, as a frame of reference, we will make these comparisons and try to point out the advantages as well as the limitations of electric power. The Astro-10 and the Astro-25 are the result of two years of hard work, engineering, and development on the part of Bob and Roland Boucher. It is the first phase of the Quiet Revolution, and we predict that five years from now electric power will be virtually as prevalent as the glow engine, if not more so. And, then, we will look back on this article with the same amusement as we would on an article in an old issue of one of the model aviation publications where they presented the impossible dream – the first practical, but then still experimental, low winged RC aircraft!

DESIGN GOALS

What are our goals in working with the electric power plant?

For some, it would be simply to be able to launch an aircraft and fly around in silent flight with something similar to a powered sailplane such as the Fournier RF-4. To others, the ultimate goal would be to have a Sunday aircraft that was capable of most fun fly maneuvers. And, to still others, the ultimate goal would be electric powered pylon racing or a pure precision electric pattern aircraft.

All of these are possible with electric power and, with the proper research and development, will become a reality in the very near future. Insofar as this author is concerned, I would like to see all of these goals become a reality - - - providing the RC'er with a quiet, dependable power plant that would be an equal alternative to the glow engine. But, if these goals are to be realized, we must understand the advantages and limitations of electric propulsion.

POWER TO WEIGHT

To begin with, let's take a look at the relative weight of the various types of propulsion currently available. This is illustrated in Figure 1 below. Ob-

Power Source	Specific Weight	
	Lbs./HP	Watt/Lb.
Manpower	200	3.75
Electric Motor	5	150
4-cycle Engine	2	375
2-cycle Engine	1	750

FIGURE 1

viously, from Figure 1, it is evident that on a power-to-weight ratio the two cycle engine is far more efficient than the electric motor. But let's go on to Figure 2 and look at the relative

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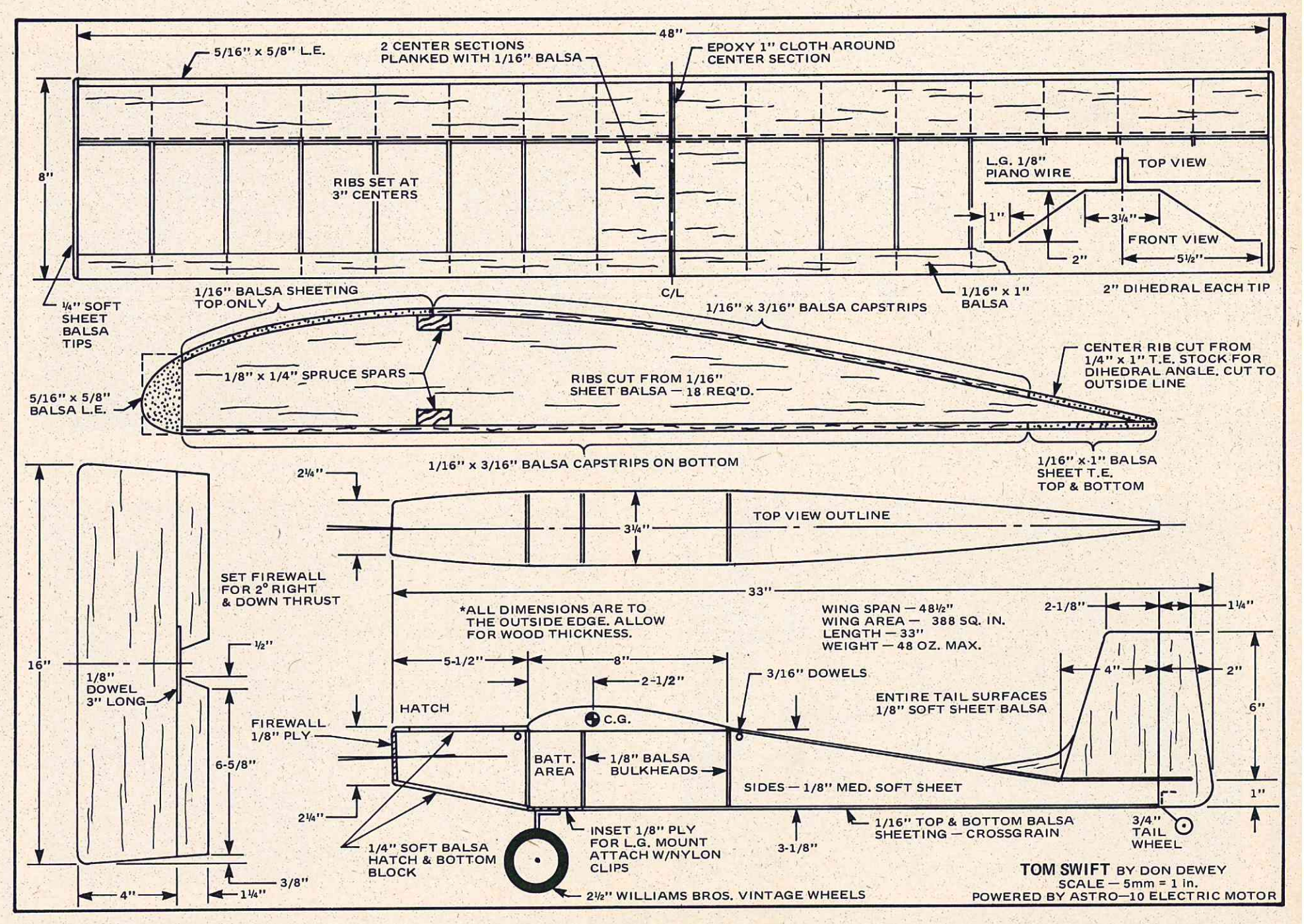
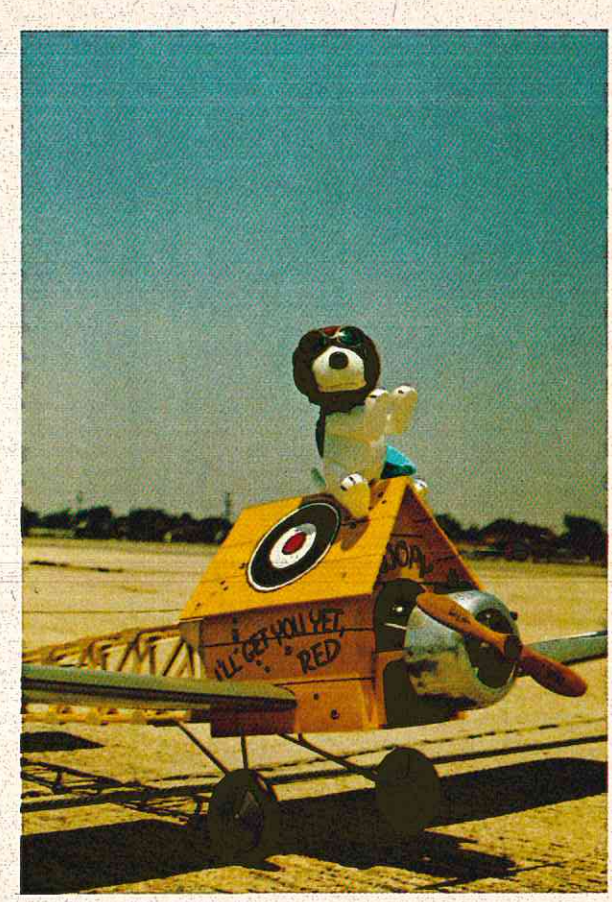

48"
5/16" x 5/8" L.E.
2 CENTER SECTIONS PLANKED WITH 1/16" BALSA
EPOXY 1" CLOTH AROUND CENTER SECTION
8"
RIBS SET AT 3" CENTERS
L.G. 1/8" PIANO WIRE
TOP VIEW
1"
3¼"
FRONT VIEW
2"
5½"
¼" SOFT SHEET BALSA TIPS
1/16" BALSA SHEETING TOP ONLY
C/L
1/16" x 1" BALSA
2" DIHEDRAL EACH TIP
1/16" x 3/16" BALSA CAPSTRIPS
CENTER RIB CUT FROM 1/4" x 1" T.E. STOCK FOR DIHEDRAL ANGLE. CUT TO OUTSIDE LINE
1/8" x 1/4" SPRUCE SPARS
RIBS CUT FROM 1/16" SHEET BALSA — 18 REQ'D.
5/16" x 5/8" BALSA L.E.
1/16" x 3/16" BALSA CAPSTRIPS ON BOTTOM
1/16" x 1" BALSA SHEET T.E. TOP & BOTTOM
2¼"
3¼"
TOP VIEW OUTLINE
SET FIREWALL FOR 2° RIGHT & DOWN THRUST
33"
*ALL DIMENSIONS ARE TO THE OUTSIDE EDGE. ALLOW FOR WOOD THICKNESS.
WING SPAN — 48½"
WING AREA — 388 SQ. IN.
LENGTH — 33"
WEIGHT — 48 OZ. MAX.
2-1/8"
1¼"
16"
½"
1/8" DOWEL 3" LONG
5-1/2"
8"
2-1/2"
3/16" DOWELS
4"
2"
6"
HATCH
C.G.
ENTIRE TAIL SURFACES 1/8" SOFT SHEET BALSA
FIREWALL 1/8" PLY
6-5/8"
BATT. AREA
1/8" BALSA BULKHEADS
SIDES — 1/8" MED. SOFT SHEET
1"
2¼"
INSET 1/8" PLY FOR L.G. MOUNT ATTACH W/NYLON CLIPS
3-1/8"
1/16" TOP & BOTTOM BALSA SHEETING — CROSSGRAIN
3/4" TAIL WHEEL
1/4" SOFT BALSA HATCH & BOTTOM BLOCK
4"
1¼"
3/8"
2½" WILLIAMS BROS. VINTAGE WHEELS
TOM SWIFT BY DON DEWEY
SCALE — 5mm = 1 in.
POWERED BY ASTRO—10 ELECTRIC MOTOR



A Club Project For Public Demonstrations, Or Just For Fun . . . .

SNOOPY

BY NICKOLAS J. LINARDOS

A few years ago, my two sons and I had finished flying our free flight and "U" control models at Mile Square and decided to pack up and drive over to the Radio Control area to do some spectating. My kids went wild when they saw that someone had seated Snoopy in the cockpit of an "Antic" (Lou Proctor's kit) and lettered "Curse You, Red Baron" on the side. That's when I got carried away, and I told the boys it might be possible to build a flying doghouse with Snoopy sitting on it. The design would incorporate the lifting surfaces as part of the house, while also simulating as much as possible of the mythical Sopwith Camel used in the comic strip. Now we could fly their hero on his doghouse and associate it with the imaginary aircraft he flies in. Yet, it had to fly like a standard R/C aircraft. The boys were delighted but just couldn't believe it could be done. After we reached home we sketched for hours, and I finally convinced the boys it could be done.

I had an older Orbit proportional system and was approximately 50 percent finished with the construction of a slope soarer. I promised the boys that I would start the design of Snoopy's doghouse after the glider was flying. Early the next year, after many crashes and repairs, I finally earned my R/C wings on the sailplane and was promptly reminded of my promise to build Snoopy.

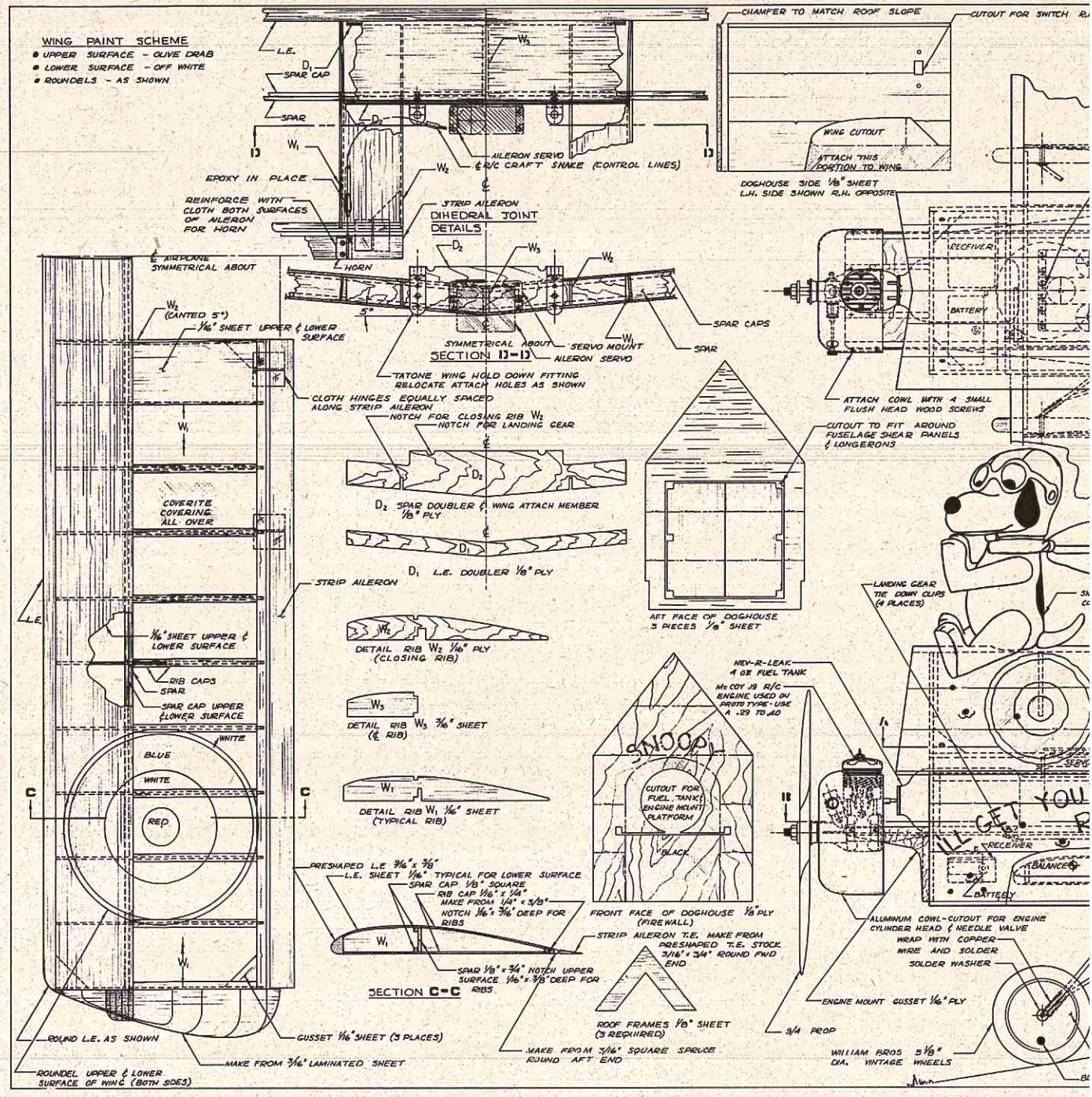
Design work on Snoopy began. After purchasing a plastic Snoopy doll, I sized the doghouse. It was difficult to retain the aspect ratio of the doghouse used in the comic strip and fit the radio gear within the doghouse envelope. Since the old radio equipment is somewhat larger and heavier than the present "state-of-the-art" equipment, I slightly expanded the fore and aft dimensions of the doghouse to accommodate the avionics.

After a few sketches of the wing and tail planform, and an estimate of the weight of the finished model, it appeared that a .19 cubic inch engine would do the job. I purchased a McCoy .R/C .19 engine so I could start the layout, and found that making accurate three-view drawings of all the airborne radio equipment was invaluable during the preliminary design period.

Now, I had another problem. My sons had sworn me to secrecy about this project. They knew I was a slow builder – and a big talker – and were concerned that someone else would beat us to the punch, especially if I started talking about it. I had a convenient place to work on the layout, but it was hardly secret. It was my drawing board at Northrop, where I am employed as an aeronautical engineer, and this was to be my lunchtime project. Every noon, when I unrolled the drawings, my gallery would come over for comments and general kibitzing. All my model building associates at work were aware of the Snoopy design program and, of course, I was becoming concerned that the project would leak out before I finished the design. If this did happen, I would be in the doghouse at home!

The airfoil selected was a Clark Y, modified to retain a flat forward lower surface for ease of fabrication. I referred to my Aircraft Profile publication on the Sopwith Camel to reproduce the tail surfaces and wing tip shape. The vertical and horizontal tail were built from 3/16" balsa sheet and the wing tips were formed from laminated 3/16" balsa strips shaped and rounded to fit the Clark Y modified airfoil. I believed that if I covered the trusswork fuselage, it would have the tendency to overpower the doghouse and obscure it, so I decided to leave the fuselage exposed and show all the detailed gussets and diagonal members for effect. The fuselage longerons and diagonals were all made from 3/16" square spruce, and all the gussets were 1/16" sheet balsa. The shear panels on the fuselage were made from 1/16" plywood. The wing hold-down and engine mount panel was made from 1/16" plywood. The upper fuselage shear panel was made from 1/16" plywood doubled with 1/8" plywood in the area of the servo mounting cutouts. The front face of the doghouse, the firewall, was made from 1/8" plywood, and when I bored the hole through the firewall for the fuel tank my wife thought I was building a bird house, not an airplane.

The engine was attached to the forward end of the 1/16" plywood engine mount and wing-attach platform with machine screws, lock washers and nut, then soldered in place. A 3/16" square spruce stiffener was glued directly under each engine mounting flange, terminating at the front face of the doghouse. These



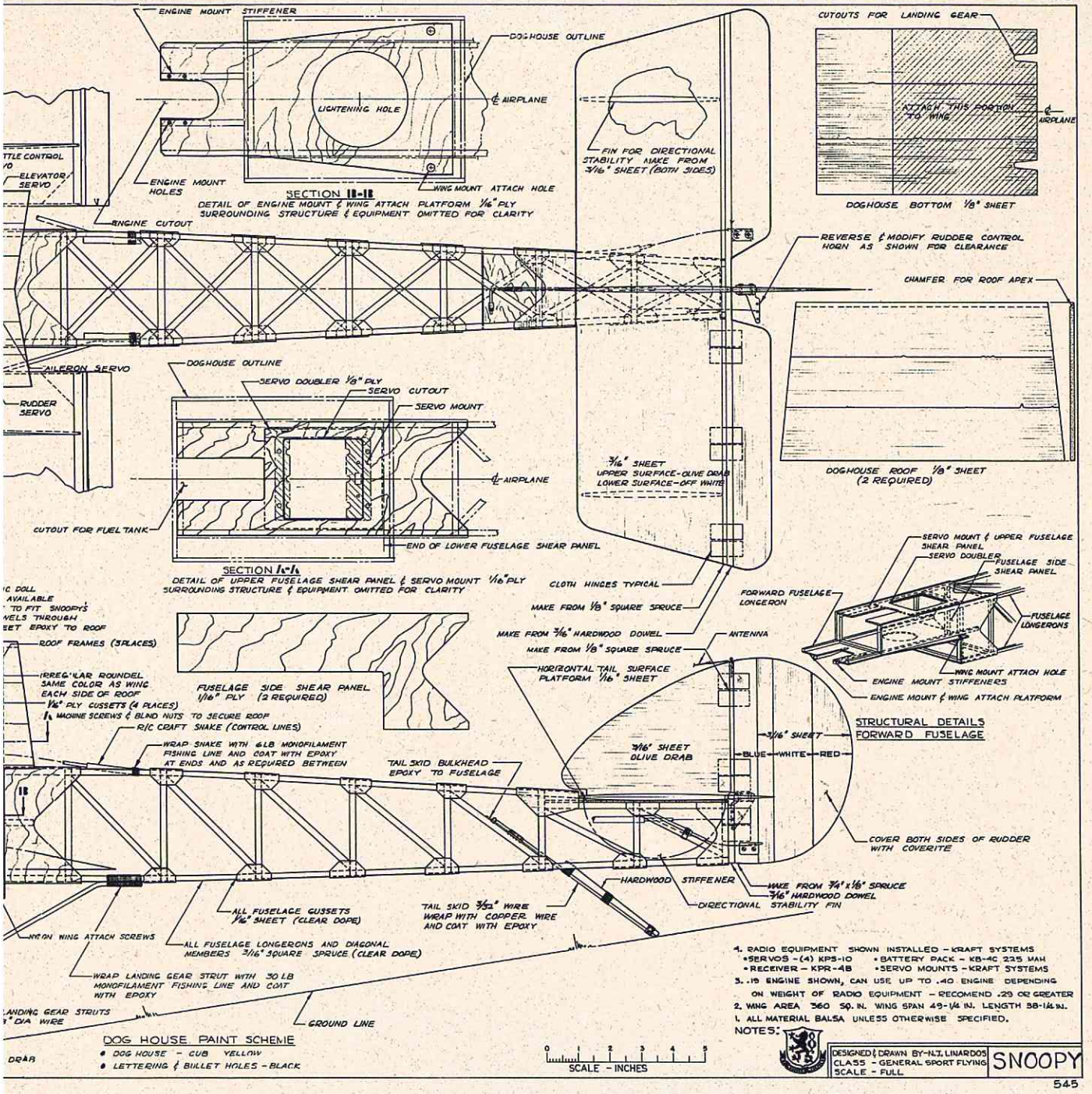
stiffeners were required to add more rigidity to the engine mount platform.

The aluminum alloy engine cowl was purchased from a local model shop. The proper cutout was made to accept the engine cylinder head, and a hole was drilled on the left hand side for the needle valve adjustment screw. The cowl is secured to the engine mount platform by four small wood screws. A plastic bowl could also be used.

The propeller selected for the first flight was a 9/4, and was based on the engine manufacturer's recommendation.

The wing design is shown in detail on the plans. The wing is removable and secured to the wing hold-down platform with Tatone wing hold-down fittings and nylon screws. The main wing box carries through the doghouse and fuselage, and the wing aft of the main spar butts up against the side of the doghouse. Structural provisions have been made to allow the cantilevered portion of the wing to carry torque by using a plywood end rib and by sheeting the complete airfoil section at the inboard bay. The structure is defined thoroughly in the detailed drawings.

The item of most concern is the aerodynamic characteristics of the overhanging doghouse roof and, of course, "good old Snoopy" sitting on top, completely exposed to the airstream. It is obvious that the drag of these components will be substantial, although this is relatively minor when compared with the pitching moments caused by this drag. The geometry of this configuration led me to believe that, as the airplane speed increases, a nose-up pitching moment will occur and adequate elevator trim will have to be applied if this pitching problem develops.



The control system consists of three servos – rudder, elevator, and throttle control. R/C craft "snakes" were used for the control rods and secured to the fuselage longerons with monofilament fishing line and epoxy. The rudder area selected was somewhat larger than a more conventional airplane because the rudder effectiveness would be reduced due to the doghouse configuration directly in front of this control surface. The elevator area was also sized larger than that of a more conventional airplane in order to handle the predicted large pitching moments associated with Snoopy and the doghouse roof.

The roof of the doghouse is held in place by four flush machine screws. Snoopy is secured to the roof with epoxy and dowels through his bottom and feet. The peak of the roof is shaped to fit his bottom. Removal of the roof allows accessibility to the servos and receiver for maintenance and/or repair. The wing must be removed if access to the battery is required.

To ensure that the doghouse would stand out, Cub Yellow was selected for its color. Black was used for the doghouse entrance, lettering, and bullet holes. The board joints were drawn with a Rapidograph pen and India ink, then coated with clear dope. The roundel on the doghouse was purposely painted irregularly. The roundel is an RFC (Royal Flying Corps) WW I insignia and has a red center, white and blue band and is bordered by a thin band of white. The upper surface of the horizontal tail and wing were painted olive drab. The stock color olive drab was too dark, so I mixed about 25 percent white into it to produce the color desired. The vertical tail was also painted with this

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TIPSY NIPPER MK2

BY BRYCE PETERSEN

Education and experience gives us the ability to design creations that are new and different. Sometimes these creations go one step beyond in performance and beauty and become outstanding. If you analyze this type of creativity, you usually find the creator is in love with his work and is just doing "his thing". The rumor is the engineers that created the Tipsy Nipper were short on work and were given the freedom to play with a project they themselves would like to design. Naturally, their choice was a semi–aerobatic, single seat, ultra–light sport plane - - - what else! I have no doubt they envisioned themselves floating around in their own private sport plane during its creation. The Nipper MK2 was designed by the Avions Fairey S.A. in England. It flew for the first time in 1959 and was originally intended for manufacture in kit form. Nippers were sold to aero clubs and private owners in many parts of the world before the design was sold to the Cobelavia Company in Belgium. The MK2 was powered by a 45 H.P. engine and had a maximum speed of 101 mph and a service ceiling of 13,100 feet.

To me, the design is perfect for modeling. It is round in the right places for beauty and square in the right places for construction. The shoulder wing must be removed and requires a little tight fitting. It is the only factor that keeps it out of the beginner's class. The foam wing is simple to cut and is cored out in the center for lightness.

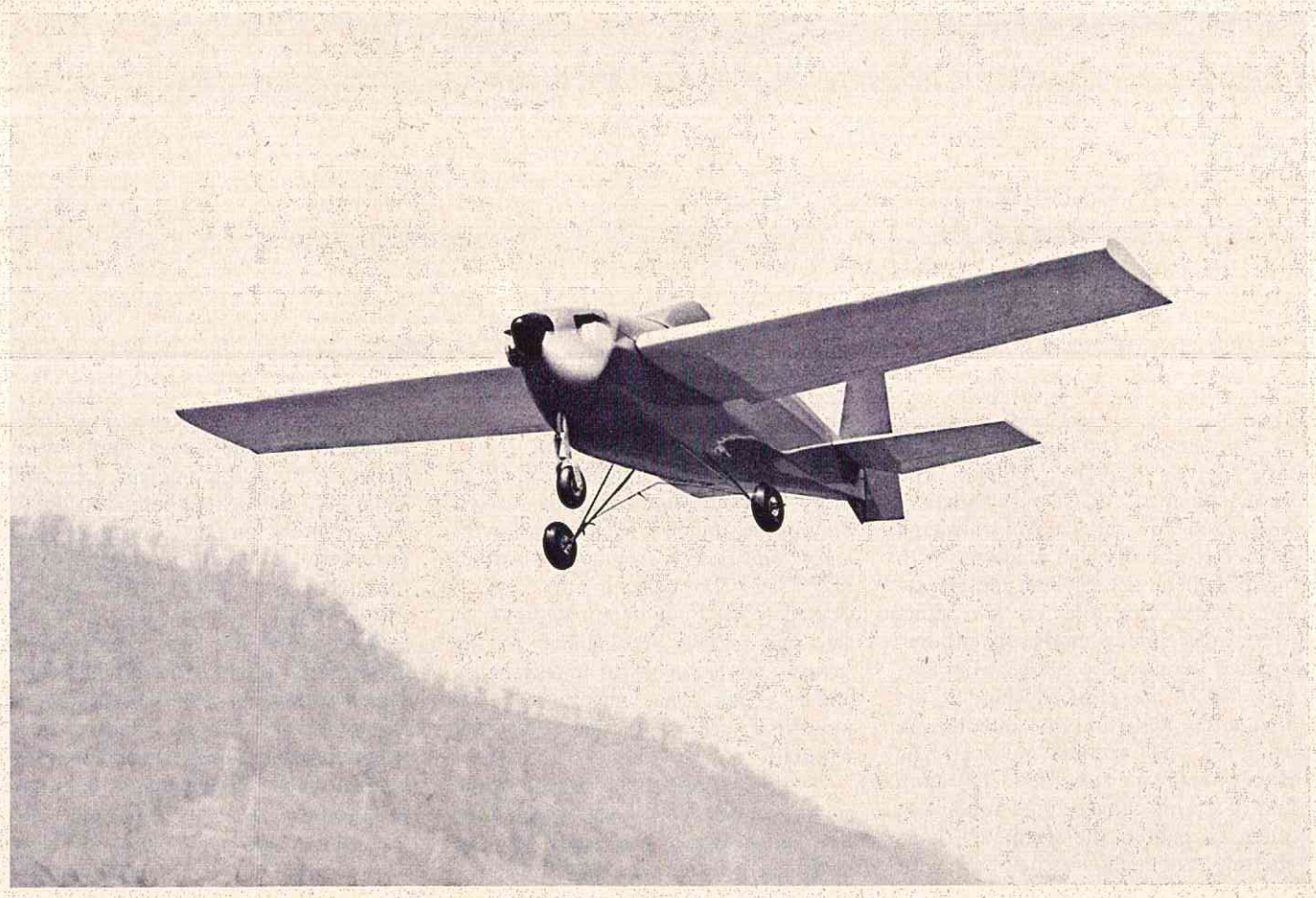
It has been disappointing to hear that foam cutting is losing popularity with home builders. Even Don Dewey gave away his foam cutter! Could it be that he has been playing with gliders too long? Seriously, I suggest you give foam another try. It will give you perfect wings every time; it is quicker to construct; and it will take more punishment on the field. Balsa is the king of construction materials and always will be. It will stand up to vibration better than just about anything else except one material: you guessed it - - - foam!

FLYING

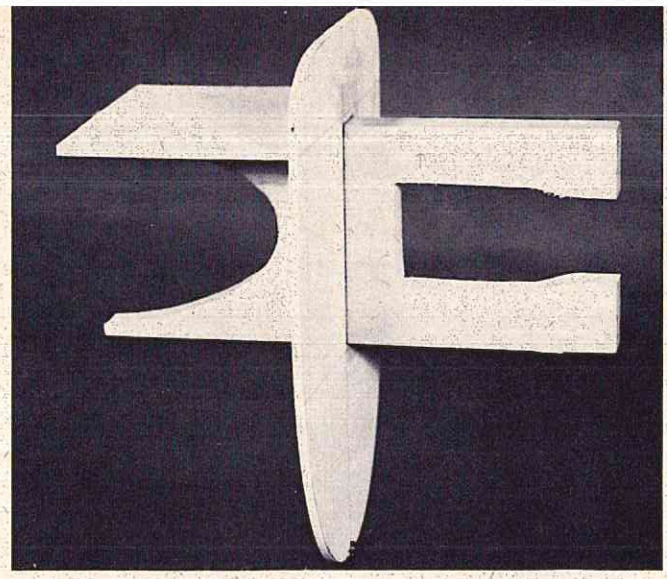
My Nipper tracked down the runway and lifted off with a little up elevator. The Super Tigre .29 seemed to be plenty of power for round loops and vigorous aerobatics associated with Sunday afternoon flying. The real fun with the Nipper is landings. It was designed for landings and has no equal in this maneuver. Slow flight is exceptional with very little wing drop–off after full stalls. The rudder was less sensitive than I expected and requires more than average travel to be effective.

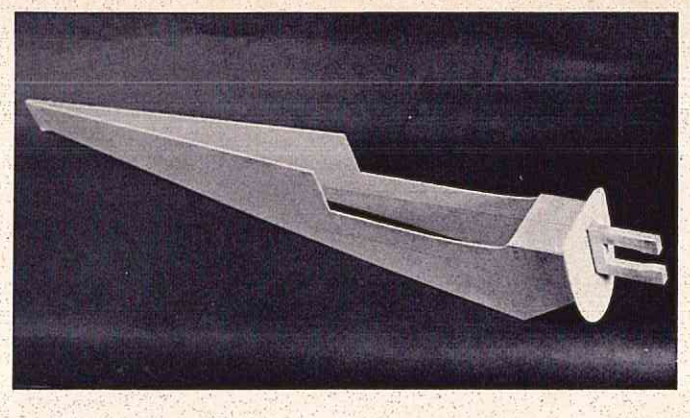
The roll rate is brisk and axial with extra air speed. The elevator's reaction seems normal for a short coupled airplane and normal movement is recommended. The nose gear should be geared down for shallow turns on the ground because of the short distance between the nose gear and main gear. Actually, there are no bad flight characteristics that I can find after thirty flights, and I feel the Nipper would make an excellent trainer.

text to page 81

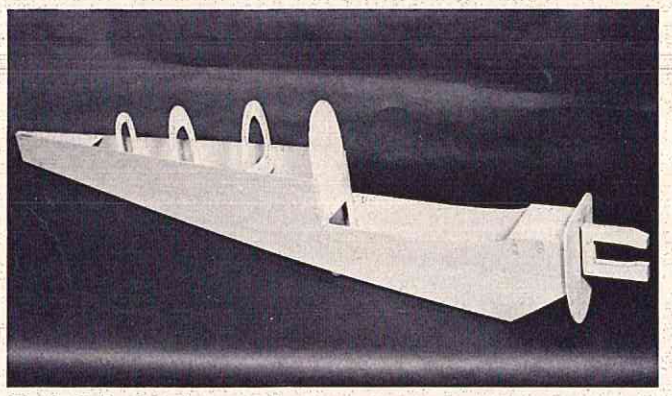



OO·NIP

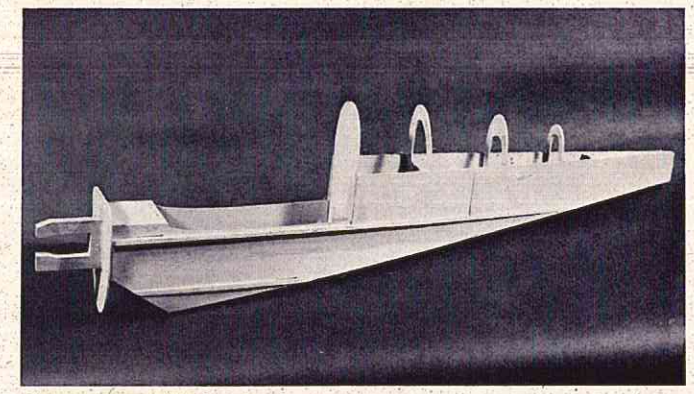




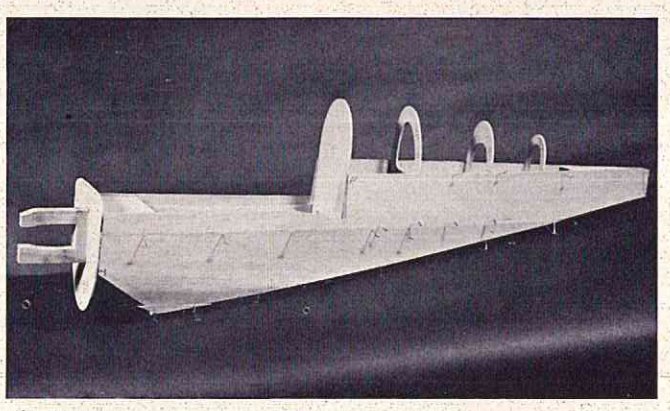
These series of photos by the author illustrate the construction sequence of the Tipsy Nipper. At left, the engine mount and firewall building block, step #1. ABOVE: The 1/8" sheet sides in place.



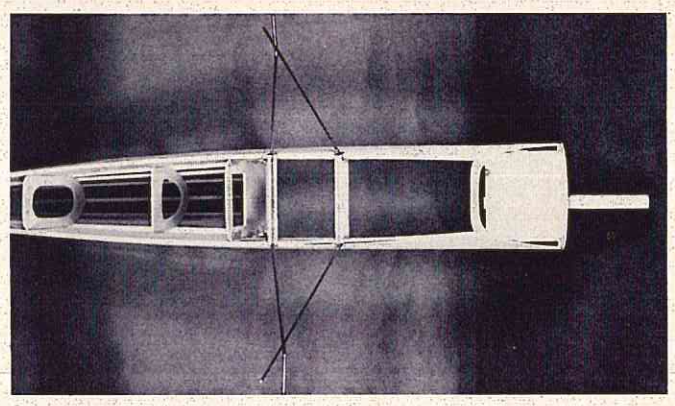
The basic fuselage framework.



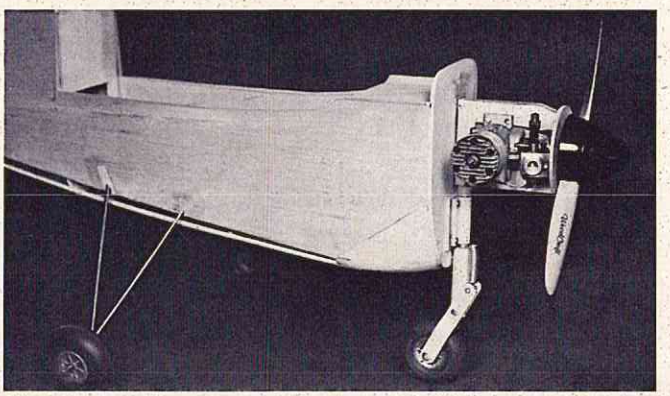
Side stringers added to fuselage.



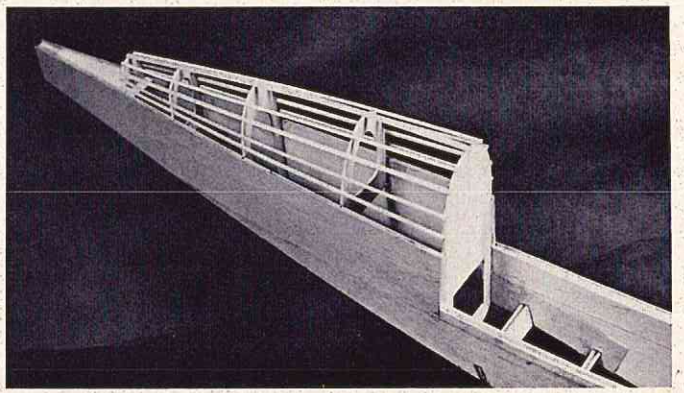
1/16" balsa side sheeting added over stringers.



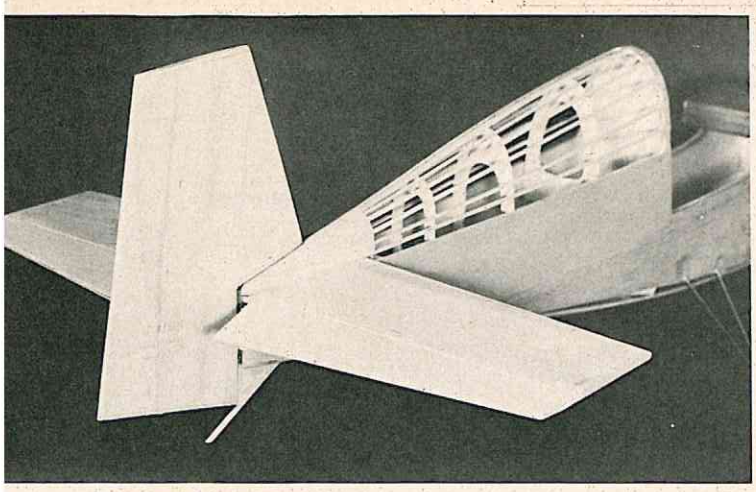
Next, the leanding gear is added in place.



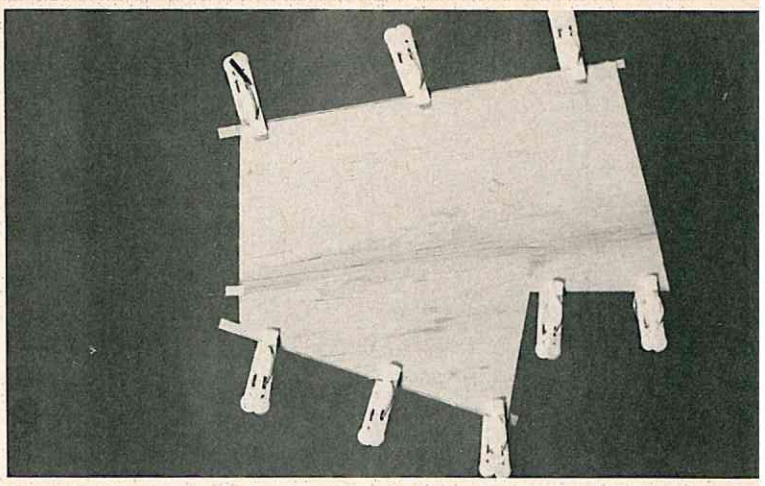
Nosewheel and engine mounted.



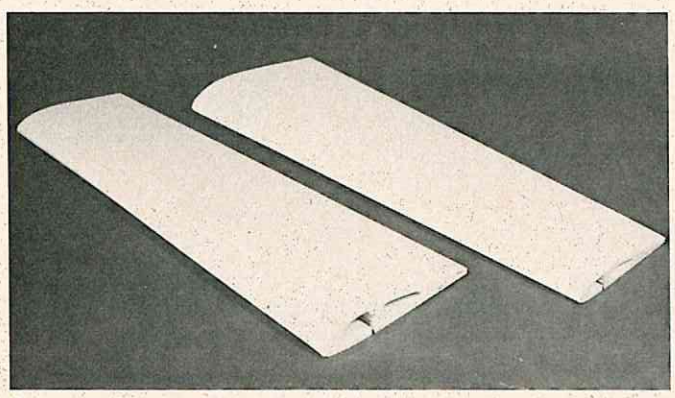
The addition of all spruce stringers.



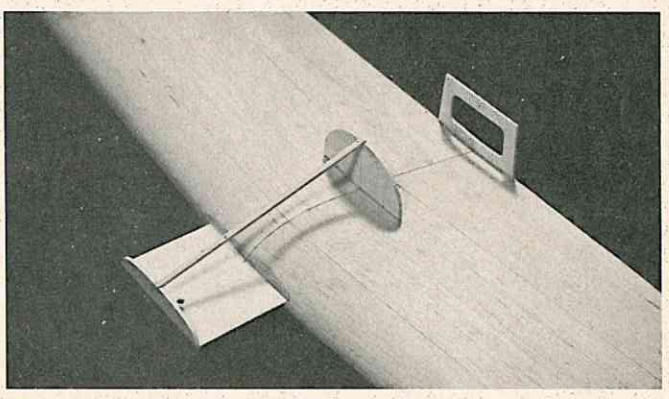
Close-up of empennage.



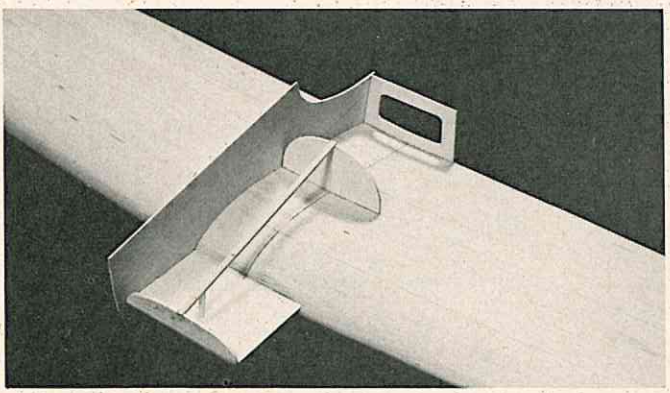
Rudder construction with spruce spar and 1/16" balsa.



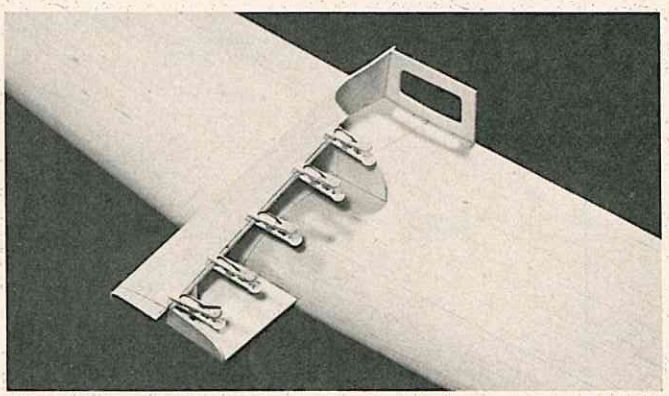
Foam wing cores with centers cored out.



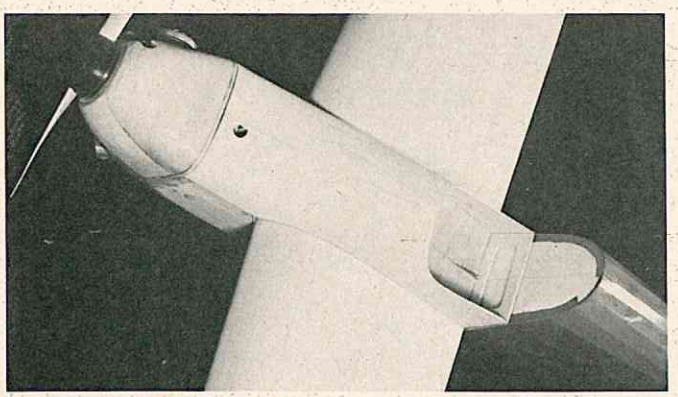
Wing mount to fuselage, step #1.



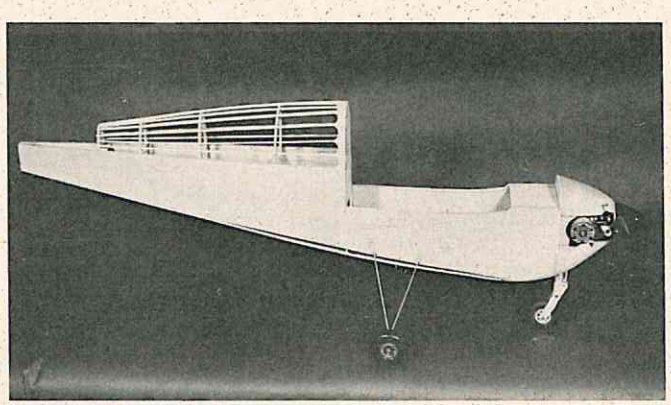
Wing construction detail, step #2.



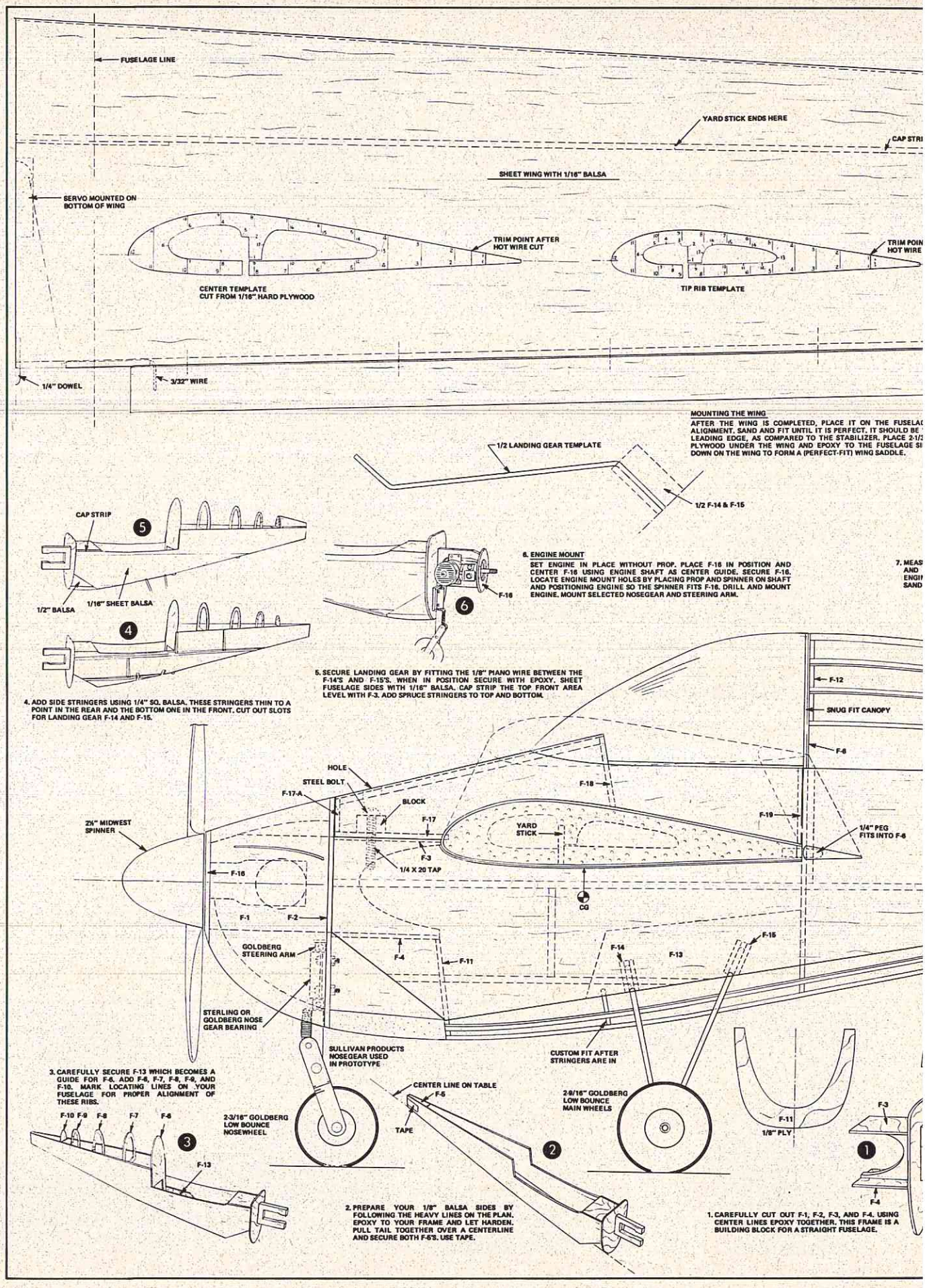
Wing construction detail, step #3.

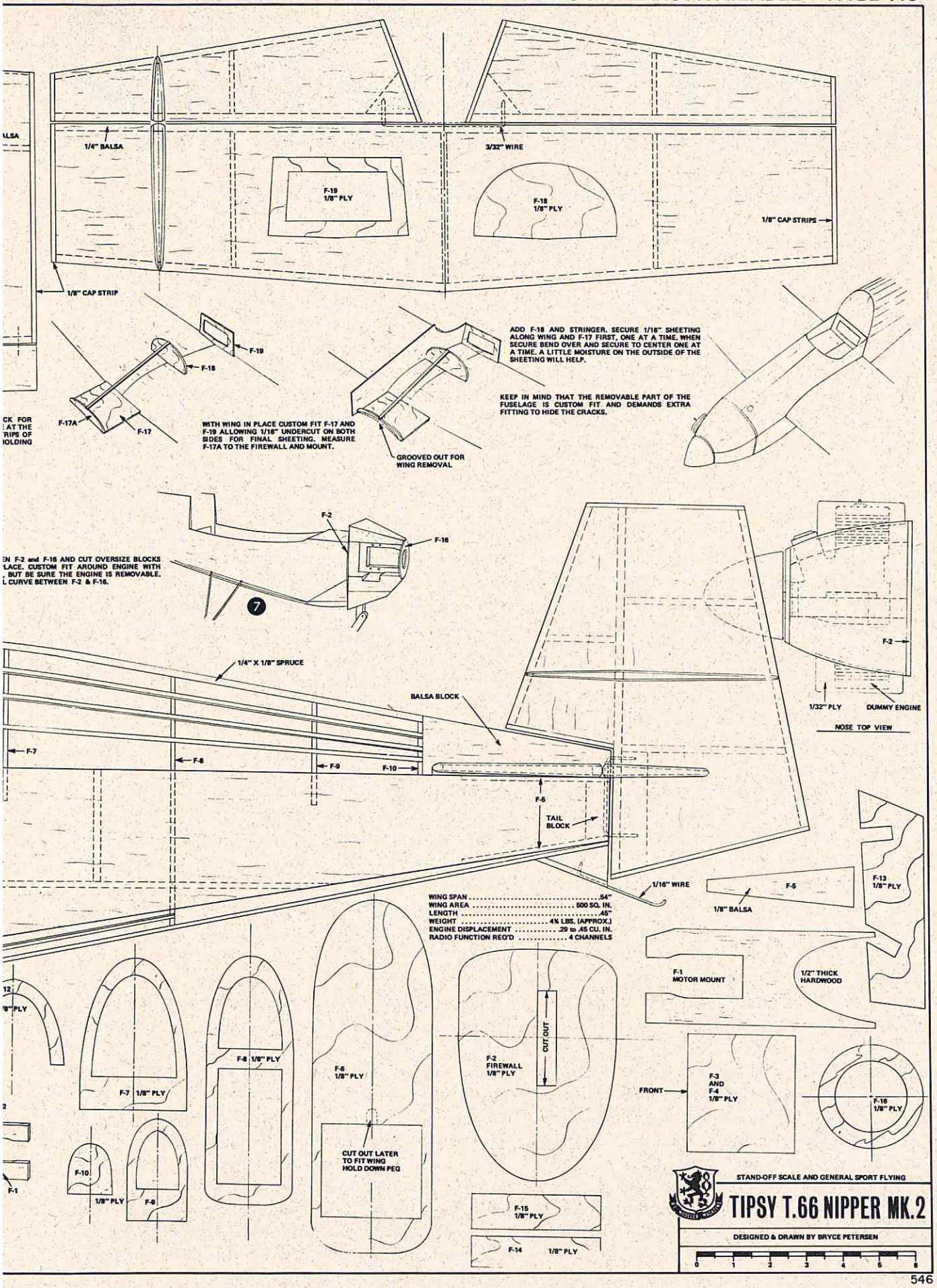


Wing construction completed.



Completed fuselage with engine mounted.


FUSELAGE LINE
YARD STICK ENDS HERE
CAP STRI
SHEET WING WITH 1/16" BALSA
SERVO MOUNTED ON BOTTOM OF WING
TRIM POINT AFTER HOT WIRE CUT
CENTER TEMPLATE CUT FROM 1/16" HARD PLYWOOD
TRIM POIN HOT WIRE
TIP RIB TEMPLATE
1/4" DOWEL
3/32" WIRE
MOUNTING THE WING
AFTER THE WING IS COMPLETED, PLACE IT ON THE FUSELAG ALIGNMENT. SAND AND FIT UNTIL IT IS PERFECT. IT SHOULD BE LEADING EDGE, AS COMPARED TO THE STABILIZER. PLACE 2-1/2 PLYWOOD UNDER THE WING AND EPOXY TO THE FUSELAGE SI DOWN ON THE WING TO FORM A (PERFECT-FIT) WING SADDLE.
1/2 LANDING GEAR TEMPLATE
1/2 F-14 & F-15
CAP STRIP
5
1/2" BALSA
1/16" SHEET BALSA
4
F-16
6
6. ENGINE MOUNT
SET ENGINE IN PLACE WITHOUT PROP. PLACE F-16 IN POSITION AND CENTER F-16 USING ENGINE SHAFT AS CENTER GUIDE. SECURE F-16. LOCATE ENGINE MOUNT HOLES BY PLACING PROP AND SPINNER ON SHAFT AND POSITIONING ENGINE SO THE SPINNER FITS F-16. DRILL AND MOUNT ENGINE. MOUNT SELECTED NOSEGEAR AND STEERING ARM.
7. MEAS AND ENGI SAND
4. ADD SIDE STRINGERS USING 1/4" SQ. BALSA. THESE STRINGERS THIN TO A POINT IN THE REAR AND THE BOTTOM ONE IN THE FRONT. CUT OUT SLOTS FOR LANDING GEAR F-14 AND F-15.
5. SECURE LANDING GEAR BY FITTING THE 1/8" PIANO WIRE BETWEEN THE F-14'S AND F-15'S. WHEN IN POSITION SECURE WITH EPOXY. SHEET FUSELAGE SIDES WITH 1/16" BALSA. CAP STRIP THE TOP FRONT AREA LEVEL WITH F-3. ADD SPRUCE STRINGERS TO TOP AND BOTTOM.
F-12
SNUG FIT CANOPY
F-6
HOLE
STEEL BOLT
F-17-A
BLOCK
F-17
F-18
F-19
YARD STICK
1/4" PEG FITS INTO F-6
2¼" MIDWEST SPINNER
F-3
1/4 X 20 TAP
F-16
CG
F-1
F-2
GOLDBERG STEERING ARM
F-4
F-11
F-14
F-13
F-15
STERLING OR GOLDBERG NOSE GEAR BEARING
SULLIVAN PRODUCTS NOSEGEAR USED IN PROTOTYPE
CUSTOM FIT AFTER STRINGERS ARE IN
3. CAREFULLY SECURE F-13 WHICH BECOMES A GUIDE FOR F-6. ADD F-8, F-7, F-8, F-9, AND F-10. MARK LOCATING LINES ON YOUR FUSELAGE FOR PROPER ALIGNMENT OF THESE RIBS.
F-10 F-9 F-8 F-7 F-6
3
F-13
2-3/16" GOLDBERG LOW BOUNCE NOSEWHEEL
CENTER LINE ON TABLE
F-5
TAPE
2
2-9/16" GOLDBERG LOW BOUNCE MAIN WHEELS
F-11
1/8" PLY
F-3
1
F-4
2. PREPARE YOUR 1/8" BALSA SIDES BY FOLLOWING THE HEAVY LINES ON THE PLAN. EPOXY TO YOUR FRAME AND LET HARDEN. PULL TAIL TOGETHER OVER A CENTERLINE AND SECURE BOTH F-6'S. USE TAPE.
1. CAREFULLY CUT OUT F-1, F-2, F-3, AND F-4. USING CENTER LINES EPOXY TOGETHER. THIS FRAME IS A BUILDING BLOCK FOR A STRAIGHT FUSELAGE.


1/4" BALSA
3/32" WIRE
F-19
1/8" PLY
F-18
1/8" PLY
1/8" CAP STRIPS
1/8" CAP STRIP
F-19
F-18
F-17A
F-17
WITH WING IN PLACE CUSTOM FIT F-17 AND F-19 ALLOWING 1/16" UNDERCUT ON BOTH SIDES FOR FINAL SHEETING. MEASURE F-17A TO THE FIREWALL AND MOUNT.
GROOVED OUT FOR WING REMOVAL
ADD F-18 AND STRINGER. SECURE 1/16" SHEETING ALONG WING AND F-17 FIRST, ONE AT A TIME. WHEN SECURE BEND OVER AND SECURE TO CENTER ONE AT A TIME. A LITTLE MOISTURE ON THE OUTSIDE OF THE SHEETING WILL HELP.
KEEP IN MIND THAT THE REMOVABLE PART OF THE FUSELAGE IS CUSTOM FIT AND DEMANDS EXTRA FITTING TO HIDE THE CRACKS.
F-2
F-16
7
1/4" X 1/8" SPRUCE
BALSA BLOCK
F-7
F-8
F-9
F-10
F-5
TAIL BLOCK
1/16" WIRE
F-2
1/32" PLY
DUMMY ENGINE
NOSE TOP VIEW
F-5
1/8" BALSA
F-13
1/8" PLY
F-1
MOTOR MOUNT
1/2" THICK HARDWOOD
WING SPAN ..... 54"
WING AREA ..... 600 SQ. IN.
LENGTH ..... 45"
WEIGHT ..... 4¼ LBS. (APPROX.)
ENGINE DISPLACEMENT ..... .29 to .45 CU. IN.
RADIO FUNCTION REQ'D ..... 4 CHANNELS
F-8 1/8" PLY
F-7 1/8" PLY
F-6
1/8" PLY
CUT OUT LATER TO FIT WING HOLD DOWN PEG
F-2
FIREWALL
1/8" PLY
CUT OUT
FRONT
F-3
AND
F-4
1/8" PLY
F-16
1/8" PLY
F-10
1/8" PLY
F-9
F-1
F-15
1/8" PLY
F-14
1/8" PLY
STAND-OFF SCALE AND GENERAL SPORT FLYING
TIPSY T.66 NIPPER MK.2
DESIGNED & DRAWN BY BRYCE PETERSEN
0 1 2 3 4 5 6

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RCM-WORLD

SIX CHANNEL DIGITAL PROPORTIONAL SYSTEM

PART III: RECEIVER AND DECODER BOARDS

BY JOHN MALONEY

In our last article we wrote the instructions for the assembly of the two boards in the RCM-World Six Transmitter. Frankly, we would have preferred to finish up the transmitter in this article. However, our art work got a little bit behind schedule. Anyway, we feel that since our readers have been assembling boards, we might as well get the receiver and the decoder boards out of the way in this article.

Before getting into the assembly of boards, I would like to touch upon the design of this receiver and decoder. The receiver is basically the same receiver that we used in our Mark II Blue Max System. This receiver was evolved over about two years of extensive test flying. Getting a good receiver designed, nailed down, and working, is no small task. In other words, it's not something you just pop out for the sake of having something new. We are talking about the development of something that requires thousands of test flights and hundreds of gallons of model airplane fuel and the agonizing death (from old age) of 8 or 9 test airplanes! Also, when you are looking for little tiny glitches, you are not going to find them with some clod flying the airplane. Our test pilot at World Engines is Dave Brown who placed in the top ten at the Nationals this year and in the top ten at the Masters Tournament last year. A contest flyer of this caliber can spot jiggles in the air that the writer would never notice and the writer has been flying R/C since 1952.

For the last two or three years I have attended the Nationals at Chicago and while I am there I generally pace off the distance that the R/C pattern flyers are going out from the judges. It is amazing how much the distance varies from flyer to flyer. Some flyers are getting out to about 400 paces or about 1200 feet. However, each year the airplanes seem to get faster and heavier and this means that it takes more distance to do a long slow roll. So, we are saying that the demands on the radio system are growing. Our test field is on the southern edge of a small airport in northeastern Cincinnati – Blue Ash. The distance from Plainfield Road, which borders this airfield on the west, is about 1500 feet to our take-off point. During a lot of tests we have dropped off an observer on Plainfield Road with a Walkie-Talkie so that he can tell us, back at the transmitter, just how far we are going over the road which gives us a good idea of our flight pattern. Also, in our search for glitches, we have carried a Norelco pocket tape recorder on the airplane and actually recorded the received signal on tape. This whole procedure has been very enlightening and, it was through this program, that we evolved the receiver that we are presenting here today. There are still a few trade secrets, however, and we wish to maintain some of the results that we found in these testing activities as our secrets.

The development of the decoder was evolved in much the same way and at the same time we were developing this receiver. We are using an integrated circuit in this decoder that is very popular and used by many, if not most, of the other R/C equipment manufacturers. There are certain parts of the decoder, however, which are made up of discreet components and their values and arrangement were selected to reduce nervousness in the system at the edge of range.

Any receiver and decoder has a certain amount of internal noise. Our servo and decoder have been designed especially to keep this internal noise to an absolute minimum and it is necessary for us to do this because our servo I.C. is extremely sensitive and it can pick up this noise if it is existent. Frankly, some other R/C equipment manufacturers are not using our integrated circuit because they have such noise in their system and, therefore, need a less sensitive servo I.C. We might add, however, that there are four or five other R/C equipment manufacturers on the planet that are using our integrated circuit, domestically and off-shore. □

SOLDERING COMPONENTS INTO THE RECEIVER BOARD

The receiver board measures approximately 1-3/8" x 1-3/4" and has its corners cut away. It has one large hole of 3/32" diameter drilled near the middle of one edge. Place this board on the table, foil side down, so that the large hole is located on the right.

When installing a component, follow the seven-step procedure explained in the general instructions.* This procedure involves identification, mounting, soldering, and finishing for each component.

Figure R-1 shows the locations of the components on this board. Begin by installing i.f. transformer T3 in the right front corner of the board. Next, install one of the components adjacent to T3. Continue adding components, one by one, working outward and away from those already installed. Use the installed components as guides to help locate the correct position of the next component.

**The general instructions will be found in the second article of this series which appears in the November 1973 issue of this magazine.*

SPECIFIC MOUNTING INSTRUCTIONS

RESISTORS

SYMBOL	DESCRIPTION AND MARKING
R1, R2	1 Meg. ohm (brown, black, green)
R3	1500 ohm (brown, green, red)
R4, R5	47K ohm (yellow, violet, orange)
R6	1000 ohm, 1/8 watt (brown, black, red)
R7 – R9	1000 ohm (brown, black, red)
R10 – R12	4700 ohm (yellow, violet, red)
R13	220K ohm (red, red, yellow)
R14, R15	15K ohm (brown, green, orange)
R16	100 ohm (brown, black, brown)
R17	3300 ohm (orange, orange, red)

HORIZONTAL MOUNTING

Make a smooth 90° bend in each lead close to the body of the resistor. Insert the leads into the proper holes and push the resistor down against the board.

VERTICAL MOUNTING

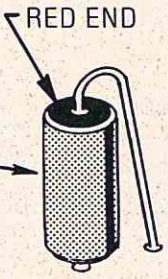
Make a smooth bend of about 160° in one lead. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the resistor is drawn, and push the resistor down against the board.

CAPACITORS

SYMBOL	DESCRIPTION AND MARKING
C1	33 pfd Disk (33K)
C2	1 pfd Tubular (brown, black, white)
C3 – C5	27 pfd Disk (27K)
C6 – C10	.05 µfd Disk (.05)
C11	.22 µfd. Blue cap. (224Z)
C12	4 pfd Disk (4)
C13, C14	47 µfd Tantalum (47 µF or 47K or 25V47)
C15	.47 µfd Tantalum (0.47 or R47)
C16, C17	4.7 µfd Tantalum (4.7 M or 4R7)
C18	2.2 µfd Tantalum (2.2K or 2.2M or 2R2)
C19	1.0 µfd Tantalum (1 µf or 1UF or 1.0K)
C20 – C22	.01 µfd Disk (103Z or 10N)
C23	.02 µfd Disk (203Z)

TANTALUM CAPACITOR MOUNTING (VERTICAL ONLY)

Make a smooth bend of about 160° in the lead coming out of the positive (red) end of the capacitor. Do not allow the lead to touch the body of the capacitor. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the capacitor is drawn, and push the capacitor down against the board. The red end must be up.



TUBULAR CAPACITOR MOUNTING

Make a smooth bend of about 160° in one lead. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the capacitor is drawn, and push the capacitor down against the board.

DISK CAPACITOR MOUNTING

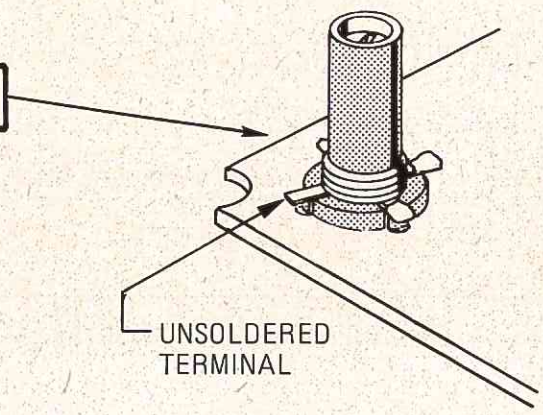
Insert the leads into the proper holes and push the capacitor down to within 1/16" of the board.

COILS AND CHOKE

SYMBOL	DESCRIPTION AND MARKING
L1	Antenna coil (one upper terminal unsoldered)
L2	Mixer coil (one upper terminal painted red)
L3	.33 µh Tubular (gold, orange, orange)

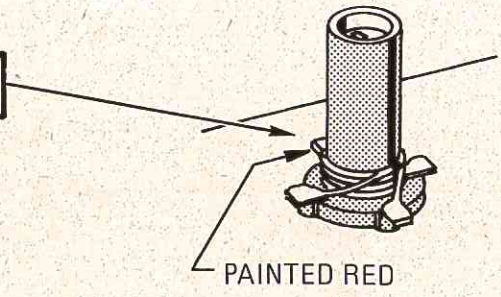
ANTENNA COIL MOUNTING

Insert the four lower terminals into the proper holes so that the unsoldered upper terminal points towards the nearest corner of the board.



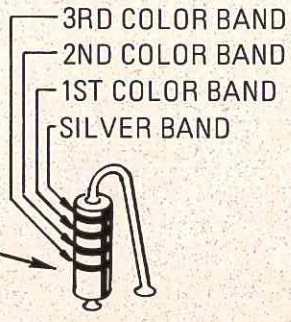
MIXER COIL MOUNTING

Insert the four lower terminals into the proper holes so that the red upper terminal points towards the rear edge of the board.



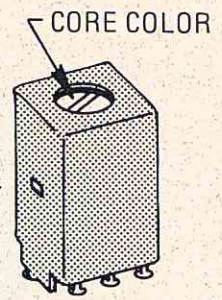
CHOKE MOUNTING

Make a smooth bend of about 160° in one lead. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the choke is drawn, and push the choke down against the board.



TRANSFORMERS

SYMBOL	DESCRIPTION AND MARKING
T1	i.f. transformer (yellow core)
T2	i.f. transformer (white core)
T3	i.f. transformer (black core)



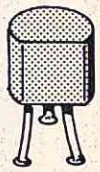
Holes have been located in the board to fit the leads properly. Insert the seven leads into the corresponding holes as shown in Figure R-1.

TRANSISTORS

SYMBOL	DESCRIPTION AND MARKING
Q1 – Q3	p-n-p transistor (5139TP)
Q4	p-n-p transistor (4916TP)
Q5	n-p-n transistor (2N3563)

Q1 – Q4 MOUNTING (See appendix for Q1 – Q3 transistor substitution)

Bend the two outer leads (the leads closer to the flat face) slightly apart. Bend the center lead (the lead farther from the flat face) slightly away from the flat face. Insert the leads into the holes in the board, and push the transistor down to within 1/8" of the board. The flat face must be positioned as shown in Figure R-1.



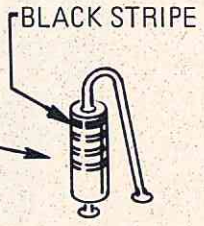
Q-5 MOUNTING

The case geometry of this transistor differs from that of the other transistors. Bend the two leads located on a diameter of the case slightly apart. Bend the remaining lead slightly outward and away from the other two. Insert the leads into the holes in the board and push the transistor down to within 1/8" of the board. The flat face must be positioned as shown in Figure R-1.

DIODE

SYMBOL	DESCRIPTION AND MARKING
D1	1N34A (black, orange, yellow, brown)

Make a smooth bend of about 160° in the lead coming out of the end marked with a black stripe. Leave the other lead straight. Insert the straight lead into the hole on which the outline of the diode is drawn, and push the diode down against the board.

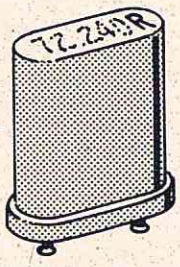


CRYSTAL

SYMBOL	DESCRIPTION AND MARKING
X	Frequency printed on case

Caution: Use the receiver crystal which is identified by the letter "R" printed after the frequency number on top of the case. For example, a crystal might be designated 72.240R. The corresponding crystal, 72.240T, is used in the transmitter.

Insert the leads into the proper holes in the board as shown in Figure R-1.



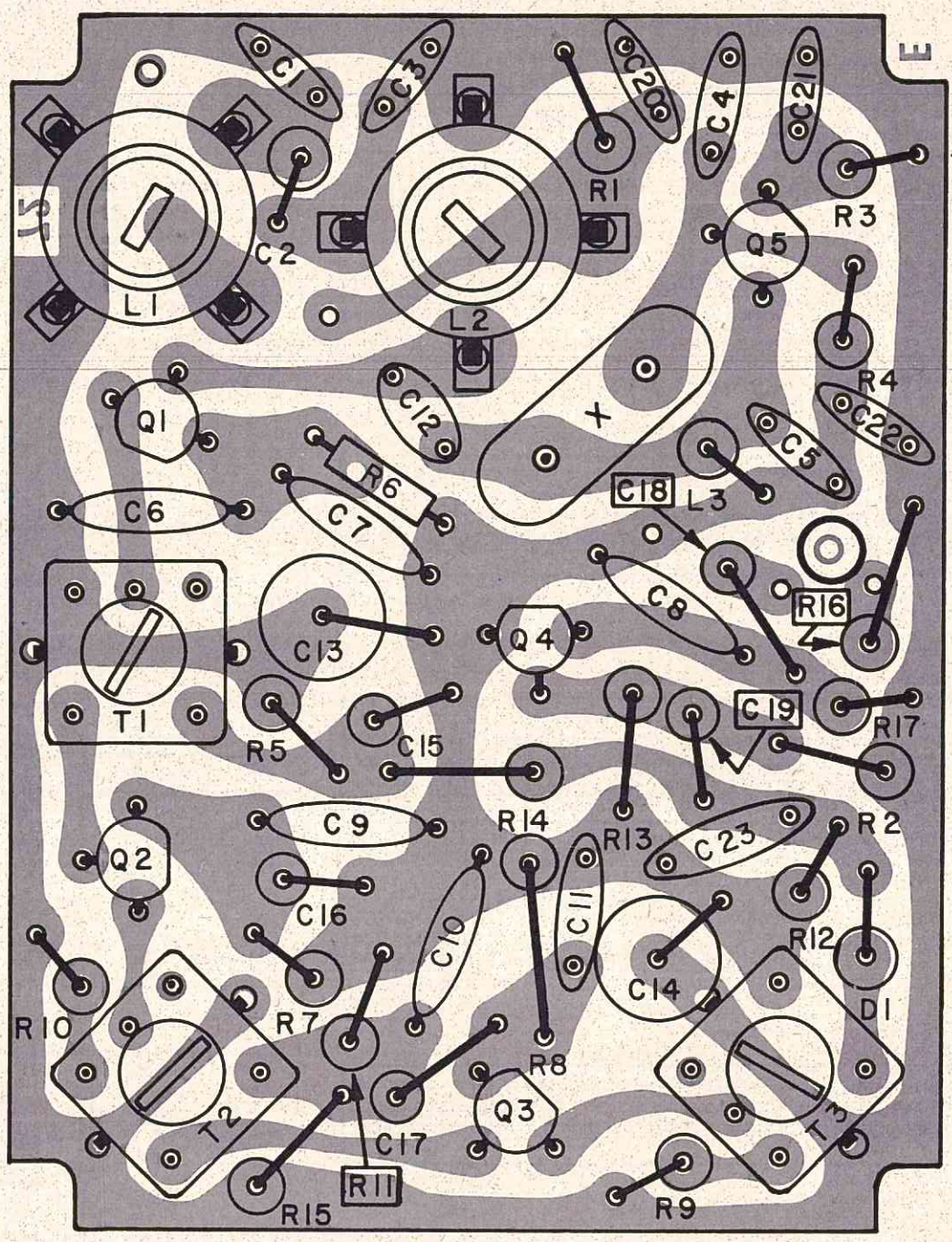


FIGURE R-1
RECEIVER PRINTED CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)

RECEIVER BOARD

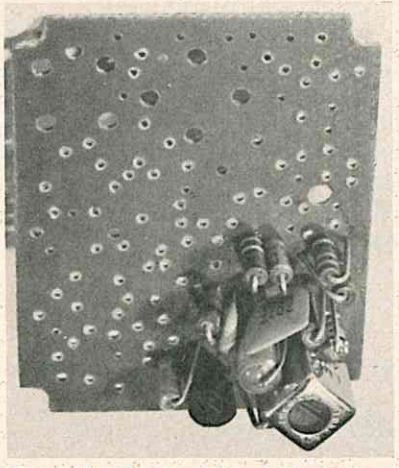


Photo 1 – Receiver Board. Beginning of assembly.

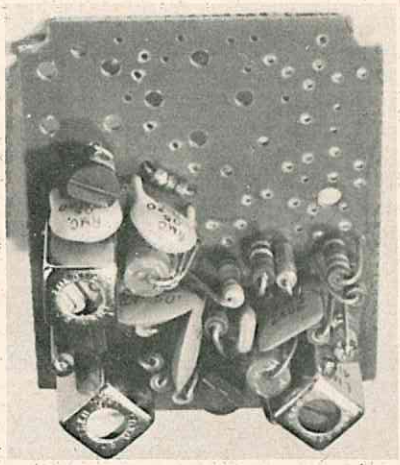


Photo 2 – Receiver Board. About half-way through assembly. Note tiny 1/8 watt resistor in horizontal position.

Photo 3 – Receiver Board. Almost completed.

Photo 4 – Receiver Board. Completed. The antenna and mixer coils have been installed last to minimize the danger of bending the paper tubes.

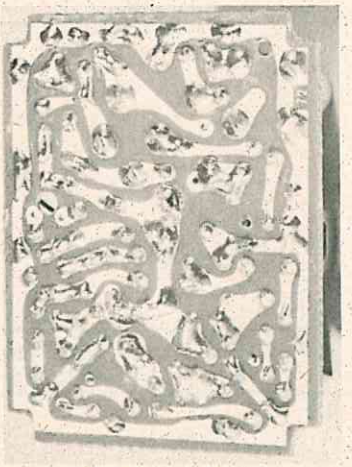


Photo 5 – Receiver Board. Completed. Foil side showing soldered connections.

DECODER BOARD

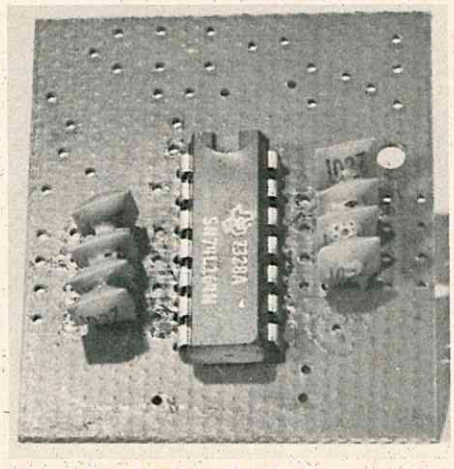


Photo 6 – Decoder Board. Beginning of assembly.

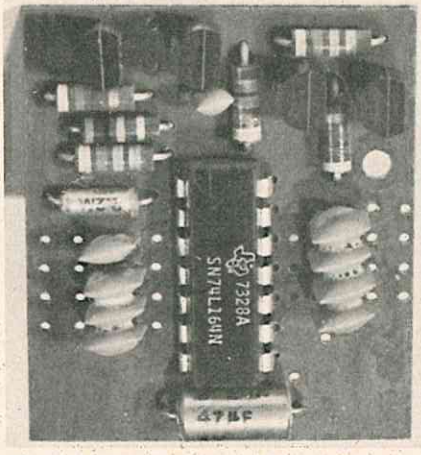


Photo 7 – Decoder Board. Completed.

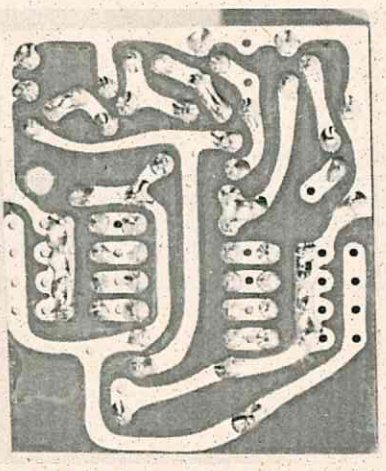


Photo 8 – Decoder Board. Completed. Foil side showing soldered connections.

SOLDERING COMPONENTS INTO THE DECODER BOARD

The decoder board measures approximately 1-5/16" x 1-1/2" and has one large hole of 3/32" drilled near one edge. Place this board on the table, foil side down, so that the large hole is located on the right.

When installing a component, follow the seven-step procedure explained in the general instructions.* This procedure involves identification, mounting, soldering, and finishing for each component.

Figure D-1 shows the location of the components on this board. Begin by installing the integrated circuit, I.C., in its place at the center of the board. Next, install capacitors C25 – C32, making certain to leave a strip of vacant holes between the I.C. leads and the capacitor leads. Continue adding components, one by one, working outward and away from those already installed. Use the installed components as guides to help locate the correct position of the next component.

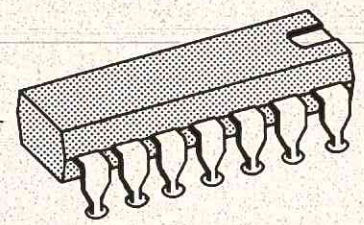
**The general instructions will be found in the second article of this series which appears in the November 1973 issue of this magazine.*

SPECIFIC MOUNTING INSTRUCTIONS

INTEGRATED CIRCUIT

SYMBOL	DESCRIPTION AND MARKING
I.C.	14-PIN CHIP (SN74L164N)

Position the I.C. as shown in Figure D-1, and insert the leads into the proper holes. Make certain that the indicator dimple in the top face of the I.C. is closer to the rear edge of the board than to the front edge.



RESISTORS

SYMBOL	DESCRIPTION AND MARKING
R18, R19	4700 ohm (yellow, violet, red)
R20	10K ohm (brown, black, orange)
R21 – R23	47K ohm (yellow, violet, orange)

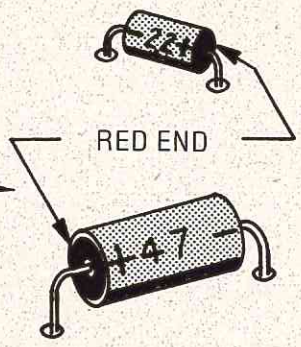
Make a smooth 90° bend in each lead close to the body of the resistor. Insert the leads into the proper holes and push the resistor down against the board.

CAPACITORS

SYMBOL	DESCRIPTION AND MARKING
C24 – C32	.01 µfd Disk (103Z)
C33	2.2 µfd Tantalum (2.2K or 2.2M or 2R2)
C34	47 µfd Tantalum (47 µF or 47K or 24V47)
C35	.002 µfd Disk (202)

TANTALUM CAPACITOR MOUNTING (HORIZONTAL ONLY)

Make a smooth 90° bend in each lead close to the body of the capacitor. Insert the leads into the proper holes as shown in Figure D-1. The 2.2 µfd. capacitor has its red end point to the right. The 47 µfd. capacitor has its red end pointing to the left.



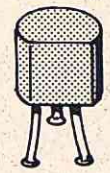
DISK CAPACITOR MOUNTING

Insert the leads into the proper holes and push the capacitor down to within 1/16" of the board.

TRANSISTORS

SYMBOL	DESCRIPTION AND MARKING
Q6 – Q9	n-p-n transistor (TIS97)

Bend the two outer leads (the leads closer to the flat face) slightly apart. Bend the center lead (the lead farther from the flat face) slightly away from the flat face. Insert the leads into the proper holes on the board and push the transistor down to within 1/16" of the board. The flat face must be positioned as shown in Figure D-1.



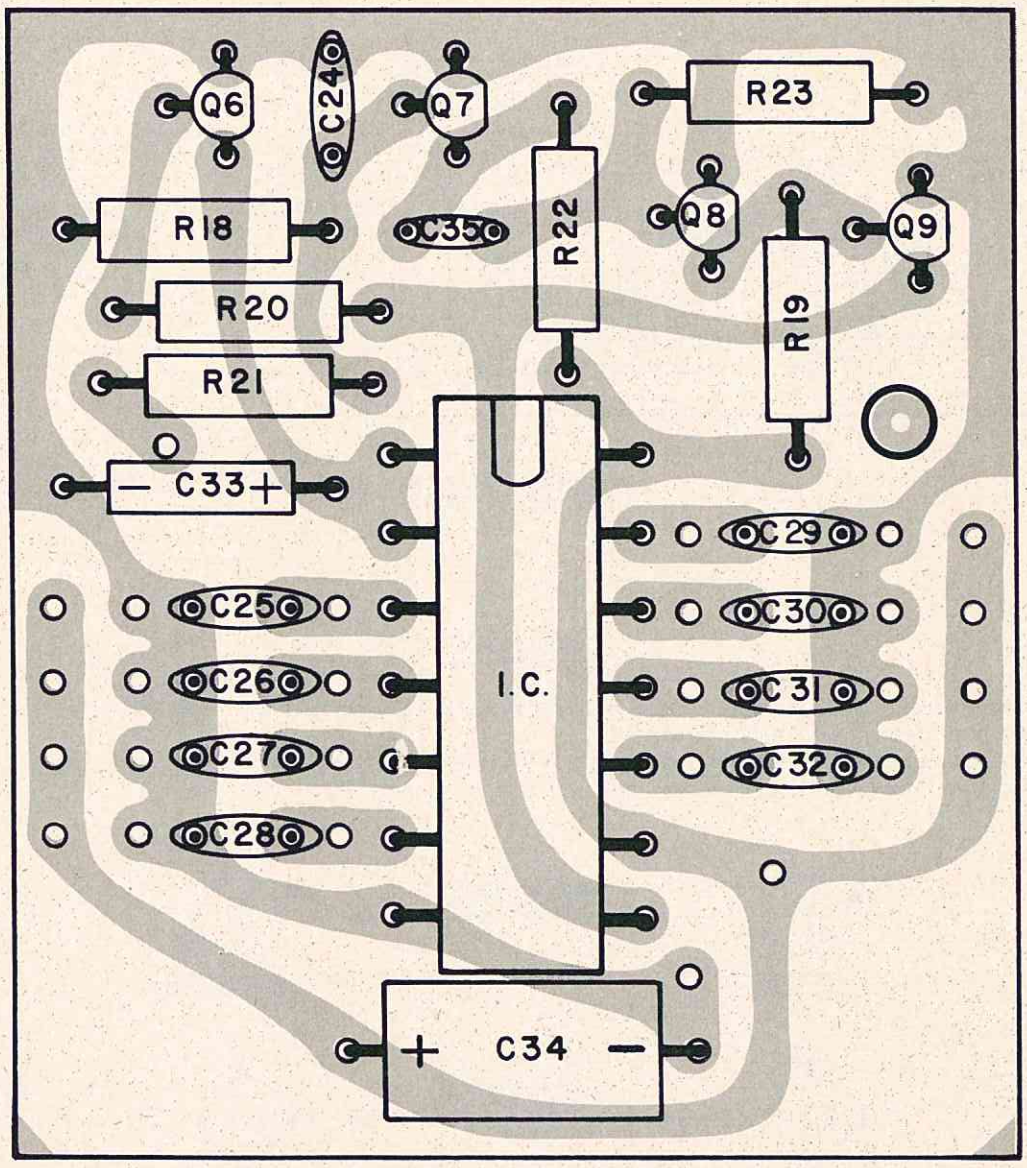
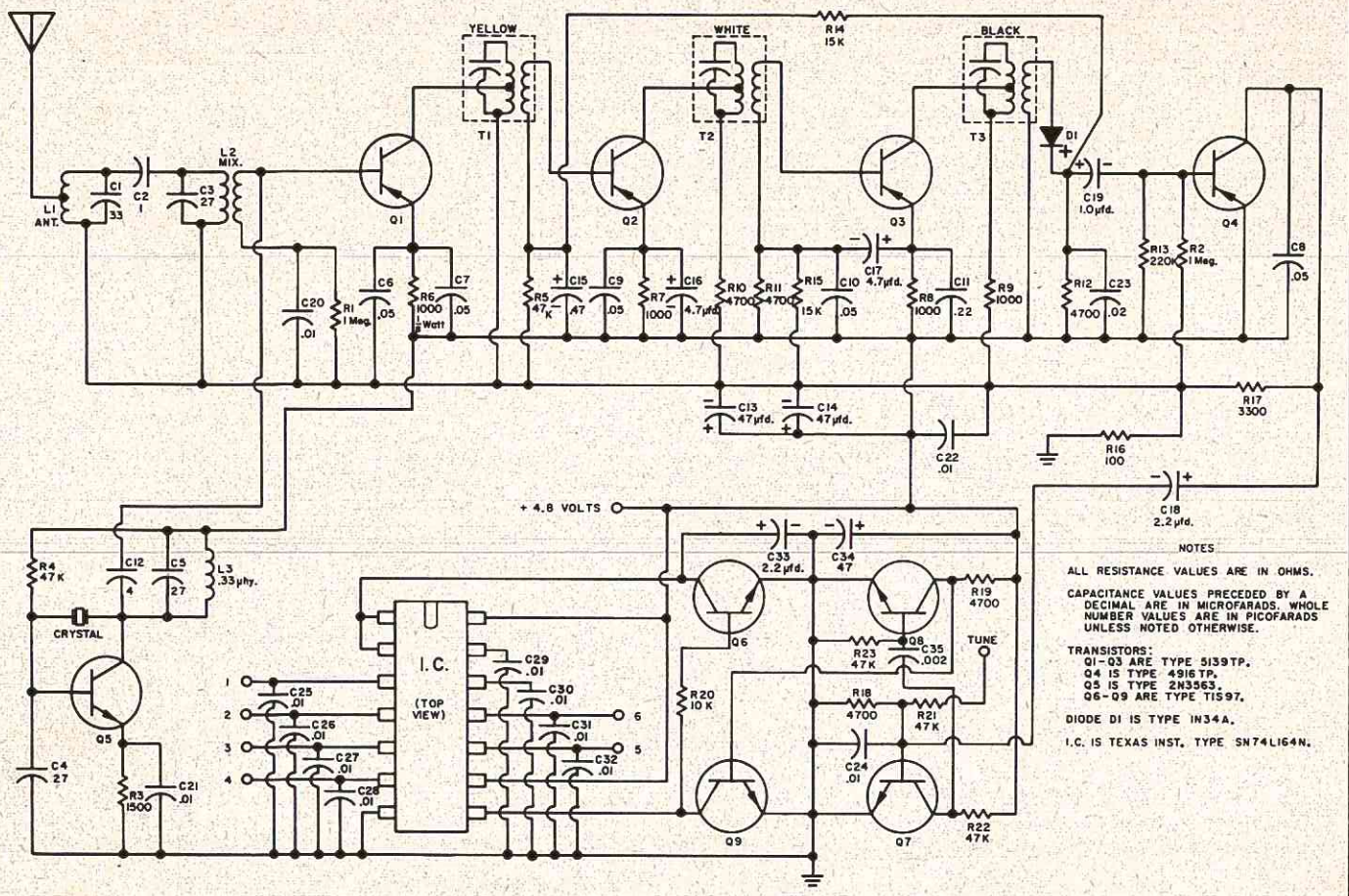


FIGURE D-1
DECODER PRINTED CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)



NOTES

ALL RESISTANCE VALUES ARE IN OHMS.

CAPACITANCE VALUES PRECEDED BY A DECIMAL ARE IN MICROFARADS. WHOLE NUMBER VALUES ARE IN PICOFARADS UNLESS NOTED OTHERWISE.

TRANSISTORS:
Q1-Q3 ARE TYPE 5139TP.
Q4 IS TYPE 4916TP.
Q5 IS TYPE 2N3563.
Q6-Q9 ARE TYPE TIS97.

DIODE D1 IS TYPE 1N34A.

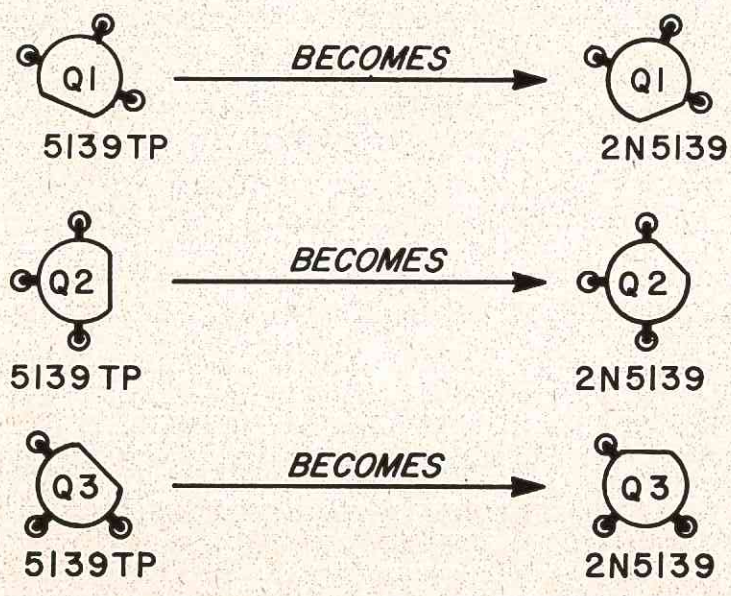
I.C. IS TEXAS INST. TYPE SN74L164N.

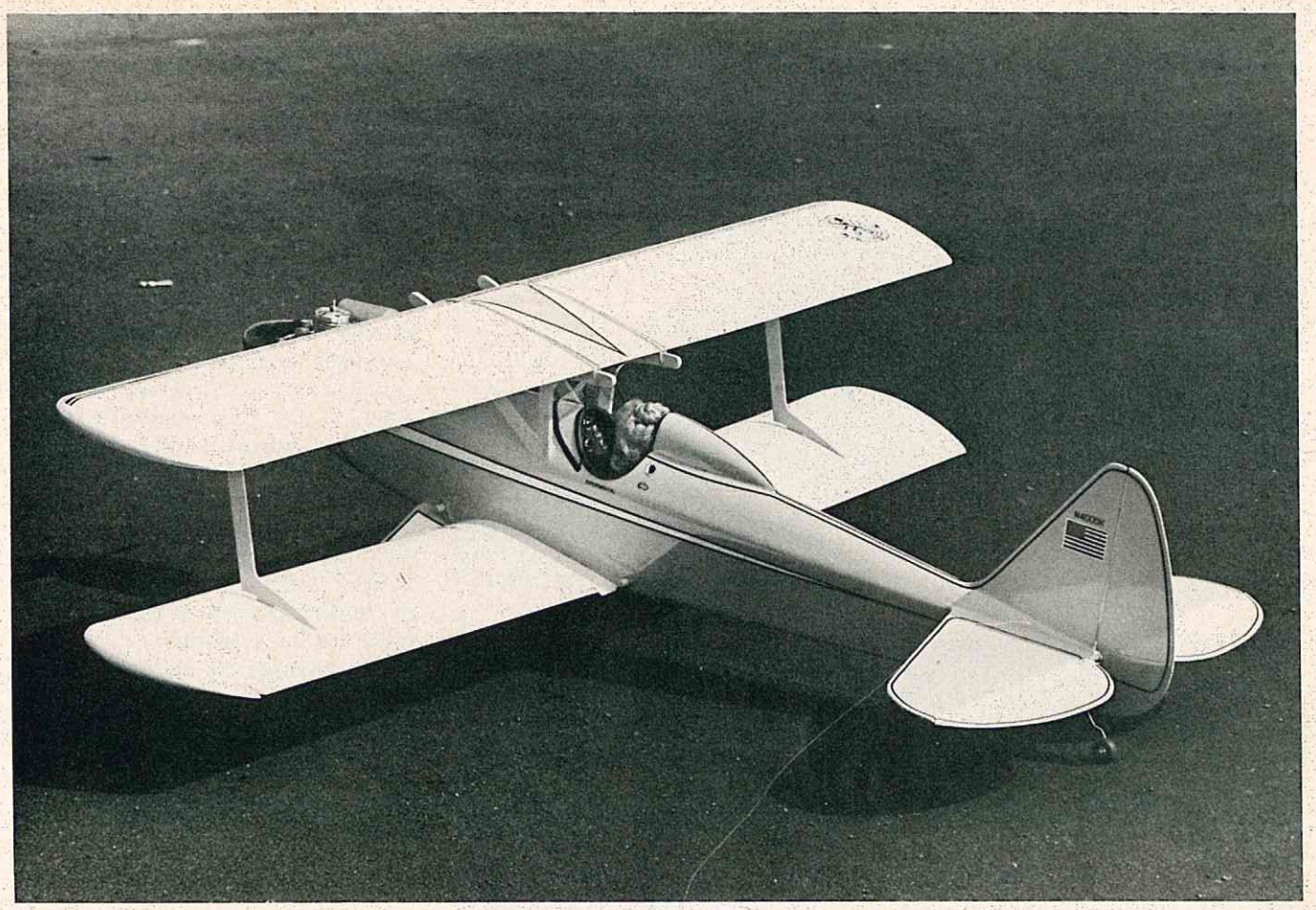
SIX-CHANNEL RECEIVER-DECODER SCHEMATIC

APPENDIX

Some kits may have 2N5139 transistors substituted for the 5139TP transistors Q1 – Q3. The substitutes are equivalent to the 5139TP's in every respect except case geometry.

The only mounting change required for installation of the substitutes is a 45° counterclockwise rotation of the position of the flat face from that shown in Figure R-1.





RCM's Wayfarer, built from the Svenson kit. Yellow K & B Super Poxy fuselage, white Solarfilm wings and stab, DJ's Multi-Stripe trim.

RCM TESTS THE SVENSON

WAYFARER

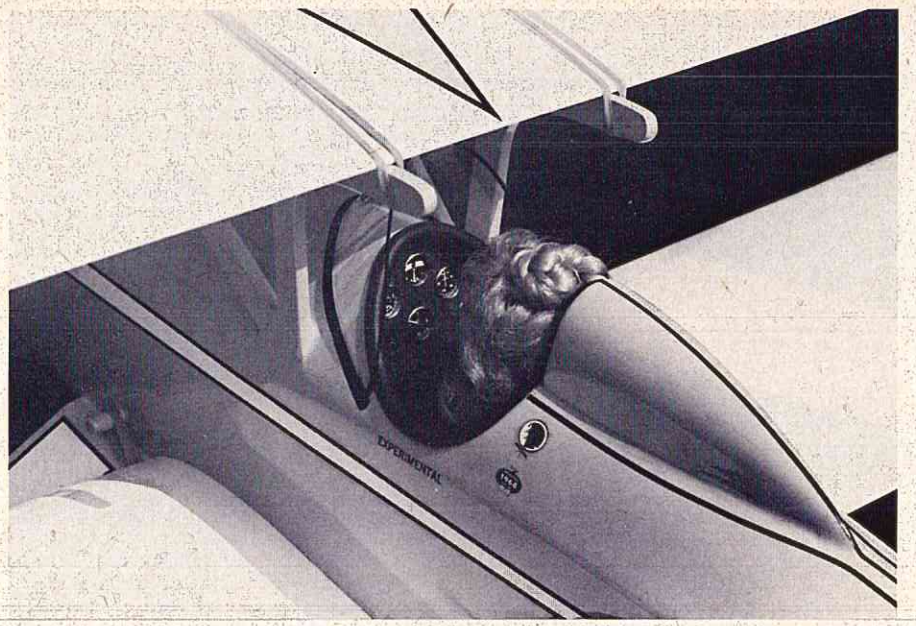
TEST REPORT

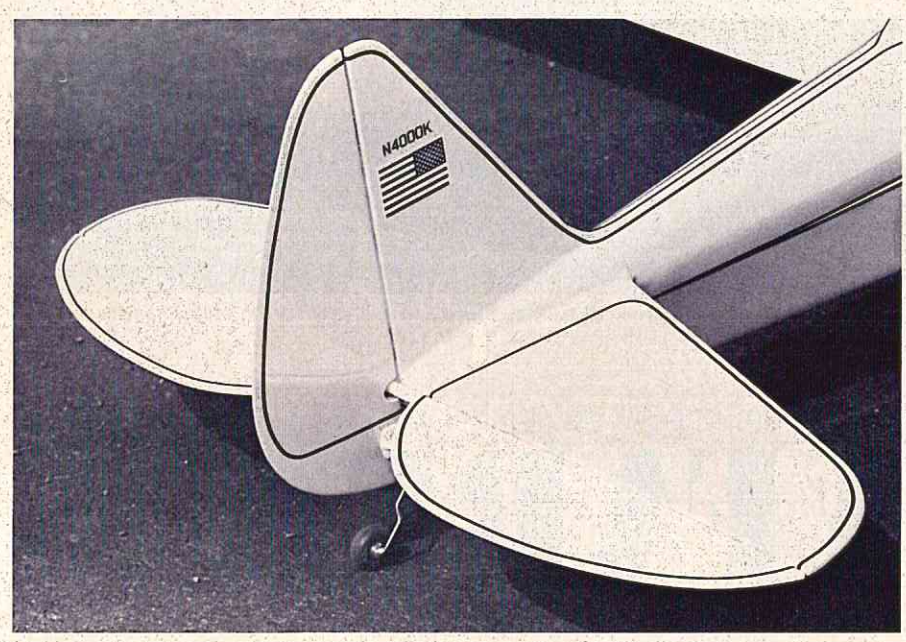
Product Test: Dick Kidd *Photography: Don Dewey*

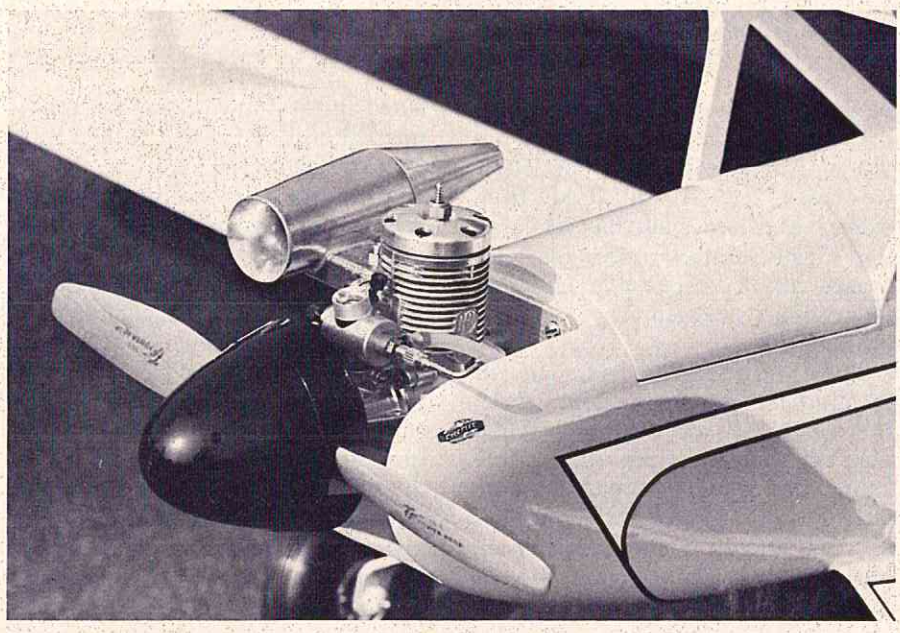
The Wayfarer biplane was designed by RCM's editor, Don Dewey, and first appeared as a construction article in the February 1972 issue of RCM. This .40 to .60 powered biplane quickly proved to be the best selling plan ever presented in the pages of this publication. From the standpoint of flying characteristics, it is capable of all of the pattern maneuvers with a degree of in-flight realism that had to be seen to be appreciated. Yet, the aircraft can easily be handled by the sport flyer and draws attention from every other flyer and spectator on or near the field. One of the most outstanding attributes of the Wayfarer is its slow flight characteristics – it can be slowed down to a walk with no fear of stalling or sudden snaps. In addition, from the hundreds of letters we have received at RCM from readers who have built the Wayfarer, the flight characteristics did not change at all despite the fact that flying weights ranged from 5 to 8½ lbs.

Shortly after the Wayfarer appeared in print as a construction article, Svenson Models of Belgium acquired the kitting rights from RCM. Well-known throughout Europe, and more recently in the United States, for their excellent lines of quality kits, Svenson was almost a year in the preparation of the Wayfarer which would be distributed in the United States by Tenco-International, P.O. Box 1987, Palm Springs, California 92262.

When we were notified that the Wayfarer kits had arrived on the dock at the Port of Los Angeles, we asked that an entire case of kits be delivered to us in an unopened condition. A shipping case consisted of ten complete kits and, since this kit prominently displayed the name of RCM's editor as well as that of this publication, we intended to be quite critical of this particular kit. In addition, we wanted to see a random sampling of kits to ascertain that quality control standards were maintained on a box-to-box basis.







I.M. Instruments, DJ's Multi-Stripe and a potent H.P. .40 to pull it all along . . . .

Tenco-International obliged us by delivering a factory sealed and unopened shipping case consisting of ten Svenson Wayfarer kits. We went through each kit, piece by piece, and found that each and every one of them contained an excellent assortment of wood, in fact, balsa that was so white it looked almost as if it had been bleached. This type of wood is characteristic of Svenson kits and its origin is unknown to us at this time. However, we do understand that the color of balsa is dictated, in a large part, by the mineral content in the ground in which the tree is grown.

The Svenson kit of the Wayfarer consists of highly detailed plans, complete instructions in several languages including English, all necessary hardware including wheels, fuel tank, all hardware fittings and control horns, bellcranks, and the like. If we had not seen previous Svenson kits, we would have been completely astounded by the inclusion of the fuel tank and wheels in one of today's kits! However, this is standard practice in Svensons top line offerings.

The die cutting in the ten kits we inspected were of the absolute highest quality and were accurate and identical from sheet to sheet. In fact, the plywood die cutting was so sharp that when a plywood sheet was lifted from the box the parts fell out of the sheet! As previously mentioned, the wood selection was excellent with the exception of a few stringers and the strip stock used in the horizontal stabilizer. This was extremely soft by American standards and, while typical and acceptable in Europe, was too soft for our use. We would recommend that you replace these few pieces of strip stock or use a ¼" sheet stabilizer, the latter being a modification that we have made to the Wayfarer since its appearance in RCM. While the built-up open structure of the stabilizer looks nice if covered with a transparent plastic film, it is somewhat weak and you would be better served by replacing the stab with a ¼" sheet unit.

All parts contained in the Wayfarer kit fit to perfection and no modifications were necessary. The instructions were complete and the kit can be built

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Bantamweight field kit uses only six items, five of which fit easily into your pants pockets. The sixth is worn on your wrist. The two fuel cells fit perfectly into standard-size Glad Bags, which are then wrapped around the cells and rubber banded to keep oil out of your pocket. At bottom of photo, an extra prop. To the right, folded paper towels. Note spare glow plug screwed into plastic case. 4-way wrench rounds things out.

MICRO MINI FIELD KIT

A flight box that fits on your wrist, what else?

By J.P. Dobyns

You show up at the field balancing your plane in one hand and your transmitter in the other. You forgot to bring your field kit? Right – no heavy, bulky field kit. Why? Because once in a while it's nice to head out for two or three flights without lugging along 30 pounds of motorcycle battery, starter, pump, tach, etc.

The Micro Mini Field Kit weighs ounces, not pounds. It is truly mini (even micro). Whether anyone believes it or not, that little box on your wrist contains:

1. A Tatone 1.3 volt, nickel cadmium starting battery with built-in recharging jack and pilot lamp.
2. A Du-Bro Kwik-Glow, Starter Cord with a tube holder to keep things neat.
3. A combination voltmeter/ammeter. The ammeter tells you if the glow plug is good. The voltmeter tells you when the battery needs charging.
4. A field strength meter, operated by the same rechargeable battery. No tuning – no aerial to extend. It works with any transmitter, regardless of frequency or power output.
5. An extra glow plug screwed into the outside of the case.

All this is contained in a wrist package not really much bigger than some of today's mod wristwatches. No

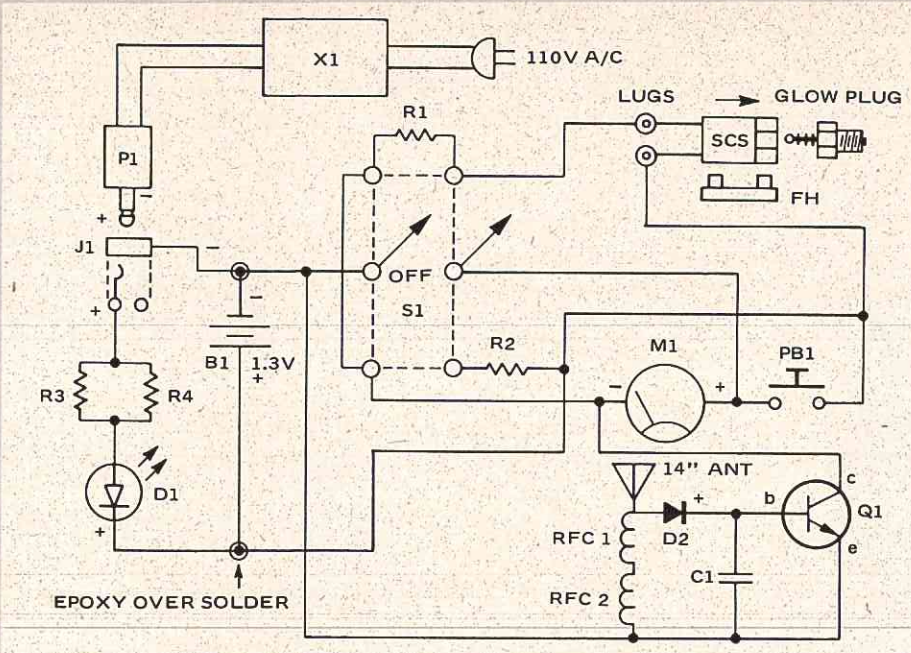
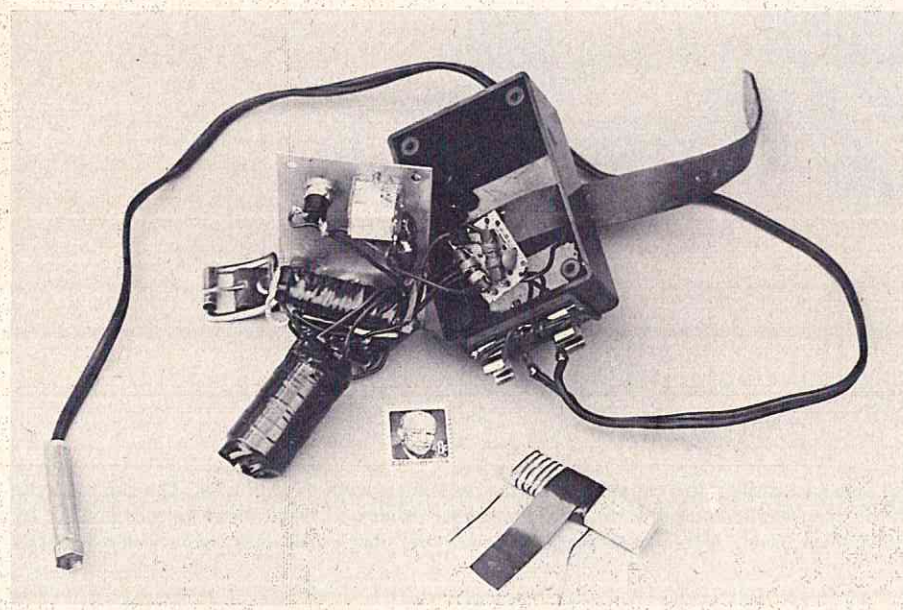


FIGURE 1: SCHEMATIC. POLARITIES ARE IMPORTANT HERE. THE PLUS LEAD FROM THE CHARGER MUST GO TO R3, R4. THE CATHODE ("PLUS") OF D1 MUST GO TO THE POSITIVE BATTERY TERMINAL. IF YOU MIX THESE UP, YOU'LL RUIN THE BATTERY AND/OR DIODE.



The field strength circuit board, center, is about the size of a postage stamp. Board is wrapped in electrician's tape before final assembly of the wrist package. Note wrapped battery to left of stamp. Wire wound piece of balsa is a homemade resistor, also to be wrapped with tape before final assembly.

longer will your Tatone Booster Battery fly off the top of your engine when the prop starts to kick. No longer will that self-same battery be shorting out amidst the loose change in your pocket, setting you on fire!

Who needs electric fuel pumps, hand cranks, and/or air pressure bulbs? Not you. In your right pocket you're carrying two plastic fuel cells encased in Glad Bags (the bags to keep oil out of your pants pocket). These bottles are Miss Clairol Shampoo Formula Applicators and can be stolen from your wife, daughter, or old flame – or bought at any drug store for two bus tokens. The blue printing on the bottles can be removed with one week of thumbnail scratching, or with one minute of rubbing with a cloth soaked in Superpoxy thinner. Each fuel cell holds five ounces of fuel and has a flip-up nozzle/valve that serves both as a fueler/de-fueler and primer.

In your left pocket you have a standard 4-way wrench and extra plastic prop. If you prefer a wood prop, don't leave it in the pocket that holds your wrench; the wrench could scratch or nick the edge of the prop. You don't want that wood prop in your back pocket, either; you might sit on it! Stick the thing into your belt or wear a hunting-knife sheath on your belt and put it there.

In one of your back pockets you have a folded paper towel for wiping fuel from your hands and/or radio. You still have one pocket left for your wallet and car keys. If you wear pants that have no pockets, you're right in style but abandon this article forthwith – or sew on some pockets.

Now, that's traveling **light**. In the trunk of your car you can leave the usual assortment of screwdrivers, pliers, paper towels, plane cleaner, etc.

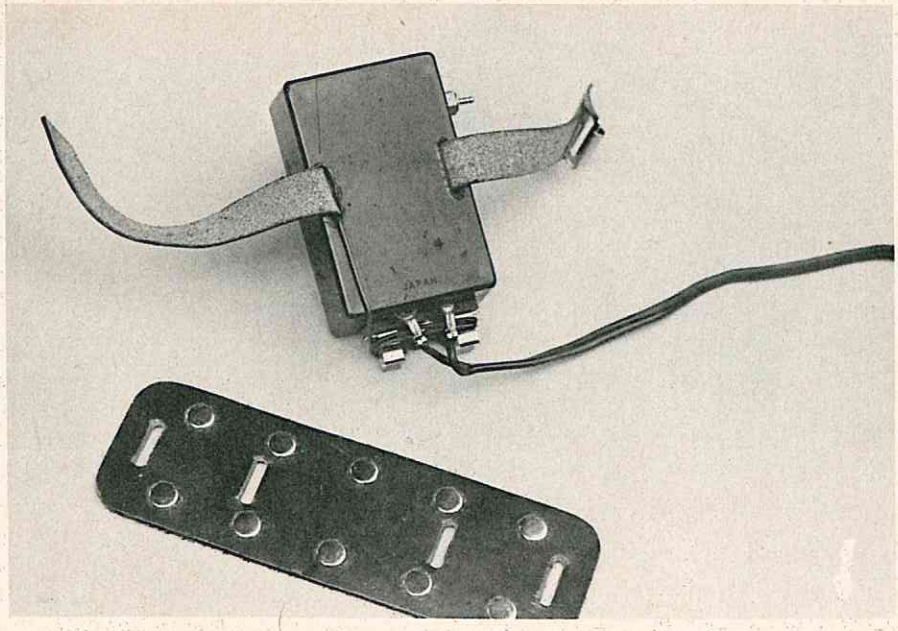
For a typical R/C plane equipped with a .19 to .23 engine, you fuel the plane's four ounce tank to three-quarters full at home (don't fill it completely – you don't want spillage in your car trunk). At the field, you would then have enough fuel and primer to execute three flights. Three flights are all most fliers do under today's crowded conditions, anyway. If your engine backfires on you and the prop comes loose, you have your wrench. If your plug suddenly takes a ten count, you can prove it's knocked out with your ammeter, and you have an extra plug on your wrist. If you break a prop, there's another in your pocket or sheath.

Even using a .40 engine and eight ounce tank, you have more than enough fuel for two flights. You can't quite swing it for a .60, though. This kit is primarily for medium size and small engines. For those who yearn to travel light now and then, it's ideal.

CONSTRUCTION

Start by drilling out the aluminum face of the utility box. The switches, meter, light emitting diode and jack, should be arranged approximately as shown in the photos so that the battery will fit in easily. To cut the meter rectangle, first drill out a 1/4" hole, then shape to size with a saber saw equipped with a metal cutting blade. After drilling, the face plate will probably be scratched and the holes ragged around the edges. Polish the plate smooth with emery paper. Insert switches and jack.

Epoxy the diode-light and meter in place with 5 minute Devcon. Add black Letraset lettering, if you like; then wrap masking tape over the switches, etc., and spray the plate with a single coat of Superpoxy clear. If



A 25 watt soldering iron is used to burn slots into the bottom of the plastic case to accomodate the leather strap. The strap, a full circle type, was removed from the "mod" wristwatch holder in foreground. Watch straps of this type are available at any drugstore. Note insulated wire leading from strap slot to fuse holder. This is the field strength circuit's antenna, the bulk of which is wound around the fuse holder clips.

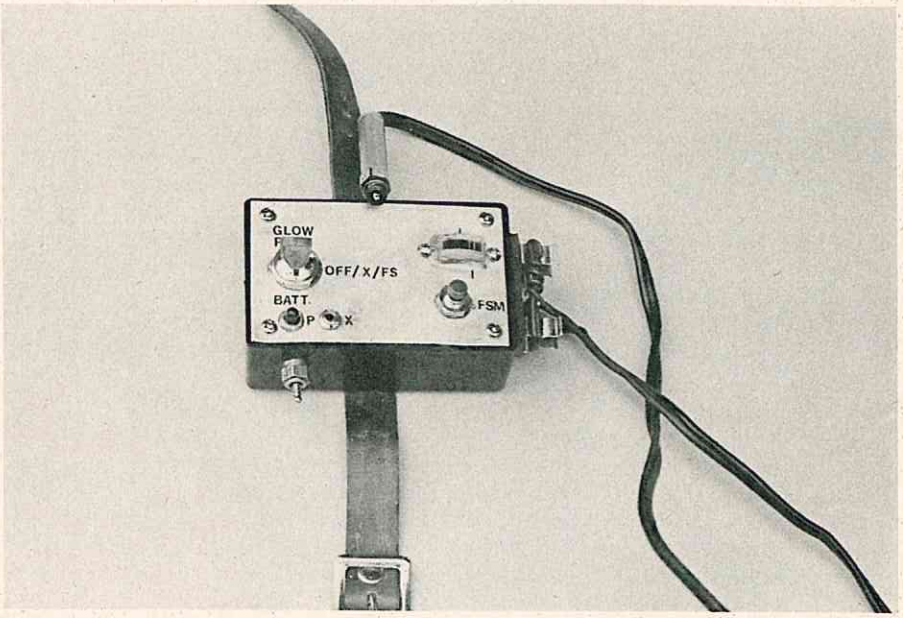
With a glow plug in the clip, and the switch on the BATT. (battery) position, the meter's needle is well within the red square to the right. This indicates that the battery doesn't need recharging. When the meter's needle drops into the black section of the meter, it's time to recharge. Note charging jack, pilot lamp, position of spare glow plug, and antenna wire wound around the fuse clip at the right side of the box.

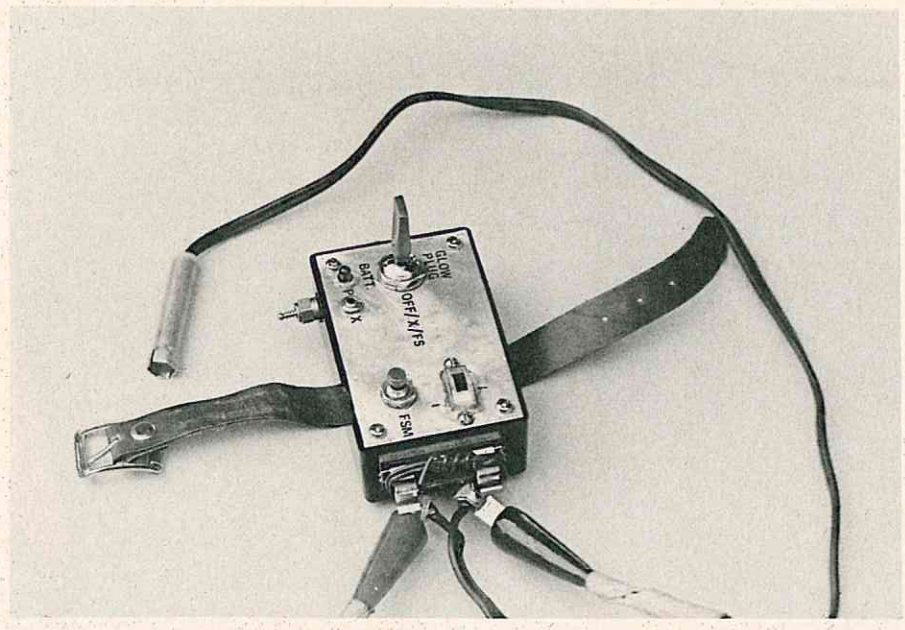
you don't own an airbrush, brush on a coat of clear polyurethane varnish (don't try to brush on Superpoxy clear – the letters will smear). Let the plate dry overnight.

Now comes the plastic case. With a 25 watt soldering iron, burn slots in the plastic to accommodate the leather strap. This will raise plastic ridges which can be trimmed off with a single-edge razor blade or pen knife. Incidentally, this business of burning holes in plastic should always be done in front of an open window with the project held at arms length. Breathing the fumes can be dangerous!

Later, you can clean the plastic from your iron with Superpoxy thinner or rough sandpaper.

At one end of the box, burn a hole to accommodate the fuse clip holder,





so that the holder will be parallel to the top of the box, as shown in the photos. Mount the fuse holder with a short 4/40 nut and bolt. Underneath the holder burn two holes for the Du-Bro Starter Cord lugs. Insert the circular part of the lugs halfway into the holes and epoxy them there. The reason for doing it this way is that it's easy, and you have the option of attaching alligator clips to the lugs.

The Du-Bro Starter Cord will accomodate only standard-size glow plugs. However, alligator clips can be attached to the Du-Bro lugs and a separate starter cord can be used with a clip that fits ½A, ¼A or what-have-you engines. The Micro Mini Field Kit stops at nothing.

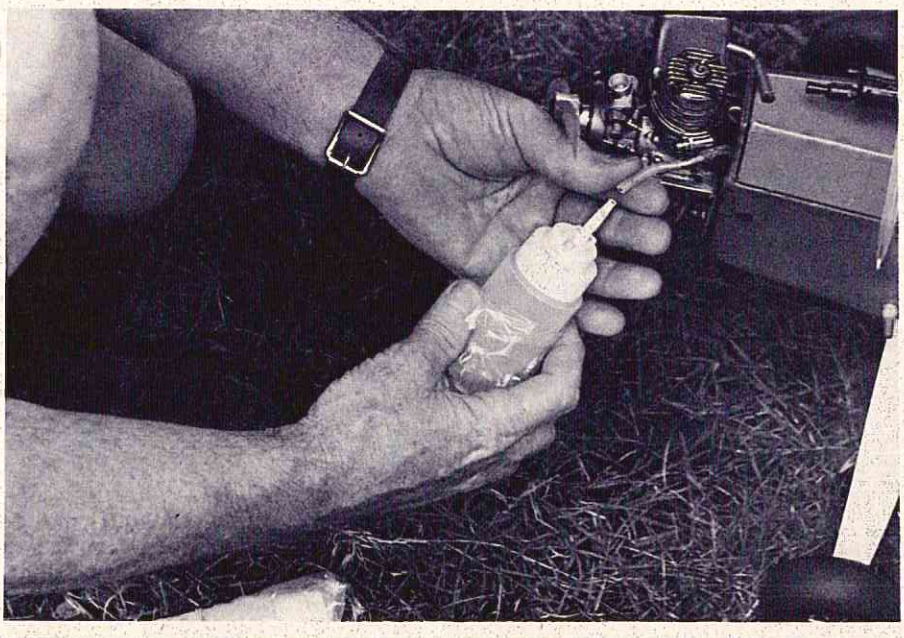
Then you can attach a separate starter cord for ½A glow plugs (the regular starter cord will accommodate only standard-size glow plugs).

One more hole to burn. Note in the photos the position of the extra glow plug. Burn a hole there, ignore the raised ridges of plastic, and screw the plug in while the plastic is still warm. Screw it in; don't push it it. When the plastic cools, you have a perfect thread for your plug. Take care you don't ever screw the plug in too hard, or you'll strip the plastic thread. Just roll the plug in, finger tight. When making the thread, don't worry about the warm plastic sticking to your plug; it won't.

You're practically done now except for a few miles of wiring. Have patience because this inter-galactic

ABOVE: Tatone charger plugs into wrist-package jack, causing pilot light to glow. Light will not glow unless the battery is actually being charged. Spare glow plug screws into heat-formed threads in side of plastic case. See text. Marker above meter shows normal ammeter reading, indicating a good plug when the switch is on GLOW PLUG. Marker below meter indicates where meter needle should be when battery is fully charged and under load (with the switch on BATT.)

LEFT: Using the field strength meter on a 27 mHz transmitter. Note that starter cord is unwrapped. For 72–75 mHz transmitters, the cord is wrapped around the box, and the brass tube is inserted into the fuse holder. Just press the button with the unit an inch or so away from the transmitter antenna. But don't touch anything but the button, if you want reliable readings.



Fill 'er up. Tank lead is standard-size silicone tubing. Nozzle of fuel cell is inserted into tubing, then the cell is raised and squeezed. Next, the fuel tubing is pinched between thumb and forefinger of left hand. The cell is lowered and the nozzle removed to allow air into the cell. The process is repeated until the tank is full. Cell may also be used as a primer bottle. The nozzle itself is a fold-down valve, which allows you to lay the cell on the ground horizontally with no fear of spillage. Don't forget that the cell can also defuel. Just squeeze an empty cell, insert nozzle into fuel tubing, and let cell's suction draw out the small amount of fuel left in the tank after a final flight.

gadget is really worthwhile. Start with the Tatone charger. Solder the charger's lead wires to a subminiature phone plug with the tip of the plug connected to the red wire (+). Do **not** use the in-line resistor shown with the Tatone instructions. The in-line resistance is built in to the wrist package, as shown in the schematic, Figure 1.

Next, you'll need to make one of the resistors because that's the only way you can get one that small in value. Take a piece of 3/8" x 3/16" x 1¾" balsa and wind it with twenty turns of #22, Solvat-insulated, solid copper wire (Radio Shack has it). It isn't necessary to space the turns, as the wire is insulated (if you use bare wire, **space** the turns). Epoxy your resistor to keep the turns in place. Scrape the insulation from the leads with a razor blade, then "mummy wrap" your masterpiece with plastic electricians tape. Ah, the worst is over.

Assemble the field strength circuit on a piece of 1" x 3/4" perf board. Don't shudder; you can do it – the parts count is low. Extend one 14" antenna and two 6" hook-up wire leads from the board, then wrap the board in plastic electricians tape. Run the antenna wire through one of the strap slots in the plastic case. Insert strap. Wrap the excess antenna wire around the fuse holder when the completed unit is ready to use (see photos).

The rest is a cinch. Carefully follow the schematic and use #20 insulated hook-up wire to make the connections. No battery holder is used for the battery. It isn't needed; and besides, you can't buy one for a battery that size. Solder lead wires directly to the Tatone battery and smother the connections with 5 minute epoxy. For the negative connection, wrap stripped wire all the way around the battery's body, twist tight and solder lightly (don't let a lot of soldering iron heat accumulate in the battery – it could damage the battery or even make it burst its seal).

Now wrap the battery in electricians tape. The reason for all this wrapping is to avoid short circuits. The internal package is a tight (but possible) fit; therefore, insulate everything in sight with tape or epoxy, but only if you think it needs it.

OPERATING THE UNIT

Insert a glow plug into the Du-Bro clip and flip the switch to GLOW

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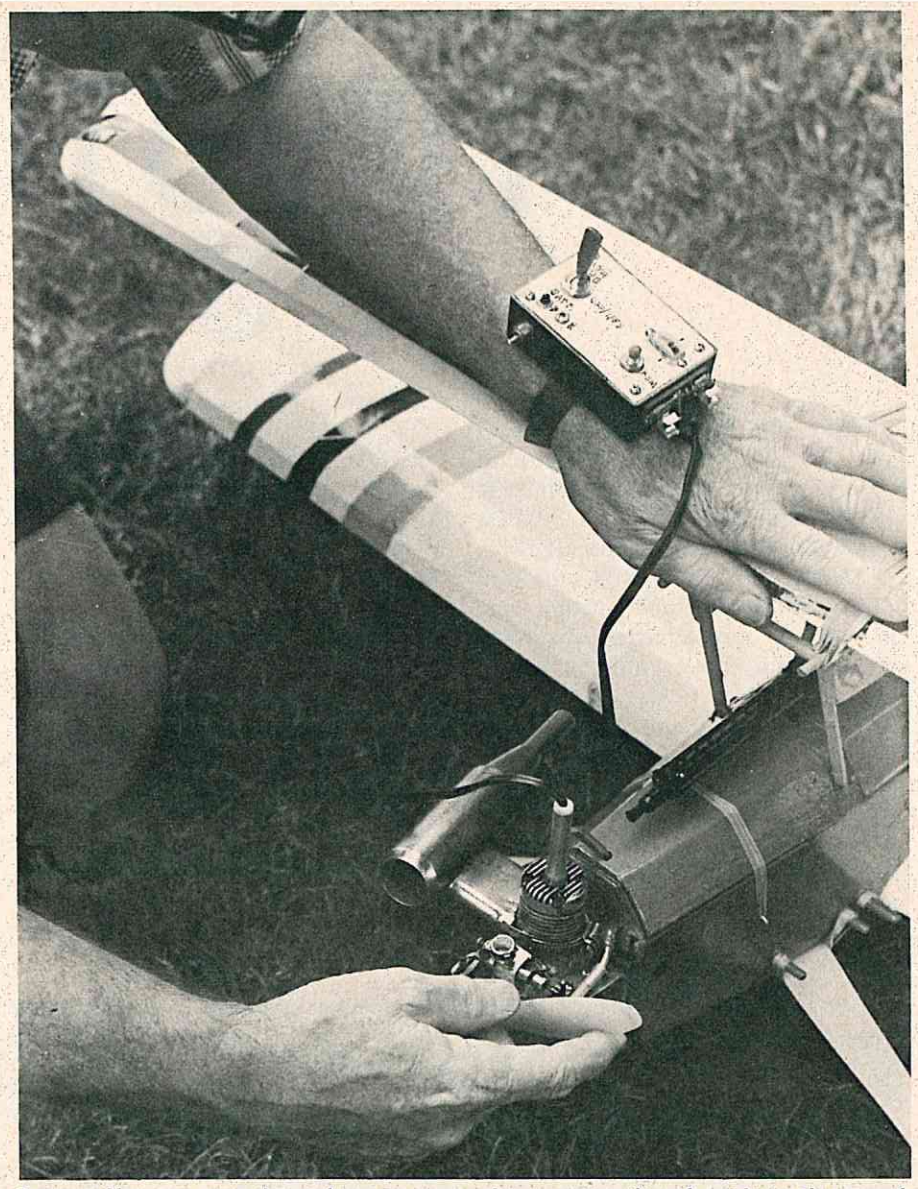


Contact. You can wear the package on your wrist or unstrap it and use it on the ground. Engines should always be started with the switch on the GLOW PLUG position, because this position checks the plug whereas the BATT. position does not. When engine starts switch to OFF to see if engine keeps going evenly. If not, switch back to GLOW PLUG until you get results. The point is, you don't have to keep unclipping and clipping the glow plug itself. Plane is a modified Migabipe.

PARTS LIST FOR MICRO MINI FIELD KIT
(The majority of parts are available from Radio Shack)

B1	1.3 volt, Tatone Pocket Booster Battery (Hobby shop)
C1	1,000-pF, disc capacitor (RS 272-126)
D1	Light emitting diode (RS 276-041)
D2	1N60 glass diode (RS 276-821)
FH	Fuse Clip-in holder (RS 270-739)
J1	Subminiature jack (RS 274-292)
M1	Calectro subminiature panel meter D1-901 (Electronic store)
P1	Subminiature phone plug (RS 274-289)
PB1	SPST miniature push button switch, normally open (RS 275-1547)
Q1	2N5088 npn transistor (RS 276-2013)
R1	Copper wire for homemade resistor (RS 278-003)
R2	2,200 ohm, ½ watt resistor (RS 271-000 series)
R3,4	15 ohm, ¼ watt resistors (RS 271-1800 series)
RFC1,2	1 uH RFC chokes (Electronic store)
S1	DPDT, center off switch (RS 275-653)
SCS	Du-Bro Starter Cord Set (Hobby Shop)
X1	Tatone Pocket Booster Charger (Hobby Shop)

Bakelite utility case (RS 270-230)
Leather Wristwatch strap, full circle type (Drugstore)
MISCELLANEOUS: Perf board, electricians tape, black Letraset lettering, Devcon epoxy, #20 insulated hook-up wire, Superpoxy clear and thinner, two Miss Clairol Shampoo Formula Applicators, Glad Bags, paper towels, extra glow plug, 4-way wrench, extra plastic prop, model airplane, money.

RCM TESTS FIBRE FOAM PRODUCTS

MINI-STIK

TEST REPORT

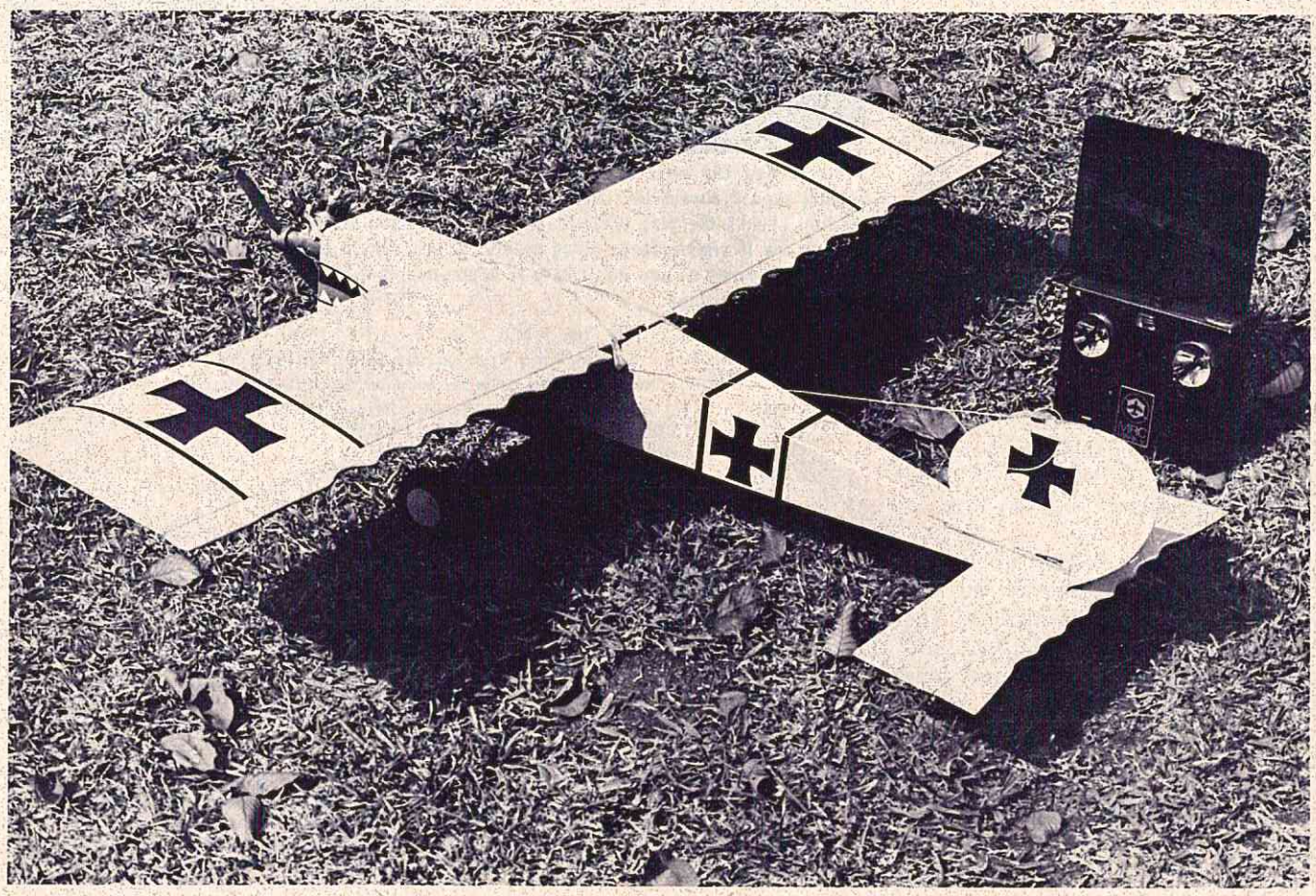
Product Test: Don Dewey

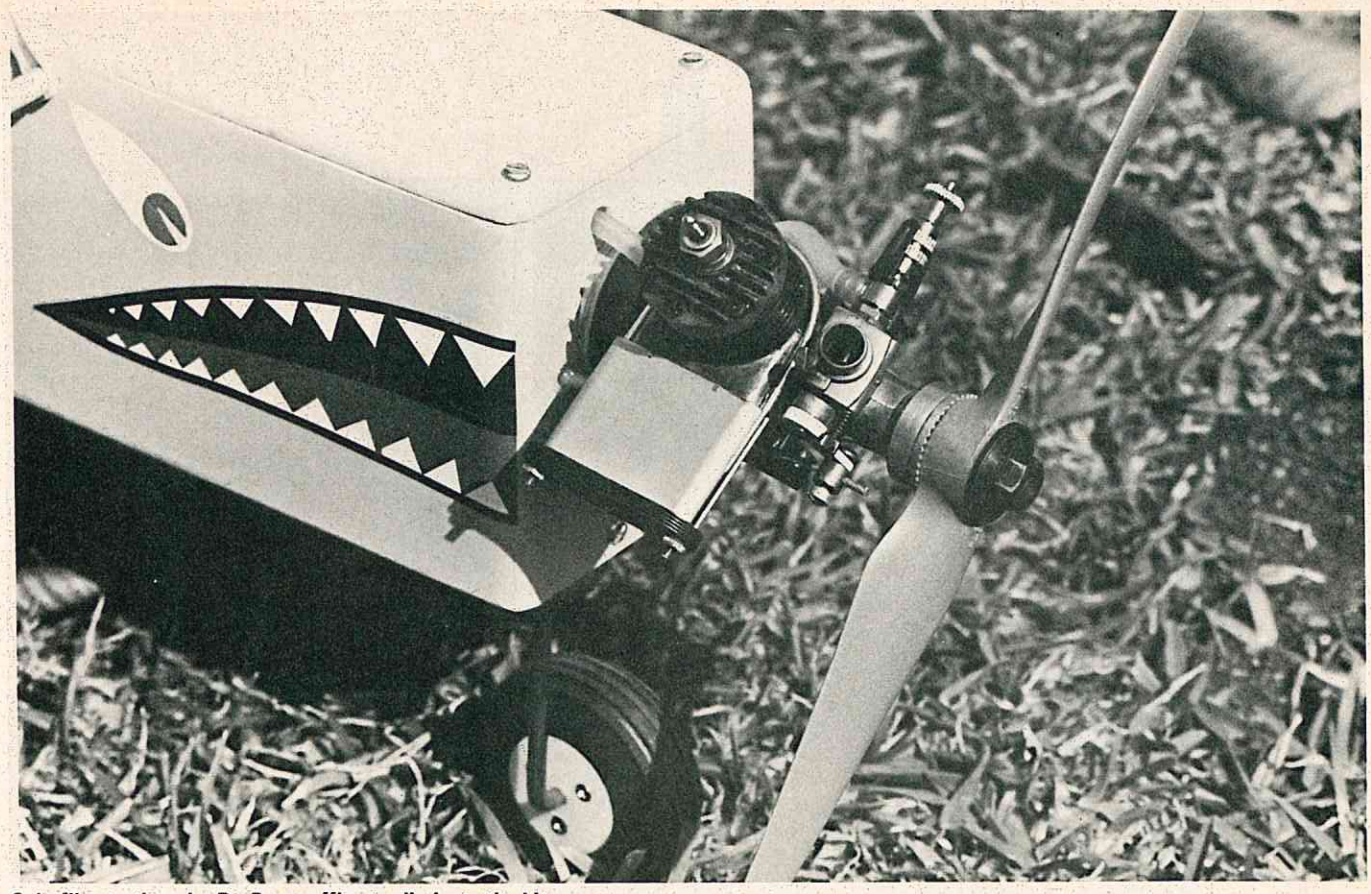
If we were asked to select one model as the best flying .15 powered sport aircraft that we have tested to date, it would have to be the Mini Stik by Fibre Foam Products, 6370 East 22nd Street, Tucson, Arizona 85710.

Designed by Bruce Lyons, the Mini Stik is a 46" span model with a wing area of 375 square inches. The all-up flying weight of our prototype was 2¾ pounds with an OS Max .15 and new Du-Bro Muffler. Featuring a 12% Clark Y airfoil, the Mini Stik actually flies like the full size Ugly Stik. Designed for four channel operation, this model grooves like a .60 pattern ship and has neutral stability – in other words, it stays in any attitude you put it without attempting to recover on its own. Yet, with a sport .15 engine, the flight speed is approximately 45 to 50 mph and the landing speed is remarkably slow, making this an excellent four channel trainer for those RC'ers who have had previous flight time on a ship without ailerons or as a first trainer for an individual who has an experienced instructor. With an OS Max .20 or .25, the Mini Stik is capable of any maneuver you want to put it through including sustained verticals.

Although the Mini Stik could be classified in the "full-house" trainer category, the instructions, while adequate for the average builder to construct the Mini Stik, are lacking in detail for the novice. The kit is highly pre-fabricated and features all factory saw cut and sanded balsa and plywood parts with no die cutting whatsoever. Full size plans, instructions, formed wire landing gear and a hardware package are included in this $29.95 kit. The fuselage consists of two full length 3/16" balsa sides with no doublers, a 3/16" plywood firewall, two 3/16" balsa bulkheads and 3/32" balsa and plywood bottom with 1/16" balsa cross-grain top sheeting. All tail surfaces are 1/8" sheet balsa. The wing is a conventional D-tube structure with 1/16" top and bottom sheeting, capstrips, and webbing. Ailerons are 3/16" balsa. Our prototype, shown in

Fibre Foam Products outstanding Mini-Stik. RCM's prototype covered in yellow and white FliteKote. Black Solarfilm, DJ's Multi-Stripe trim.





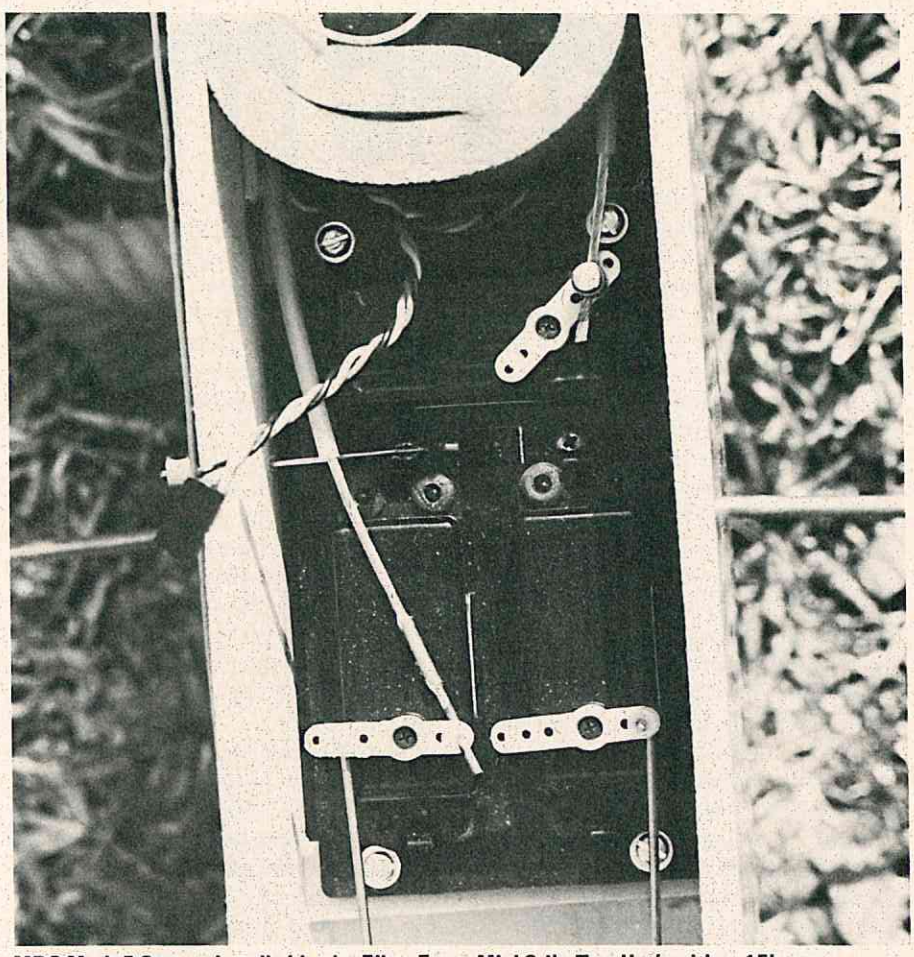
Solarfilm teeth and a Du-Bro muffler to eliminate the bite.

the photographs, used an OS Max .15 engine, Du-Bro Muffler, Kraft-Hayes motor mount, Kraft-Hayes wheels and was covered in yellow and white Flite-Kote with yellow, black and red Solarfilm trim. Hinges for all control surfaces were made from Flite-Kote. The radio system used in the prototype was an MRC Mark 5 five channel proportional system on 75.640 mHz.

The Fibre Foam Products Mini Stik is a week-end project since the airplane can be completely framed up and sanded in two days. There is more than adequate room inside the radio compartment for any of today's proportional systems and the battery compartment holds a flat or rectangular battery pack along with a 4 oz. Kraft-Hayes fuel tank with room to spare. The compartment interior is so designed that the battery and fuel tank do not interfere in any way with the steerable nosegear.

As we mentioned earlier in this article, the Mini Stik is the finest sport .15 powered aircraft we have flown to date. Designed originally as a "one-design" ship for a club racing event, the Mini Stik is an excellent full-house trainer and is an ideal small aircraft for the expert as well as the Sunday flyer.

Tested, Approved, and Recommended by RCM. □



MRC Mark 5 System installed in the Fibre Foam Mini-Stik. Top Hat's with a .15!

TEST REPORT

Product Test: Don Dewey

TRULY, NOBODY'S KID BROTHER. RCM TESTS THE MRC MARK V

If there was a milestone made in 1973 in radio systems, it would have to be in the area of extreme reliability as well as in the introduction of many low-cost "sport" type systems available to today's RC'er. In order to meet the requirements for a low-cost system, many companies have offered stripped-down versions of their top-of-the-line competition systems. This is often done by providing a transmitter that will be powered by a 9 volt dry battery to be provided by the owner; possibly the use of alkaline energizers in the airborne system; and center tapped power supplies which, it is often argued, provide less power and resolution. This is not to say that these items are totally undesirable, but they are less than the optimum.

Recently, Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817, released their MRC Mark V which is priced in the sport system range but features the most up-to-date technology such as shift register and hex inverter IC's. Performance, rather than economy dictated the choice of parts. For example, this new system uses gold-plated military specification pins and sockets in the connectors for utmost airborne reliability even though this increases cost considerably. The nickel cadmium batteries go through several reliability life tests before they are put into the Mark V system. In fact, MRC's extensive testing program includes spectrum analysis of each transmitter output in actual field ground testing of each system. Add to this the fact that Model Rectifier Corporation backs up their Mark V system with a written one year guarantee and you have an indicator that this is one company that has complete faith in their product.

R/C Modeler Magazine obtained an MRC Mark V proportional system on 27.095 mHz. Several features immediately impressed us. the first of which was the small size of the transmitter. Perfectly balanced in the hands, the transmitter measures 6.7" x 5.5" x 1.8" and weighs 2 lbs. including the nickel cadmium power supply and antenna. The compact Mark V transmitter is clad in black vinyl and features ball bearing pivoted sticks, a self-contained collapsible antenna, a high RF output for interference free operation, a battery condition meter which monitors transmitter operation, and is available on Mode I or Mode II operation. The throttle ratchet is the smoothest operating we have used to date on any transmitter. This ratchet is difficult to explain and has to be operated to be appreciated.

The specifications for the Mark V transmitter are as follows:

TRANSMITTER

Size: 6.7" x 5.5" x 1.8".
Weight: 2 lbs. including battery and antenna.
Battery: Eight 500 mah nickel cadmium cells, nominal 9.6v.
Average Current Drain: 110 Ma.
Frequency Tolerance: .005% crystal controlled.
Modulation: Pulse position type, 100%.
Controls: Two 2 axis sticks, 1 discrete on-off channel.
Frame Time: 18 milliseconds.
Neutral Time: 1.6 milliseconds.
Operating Temperature Range: —10 to +150°F.

Control Potentiometers: Hot molded carbon element.
Operating Time: Approximately 3 hours on full charge.
Battery Charging Rate: 45 Ma for 12 to 14 hours.

The Mark V receiver features a double tuned front end for high selectivity, two low current drain integrated circuits in the receiver, AGC and noise rejection circuitry, and all silicon semi-conductors. The highly selective double tuned front end receiver measures only 2.3" x 9" x 1.7" and weighs only 1½ oz., including cables and antenna. Specifications for the receiver are as follows:

RECEIVER
Size: 2.3" x 9" x 1.7"
Weight: 1.5 ounces, including cables and antenna.
Power Supply: Four 500 mah cells, 4.8v; current 15 ma; idle 50 ma with 4 servos.
Receiver Type: Superhetrodyne, double tuned front end.
IF Frequency: 455 KC.
Selectivity: 3 db down at 6 KC.
Sensitivity: 3 micro volts for full control.
AGC Dynamic Range: 60 db minimum.
Operating Temperature Range: −10 to +150°F.
Frequency Tolerance: .005%, crystal controlled.
Required Antenna: 36" as supplied: DO NOT SHORTEN.

The Mark V servos are rotary output and are furnished with a rotary disc that has so many holes in it that it looks like a sieve! In reality, these rotary output wheels offer you a wide latitude of servo throw variations as well as providing differential throw from the servo itself. Also included with these systems are two additional straight arms including an extra long and a conventional arm with one long side and one short. Both the throw of the servo as well as the trim throws are greater than many proportional systems we have flown and this feature alone would highly recommend this system for use in sailplanes where a wide trim throw range is needed. The servos measure 1.82" x 1.45" x .83", exclusive of mounting lugs, and are both powerful and fast. Utilizing a low drain three wire circuit, the servos have a current drain of 9 ma at idle. The servo connectors are gold plated mil. spec. miniature units designed for maximum reliability. The servo trays provided with the system allow a 2+2 or 2+1 installation for maximum flexibility. One very unique and highly desirable feature of these servo trays is the fact that four plastic risers fit into the servo mounting grommets and the servo, in turn, is held into the tray by two plastic snap locks which eliminate the necessity for mounting screws. When the servos are snapped into place

in the servo tray, they are held firmly in place yet have the proper amount of flexibility to dampen vibration and shock. We would have to say that this is one of the finest designed servo trays we have seen to date.

Specifications for the servos are as follows:

SERVOS
Size: 1.82" x 1.45" x .83" exclusive of mounting lugs.
Weight: 1.6 ounces with cable and connector.
Output: Rotary.
Power Output: 4 pounds.
Amplifier Current: Idle 9 ma; Stall 375 ma.
Pulse Polarity: Positive.
Neutral Time: 1.6 milliseconds.
Response Time: 18 milliseconds maximum.
Travel Time:..6 seconds for ±50°; 100° total.
Operating Temperature Range: −10° to +150°F.
Amplifier: Dual inline package integrated circuit with internal motor drivers.
Mounting: Mounting lugs integral with servo case; clip type trays supplied.

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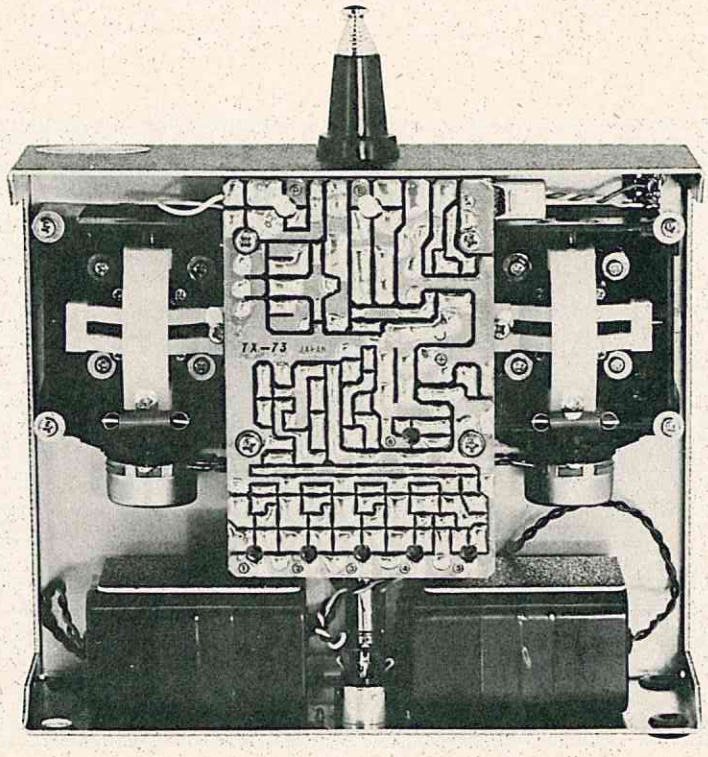

BASIC SAILPLANE DESIGN

BY PRESTON ESTEP JR.

PART X: A DISCUSSION SUMMARY

Let's review all the design criteria we have covered. The mounds of data we have sifted will all be summarized in a series of design rules which I hope will help you in designing your own super-sailplane. So here goes:

1. The governing principle is to achieve a high ratio of lift to drag. This usually occurs at fairly high coefficient of lift.
2. Drag is determined by parasitic drag and induced drag: induced drag is a function of Aspect Ratio; parasitic drag is a function of streamlining and cross-sectional area. Wing loading does not affect L/D ratio.
3. Models do not achieve Lift/Drag ratios much above 15:1. Advertising of higher ratios should make you suspicious.
4. Speed is determined by wing loading and coefficient of lift. Downtrim is a very inefficient way of increasing flight speed. Increased loading is highly superior (see Figure 1).
5. A logical way to increase loading without damaging still-air time is by decreasing chord while holding span constant, thus increasing AR and loading together.
6. High wing loadings are essential for maintaining good L/D ratios while thermal flying in wind.
7. Stab area, C.G. position, and tail moment go together, and can be determined from the formula:

$$\left(\frac{\text{tail moment}}{\text{wing ang. chord}}\right)\left(\frac{\text{stab area}}{\text{wing area}}\right)$$

(.4) + (.25) = C.G. position

Keep the C.G. as far aft as you safely can.

8. Vertical tail area should be about 7% of wing area, for most commonly used tail moments.
9. If your plane won't turn, it probably needs more dihedral.
10. If you use a V-tail, it should have about 23% of the wing area, and an included angle of about 110 degrees. Differential hinging or some differential action is a good idea.
11. Airfoil choice is not as important as you may have been told, but a flat-bottomed 10% airfoil with maximum camber point at 33% (NACA 4309) is a good start. A fairly sharp leading edge, and no positive camber on the bottom of the section, are requirements.
12. If you want to exert the extra effort to build an undercambered wing, you will be rewarded, but remember that thin undercambered sections are much superior to thick ones. The NACA 6412 is no improvement over the Clark Y. The NACA 6309 or Benedek 10307 are superior choices, as is the Eppler 385.
13. A T-tail with an all flying stab is nearly as good as a V-tail, and gives better control. For forward C.G. positions, a symmetrical tail section is okay, while for aft C.G. locations a "lifting" section such as a 4309 is preferable.
14. Bigger airplanes outfly smaller ones for a variety of reasons; Reynolds number, irreducible minimum fuselage cross-section, and ability to lift the towline are three obvious ones. The larger airplanes are able to take fuller advantage of the high loading, flat-polar effect mentioned earlier and elaborated on in Figure 1. 15.
15. Towhook position should be forward of the C.G. by an amount such that a line from C.G. through towhook would fall at about 30 degrees from vertical (see Figure 2). The towhook should be made adjustable, because towline perfor-

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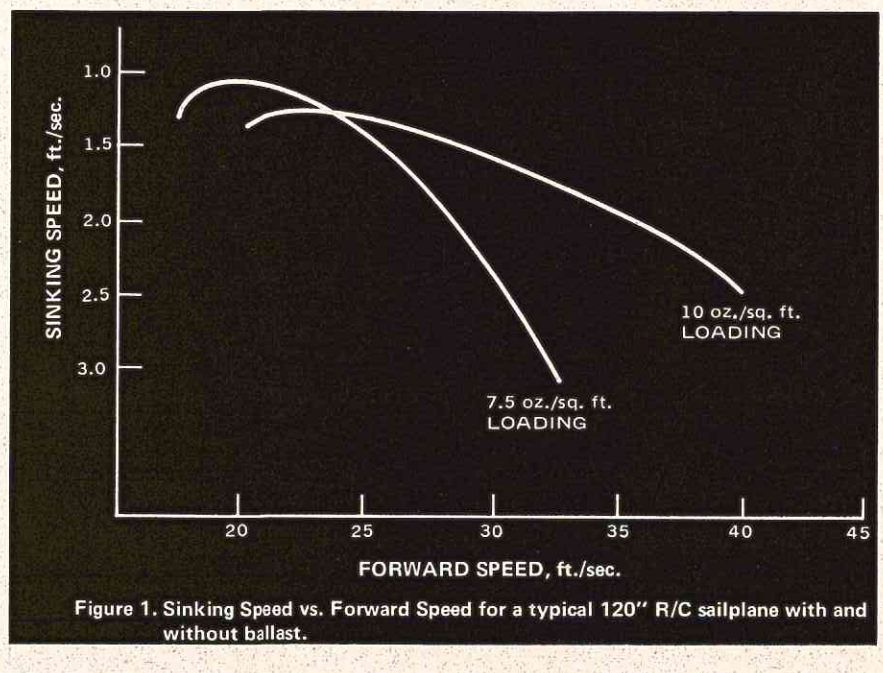


Figure 1. Sinking Speed vs. Forward Speed for a typical 120" R/C sailplane with and without ballast.

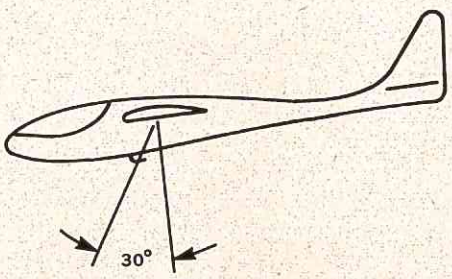
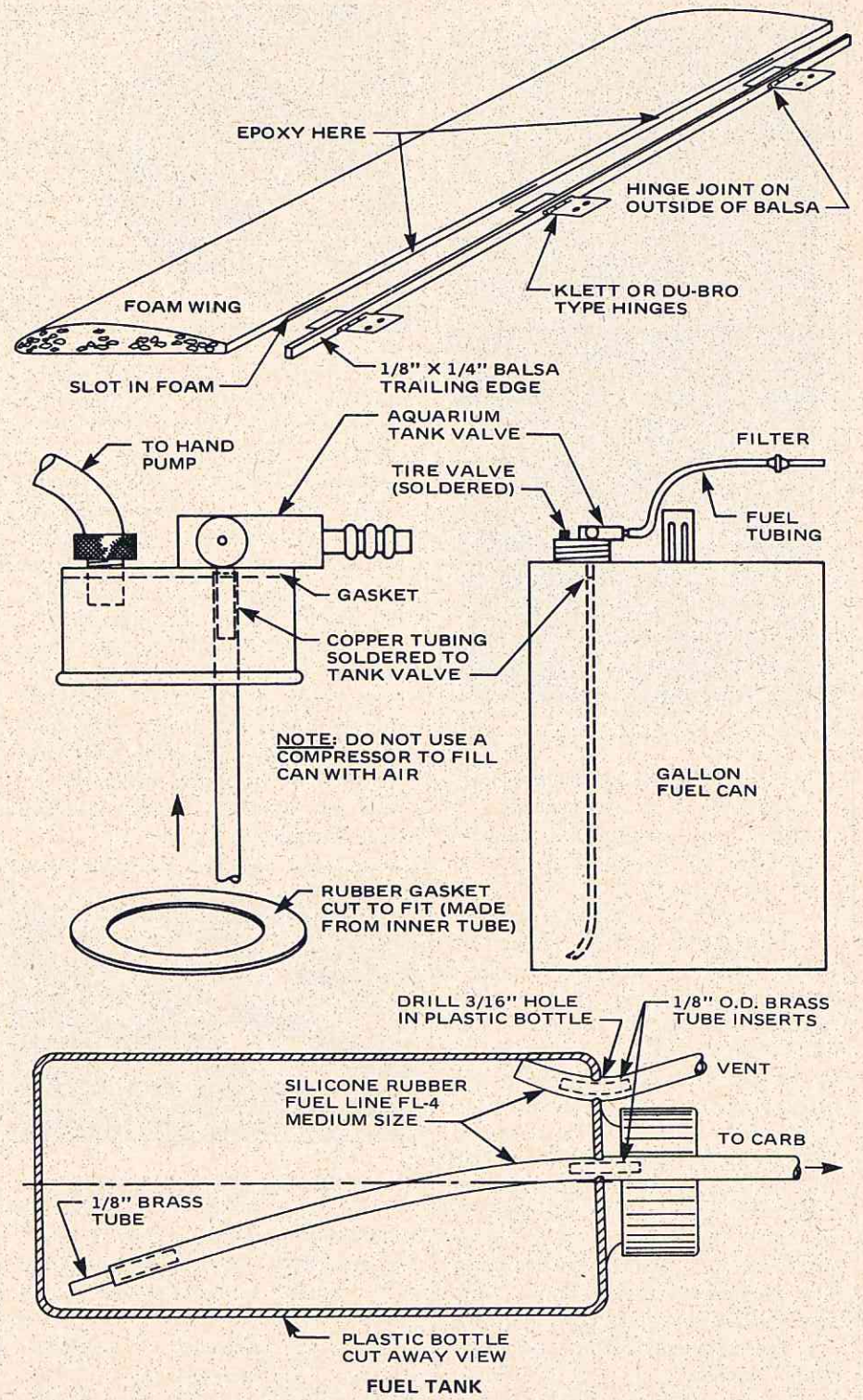


Figure 2

FOR WHAT IT'S WORTH

Here is a fast, simple and easy way to hinge control surfaces on foam wings and tails as suggested by George M. Chabot of Saugus, California. Cut the trailing edge of the wing with a knife and straight-edge back until the trailing edge thickness is 1/4" or thicker, depending on the size of the trailing edge balsa strip used. Then cut the hinge slots through the balsa strip, insert the hinges in the balsa, cut corresponding slots in the trailing edge of the foam wing. Now, mix up some 5 minute epoxy, apply this adhesive on the trailing edge of the foam wing, put the trailing edge balsa on the foam and your wing is hinged without any chance of epoxy getting in the hinge joint. George mentions that he has never had one of these come loose.

Although pressurized fuel containers are not new, Douglas L. Motley of Danville, Virginia, submitted this sketch of the method he used which works quite well and is easy to make. Since the "works" are all contained in the fuel can cap, it can easily be removed and placed in another container. The container is pressurized with an ordinary hand operated auto/bike tire pump. The only precaution is that pumping should be done very slowly and, upon any signs of the container bulging, pumping should be discontinued. About three strokes of a regular auto tire pump is adequate for several refuelings. When the tank is full, simply turn off the aquarium type valve. Doug has used this system for three years and has encountered no problems.



FUEL TANK

Here's a method from Ed Gerhardt of Basking Ridge, New Jersey, of making a fuel tank from any convenient size plastic bottle that has a cap. Ed has used it successfully for years. Originally the fuel line used was neoprene but the new silicone tubing makes an even better job. Drill 3/16" holes through the bottle wherever you want your lines; they can go through the cap but Ed prefers the shoulder of the bottle as shown. 1/8" O.D. brass tube segments are then worked inside the fuel line to the location where the tube will pass through the bottle. This is tedious, but not difficult. By alternately pushing and pulling on the outside of the line it will work its way in. Pushing with a piece of 3/32" wire also helps. The brass tube for the vent must be curved to direct the silicone line to the top of the tank. The fuel line is then fed through the 3/16" hole from the outside. Use your long nose pliers to reach through the neck of the bottle and pull the fuel line while pushing and wiggling from the outside. This results in a tight fit which will last as long as the fuel line. Pull the end of the pick-up line out through the neck to insert a piece of tubing for weight. A short tank may require some solder wrapped around the tube for better clunk action. Ed uses a single vent as shown which is filled through the carburetor line. No filter is used in the carburetor line since one is used in the line from the fuel pump or container.

SHOWCASE '73

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model boats when Gary Pruss of GEM Models nearly doubled the existing speed record for electric boats using an Astro 25. For further information contact Astro Flight Inc., 13377 Beach Avenue, Venice, California 90291.

ALL-BALSA ALL-SCALE SPITFIRE KIT

From Royal Products Corporation, 6190 E. Evans Ave., Denver, Colorado 80222, comes the announcement of a new all balsa and all scale Spitfire kit. Constructed on a scale of 1¾" = 1", the kit features a spun aluminum cowl, and a complete hardware package. Fuselage length is 52-1/8"; wing span 64½"; and a wing area of 736 square inches. Engine size is .60-.80. The kit is priced at $69.95 and is an excellent addition to the Royal Products line of high quality and hand crafted scale kits. □

BASIC SAILPLANE DESIGN

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mance may change quite a bit with small changes in hook position.

16. The weight in extremities should be kept to a minimum (light tail, tips, etc.). The nose weight should all be concentrated near the battery pack, and the nose should be kept as short as possible. The overall effect of these precautions is to reduce the moment of inertia of the plane, increasing the control capabilities of the empennage and eliminating "Cumulus gallop."
17. Variable camber sections etc., are of little use because reducing C_L will probably reduce L/D ratio. This goes hand in hand with the comments about down-trim. Adding ballast is better than varying camber. Semi-symmetrical or symmetrical wing sections are violations of common sense.
18. Wing planforms should approximate elliptical loading. A good way to do this is through a combination of taper and washout. A tip chord of .6 the root chord, coupled with about 12 degrees of washout, gives a very close to elliptical loading.
19. Tip chord of less than 4½ inches or so is undesirable because of the very low Reynolds number. If your tips are too skinny, tip stall results. Countering this with washout or progressive airfoils leaves you with tips which are just going along for the ride.
20. A Hi-Start will give you a calm-air launch equal to a little more than the length of the towline (excluding rubber) provided you use surgical tubing. The shock-cord type of Hi-Start gives a short sharp yank instead of the longer, smoother pull obtained with the tubing. Use Airtronics small size for Lil T, Windward, Windfree, Monterey, etc.; medium for Olympic, Cirrus, etc.; large for Cumulus, Grand Esprit, etc. A winch will launch you higher, but you don't need one and shouldn't concern yourself with winches unless you have the Formula I mentality.

So much for this summary of generalities. Let me add a couple more pithy coments before I stop. An airplane's performance is defined by laws of physics, and the governing principles are immutable. Design breakthroughs, like the Liebeck airfoil, may come along to improve performance but, in general, there is no magic force arrangement, decalage, configuration, or what have you which will defy all known laws and produce a super winner. Frequently you see claims about the performance of such-and-such a design which a little common sense will tell you cannot be true. Please think a little bit about the design precepts discussed in these columns before you accept such claims at face value. □

MRC MARK V

from page 55

Both the transmitter and airborne pack use nickel cadmium batteries that have been previously put through several reliability life tests by Model Rectifier Corporation before they are shipped with each system. The transmitter and receiver batteries can be charged independently or simultaneously from the transformer isolated, dual output charger provided with the system.

The airborne weight of the complete system consisting of a receiver,

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MRC MARK V

from page 62

four servos, battery, and switch harness is 14.5 oz. The approximate operating time is 2½ hours minimum.

After approximately 75 flights on the MRC Mark V system, over half of which were conducted in an area known to be high in 27 mHz frequency interference, we found this system to equal or exceed any system previously tested regardless of cost. We experienced absolutely no failures of any kind nor could we fault the performance of the system from the sport fliers standpoint. As with any system designed to sell in the sport range, you do not have your choice of options such as servo size and configuration nor can you order a single stick version. However, the new MRC Mark V offers a great deal of flexibility in the servo tray configurations offered, the various servo output arms furnished with the system, and the fact that this system can be ordered on either Mode I or Mode II transmitter stick configuration.

Based on the performance of this system to date, and along with MRC's one year guarantee, we would have to agree with their advertising that this system does not take a back seat to any system either sport or competition - - - it's front line all the way and we doubt if anyone will call the Mark V any system's "kid brother."

Tested, Approved, and Recommended by RCM. □

MICRO MINI FIELD KIT

from page 51

PLUG. The reason for the long lever switch is that it's easy to operate with the box strapped to your wrist. You may prefer a miniature switch, but it would have very little leverage and be awkward to operate.

Your switch is on GLOW PLUG. The plug will light, and the ammeter will show a reading in about the center of the meter. The reading doesn't have to be exact center but should be around there if you made your resistor correctly. If you wish to alter this reading, make a new resistor with either more or less turns (more turns will give you a higher reading, and vice-versa).

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MICRO MINI FIELD KIT

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The important thing is to get a reading. No reading means a dead plug or a poor connection at the plug. Always start your engines with the switch in this position. You can also start your engines with the switch on the BATT. position, but this doesn't test the plug. Incidentally, when the glow plug is wet with fuel, you'll get a slightly different ammeter reading which means nothing. Mark the normal reading **above** the meter with a Letraset capital i.

As a glow plug ages and its filament oxidizes, the ammeter reading will gradually go down (to the left of your ammeter marker). This is normal, but a **way below** normal reading indicates a badly oxidized plug. It can't last much longer, so replace it for optimum engine performance. You'll also get a below normal ammeter

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MICRO MINI FIELD KIT

from page 70

reading if your battery is run down. Therefore, your ammeter readings should always be taken with the battery in good charge condition. Should you get a higher-than-normal ammeter reading from a plug, pat yourself on the back – it's a terrific plug. Or it's an idle bar plug, and these give slightly higher readings than standard plugs. Idle bar plugs naturally draw more current.

Remove the glow plug from the clip. Flip the switch to the BATT. position. The meter's needle should be in about the center of the **red** square on the meter face. Try it again with a glow plug inserted in the Du-Bro clip. The meter needle should be further to the left but still well within the red square. If you need to adjust the needle at all, the meter has a needle adjustment at its base.

Everything adjusted? Okay, when the unit is in use and the meter reads below the red, actually into the **black**, while **under load** (glow plug on), the battery needs recharging. Once the needle is in the black, your plug will still glow, but not for long. Time to recharge. Put a Letraset capital i marker **below** the meter to mark where the needle should be with the battery fully charged and under **load**.

Set the switch to OFF. This is the correct setting for recharge and explains the X beside the OFF position and jack. The P is for pilot, but that's not you, that's the recharge light. This red diode will glow only if the battery is actually being recharged. You must use this diode because it forms part of the necessary resistance to the charger current (the diode subtracts 25 mA). In this respect, a light emitting diode is superior to an ordinary 25 mA lamp, because the diode will glow only if there is a forward voltage from the charger. An ordinary lamp can produce a glow from the **battery** (in which case the charger would be connected but not working). Use the diode.

Another nice thing about this outfit is that you can cycle the nickel cadmium battery by inserting a glow plug in the Du-Bro clip and flipping the switch to BATT. As soon as the meter indicates a run-down battery, set the unit for the recharge overnight. Do this once a month in the Winter when the battery isn't in use, and it should last for many years.

The OFF position is also the correct position for using the built-in field strength meter. Note the FS beside the X and the FSM beside the red push button. You must use a push button switch with the circuit because a regular switch might be left on accidentally, and then the glow plug wouldn't light.

To use the field strength meter, wrap the Du-Bro Starter Cord around the box and push the glow plug clip into the fuse holder. Unstrap the unit from your wrist and lay it on a table so that the brass tube is parallel to, and about an inch away from your transmitter's antenna. You have no aerial to extend; the aerial wire is wrapped around the fuse holder. Extend the transmitter's first section of aerial (the thickest tube), so that it is about ten to twelve inches above the top of the transmitter case. Many 72-75 mHz transmitters come with the antenna already in this position. Others have retract antennas. In any case, have a foot of antenna above the top of your transmitter. Now, without

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MICRO MINI FIELD KIT

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touching the metal face plate of the wrist package, press your forefinger against the push button switch. Turn your transmitter on and move it closer or farther away from the brass tube until you get some sort of meter reading.

Depending on power output, 72-75 mHz transmitters will give a full meter deflection with the brass tube ¼" to 1" away from the transmitter aerial. For instance, a 250 mW Digit Migit on 75.640 produced a full meter deflection ¼" away, while a Pro-Line 600 mW transmitter on the same frequency pinned the needle to the right at a 1" distance. Don't let the brass tube touch the antenna; this will merely make the meter needle whang to the right. This doesn't harm anything, but it does keep you from getting a correct reading.

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MICRO MINI FIELD KIT

from page 74

To test 27 mHz transmitters, you must **unwrap** the starter cord completely and position the fuse holder about ½" to 1" away from the antenna to get full meter deflection.

Notice while making tests that placing your palm on the face of the transmitter, or a finger on the face plate of the wrist package, brings body capacitance into play and thus a higher field strength reading, which varies considerably with the amount of pressure applied by your palm or finger. Therefore, for reliable readings, just press your forefinger to the push button; don't touch anything else.

Don't try to take field strength readings with the wrist package strapped to your wrist; they will be unreliable.

Once you know exactly how far away to position the unit from your

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MICRO MINI FIELD KIT

from page 76

particular radio for a full meter deflection, you're set (presuming that your radio was okay to begin with). Later, if you get anything less than a full deflection at the same position, your transmitter needs charging, a new dry cell, or repair.

Obviously this is not an elaborate field strength meter; its purpose is to get a quick check for trouble. It's an asset if your transmitter doesn't have a meter or uses a meter that merely tells if the transmitter is on or off. What this little meter does is quickly check to see if the transmitter is delivering an adequate signal for safe flight. Maybe you'll want to leave the field strength meter circuit out. The author, however, was using a Digit Migit without a meter and noticed a few in-flight glitches. Bringing the bipe down pronto, the Micro Mini FSM was then applied to the transmitter on a car seat and no field strength reading at all was obtained, except by touching the brass tube to the antenna. Opening up the transmitter, and voltmeter-testing the battery under load, showed the dry cell battery producing not eight volts but **four** volts! So the meter works, by George, and kept your ancient author's plane grounded until a new transmitter battery could be installed. The new battery produced an excellent FS reading.

So there you are. The normal carrying position for the unit is on your wrist with the Starter Cord wrapped around the case and the clip in the fuse holder. You can use the unit this way or unstrap it and use it on the ground. If you use it on your wrist, it isn't absolutely necessary to rewind the cord each time; just let it dangle. Only watch out for whirring props; starter cords and props make a mean mixture. It's really not a bad idea to rewind after each start; it takes seconds. Alternately, you could just "hang up" the brass tube in the holder the way you do a telephone; this pretty well keeps the cord out of trouble, without rewinding.

Another convenience to notice is that you don't **have** to remove the Du-Bro clip from the plug after the engine starts. Just flip the switch to OFF. If the engine starts to die, switch back to GLOW PLUG until the engine is running smoothly, then try switching to OFF again. That way you won't have to keep unclipping and clipping the glow plug.

Have plane/will travel? Travel light with a Micro Mini Field Kit. It's especially nice if your field's parking lot is quite a distance from your flying site. It's doubly nice at the end of a flying session, when you may be feeling your years or the aftermath of last night's violent ping-pong game. The battery will give ten to fifteen starts under normal starting conditions, so if you decide to tote more props and a quart or two of extra fuel in your car trunk, you can have about as many flights as your airborne battery pack will allow. But don't leave fuel in your car trunk on a hot day.

The only thing you'll have to beware of is the sensation this little field kit will produce the first time you use it at the field. You'll probably be plied with questions from all sides and have some trouble finding your plane amidst all the arms and legs. Just direct your friends to this issue of RCM and shout,

"Clear the runway!" □

SVENSON WAYFARER

from page 46

in approximately two weeks of evenings by a builder with average experience. When completed, we covered the wings of our Wayfarer with white Solarfilm and used three coats of K & B Superpoxy primer over the bare fuselage and struts followed by two coats of K & B Superpoxy yellow enamel. The all up weight of our prototype was 5½ lbs., and it is powered by a HP .40 RC engine. For general sport flying a conventional front rotor .40 is adequate while a .60 will provide absolutely spectacular performance in the vertical maneuvers.

The Wayfarer has a 52" span and approximately 800 square inches of wing area. The fuselage length is 43". Price of the Svenson Models kit is $64.95 – quite reasonable considering the high quality of the kit and the fact that virtually all needed accessories are included with it.

We are highly impressed by this Svenson kit and recommend that you see it at your local hobby dealer. Tested, Approved, and Recommended by RCM. □

TIPSY NIPPER MK2

from page 30

The model should weigh around 4-3/4 pounds with Kraft KPS-14 servos. Keep in mind that the nose is short, so build light in the tail and heavy in the nose, using generous amounts of epoxy around the engine. The wing is held down with a steel bolt. The covering is Solarfilm except for the nose block where dope is more durable. The dummy engine should match the cylinder of your engine and can be made from a stack of 1/32" balsa rings, one slightly smaller than the other to form fins. The landing gear is simply epoxied between plywood without bolts or wrapping.

The one tedious part of this model is the removable wing and associated parts. Remember that, once completed, there is no shimming of the wing or stab for trim, so it must be right the first time. You have probably noticed that I am using 1.25 degrees positive incidence on the wing as compared to the stab. This is because I like small engines, and most of my flying is at reduced throttle. If you are a power bug and plan on using a .45 or larger, I suggest you reduce the angle of attact to zero.

BEFORE COVERING

Set the wing on the fuselage and check your angles. Place a flat sheet of sandpaper under the wing with the rough part against the fuselage. Moving the wing back and forth will sand your wing saddle to a perfect fit. With the wing in place, add F-17 and check that there is exactly 1/16" undercut to the outside dimensions of the fuselage. Fit F17A, F18, and F19 at this time. Because the wing must be lifted up in front slightly for removal, F17A is grooved out. Drill and mount the 1/4" hold down dowel in the trailing edge of the wing. Fit this dowel to F6 by filing a little at a time until it slips in.

Fit and secure the windshield with the wing slightly raised in front. The trick is to find the point where the wing will slide forward slightly and relieve the rear hold down dowel.

Snug fit your windshield at this point. Remember that the windshield is not fastened in the rear. After the wing is bolted down, there will be 1/16" clearance which is a very attractive arrangement. This is the only part of construction that requires finesse and the rest of the ship is straightforward and simple.

One interesting aspect about the Nipper was the fact that people either loved it or ignored it. There was no in-between feelings about the design. One thing everyone agrees on was its advanced capabilities in the air, so I am guessing what we have here is the sport pilots versus the fighter pilots.

With me, I guess the war is over because the Nipper sure is fun to fly.

Fly safely. □

SNOOPY

from page 29

color, and the rudder was striped with red, white and blue. The lower surface of the wing and horizontal tail were painted off-white. By adding a portion of olive drab paint to the white, the desired color was obtained. The fuselage truss structure was left unpainted to simulate the natural color of spruce, and then coated with clear dope. The aluminum cowl was left unfinished.

Roll-out ceremonies were held on May 11th, and on May 30 the first flight was attempted. Many photographs had been taken to document the project in case "good old Snoopy" got shot down on the initial flight. My good friend and expert R/C pilot, Carl Weyl, had consented to try the first flight. The field was level hard dirt but with many ruts and soft spots. As I expected, after examining the field, Snoopy's little William Bros. vintage wheels couldn't hack it and, after two attempts we gave up and decided to fly it from an asphalt or concrete runway at a later date. The first flight attempts indicated that the landing

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gear was too flexible; it developed a galloping action over the rough terrain. Although a smooth runway surface would probably eliminate this problem, I didn't want to risk having the galloping action occur again. A brace was added to the existing landing gear, picking up at the axle and extending aft into the lower fuselage longerons. This modification added ample stiffness to the landing gear and is incorporated into the detail design plans.

On June 25th the second test flight was attempted. Carl Weyl had asked Don Barton to take over the controls since Don had learned to fly on the same radio set as Snoopy's. This time we selected a fairly smooth asphalt strip for the runway.

This test confirmed my suspicion. The model was too heavy for 360 square inches of wing area and .19 cubic inches engine displacement. Snoopy started down the runway, raised his horizontal tail and reached a top speed of approximately 15 miles per hour but just wouldn't go any faster. Don did not want to risk applying up elevator; Snoopy would probably have stalled out and been damaged. The rudder was quite effective. Don kept Snoopy going straight down the runway finally throttling back after about a 75 yard run.

All of Snoopy's fans and my R/C model building associates were bound and determined to get Snoopy in the air. Carl Weyl loaned me his K & B .40 engine and it was installed in a couple of days. However, the engine and some minor fixes now increased the wing loading to a relatively high level. Don Barton got on the phone and helped alleviate the wing loading problem by obtaining the loan of a Kraft Systems Micro airborne system thanks to Chuck Hayes of Kraft Systems. The equipment consisted of three KPS-10 servos, a KB-4C 225 MAH battery pack and a KPR-4B receiver. Don and I installed the equipment in an evening and it was quite surprising to see how little room was required in the doghouse for the Kraft avionics. The total weight was now 3 pounds, 12 ounces, giving us a wing loading of 20 ounces per square foot.

Snoopy was now ready for his third attempt at flight. Thursday afternoon,

a few Snoopy fans met at the dirt field where we had attempted the first flight. I fired up the big .40 and, with Don Barton at the controls, Snoopy taxied down the hard packed runway. Don only used approximately three-quarters throttle and after about a 50-foot run, Snoopy was airborne. The bright yellow doghouse and Snoopy overpowered the rest of the plane, and Snoopy with his scarf streaming and his head turned toward the onlookers, appeared as if he was giving us the Raspberry! Don said that he had insufficient rudder control and showed me that the rudder stick on the transmitter was against the stop-at-full-travel. After barely completing a large left turn Don tried to line up on the runway with the engine throttled back and landed without a scratch. My boys were screaming, "He flew, he flew."

An analysis indicated that, when Snoopy became airborne, flying at angle of attack, the vertical tail and rudder were completely blanked out by the doghouse and the doll. The airstream separated and became turbulent around the doghouse and was not rejoining to flow smoothly over the vertical tail surfaces. This would reduce the dynamic pressure on the vertical tail surface and render the rudder almost useless. I had also noticed that the plane had oscillated from right to left continuously which further verified my analysis. The easiest fix was to enlarge the vertical tail and rudder surface.

Saturday we were ready to try again. Snoopy had a vertical tail and rudder approximately twice the size of the original one. Don Barton was at the controls again. The rudder control during take-off was great but when Snoopy became airborne, Don called out "no rudder control, same as last time." Don went to full throttle because he thought the reduced angle of attack with more power would reduce the airflow separation over the vertical tail surface. Apparently the increased engine torque rolled the model sharply to the left, causing Snoopy to lose flying speed and dropping steeply to the ground. The Red Baron won again, and this time Snoopy had sustained considerable damage. I now know that Snoopy needed ailerons to turn, and some lower fins for directional stability.

About a month later Snoopy was ready again. Don had purchased four KPS-10 servos, and returned the borrowed equipment to Kraft Systems. He also had a KB-4B battery

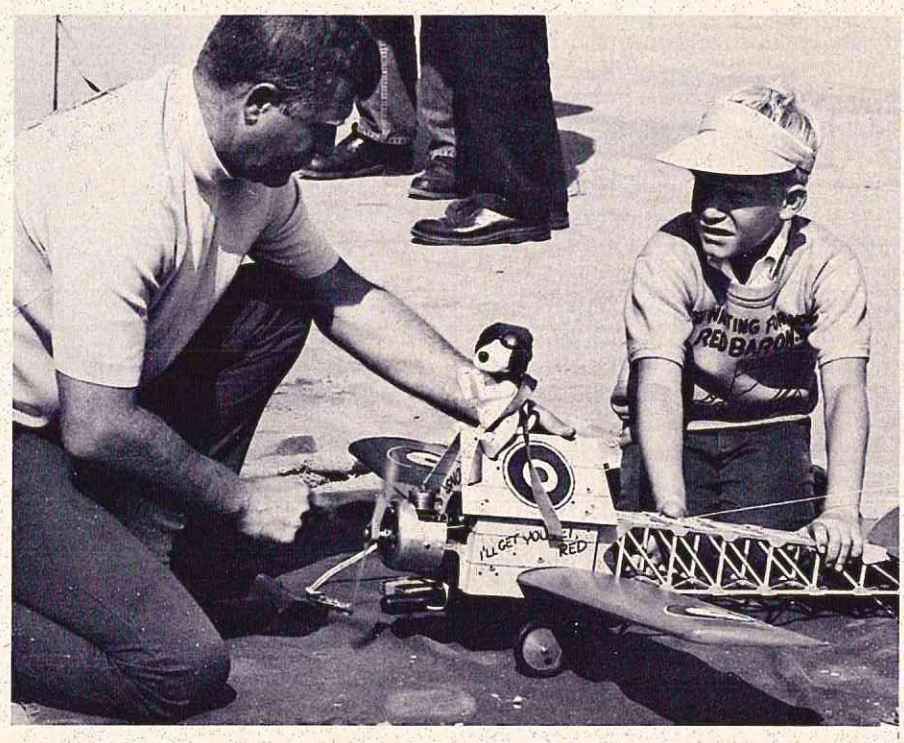
pack and KB-6B receiver. I had added the aileron servo and strip ailerons to the wing assembly and 2 vertical fins were mounted outboard on the lower surface of the horizontal tail, clearing the aerodynamic envelope of the dog-house.

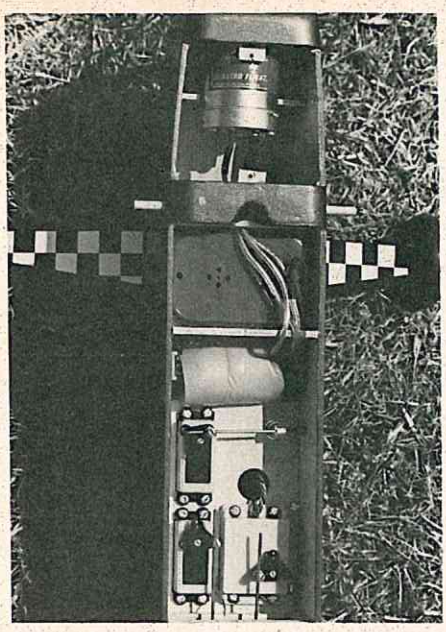
Ron McGaffin and Russ Drake of Northrop Corporation convinced Jim Brown of CBS television's Channel 2 to come out and film Snoopy's next flight. I tried to get a Fokker DR1 to fly at the same filming but couldn't locate one in time for the filming appointment. Thanks to Paul Umrisek of the North American Eagles, he showed up the Saturday morning of the filming with an R/C monoplane all painted up bright red and with WW I German markings. Snoopy flew well. Don was making a low level pass by the T.V. camera and inadvertently hit the ground raising a cloud of dust. The effect was perfect; Snoopy was hardly hurt but nosed up in a typical crash position. Bill Halpin of the North American Eagles flew the Red Barons plane supplied by Paul Umrisek.

Jim Brown and the Channel 2 television crews artful film editing turned the event into a realistic "dog-fight" between Snoopy and his arch foe the Red Baron. The feature was aired that evening in the Big News ending with Jim Brown kneeling over the shot down Snoopy saying "Curse you, Red Baron" as Bill Halpin (the Red Baron) pulled a beautiful victory roll over Jim Brown and Snoopy.

If you want something different that will please the crowds and keep their attention at public R/C demonstrations, build something they can identify with - - -

- - - build Snoopy. It will be worth it. □





A QUIET REVOLUTION

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Fuel	Specific Weight	
	Foot/lb./lb.	Watt/Hr/lb.
Rubber Motor	2,500	0.94
Ni-Cad Battery	27,000	10
Silver Zinc Battery	165,000	60
Glow Fuel	600,000	222

FIGURE 2

weight of fuel.

It is evident that to obtain a desired degree of power from electric motors, we are going to have to accept a higher degree of weight due to the combined weight of the electric motor and its rechargeable nickel cadmium batteries. Just how much weight does this entail? In the case of the Astro-10 it is 21 ounces and in the case of the Astro-25 it is 40 ounces. Before you write this project off as impossible, let's take a look at Figure 3 which shows the relative weight of a glow engine as compared to the Astro-10.

Item	Weight/Oz.	
	O.S. Max .10	Astro-10
Motor	3	22
Muffler	1	–
Mount	3	–
Tank & Fuel	4	–
Fuel Proofing	5	–
Total	16	22

FIGURE 3

As you can see from looking at this chart, there is approximately a 7 oz. difference between the Astro-10 and the OS Max .10 engine and its accessories. The 5 oz. fuel proofing figure is a nebulous one, since most modelers will prefer some form of covering on their electric airplane even though none is required. Thus, it is safe to say that the Astro-10 electric power plant and battery will weigh almost twice as much as an OS Max .10. And, although we are getting ahead of our story, we've found that the Astro-10 puts out a power that's more closely equivalent to a muffled OS Max .15.

It's apparent from the previous figures that the weight of electric power certainly does not preclude its use but, rather, dictates a different set of parameters than one would use in designing for the lighter weight glow engine. In order to understand these parameters, let's take a look at the propeller efficiency of the smaller of the two electric power plants, the Astro-10, using a 7/5 Top Flite wooden prop. Remember that gearing is not necessary for this motor since it is designed to work with standard RC props and drive them directly.

Speed/ MPH	Efficiency Percent	Thrust in ounces
Static	0%	20
30 mph	60%	12
45 mph	78%	12
60 mph	70%	7

FIGURE 4

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ENGINE CLINIC

from page 10

right angles to the air intake venturi — could this be contributing to my difficulty?

In your reply, I would appreciate a formula for a glow plug fuel. I'm an employee of a small chemical manufacturing company and have access to nitro-methane, methanol, and castor oil.

Yours truly,
F.G. Fleschner

Five inches is about the maximum distance you would want the clunk from the carburetor on a .15 size engine. However, this distance should not affect starting characteristics of the engine if the height of the tank is located properly in relation to the needle valve. With a .15 you should be using a 4 oz. tank and the center line of the tank should be approximately ¼" below the needle valve. The first mistake many fellows use with the smaller displacement engines is to use too large a fuel tank, such as a 6 or even an 8 oz. tank. Dropping of the fuel level causes too much of a change in the fuel head, or pressure, and the engine cannot cope with this variation. So, the first thing to do is change to a four oz. tank, if you are not already using one, and get it as close to the firewall as possible. In turn, be sure the engine is as close to the firewall as possible also. Don't have it sitting an inch or so forward of the firewall just to balance the airplane, etc.

The position of the hole in the needle valve can also be contributing to your trouble. The hole in the spray bar should be straight down in relation to the venturi or forward very slightly. It should not be at right angels or 90 degrees to the venturi.

As for a glow fuel formula, I did a complete article on fuels several years ago which has been reprinted in the RCM Anthology Library series book, "The R/C Engine." However, a good basic fuel would be 22% lubrication. This can be either Baker AA castor oil or Klotz Special Formula oil – 10%-15% nitro-methane – balance Methanol alcohol. Vary the nitro as per your power needs. If you want maximum power, use 15%. If you are less concerned with power and more concerned with fuel costs, use 10%. For that matter, even 5% nitro can be used but, generally, a little more nitro will result in a better performing engine.

Dear Mr. Lee,
I have just ordered one of your "new"

Veco .61's for my Mach I. Perhaps the answer to at least one of these questions will be in the accompanying instructions.

First of all is K & B Supersonic 100 a recommended blend for breaking in this engine? If so, is it also recommended as a post break-in fuel or would Supersonic 1000 get the job done better? I am considering these fuels not only because of their relation to the engine manufacturer, but mainly because they are the only ones available to us through our European Exchange System here in Germany. There are, of course, several German brands available at the local hobby store, but I've been unable to find out the percentages of the ingredients (for example Graupner Super G which has an advertised 5% nitro and an undisclosed amount of castor oil and methanol).

Assuming that one or both of the Supersonics are recommended, my second question is this: Invariably the fuel purchased at the exchange here is full of little white particles which I am told is solidified castor oil. If strained carefully and used with a fuel filter is it okay to use this? Is this a common problem or an exception? How much of a difference will it make in the percentage of oil available? This problem seems to be more prevalent in the 100 blend. (By the way, perhaps you could tell me what the percentages are in the K & B fuels – it would be nice if they were listed on the can.)

Thirdly, (and I'm sure I read this in your column somewhere referring to a Webra .61, but I can't find it), would you suggest bench running this motor a lot, some, a little, or slap it right in the plane and keep it nice and rich while working it a little? Also, when flying a "rich" setting should the ground setting be just in between 2 and 4 cycle or considerably richer?

I'm pretty new at this powered flight business since, until recently, it was all sailplanes. In the short time I have been flying power, I've managed to "hurt" a few engines. I want to give this Veco a fighting chance!

Thank you for your time.

Sincerely,
Dan Juhlin, USAF
Ramstein, Germany

Any of your milder nitro fuels can be used both for break-in and post break-in flying. I really don't recommend the use of K & B 1000 as a sport flying fuel in the larger engines as the nitro content is 25%. This fuel is intended primarily for the smaller displacement engines that require higher nitro fuels or competition use, such as free flight, etc. However, the trend among competition pattern fliers lately has been smaller propellers and higher nitro fuels.

The white specks you notice in your fuel is a real problem to all fuel manufacturers. No matter how many times the fuel is filtered by the fuel manufacturer, if the fuel is allowed to get hot and then cold again, fats in the castor oil will solidify. Warming the fuel will usually cause the specks to go away again. Different batches of castor oil seem more prone to this solidifying than others. Filtering these white specks out of your fuel will not hurt

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Thus, as it can be seen from Figure 4, the Astro-10 develops maximum thrust at rest but the maximum efficiency is in the 45 mph range where it reaches an efficiency of 78% with 12 oz. of thrust. Now, let's take a look at some figures for the minimum power required to hold altitude. Remember, we said **hold**, and not **climb**.

Aircraft Weight in pounds	Wingspan in Feet 4	8
2.5	1/50	1/100
5.0	1/15	1/30
10.0	1/6	1/12
20.0	1/2	1/4

FIGURE 5

Thus, from Figure 5 we can determine the minimum power electric engine required to simply hold a given altitude. Now, let's take a look at Figure 6 to find out the power that is required in order that our aircraft may climb at a given climb rate.

Aircraft Weight in Pounds	Climb Rate 250 FPM	500 FPM
2.5	1/26 HP	1/14 HP
5.0	1/14 HP	1/7 HP
10.0	1/7 HP	2/7 HP
20.0	2/7 HP	4/7 HP

FIGURE 6

From Figure 6, and comparing it to Figure 5, we can determine what size electric motor is necessary to hold altitude and to provide an acceptable rate of climb.

Now let's take a look at the Astro-10 and Astro-25 and find out just exactly what we have to work with.

The Astro-10 motor is rated at 1/10 horsepower (75 watt output) at 12,000 rpm. It will produce this power at 8.3 amperes when using a 7/4 Top Flite wood propeller. The weight of the motor, itself, is 9.5 oz. while the rechargeable nickel cadmium battery pack weighs 12.5 oz. for a total system weight of 21 oz.

The Astro-25 is rated at 1/4 horsepower at 9000 rpm and will produce its power at 12.8 amperes when using a 9/7 Top Flite wood propeller. The weight of the Astro-25 motor is 14.5 oz. while the attendant battery pack weighs 25.5 oz. for a total system weight of 40 oz.

Although heavier than that with which we are used to with respect to glow engines, remember that we are

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working with an entirely new form of propulsion system and these are the weights with which we currently have to work as future developments in the field of rechargeable nickel cadmium cells take place, we may see a reduction in battery size and weight. For the present, however, these are our weights and our aircraft must be designed around them. They are certainly within the realm of practicality as I shall attempt to show later in this article.

Now, insofar as charging and flight time is concerned, the Astro-10 is field charged in 15 minutes from an 18 volt source and gives a flight time of 4 minutes. The Astro-25 is also field charged in 15 minutes but from a 24 volt source and gives a flight time of 8 minutes. These flight times will, of course, depend on the aircraft used and the propeller selected. Using a larger prop than is recommended will not only load the motor down and overheat the batteries but will cut down on these flight times.

COST

The next item to consider in electric propulsion is the initial cost and the cost per flight over a normal flying season. To begin with, the electric motor and its nickel cadmium battery power supply is expensive compared to the glow plug engine. But, eliminating fuel, glow plugs, starters, and other miscellaneous items associated with the glow engine brings the unit cost per flight down considerably until, over the course of a normal flying season, the electric motor is less expensive than the two cycle engine. Let's take a look at Figure 7 which shows the relative cost per flying season of a standard .19 engine

COST IN DOLLARS

Item	.19 Glow	Astro-25
Motor	$ 30.00	$ 80.00
Fuel (250 flights)	$100.00	–
Glow plugs	$ 5.00	–
Batteries	$ 5.00	$ 20.00
Total	$140.00	$100.00

FIGURE 7

Figure 7 is actually hypothetical, since one could add more accessories for the glow engine such as electric starter, tachometer, etc. By the same token, you could have three chargers for your three six volt motor cycle batteries used to rapid charge the Astro-10 or two chargers for the two 12 volt batteries to rapid charge your Astro-25. The point we are trying to make is simply that the electric power plant is less expensive over a normal flying season than the two cycle glow engine.

Thus, to this point, it can be concluded that the electric propulsion plant is definitely within the power-to-weight ratio, although heavier than its glow engine counterpart, and, while initially more expensive, the electric power plant is less expensive over a normal flying season due to the fact that it does not use expensive commercial fuel. Now, let's take a look at the design parameters for the electric RC aircraft.

DESIGN PARAMETERS

To begin with, the key elements to either the Astro-10 or Astro-25 is that they feature a lightweight permanent magnet motor with high current batteries and a rapid charge circuit. The key performance parameters is the choice of a 1/10 or 1/4 horsepower electric motor and either a 4 or 8

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minute flight time. Both motors recharge to full potential at the field in 15 minutes.

Taking the Astro-10 first, the average sport aircraft must be designed with overall weight foremost in mind. This will be no problem if you are a former free flighter, but RC'ers used to building on the heavy side will have to pay some attention to the weight of their aircraft structure.

The Astro-10 aircraft should have a span of 42" to 48" with an overall wing area of 350 to 400 square inches. The total flying weight, complete with 22 oz. motor and battery pack must be in the 42 to 48 oz. range. Simple arithmetic shows that the aircraft with radio must weigh in the 21 to 26 oz. category. Since the aircraft can be flown with either two or three channels, we will assume a 6 to 8 oz. radio system weight, which means that your bare airframe, ready to fly less electric motor, battery, and digital proportional system, must weigh 12 to 18 oz. This is not difficult to accomplish, but does require some careful design planing as well as a careful selection of materials used in the aircraft.

The fuselage length for this size aircraft should be approximately 30" and the airfoil should be a flat bottom 12 to 15 percent section. The aircraft shown in the photographs which the author designed for RCM's test of the Astro-10 consisted of a simple constant chord wing with flat bottomed airfoil and a fuselage that was built up of 1/8" sheet sides, top, and bottom. We deliberately loaded the aircraft to a weight of 57 oz. which not only was far beyond the extreme weight limit for the Astro-10, but was of a weight that would be virtually the extreme limit for a sport .15 glow engine if reasonable performance is to be expected. This was done deliberately in order to check the power of the Astro-10 power plant. To our amazement, the aircraft flew and, in fact, needed down thrust in the engine! This is not to say that it flew extremely well at that weight since the wing loading was very heavy. Removing 6 oz. of weight from the aircraft put it at 51 oz. which was still almost a quarter of a pound above the outer weight limits previously

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mentioned. At this weight the aircraft would loop from level flight, roll, and perform other basic maneuvers. In fact, in one flight we did eight consecutive loops, four rolls, and a couple of four or five turn spins. The point of this information is to show that this Astro-10 power plant has sufficient power to perform extremely well within its design weight limits since it will perform adequately even when loaded beyond those limits.

For the aircraft just described we experimented with several different propellers and found that maximum performance was obtained from a 7/6 glass-filled Taipan nylon prop available from Hobby Shack. It has been our experience with glow engines that these particular props were not only balanced properly, but due to their lack of flexing and their true pitch, gave a definite increase in performance on a glow engine. This proved to be equally true when used with the electric motor.

With regard to the Astro-25, the best starting point is with an airplane in the 600 square inch area weighing approximately 5 lbs., ready to fly. As a starting point, a Falcon 56 would make an ideal subject. The design parameter insofar as weight is concerned is 80 to 96 oz. using 600 to 700 square inches of wing area. Excellent results have been obtained with a Falcon 56 modified to properly hold the electric motor and its batteries.

While these design parameters are a starting point, it is hoped that you will experiment with various sizes and configurations of aircraft in order to arrive at the maximum potential of these electric power plants. As a starting point, we are showing the plans for Tom Swift, the test machine RCM used for the Astro-10. Again, pay particular attention to the weight of your aircraft all the way through the building and finishing stages. Remember, too, that an elaborate finish only adds unnecessary weight – and no fuel proofing is needed on an electric airplane!

TO BE CONTINUED.

TALL TEXAN

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tion by cutting out all formers, tail surfaces, and fuselage sides. Clamp the fuselage sides together and sand them to get two perfectly matched sides. Now glue the 1/32" ply doubler and the 1/8" square stringers in place. After they have dried, clamp the 1/4" x 1" trailing edge tail post between the fuselage sides. Next, install the 1/8" ply firewall. Then add former F–4 and the other smaller formers. This should give you a pretty true fuselage. Now, complete the structure by putting the ½" sheet turtle deck and tail surfaces in place along with the 3/32" bottom sheet. Add the soft nose block and 1/16" sheet canopy and cowl.

The hard part is now completed. The wings are the Ace 2T mini–foam wing set with the center section trimmed to 13 inches. Trim the foam trailing edge back ¼" and add a ¼" x 1" balsa trailing edge. Now slot the wings as shown on the plans to accept the landing gear. Bind the landing gear to the 1/8" ply mount and epoxy "the whole thing" together.

Finish the craft by using a plastic bottle for a cowl or, if you have a good buddy who is a sheet metal man, you might be able to get a light aluminum cowl.

Finishing the model is up to you but I would suggest using Top Cote, Solarfilm, or Flitekote to cover the wing for a nice look.

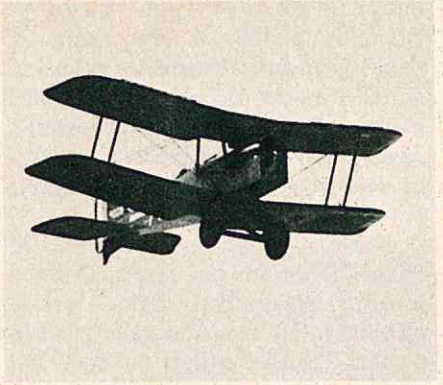
Flying is no different than any other tail dragger, so enough gab. Go out and have a ball! Happy landings!

SCALE IN HAND

from page 16

go-ahead for their first attempts at scale. When we look at some of these models today, it's all too easy to be amused, or appalled, at just how scale they weren't! Again, we must remember that RC was only beginning to emerge. Most models still had considerable free-flight influence, one example might be the sacred cow that said "Thou shalt have 33% stabilizer." The truth is that we owe everything to these "awful" models.

Over the next few years, until around 1966, scale models slowly shed these sacred cows. Radios, engines, techniques, and models, reached a very acceptable level of quality. Propor-



Sharp-eyed readers might spot the leading-edge slots added to this S.E. 5a by Emile Fischer, Belgium. Fine in-flight photo.

tional radios were making their debut, to the further benefit of scale.

Thus, by '66 or '67, the full-scale RC model, as we know it today, was beginning to crystalize. Further improvements have since been made in the holding of very exact outlines, wing sections, and other pure accuracy points. Also, we have seen internal and external detail reach definitive levels. Probably, the models of 1980 will not be *significantly* better than those we are seeing from the top scale experts right now. We will be looking for a few general improvements, one example might be that fixed LG (on a retract-gear subject) will be gone forever by then; perhaps also we may see that presently rare and elusive quality we'll call "convincing-ness" being achieved by more modelers. (Some explanation of this may be due. We have seen many models built over the last 2-3 years which were really impeccable, yet which lacked something. for a while we were mystified by this, until it finally dawned that most of these models, beautiful and accurate though they were, still looked like *models.* What we were looking for was models that looked like *real airplanes.* It's likely that nobody can truly pin down what it takes to give a model this look; but we have wondered if the present emphasis on superb and meticulous craftsmanship isn't running counter to the achievement of this "feeling" about a model.)

Of course, models such as this, usually built for the AMA Nationals, are not for everyone - - - indeed, the building of an AMA Scale RC model can only be described as a labor of love. Because of this, a ground-swell of demand for a return to a somewhat simpler life soon reached epic proportions.

Thus was Stand-Off Scale born. How come the name? This class, in the official language of the AMA Rule Book, is called "Sport Scale." What, then, is "stand-off?" The word is derived from the fact that during the static (ground) examination of these models in a contest, the judges keep a 10 foot distance away from the model – they "stand-off." Thus, no measuring or ultra-close nit-picking scrutiny is possible, and this results in a relaxed atmosphere, more concerned

with fun than with finesse. It is quite sufficient to have a model that is *reasonably* close to outline shapes. Wing and tail sections usually follow ordinary sport-or-pattern model practice. Surface detail (rivets, etc.), cockpit interior, dummy engines hidden by a cowl, fussy L.G. detail, scale tires, and so on, are not required and go unrewarded in ground points, so are seldom seen.

What we have here is virtually a return to the 1966 "scale" model we described earlier. A true stand-off model is an entirely superior animal to those questionable "semi-scale" models of a few years ago. It possesses *dignity*, and however expert a scale RC modeler may be, he is not lowering himself by building one.

Essentially, the real attractions of Stand-Off Scale are three: 1) Much superior appearance, giving greater pleasure in building and more pride in owning, 2) The outlay, in cost and time, is little or no more than a conventional "sport" model, and 3) These models *really* fly – all the dark predictions of disaster associated (usually unfairly) with true scale models do not apply in this case anyway. Indeed, there's no reason a good Stand-Off Scale model can't win in pattern; it has happened.

To these strong points we might also add, that if the AMA true scale model is your eventual aim, no finer method of reaching the skill level needed exists than to serve an apprenticeship in Stand-Off.

Summing it all up, today's stand-off model is an altogether admirable RC model which looks good, flies well,

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SCALE IN HAND

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and commands the respect of all scale fans.

★ ★ ★

So much for the history and attractions of the stand-off RC job. Supposing you want to build one – maybe just to fly Sundays on the club field, maybe to enter competitions; how to go about it? This is the question we plan to answer here in this series of Scale in Hand.

There are really three ways to go about selecting a model to build. You can simply buy a kit, you can send to RCM or any of the other magazines for a catalog of the plans they sell and select a model from among these (often erroneously called "scratch-building"), or you can make a true scratch-building project out of it, and design and build the whole thing yourself.

There are advantages and disadvantages in each of these schemes. Taking them in turn, the obvious benefit of buying a kit is that you'll have a model flying in very short order. So if building time is hard to come by, this is the way to go. Contrary to what most modelers think, you'll save a bit of money too. By and large, kits offer excellent value for money, and it is highly unlikely that a scratch project will cost less (guess how I know this).

Essentially, the disadvantages in buying a kit are that a) you are confined in your choice of subject to what is available; and b) if you are the rugged-individual type who wants something fresh, something nobody else has, you have a problem. These considerations are not too hard to lick, however, even if you want to go with a kit; you can do what we call a "conversion," that is, by modifying the kit, create a model of some other variation of the aircraft, safe in the knowledge that probably 90% of the kits like yours will be built in the version shown on the plans and using the provided markings.

Taken to an extreme, it is even possible to find two subjects which have enough common basic design

similarities that you could buy a kit and turn it into something else. This is something worth thinking about. Just to take a couple of examples, it wouldn't really be too great a trick to convert a Sopwith *Camel* into a *Pup*, a Cessna *150* into a *172*, or even a *Spitfire* into a *Heinkel 112!* Stand-Off models usually have flat sheet wood stabilizers and vertical fins, so a change in the shape of these is very easily accomplished. With differently shaped wing tip blocks and a new canopy, we have most of what's needed to make a good conversion.

Some of the other conversions that spring to mind which would take little skill yet result in a definitely off-beat scale conneiseur's airplane would be a *F.W. 190* into a *Ta 152;* a *Ryan STA* into a *PT-22;* a *Kawasaki Ki-61 "Tony"* into a *Macchi 202*, a *Spitfire* into a *Spiteful* and a *Jenny* into an *R.E.8.* All of the first-named aircraft mentioned here are available as kits.

There are probably dozens of other great conversions possible using existing kits, but we just wanted to give you the idea. So we can see that buying a kit doesn't have to limit us to having the same ship the other guy is flying.

Next month we'll cover the approach of building from plans and also show some of what to look for in a design, or kit, to make sure we have a model suited to the skill level of the piloting involved and, also, which will be capable of carrying the goodies we want to put into it. □

from page 12

Navy specifications. Component cases were sealed with silicone RTV with special attention to the wire entry. All components and wire connectors were covered with rubber balloons. The balloon trick I had read about someone doing for battery packs to keep out fuel and it had worked for me. Mentally I had written off the radio before my trip. The only signs of corrosion are on the transmitter case due to salt water from my hands. The radio is Heathkit and in use today.

My BT-72 met its end shortly after returning home. I was in the middle of low altitude acrobatics, A Cuban Eight, when an old buddy yelled good-bye. I was distracted just long enough to lose it . . . CRASH!!! It's surprising what a fraction of a seconds distraction will do!

Oh yeah, I used coordinated aileron-rudder on the BT-72. It was easy to do and worked well. Rolls were barrel-shaped and take-off rolls as a tail-dragger were "S" shaped in a cross wind.

Yours Truly,
Bob Owens

to page 106

NATIONAL MINIATURE PYLON RACING ASSOCIATION

WHAT IS IT:

The NMPRA is a special interest group, reporting to the AMA, which represents the F-I, F-II, FAI, and QM pylon pilots on all matters related to racing including rules making and conduct of contests.

HOW DOES IT FUNCTION:

The organization has a President, Secretary/Treasurer, Newsletter Editor, and seven Vice Presidents who represent the NMPRA in their districts. In addition, an Executive Vice President heads the QM activities with the support of seven Associate V.P.'s. These officers lead the membership and coordinate all racing activities.

WHAT ARE THE BENEFITS:

Have a part in the making of racing rules and procedures. Compete in district Championships. Compete in National Season Point Championships. Compete in National NMPRA Championship Race. Receive NMPRA monthly newsletter, a timely publication of current racing activities including: NMPRA business, opinion polls, contest reports with pictures, new product reports including engine and airplane accessories, district and national point standings. Purchase privileges: NMPRA patches, decals, shirts and caps, Reed Kinert Racing books. Receive NMPRA Racing Number.

HOW TO JOIN:

Fill in the following form, enclose your $10.00 dues, and mail to Gil Horstman, E. 11223 La Crosse, Spokane, Washington 99206.

NAME _____ AMA NO. _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

I am interested in the following events: F-I F-II FAI QM

SUNDAY FLIER

from page 103

Bob sent me the beautiful shot of the BT-72 taking off from the lagoon out there in Fiji. Man, would I have loved to have been there to see it in person. I get a thrill just looking at the action of the float on the water, the tip floats up and free, and the spray flashing away from the step as the plane breaks from the wake.

Bob's method of protecting radio gear may be tedious, but if you're going to fly off salt water, you better try it. No matter how hard you try to keep water out of the radio compartment, the odds are that you will fail, so plan on water getting in, protect the gear from it, and you'll have no more trouble. Maybe, in addition, you should plan to wipe off your hands before grabbing the transmitter!

Another question I asked about float design was the reason for the configuration I referred to as the Edo type bottom, which I had never seen used on models. Wouldn't you know it? Turns out that Bruce Allen, Manufacturing Planning Manager for the Government Products Division of the Edo Corporation, is an R/C buff. And here's what he wrote:

Dear Ken,

Your "Sunday Flier" article in the August 1973 issue of R/C Modeler, generally discussing RC Model Seaplanes and flying boats, was most interesting.

As a typical Sunday flier of many years and as a long time employee of Edo Corporation, I thought I'd respond to your question concerning aircraft float bottom design and the Edo "double V bottom."

The primary reason most Edo floats, designed for all but very light aircraft, utilize the double fluted bottoms (from the step forward to the bow), is to facilitate breakaway of the floats from the water at take-off. The bottoms, from the step aft to the stern, are usually similar to your "cruiser" cross-section. This combination has been found to be optimum in easing power requirements and providing shorter take-off runs.

The double fluted design affords a secondary benefit also. The use of an extruded keelson at the keel position and extruded sister keels at the mid-way points between the keel and the chine positions, provides a very rigid structure when tied in with the frame and bulkhead stations as well as the other longitudinals and skins.

Edo's floats, for very light aircraft, are "V" flat bottoms. From the step location forward, however, a sheet metal semi-fluted projection is riveted to the bottom at the sister keel location to, again, provide better take-off characteristics. This is a cheaper manufacturing approach and is used for light aircraft where lower strength can be tolerated.

Sincerely,
Bruce M. Allen

So the reason for the design is twofold – it gives better breakaway from the water and provides added strength for the structure. In our models, the structural strength factor would be unnecessary, since we don't have the impact loads. But if any of you decide to try the Edo type bottom to see how it works in aiding the breakaway for models, I'd like to hear the results. You might start a trend.

Finally, on the subject of seaplanes, and some of the attendant problems, read this tale of woe from Nigel Chippendale of Ottawa, Canada:

Dear Ken:

Having long been an admirer of your design philosophy, I thought you might be interested in my experiences with one of your flying boats, the Sea Foam.

What prompted me to put together the ship was the combination of un-earthing an old Midwest kit that I had once started and that contained the wing called for on your design, together with the prospect of spending several weekends at a friends cottage on a lake near St. Jovite, Quebec. So I dug out the appropriate issue of RCM, enlarged the plans straight onto the balsa and between Monday evening and Friday evening managed to finish the model.

I rationalized that throttle wasn't really necessary, that all I had to do was take-off, fly around till the fuel ran out, glide in reasonably close to the boat and row over and get it. So I installed my second system,

a two channel Kraft Brick, and an old reliable Enya .09 without throttle. The all-up weight was 32 oz., and the ship was covered in Kwik Cote.

On Saturday we headed for the lake and that evening when the breeze had dropped I rowed out a little way, added about 1/2 oz. of fuel and fired up. What I hadn't counted on was how long that little Enya would go on a few drops of fuel. The model turned out to go at a great rate on the water but to show no sign of lifting off. Moreover, directional control was erratic. Sometimes I could get a skidding turn, but mostly, even full rudder had little effect. In the end, the plane ended up about half a mile down the lake.

After retrieving it, I was all set for another go when the rudder fell off just as I was about to release. That evening I took a good look at the Kwik Cote hinges and found the elevator about to let go too. Also, the Kwik Cote was starting to lift badly in a number of spots. I ironed everything down again, after cleaning well with alcohol, and added some extra hinges made of plastic tape as a safety precaution.

Next day, the performance was about the same, except that I had increased the rudder throw and now had some control over direction. However, the only time I got into the air was when I hit the beach full tilt and flew 30 to 40 feet into the bushes. By the time I had made two attempts, the covering was peeling off all over and it was clearly time to think again.

Monday evening, back home, I patched up the covering and went out to our regular field. There I found that the Enya had plenty of power to fly it but that the snap roll tendency you mention in the article is quite something. Shifting the CG forward 1/4 inch helped a good deal, but it still wasn't an easy model to land. Nevertheless, I felt I had it under control and just needed throttle and a bit more power to handle it on the water. So I installed my trusty Logictrol III and a new Max .15. Wednesday back at the field I got it reasonably trimmed and Thursday took it down to the Rideau River.

This time, after one abort due to pilot error, I got it off the water, flew a few circuits and made a successful landing and taxied back to shore. Great jubilation. Two more such efforts including a touch-and-go, confirmed the good news, but then the %&*! covering started peeling off again, despite liberal doses of urethane varnish on all seams.

That weekend, after more patching and even more liberal applications of urethane, I was back at the lake and had about three fine flights. But then, on a touch-and-go that was a little harder than planned, the model came off the water with great strips of Kwik Cote hanging below. That decided it. Off came the plastic covering.

I decided to paint the bare balsa with Hobbypoxy II and spray on Hobbypoxy paint. I also decided to replace the 1/8" sheet stab with 3/16", as the water seepage had warped it (the sheet tail was about the only deviation from plan). After I had finished all this, I shifted the battery pack ahead a little to back the CG ahead to its previous location and went out to fly.

Quite frankly, the results of that session and a couple more since have been most disappointing. I have not tried off water, but from a hand launch at the field the model is not at all pleasant to fly. Reduced elevator throw has cut down the snapping tendency, but the plane has a very disconcerting tendency to wallow on approach and to respond unpredictably to rudder sometimes lurching violently and other times not wanting to turn at all. Then I weighed it! It had gained nearly 12 oz., what with the change of gear, the bigger engine, and the new finish.

A few calculations revealed the following:

The wing area is approximately 6" x 44" = 264 square inches or about 1.8 square feet.

The original weight was 32-33 ounces, giving a loading of about 18 oz./sq. feet.

The new weight was 44 ounces, raising the loading to about 25 oz./sq. feet!

This is clearly the source of my problems. I just don't think you can hope to fly a non-aileron model successfully at that sort of loading, and it certainly isn't in the Sunday flying league. So now I am undecided as to whether to build a 48" x 8" wing (giving about 16-17 ounce loading) for the existing model, or to build a nice light Puddlejumper or the like.

Any comments you might have on the covering would be appreciated. How has MonoKote (the real thing) and Solarfilm stood up to the water? How do you seal the edges? Do your MonoKote hinges work on seaplanes? Have you tried Kwik Cote? The plastic coverings are a boon, but my experiences were so sad this time that I'll think twice before using them again on a seaplane.

Enough rambling. I hope you've found something of interest here. I would be interested in comments you might have on your experiences with wing loading.

Good flying,
Nigel Chippindale

First, Nigel, let me comment on your wing loading. Heavy-y-y! You're right when you say that it's virtually impossible to fly a model without

ailerons at 25 oz. per square foot. It can be done, but I certainly wouldn't recommend it. And, if the wing design has a tendency for tip stall to begin with, the heavier the wing loading, the worse it gets! In the smaller models, around three to four feet in span, a wing loading at 16 ounces or slightly less will work best. With normal aspect ratios, that means total weight in the 24-36 ounce range – maybe up to 40-45 ounces with a four footer. If you add aileron control, the weight can go higher.

As for your problems with the mylar plastic covering materials, they are not uncommon, but they can be overcome. First, there must be at least a ¼" overlap at all seams, and that overlap must be securely sealed with the iron. Any little wrinkle will let a drop of water get under the seal, and it won't be long before the opening will spread, as it did with your plane. I've had the same thing happen, until I learned to make absolutely certain that all seams are sealed. My personal preference is for MonoKote. And yes, I use it for hinges, but pre-flight inspection before any water flying is mandatory. Reseal any loose spots, or you'll lose the control surface. I've never had it happen – and don't intend to.

And how do you seal the edges? First, make sure there is no oil, dirt, grease or contaminant on the smooth side of the MonoKote. I use a cleaner called Fantastik, even when the MonoKote is newly removed from the roll, to remove any impurities. Fantastik cleans everything off, but leaves a thin, cloudy film that then must be rubbed off with a soft cloth. And, I can tell you that if you do the job right, the MonoKote will tear before the sealed seam will let go.

* * * *

The other subject I wanted to talk about is the LSF Tournament. Just some of my own observations, since it is being covered in more detail elsewhere.

First, I thought it was an excellent run event – well planned, well organized, and efficiently operated. The facilities were the best yet; housing was convenient and reasonable, comfort facilities were adequate, parking was as good as I have ever seen, and the Lions Club had a barbeque stand on the field with broiled hamburgers that were terrific. I certainly would recommend that the event be held at Oxnard Air Force Base again if the facilities are available.

Also, the open flight order, and the opportunity to make a decision as to which task you would attempt after one minute had elapsed from tow release, were innovations that I thought were excellent, since they did provide the flyer with a decision making process that, at least partially, could offset the element of luck, although not entirely.

However, there still is a need to come up with a combination of

The Camarillo Lions were instrumental to the success of the '73 LSF Tournament. Here are some of them in front of their hamburger stand on the field.

events – and, personally, I think more than two are needed – which will make the ultimate outcome more truly representative of the thermal soaring pilots' overall skill. But there is no question that that objective will be hard to achieve, and no matter what combination is suggested, it won't satisfy everyone. One thing is for sure, though, if there is to be a speed-distance event, then the course will have to be set up so the furthest point the plane must be from the pilot is within the slant range capability of the equipment. Far too many planes went out of range when close to the ground this last time at the downwind turn – and I don't buy the argument that the pilot can make the decision not to go that far if he's that low. No competitive flyer will stop short if he thinks he's got a chance, and it isn't worth it. Two laps of a shorter course would accomplish the same objective without the attendant danger. □

ENGINE CLINIC

from page 89

its lubrication qualities. Do the filtering while the fuel is cold. If, after filtering, the white specks come back repeatedly the chances are pretty good then that the fuel is old and the castor has gone rancid. The fuel has probably been sitting around some GI warehouse too long. As for listing fuel ingredients on the can, most fuel manufacturers prefer to keep their formulas to themselves. After all, it is a competitive field. As it is there are many small operation fuel mixers marketing fuels claiming to be exactly the same as Supersonic 100, Duke's mix, etc., for lower prices. So, for this reason, most large scale fuel manufacturers are rather reluctant to make their fuel formulas common knowledge.

Any of your larger size ringed engines can be flown out of the box without any bench running as long as you are careful and use a little common sense. Initial flights should be with the mixture set so that the engine is breaking back and forth between a two and four cycle IN THE AIR. Depending on the particular installation, tank position, engine, etc., some engines will lean out after take-off, others richen, etc. So you cannot make a flat statement such as set it "such and such" on the ground and expect that to be the correct setting for all cases. Even the propeller can make a difference here, as can the design of the airplane. Some propellers will unload more than others, and a clean design airplane will pick up more speed, again allowing the engine to unload more than a 'Smog Hog' type of design. So, correct setting has to be in the air.

Dear Mr. Lee:
I have discovered several problems and unusual characteristics which came with my Fox .15 R/C engine. The biggest problem is that the idle is almost nonexistent; I have done everything I can think of but it still will not idle. I have changed the low speed setting, moved the fuel tank to every possible position, and used the entire range of fuels. Now come the unusual characteristics, first of which is the noise. I have heard three other .15 engines from different companies and none have come anywhere near the noise level of my engine. Second, I have found, using a tach, that my engine turns a 8/4 prop at over 23,000 rpm! The needle valve has no effect; I have had it from a quarter of a turn from full closed, to a point where the needle falls out and the engine still runs the same. One last point on the .15, in trying to get the engine to idle I put

some Fox 40-40 in the tank and the engine responded by spitting fire out of the exhaust. I have not used it since.

I also have a S.T. 56 mounted inverted in a Top Flight P-51 which is almost totally cowled in. The cylinder head and a small portion in the front of the engine are the only parts exposed. Also, new field rules require all engines to be muffled. What I would like to know is, with the engine mounted this way and the muffler, won't the engine overheat?

Sincerely,
Bob Fiffik
Beachwood, Ohio

Many variables can affect the noise level of an engine. An engine with a high compression head will have a noticeably higher crack to the exhaust than one with lower compression. The size of the exhaust port can also make quite a difference in the noise level of the engine. The more exhaust port area, the more noise. A smaller prop letting the engine wind up is, in turn, going to make more noise than a larger slower turning prop.

A 23,000 rpm reading with an 8 / 4 is a bit unlikely with a .15 size engine. Due to the fact you cannot get a needle setting I am guessing that you are experiencing extreme vibration and fuel foaming. The fuel foaming is causing the needle setting trouble and also a multiple reading on your tach.

Spitting fire out the exhaust is simply a matter of having flooded your engine. I doubt very much if it had anything to do with the fact you were using Fox 40-40. This can happen with any fuel if you flood the engine and then connect the glow plug battery.

Mufflers do cause an engine to run hotter than if no muffler were used. Cowling the engine will not cause it to run hotter if it is PROPERLY cowled. Be sure you have an ample air entrance and an exit half again as large as the entrance. The air has to pass over the fins in order to carry away the heat and, in turn, have a way to get out. So a proper exit is most important.

Dear Mr. Lee:

Been reading your column for some time now. I don't always agree with you but I have a couple of questions. First, I acquired a K & B .40 RV R/C. I need to replace the rotor. How do I know what rotor to order for it and how does the retainer pin press out? Second, I just bought a Veco .61 R/C engine. The engine binds a little with the crank pin rubbing the back plate. If I loosen the back plate screws half a turn each, it turns free. Will this wear in? Should I dress the back plate a little or what? I have not had a prop on the engine or fired it up. I thought about sending it back to the factory, but the last time I sent a Veco in for repairs I never heard of it again — a Veco .31 to Henry Engineering about the time K & B took over. I sure did like that little engine. Thanks in advance for any advice.

George G. Harward
Roseville, California

The part number for the K & B rear rotor .40 is 7754. All you have to do is look at a K & B .40 parts list. The rotor pin is simply pressed in. The best way to remove it is to support the back plate assembly firmly. A flat piece of wood with a ¼" hole drilled in it is good for this. If you have access to a drill press use it to push the pin out with the aid of a small diameter punch. If you do not have access to a drill press you will have to tap it out with a punch and hammer. Do this gently. Reverse the procedure for assembly. Set the rotor clearance at .004" using two strips of .004" shim stock. One on each side of the rotor pin.

I think if you put a prop on your Veco .61 and tightened the nut you will find the crank will stop rubbing on the back plate. Evidently the crankshaft has been pushed back in the bearing – probably during shipping. Installing the propeller will pull it back into place again. I don't think you have any real problem. □

CUNNINGHAM ON R/C

from page 6

The fourth thing that you are going to need is an understanding wife. If your wife is understanding, then try to make this hobby for both of you. More and more we are seeing husband-and-wife teams out flying and really enjoying each others company. Also, more and more women are taking up active building and flying, with the advent of gliders all of the mess and noise of the powered aircraft are gone, replaced by the beautiful silence of the flight of soaring aircraft. If your wife is against your entry into the hobby then you should either give it up or start out on an educational program for her.

First, you must totally dispel the idea that we are a bunch of grown men playing with toys. We may be grown, but we darn sure are not playing with toys. We, and I hope you, are engaged in one of the best all around hobby/sports that exists today. The building and flying of radio/controlled model aircraft is simply not for kids. It is a demanding and exacting hobby from the standpoint of construction and radio installation, and an equally demanding sport from the standpoint of flying. The words "model airplanes" bring to the layman's mind the plastic U-control type aircraft that may have been the starting point for your entry into R/C. I, personally, believe that all of us should change our terminology. I think that we should speak of our hobby/sport as "Remote guided miniature aircraft," or "Remote guided pilotless aircraft," or "Radio controlled miniature aircraft." Any of these names are more descriptive of what we are doing than "model airplanes." If you don't believe it, try telling a friend that you are building a model airplane. Then, tell another friend that you're building a radio controlled miniature aircraft, and see the difference in his response to you. It makes a lot of sense.

Do **not** go into this field as a way that you and your young son can spend a lot of time together. Don't use your offspring as a crutch. If you want to get into the hobby, get into it for your sake, **don't** blame it on the kid! In the first place youngsters simply cannot get much enjoyment from this

sport until they can really participate in it, and even the most coordinated youngster has an awfully tough time in this sport before he is 12, 13 or 14. Sure, there are a few boys and girls around the country who are good fliers at 10 or 11, but the majority of children this age need more active sports and their attention span is not long enough to stick with a building project, or a flying session. If you are lucky, you may be able to capture their interest when they get older, but don't try and force an interest on the youngsters because you used them to justify your entry into R/C. Do it for yourself, and enjoy yourself.

The fifth word of caution is to seek advice before getting into the hobby end, by visiting a popular, well run hobby shop and asking the dealer for his recommendations. I know that not everywhere are there good hobby shops. Often the place that sells miniature aircraft parts also sells paint by number sets, and other craft supplies. If this is your problem, then visit the local flying field and see what is going on. No doubt this won't be of much help to you from a rank beginners standpoint, since the majority of fliers will be buzzing back and forth across the skies with aircraft traveling 90 mph or more. But, take note of what types of radios are most popular in your area. There are a lot of great radios on the market today, but some types are more popular in some parts of the country than are other radios. Look around you and see what is used. This is a pretty good indication of what will work best for you. I don't want to give you a listing of what radio to buy, simply because I may overlook one that is awfully good, but if you are in a quandry about what to buy, see which ones are advertised in the pages of RCM. If we advertise it, you can be sure that it will be a good radio. Of course, you can get a lemon in every brand, but today's radio manufacturer will make good on a lemon that happens to slip by. Try that on your friendly automobile dealer. There are a lot more automobiles on the roads today that are lemons at $5,000.00, than there are radios at $200.00 to $400.00.

So, if you have picked out a radio to invest in, then what should you do for the number of channels? Well, this is dictated by two things. One, the size of your pocketbook and how much that you want to invest in the hobby and, the other, what you plan to do. If you are going in for soaring, then the

two/three channel bricks are perfect. They are inexpensive and offer you very reliable radios, and will fly your sailplane for a long, long time. If you are going into power flight, then I believe that you should get at least a four channel rig. You may only use two or three channels at first, but later you will use all four functions. If you are buying used radio equipment, be careful that the set that you are buying will work. This is an excellent way to pick up radio equipment at a good price, since all of us are constantly buying and trading radio equipment. I know a number of fliers who buy new equipment every year, and sell perfectly good sets at a very reasonable price. Keep your eyes open for a good bargain, but also be sure that you are not taken. Don't buy an old reed set, or something similar, even if you get it for a "fantastic" price. If you have trouble with it, the chances of finding someone who can repair it are very slight. Buy a used radio set with care, but don't overlook this as a possible entry into R/C.

One of the biggest questions that you will have is what size engine to buy, and what model to build for that first project. I, personally, have a very long standing belief that you should start small. I really hate to see a beginner start off with a .61 engine that cost him sixty to a hundred bucks. Why not save that big engine for the time when you have learned to fly, and use it to power a slick, beautiful pattern aircraft. With today's outstanding .15 and .19 engines why look for something more? These engines will fly a multitude of aircraft and will do it with a lot of power, and with a good idle. They are not cranky and hard to start, and they don't need several gallons of fuel run through them to break them in. Also, they do not need a lot of fuel to run on, and props are equally inexpensive. And, a plastic prop is perfectly satisfactory for this size engine. This is not the case for the .60 and the fast reving .40 engines. Plastic props should be avoided on these engines as, all too often, a blade can break loose and take off for the nearest victim. Use only wood props on the larger engines.

If you select a .15 engine then you must select a suitable aircraft for it. Do **not** buy a quarter midget for your first project! These are not beginners aircraft, and don't let anybody tell you that they are. Pick out a high wing trainer type aircraft to build. The Andrews H-Ray is a good example.

Also, the Falcon .56 by Carl Goldberg is an excellent trainer. I have seen Falcons almost fly themselves. The Bridi RCM Trainer is another great choice in this field. The thing to avoid is getting an aircraft to build that is not a simple, stable type of airplane. For that first aircraft you want one that will do a pretty good job of flying even if your fumble fingers are goofing up the controls. You want something that will fly slow, to give you time to react to what it is doing in the sky. Also, you want an aircraft that is easy to build and will not be too hard to repair. When building it, resist the temptation to make it a great thing of beauty. It is okay to make it at least a bit presentable, but don't pour pounds of paint and dope on it to make it a gleaming model. This gleaming finish also will weigh a bunch and nothing robs an aircraft of its ability to fly as much as being overweight. Cover the first effort with MonoKote, Solarfilm, or any of the other new plastic films. They are easy to use, light, and strong, and give you a finish that looks like a real pro.

Another great way to start is with a sailplane kit. A good sailplane really will fly by itself and you need only interrupt its flight to keep it near to you. If you wish, put a small engine in the nose, or on a power pod, since your aim is to learn to fly, not to be a purist at any sport.

If you were taking up golf or tennis you would not expect to go out and challenge an Arnold Palmer or a Rod Laver right off the bat. The same is true in getting into this sport. Take your time, pick up whatever tips and help that you can get from people and from magazines, and use your head. It isn't easy to do. It isn't easy to build your first aircraft, and it sure isn't easy to fly that first one, but when you have accomplished it, the thrill is greater than a 250 yard drive or a zinging serve that blasts off your opponent's backhand.

Next month we will go into setting up a minimum workshop and how to go about constructing your first model. In the meantime, go out and buy youself a Jetco balsa glider kit for about 69 cents. Build it exactly according to the plan. Sand it where it says to sand it, and glue it where it says to glue it. Then go out and fly it. You can sharpen up your building technique on this one, and also learn something about aeronautics at the same time. After you have built the first one, buy some raw balsa wood of

similar sizes and build several more, cutting them out of the raw stock with a razor blade. Each time that you build one, try to make it a bit better than the last one. Make sure that you glue on the wing and tail pieces exactly correct. You will learn from your gliders just what caused an aircraft not to fly well if it is assembled in a poor manner. By the time that you have built three or four hand launched gliders you should be beginning to learn how to handle a razor blade, a piece of sandpaper on light wood, and a tube of glue.

If you have questions that I may be able to help you with, write to me in care of RCM. I will not be able to send a personal answer, but perhaps your question will be of general interest to all readers. Until next month, go try a hand launched glider. □

FROM THE SHOP

from page 2

There are technicians around the country who still do repairs on many of the older systems such as the Bonner and F & M. One of these is Ted White whose address is 6193 Carl Sandburg Circle, Sacramento, California 95842. While I doubt if they have some of the parts you are looking for, I'm sure he could help you with repairs. Possibly one of our readers may have a set of schematics for the Bonner 4RS.

Don:
In the September issue (1973) of R/C Modeler Magazine, page 12, "Understanding Your Aircraft" is a picture of a twin engine model airplane that I like very much. Will you please tell me where I can get a set of plans for this aircraft.
Thanks in advance.
Bill Grady

The model you are referring to was built by Dean Hawks whose address is 1764 Glenview Avenue, Anaheim, California 92807. This is an original design aircraft which Dean has built for a twin engine pattern event that he is proposing. Plans are available and can be obtained directly from Dean. Although we used it simply as a "filler" photo for the article, we consider it to be one of the nicest looking aircraft we have seen in a long time.

Don:
While on vacation last month I visited the Quincy, Illinois Falcons flying site and observed my first real taste of radio control flying. Having flown light aircraft for fun a number of years ago and owning a Taylor-

craft and giving both up out of necessity and not choice, I was at once enthused in R/C flying.

Upon returning home from vacation I found your magazine on the local newsstand and have read it from cover to cover more than once.

I know of no one in the area who flys RC so would welcome any suggestions you might have as to type of equipment a beginner should start with and still be practical as one improves in proficiency. Do you think it would be wise of me to undertake building the RCM-World digital system from the kit and series of articles staring next month? Will the savings be substantial over purchasing an adequate system? Will it take 12 months to build?

Yours very truly,
J.W. Fryrear
Rt. No. 1
Nevada, Missouri

Perhaps an RCM reader in your area may contact you and offer his assistance in helping you get started. I sincerely hope so, since RC is difficult enough in the beginning without having to go it alone. Insofar as building your own radio system, I would not suggest that you build the RCM-World digital system unless you have previously built electronic kits.

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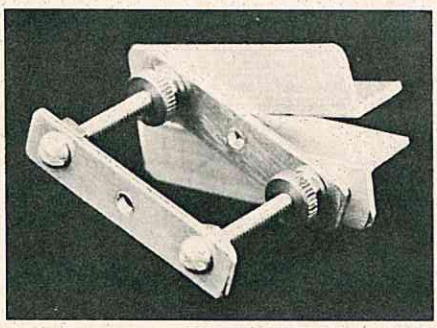

Before we close out this months column, we're including a photograph of a jig designed by Julian Whitley of Covington, Tennessee. This jig can be built in a very short time at a cost of less than 50 cents and is designed for accurately installing Robart Hinge Points. All materials used can be easily obtained and consist of two 6/32 x 1½" bolts, 1 foot of aluminum inside 90 degree corner molding, two 6/32 cap nuts, two 6/32 hex nuts, and, for ease of adjustment, two 6/32 knurled nuts. Julian found that by having the top drill guide it is possible to drill a 1/8" hole in 3/16" balsa stock without running through the sides. We tried Julians hinge guide here at RCM and have found it to be invaluable when installing Robart Hinges. Take a look at the photograph, then put one together and give it a try. It makes an excellent hinge even easier to install.

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That's it for this time. □