radio control
RC MODELER
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RC MODELER

FEATURES

PRODUCT TESTS

DEPARTMENTS

VOLUME 11 1974 NUMBER 3

MARCH

THIS MONTHS COVER

Lisa Miller, beautiful professional model from Chicago, poses with Jim Newman's Strikemaster, an unusual .40 sport pattern design featured in this month's issue. Ektachrome by Bill Coons.

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FROM THE SHOP

DON DEWEY

At a time when our nation is facing the worst crisis it has experienced since the second World War and, during a time when a majority of the American people have suffered a loss of confidence in their country's leadership, I thought it might be appropriate to reprint the following editorial which was presented on June 5, 1973, over radio station CFRB in Toronto, Canada, by Gordon Sinclair. It was later read by Chuck Lilligren on radio station WCCO in St. Paul, Minnesota, and reprinted in the "Post" newsletter of the St. Paul Model Radio Controllers Inc.:

The United States dollar took another pounding on German, French and British exchange this morning, hitting the lowest point ever known in West Germany.

It has declined there by 41 per cent since 1971 and this Canadian thinks it is time to speak up for the Americans as the most generous and possibly the least appreciated people in all the earth.

As long as 60 years ago, when I first started to read newspapers, I read of floods on the Yellow River and the Yangtze. Who rushed in with men and money to help? The Americans did.

They have helped control floods on the Nile, the Amazon, the Ganges and Niger.

Today the rich bottomland of the Mississippi is under water and no foreign land has sent a dollar to help.

Germany, Japan and to a lesser extent Britain and Italy, were lifted out of the debris of war by the Americans who poured in billions of dollars and forgave other billions in debts.

None of those countries is today paying even the interest on its remaining debts to the United States.

When the franc was in danger of collasping in 1956, it was the Americans who propped it up and their reward was to be insulted and swindled on the streets of Paris.

I was there. I saw it.

When distant cities are hit by earthquakes it is the United States that hurries in to help . . . Managua, Nicaragua, is one of the most recent examples. So far this spring, 59 American communities have been flattened by tornadoes. Nobody has helped.

The Marshall Plan, the Truman Policy, all pumped billions upon billions of dollars into discouraged countries. Now newspapers in those countries are writing about the decadent war mongering Americans.

I'd like to see just one of those countries that is gloating over the erosion of the United States dollar build its own airplanes.

Come on let's hear it!

Does any other country in the world have a plan to equal the Boeing Jumbo Jet, the Lockheed Tristar or the Douglas 10?

If so, why don't they fly them? Why do all international lines except Russia fly American planes?

Why does no other land on earth even consider putting a man or woman on the moon?

You talk about Japanese technocracy and you get radios. You talk about German technocracy and you get automobiles.

You talk about American technocracy and you find men on the moon, not once but several times . . . and safely home again.

You talk about scandals and the Americans put theirs right in the store window for everybody to look at.

Even their draft dodgers are not pursued and hounded. They are here on our streets. Most of them, unless they are breaking Canadian laws, are getting American dollars from Ma and Pa at home to spend here.

When the Americans get out of this bind . . . as they will . . . who could blame them if they said the Hell with the rest of the world. Let someone else buy the Israel bonds. Let someone else build or repair foreign dams or design foreign buildings that won't shake apart in their earthquakes.

When the railways of France, Germany and India were breaking down through age, it was the Americans who rebuilt them. When the Pennsylvania Railroad and the New York Central went broke, nobody loaned them an old caboose. Both are still broke.

I can name to you 5,000 times when the Americans raced to the help of other people in trouble.

Can you name me even one time when someone else raced to the Americans in trouble.

I don't think there was outside help even during the San Francisco earthquake.

Our neighbors have faced it alone and I'm one Canadian who is damned tired of hearing them kicked around. They will come out of this thing with their flag high. And when they do, they are entitled to thumb their nose at the lands that are gloating over their present troubles.

I hope Canada is not one of these.

But there are many smug, self-righteous Canadians.

And, finally, the American Red Cross was told at its 48th annual meeting in New Orleans this morning that it was broke.

This year's disasters . . . with the year less than half over . . . has taken it all and nobody has helped.

•

While the preceding editorial had no direct bearing on modeling in general, it was an unexpected kindness on the part of our friends, the Canadian people. On behalf of RCM and its readers, our sincere thanks and appreciation to Gordon Sinclair for his words that went a long way in bolstering this writer's morale during the current period of national crisis.

And, on this subject, the energy crisis has just begun to affect each of us in some fashion. While it is no secret that we are all "energy gluttons," using energy to provide us with many luxuries to which we have grown accustomed during the past few years, a great deal of the facts concerning this crisis seem to be incongruous, to say the least. While the most serious part of this crisis seems to be the shortage of gasoline and fuel oil – a shortage that seemed to appear almost overnight just a few months ago – the Los Angeles Times reported that one major California refinery was only operating at 32% of its total capacity. Again, with a reported drastic shortage of diesel oil which has caused truck blockades and strikes across the country, we are using untold gallons of diesel fuel to bus millions of kids past neighborhood schools in order to achieve the ethnic balance required by the Supreme Court ruling of a few years ago. And, if all of that wasn't enough, our current exports of oil are at an all-time high since the profit seems to be greater on overseas sales. And, while all of these inconsistencies exist, the shortage, however real or contrived it may be, is affecting each one of us in our daily lives.

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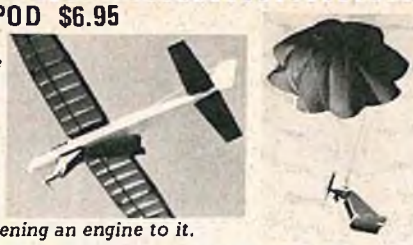
NEW! Craft Air's PARA-POD $6.95



How clever can you get! The problem solved by PARA-POD was how to loft an RC thermal glider without troublesome hi-starts or winches, or worse yet, without ruining the aerodynamics (and the appearance) of a glider by permanently fastening an engine to it.

PARA-POD mounts a Cox .049 to .09 engine and tankmount on a pod which readily slips off the glider when the engine stops. The 'chute opens and lowers the pod and engine to the ground, and the sailplane goes on its unencumbered way.

PARA-POD includes a 22" fully rigged nylon 'chute, kit for pod and release gimmick, and good instructions. The IDEA alone's worth $6.95!

NEW! Sig KWIK-BILT P-51 MUSTANG R/C

List price $42.50 **PRICE $37.97**

64" span, 700 square inch, bee-yoot-i-full scale-looking model using Sig's new formed fuselage technique with its molded-in detailing. The wings use foam cores with a new contour molded and scale-detailed plastic covering that you glue on. The size of the plane and wing airfoil seem to indicate that this ship would be a good RC pattern flyer. Good decals and hardware.

R/C ON A BUDGET — Ace R/C PULSE PROPORTIONAL R/C SYSTEMS

Ace RC's single channel (rudder-only) pulse proportional RC systems give reliable and enjoyable control when installed in small gliders and small, stable RC powered planes such as Ace High glider, Goldberg Jr. Falcon, Competitions Kits' Eindecker, Midwest Li'l "T", Tern Aero's Super Starduster, Sig's RC Sport, Stinson and Relic.

If you've never seen a powered plane fly on rudder-only control you'll probably be surprised when you see it ROG, turn, barrel roll, loop, and glide into a spot landing. And, small gliders with these super lightweight systems in them fly like trained eagles.

Ace R/C System	Airborne Weight	Recommended for:	List Price	Hobby Lobby Price
"BABY"	2.5 oz.	Pee Wee .020 Up to 48" gliders	$59.95	**$53.97**
"BABY TWIN"	2.7 oz.	Tee Dee .010-.020 Up to 72" gliders	$62.95	**$56.97**
"STANDARD"	3.7 oz.	.049 to .10	$61.95	**$55.97**
"STOMPER"	4.1 oz.	Tee Dee .049-.23	$64.95	**$58.97**

All four above systems are identical except for the actuator used, and the capacity of the airborne batteries -- the two lightest systems use 225 mah. cells, and the two heaviest systems use 500 mah. cells (for longer flying time). You can inexpensively convert your system to one of the others by simply changing the inexpensive actuators and/or batteries (all components PLUG IN). Our recommendation for the most useful all-purposes systems are the "STANDARD" and "BABY".

HOBBY LOBBY 5 — Series III — Digital Proportional

We're afraid to change it!

- Unsurpassed reliability
- Extremely Long Range
- Full 90 day Warranty backed by the manufacturer and by Hobby Lobby
- Smallest, Lightest, Servos made
- A Complete system; Transmitter, Receiver, 4 servos, all n-cads, charger, 27 or 72 mhz
- Extra servos cost only $13.00
- I. C. FULL-POWER servo amplifiers
- Only 11 ½ oz. airborne weight
- Reliable Airborne battery pack with ONE-CELL-OUT flight ability
- PRICE: About HALF of what you'd expect to pay for a top quality 5 channel system.

It has become a pretty well-accepted fact among knowledgeable RC'ers that there have been "vintage" years for various radio systems. As digital proportionals have evolved to their present state, a great deal of trial and error was involved. But certain systems from specific years' production of various manufacturers have been ahead of their time in terms of reliability and accurate performance.

During the summer of 1973 we began to realize that we had a "vintage" model in our SERIES III Hobby Lobby 5. The reliability was tops -- the best we'd ever seen in any brand of radio -- and the performance began to be discovered by the more sophisticated RC flyers to whom the SERIES III's tight control stick-to-servo resolution, and its ability to preserve their complex contest planes through a long flying season are the criteria for judging a radio system.

Series III
HOBBY LOBBY 5 Digital Proportional $209

We will continue the SERIES III Hobby Lobby 5 absolutely unchanged for 1974 simply because we can not think of any change that would improve either its accurate performance or its superb dependability.

HOBBY LOBBY 5 — COMPLETELY Ready-to-Fly 3 CHANNEL AIRPLANE

Ready Bird 23 $19900

he READY BIRD 23 is an most fully assembled Lanier rplane with an EK Products Little Red Brick" 3 Channel dig-al proportional system FULLY NSTALLED, a Fox 25RC ngine INSTALLED, and ushrods, wheels, fuel nk, . . . EVERY HING except batteries... ULLY INSTALLED ND ACTUALLY READY OR YOU TO FLY!!!

Since we couldn't fit the fully assembled plane into a box you must glue the two wing halves together, and glue the tail to the fuselage. But, this only adds up to about 23 MINUTES WORK, and then you put batteries into it, gas 'er up, and GO FLY IT!!!

Volume II HOBBY LOBBY ILLUSTRATED CATALOG $2.00

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

● Just when everything is looking great in the model industry, along comes the energy crisis to louse things up. Of course, this particular crisis has loused up just about everything in the country, as well as the rest of the world, but since we are primarily interested in model building and flying within these pages, stick with me while I moan and groan a bit.

This column is being written just a few weeks prior to Christmas, and the nation has just been exposed to the oil crunch for the past several weeks. Right now, we don't know if gas rationing will become a sure thing in the near future, or if the price will go through the ceiling. We don't know if many of us will be pretty cold this winter, or just what the next few months will hold.

But, one thing is sure, we are in for some pretty difficult times, both in day-to-day living, and in enjoying our hobby. If gas is to be rationed, then it is pretty clear that we will all be doing a lot of building, and not much flying unless your flying site is pretty close to home. Of course, the current shortage of balsa wood may make building a bit of a problem, too. This, however, should ease up a bit by March of this year. And, at this writing a shortage of model fuel is already upon us. Of course, if we can't get the gas to drive to the flying field, then we won't need too much fuel!

Since there is a good chance that the transportation problem will be on us by the time that you read this, let me pass along a few thoughts that may make the enforced period of limited flying a bit more bearable. First, examine your own situation. How many miles is it to your flying field? Could a car pool help solve your problem? And second, how about an alternate flying site? It's possible that you may have a reasonable flying field nearer to you if you were flying another type of model. Perhaps sailplane flying really isn't your bag, but if it's fly a small R/C glider from the local school ground or no flying at all, you may learn to like small glider flying! Also, you might consider building a small single channel type of aircraft for an .049 engine, then use two channels of your multi set to control rudder and elevator. Again, it isn't the same as buzzing around the sky with a Webra .61 in your "Super Snarf" but, flying is flying, and it's a lot more fun than doing without! And, it doesn't gobble up much fuel. Of course, you have to be careful about the site that you select, and the type of flying that you do from that site. You may find a great school ground that is a natural for small gliders or .049's, and suddenly along comes "Joe Hot Pilot" and decides to fly his fire-breathing "Super Snarf" from this small field. You know the answer! Instant anger on the part of the residents of that area. Their interest turns to hate, and gone is another flying site. If all of us use our heads we can last out the duration of the gas shortage and still not lose out on our hobby.

•

Another thought that I have is one that I usually pass along each winter, anyway, and that is to use the time when it is impossible to fly to build up a stable of aircraft for the coming flying season. The same idea holds true for not being able to get out and fly as much. Don't spend the time in dark despair, but gut up and get busy and build a fleet of aircraft. Maybe now is a good time to build that super scale ship that you have always wanted to construct. Perhaps you can use the time to build a really good field box. Or, how about taking this time to build yourself a workshop, or a storage house to contain your models and supplies. For gosh sakes don't go back to watching the tube every evening, it gets habit forming, and contrary to political opinion, the gas and transportation shortage won't last forever.

In fact, the kits that are on the market today make it really tough to decide just what to build, be it power or soaring aircraft, the choice is almost unlimited. The same is true of engines, radios, and accessories. The choice is so wide and the products are so good that you really have to try hard to go wrong.

You can use a little imagination, though, and come up with some good ideas to make your modeling easier. For example, I have been doing a little soaring the past few weeks, when I could steal a little time from my house remodeling project, and I realized that it was somewhat stupid to lug around my large field box when I really had no need for a dozen props, or glow plugs, or pliers, fuel, starter, etc. What I really needed was a small tool box to carry a supply of wing rubber bands, some pins, a tube of glue, a few small bits of balsa and plywood, a stop watch, and a small Zebco fish scale to measure the pull on the Hi-Start, a small screw driver, and a few other incidentals. After looking around in several hardware stores I found just the perfect case. It is a small molded plastic fishing tackle box, about 12" long, 4" high, and 4" wide, complete with removable partitioned tray, and costing the enormous sum of $1.19! It's just the right thing. If you spend a little time browsing around the local hardware, sporting goods, and the auto parts store, you will be surprised at what you find to use for our hobby.

•

Last month we discussed covering your aircraft with plastic film type coverings and I mentioned that this month I would get into the location of radio equipment within the confines of your aircraft. Most plans indicate where the radio should be located, and it's a pretty good idea to follow these ideas. But, you may be using a larger or smaller radio than that which was shown on the plans. As radios have diminished in size over the past few years it has become possible to stash away a radio in much less space than was formerly occupied by the receiver and servos. If the plans of the particular model that you are building show a large radio, and you are installing a small system, you very possibly may be screwing up the location of the Center of Gravity pretty badly. Countless aircraft have been flown by builders who complained bitterly that the model that they built and were flying was really a dog and not nearly as good as the designer said that it was. And, many times the Center of Gravity was completely wrong. Generally, it has been too far back. A C.G. that is too far forward tends to make the aircraft act somewhat mushy on the controls, while an aircraft with a rearward C.G. may be much more prone to snap roll when slowed down for a landing. It doesn't take much to get the C.G. badly out of location. Even an inch to the rear of the optimum placement is enough to give you nightmares. The only way to be sure that you are going to have the

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engine clinic

By Clarence Lee

Dear Mr. Lee:

I have a Series 71 Veco .61 with Perry Carb. A fantastic engine. It turns 12,000 rpm on a 7½ power prop (TF) in a rich 2-cycle with no sweat and idles beautifully.

This engine was broken in using your suggested method and to this day has never been, and won't be if I can help it, tweaked for a lean run. Fuel has always been K & B 100 or 500, double filtered, and I use an air-cleaner – in other words, I try to take care of my engines!

My question is, under these conditions and assuming these conditions always prevail, what is the approximate length of time (running) that I can expect performance like this from my Veco?

I know there are many variables here, but I guess what I'm asking is how long can I expect this engine to last under good (pattern-type flying) conditions?

Thanks for your time.

Yours truly,
John Hammer

Quite a few RC'ers have asked this question lately, John. In particular, some of the pylon race fliers who are finding the life of their racing engines somewhat shorter than they might hope for.

There are just too many variables involved for me, or anyone else, to give any exact length of life figures. Under the conditions you propose an engine could last many hundreds of hours. While an engine is running, all moving parts are separated by a thin film of oil so, actually, there is no metal-to-metal contact. With no metal-to-metal contact there would naturally be no wear. If you were to bench run the engine only, you could get many hundreds of hours of running from it, but in the air it is another thing. No matter how careful you are, one of these days you are going to get off a little lean, a speck of dirt will get into the carburetor, etc. Everybody develops a hole in their fuel line at some time. No matter how carefully you filter your fuel, sooner or later something is going to get through and affect the carburetor. Fine hairs seem to always find their way through a filter. The engine only has to sag off lean once to scratch a ring or sleeve. Normally this does not hurt performance as long as you throttle back and land. But two or three instances like this and the engine's performance could suffer. So, you might get 100 hours and maybe only 20. It all depends on the fickle finger of fate.

Dear Mr. Lee,

Would you please advise me on the feasibility of using an exhaust tube from my muffler. The only article of yours I could find was in RCM July 1971, and the article pertained only to tuned exhaust. I am not too concerned with gain or loss of power, but only with the operating temperature of the engine.

I have an Enya .60 which has been broken in on the test bench for 1½ hours with 15 minute or shorter runs. I am using a Fox idle bar plug, Fox Superfuel, and an 11-7 prop. I broke the engine in without a muffler, and had a good idle and throttle response. After 1½ hours I added an Enya muffler and ran the engine rich for another 1/2 hour and still had a good idle and throttle response. However, I have added 3 feet of 1/2" I.D. vinyl tubing to the muffler to keep the gook off my plane. The engine still runs and idles well, maybe even idles better, but I am afraid it may overheat the engine once in the air, although both times I ran it on the bench with the 3 feet of tubing it seemed to run okay.

Any advise from you would be greatly appreciated.

Thank You,
Earl M. Applegate

I guess all of us, at some time or another, have considered the possibility of using a piece of tubing to get rid of the exhaust residue, Earl. However, even a short length of tubing is a real power robber causing excessive back pressure, and the resulting heat, carbon, and varnish build-up. A short length, such as Tatone's Exhaust Off, you can get away with, but three feet is a bit much. You would not want to use a tube this long unless you are prepared to lose about half the power of the engine and spend a lot of time taking the engine apart for cleaning. Frank , the life of the engine will be greatly shortened - - - especially the first time you get off a little lean.

Dear Clarence:

I am using the Enya .29 and .35 TV engines and find their carbs to be less than desirable.

On a 6 oz. tank I am only getting about a six minute engine run, whereas a friend who has an O.S. .35 R/C is getting more than twice this time on a 6 oz. tank.

As a larger tank in the plane is not possible, I have given thought to a metering carburetor.

I did open up the venturi in the carb .005 with no noticeable difference in fuel economy or power.

I have been using K & B 500 fuel this season.

I have made up an adaptor for the rectangular venturi of these Enyas which has a center bore of .377.

Upon fitting Perry carbs at a local hobby store, I found the Veco .19 carb to be an exact fit in the adaptor. The venturi bores of the Veco .19 Perry carbs are very similar to the Enya .29 and .35 TV carb.

My question now is – do you think the Veco .19 Perry carb would satisfy the fuel requirements of the Enyas at their normal power outputs – maintain a metered idle and be more economical on fuel than my Enya carb?

If you do not think the Veco .19 carb to be sufficient, would you advise me on a particular Perry carb?

Thank You,
Robert Wargo
Parma, Ohio

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SUNDAY FLIER

KEN WILLARD

Chief Sunday Flier with Alpha Roamer. Note index finger on throttle control. Also, note similarity of model to old "Breathless." Looks like a stretched version - - - which it is.

● In the December and January issues of RCM, Don Dewey reported on his experiences with electric power. At the same time that he was experimenting, so was I but, naturally, I was interested in the smallest unit that was available. You know I like small models when it comes to power flying.

So I decided to look into the performance characteristics of the Alpha, which is marketed by Galler Electronic Industries. Specifically, I went for the Alpha II, since it weighed the same as the Alpha I and had more power; it was necessary to get as much power as possible, because it's no secret that electric power requires heavy batteries if you expect to have any endurance at all. Maybe one day there'll be a breakthrough but, meanwhile, we have to design around what is currently available.

The Alpha II unit is a neat little package. A plastic block is affixed to the motor housing, and propeller shaft bearings are inserted in a hole which has been drilled through the block. The propeller (various sizes are available) is attached to the reduction gear and shaft by a metal filled epoxy; the epoxy flows through holes in the gear wheel and comes out the back. This is the only way to make it hold, since the gear is made of a meterial that resists all types of adhesives. There's a side benefit to this; on hard landings, the epoxy breaks away, letting the propeller spin free. The first time that happened to me I was at a loss as to what action to take, but the solution was simple. Remove the assembly from the block (it's held in place with a simple Tinnerman clip) and separate the gear wheel from the propeller. Note where the holes matched up to the epoxy on the prop, mix up some 5-minute epoxy, (just a couple of drops is all that's needed) and press the gear wheel and prop back together. In ten minutes you're ready to go again. Of course, if more serious damage is sustained, you can get a replacement unit from the manufacturer.

The gear wheel gives a reduction of 6.2 times. Thus, when the prop is turning 4000 rpm, the motor is turning 24,800 rpm. At that speed it gets warm, but doesn't seem to mind it.

Maybe this would be a good time to make an observation. If you're looking for a technical discussion of the Alpha, write the manufacturer; I don't know a diddlesquat about electronics. I'm a Sunday flier who's interested in the practical results of the performance - - and I'm favorably impressed with the performance of the Alpha II. It ain't no barnburner when it comes to power, but so far as I have been able to check it, it does what it's supposed to - - and that's what counts.

Which brings up a point. I heard

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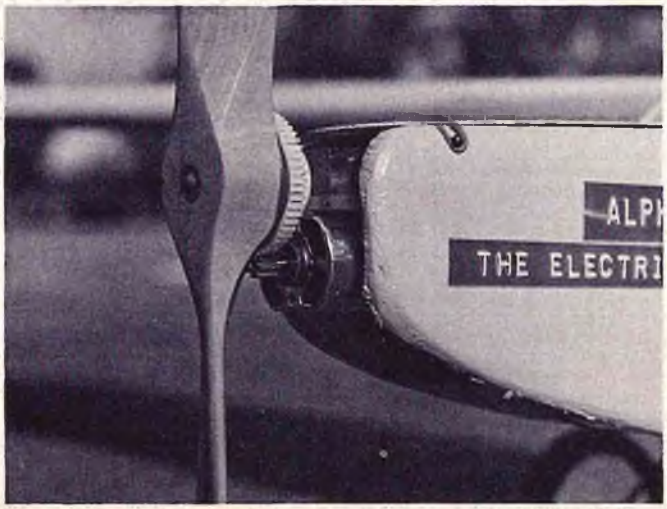
6.2-1 gear ratio gives 3800 rpm to a 9/8 prop on standard pack; 4200 rpm on 600 mil pack. Latter gives 25% more power, weighs 4 oz. more.



Alpha Roamer glides in for a landing with the prop positioned for minimum exposure to "tip-rash" frame nose-up.

RCM TESTS THE SULLIVAN

HI-TORK STARTER

TEST REPORT

Product Test: Ray Hanisco *Photography: Don Dewey*

● "In promulgating esoteric cogitations or articulating superficial sentimentalities, amicable philosphical and psychological observations; beware of platitudinous poderosity. Expunge all unmitigated unctiousness fallacious falderal" . . . . What the h*!! is he saying?

This was written by some unknown author.

In essence what it all means is – say what you mean, and don't get fancy with your words.

Sullivan Products is doing just that with their new electric starter for model airplanes.

Not only are they saying in clear concise advertising what it will do, they are demonstrating their ability to manufacture a top grade product that has been human engineered.

That's right – human engineered. Things fit and are placed where they should be for convenience and the natural use of the human hand – even a chimp could use it without problems. Well – maybe a chimp could – I haven't been able to find one who builds and flies model airplanes. *(Ed: I do!)* To make my point "perfectly clear," Sullivan Products did not jump in with just another starter – they built a better mousetrap.

My introduction to this great new starter came with a call from Matty Sullivan asking me to stop in to see something that was "out of this world." It was early on a Saturday morning when I walked into his office and saw Matty with his left hand bandaged, looking somewhat like the wrappings on a mummy. There he sat with that sheepish grin on his face leaning back in his chair so that the mod art wall decoration behind him looked like a halo over his head.

"What happened to you?" I said as he asked me to join him in his inner sanctum.

"This, my boy, is the result of disbelief," he said. As the tale unfolded, I found that he had been testing starters by holding the spinner cup in his hand and energizing the motors. There was no damage to his hand until he tried the proposed Sullivan starter motor which, without dif-

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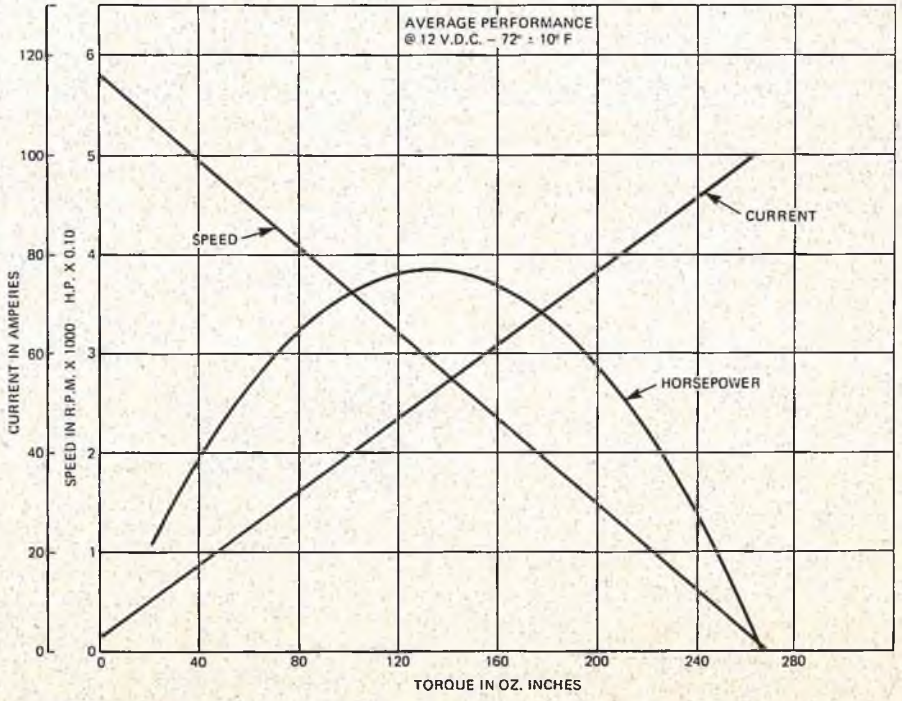


STRIKEMASTER

BY JIM NEWMAN

Over the years a number of model plane designs were evolved only because some R/C equipment required testing and probably the most well known model to be born this way was the Ugly Stik. Strikemaster came about in more or less the same way because, after years of using highly unreliable home built equipment, I finally received a big break and found that I was able to afford my first real R/C gear – a brand new Series 70 Kraft six channel, so it was natural that I should want to get it into the air in the shortest possible time. I could have built an Ugly Stik, I suppose, but as a good Chicago Scalemaster, I felt that my creation should have at least some likeness to a full size aircraft and my original lunch time sketches bore resemblances to the Anglo-French Jaguar, BAC TSR 2 and the BAC Lightning, all of which I had been intimately connected with back in the old country. In fact, the model presented here in its Mark Three version, bears psuedo 56 Squardron, Royal Air Force markings stolen from a Lightning of that illustrious and historic squadron.

The early flights with Mark Two were quite an adventure. I was very uncertain of the modified and larger leading edge radius so the C.G. was kept forward of the design position. Just how far forward I discovered later – almost too late as it turned out.

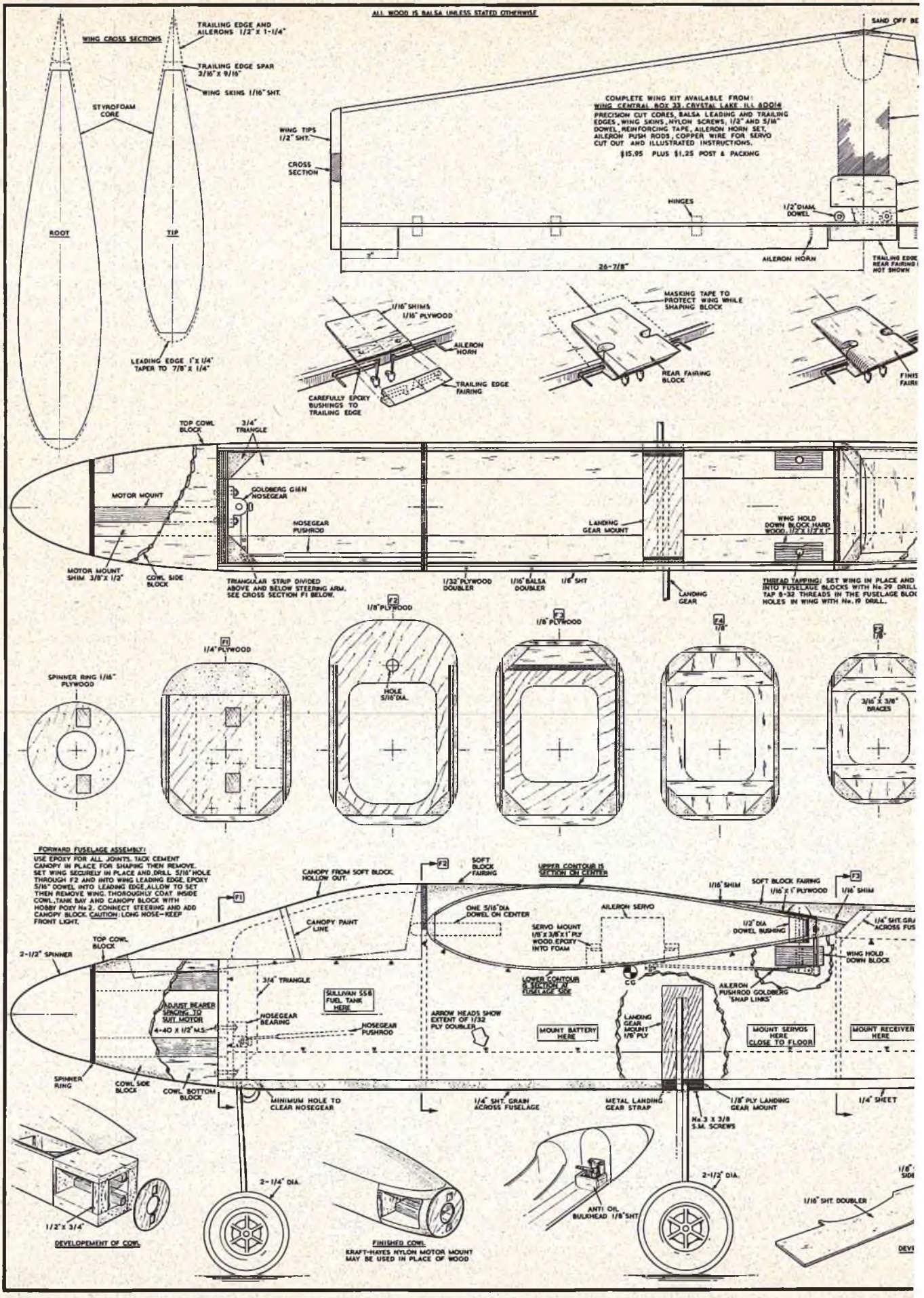
One calm, smokey, Spring evening, I could no longer offer any valid excuses so the McCoy .40 was pulled over into life. With my ever patient wife, Kathy, mentally fingering The Modeler's Rosary and Joe Bush of the Midwest Sundowners acting as 'chase pilot' at my elbow, Strikemaster cleared the ramp and lined up on the duty runway. 100% power was applied and we began the roll, but, at about two thirds distance I had the feeling that the available runway was insufficient and a slight change of heading was requested – in fact it was about 45 degrees right . . . . .

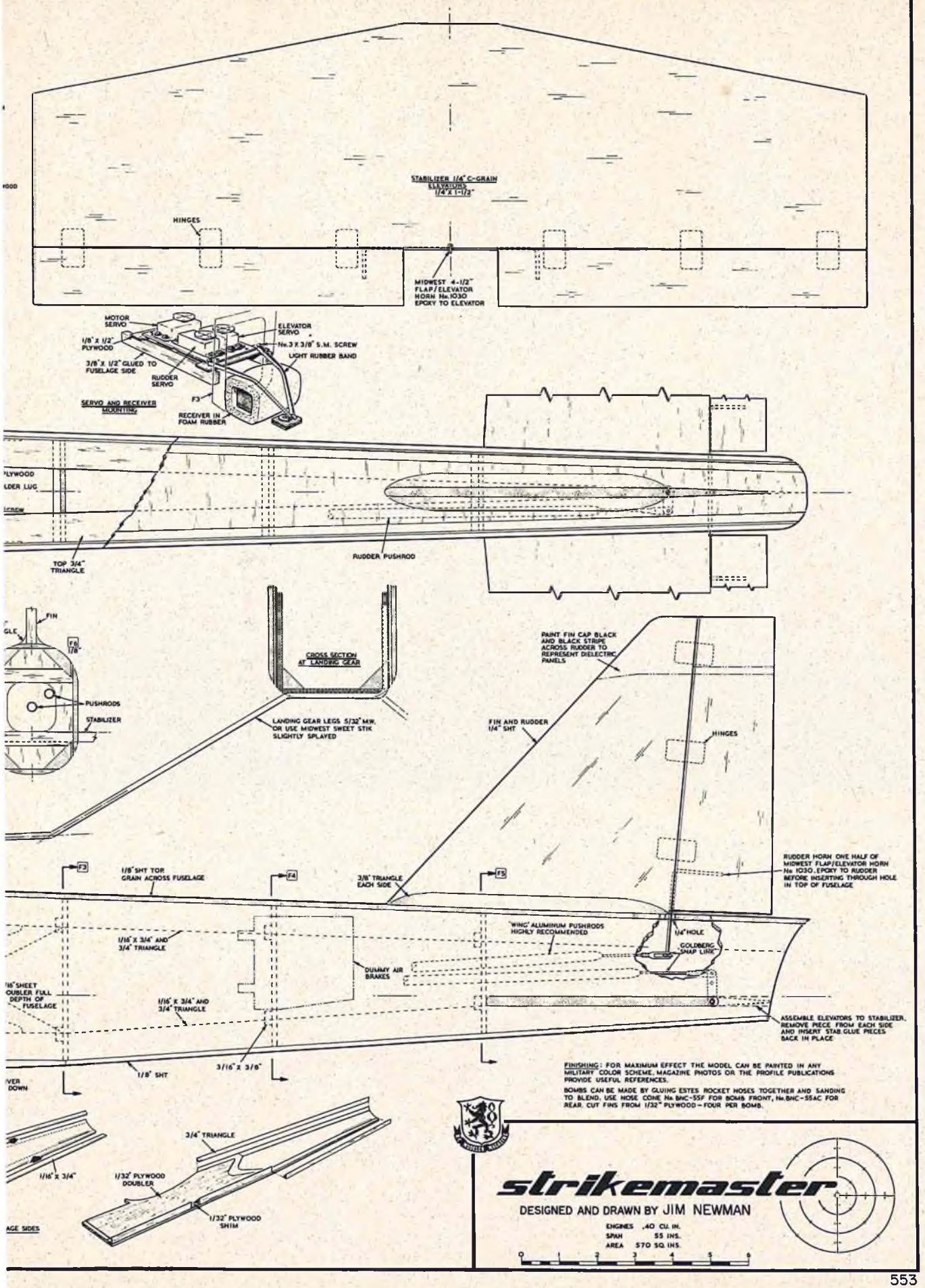
With the model about to vanish into the adjacent county I felt it was about time to call, "Rotate!" Well, rotate I did, all the way back to the stops and the airplane climbed out at about 40 degrees. The trip around the field was just a little worrying but only to the point where I was wishing I had worn my darker colored slacks. Seems I had run out of up trim, almost run out of back stick and just about out of ideas. Fortunately, Uncle Joe is a good guy to have around in such situations and four dummy approaches later, followed by his own special brand of V.G.C.P.A. (Verbal Ground Controlled Precision Approach) he had me sliding nicely down the Glide Slope and onto the numbers. That C.G. really had been forward! One other thing we learned that evening was that Strikemaster Mark Two had one devil of a flat glide, a fact which Elmer Ahlberg was to discover much later and to his considerable embarrassment when he floated right out of the field and into our parking lot – which is how Mark Three came about.

The main differences between Mark Two and Three are in the distribution of the plywood doublers, the reseating of F3 to accomodate the 45 degree ramp and a change to 8-32 nylon screws. I found the 1/4" screws were too tough and not shearing under impact as they were supposed to. In addition, the grain of certain fuselage top and bottom sheeting was reorientated cross ways and the fuselage will now absorb much more impact without the tendency to split open longitudinally.

I'm afraid my flying will never do any model justice, being just an ordinary ham fisted Sunday flier with all the finesse of a battle tank and good landings being the exception rather than the rule. So, I can honestly recount that the Strikemaster has been more than forgiving, the low wing loading and that generous leading edge

Jim's Strikemaster is finished entirely in Super MonoKote with markings in trim MonoKote. Bombs are made from Estes rocket nose cones glued together. Bomb pylons are 1/32" ply cones with 1/8" balsa each side.


ALL WOOD IS BALSA UNLESS STATED OTHERWISE
WING CROSS SECTIONS
TRAILING EDGE AND AILERONS 1/2" x 1-1/4"
TRAILING EDGE SPAR 3/16" x 9/16"
WING SKINS 1/16" SHT.
STYROFOAM CORE
ROOT
TIP
LEADING EDGE 1" x 1/4" TAPER TO 7/8" x 1/4"
COMPLETE WING KIT AVAILABLE FROM: WING CENTRAL BOX 33, CRYSTAL LAKE, ILL 60014
PRECISION CUT CORES, BALSA LEADING AND TRAILING EDGES, WING SKINS, NYLON SCREWS, 1/2" AND 5/16" DOWEL, REINFORCING TAPE, AILERON HORN SET, AILERON PUSH RODS, COPPER WIRE FOR SERVO CUT OUT AND ILLUSTRATED INSTRUCTIONS.
$15.95 PLUS $1.25 POST & PACKING
WING TIPS 1/2" SHT.
CROSS SECTION
HINGES
1/2" DIAM. DOWEL
AILERON HORN
26-7/8"
1/16" SHIMS
1/16" PLYWOOD
AILERON HORN
TRAILING EDGE FAIRING
CAREFULLY EPOXY BUSHINGS TO TRAILING EDGE
MASKING TAPE TO PROTECT WING WHILE SHAPING BLOCK
REAR FAIRING BLOCK
TOP COWL BLOCK
3/4" TRIANGLE
MOTOR MOUNT
GOLDBERG GIANT NOSEGEAR
NOSEGEAR PUSHROD
LANDING GEAR MOUNT
WING HOLD DOWN BLOCK HARD WOOD 1/2" x 1/2" x 1"
MOTOR MOUNT SHIM 3/8" x 1/2"
COWL SIDE BLOCK
TRIANGULAR STRIP DIVIDED ABOVE AND BELOW STEERING ARM. SEE CROSS SECTION F1 BELOW.
1/32" PLYWOOD DOUBLER
1/16" BALSA DOUBLER
1/8" SHT
LANDING GEAR
THREAD TAPPING! SET WING IN PLACE AND INTO FUSELAGE BLOCKS WITH No. 29 DRILL. TAP 8-32 THREADS IN THE FUSELAGE BLOCK HOLES IN WING WITH No. 19 DRILL.
F1
1/4" PLYWOOD
SPINNER RING 1/16" PLYWOOD
F2
1/8" PLYWOOD
HOLE 5/16" DIA.
F3
1/8" PLYWOOD
F4
1/8"
F5
1/8"
3/16" x 3/8" BRACES
FORWARD FUSELAGE ASSEMBLY:
USE EPOXY FOR ALL JOINTS. TACK CEMENT CANOPY IN PLACE FOR SHAPING THEN REMOVE. SET WING SECURELY IN PLACE AND DRILL 5/16" HOLE THROUGH F2 AND INTO WING LEADING EDGE. EPOXY 5/16" DOWEL INTO LEADING EDGE, ALLOW TO SET THEN REMOVE WING. THOROUGHLY COAT INSIDE COWL, TANK BAY AND CANOPY BLOCK WITH HOBBY POXY No. 2. CONNECT STEERING AND ADD CANOPY BLOCK. CAUTION: LONG NOSE—KEEP FRONT LIGHT.
CANOPY FROM SOFT BLOCK. HOLLOW OUT.
SOFT BLOCK FAIRING
UPPER CONTOUR IS SECTION ON CENTER
1/16" SHIM
SOFT BLOCK FAIRING 1/16" x 1" PLYWOOD
1/16" SHIM
ONE 5/16" DIA DOWEL ON CENTER
AILERON SERVO
CANOPY PAINT LINE
SERVO MOUNT 1/8" x 3/8" x 1" PLY WOOD. EPOXY INTO FOAM
1/2" DIA DOWEL BUSHING
1/4" SHT. GRAIN ACROSS FUSELAGE
TOP COWL BLOCK
2-1/2" SPINNER
WING HOLD DOWN BLOCK
3/4" TRIANGLE
SULLIVAN 556 FUEL TANK HERE
LOWER CONTOUR IS SECTION OF FUSELAGE SIDE
CG
AILERON PUSHROD GOLDBERG SNAP LINKS
ADJUST BEARER SPACING TO SUIT MOTOR
4-40 x 1/2" M.S.
NOSEGEAR BEARING
NOSEGEAR PUSHROD
ARROW HEADS SHOW EXTENT OF 1/32 PLY DOUBLER
MOUNT BATTERY HERE
LANDING GEAR MOUNT 1/8" PLY
MOUNT SERVOS HERE CLOSE TO FLOOR
MOUNT RECEIVER HERE
SPINNER RING
COWL SIDE BLOCK
COWL BOTTOM BLOCK
MINIMUM HOLE TO CLEAR NOSEGEAR
1/4" SHT. GRAIN ACROSS FUSELAGE
METAL LANDING GEAR STRAP
1/8" PLY LANDING GEAR MOUNT
1/4" SHEET
No. 3 x 3/8 S.M. SCREWS
1/2" x 3/4"
DEVELOPEMENT OF COWL
2-1/4" DIA.
FINISHED COWL
KRAFT-HAYES NYLON MOTOR MOUNT MAY BE USED IN PLACE OF WOOD
ANTI OIL BULKHEAD 1/8" SHT
2-1/2" DIA.
1/16" SHT. DOUBLER


STABILIZER 1/4" C-GRAIN
ELEVATORS
1/4" X 1-1/2"
HINGES
MIDWEST 4-1/2" FLAP/ELEVATOR HORN No.1030 EPOXY TO ELEVATOR
MOTOR SERVO
ELEVATOR SERVO
1/8" x 1/2" PLYWOOD
No.3 X 3/8" S.M. SCREW
LIGHT RUBBER BAND
3/8" X 1/2" GLUED TO FUSELAGE SIDE
RUDDER SERVO
F3
SERVO AND RECEIVER MOUNTING
RECEIVER IN FOAM RUBBER
TOP 3/4" TRIANGLE
RUDDER PUSHROD
FIN
F6
1/8"
PUSHRODS
STABILIZER
CROSS SECTION AT LANDING GEAR
LANDING GEAR LEGS 5/32" MW. OR USE MIDWEST SWEET STIK SLIGHTLY SPLAYED
PAINT FIN CAP BLACK AND BLACK STRIPE ACROSS RUDDER TO REPRESENT DIELECTRIC PANELS
FIN AND RUDDER 1/4" SHT
HINGES
F3
1/8" SHT TOP GRAIN ACROSS FUSELAGE
F4
3/8" TRIANGLE EACH SIDE
F5
RUDDER HORN ONE HALF OF MIDWEST FLAP/ELEVATOR HORN No 1030. EPOXY TO RUDDER BEFORE INSERTING THROUGH HOLE IN TOP OF FUSELAGE
1/16" X 3/4" AND 3/4" TRIANGLE
"WING" ALUMINUM PUSHRODS HIGHLY RECOMMENDED
1/4" HOLE
GOLDBERG SNAP LINK
DUMMY AIR BRAKES
1/16" SHEET DOUBLER FULL DEPTH OF FUSELAGE
1/16" X 3/4" AND 3/4" TRIANGLE
ASSEMBLE ELEVATORS TO STABILIZER. REMOVE PIECE FROM EACH SIDE AND INSERT STAB GLUE PIECES BACK IN PLACE
1/8" SHT
3/16" x 3/8"
FINISHING: FOR MAXIMUM EFFECT THE MODEL CAN BE PAINTED IN ANY MILITARY COLOR SCHEME. MAGAZINE PHOTOS OR THE PROFILE PUBLICATIONS PROVIDE USEFUL REFERENCES.
BOMBS CAN BE MADE BY GLUING ESTES ROCKET NOSES TOGETHER AND SANDING TO BLEND. USE NOSE CONE No BNC-55F FOR BOMB FRONT, No.BNC-55AC FOR REAR. CUT FINS FROM 1/32" PLYWOOD — FOUR PER BOMB.
3/4" TRIANGLE
1/16" x 3/4"
1/32" PLYWOOD DOUBLER
1/32" PLYWOOD SHIM
strikemaster
DESIGNED AND DRAWN BY JIM NEWMAN
ENGINES .40 CU. IN.
SPAN 55 INS.
AREA 570 SQ. INS.
0 1 2 3 4 5 6

553

radius taking care of me on many occasions. The model's characteristics are that it should have enough performance to satisfy the 'almost expert' and yet it will fly slow and docile enough to make it a good transition model for any RC'er trying multi for the first time. Mehlin Smith (responsible for the first ever Goldberg Shoestring you may recall) can really show off its low speed handling by flying it low and slow, dragging it in nose high just above the weeds to finally rub my nose in it by dumping it on its elevator right at my feet! Another party piece is to hover into the wind with the stick way back, throttle closed, using rudder only to maintain heading and finally sinking right into the field.

Little need be said about the construction since it is very basic with its all sheet fuselage, but a couple of notes on the order of things will be an assistance I'm sure.

CONSTRUCTION

Assemble the wing first – a straightforward 1/16" balsa sheeting job over a foam core. I used Southern's Sorghum to attach the skins and have found it satisfactory. Five Minute epoxy holds the tips, leading and trailing edges in place.

Next, assemble the fuselage sides remembering, of course, to make a RIGHT and a LEFT. I did find it a distinct advantage to use 3M77 spray contact adhesive when laminating the sides to the balsa and plywood doublers but I also took care to mask off other areas where conventional glues would be used. (Judging by the lustiness of young Scott there is nothing wrong with my chromosomes, either!) The sides are erected over the plan with F1, 2, and 3 epoxied in place and once they have set and are squared up, you can add the remaining formers and the rear wing hold-down blocks. This is now a good time to test that the wing and stabilizer seats are parallel with each other by laying a couple of straight-edges across them and sighting from front to rear.

Set the wing in place, squaring it up from all directions and by measuring up from the building board to the leading and trailing edge, verifying that the wing and the stabilizer will be at zero incidence. A reliable volunteer should now be pressed into service to hold the wing firmly on its seat while you use the 5/16" hole in F2 as the guide to drill the 5/16" hole in the wing leading edge to accomodate the hold-down dowel. Five Minute epoxy can be introduced into the hole with a stick before inserting the dowel. While your volunteer is still in an acceptable frame of mind, carefully mark and drill No. 29 holes down through the wing trailing edge and into the hold-down blocks in the fuselage. By now the front dowel will have set up so remove the wing and open out the two holes in it with a No. 19 drill. The holes in the fuselage blocks should be tapped with an 8-32 tap.

The top and bottom fuselage planking can be glued in place but be sure that you have the nosegear bearing and the motor mounting blind nuts in place **before** epoxying the cowl blocks to the front of F1. I only mention this because of my own bitter experience. The canopy block is only tack cemented on at this stage and with the planking completed you are ready to razor plane and sand the fuselage to shape. By way of interest, while building my fuselage, I reached this rough shaped stage at 10:30 p.m. on a Saturday, having only commenced cutting parts on my Dremel saw at 1:30 p.m., so it is a reasonably fast model to build because I am most definitely not the world's speediest builder. Before final sanding the canopy block is removed with a smart 'bunny chop' and speedily hollowed out with a sanding drum and wire brush in a Dremel flexible drive. I would advise against omitting the hollowing out stage because this ship has a fairly long nose and you really cannot afford too much weight forward. The only commercial motor mount that I can recommend for this reason is the excellent Kraft-Hayes mount. Using Hobbypoxy No. 2, thoroughly fuel proof the inside of the tank bay and the underside of the canopy block. Most important – do not omit the little bulkhead around the nosegear bearing. Without it a strong flow of exhaust residue is induced because of the open jet exhaust at the rear of the fuselage. While the canopy block was off I found it convenient to fit the tank and plumbing between sponge rubber blocks; likewise I fitted the nose leg and centered it all up before clipping on the steering pushrod.

One of the pleasing aspects of this model is that its lines will accept the color scheme of numerous air forces and still come out looking right. R.A.F. and U.S.N. schemes are pretty common so how about trying Royal Navy, West German, Swedish, Norwegian, or even a Russian scheme. Start with your favorite finishing system then dig up some good magazine photos or crib from the excellent Profile Publications for authenticity.

I have experienced some strong reaction to the unusual placing of the receiver. This became necessary because, for styling reasons alone, the model has a fairly long nose for a swept wing ship. Not being a competition machine I felt we could tolerate a little excess Polar Moment of Inertia. Since I refuse to mount batteries or

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THE LITTLE SQUIRT

BY RAY G. SOUTHARD

Happiness was building and operating a radio control harbor fire boat for your writer who is also a R/C flyer. Boating is a very relaxing sport. Have you ever thought of pulling up beside a duck on a beautiful lake and giving him a squirt of water from the old pump or cooling off a bathing beauty with a full burst or just putting out a fire? There are all kinds of possibilities with this boat for bad weather is seldom a problem and with running lights, you can easily track the boat at night. The cabins are lighted and it is a beauty to behold on the water at dusk with the lights reflecting in the water.

I wanted to build a model boat that would be easy to construct so I began looking for a boat kit that had a fiberglass hull. The boat I was looking for had to be able to do something as I had purchased a new three channel, two stick Kraft radio just for boating. The Harbor Fire Boat which is sold by Fibo Craft Model of Bay Shore, New York ended my search. This kit is sold with or without a fiberglass hull and a complete set of deck fittings. I equipped the boat with a working water pump for fighting fires. There was plenty of room in the hull so I put in a tape recorder which has a sound track complete with fog horns, bells, sirens, crew voices, diesel motor sounds and music just for listening. Two small speakers are mounted on the deck behind two life preservers. They give a very realistic sound with plenty of volume and fidelity. It is surprising just how much the sound effects add to the boat. The power source for the boat is a 6-volt battery. A Pittman electric motor runs the boat at scale speed using one shaft and propeller. There are several inexpensive rechargeable 6-volt batteries that are ideal for operating electric boats. I have a battery that will run the boat motor and lights for about four hours without any loss in power. After an overnight charge you are ready for another day of boating. The battery is manufactured by Elden Industries of Hawthorne,

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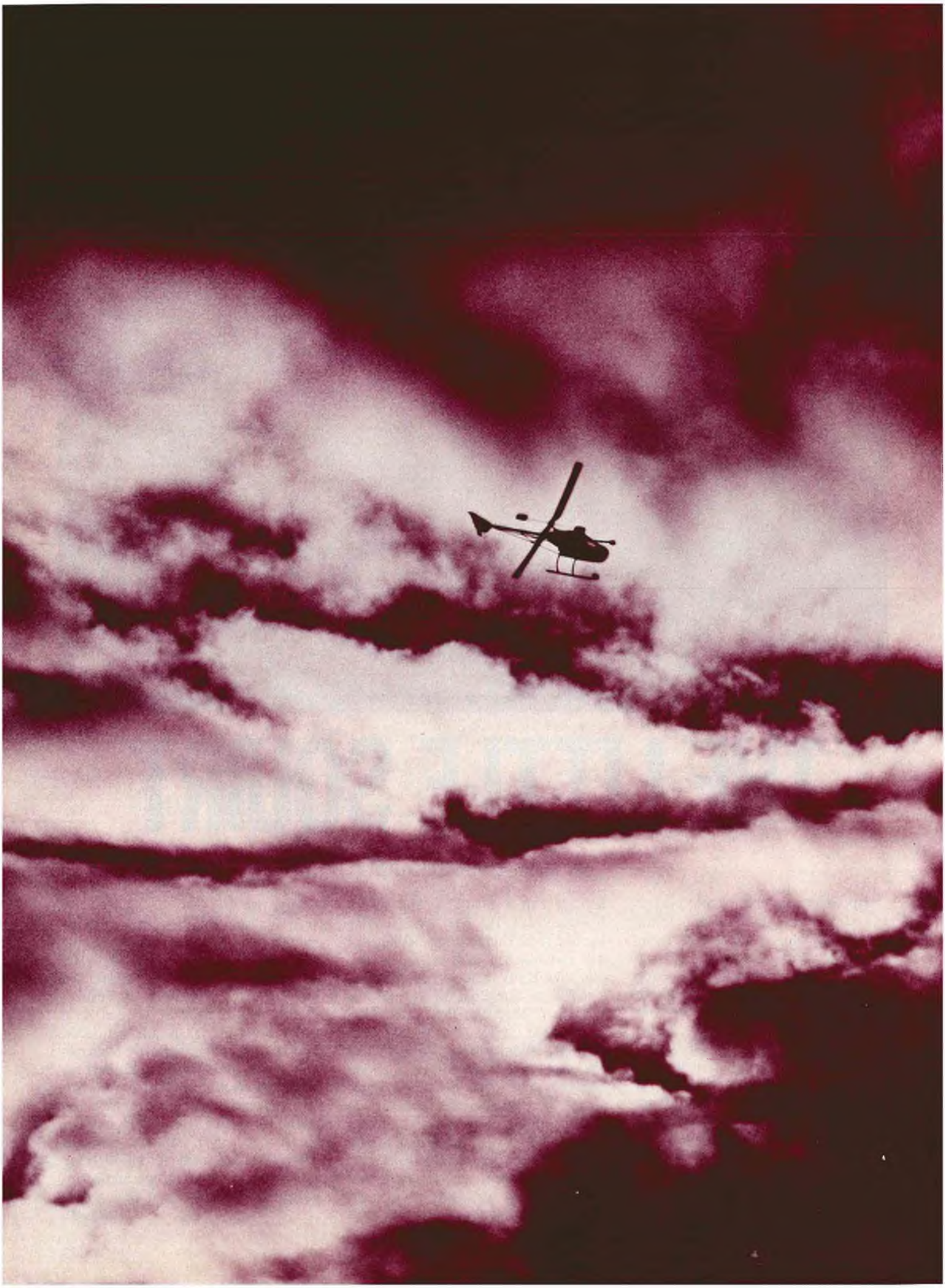

The Du-Bro SHARK

Photography: Bernie Murphy / Howard Griffith

DuBro's answer to the energy crisis is the finest helicopter kit available. Once you learn, the front street can be adequate for practice. The noise level is lower than a power mower. By Bernie Murphy.

● The latest kit on the helicopter scene is the new Du-Bro Shark. We had the pleasure, last November, of traveling to the Du-Bro factory to check out the Shark.

The day we arrived at Du-Bro's, the weather was miserable, to say the least – 28 degrees with 30 mph winds. We had brought along our radio equipment, planning to install it in one of the Sharks, for a flight test, though now the weather made this seem unlikely.

Fortunately, Dave Gray does not readily accept the wind, cold, or both, as a reason not to fly, and soon we were busily feeding Mr. Kraft's electronic boxes into the Sharks guts. If you have ever built a chopper, you can certainly appreciate the fact that the ENTIRE installation took less than thirty minutes, and included switching around a couple of servos in order to obtain the proper throw directions. This machine is a study in simplicity!

Mechanically, the Shark is almost identical to the Du-Bro Hughes 300, incorporating numerous refinements, developed as a result of the Hughes. There have been improvements in the O & R engine, making it not only more reliable, but also more powerful. The Shark uses the same rotor head, though the blades have been shortened from 57" diameter to 52" diameter. The tail rotor is identical to the Hughes, although a universal has been added between the tail rotor gearbox and the driveshaft. In addition, the Shark is about 1½ pounds lighter, weighing in around 12½ pounds.

After we had been given the complete tour of the new machine, and had completed our radio installation, Dave said, "Wanna' see it fly?!" Dave was referring to his Shark, since the one our radio was in was set up left handed. Considering the weather conditions, we were happy it was. "Sure," (why not, it's his machine).

Outside we watched, and shivered, as Dave fired up his Shark with but a single pull of the built-in starter. A quick check of the controls, and up into a hover. Gradually the nose tipped downward, and the Shark began to accelerate into the wind, as Dave proceeded to wring out the chopper. Being lighter, slimmer, and more streamlined than the Hughes 300, the Shark is capable of flying faster, and is more maneuverable. It is also quite capable of flying in high gusty winds – although this requires a lot of piloting skill. Soon Dave was

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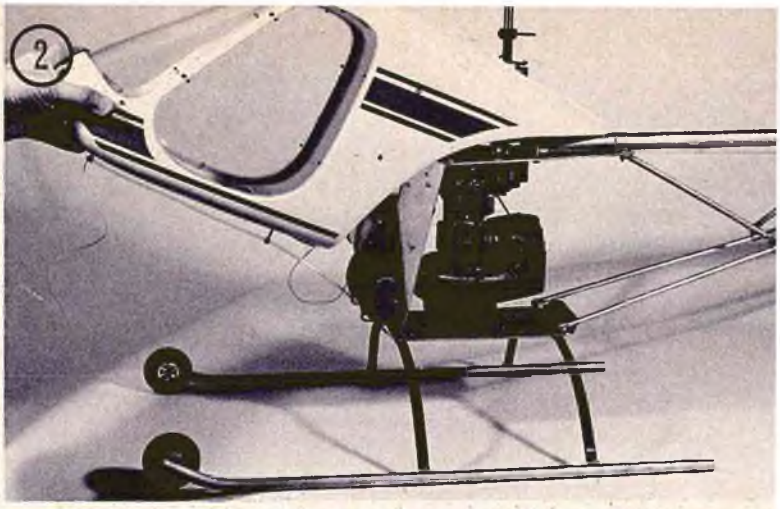
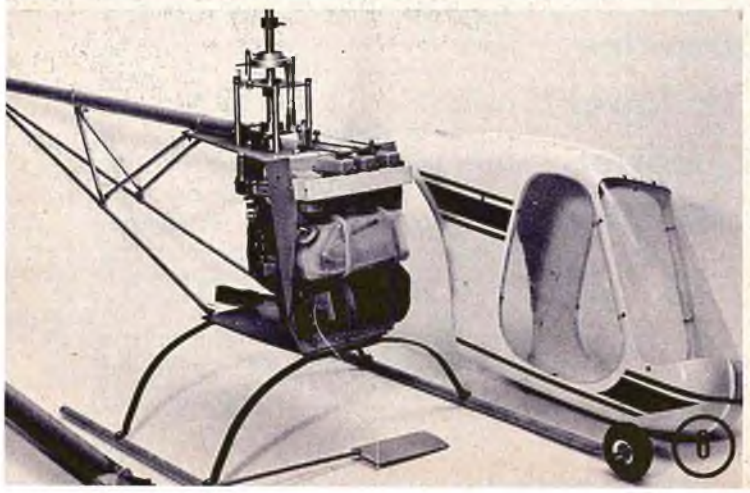
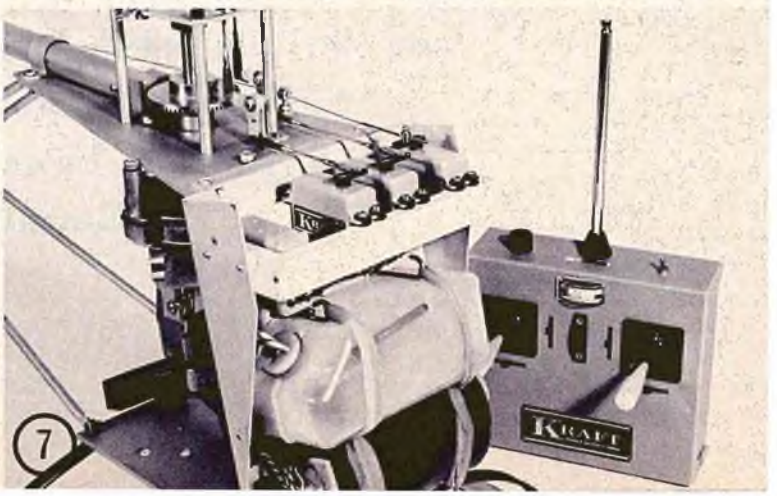
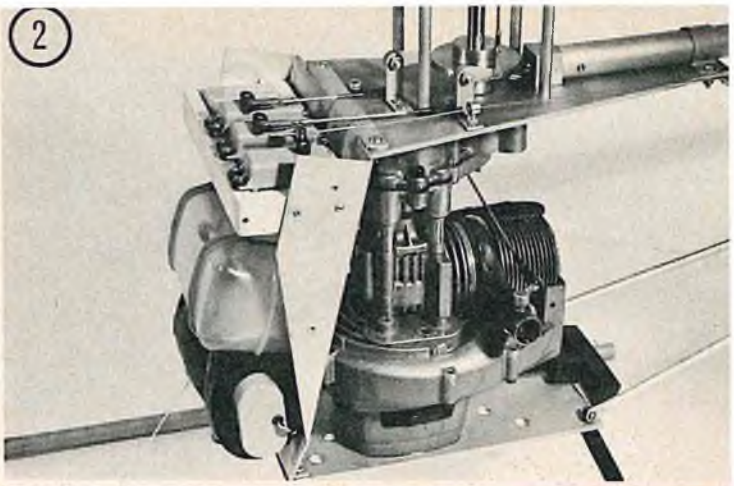
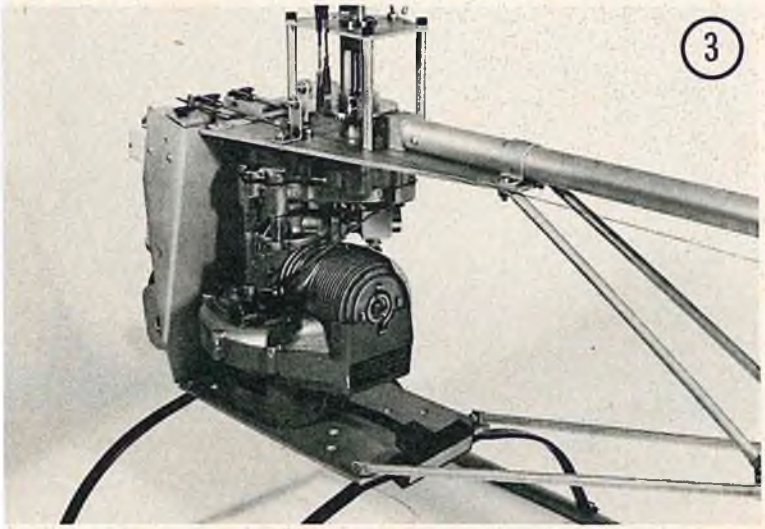


(1) Shark has simple plastic body covering all-metal framework.
(2) Vacuum formed ABS plastic body shell is easily removed for service or adjustment. Saves time building, too!
(3) The Shark is easily converted to float operation for water, snow or grass flying.
(4) Floats from Model Helicopters add to the versatility of the Shark.
(5) Note simplicity of all-metal structure when plastic shell is removed.
(6) Servo tray and rotor blades are the only wood parts in the Shark kit.
(7) Simple tray holds four control servos; receiver and battery pack in foam sleeve secured by rubber bands. Tank also hooks simply in place.









(1) Basic metal framework can be repaired in minutes after any crash damage.

(2) Totally self-contained drive train and control system make the Shark a snap to construct or service.

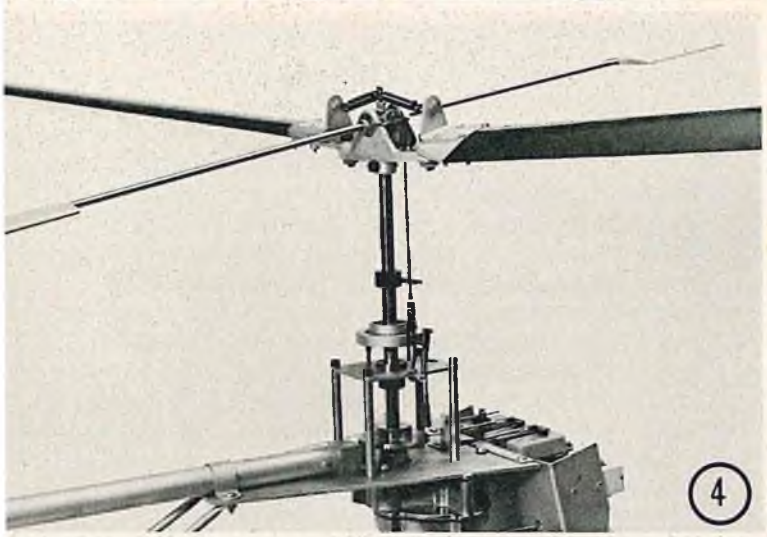
(3) Rear view of Du-Bro modified O & R engine. All photos on these pages taken after flight shots on page 28 were made of same machine. Strip-down time for photos approximately fifteen minutes!

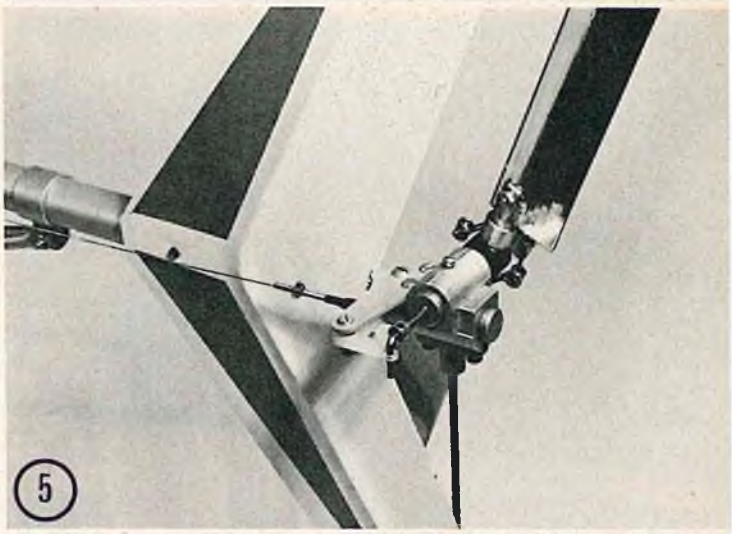
(4) Rotor head assembly easily removed with one bolt and nut for easy transportation. Blades are machined hardwood for maximum durability.

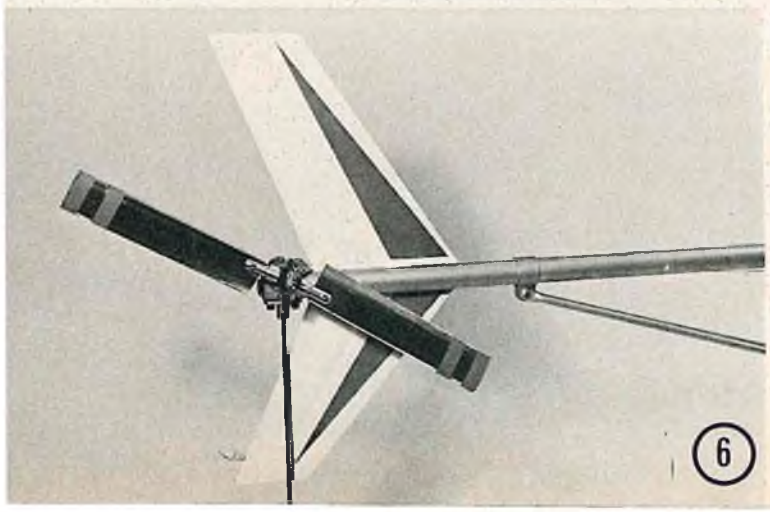
(5) Tail rotor assembly. Gearbox uses STP oil. Ribbed metal fin held in place with two sheet metal screws.

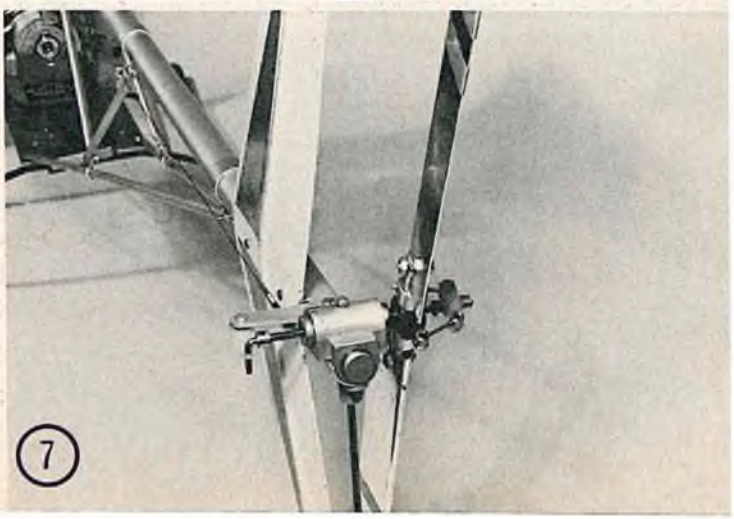
(6) Opposite view of tail rotor, Solarfilm covered.

(7) Rear view of tail rotor gear box and rotor linkage.

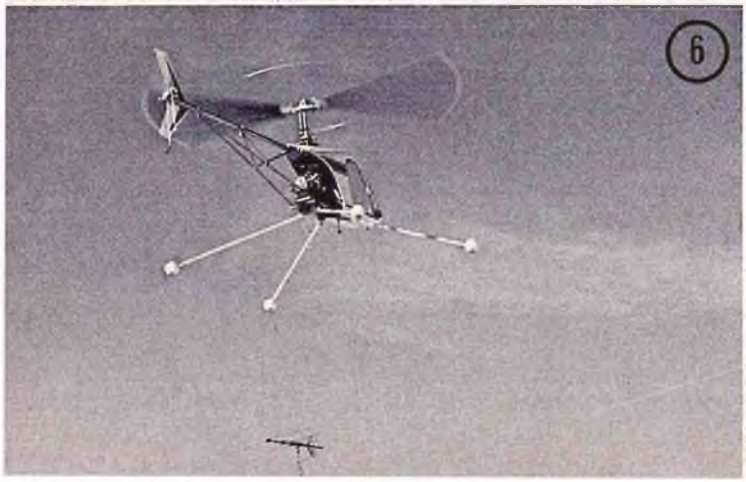


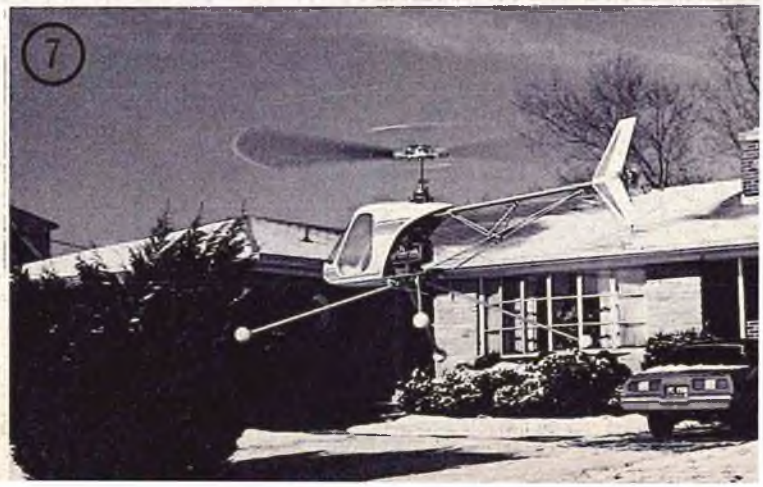


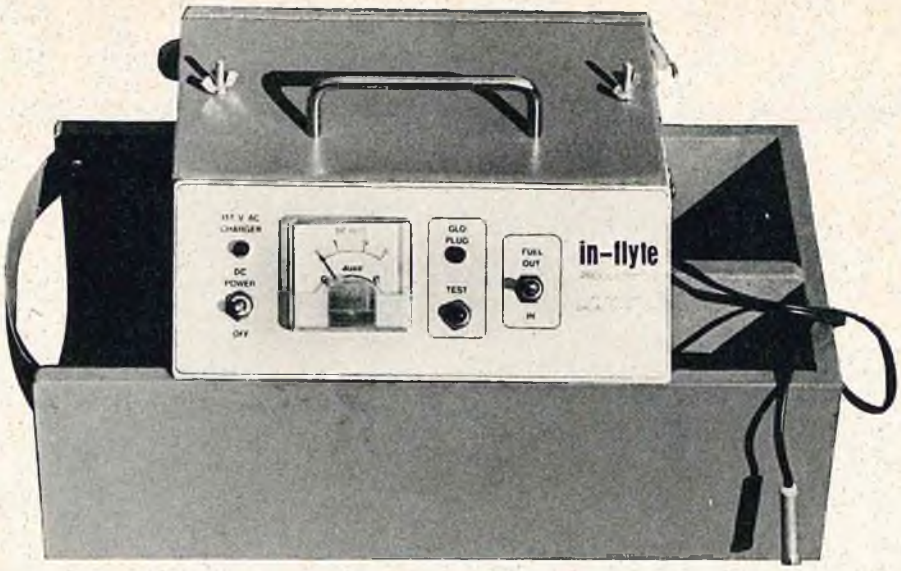




(1) RCM's Bernie Murphy with the Du-Bro Shark. Incidentally, that white stuff (for West Coasters) is called snow and ice. Temperature is 20° with 30+ mph winds! What some people won't do for a photo!
(2) The Shark takes off down the street. Don't try this until you really know how to fly!
(3) Telephoto lens pulls in the Shark as its training gear seems to dwarf a neighbor's VW.
(4) And up she goes. Fibreglass rod legs and rubber balls on training gear eliminate a lot of crash damage while learning to fly.
(5) Making a turn back down the street, RCM's freezing chopper pilot passes in front of his house. Assist on flight photos by Howard Griffith. Just ain't found a way to fly and photograph, too!
(6) Maximum altitude for good close-up photos.
(7) A final hover and soft landing in front of the house.







RCM TESTS THE FLYTE BOX

TEST REPORT

Product Test: Don Dewey

● It always seems to work that way.

Just when you get your flying procedure down pat, someone comes up with a better way to do something with less trouble, more convenience, and adding immeasurably to the overall pleasure of the day's flying session.

For years we've hauled around everything from cardboard cartons to the latest innovations in wood and fiberglass field boxes, each time rearranging the ever-expanding group of accessories we haul to the field. Electric starters, a motorcycle battery, starting battery, fuel pump, fuel can - - - all are rearranged in the latest flight box the well-dressed RC'er carries to the field. And, each time, the weight seems to go increasingly higher until we are rapidly approaching hernia level.

At last, we have found what we feel is the end of the line in flight boxes - - - the precision engineered Flyte Box manufactured by In-Flyte Products Co., P.O. Box 30247, Dallas, Texas 75230.

The Flyte Box has solved all of our problems with regards to flight-line fueling and electrical problems in one complete compact unit. This extremely well-designed system, available in an easy-to-assemble kit, or pre-assembled and finished, completely encloses a 12 volt, high amperage, long life wet cell battery; a voltmeter that continuously indicates battery condition; a specially designed built-in charger which maintains the 12 volt battery at peak power; a 1/2 gallon fuel tank with all lines and fittings; a Sullivan 12 volt reversing gear driven fuel pump; a Du-Bro glow plug cap and cable which supplies 1.5 volts for fast, hot starts; a lighted test circuit which confirms glow plug performance in the engine; and external screw taps for easy connection of any 12 volt hand starter. In addition, an open compartment and strap on the side is provided as a transmitter caddy while on the opposite side of the master control panel is a divided compartment which we use to hold a Sullivan Hi-Tork starter, spare glow plugs, props, and miscellaneous small tools. And, as an added plus, the overall weight of the unit is substantially less than the behemoth type field boxes we have normally been carrying to the flight line. If you're one of those who insists on taking a duplicate of your shop to the flying field with you, you can use one of the larger field boxes to carry all of that other paraphernalia, leaving it in the trunk of your car until needed.

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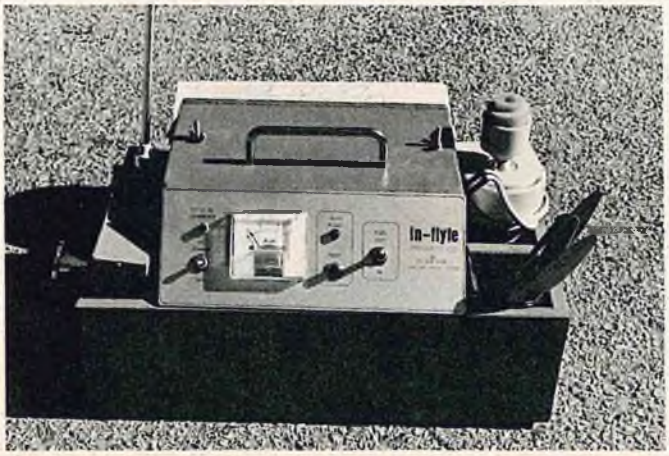
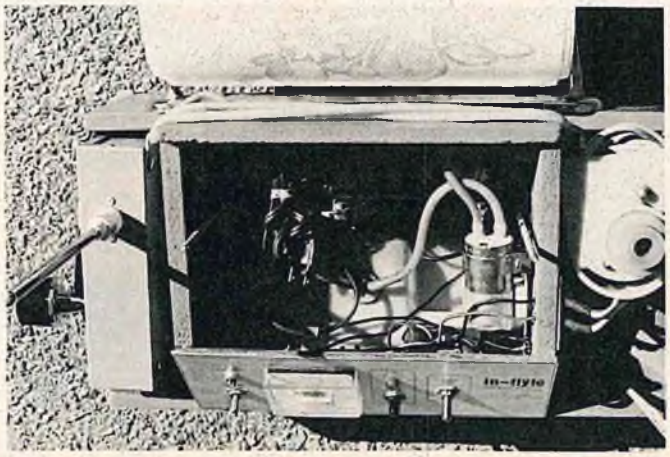
The Flyte Box with author's RS transmitter, Sullivan Hi-Tork Starter, Austin-Craft 4-way plug wrench, spare glow plugs and props, and a couple of screwdrivers.



Inside the Flyte Box. A half gallon fuel container, Sullivan reversing pump, charging cord and charger, 12V battery. Towel rack added to back for field convenience. Be sure to use 2V glow plugs with any lead acid battery.



HONKER BIPE

● Almost everyone turns on to a biplane. The sight of one sitting on the tarmac brings a wave of nostalgia to even the youngest modeler, because you don't have to remember the good old days to appreciate them. Two wings bring back the 1930's, the golden age of American aviation – the era of grace and rigging, before the war warped the airplane forever into a machine of speed and efficiency and blind rivets and steel.

The very names of these early planes have magic: Eaglerock, Great Lakes, Travelaire, Knight Twister, Honker Bipe . . . er, Honker Bipe?

Well, it never hurts to associate your product with the respected names of the industry – after all, Phil Kraft made it by setting his gear on the hood of a Continental, didn't he? Besides, you can create any one of those famous bipes from a standard Honker biplane, using just a touch of imagination and a roll or two of Solarfilm.

The big drawback to building most model biplanes is, of course, those very two wings that look so neat. Not everyone enjoys gluing great mounds of identical ribs in place, especially when you put in the very last one with a sigh, only to realize that you're only half finished – you still have another whole wing to go. The Honker Bipe is designed to streamline this operation. No ribs, no spars, no dihedral braces – just two pieces of sheet balsa laminated at a 6 degree angle and razor-planed to airfoil shape. Too crude, you say – looks like a hand launch glider. But how long since you've seen a well-designed hand launch fly? The fact is, we've thermalled the number two prototype here in Albuquerque, and slope-soared the same plane (dead stick) out at Torrey Pines.

Wing loadings with a three-channel Kraft brick hover around 10 ounces per square foot, and the biggest complaint the experienced pattern flier has of the bipe is that he can't get it down! If you suffer from this same complaint, you can always leave the bottom wing at home. She flies fast but rock-stable on top-wing only, and looks like a WW I observation plane in the air. The increase in relative stab area seems to more than compensate for the rearward Center of Gravity you get when you fly parasol. But, two words of warning. First, be sure your receiver is tied down securely, and not likely to come tumbling out of the hole left by the missing wing! Second, don't stress that lone top wing too far unless you've glassed the center joint, something that isn't necessary if you plan to fly it only as a biplane. I still fly the number two proto parasol-style once in awhile, just to show off, but I never forget that the wing on it was designed and built for an .049 (it was pirated from an ancient, decrepit Honker) and it presently has a very young and virile O.S. .25 on it!

Which brings us to engines. The number one prototype, built by Dick Roberts here in Albuquerque, flew beautifully with a Max .15. This is also the engine Don chose for the RCM prototype. Gentle, realistic performance at sea level can be had with a good .09 sized mill such as the Enya or Max .10, but these engines become marginal at altitudes above three or four thousand feet. If you decide on a .09, however, you needn't worry about the tip stalls and unexpected snap rolls that plague most marginally-powered models – the great virtue of the Honker wing is that, properly built, it is extremely tip stable at low airspeeds. Don't ask me why – just build one and see.

On the other hand, I recognize that there are power-mad individuals among us . . . people so warped and perverted by the modern obsession for speed that they will not rest until they have the fastest airplane on the field. People who are driven by a relentless mania into building machines that will perform vertically every maneuver that their more sensible comrades are content to do horizontally. People who claim they only keep all that excess power on hand "for emergencies" - - - but just watch them on take-offs.

These people are fools, and ought to be ostracized by rational men everywhere. I, myself, treated them so, until I tried flying one of their planes once. Gad! They're right – it's the only way to fly! So, I never put less than a .25 on my Honker Bipes. After all, the excess engine weight assures a nice forward Center of Gravity. And realistic third-throttle take-offs. And true vertical climbs at sea level (O.S. Max .25, Top Flite 8/4 prop, 35% nitro fuel). Besides, I only use the extra power in emergencies.

Before we begin construction, a word of reassurance to fliers who have cut their teeth on tricycle-geared aircraft. In spite of what your local field prejudices may say, taildraggers need not be tricky to handle on the ground. Half the battle is the correct type and

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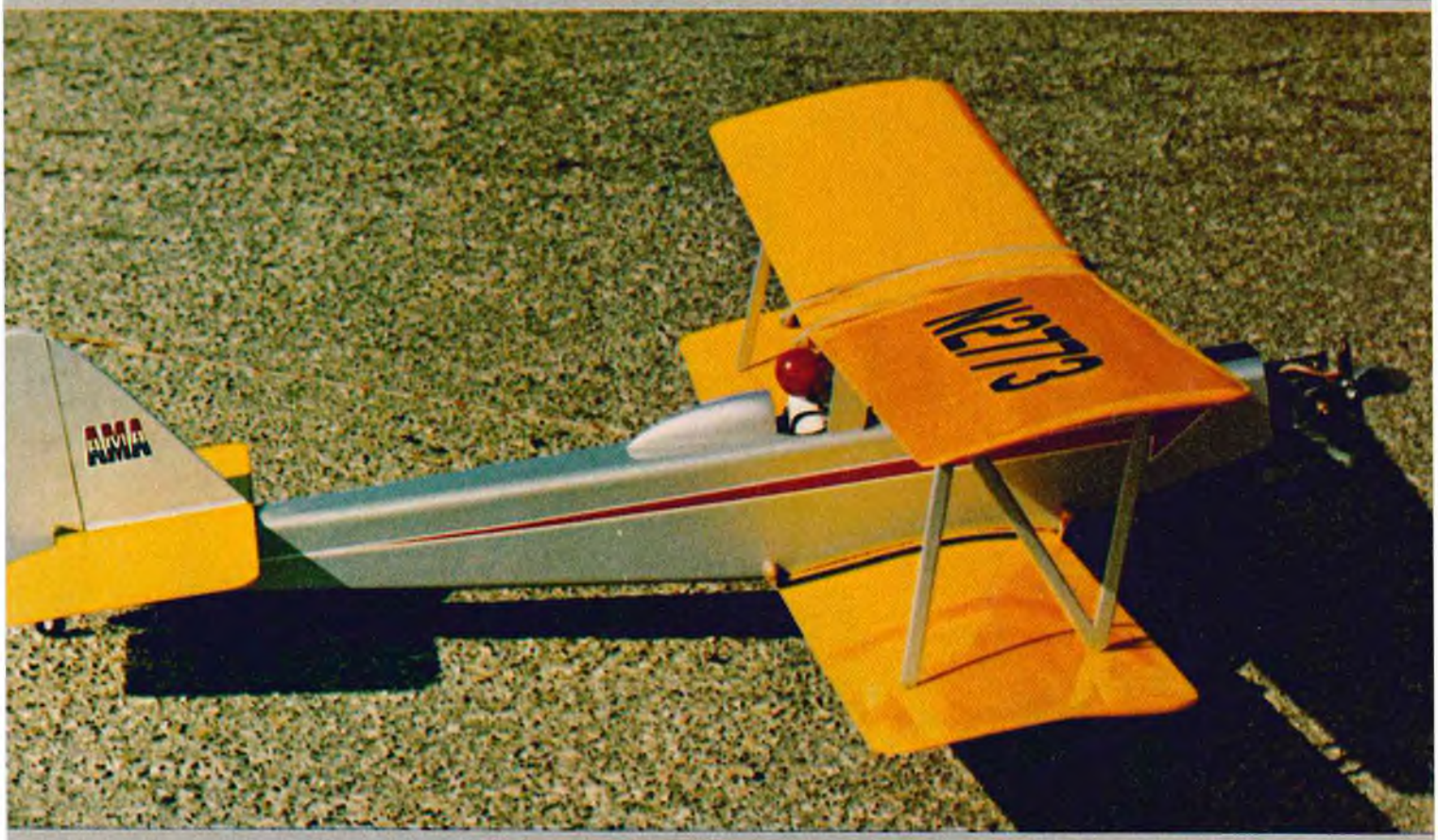
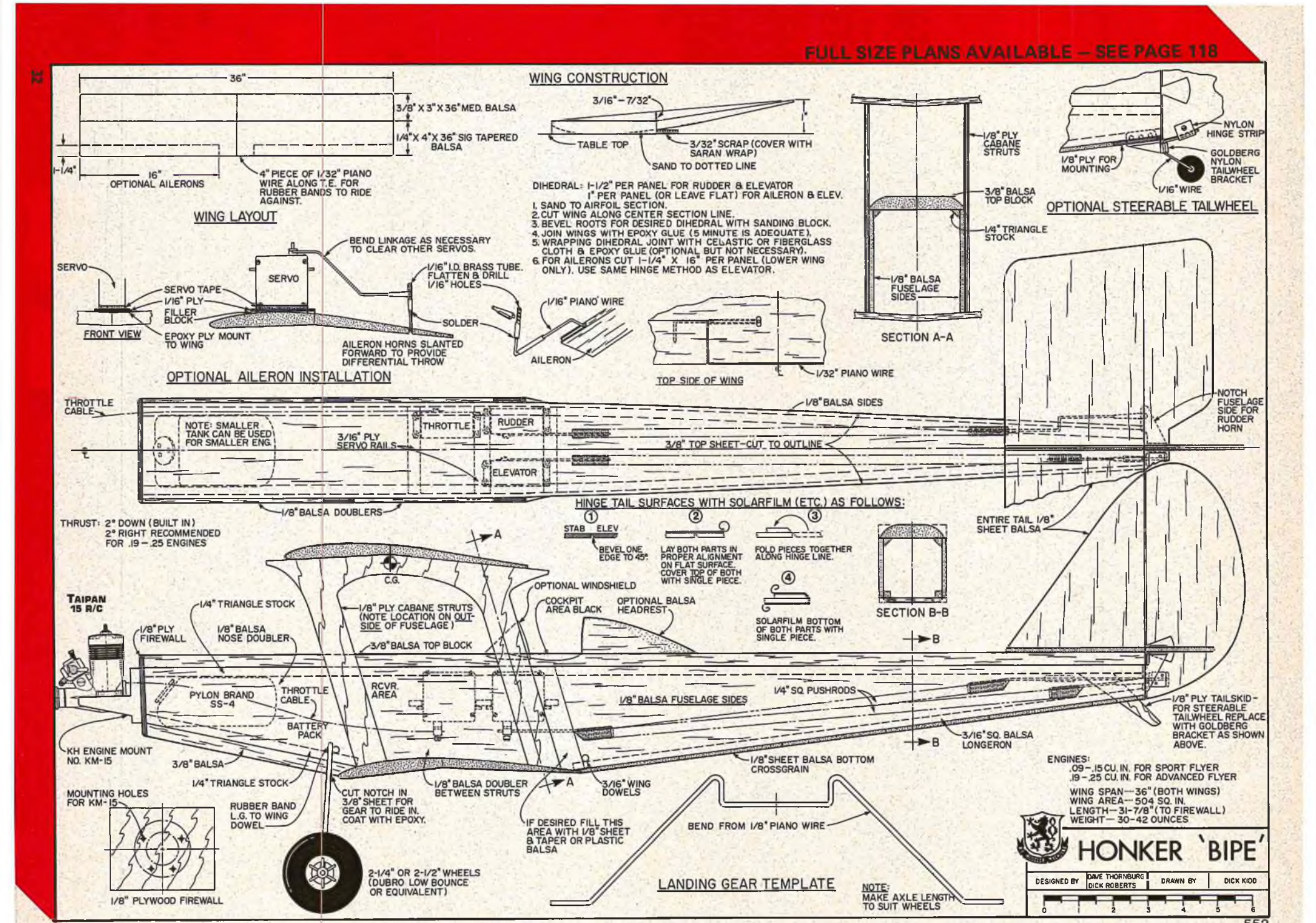
The Honker Bipe will do some of the wildest maneuvers you've ever seen with a .15, yet is light enough to thermal. And, why not? It was designed by a sailplane manufacturer.

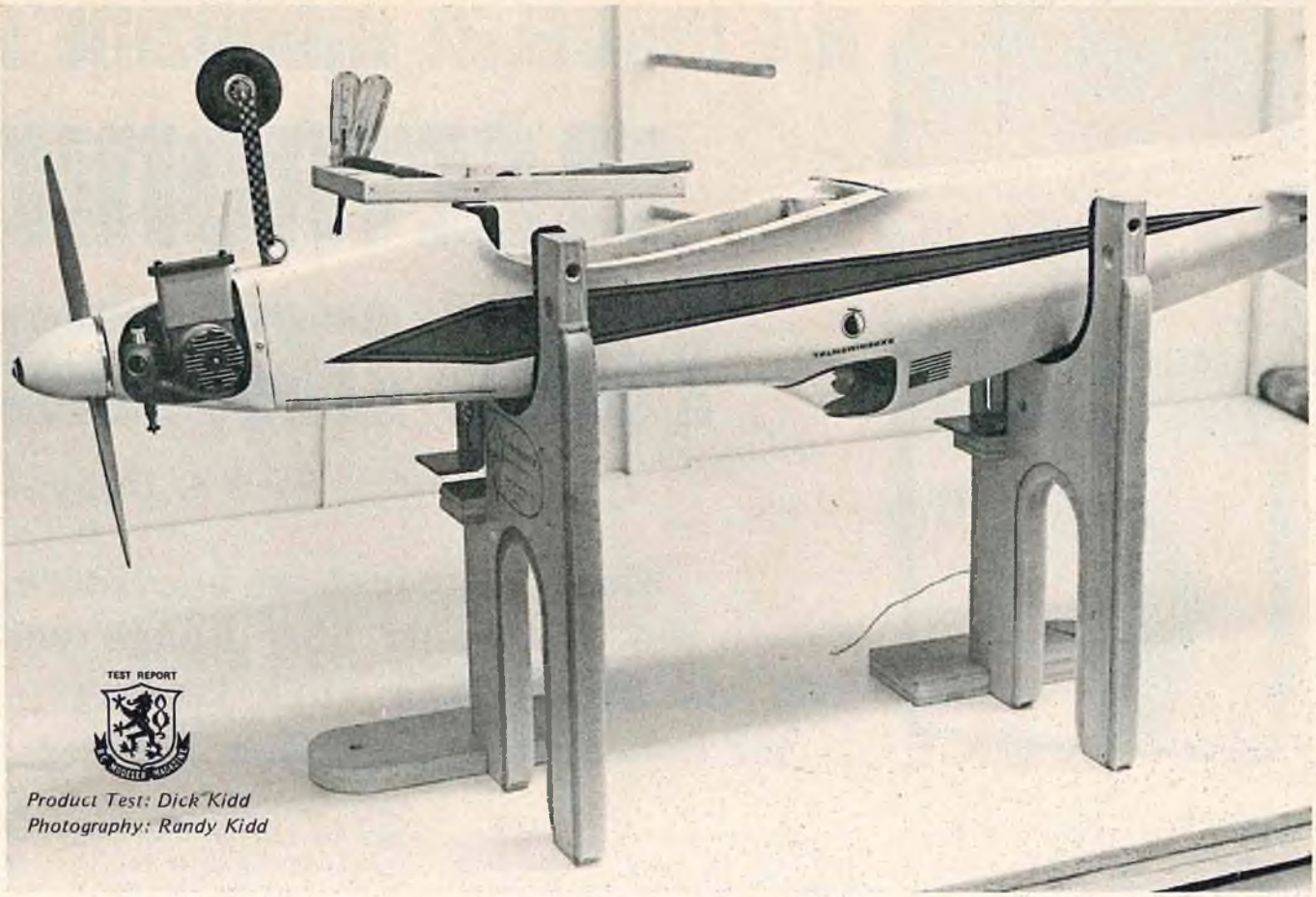
BY DAVE THORNBURG & DICK ROBERTS

For people driven by a relentless mania to build machines that will perform every maneuver vertically.....



.....or for realistic performance at trainer-like speeds and a floating glide that almost never quits.


WING LAYOUT
36"
3/8" X 3" X 36" MED. BALSA
1/4" X 4" X 36" SIG TAPERED BALSA
1-1/4"
16" OPTIONAL AILERONS
4" PIECE OF 1/32" PIANO WIRE ALONG T.E. FOR RUBBER BANDS TO RIDE AGAINST.
WING CONSTRUCTION
3/16" - 7/32"
TABLE TOP
3/32" SCRAP (COVER WITH SARAN WRAP)
SAND TO DOTTED LINE
DIHEDRAL: 1-1/2" PER PANEL FOR RUDDER & ELEVATOR
1" PER PANEL (OR LEAVE FLAT) FOR AILERON & ELEV.
1. SAND TO AIRFOIL SECTION.
2. CUT WING ALONG CENTER SECTION LINE.
3. BEVEL ROOTS FOR DESIRED DIHEDRAL WITH SANDING BLOCK.
4. JOIN WINGS WITH EPOXY GLUE (5 MINUTE IS ADEQUATE).
5. WRAPPING DIHEDRAL JOINT WITH CELASTIC OR FIBERGLASS CLOTH & EPOXY GLUE (OPTIONAL BUT NOT NECESSARY).
6. FOR AILERONS CUT 1-1/4" X 16" PER PANEL (LOWER WING ONLY). USE SAME HINGE METHOD AS ELEVATOR.
1/8" PLY CABANE STRUTS
3/8" BALSA TOP BLOCK
1/4" TRIANGLE STOCK
1/8" BALSA FUSELAGE SIDES
SECTION A-A
NYLON HINGE STRIP
GOLDBERG NYLON TAILWHEEL BRACKET
1/8" PLY FOR MOUNTING
1/16" WIRE
OPTIONAL STEERABLE TAILWHEEL
SERVO
SERVO TAPE
1/16" PLY
FILLER BLOCK
FRONT VIEW
EPOXY PLY MOUNT TO WING
BEND LINKAGE AS NECESSARY TO CLEAR OTHER SERVOS.
1/16" I.D. BRASS TUBE. FLATTEN & DRILL 1/16" HOLES
SOLDER
AILERON HORNS SLANTED FORWARD TO PROVIDE DIFFERENTIAL THROW
1/16" PIANO WIRE
AILERON
OPTIONAL AILERON INSTALLATION
1/32" PIANO WIRE
TOP SIDE OF WING
THROTTLE CABLE
NOTE: SMALLER TANK CAN BE USED FOR SMALLER ENG.
3/16" PLY SERVO RAILS
THROTTLE
RUDDER
ELEVATOR
1/8" BALSA SIDES
3/8" TOP SHEET-CUT TO OUTLINE
1/8" BALSA DOUBLERS
NOTCH FUSELAGE SIDE FOR RUDDER HORN
ENTIRE TAIL 1/8" SHEET BALSA
THRUST: 2° DOWN (BUILT IN)
2° RIGHT RECOMMENDED FOR .19 - .25 ENGINES
HINGE TAIL SURFACES WITH SOLARFILM (ETC.) AS FOLLOWS:
1 STAB ELEV
BEVEL ONE EDGE TO 45°
2
LAY BOTH PARTS IN PROPER ALIGNMENT ON FLAT SURFACE. COVER TOP OF BOTH WITH SINGLE PIECE.
3
FOLD PIECES TOGETHER ALONG HINGE LINE.
4
SOLARFILM BOTTOM OF BOTH PARTS WITH SINGLE PIECE.
SECTION B-B
TAIPAN 15 R/C
C.G.
OPTIONAL WINDSHIELD
COCKPIT AREA BLACK
OPTIONAL BALSA HEADREST
1/4" TRIANGLE STOCK
1/8" PLY CABANE STRUTS (NOTE LOCATION ON OUTSIDE OF FUSELAGE)
1/8" PLY FIREWALL
1/8" BALSA NOSE DOUBLER
3/8" BALSA TOP BLOCK
PYLON BRAND SS-4
THROTTLE CABLE
RCVR. AREA
BATTERY PACK
1/8" BALSA FUSELAGE SIDES
1/4" SQ. PUSHRODS
1/8" PLY TAILSKID - FOR STEERABLE TAILWHEEL REPLACE WITH GOLDBERG BRACKET AS SHOWN ABOVE.
3/16" SQ. BALSA LONGERON
KH ENGINE MOUNT NO. KM-15
3/8" BALSA
1/4" TRIANGLE STOCK
1/8" BALSA DOUBLER BETWEEN STRUTS
3/16" WING DOWELS
1/8" SHEET BALSA BOTTOM CROSSGRAIN
ENGINES:
.09 - .15 CU. IN. FOR SPORT FLYER
.19 - .25 CU. IN. FOR ADVANCED FLYER
WING SPAN — 36" (BOTH WINGS)
WING AREA — 504 SQ. IN.
LENGTH — 31-7/8" (TO FIREWALL)
WEIGHT — 30-42 OUNCES
MOUNTING HOLES FOR KM-15
RUBBER BAND L.G. TO WING DOWEL
CUT NOTCH IN 3/8" SHEET FOR GEAR TO RIDE IN. COAT WITH EPOXY.
IF DESIRED FILL THIS AREA WITH 1/8" SHEET & TAPER OR PLASTIC BALSA
1/8" PLYWOOD FIREWALL
2-1/4" OR 2-1/2" WHEELS (DUBRO LOW BOUNCE OR EQUIVALENT)
BEND FROM 1/8" PIANO WIRE
LANDING GEAR TEMPLATE
NOTE: MAKE AXLE LENGTH TO SUIT WHEELS
HONKER 'BIPE'
DESIGNED BY DAVE THORNBURG DICK ROBERTS
DRAWN BY DICK KIDD
0 1 2 3 4 5 6



TEST REPORT

Product Test: Dick Kidd
Photography: Randy Kidd

RCM TESTS THE

BENCH MODEL CADDY

● One of the most useful shop accessories that we have tested to date is the Bench Model Caddy from Creekmore Model Products, 2236 Lysander Avenue, Simi, California 93065. This unit is designed to mount to your workbench and allows you to hold your aircraft fuselage and/or wing while installing radio equipment or making general repairs without the "hangar rash" usually associated with this type of operation.

As can be seen from our photographs, the fuselage can be held in the Caddy Cradles and, by reversing the Caddys, the wing can be inserted for the installation of the ailerons and hinges, etc. The Bench Caddy is clamped onto the edge of your table or, for workbenches with no ledge, or if the ledge is too thick, the Caddy support brackets can be attached to the top of the bench with the screws provided with the kit. When attaching them to the bench, be sure to place them the correct distance apart so the fuselage fits conveniently in the Caddy Cradles.

The Creekmore Bench Caddy also has a work tray which holds tools and small parts conveniently at hand. To add to the convenience of this shop

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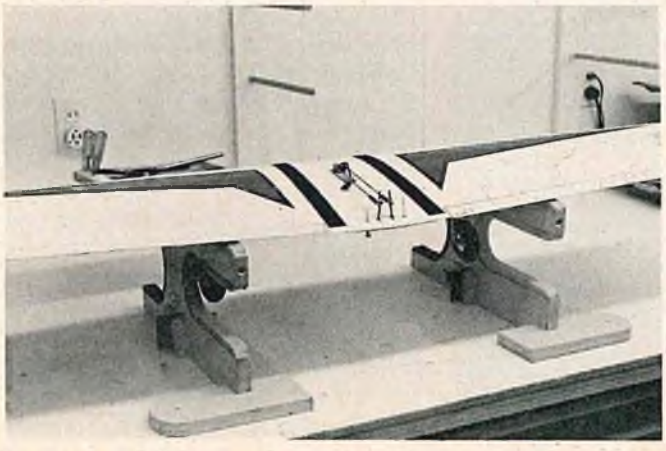
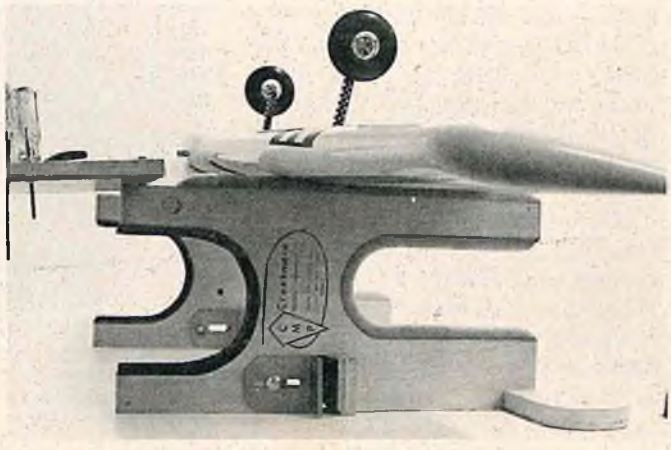
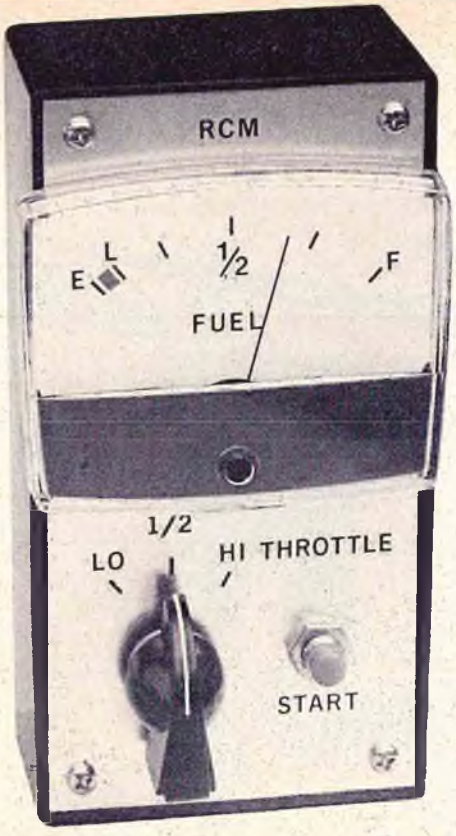






R/C MODELER MAGAZINE'S ELECTRONIC FUEL GAUGE

By J.P. Dobyns

More than just an accessory, the Electronic Fuel Gauge will help you avoid dead stick landings··· for helicopter pilots, it's a must !

● Imagine a fuel gauge on top of your transmitter. Your R/C plane is tooling around in the blue. How much gas do you have left? You glance at the fuel gauge; it shows you have three-quarters of a tank to go. You glance at your gauge later and see you have a quarter of a tank left. A few minutes later your gauge's needle is pointing to L. The L stands for **Low Fuel** or LAND! (Take your pick). The whole idea of this project is to help you avoid dead stick landings. A fuel gauge that tells you where you stand at any moment also keeps you from running dry a half mile out, fifty feet over a corn field. For helicopter pilots, it's an absolute must!

Does this mean you've installed a telemetry system aboard your plane that radios the fuel level to the ground? No! Under current FCC regulations, that would be illegal. What you're using is RCM's Electronic Fuel Gauge! You have an actual gauge, similar to the ones used in full size aircraft. There are no buzzers or flashing lights involved; you just read the gauge.

The unit has three throttle settings: LO, 1/2, and HI. LO gives you 14 minutes from F (full) to L (LAND!). 1/2 gives you 10 minutes. HI provides 6 minutes. In each case, the meter needle will take several more minutes to drop from L to E (empty). Furthermore, you can alter these timing periods to suit yourself.

To use the gauge, you decide in advance how you're going to fly. If you intend to fly mostly at 1/3 to 1/4 throttle, you pre-select LO THROTTLE. If you intend to go wide open, it's HI. 1/2 THROTTLE is the right setting for an average flight, provided you're using a standard size fuel tank (see Figure 7 chart).

To start the timing period, just press the red button for one second before taking off. Note that there is no on/off switch for this project: You don't need one – the only time the battery is in the circuit is when you press that red button.

That little red button works wonders. It's also an instant **reset** button. Let's say you began a flight, but your engine leaned out after a minute. You retrieved your plane and got her going again at a richer needle valve setting. You look at your fuel gauge, and it shows three-quarters of a tank to go. How do you reset it? Press the red button! The meter needle will go to F. Don't forget though, that your **tank** is supposed to be full.

Want to know the condition of your fuel gauge battery? With the meter needle on E., press the red button for one second (mentally say, "Thousand one"). If the meter needle stops short of F, the battery is weak. However, you can stretch that battery by simply holding the red button down until the meter needle finally reads on F. Eventually it's going to take quite a while for a weak battery to stretch out to F, and this is the time to replace it.

This is an easy project. You can probably build the full size version on a Saturday morning and still have time to pursue your favorite magazine. We say full size version because there are four possible versions, each one smal-

PARTS LIST FOR ELECTRONIC FUEL GAUGE FULL SIZE VERSION (unless otherwise noted in the text, all parts are avilable at Radio Shack)

B1	9-VDC transistor battery (RS 23-464)
	9 Volt battery clip (RS 270-325)
C1,2,3,4	1,000 uF, 16-VDC electrolytic capacitors (RS 272-1008)
C5	500 uF, 16-VDC electrolytic capacitor (RS 272-1007)
D1	4 Volt, 1/2-Watt zener diode (RS 276-620)
M1	0-50 uA panel meter (RS 22-051)
R1	33,000 ohm, 1/2-watt resistor (RS 271-000 series)
R2	47,000 ohm, 1/2-watt resistor (RS 271-000 series)
R3	470 ohm, 1/2-watt resistor (RS 271-000 series)
S1	SPST miniature pushbutton switch (RS 275-1547)
S2	SP, multiple position rotary switch (RS 275-1385) and pointer knob (RS 274-349)
	Utility box (RS 270-233)
	Aluminum tube spacers, if needed (RS 270-1393)

MISCELLANEOUS: No. 20 hook-up wire, black Letraset press-on letters, clear polyurethane varnish, perf board, white and red sticky MonoKote, etc.

ler than the preceding. There are a number of reasons for all these options. The full size version isn't exactly tiny and weighs 8 ounces. Then, if you're going to mount it on top of your transmitter, you'll have to drill holes in that beautiful transmitter case. The most convenient way to utilize the big version is to bolt it to your field box. The large meter is easily read at a ten foot distance; or more, if you have eagle eyes.

Alternately you could bolt an L-bracket to the back of the case and have the bracket serve as an angle stand. Then you can set your gauge on the ground. Still, if you don't mind holes in your transmitter and the extra weight, the big gauge stands high on your transmitter, a cinch to read at a glance. It's up to you to decide what gauge you want: big, miniature, subminiature, or micro-mini. The advantages and disadvantages of each will be explained as we go along. Pick the one best suited to your needs.

One of the nice features of the big gauge is that it uses a rotary switch. This allows the LO, 1/2, and HI THROTTLE settings to be **in sequence**. The other versions don't have this feature.

Here's how the gauge works. A capacitor discharged through a resistor takes a specific length of time. By distorting a panel meter to the right with a zener diode bridge circuit, we can make the meter behave like a clock. Without the zener bridge circuit, the meter needle would drop quickly, then very slowly, and thus be useless to us. But, thanks to the genius who invented zener diodes, we RC'ers can now have the ultimate in flite timers.

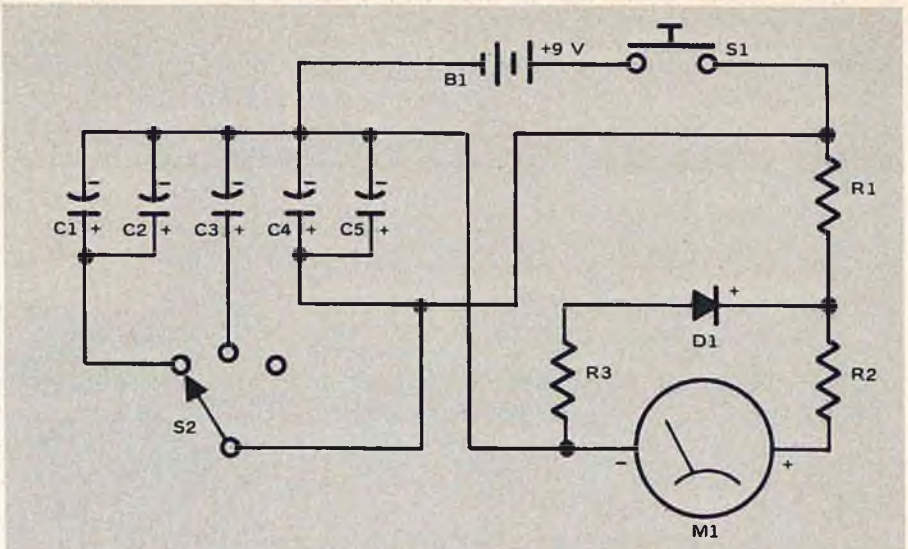


FIGURE 1: Schematic. Pressing pushbutton S1 charges the electrolytic capacitors. When the pushbutton is released, the capacitors discharge through the resistors and zener bridge circuit, driving the meter. Thus, the capacitors act as rechargeable batteries as well as timing components.

CONSTRUCTION

Refer to Figure 3 for the front panel modification, meter template, and perf board layout for the big version. To cut the meter hole, first drill out a 1/4" hole. Insert the blade of a saber saw equipped with a metal cutting blade, or use narrow-nose tin snips. The tin snips make the job very easy.

Assemble the components on the perf board exactly as shown, connecting the components under the board with No. 20 hook-up wire.

When the unit is ready to be tested, adjust the meter needle at its base, to as far **left** as the needle will go. Now press the red button. The meter needle should read slightly **more** than 50 uA. If the needle reads **less** than this, adjust the needle at its base until you get the correct reading. If your initial reading is well past 50 uA, it doesn't matter.

Now, remove the meter cover, use the drawing of the meter face in Figure 3 as a template, and cut this shape from sticky white MonoKote. Peel the backing off the MonoKote with a single-edge razor blade; and with the MonoKote stuck to the edge of the blade, position the cutout on the meter face. Air bubbles can be pressed out with a handkerchief over your forefinger. Next, position the template over the MonoKote and trace the markers with a ballpoint pen. When you remove the template, the lines will be indented in the MonoKote. All you have to do to finish the meter face is add black Letraset lettering. The marker lines can be made from Letraset capital I's. A tiny square of sticky red MonoKote placed between the E and L markers completes the job. When your meter needle is in that red square, you're dangerously low on fuel.

Complete assembly of the unit. Lay down the switch lettering with Letraset, then protect the letters with a coat of clear polyurethane varnish. The varnish should be allowed to dry for 24 hours.

By the way, be sure to flatten the solder lugs on **both** switches before

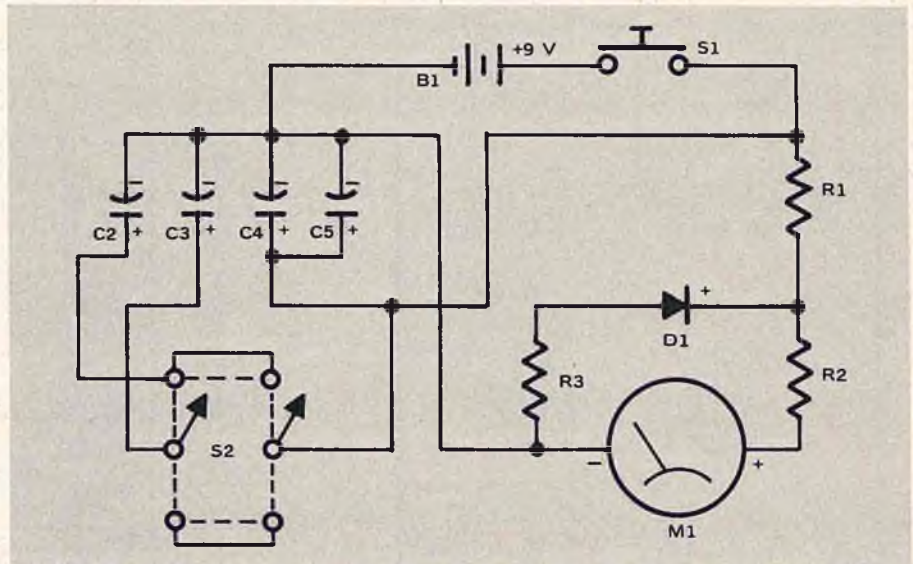
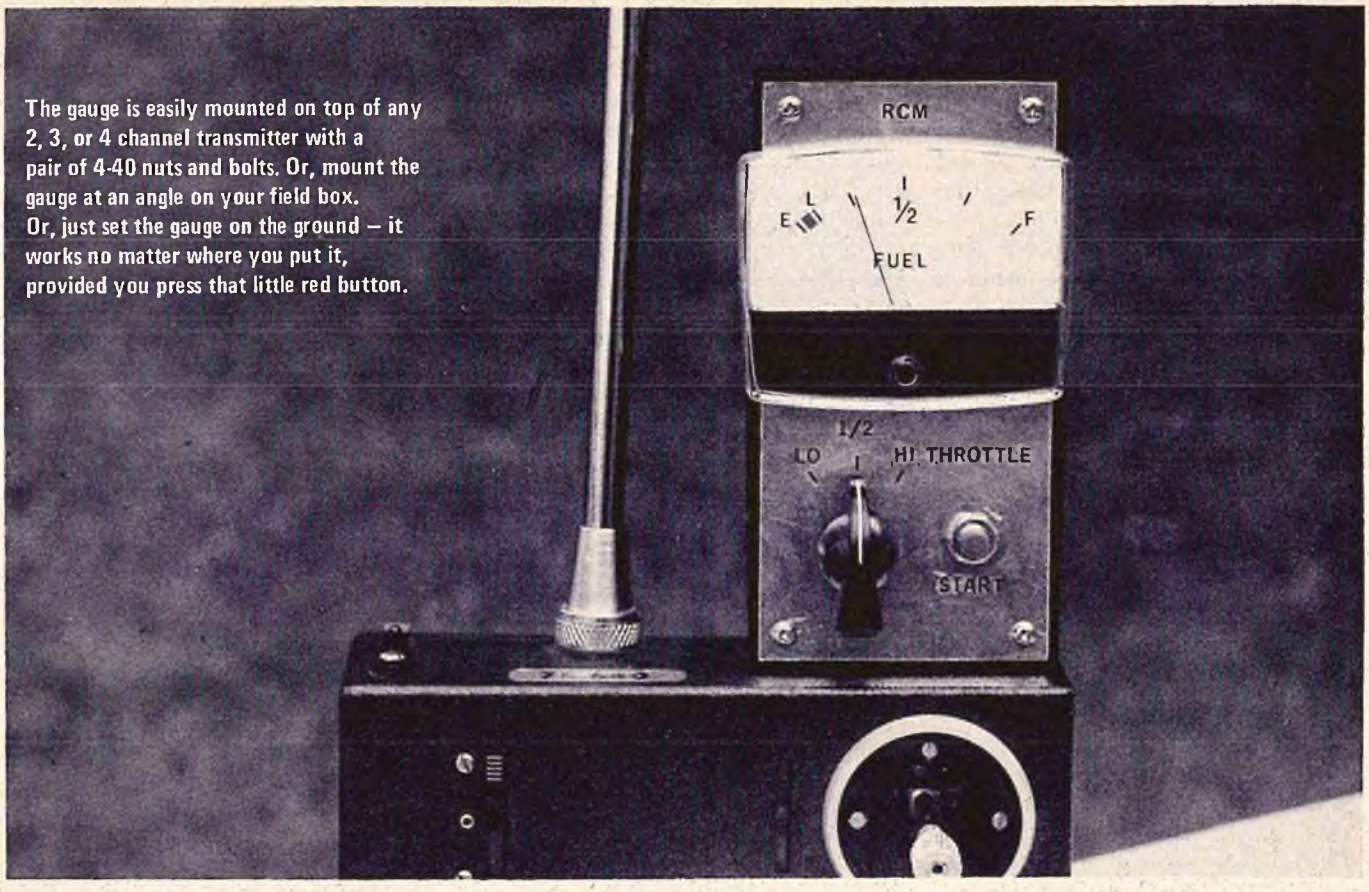


FIGURE 2: Schematic for minaturized fuel gauge. Note that capacitor C1 is eliminated, though the three timing periods remain the same. This space saving is made possible by the double pole switch. Be sure to connect the <u>outer</u> poles of the switch as shown.



The gauge is easily mounted on top of any 2, 3, or 4 channel transmitter with a pair of 4-40 nuts and bolts. Or, mount the gauge at an angle on your field box. Or, just set the gauge on the ground – it works no matter where you put it, provided you press that little red button.

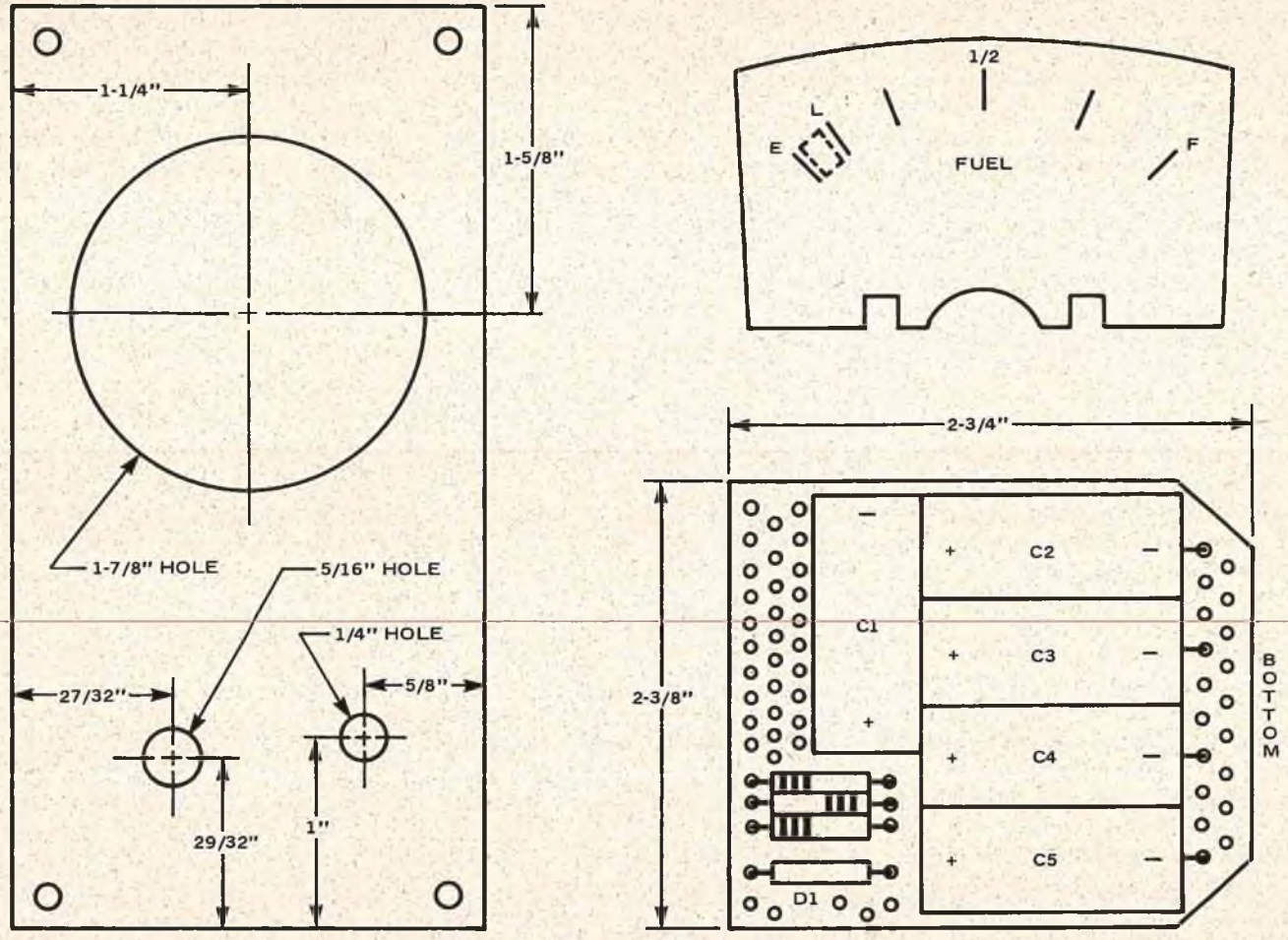


FIGURE 3: Panel modification, meter template, and perf board layout. Construction should follow these drawings closely to assure proper fit and operation.

final assembly; if you don't, the case won't close.

Note in the photos how the 9V battery is positioned at the top of the case. You have a right to ask, "Why can't we just use our transmitter battery?" You can, if your transmitter uses a 9V dry cell. You can't if your transmitter uses a 9.6V or 12V nickel cadmium cell; the higher voltage would require a re-deisgn of the circuit. Furthermore, the smallest versions of the fuel gauge use a 15V battery; and these are the versions best suited to bolting or taping to your transmitter. The 9V versions with a self-contained battery are well suited for use bolted to a field box. So, let's forget your transmitter battery; it has enough to do, keeping your Tx up to snuff.

For those of you who may be tenderfoots in electronics; wires that cross each other in the schematic are **not** to be connected unless a black dot appears at the juncture.

You can mount the unit on top of your transmitter with a pair of 4-40 nuts and bolts. If you have a 6 channel Tx with switches on top of the case, you can still mount the gauge with aluminum-tube risers (see photo). The risers are available from Radio Shack. Use four risers and long 4-40 bolts.

A MINIATURE FUEL GAUGE

This version uses a smaller meter and one less capacitor and, therefore, costs less. Refer to Figure 2 for the schematic. There is no special parts list for this version at the end of the article, so pay close attention, please. The meter is a 0-50 uA miniature panel meter; Radio Shack 22-017. Remember to set the meter needle as far left as it will go; this must be done with all versions. However, this adjustment should be made with the meter cover **on**: don't pull off this plastic cover and just lock the needle to the left.

The utility box is Radio Shack 270-231. You don't use a rotary switch; you use a subminiature DPDT, neutral center switch: Radio Shack 275-1545. These are the only changes, except for the layout (see Figure 4). The timing periods are exactly the same.

The advantages of the miniature version are lighter weight, smaller size, and lower profile. The meter is large enough to read at an eight foot distance, if you elect to bolt the unit to a field box. Certainly if you own more than one transmitter, a field box ver-

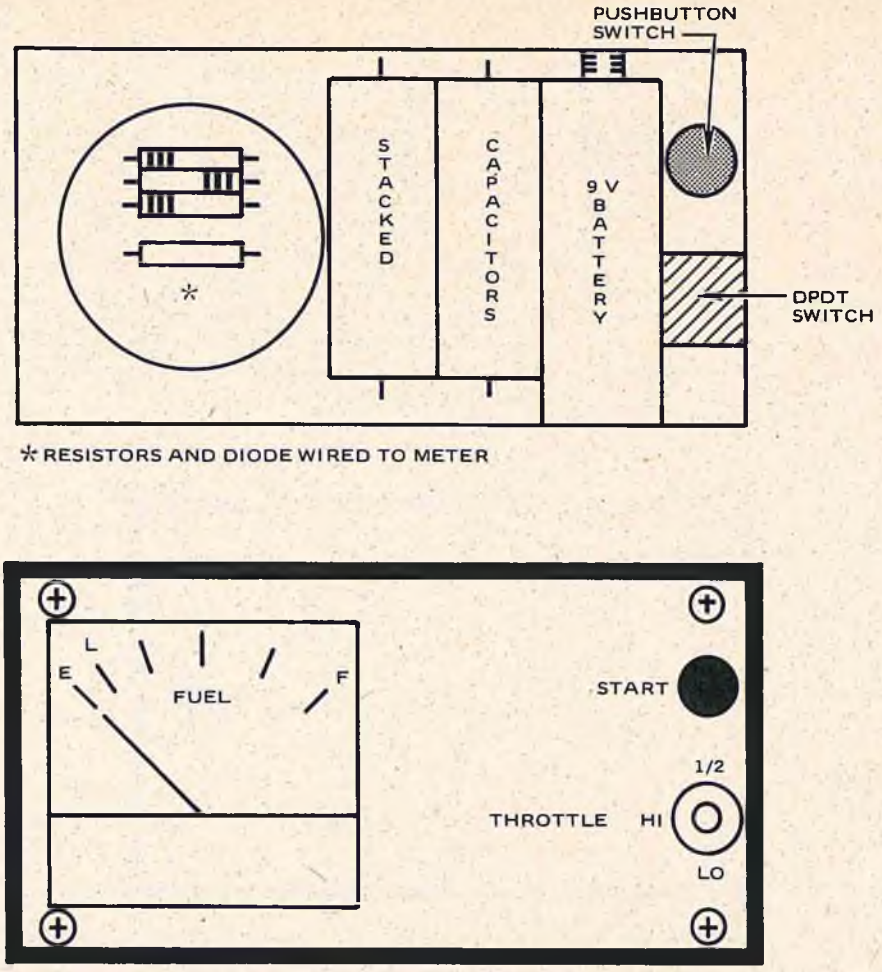
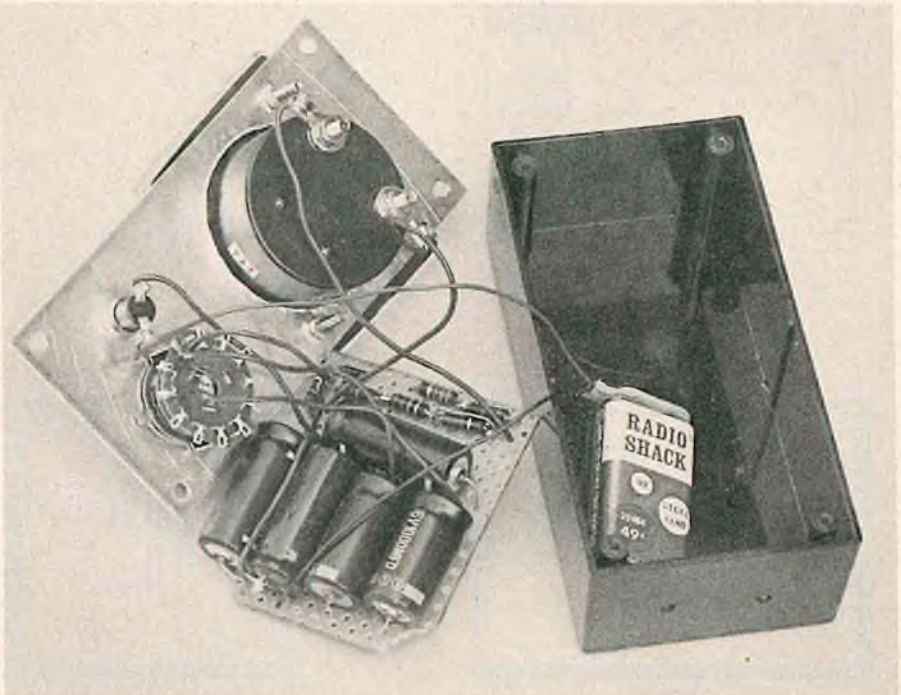
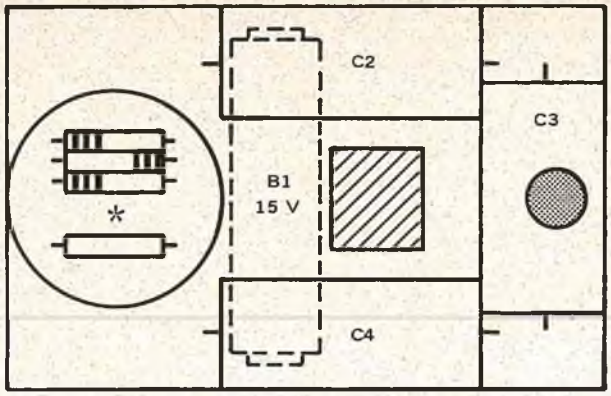


FIGURE 4: Suggested layout for miniature version. Meter is set as far left as it will go. The capacitors are stacked in the center. Battery stands on end, while switches are at extreme right.



Simplicity of circuit is obvious; it's mostly capacitors. Don't let all those resistors fool you; you'll only need three for your version. Reason for six resistors on original perf board was to experiment with different timing periods. Note how, on both the push button and rotary switches, the solder lugs are flattened; this is necessary to assure proper fit.



* RESISTORS AND DIODE WIRED TO METER

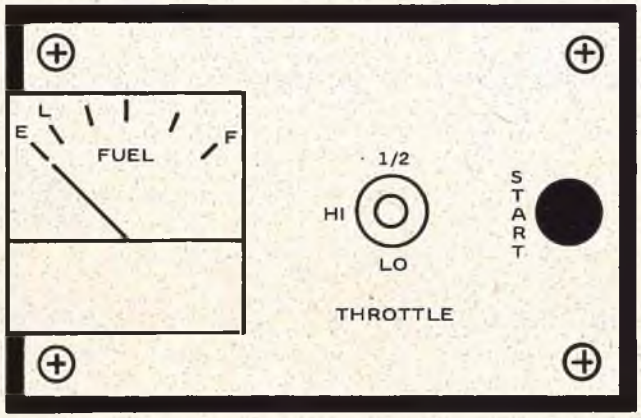
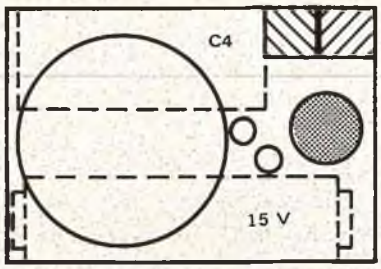


FIGURE 5: Suggested layout for subminiature version. Meter is set to extreme left. Shaded areas are switches. Tiny battery rests on top of C2 and C4. Note that C3 is a shorter, wider shape than C2 and C4 (see text for details).



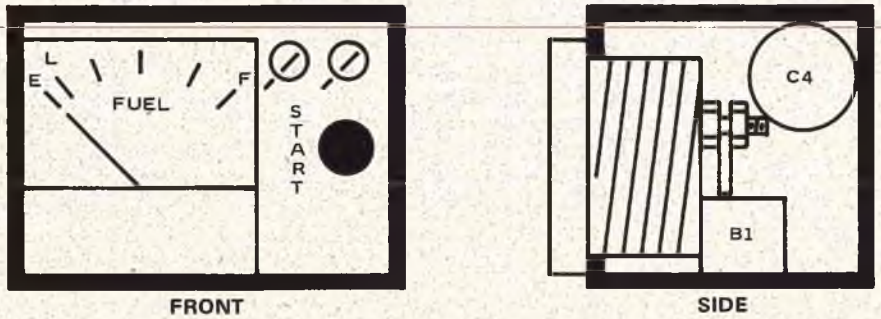


FIGURE 6: Suggested layout for micro-mini version. Only one capacitor is used. Shaded area at top right indicates 1/4" cube, screwdriver-adjust potentiometers. Tiny circles are the diode and bias resistor for diode.

sion seems a logical choice. However, the unit is small enough to bolt to the tops of most transmitters. But it's probably too large to tape to the front of a transmitter with double sided tape.

A SUBMINIATURE FUEL GAUGE

If what your heart pines for is a gauge you can tape to the front of your transmitter, refer to the design in Figure 5. Note that this version uses a 15 Volt battery (Radio Shack 23-509). The higher voltage allows us to drop off another capacitor. Referring to Figure 2, scratch out C5 with a ball-point pen. C2 and C3 have to be changed to 500 uF, 16-VDC electrolytics (Radio Shack 272-1007). C4 remains the same at 1,000 uF. R1 has to be changed to 47,000 ohms (1/2 watt). R2 has to be changed to 39,000 ohms (1/2 watt). The timing periods are almost the same as in the two previous versions.

The utility box is Radio Shack 270-230. The switch is Radio Shack 275-1545. The meter is a Calectro miniature, 0-50 uA, available at large electronic stores, or direct from GC Electronics, Rockford, Illinois 61101.

The big disadvantage of this version is the battery. Although Radio Shack lists these batteries in their catalogue, not every outlet stocks them. You may have to order it. Also, to use the battery, you'll need to solder lead wires lightly, to the terminals, then epoxy the connections. This makes the battery a nuisance to replace; you'd have to cut the lead wires each time, strip the ends, solder, and epoxy; which means having long lead wires to start with.

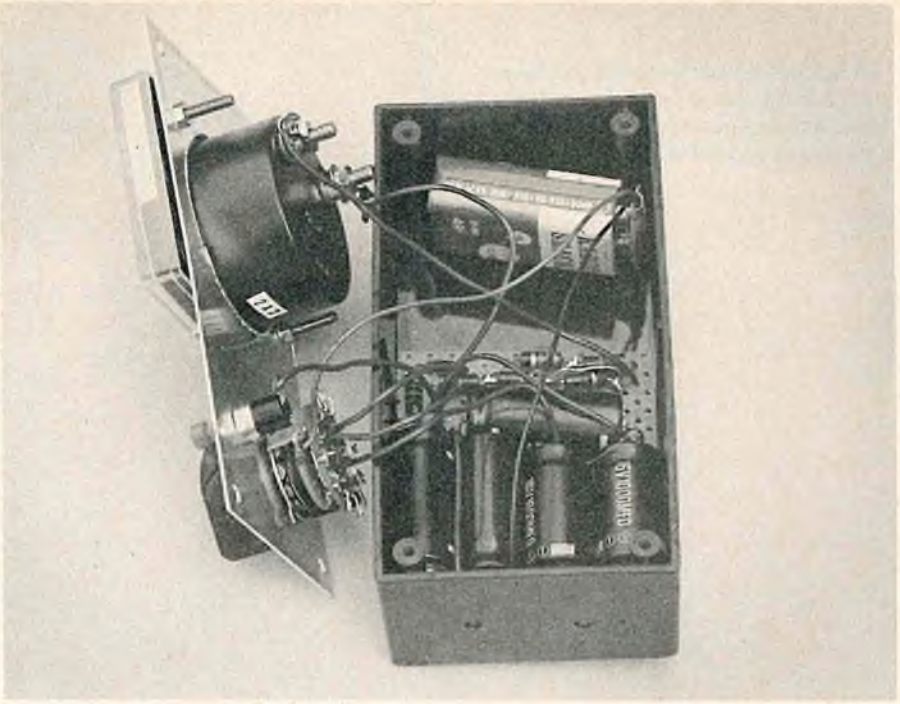
Here's another little problem. Note in Figure 5 that C3 is not the same length or diameter as the other two capacitors. You'll have to hunt around Radio Shack outlets to find one that size and shape. C3 has to be that size to fit in the end of the box, between the mounting posts.

Finally, the higher voltage makes R1 and R2 quite sensitive to variations in tolerance. If you construct this version, you may find that the meter needle stays at the far right for a considerable time, before it at last begins to fall. To correct this, increase R2 several thousand ohms. Just add a 3,300 or 3,900 ohm, 1/2 watt resistor between the plus side of the meter and R2.

MICRO-MINI FUEL GAUGE

The micro-mini version, Figure 6,

Component board fits at bottom of case, while battery snuggles in at the top. The fit is fairly close; close enough so that Figure 3 was drawn to help you fit everything successfully.



requires that you construct a box for it from 3/32" plywood. It, too, uses the 15 Volt battery (RS 23-509). Note that there is only one electrolytic capacitor (1,000 uF). Therefore, scratch out C2, C3, and C5 from Figure 2. Scratch out the DPDT switch; we can't use it. Change R1 to a 200,000 ohm miniature potentiometer. Change R2 to a 50,000 ohm miniature potentiometer. These potentiometers are 1/4" cubes with a set screw; you can buy these from Poly Paks, P.O. Box 942, South Lynnfield, Mass. 01940. The cubes sell two for $1.00, plus postage (stock No. 92CU1213).

The meter is a Calectro miniature, 0-50 uA – the same one used in the subminiature version.

This version provides a range variable from 6 to 20 minutes (F to L). The disadvantage, aside from the battery, is that you have to adjust two potentiometers. With R1 at 47,000 ohms and R2 at 39,000 ohms, the timing period from F to L is 6 minutes. With R1 at 120,000 ohms and R2 at 31,000 ohms, the period is 20 minutes. The in-betweens are up to you, stout hearted experimenter. You'll find an ohmmeter very useful. Or, just toy with different potentiometer settings and sit back and see what time periods you get.

A great advantage of this unit is that you can make precision settings. Let's say you discover through experience that your typical flight runs 9 minutes, 10 seconds, and 1 mill. All you do then is set your fuel gauge accordingly.

The severe disadvantage is that you have no throttle-select switch. You also have to build, glue and paint your own box, then figure out a way to make the bottom of the box remov-

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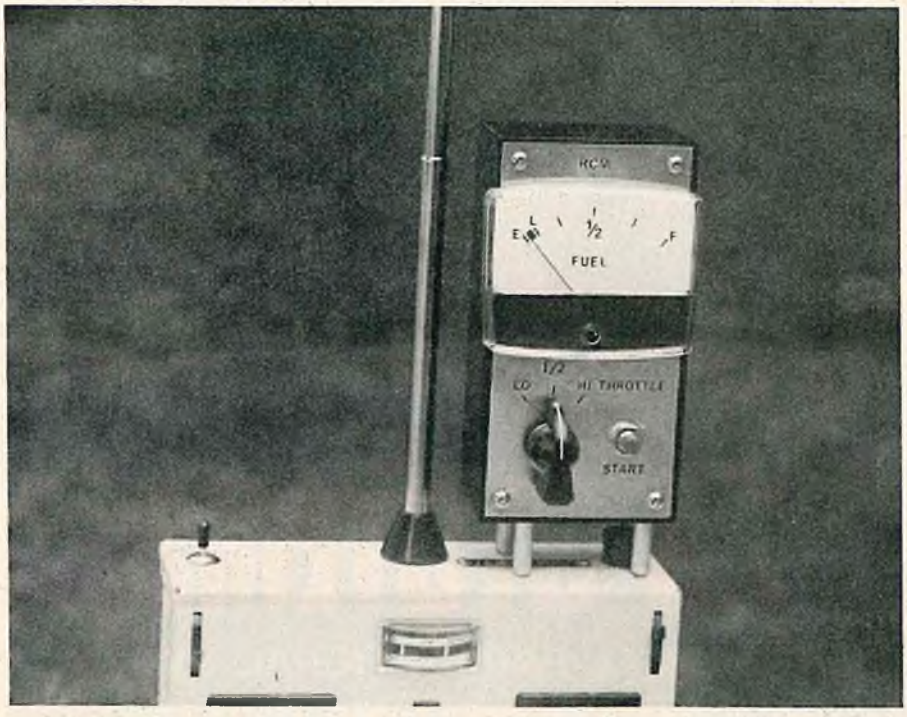
STANDARD ENGINE/TANK SIZES FOR R/C

ENGINE	TANK – OZ.	ENGINE	TANK – OZ.
.05	1	.35	6
.10	2	.40	8
.15	3	.45	8
.20	4	.50	10
.25	4	.55	10
.30*	6	.60	12

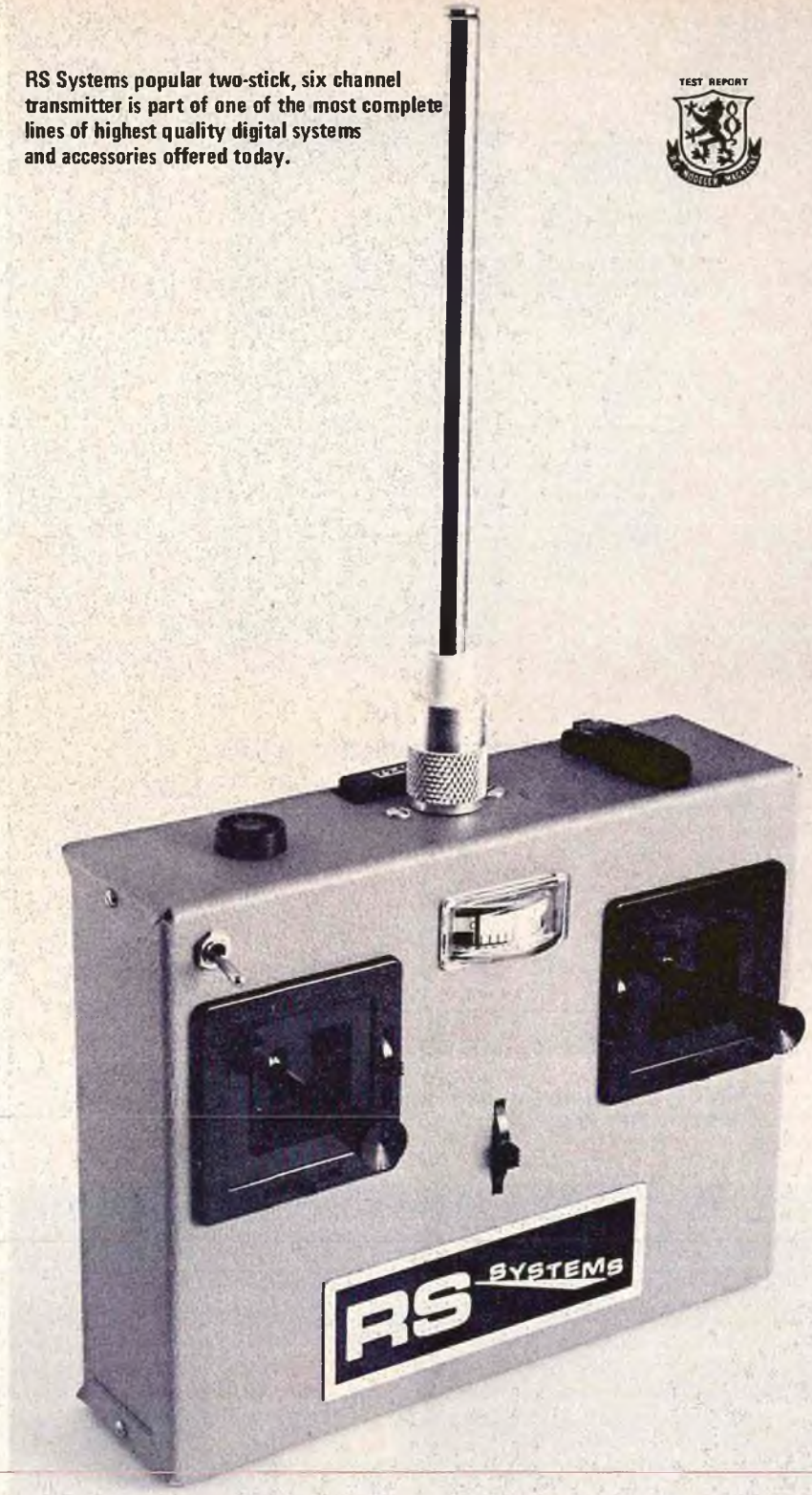
* WANKEL .30 SHOULD USE 8 OZ. TANK

FIGURE 7: Consult this chart for correct fuel tank size to use with Electronic Fuel Gauge.



If you have a 5 or 6 channel transmitter with switches on top of the Tx box, you can still mount the Electronic Fuel Gauge with four aluminum tube-spacers (see text and parts list for details). Better yet, try building a subminiature version of the gauge; you can tape that to the front of your transmitter (now you have to read the text).

RS Systems popular two-stick, six channel transmitter is part of one of the most complete lines of highest quality digital systems and accessories offered today.



R/C MODELER MAGAZINE TESTS

RS SYSTEMS

1974 DIGITAL PROPORTIONAL SYSTEM

● Approximately a year ago RS Systems provided us with a six channel single stick digital proportional system for test and evaluation. That particular radio saw duty in aircraft ranging all the way from the smallest .049 powered ship to .60 pattern aircraft of virtually every description. Since that time, and based on the performance of that system, RCM has purchased five additional RS Digital Guidance Systems for use in the many, many test projects we evaluate each month ranging from sport and pattern aircraft to helicopters. During that period of time, and with many hundreds of flights logged by these various radios, we have yet to experience any difficulty whatsoever. It was only coincidental, during a period of working with Du-Bro products on their new Shark helicopter, that we discovered that the RS Digital radio is one of the few systems currently available that will work on 72 mHz in the all-metal helicopter without difficulty. For the purpose of this review, RCM turned to our old friend and former Technical Editor Don Mathes, who is an engineer for RS Systems, for assistance in describing the advanced and unique features of this proportional system.

The Digital Guidance System from RS Systems has been designed to take full advantage of the many new developments in the field of integrated circuitry. Incorporation of integrated circuits throughout the complete system has resulted in performance never before achieved in digital remote control.

The transmitter electronics have been completely redesigned, resulting in several unique and exclusive features. The "totally integrated module" concept in both electronic and mechanical assemblies is truly a first within our industry. Plug-in encoder and RF Boards plus plug-in stick and harness assemblies make this system the most flexible and serviceable system available. Most normal service operations may be accomplished by plugging in a replacement module.

The frequency change capability has been further improved by RS. The transmitter and receiver modules are pre-tuned and matched for any frequency in the 27 mHz, 53 mHz, or 72 mHz bands. The advantages of this system are immediately apparent. There is no compromise in receiver tuning or selectivity and no loss of transmitter output power. For the first time, it is now possible for you to

The RS Systems 3-channel digital is designed for the sailplane and sport flying enthusiast.

The 6-channel single stick, choice of many sport as well as top competition flyers.

change frequencies in the 72 mHz band - - - legally! The AFD (automatic frequency display) system employed by RS ends the confusion factor in changing frequencies. When the transmitter RF module is changed the operating frequency is automatically displayed at the top of the transmitter main frame.

RS's new integrated circuit encoder represents a breakthrough in design technology. Three integrated circuits are combined to make this encoder one of the most efficient and stable circuits since the original digital concept. All encoded channels share a single timing circuit instead of the usual use of a separate timing stage per channel. Unlike other systems using this basic principle, the RS encoder uses a single capacitor to time both the On and Off times of the encoded information. It is impossible to have interaction between channels when using this principle.

In other transmitters utilizing the open gimbal concept with electronic trim, total servo travel changes as much as ten per cent with trim position. In addition, the trim is inherently non-linear. At RS Systems, they had the patience and determination to create a method whereby these problems are eliminated. As a result, total servo travel is unaffected by trim settings and the trim function is completely linear.

All models of the new RS transmitter feature the popular "open gimbal" stick assemblies which have been improved upon to make operation smoother than ever before. A completely new control potentiometer manufactured of thick film conductive plastic insures a reliable, homogenous, and virtually wear-proof resistance element with 1% or less dynamic noise and 5% independent linearity. A precision rhodium plated wiper complements this assembly with results in outstanding electrical and mechnical life. These potentiomenters are manufactured for RS Systems to MIL-R-94 specifications. RS Systems is so confident of this important and vital feature, they guarantee their control potentiometers **forever!**

Also offered as an accessory is a master-trainer ("buddy-box"), system at slight additional cost. All that is required to use this function is connecting the trainer cable between two transmitters. This automatically turns off the trainer transmitter carrier and initiates the other as the master. The instructor has control until he presses the button transferring control to the trainer. When the instructor releases the button he assumes control. Transmitters need not be on the same frequency. Two stick transmitters may be used together regardless of mode and are compatible with the single stick and three channel models.

RS Systems continues its exclusive use of a coaxial transmitter antenna connector, resulting in optimum transfer of RF energy to the antenna. While

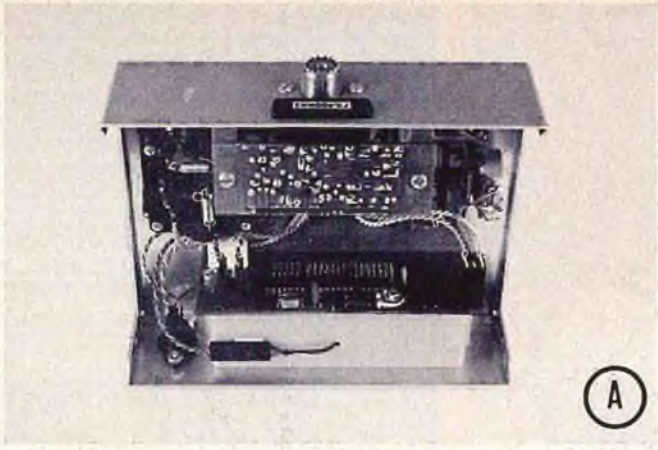
TRANSMITTER:
Power Input (Total): 1.300 watts
Power Input to Final R.F. Amplifier: 1 watt
R.F. Power Output: .72 watts
Operating Voltage: 9.6 vdc nominal
Operating Temperature Range: –10°F to +150°F
Frequency Tolerance: plus or minus .0025%
Frequencies Available: All 27 mHz, 6 meter and 72 mHz frequencies
Operation Time: 4 hours cont.
Neutral Time: 1.5 milliseconds
Control Stick Modes: Mode I or Mode II – Dual Stick Only
Size: 7" x 5.6" x 1.9" (17.8 x 14.2 x 4.8cm)
Weight: 1 lb., 12 oz. (.78 kg)
Antenna: 8 section, 42" (106.7cm) collapsible to 7" (17.8cm)
Frame Time: 16 milliseconds (locked)
Modulation Type: Pulse Position
Modulation Percentage: 100%
Interaction between channels: None
Construction: Modular
Control Potentiometers: . Thick film conductive plastic

RECEIVER:
Sensitivity: Less than 2 microvolts for full control
Current Drain: 25 milliamperes
Voltage Stability: Full control to 3.6 volts
Automatic Gain Control: 100 db min. dynamic range
Selectivity: 6 db down @ 3KC
Image Rejection: 6KC
Second Harmonic and all other spurious signal rejection: 80 db min.
Operating Temperature Range: –10° to +150°F
Available Frequencies: Same as transmitter
Size: .9" x .850" x 2.2" (23mm x 21mm x 57mm)
Weight: 1-1/3 oz. (39 grams)
Power Supply: 4.8 vdc

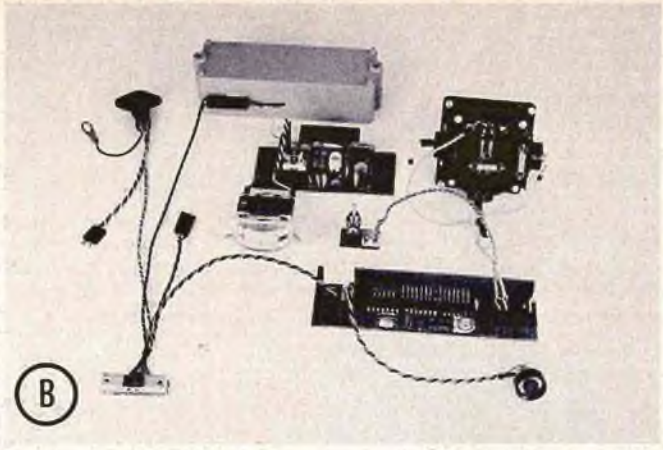
SERVO – LDR-2:
Size: 1.5" x .730" x 1.480" (38mm x 19mm x 37mm) exclusive of mounting lugs and output wheel)
Weight: 1.25 oz. (35 grams)
Output: Rotary
Output Power: 4 lbs. (1.8 kg)
Input Current: 8 milliamps
Stall Current: 400 milliamps
Neutral Time: 1.5 milliseconds
Response Time: 16 milliseconds maximum
Transit Time: .35 seconds (350 milliseconds)
Travel: ±50 degrees
Centering Accuracy: ±.3 percent
Gear Backlash: .0005" max.
Operating Temp. Range: –10° to +150°F
Feedback Element: Thick film conductive plastic
Amplifier: Monolythic integrated circuit
Mounting: Lugs integral with servo case

SERVO – LDR-3:
Size: 1.8" x .870" x 1.54" (46mm x 22mm x 39mm) exclusive of mounting lugs and outputs
Weight: 1.5 oz. (42 grams)
Output: Rotary, dual linear or both
Output Power: 4.5 lbs. (2.025 kg)
All other specifications: Same as for LDR-2

AIRBORNE POWER SUPPLIES:
L4-S (4 cells – square)
Size: 1.3" x 1.3" x 2.2" (33mm x 33mm x 56mm)
Weight: 3¾ oz. including switch harness (105 gr)
Capacity: 500 milliampere hours
Charge Rate: 50 milliamperes
L4-F (4 cells – flat)
Size: 2.4" x .740" x 2.2" (61mm x 19mm x 56mm)
Weight: 3¾ oz. including switch harness (105 grams)
Capacity: 500 milliampere hours
Charge Rate: 50 milliamperes



A



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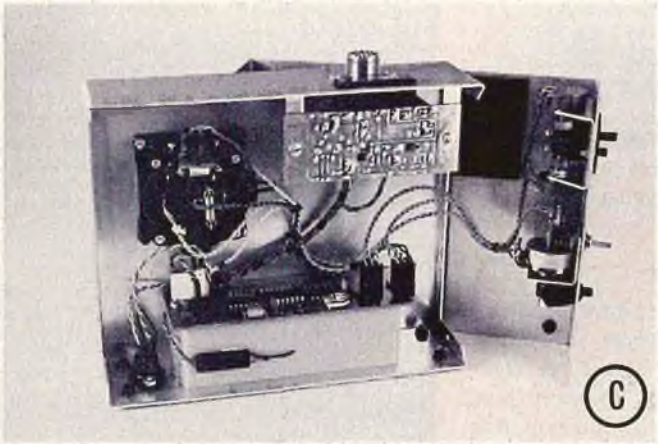

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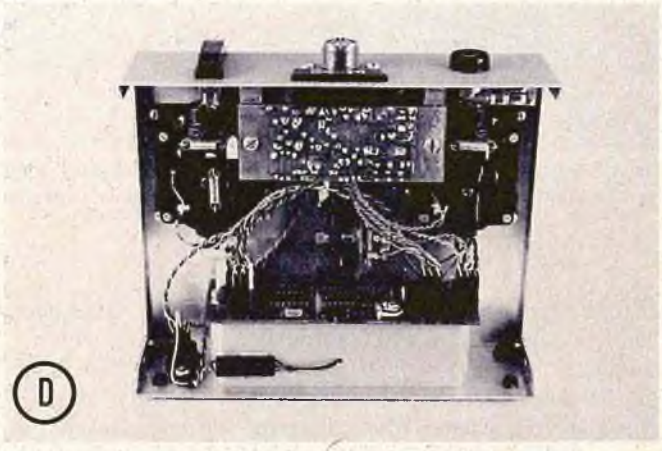

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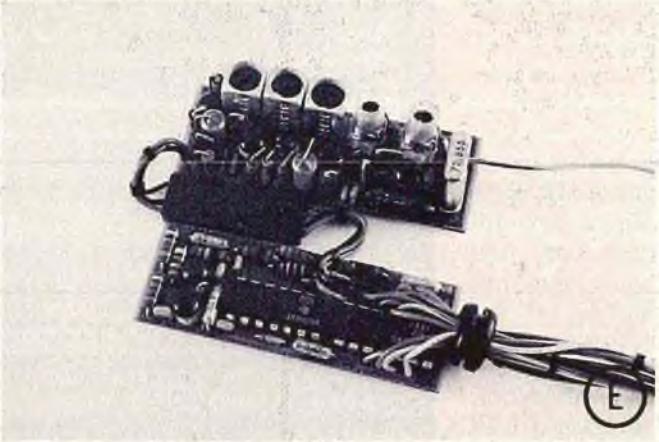
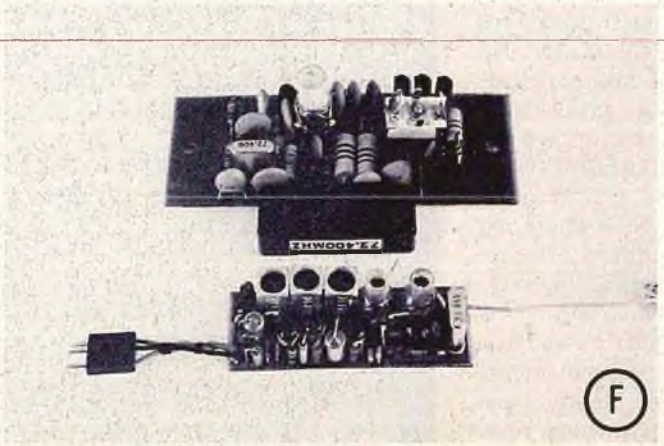


E

(A) Inside the RS 3-channel transmitter. Frequency display is automatic simply by changing the PC board and is permanently attached. Stick assemblies, PC boards, switch - - - all are modular plug-in units. (B) Modular units removed from Tx. (C) Single stick transmitter features one piece back without side plate due to modular concept. (D) Inside the 6 channel two-stick Tx. (E) The receiver with case removed. RF module, above, can be removed from decoder module by unplugging. (F) Frequency charging. Transmitter section above, receiver below. (G) The transmitter encoder board module is an example of careful engineering – three IC's, three output plugs.



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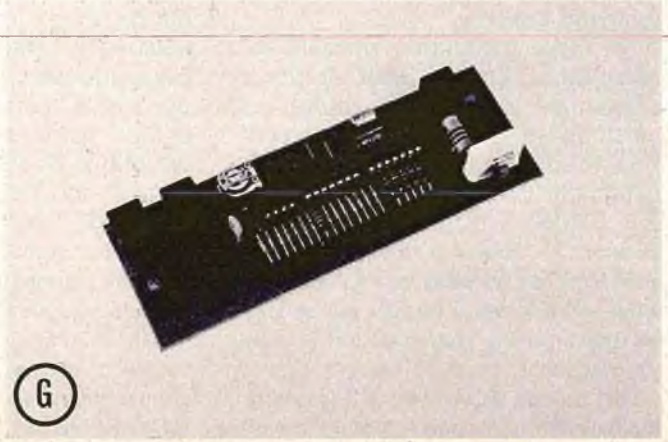

G

this connector is no doubt more expensive than that of their competitors it is also more efficient.

The RF module takes full advantage of FCC regulations allowing a full one watt input to the final amplifier. A 3 stage oscillator-buffer amplifier – final amplifier combination, results in an efficiency of 72% or .72 watts output. This RF section is unconditionally stable with the antenna extended, retracted, or removed.

The receiver-decoder modules have been completely re-designed for 1974. A two stage Butterworth filter provides maximum amplitude transfer characteristics to the mixer stage. Thompson-Ramo-Woodridge transformers are used in all IF stages with external silver mica resonating capacitors. These transformers are approximately five times more expensive than their imported counterparts. However, their temperature characteristics and long term stability are exceptional. Again, the RS Systems philosophy is evident, as cost seems always to be a secondary consideration to quality with them. Automatic gain control voltage is generated by the Class B second detector and applied to two IF stages. This allows a simple yet highly effective AGC system with capabilities of following signal excursions as great as 100 db (a variation of one hundred thousand to one) without overload or distortion. This receiver cannot be overloaded even with the receiver antenna wrapped **around** the transmitter antenna. All IF stages use emitter degeneration for excellent stability without using unpredictable neutralization techniques.

This receiver exhibits excellent sensitivity and cross modulation characteristics are exceptional.

All capacitors are either silver mica, monolythic, or tantalum throughout the entire airborne system, thereby eliminating all disc capacitors, the latter being a common source of failure. Passive series and shunt clipper systems plus noise integrators set thresholdvoltages to the decoder module. This circuit approaches the theoretical maximum for noise rejection while processing the desired information without distortion. A two stage discrete amplifier drives two TTL low power integrated circuits which separate the encoded information into individual channel outputs. A dual power supply decoupling technique completely isolates servo noise from the receiving system. A new automatic

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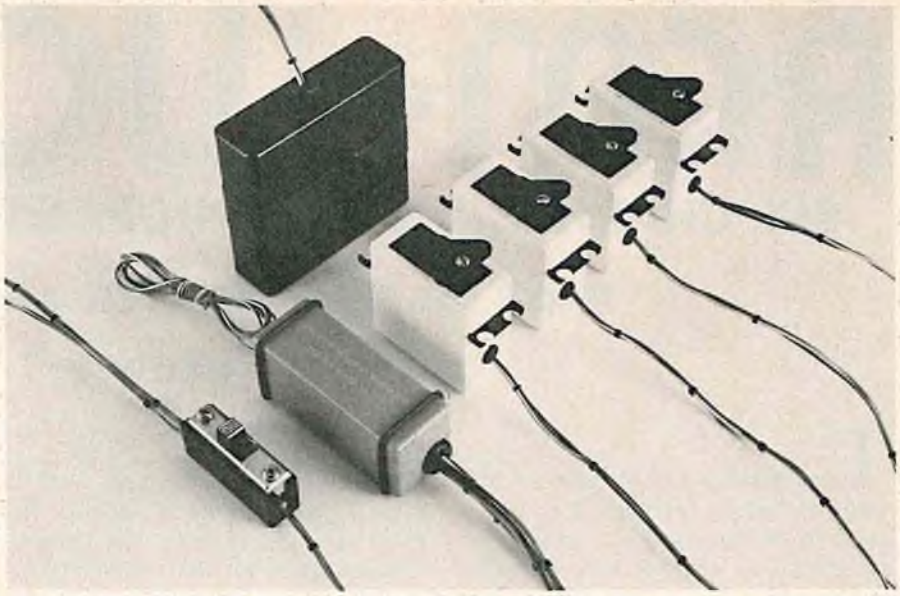
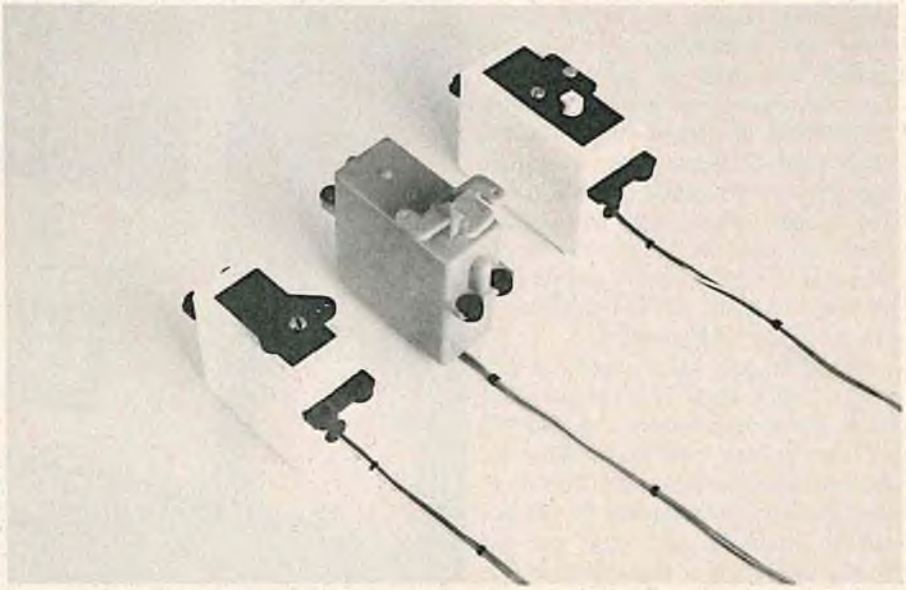


The complete RS airborne system. Choice of linear or rotary servo outputs. Receiver held together with two "O" rings for ease in changing frequency.

Three RS servo configurations – rotary in foreground, retract servo in center, linear output in background.



RCM-WORLD

SIX CHANNEL DIGITAL PROPORTIONAL SYSTEM

PART VI: TRANSMITTER ASSEMBLY

BY JOHN MALONEY

The following articles have to do with the wiring of the mechanical assembly of the transmitter. If there is a criticism to what we have done in this direction it is probably that the instructions are too long, that there are too many drawings, etc. There is a good possibility that all this material is not necessary for a really sharp technician who could probably just about put the transmitter together without anything in the way of instructions after he had the printed circuit board completed. The man working with me here at World Engines on this project is John McAndrews. By profession, John was, at one time, a high school teacher in the math and science area. He is very meticulous in his approach to a problem like this and, therefore, I feel that we have probably gone overboard in trying to make these instructions as clear and explicit as possible.

This is not the first kit or semi-kit system that World Engines has offered. Right at this time we are marketing our Mark IV Blue Max System in semi-kit form. We have sold thousands of these systems in semi-kit and kit form and we get quite a number of them back because the people assembling the transmitter do not pay enough attention to the wiring between the sticks and the board. In the RCM-World 6 transmitter with the open gimbal sticks, it is even more important to do a good job in this area and to pay attention to the instructions as they are presented. If the wiring is just plain sloppy and running all over the inside of the transmitter it can cause some RF problems.

World Engines has changed one part in the D & R stick. It is the part that holds the potentiometer and also this part has a trim lever knob. What we did was add the little wire keeper so that the wires coming out of the pot can be strain relieved right on this plastic part. This is illustrated on the right hand side of the page in T-5. Also, we have elected to assemble the sticks at World Engines. The primary reason for this was that we wanted to insure that the pots in the stick were lubricated and positioned properly during the stick assembly. In some of our recent advertising you will notice that we are selling a scratch-builders kit consisting of transmitter case, printed circuit boards, and unassembled sticks less pots. The scratch-builder will have the burden of assembling his sticks without any detailed instructions here in this article series. A mechanic of this caliber should not have any trouble as it is reasonably straightforward. □

ENCODER/TRANSMITTER – FINAL WIRING AND ASSEMBLY

PART A. ASSEMBLING AND MOUNTING THE BATTERY PACK.

[ ] Step A-1. Observe the two four-cell batteries. Two cells in each battery have one electrode that is not connected to any other cell. Place these four cells in juxtaposition with their unconnected electrodes at the top as shown.

[ ] Step A-2. Peel the backing from a 1" x 2" x 1/16" strip of adhesive foam and stick it onto the bottoms of the cells. Then place the assembly in the case bottom. The bottom can be distinguished from the top in that the bottom has smaller diameter lateral holes.

[ ] Step A-3. Strip 1/8" of insulation from each end of a 1½" black wire and tin the exposed metal.

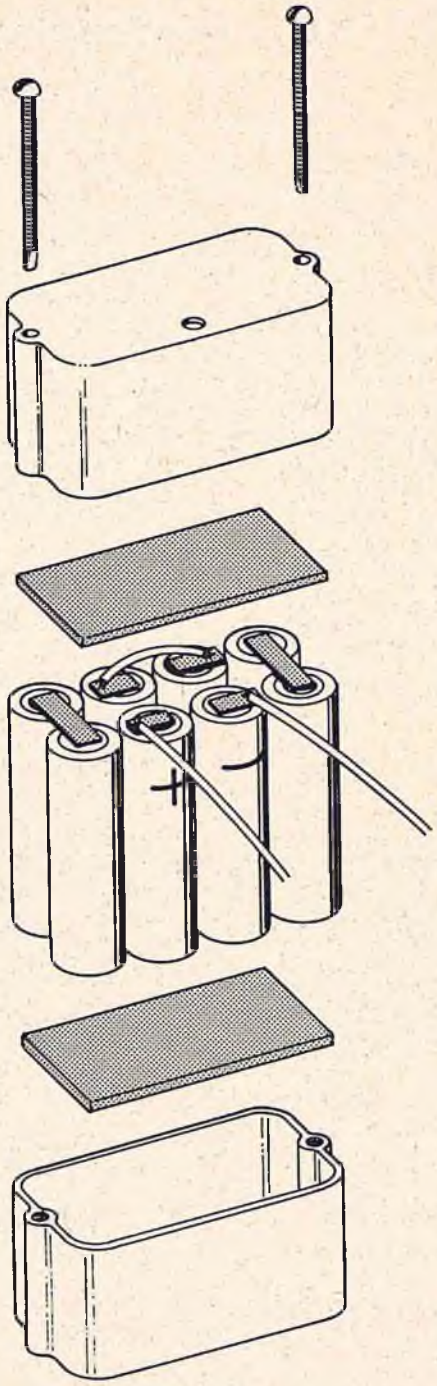
[ ]Step A-4. Form a nodule of solder on each of two unconnected electrodes in the same row-of-four. Solder the wire prepared in Step A-3 between these two electrodes as shown. This step converts the two four-cell, 4.8 volt batteries into one eight-cell, 9.6 volt battery. The positive and negative terminals of this battery are the two remaining unconnected electrodes. They are located at the ends labeled "+" and "–" respectively.

[ ] Step A-5. Strip 1/8" of insulation from one end of a 7" red wire and a 7" black wire. Tin the exposed metal.

[ ] Step A-6. Solder the prepared end of the red wire to the positive (+) terminal of the eight-cell battery and the black wire to the negative (–) terminal. Remember to tin the terminals first as in Step A-4.

[ ] Step A-7. Stick the second piece of 1" x 2" x 1/16" adhesive foam onto the tops of the cells.

[ ] Step A-8. Thread the red and black wires through the 1/8" diameter hole in the case top. Put the two halves together and fasten with the two #4-40 x 1½" roundhead machine screws which have been specially ground to make them self-tapping.

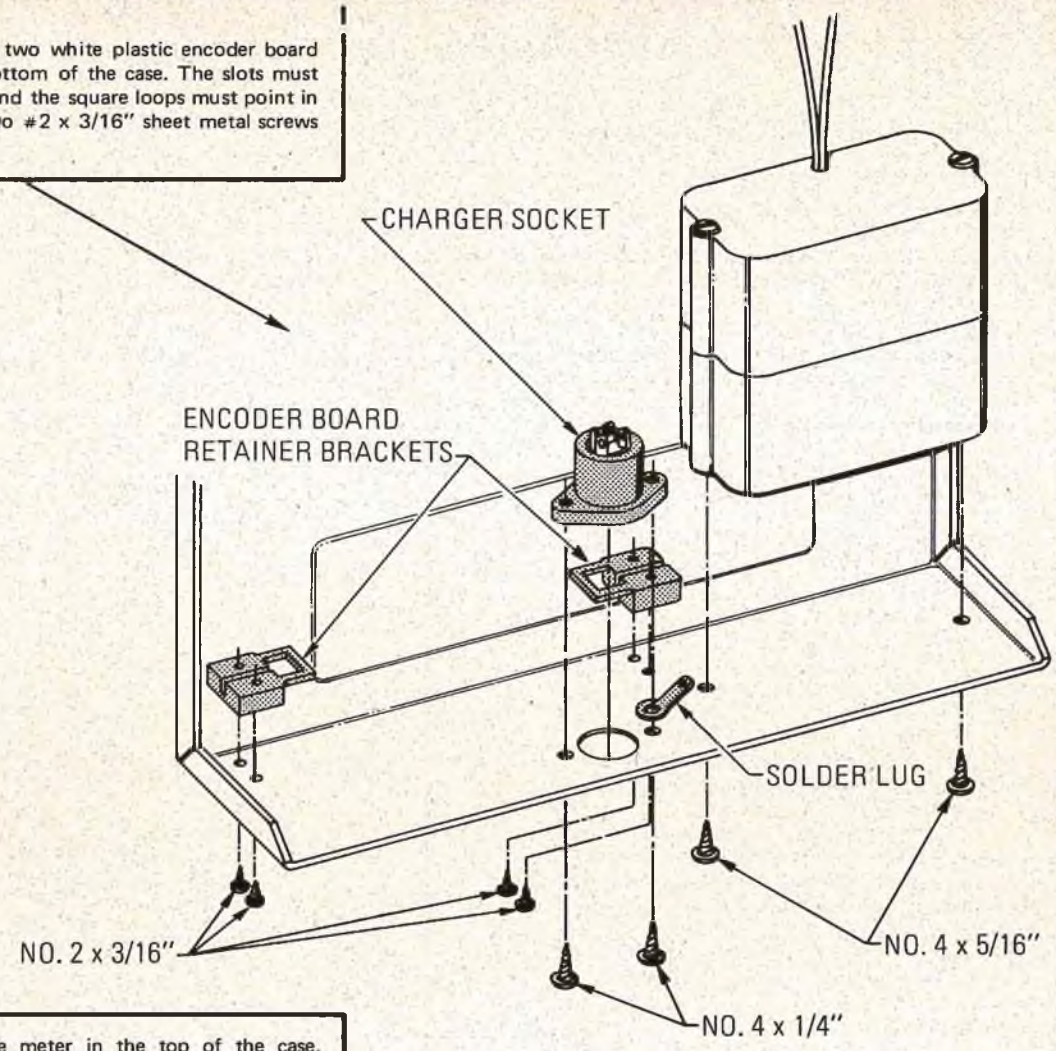


[ ] Step A-9. Mount the battery pack in the transmitter case. Use two #4 x 5/16" sheet metal screws up through the bottom as shown on the following page.

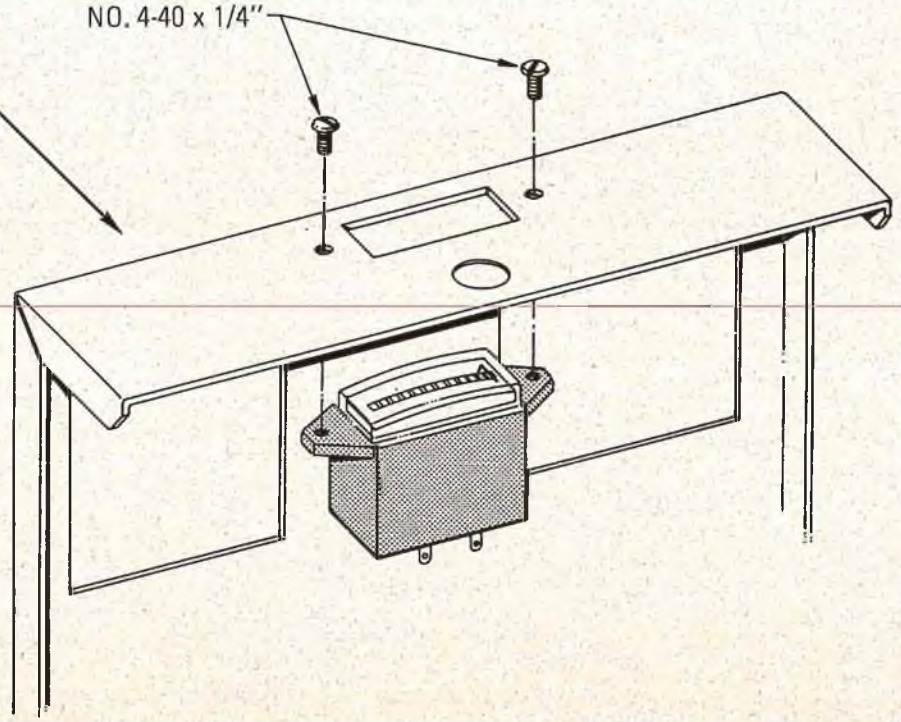
PART B. MOUNTING THE NON-PREWIRED PARTS IN THE CASE.

[ ] Step B-1. Mount the charger socket in the bottom of the case. Position the socket so that the slot lies away from the front panel. Use two #4 x 1/4" sheet metal screws. Include a #4 hole x 21/32" long solder lug under the socket flange as shown on the following page.

[ ] Step B-2. Mount the two white plastic encoder board retainer brackets in the bottom of the case. The slots must open away from the case and the square loops must point in towards each other. Use two #2 x 3/16" sheet metal screws for each bracket as shown.



[ ] Step B-3. Mount the meter in the top of the case. Position the meter so that its terminals lie away from the front panel and the needle will be at the left when viewed during normal flying operation. Use two #4-40 x 1/4" binder-head machine screws. Do not overtighten the screws against the plastic threads.

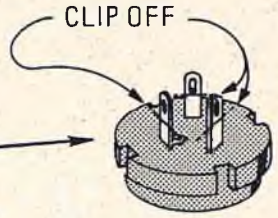


PART C. WIRING THE RUDDER/THROTTLE CONTROL STICK

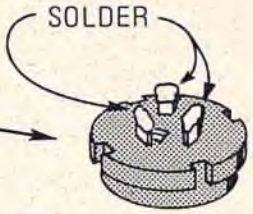
The rudder/throttle control stick has an outer potentiometer mounted on each of its four sides, and an inner fifth potentiometer on the side of its pivot box. The outer potentiometer without a movable front-located serrated-tab control identifies the top of the control stick. Throughout these instructions, the outer potentiometers will be referred to as "top," "bottom," "left," and "right." "Left" and "right" shall always be determined by viewing the stick from its rear or spring side. The throttle control has no spring affixed to its neutral return brackets. It moves up and down in normal operation. The rudder control moves right and left and returns to neutral when released. The wiring of this stick is illustrated in Figure T-4.

[ ] Step C-1. Temporarily remove the spring on the neutral return brackets of the rudder control.

[ ] Step C-2. Clip off each of the 15 pot terminals at the bottom of its slot.



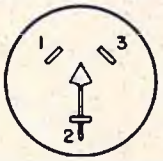
[ ] Step C-3. Melt a quantity of solder onto the end of each clipped terminal to which a wire is to be connected. See Table T-1 below.



[ ] Step C-4. Select the wires called for by Figure T-4. At this point, the wires are longer than required. They will be cut to the correct lengths in a later step. Strip 1/16" of insulation from one end of each wire and carefully tin the exposed metal.

[ ] Step C-5. Solder the wires to the pot terminals. Table T-1 lists the terminal number to which each wire is to be soldered. It is important for proper installation and free operation of the stick to route the wires exactly as shown in Figure T-4.

TABLE T-1
POT TERMINAL CONNECTIONS



POT LOCATION	WIRE COLOR	TERMINAL NUMBER
TOP	red-white blue	2 3
RIGHT*	red-white yellow-white	2 3
BOTTOM	blue blue	2 3
LEFT*	violet violet	1 2
INNER	red-white violet	2 3

*viewed from rear of stick

[ ] Step C-6. Pass the red-white and violet wires from the inner pot through the strain-relief hole in the pivot box towards the interior. Cut both wires to extend 2¼" beyond the hole.

[ ] Step C-7. Pass each pair of wires from the bottom and two side pots under the adjacent strain-relief clamp as shown in Figure T-4 and tighten the pressure screw just enough to prevent slippage.

[ ] Step C-8. Cut each pair of wires from the four outer pots to the lengths specified in Table T-2. Be sure to measure the lengths from the point specified in the third column of the table.

TABLE T-2
WIRE LENGTHS

WIRE PAIR	CUT TO	MEASURED FROM
red-white blue	5"	POT LUGS
yellow-white red-white	5¾"	CLAMP
blue blue	2¾"	CLAMP
violet violet	2¼"	CLAMP

[ ] Step C-9. Reinstall the spring on the neutral return brackets of the rudder control.

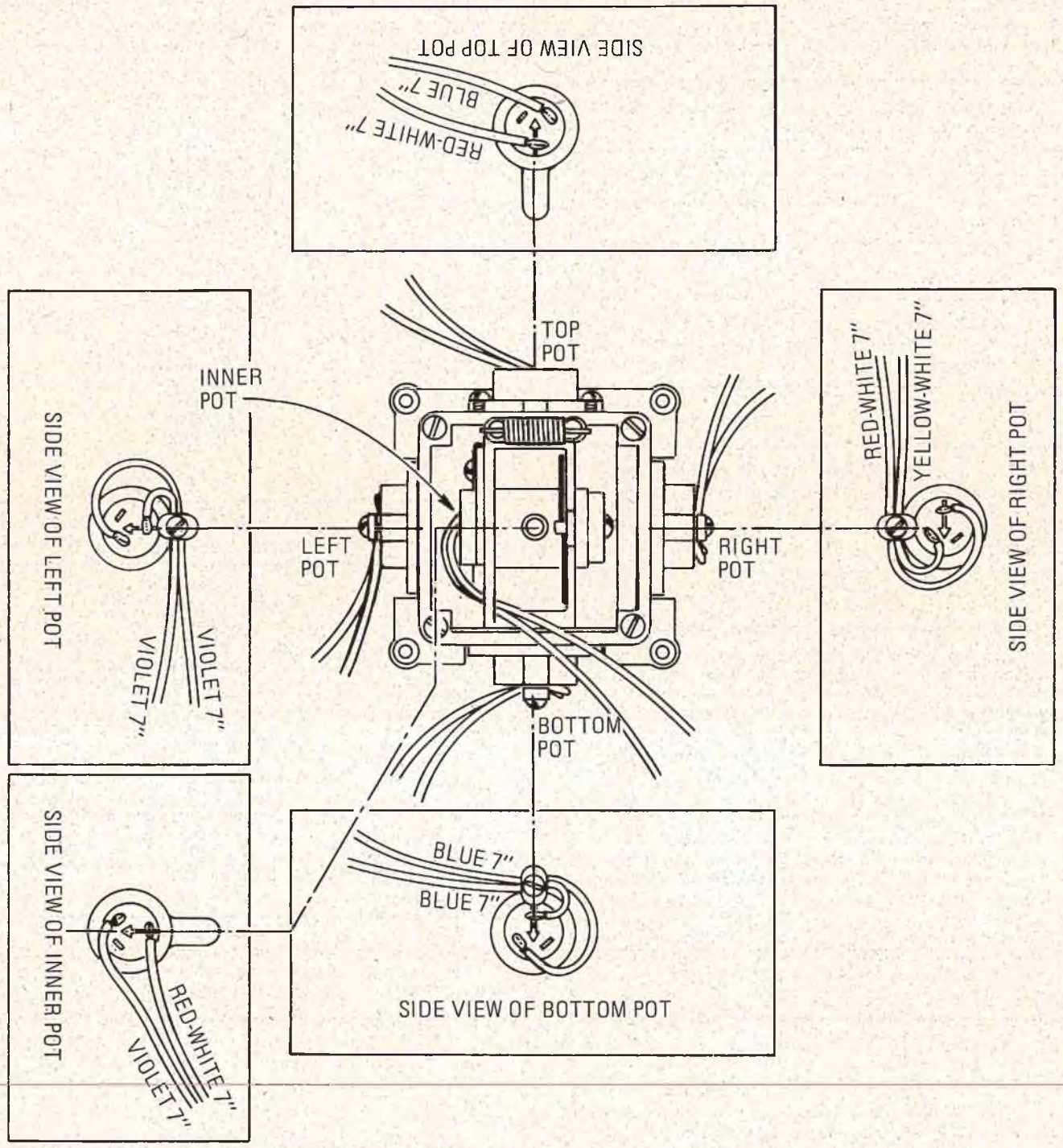


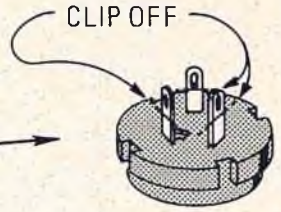
FIGURE T-4
RUDDER/THROTTLE STICK SHOWING WIRING

PART D. WIRING THE AILERON/ELEVATOR CONTROL STICK.

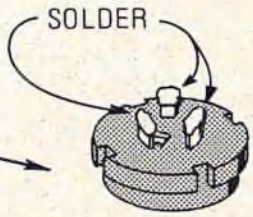
The aileron/elevator control stick has outer potentiometers mounted on three of its sides and an inner fourth potentiometer on the side of its pivot box. As on the other control stick, the outer potentiometer without a movable front-located serrated-tab control identifies the **top** of the control stick. The aileron control moves right and left in normal operation and the elevator control moves up and down. Both controls are returned to neutral by springs when released. The wiring of this stick is illustrated in Figure T-5.

[ ] Step D-1. Temporarily remove the spring on the neutral return brackets of the aileron control. This spring is located near the top potentiometer.

[ ] Step D-2. Clip off each of the twelve pot terminals at the bottom of its slot.



[ ] Step D-3. Melt a quantity of solder onto the end of each clipped terminal to which a wire is to be connected. See Table T-3 below.



[ ] Step D-4. Select the wires called for by Figure T-5. At this point the wires are longer than required. They will be cut to the correct lengths in a later step. Strip 1/16" of insulation from one end of each wire and carefully tin the exposed metal.

[ ] Step D-5. Solder the wires to the pot terminals. Table T-3 lists the terminal number to which each wire is to be soldered. It is important for porper installation and free operation of the stick to route the wires exactly as shown in Figure T-5.

TABLE T-3
POT TERMINAL CONNECTIONS

POT LOCATION	WIRE COLOR	TERMINAL NUMBER
TOP	red-white yellow	2 3
RIGHT*	green green	1 2
BOTTOM	yellow yellow	2 3
INNER	green red-white	1 2

* Viewed from rear of stick

[ ] Step D-6. Pass the green and red-white wires from the inner pot through the strain-relief hole in the pivot box towards the interior. Cut both wires to extend 3¼" beyond the hole.

[ ] Step D-7. Pass each pair of wires from the bottom and side pots under the adjacent strain-relief clamp as shown in Figure T-5 and tighten the pressure screw just enough to prevent slippage.

[ ] Step D-8. Cut each pair of wires from the three outer pots to the lengths specified in Table T-4.

TABLE T-4
WIRE LENGTHS

WIRE PAIR	CUT TO	MEASURED FROM
red-white yellow	5"	POT LUGS
green green	2¼"	CLAMP
yellow yellow	2¾"	CLAMP

[ ] Step D-9. Reinstall the spring on the neutral return brackets of the aileron control.

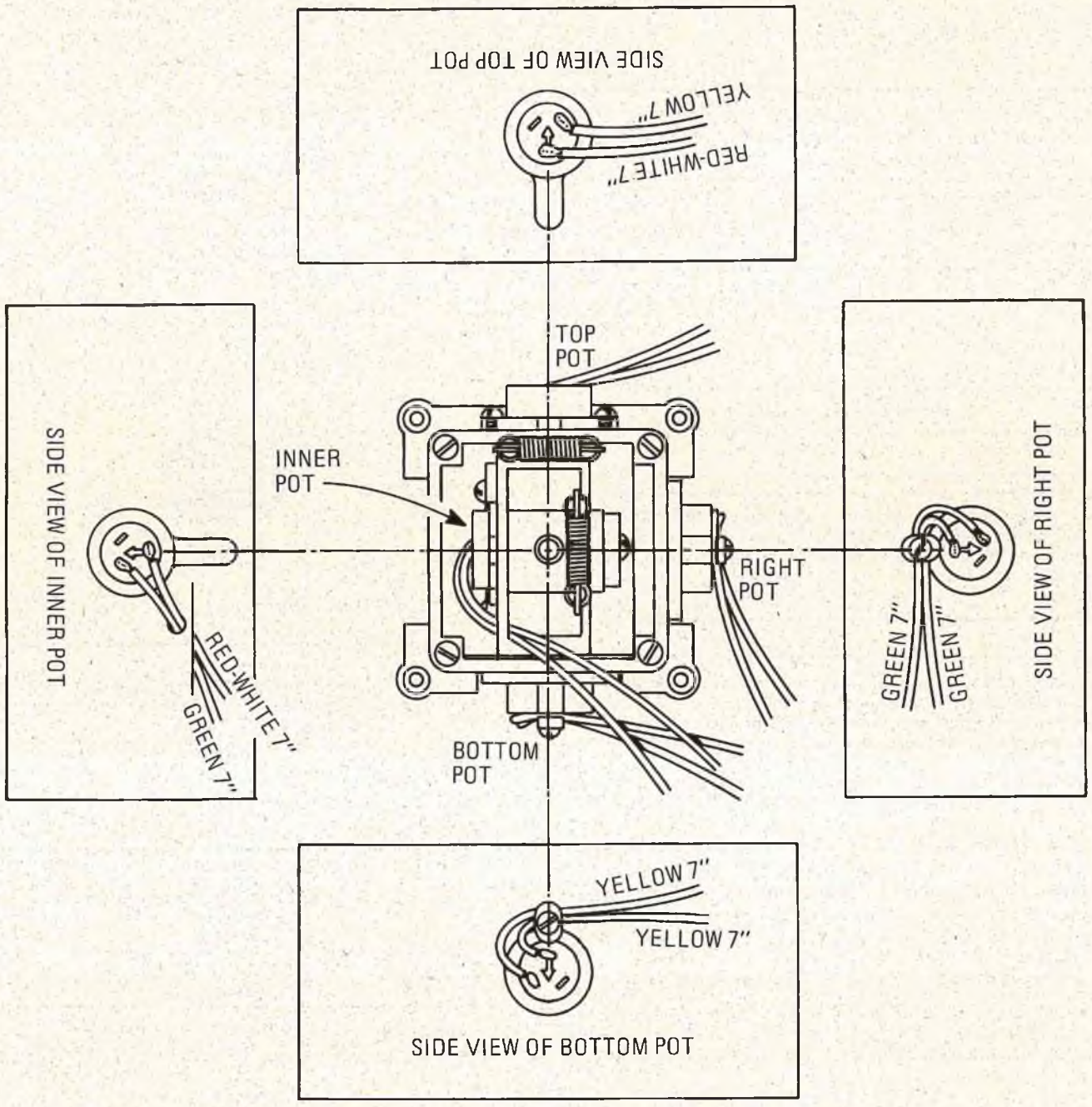


FIGURE T-5
AILERON/ELEVATOR STICK SHOWING WIRING

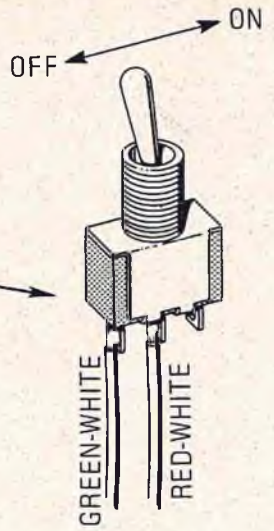
PART E. WIRING THE CHANNEL-6 TOGGLE SWITCH

[ ] Step E-1. Select 7" lengths of red-white wire and green-white wire. Strip 1/8" of insulation from one end of each wire and carefully tin the exposed metal.

[ ] Step E-2. Solder the red-white wire to the center terminal of the channel-6 toggle switch.

[ ] Step E-3. Solder the green-white wire to either of the other two terminals.

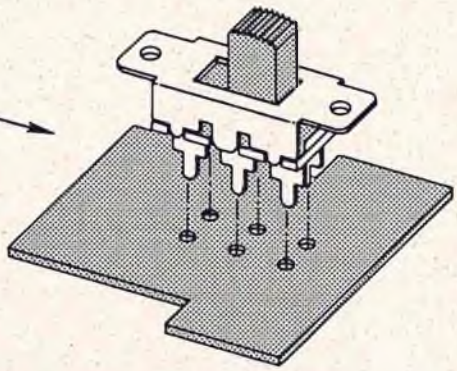
[ ] Step E-4. Cut both wires to have a length of 4¾" measured from the switch terminals.



PART F. INSTALLING THE MAIN SWITCH ON THE SWITCH TERMINAL BOARD

[ ] Step F-1. Locate the six-terminal, two-position slide switch and the switch terminal board (marked on its foil side: STB).

[ ] Step F-2. The switch will be mounted on the component side. Refer to Figure T-6. Insert the switch terminals into the six holes provided in the center of the board so that they emerge on the foil side of the board. Solder each of the six terminals to the copper foil lands.



[ ] Step F-3. Form a nodule of solder on the right side of the switch case where a bare wire is to be connected. See Figure T-6.

[ ] Step F-4. Solder one end of a 1" length of bare wire at the location just prepared. Push the other end of the wire through the indicated hole in the board and solder it to the copper foil. Clip off excess wire even with the buildup of solder.

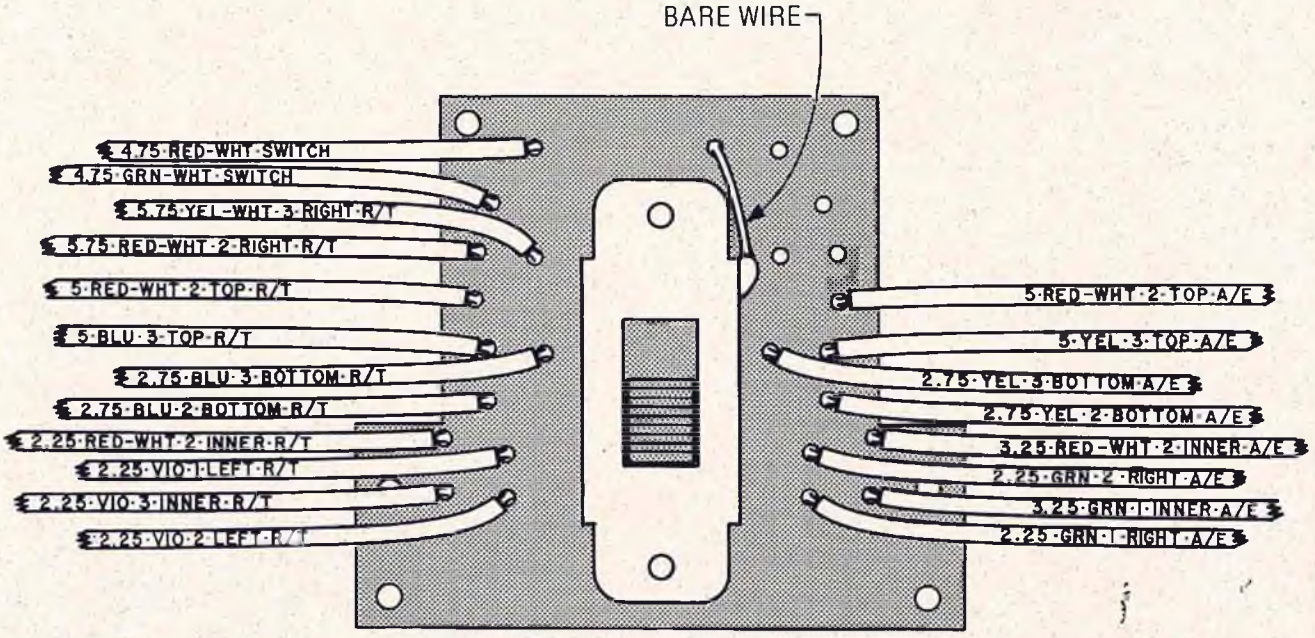


FIGURE T-6
SWITCH TERMINAL BOARD SHOWING WIRING
(VIEWED FROM SWITCH SIDE)

PART G. COMPLETING THE PULSE CONTROL ASSEMBLY

The purpose of this assembly is to control the time between the various pulses generated in the encoder. It consists of the two sticks and the channel-6 toggle switch wired to the switch terminal board.

[ ] Step G-1. Strip 1/8" of insulation from the free end of each wire already connected to the channel-6 toggle switch and to both control sticks. There are 20 such wires to be stripped.

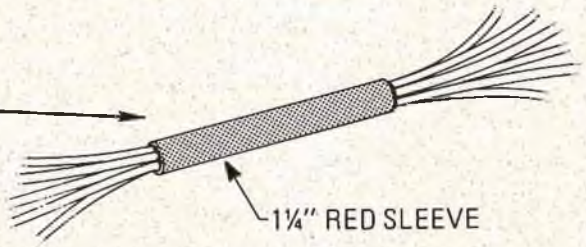
[ ] Step G-2. Carefully tin the exposed metal on each of the wires stripped in Step G-1.

[ ] Step G-3. Gather together the following six wires:
red-white and blue from top pot on rudder/throttle stick

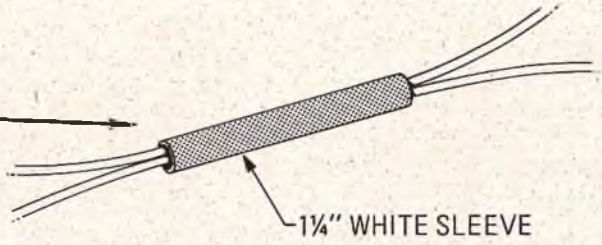
red-white and yellow-white from right pot on rudder/throttle stick

red-white and green-white from channel-6 toggle switch

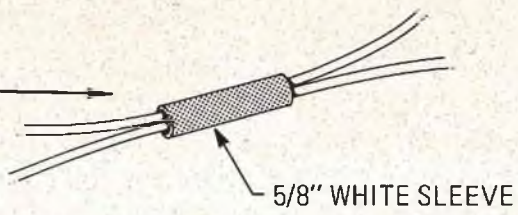
Slip a 1¼" sleeve of red tubing over this bundle.



[ ] Step G-4. Slip a 1¼" sleeve of white tubing over the red-white and yellow wires from the top pot on the aileron/elevator stick.



[ ] Step G-5. Slip a 5/8" sleeve of white tubing over each of the wire pairs from the other six pots on both sticks.



[ ] Step G-6. In this step, the wires will be inserted into holes on the component side of the switch terminal board and soldered to lands on the foil side. On Figure T-6 the wires are designated by means of a shorthand code which will now be explained by working through an example.

Orient the sticks and switch terminal board as in Figure T-7. Insert the 2¼" violet wire from lug No. 2 on the left pot of the rudder/throttle control stick into the indicated hole on the switch terminal board. This is the lower left wire designated "2.25 • VIO • 2 • LEFT • R/T" on Figure T-6. Solder it to the copper foil land and clip off any excess wire coming out of the solder buildup.

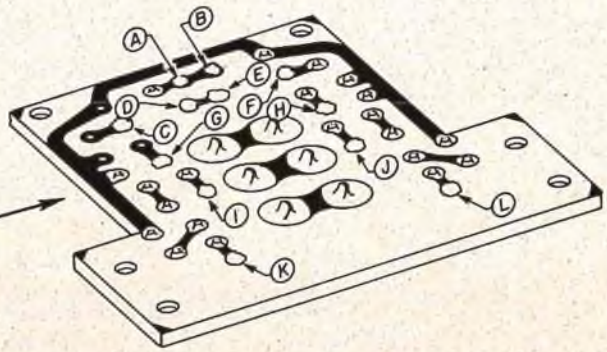
The coded wire designation "2.25 • VIO • 2 • LEFT • R/T" is an abbreviation of the instruction:

2¼" violet wire from lug No. 2 on left pot of rudder/throttle stick

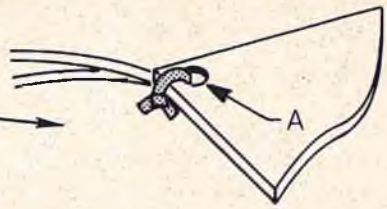
2.25 • VIO • 2 • LEFT • R/T

Figure T-6 shows where each wire is to be inserted. Continue to connect the remaining 19 wires to the board in a similar fashion.

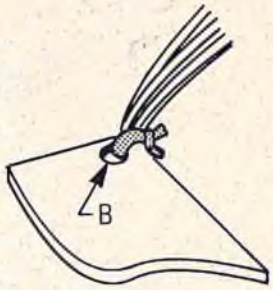
[ ] Step G-7. Turn the switch terminal board over and form nodules of solder at the twelve points A, B, . . . L inclusive.



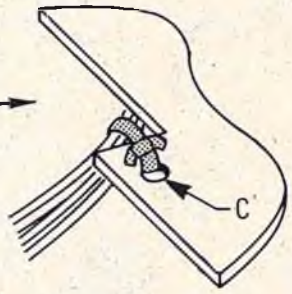
[ ] Step G-8. (Refer to Figure T-8 for this and the following three steps.) Tie the two-wire bundle from the top pot of the aileron/elevator stick to the swtich terminal board (abbreviated STB). Run the braided lacing cord through hole A.



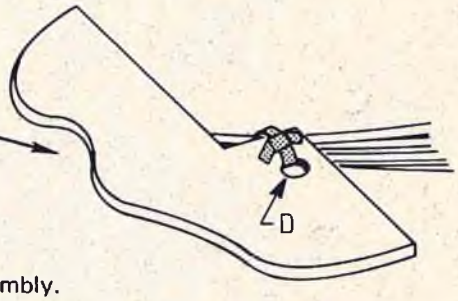
[ ] Step G-9. Tie the six-wire bundle from the top and right pots of the rudder/throttle stick and the channel-6 toggle switch to the STB. Run the cord through hole B.



[ ] Step G-10. Tie the three two-wire bundles from the right, inner, and bottom pots on the aileron/elevator stick to the STB. Run the lacing cord through hole C.



[ ] Step G-11. Tie the three two-wire bundles from the left, inner, and bottom pots on the rudder/throttle stick to the STB. Run the lacing cord through hole D.



PART H. MOUNTING THE PULSE CONTROL ASSEMBLY IN THE CASE.

Figure T-7 illustrates the parts required for mounting the pulse control assembly.

[ ] Step H-1. Mount the rudder/throttle stick using four #2-56 x 3/8" binder-head machine screws.

[ ] Step H-2. Mount the aileron/elevator stick using one #2-56 x 7/16" and three #2-56 x 3/8" binder-head machine screws. Use the longer screw to mount also the encoder board upper support arm to the stick.

[ ] Step H-3. Mount the switch and switch terminal board using one #4-40 x 1/4" pan-head machine screw and one #4-40 x 5/16" binder-head machine screw. Use the longer screw to mount also the switch lock and switch lock bearing.

[ ] Step H-4. Mount the channel-6 toggle switch using two nuts and one lock washer as shown. No washer is used under the outer nut. Be sure the unwired lug on the switch is farthest from the front panel.

[ ] Step H-5. Tie the channel-6 toggle switch wires to the unwired lug on the switch with the braided lacing cord supplied.

[ ] Step H-6. Dress the wiring from the sticks in a neat and orderly fashion. In particular, make sure that the wires do not restrict the freedom of movement of the controls or trim pots. See photo of transmitter showing arrangement of pulse control assembly wiring.

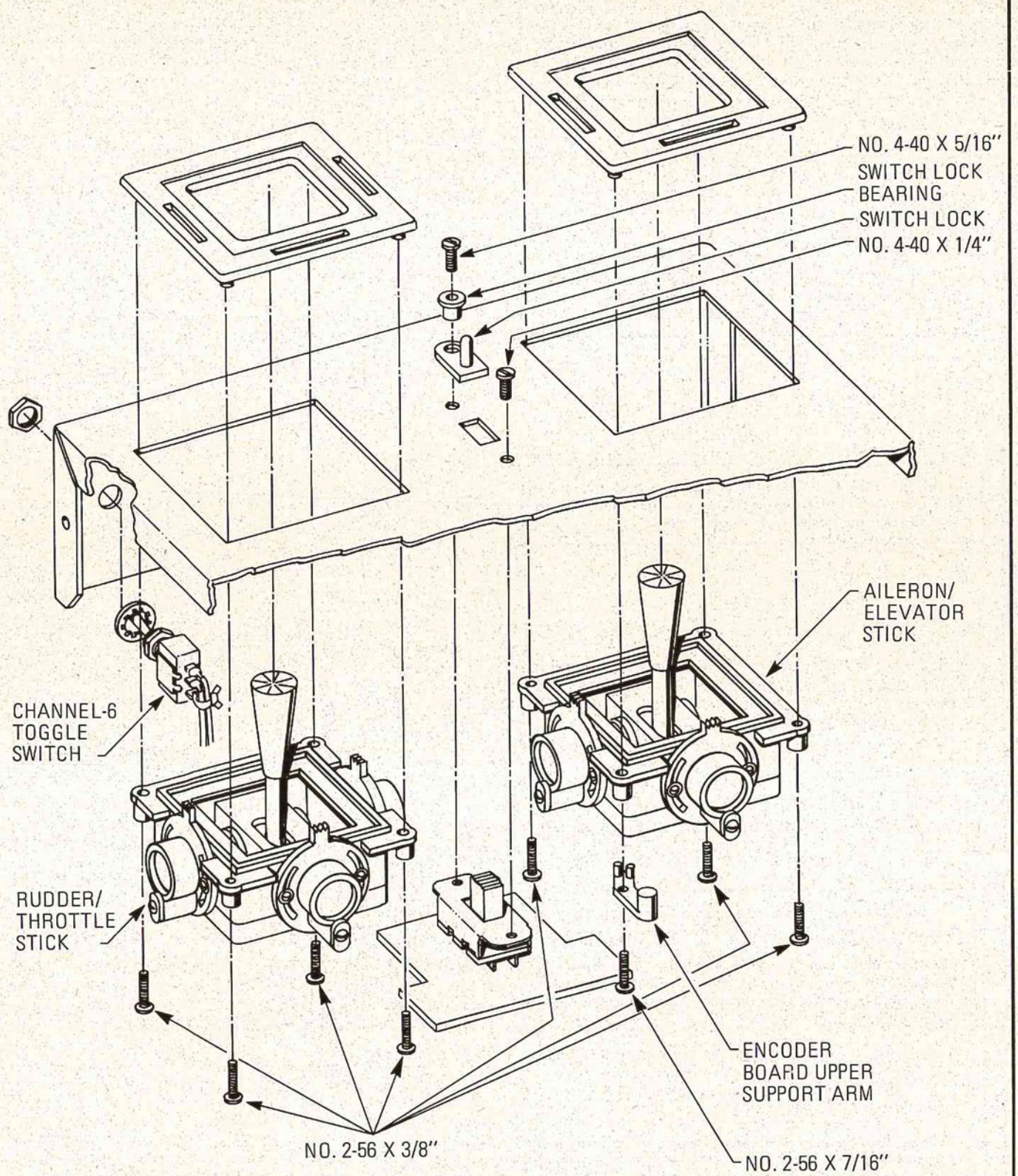
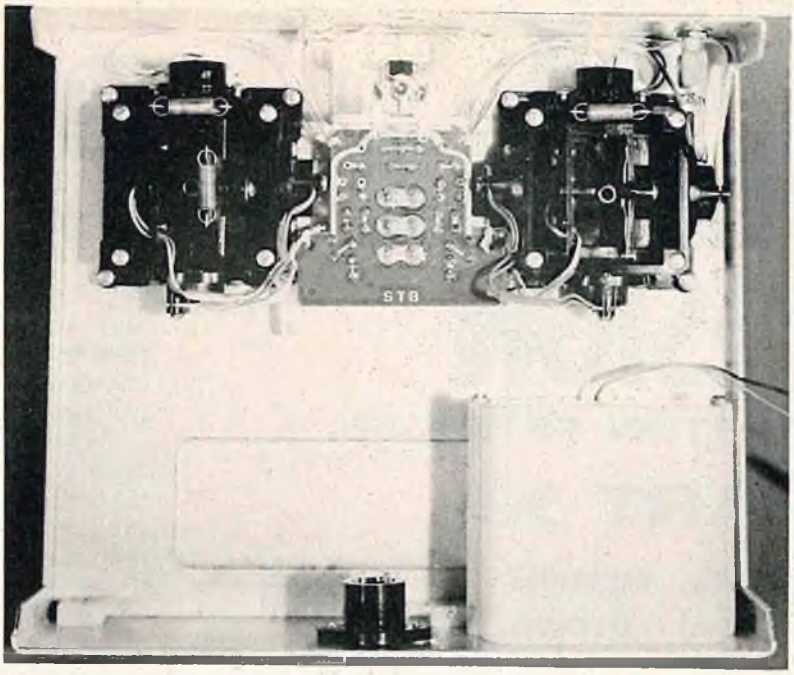


FIGURE T-7
MOUNTING OF PULSE CONTROL ASSEMBLY



Pulse Control Assembly Mounted in Case

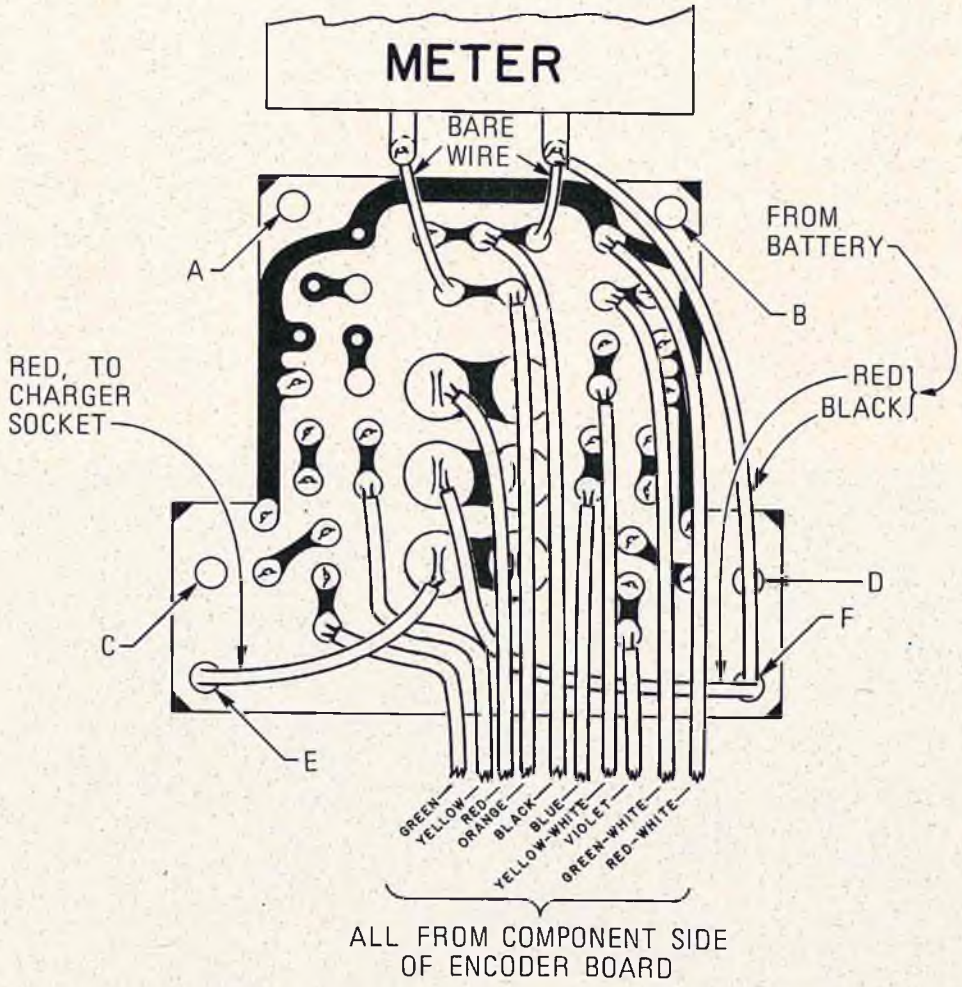


FIGURE T-8
SWITCH TERMINAL BOARD SHOWING WIRING
(VIEWED FROM FOIL SIDE)

BASIC SAILPLANE DESIGN

BY PRESTON ESTEP JR.

PART XI:

MORE TESTS, SOME RESULTS AND AN AIRPLANE.

● Over the past year I have been continuing the still-air tests, L/D measurements, and design experiments which originally got me interested in this whole project. In addition, many readers have sent me data on their tests, airfoil and wind tunnel data, computer programs, and all sorts of goodies. This article will present some of the results of my most successful experimental efforts, involving wing planform, force arrangement, airfoils, and tail design. After five preliminary airplanes were tested and the various features of each were evaluated, the final tests began.

I built two fuselages, two wings, and two sets of stabs (see 3-views, Figure 1). The wing planform had evolved to that shown after a series of earlier tests. Theory tells us that this planform will produce a reasonable facsimile of elliptical lift distribution, because of the 2 degree tip washout coupled with the taper and the effect of the slight polyhedral. The effect of that very small amount of polyhedral on the turning quality of the aircraft is dramatic, and was first revealed to me by a modified Kurwi I saw at a contest.

The short tail moment came about partly by accident, but it turned out to be better than longer moments I tested, in that a very small thermal circle could be locked in and held with an amazingly small increase in rate of sink. I have tested tail moments up to 50% longer; they give good stability, but require somewhat wider circles. I have also tested straight dihedral and various other combinations of polyhedral, as well as swept tips, etc. This wing shape is the best, I believe, particularly when you consider the construction advantages of a straight root section (more on this later).

Two tail configurations were tested; the conventional tail, derived from an old Olympic tail I had around, and the cruciform flying-stab version. The flying-stab version worked okay when I used it with Olympic wings (790 square inches). In fact, that version of the plane, weighing 58 ounces, flew quite well and turned in a thirty-minute plus flight in one of the early tests. However, the all-flying tail plus the short moment proved to have inadequate control when the eleven-foot wings were plugged in. It was quite surprising how much better the articulated elevator worked in terms of giving positive pitch control. Even though the drag of such an arrangement is higher, it was worth it in this particular case because of the excellent stability of this version.

The airfoils tested are shown in Figure 2. The first is the familiar 9.5% flat-bottomed adaptation of the NACA 4309. This airfoil produced a

to page 63

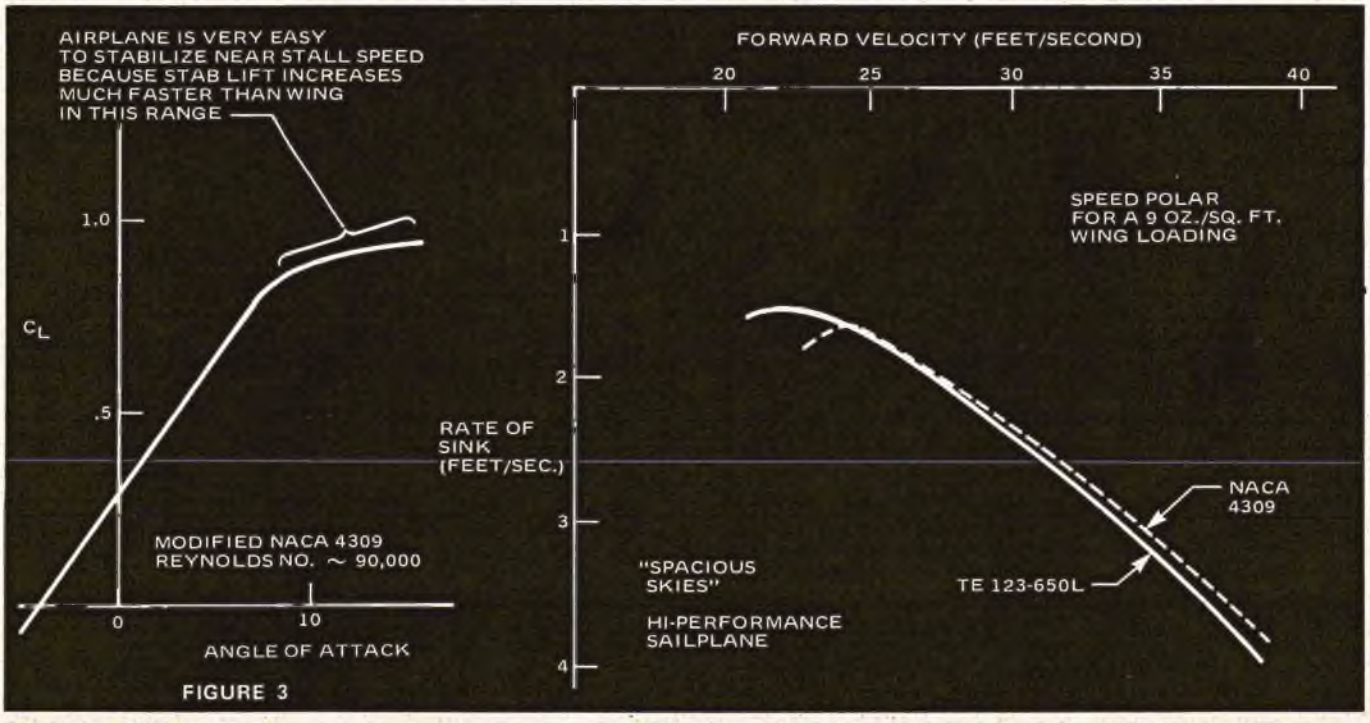
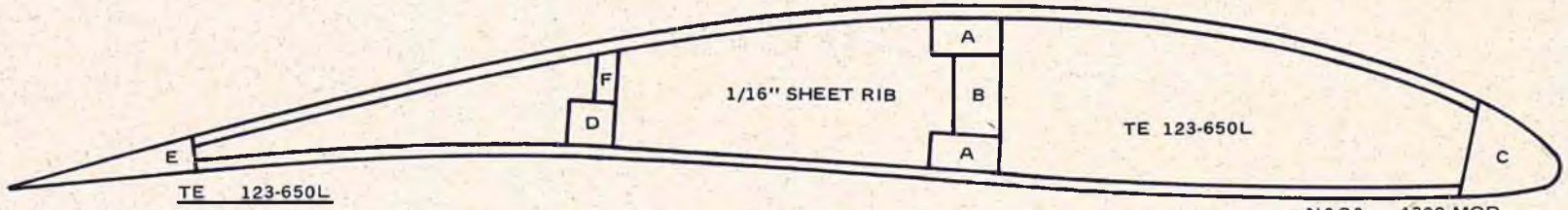


FIGURE 3

TE 123-650L APPROXIMATE CO-ORDINATES

STATION	5	10	20	30	40	50	60	70	80	90	100
TOP	5.25	7.25	9.5	10.5	10.5	9.75	8.5	7.25	5.75	3.5	0
BOTTOM	-2.25	-2.25	-1.5	- 1.5	- .5	.25	1.0	1.75	2.25	1.5	0

L.E. = 0, 0 L.E. RADIUS = 1.25



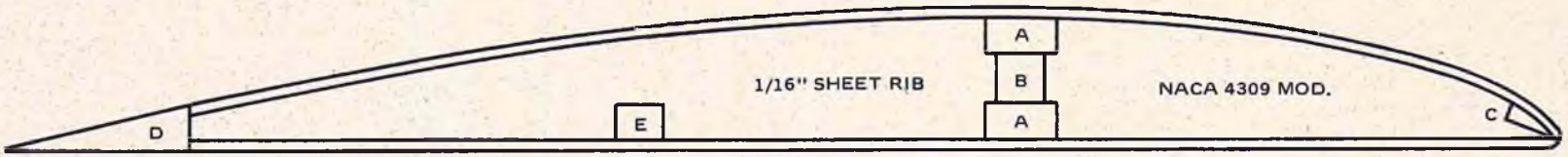
TE 123-650L

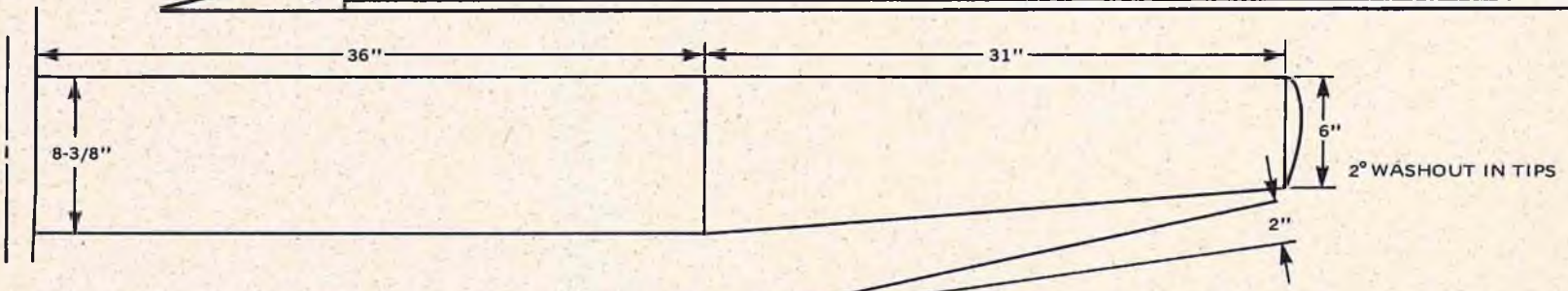
A = 3/16" x 3/8" SPRUCE SPAR
B = 1/2" x 1/4" HARD BALSA SHEAR WEB
C = 1/2" L.E. STOCK
D = 1/4" x 1/4" SPRUCE SPAR (ROOT PANEL ONLY)
E = 1/4" x 1" T.E. STOCK
F = 1/8" SHEET SHEAR WEB (GOES TO ROOT SHEETING ONLY)

FIGURE 2

NACA 4309 MOD.

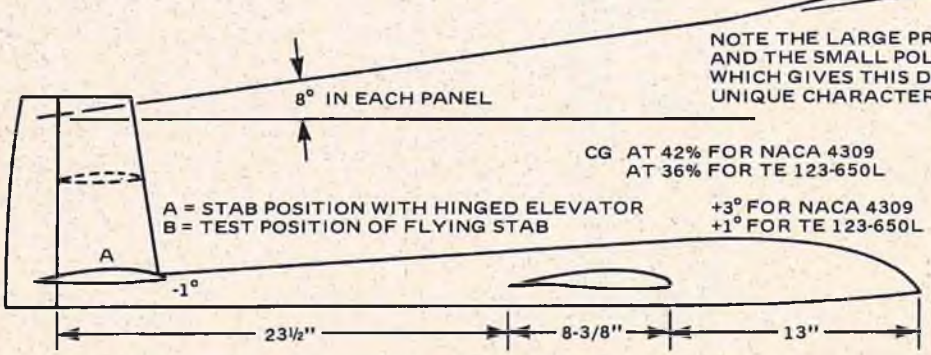
A = 3/16" x 3/8" SPRUCE SPAR
B = 1/4" x 1/4" SPRUCE SHEAR WEB
C = 1/8" x 1/4" SPRUCE L.E.
D = 1/4" x 1" T.E. STOCK
E = 1/4" x 3/16" SPRUCE SPAR (ROOT PANEL ONLY)





SCALE 1:10

WING SPAN = 139"
WING AREA = 1053"
STAB AREA = 168"
FIN/RUDDER = 68"
ASPECT RATIO = 17.6
AIRFOILS TESTED:
NACA 4309
TE 123-650L



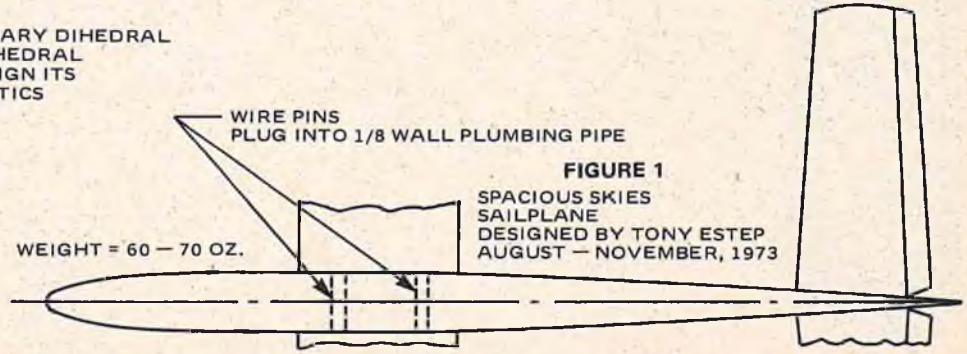


FIGURE 1

SPACIOUS SKIES
SAILPLANE
DESIGNED BY TONY ESTEP
AUGUST — NOVEMBER, 1973

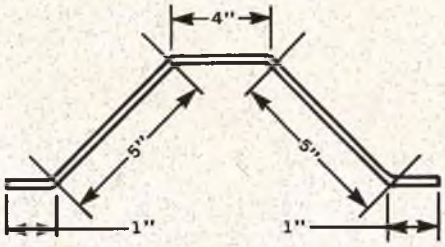
EASY WIRE BENDING

BY EARL MILLIRON

● To those of you without a commercial wire bender who, as a consequence, believe the consistent, accurate, and economical bending of piano wire landing gears and cabane struts to be beyond the abilities bestowed upon man by a providential creator, this do-it-yourself article is dedicated.

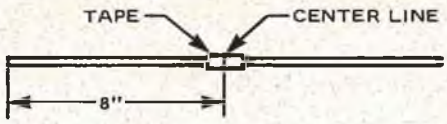
(1) First, draw an accurate full size plan of your landing gear or cabane strut, or use the drawing on your full size plan sheet. Be certain to check the plan for accuracy before you start.

(2) Mark the line dissecting angle of each bend and measure the leg segments.

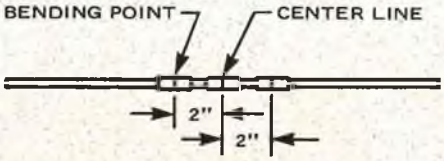


(3) Add the total of all leg segments (16 inches as shown in the drawing) and divide by two (8 inches).

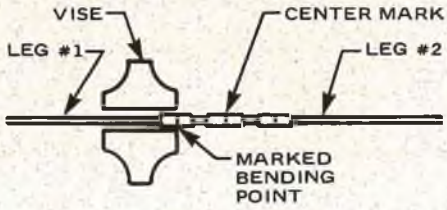
(4) Now wrap a band of masking tape 8" from one end of the wire and mark a center line exactly at the 8" point.



(5) Wrap two more bands of masking tape and mark at exactly 2" from the center line.



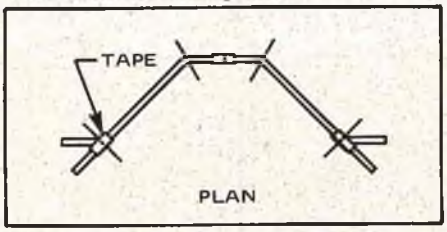
(6) Grasp one outboard end of the wire in your vice jaws and make sure the bending point is flush with the edge of the jaws. A radius edge on the vice jaw is preferred.



(7) Pre-load the wire by pulling in the direction of the bend with one hand while you hit the bending point hard with a heavy mallet or hammer. Hit hard with as few blows as possible to prevent work hardening the wire at the bending point.

(8) Turn the wire around in the vice and make the other bend. Be sure to always grasp leg number 2 exactly as you did leg number 1. Now check the accuracy of the leg angles against the plan and correct as needed.

(9) With the wire laid over the plan, place a wrap of masking tape on each leg where the final bend is to be made and mark the bend points.



(10) Grasp the final leg (axle segment) in your vice with the bend point flush with the jaws as before. Bend and check the accuracy of the bend against the plan. Finally, bend axle segment on leg number 2.

(11) Use a grinder to trim the axle segments to the exact length required.

(12) Now congratulate yourself for getting a perfect job on the very first try. □

PLYWOOD SKIS

REPRINTED FROM THE MICHIGAN SIGNAL SEEKERS R/C CLUB NEWSLETTER

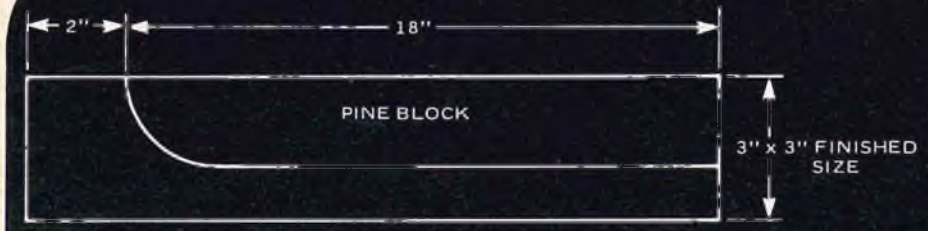
● I believe that plywood skis are the easiest to build and the chart accompanying this article gives the sizes for the average .61 size model using either conventional or tricycle landing gear. The major advantage of these dimensions is that you do not need to change the legs but, rather, simply slip off the wheels, and pop on the skis. Add three rubber bands and you are in business for some Winter flying.

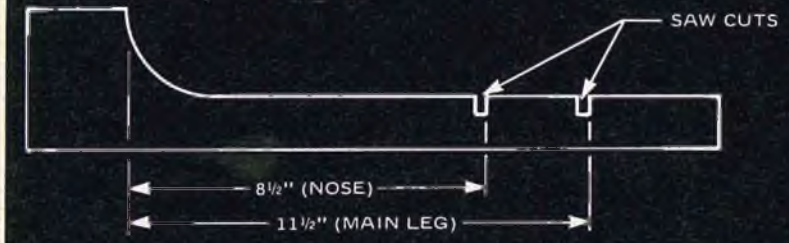
Make the plywood types from three laminations of 1/32" plywood ignoring the grain direction. Use epoxy for adhesion and wax the mold before use. I use three C-clamps for pressure and leave overnight to set. You can mold up the two main gears at one setting being very careful not to get epoxy on the wrong surfaces. There is no need to spread the epoxy on both surfaces if you have a good mold.

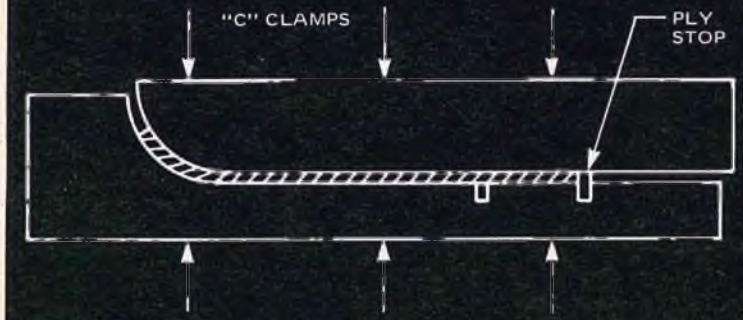
The mounting blocks, or trunions, are unconventionally placed at the rear of the ski for the reason that you do not want the nose of the ski to dig into the snow, and as there are rough places, a stiff ski with the leg pressing down in its middle would definitely dig in in spite of the curved front tip. However, our skis have the leg pressing down at the 1/3rd position so that the weight distribution allows the front of it to ride the waves. Furthermore, our skis are allowed to "work" as they travel across the irregular surface due to the pivot and the rubber band tensioning force. You can, in fact, lash the ski to the leg, itself, and not use the hook, as long as it is able to deflect slightly. I know you are now thinking of what will happen in the air - - - if you can think of how little the ski can actually deflect because the 1/8" tensioning wire is close to the pivot point, and there being only a short distance for the rubber band to work in, you will agree that, as long as the band is tight, there is no trouble with the skis acting like wings. Notice that this wire is bent over at the bottom of the trunion block before it is epoxied to the ski.

If you follow the sketches accompanying this article, you will have little difficulty in fabricating a set of easy and practical skis for Winter flying. □

PLY TYPE MOLD





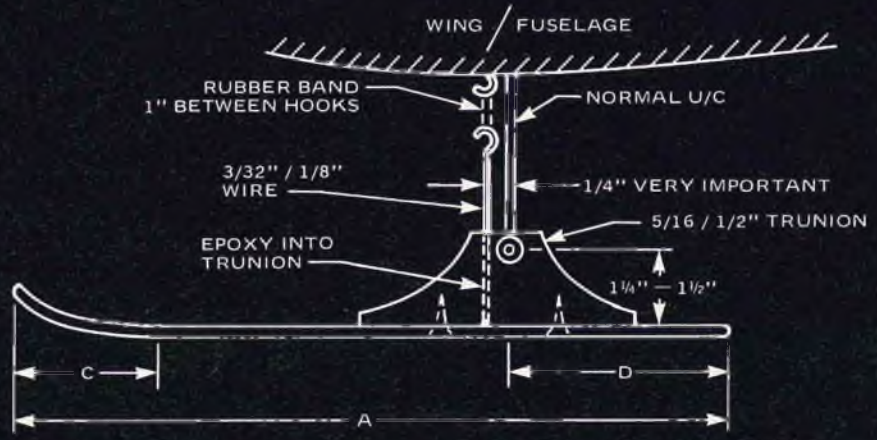


LAMINATE 3 PIECES 1/32" PLY — 12" x 3", MAIN GEAR
USE EPOXY — WAX THE MOLD 9" x 3", NOSE GEAR

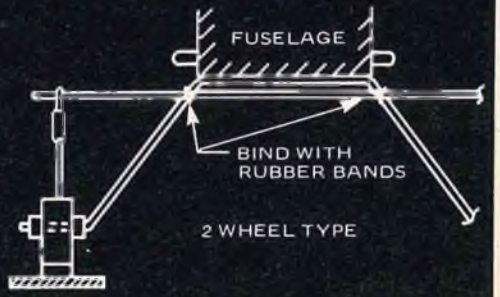
ALL SKIS MUST BE COVERED ON THEIR BOTTOMS WITH F/BLASS OR EASY-DOES-IT CLOTH & EPOXY. WRAP OVER EDGES & LAP ON TOP!

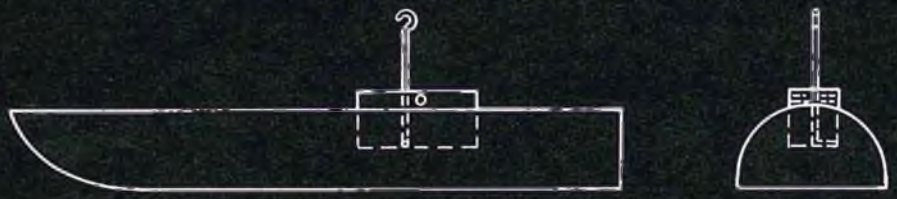
NOTE: ADD 3/8" IF MORE CURVE AT FRONT OF SKI IS DESIRED.

SKIS



	A	B	C	D
2 WHEEL	17½"	2¾"	4"	6"
TAIL	5"	1-3/8"	2"	1¾"
MAIN TRIKE	12"	2¾"	3"	3½"
NOSE TRIKE	8¾"	2¾"	3"	3¼"

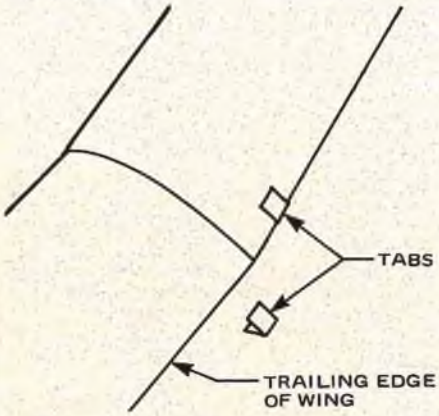




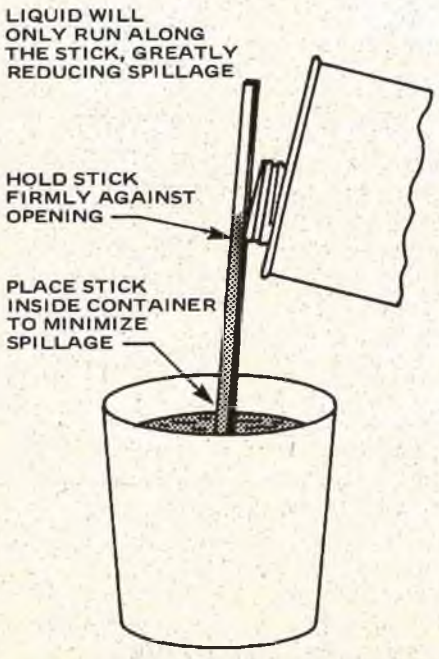
FOAM SKIS

FOR WHAT IT'S WORTH

Have you ever had the rubber bands which hold the wing to the fuselage, crush the trailing edge of the wing? Here is a simple solution from Andre Belanger of Ontario, Canada. Cut two tabs of suitable size from a soda pop, or beer can and shape the tabs to fit the trailing edge of the wing. The tabs will protect the trailing edge from any further damage by the rubber bands. If you wish a permanent installation, secure the tabs with epoxy glue.



If you have ever experienced difficulty in pouring liquid from one container to another, such as thinner into a small mouth dope bottle, try using a stick or rod as shown in the sketch by Phil Kantor of Cannonsburg, Pennsylvania. Any type of stick or rod will do as long as it's not affected by the liquid in use.



William Calvert of Ada, Ohio, mentions that he has seen in RCM's For What It's Worth section a hint and kink for using the plastic bands used to hold pop and beer cans together for hinge material. For those modelers who prefer something heavier, hinges can be made from plastic bottles or jugs. The heavier hinges are cut out of the side of the jug and then, if bent sharply back and forth several times, will form a good and virtually unbreakable hinge line.

Richard M. Elersich of Simi, California, suggests making a quick and easy screwdriver rack by taking a piece of plywood with dimensions of ½" x 2" x 8" and screwing several screw eyes into it ranging from small to large according to the size of screwdrivers you plan on putting in it.

Need a carburetor gasket in a hurry? Joe Hudacky of Lake City, Pennsylvania, suggests going to your local hardware store and picking up an O-ring seal. Used in plumbing repairs, they come in a variety of sizes and can take the high temperatures your engines put out.

Yet another method for laying out tapered wing ribs which, incidentally, can also be used for airfoiled elevators and vertical fins, is suggested by Mit Grimes of Omaha, Nebraska. Take thin drafting paper and carefully trace the airfoil shape from your three view. Cut around the tracing to fit a photographic enlarger and insert the tracing into the photo mask. All that is required then is to mark the location of the ribs on your plans and run the enlarger up and down until the projection fits between the leading and trailing edge at which time you can trace the outline onto the plans. Presto – instant airfoils. You must, of course, have an enlarger and an airfoil small enough to fit within the mask.

If you have scratched, or stained, a plastic canopy, it can be refinished. Just sand it down with No. 600 wet sandpaper and - - - here is the trick - - - simply brush on Hobbypoxy thinner with a very clean soft brush such as a Polly Puff sponge brush, then let the thinner dry. The results are fantastic. The finish is almost always better than new and always shinier. This idea was submitted by James Trump of Corvallis, Oregon.

Felix N. Howard, Jr., of Danville, Virginia, mentions that, with the popularity of fiberglass fuselage and foam wing kits, a few of his techniques in constructing these models might save you some time and trouble. First, before making stabilizer cut outs in your fuselage, pencil in the stab centerline on both sides of the fuselage and then use a Dremel tool, drill, or sharp point to form a dimple in the fiberglass approximately 1/8" in front and rear of the stab location. These indents will greatly assist in establishing proper stabilizer incidence. Secondly, when drilling the firewall, retracts, throttle linkage, etc., a very handy item is a piece of 1/16", or larger, wire sharpened and burred at one end. Installed in your drill, it can reach the firewall with ease. For an even easier job, heat the tip of the torch. And, finally, when applying glass cloth to the wing center sections, apply masking tape approximately 1/4" from the edge of the cloth line. Then, attach the cloth with resin or epoxy and then remove the tape. This will result in a very neat edge.

Russell Anderson of San Angelo, Texas, suggests using 3" x 24" aluminum oxide sanding belts in fine, medium, and coarse grades mounted on pieces of 1/4" plywood, 3" wide by 11-13/16" long. The belts fit very tightly on the plywood and are ideal for shaping balsa, hardwood and various other materials. The ends of the plywood are rounded slightly. Many other belt sizes are available but this size is ideal. Sanding belts are available at most hardware stores and can be ordered from Montgomery Ward.

Jim Joyce of Fargo, North Dakota, has found an excellent weighting and blocking material in stacks of IBM cards, punch cards, data processing cards, or any other name you want to call them. Jim takes a whole box full of used cards, stacks them neatly, compresses them, then paints the top side with printers padding compound. When dry, turn them over and do the same to the bottom side. Then, when dry, you can easily split them into two

blocks of any thickness you desire. Jim has made up several each 1" and 2" thick and even a couple 1/2" thick. Use a dull knife or letter opener to split the blocks. This works better than a sharp one which could cut the cards and wander off the line. Jim has found these blocks great for all sorts of weighting down, blocking up, or holding construction pieces in place while glue dries. They even make good "chopping blocks" and, when they get chewed up, just peel off a few cards and you have a fresh surface. Padding compound is rather expensive, but you can get a printer friend to supply a small amount for your purposes. Elmers or Titebond glue would probably work, but Jim mentions he hasn't tried it. New punch cards cost about $1.80 per thousand in boxes of two thousand, but you could probably get a data processing center to give you used ones for free.

A simple way of building a wing with a symmetrical or semi-symmetrical airfoil section without using a jig of any kind is to slice all the ribs in half along a line connecting the bottom of the leading edge and the bottom of the trailing edge spar. Pin the two spars down to a flat building board, cement all the top pieces of the ribs in place, then any top spars, top leading edge or trailing edge sheeting, and allow to dry overnight. Turn the entire assembly over, pin the top main spar (if the wing has one) down to the board, and proceed to cement the lower portions of the ribs in place, followed by bottom spars, sheeting, etc. This idea was submitted by George Penniket of Nelson, British Columbia, Canada.

If you want a good way of holding your receiver snuggly within the radio compartment, try using sewing hooks which have been epoxied to both sides of the fuselage. Then stretch rubber bands from one hook across the receiver to the hook on the opposite side. According to Hal Hirsch of San Jose, California, this system keeps the receiver well secured inside the fuselage when the wing is removed, especially on a low wing aircraft.

When attaching servo rails inside a fuselage, try this suggestion from Ronald Scott of Jonesboro, Tennessee. Simply mount them with silicone rubber and leave 1/16" or so space between the bearers and the fuselage sides. Stick a couple of straight pins through the fuselage sides to hold the servo bearers in place until dry, then remove the pins and you have a strong bond for the rails, but still one which gives a little added crash protection and some vibration absorption. Try it and see.

In order to build foam wings lighter and more economically, why not try this method from William A. Henn of Clifton, New Jersey. Cover only the leading and trailing edges with sheet balsa using cap strips in-between. For .60 size models, 1/16" balsa 6" wide is wrapped and glued around the leading edge of the wing and 3" wide sheets are fastened to the top and bottom of the trailing edge. 1/16" x 1/4" cap strips are used to connect the front and rear sheeting, spaced about 2½" apart. For extra strength on larger models, 1/4" x 3/8" spars can be installed directly under the rear edges of the front sheeting.

If the brass vent tube in your fuel tank is too short to make it to the top of the tank, even though you bent it to approximate size, all you have to do is add a piece of surgical tubing on the vent tube long enough to touch the top of the tank. This idea was submitted by Stephen Biswanger of Slippery Rock, Pennsylvania.

If you want to drill engine mounting holes in the right spot on a metal or glass filled motor mount, simply rub a light film of oil over the mount beams then set the engine where you want it and drop a pinch of corn starch through the holes in the engine. Allow this to set a few seconds, pick up the engine, and blow away the piles of corn starch leaving four very clean dry spots on the motor mount. Punch and drill the holes and they will fit perfectly. This idea was submitted by J.H. Weatherly of Bothell, Washington.

If you want to make your Du-Bro muffler removable for priming or cleaning, use a heavy duty spring in place of the strap provided. The muffler can then be removed with ease. This idea was submitted by Dennisom Bradford of Peoria Heights, Illinois.

Dick Russ of Oklahoma City, Oklahoma cautions you not to let your girl friend or wife throw away those panty hose when they get a run in one leg. Just cut the bad leg off the hose and use the good one to cover your fuselage or wing. Dick found that, by stretching the panty hose over the fuselage and using clothespins on the extra length at the tail, you have a nylon covering that fits all the compound curves and can be readily doped. On his fuselage, he found two coats of dope would really adhere the hose to the wood. He then brushed on one coat of K & B Resin, sanded, and applied a coat of K & B Primer. When sanded it gave an ultra smooth finish ready for painting. By using the panty hose, the nylon fibers will provide the needed strength but without the weight of silk or Silron, not to mention the cost!

OUR APOLOGIES!

It was reported in RCM's 1973 Internats coverage that world champion Tsugutaka Yoshioka was flying an original design when, in reality, he won with the Blue Angel, designed by M-Kato, and available from Model Rectifier Corporation as a superb MRC/MK kit.

BASIC SAILPLANE DESIGN

from page 56

plane with good overall characteristics, e.g. a reasonable sinking speed, a decent speed range, and outstanding stability which enabled the machine to fly hands-off in turbulent air. The second airfoil is an adaptation of the Wortmann FX-63137, a low Reynolds-number airfoil designed by Dr. Wortmann for the man-powered Liverpuffin experimental plane. I thinned it to 12% and adapted the contours to available construction materials, while trying to maintain the theoretical pressure distribution.

The results were exactly as expected. The wing was hard to build (I even made templates to control airfoil shape) and hard to sand to exact final shape. Then, it was somewhat harder to trim and fly; the uncanny stability of the flat-bottomed section was partly gone, and you had to move your thumb around a bit. But the L/D ratio and sinking speed took a noticeable jump upward, and the still-air times easily exceeded any other plane I have ever tested. This wing, in combination with the all-flying tail, made an unsatisfactory combination; only the fuselage-mounted, articulated empennage gave adequate control.

For those who would like to build

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BASIC SAILPLANE DESIGN

from page 63

such a machine, I pass along a few construction hints. First of all, you will note that the spars are positioned and spaced so that you can use full-depth shear webs made of spar stock-spruce for the thin wing, hard balsa for the thick wing. This produces a wing which appears to be as nearly "unbreakable" as possible; it will survive an outside loop, as I discovered by accident one day. Be sure to anchor the wing tubes to the spars, use plywood ribs at the root, etc. The plane comes up fairly light, so rather than add ballast, build in some extra strength and weight.

If you build the laminar (we hope) flow wing, keep checking the contour with a template. Shim up the capstrips if necessary so that they meet the sheeting neatly. Do not have lap joints in the MonoKote, or use striping tape, on this airfoil. If it really does produce laminar flow (which it seems to do) there is no sense taking any chances.

The plane's outstanding characteristic is the flat, stable turning characteristic which makes possible rates of climb that are breathtaking, while holding a very steeply banked, tight, circle. This characteristic is more favorable with the flat-bottom section, because of the wing's very gradual stall characteristic, which enables the plane to fly through reasonably large changes in the relative wind flow without ballooning, stalling, diving, or dropping off on a wing. This characteristic is due to the C_L vs. Angle of Attack curve of the airfoil (Figure 3). With the modified Wortmann section, the characteristic curve of the airfoil is not so conducive to outstanding pitch stability, but the higher available C_L produces a better speed range and L/D ratio. If you use the flat-bottom wing, you can use an all-flying stab, but I would recommend mounting it either in T-tail fashion, or fairly close to the fuselage. The halfway position used on one of my test vehicles seems to be the worst possible choice.

The fuselage used on the test planes was an ugly, boxy sort of thing. I am partial to wood fuselages, but I have found in other tests that nicely rounded fuselages, usually easier to make out of fiberglass, definitely improve L/D ratios. I am trying to get the time to build a new fuselage with an oval cross-section and big wing fairings, but so far I haven't. One last nicety would be spoilers. Watch this column for a really nifty spoiler design created by local gadget genius, Bob Walsh.

If you want to try some or all of these ideas, let me know how you fare. The layout shown here is not the ultimate – nothing is. But for thermalling in weak lift, it is tough to beat, having demonstrated many times an ability to go up while others are coming down. For speed or distance events, a simple modification will suffice. Beef up the center section of the wings until you are completely confident that nothing will ever bust 'em, then sheet the entire wing, top and bottom. This increases wing loading in the accepted full-scale manner, and strengthens the panel so that they can take the additional strain imposed by supplementary ballast in the fuselage. Total weights of up to 9 lbs. are reasonable for this machine. With an all-sheet wing and 9 lbs. of all-up weight, the plane should be highly efficient, but probably difficult to keep up with!

A further series of tests on fuselage contours will be discussed in a later issue. The basic elements of wing planform, airfoil, force arrangement, etc., will be left the same, since I am satisfied that this design is reaching a large measure of its full potential. □

RS SYSTEMS

from page 43

threshold detection system is used to perform the 'enable and reset' function to the decoder. Incoming information is processed in such a manner that both clock and sync pulses must be present before decoding can begin. This results in very clean servo drop-out.

RS Systems utilizes gold plated ITT Centiloc* co-axial Mil-Spec contacts for all connectors. These provide extremely low contact resistance and retain superior contact pressure even after thousands of insertions.

The receiver-decoder modules are packaged in a new flanged nylon case. The case halves are secured by two retaining rings providing instant access to the receiver module for their frequency change feature. The entire receiver-decoder package occupies a space of 1.683 cubic inches, making it, without question, the smallest in the industry.

Total current consumption is only 25 milliamps assuring long airborne battery life.

In our opinion, no other production servo can match the RS servo for speed and resolution. A gear train with virtually zero backlash and high efficiency make this possible. Centering accuracy is held to one-third of one percent! Voltage and temperature drift are, for practical purposes, unmeasurable. Eight ohm, 16 millimeter motors are used in all RS servos, featuring low mass, vibration resistant brush assemblies. Total transit time is under four-tenths of a second, making this the fastest servo available. A custom monolythic integrated circuit with external motor driver transistors transfers the maximum power supply voltage to the motor, while consuming only eight milliamperes idle current. Capacitance filtering and diode clipping assure total commutation noise suppression and prevent spurious re-triggering.

All nickel-cadmium batteries used in RS systems are cycled and inspected for optimum life expectancy. The 500 milliampere hour capacity can be expected to provide 3 to 3½ hours of normal airborne time, inasmuch as total airborne system idle current drain is slightly over 50 milliamperes with four servos.

The switch harness connects the battery to the receiver. This switch harness has a third connector that is electrically connected to the battery when the switch is off. It is not necessary to disconnect any plugs to charge the batteries thereby eliminating fatigue of vital wires to both battery and receiver.

A separate dual external battery charger is supplied with all systems. It is capable of charging transmitter and receiver power supplies either independently or simultaneously. An isolation transformer is incorporated in the interest of safety.

For 1974, RS Systems has added many production, quality assurance, and test procedure changes, in a continuing quality improvement program. Rigid inspections and functional tests are conducted throughout their assembly process.

The entire series of 1974 RS systems have been designed to offer the hobbiest the ultimate in digital proportional control with the highest reliability factor possible. Goals for the performance and reliability of this system are very rigid and thousands of

to page 68

RS SYSTEMS

from page 66

engineering and flight testing hours have been spent.

The RS System for 1974 has not only been designed to the highest degree of technical excellence that we have seen to date, but it has also been human engineered for maximum flexibility on the part of the RC flier who will use this system in many and varied applications. As an example, each radio is furnished with two reverse servos and two standard servos for maximum installation flexibility. In addition, the standard features of each RS System would equal or exceed many radio manufacturers optional accessory list.

In a recent advertisement, RS Systems showed the grill of a new Rolls Royce and a picture of their 1974 transmitter, indicating their pride in meeting or exceeding all of their design goals in order to offer a system believed by many to be the ultimate in radio control. As we stated in the beginning of this article, we have several RS systems on hand which are constantly in use in our various test projects. Each of these systems is covered by RS Systems Guarantee. This guarantee states that the first 90 days after purchase date, by original owner, system operation is on RS Systems. Simply return it to the factory or an authorized service center with a written description of the problem and they will repair or re-

place, at their option, as necessary to bring to original operating condition. The only cost to the owner will be shipping both ways. On one of our systems we had an opportunity to test this guarantee due to the crash of a test ship caused by pure pilot error on the part of the author of this article. The system was completely checked out, repaired as necessary, and returned to RCM with no charge. In our opinion, we have seen other radio systems that may equal a few of the features offered by RS - - - we have yet to test and evaluate a system that has exceeded it in either quality or performance.

At the time of this writing, RS Systems prices are $244.95 for 3 channel; $419.95, 4 channel; $439.95, 5 channel; $469.95, 6 channel. A single stick 6 channel system is priced at $489.95. There is no additional cost for 72 mHz or 6 meter frequencies. The "buddy box," or "trainer," system option is available for $20.00 additional. RS Digital Guidance Systems is produced by RS Systems, 2407 South Broadway, Santa Ana, California 92707. Their radio systems have been Tested, and are Approved and Recommended by RCM. □

ELECTRONIC FUEL GAUGE

from page 39

able. Still, it's very small and easy to tape to the front of your transmitter.

Talking small, you could alter the suggested layout in Figure 6 by removing the nuts and solder lugs from the back of the meter. Saw off the bolts, too; then solder lead wires directly to the bolt stubs. Put C4 at the bottom of the box and B1 at the top; now you can shrink the side view and have an even greater space saving. Make the top of the box removable so you can get at the battery.

The ultimate space saving would be to build the micro-mini or even the subminiature version right into your transmitter. Wire the components inside the case and mount the meter below your field strength meter.

GENERAL ALTERATIONS

With the large version, the miniature version, and subminiature version, you can change the timing periods by simply changing the value of the capacitors. With the big and miniature versions, every 250 uF will give you about a minute. For the subminiature version, every 250 uF will give you around a minute and a half.

With all four versions, should you get a unit that produces a reading that drops quickly, then slowly, your zener diode is wired in backwards. The cathode (+) side of the zener has to face the juncture of R1 and R2.

Whichever version you may decide to build, the gauge adds a real thrill to R/C flying. **Think** of it – you know how much gas you have throughout the flight!

How's that for wild?

BENCH MODEL CADDY

from page 33

accessory, the Caddy can be used as a free-standing unit. All that is necessary to do is to insert the Caddy into the notches of the Caddy support brackets in an upright position. To get more support, a yardstick can be clamped between the Caddys. In addition to the above features, a pushrod can be worked on by inserting it through the 1/2" beveled hole in each Caddy and locking it in by turning the Caddy toward the center. This fixture will accomodate an arrowshaft or a 3/8" square balsa pushrod. You can even dress down the sharp corners of a square balsa pushrod by gently pulling

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BENCH MODEL CADDY

from page 70

it through one of the holes before inserting it in the Caddy. When not in use the Creekmore Bench Caddy may be stored on the end of the bench where it takes up very little space.

This is an excellent unit, and the convenience of its operation can easily be seen in the accompanying photographs. Tested, Approved and Recommended by R/C Modeler Magazine. □

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placement of landing gear. If you plan to do most of your flying over a man-made surface such as concrete or tarmac (grass is considered man-made here in New Mexico) you **must** have a steerable tailwheel. A wooden skid may give the plane that Curtis-Jenny look your heart so ardently desires, but I guarantee that it won't get off the tarmac any more often than about every third try – and then not in the direction you expected it to go. A wooden skid simply hasn't enough purchase on a hard surface – it leaves your aircraft's tail at the mercy of every upsetting force imaginable, including torque, crosswind gusts, and small pebbles under the wheels. The real WW I birds had the same problem with ground looping, and pilots learned quickly that the trick was to slam in full power from a standstill and get that tail off the ground and flying as quick as possible. And to land and take-off only on dirt – a runway material most early aerodromes had in excess.

But the addition of a steerable

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HONKER BIPE

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tailwheel cures this problem. It allows tricycle-type ground handling, and takes off arrow straight, with seldom a rudder correction needed. A fixed wheel would do almost as well, although you'd sacrifice the ability to taxi out to the end of the runway and turn into the wind, a maneuver that is absolutely imperative if you wish to keep the respect of the frowning pattern experts in your audience – especially the poorer ones.

The only other aspect of flying a taildragger that deserves mention is the landing approach. You will learn to flare out like the real ones do – or buy a lot of props. But this, too, is realistic, and looks almost as good as the classic taildragger take-off: rollout, tail liftoff, long smooth run before that imperceptible second – who knows just when? – that the spinning wheels clear ground and your bird wings off into Ted Strader's "turbulent, signal-jammed, vile grey yonder." Looks like you have about thirty feet of altitude; turn her crosswind. Good; now another ninety for the downwind leg . . . okay, you're cleared to leave the pattern. You're on your own.

CONSTRUCTION

Start your Honker Bipe by cutting a piece of 3/8" x 3" x 36" to the top keel outline shown on the plans. Don't mutilate the 7" end scrap; you'll need it later for the bottom nose sheeting. Lay this top keel flat on the bench and

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glue two pieces of 1/4" x 1/4" triangle stock down each edge, indented in 1/8" for the fuselage sides. (See cross-section on plans.) If you don't trust your eye to judge the 1/8" consistently, then first mark it off with a ball point pen. Now cut the 1/8" fuselage sides from hard balsa and glue them in place.

At this point you may wish to glue the firewall in place to help align the fuselage sides; personally, I prefer to add the 3/8" bottom sheeting and its corner stringers instead, installing the firewall-engine-tank as a single unit after final sanding and MonoKoting is completed. This allows me to assemble and connect these critical items and to check their viability out in the open air instead of down inside a dark nose shell.

The next step is the bottom rear sheeting – draw its outline on 1/8" balsa using the rear portion of the top keel for a pattern. Glue the two corner stringers to the fuselage sides before adding the sheeting. (If you worry about strength, you may prefer to put this sheeting on with the grain crosswise.)

Now, cut the two cabane struts to exact shape and epoxy them to the outsides of the fuselage. (Our Editor put the cabanes and doublers inside – said it made it look nicer. Yech!) Consult the plan frequently during this operation and you can be almost certain of a trouble-free first flight. Here's why: the top wing is in front of the bottom one, right? So their combined Center of Gravity ought to be about halfway between the normal CG's of each of the wings – in other words, a bit in front of the normal CG location of the bottom wing, and a bit behind the normal location for the top wing. Now, picture the plane going into a stall, and pretend that for some reason the top wing stalls first. When it stalls, it quits flying, and the plane is suddenly relying solely on the bottom wing for support. It's as though the top wing no longer existed, and the plane was a low-wing monoplane. And where is the Center of Gravity on this monoplane? "A bit in front of the normal CG location of the bottom wing."

And we all know what happens to airplanes that suddenly find them-

selves with a too-far-forward Center of Gravity – they drop their nose and go into a dive, right? At which time the top wing begins to fly again and the plane resumes reasonably level flight. Because, by good fortune, the top wing stalled first, the bottom wing never had a chance to stall, so the airplane continued flying. And all you have to do to build in this automatic stall dampener is to set the top wing at a slightly more positive angle of attack than the bottom one. That's why the strut position shown on the plans is so important.

Now cut the 1/8" balsa fillers that go in front, between and behind the struts, and glue them in place with epoxy or contact cement (water-base glues will warp the wood and make a tight bond difficult.) You may omit these pieces entirely if you wish, but be advised that they do more than make your MonoKoting easier – they act as nose doublers for strengthening the fuselage sides. Incidentally, sanding the taper into the rearmost doublers (see top view) is much more easily done **before** gluing it in place.

At this point your fuselage is structurally complete – not much over an hour's work, using a bandsaw and 5-minute type epoxy. All that's left is to shape it to your heart's desire (some have been left perfectly square – ugh!) and finish it as you prefer.

Add the 1/8" sheet empennage, wing dowels, landing gear and tail wheel or skid according to the options shown on the plans. Feel free to reshape the rudder and stab to suit any particular plane you wish to duplicate (Fokker D-VII, Thomas Morse, Sperry Messenger) with only this stipulation: don't **decrease** any areas. You can safely add a bit of area to either the vertical or horizontal, if necessary, but the surfaces shown don't allow for much trimming down. (This is due to the necessities of kit production: with balsa getting more scarce and expensive every month, waste has to be cut to a minimum.)

The wheels you choose will also depend upon the effect you want. Williams Brothers "antique" wheels give that delicate, WW I effect, while the more robust scale types such as the standard Du-Bro's smack of the thirties.

The last step is the wings. If you or your friends have any retired Honkers (June 1973 RCM) lying about, you're in business. Here in Albuquerque we pylon-race our Honkers around football goal posts, and believe me, that

retires them fast! Almost as fast as it retires far-pylon flagmen!

In any event, construction of the biplane's wings is identical to that of the half-A Honker. Using a sanding block or jointer, bevel a sheet of 1/4" x 4" x 36" Sig tapered balsa to about 6 degrees and join it to a piece of 3/8" x 3" with about 3/16" undercamber, as per the accompanying plan.

When the glue has set thoroughly, razor-plane and sand the panel to the cross-section shown. At this point I like to apply my film covering, saving the cutting of the dihedral break for later. That way, the film goes on in just two sheets, a top and a bottom. But, of course, the quality of the dihedral break is hard to hide, unless you put a trim patch over it.

Either way, the dihedral break ought to be made with care. Be sure it is exactly centered and exactly perpendicular to the wing - - - these points are obvious. Less obvious is the inside of the joint. Use only epoxy glue for this joint (five-minute types are fine). And, take advantage of an old hand launch glider technique: after the two panels are beveled (with a sanding block) for a tight fit at the proper dihedral angle, punch a couple of dozen holes into each root with a straight pin so the glue can soak back into the wood. About 1/8" deep is plenty. Then rub the glue well into these holes before joining the panels. Voila – dozens of miniature dihedral braces built into your wing. Strong!

If you decide to use ailerons, cut them into the bottom wing as shown, before covering. Then use the film covering for a hinge, per this time-tested method: First, bevel the joint

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for a top-surface hinge. Cover the top surface first, leaving a bit of a crack (maybe 1/32") between the wood pieces. Then cut the inner end of the aileron free and hinge it up and forward until it is resting flat against the top surface of the wing. Now apply the bottom film so that it covers the aileron, both the inner surfaces of the joint, and the bottom of the wing, in one continuous piece. When you flip the aileron back into position, you'll have a neat, full-length hinge composed of two layers of film. This same method works well on the empennage.

Don't be put off by the undercamber. It's really just two flat surfaces, that must be covered one at a time. Tack down the center joint firmly, then iron on the surface you've just tacked (makes no difference whether you do the leading or trailing half first). Then move across the joint and do the other half. Just be careful not to stretch the film across the joint itself, and you should have no problem.

The radio installation will depend upon your equipment. Honker Bipes have been flown on two-channel bricks, using rudder and elevator control and a Tee Dee .09 up front running full bore. (If you're a beginner, forget advice that tells you to fly rudder and throttle - - - it takes much more expertise to make a throttle function as an elevator than it does to make an elevator function as an elevator.) They have been flown three-channel on Kraft bricks and discrete

systems with KPS-15 servos, and full house (four channel) using RS and Orbit radio with miniature servos. There is no reason why it shouldn't fly well on rudder-only; just keep in mind that this is the most difficult and challenging way to fly an airplane this large. But they're tough and forgiving and gentle, so no matter what control set up you choose, you're in for some long, pleasant afternoons.

Editor's Note: Please don't call or write Southwestern Sailplanes about supplying wing panels only – they just can't do it during the present balsa crisis. Four-inch-wide wood is incredibly hard to come by, and it's taking all they can get to maintain Honker kit production. If this situation eases, we'll spread the word – but at this writing there's no relief in sight. □

DU-BRO SHARK

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joined by Bob Bentley, and another Du-Bro Shark. Together they put on a most impressive show. It appeared that the Shark was capable of unusually quick response to control commands, including rotor acceleration during take-off and landing, comparing very favorably with the far more complex machines that have collective pitch.

After a break for lunch, and to warm up, we were informed that it was our turn. Between the heavy wind, the cold, and the fact that we were sadly out of practice, we were less than anxious. What a time to check out a new machine! A pair of fiberglass rods were strapped across the

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DU-BRO SHARK

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gear to give it a wider stance for the first try.

Our hesitation was unfounded. The Shark behaved beautifully (though we didn't always!). We were so impressed, that we burned nearly a gallon of fuel, and nearly froze to death. Being lighter than the Hughes 300, the Shark responds more quickly. Also, the smaller main rotor runs somewhat faster creating more stability, a very pleasing combination.

During our stay, a new Du-Bro "training" gear evolved, for both the Shark, and the Hughes 300. It is our belief that unless you are an extremely proficient flyer, or are performing for a crowd, you should be flying on a "training" gear. Sure, they don't look as good, but, they do cut down on maintenance. For practice flying, the higher, wider gear will totally eliminate the possibility of a flip over for the experienced pilot. It also keeps the ship up away from that dirty pavement – keeping the ship cleaner, as well as sucking less crud into the engine. So much for our pitch for "training" gear.

The new Du-Bro gear is really a refinement of the original Hughes 300 "training" gear, and consists of four half inch diameter fiberglass rods that are attached to the chopper via machined fittings and a baseplate. This gear is tough, and can withstand almost anything a novice pilot could think of.

Shortly before our departure for home, the new gear was fitted to "our" Shark for a trial. Not only does it impart a safe, secure feeling, but it also gives the impression that you are already flying, since it sits quite high.

Time was growing short, and we had a plane to catch in Chicago. As we gathered our things together to leave, we were told that we should take the Shark along for further testing. We advised our host that with today's airport security, it was unlikely that we would be allowed to "carry on" a Shark! Dewey Broberg assured us that he could quickly pack it and we could take it along as baggage. In a matter of minutes, the Shark had been disassembled into major units and carefully boxed for the trip.

When we arrived home, one of the first tasks was to unpack and re-

assemble the Shark. Within twenty minutes it was again in flyable condition. We have since put several gallons of fuel through the Shark without failure (thanks to the "training" gear).

So much for the history of our Shark. Now, some facts about the machine, and our opinion of it.

The Shark is powered by an O & R 1.34 cubic inch displacement engine, which Du-Bro has customized for operation on glow fuel. The gear box and clutch are a part of the engine, and require no maintenance, (ours has not). A pull starter is an integral part of the engine – no external, extra cost starter is needed. The main rotor span is 52 inches, giving a swept area of 2123 square inches, and is of the Hiller type semi-rigid rotor. A total weight of 12 pounds is about the average.

The fuselage or cabin is vacuum formed ABS plastic, requiring only the simplest assembly. The fuselage is attached to the machine by four screws, and can be completely removed without disturbing the radio or mechanical installations. In fact, the helicopter can be flown without the body shell installed (re-balancing would be required). The servos, tank, receiver and battery pack are all mounted on the back wall of the cabin, which is really a part of the mechanics. This arrangement makes the Shark the easiest helicopter to service. (We have actually witnessed a Shark crashing from 75 feet, then being flown again 17 minutes later!)

The Shark is not a scale helicopter, although it looks like an older Enstrom; it is a superb flying helicopter. We wonder just where all of this scale business started anyway. All of the so-called scale helicopters that are available require countless hours to build; they further require careful trimming and constant maintenance. Should you have a mishap, ding, crash, etc., then what? More hours of work, and possibly weeks of waiting for parts. If you are an experienced helicopter pilot, you may feel it worthwhile.

However! If you are an average RC'er with the urge to find out just what this helicopter business is all about, or you are an experienced chopper pilot who is tired of being "grounded," **THEN** the Du-Bro Shark is what you are looking for.

When we at RCM find a product that does what the manufacturer claims, and does it to our complete satisfaction, we give it the familiar Tested, Approved, and Recommended

by RCM, as an aid to you. The Du-Bro Shark most certainly warrants this approval. We feel further that it also warrants the following statement:

We at RCM have built and flown most of the R/C helicopters currently available. We have checked the others, both with collective pitch and without. In flight the Shark can hold its own with any competitor. We firmly believe that for ease of construction (2-3 evenings), overall serviceability, maintainability, and repairability, the Du-Bro Shark is the best helicopter kit available today.

Available at your local hobby dealer at $350.00 for the **complete** kit, including engine. For further information, contact Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, Illinois 60084. □

FLYTE BOX

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The face plate of the Flyte Box is aluminum and may be cleaned with liquid auto polish using a soft cloth. The controls include a DC power switch which turns the entire unit on and off. The switch should be in the ON position for all functions except charging. The unit may be OFF during charge. A 117 volt AC charger light indicates the charging mode and lights only when the AC cord is plugged into a .110-117 volt receptacle. A slight hum should be expected during charging. The DC voltmeter will indicate the battery condition when the unit is operating under load and should read 12-13 volts when the power switch is in the ON position. The glow plug test circuit operates only when the glow plug cap is connected to a plug. Depressing the button will give you a green light when the plug is functional. This test is most helpful when starting your engine. The two position fuel switch is "loaded" to neutral and when held in the IN position means the fuel is flowing into the airplane and when depressed to the OUT position means the fuel is being siphoned out of your tank. To fuel the internal half gallon container, all that is necessary to do is to place the fueling line in your fuel supply and hold the switch in the OUT position. A two screw terminal on the side of the box delivers 12 volts at maximum amperage and is designed to power your hand starter but will serve for any 12 volt function such as a 12 volt field soldering iron. The starter should

be attached with solderless terminals for best results. The glow plug cable supplies 1½ volts under load.

Upon receiving your In-Flyte Box, the 12 volt motorcycle battery needs to be activated with acid. Most service stations can supply acid at a small charge. Never, under any circumstances, put water into a dry battery. Only battery acid will work. Be sure to follow the instructions and fill to the lower level line only. Never exceed the upper level under any circumstances — to do so may damage your 2 volt tap or cause corrosive boil over into your Flyte Box. The battery supplied with the unit is of sufficient strength to power your starter, glow plug, and fuel pump for a full day of R/C modeling. According to the manufacturer's instructions, after the addition of battery acid, but prior to first use, you should charge the 12 volt battery for not more than 10 hours using the the built-in charger inside the Flyte Box. In addition, you should charge your battery after every extensive use. Generally 2-5 hours is adequate. Be sure to keep the fluid level at the lower level line on the battery case. Distilled water is preferable for maintaining the electrolyte level. Be sure to keep the terminals clean and free of build-up. Baking soda and a toothbrush will easily clean accumulated deposits. A little WD-40 sprayed on the terminals will usually prevent build-up or corrosion.

The Sullivan 12 volt reversing gear driven single unit fuel pump supplied with the Flyte Box is one of the finest of its kind. This exceptionally strong pump delivers fuel at the rate of 1 oz. per second. To maintain your pump in top working order never pump any liquid but fuel through the pump; never run the pump dry; and check occasionally to see if the rectangular shaped plug in the bottom of the pump is securely in place.

The Flyte Box is guaranteed against defects in workmanship or parts for 90 days. Available is an easy-to-assemble kit for $49.95, the Flyte Box is also available pre-assembled and finished for $62.50. For each unit ordered direct from the manufacturer, include $4.25 for shipping, handling and insurance. If you order the kit, it requires only a soldering iron, screwdriver, pliers, and the finishing material of your choice.

The Flyte Box manufactured by In-Flyte Products Co., is truly the R/C modeler's right hand. It is the finest

unit of its kind that we have ever tested or used and, once having used it, we wouldn't be without it. We would find this unit difficult, if not impossible, to fault in any way. Tested, Approved and Recommended by RCM. □

THE LITTLE SQUIRT

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California.

The Kraft KPS-11 servos are used to activate four small micro switches that give the following control: The right stick is used for rudder; the left stick forward activates the pump; the left stick back activates the recorder playback sound track; the third channel is used for forward, off and reverse motor control.

Building the Harbor Fire boat was a lot of fun and a rewarding experience for your writer as it could be for you. TRY IT - - - YOU'LL LIKE IT! □

STRIKEMASTER

from page 22

servo trays behind my receiver for obvious reasons, the battery sits ahead of everything, wrapped in foam, and balance considerations dictates that it sits fairly well aft, leaving the receiver nowhere to go but behind F3, where a light rubber band keeps it snugged down below the pushrods. In reality, I found no difficulty in stowing the bundle by first looping the band over the tab with a stout wire hook and keeping it in that position while the receiver is inserted. Then you just pull the band up and over to loop around screws or tabs on the servo mounts. The system has never given any trouble and, after all, how often do you remove your radio gear?

I know you will get a lot of fun out of your Strikemaster. The addition of missiles or weapons pylons has little effect on the flight characteristics, but what you gain in raised eyebrows and camera clicks is reward enough for the effort.

If you are interested in experimenting a little further I know of a varia-

tion with outboard ailerons and large inboard split flaps. Yet another version has a retract system using a nosegear and a single tandem main wheel under the fuselage. Lateral stability is attended to by wing tip whiskers. As I understand it, the nosegear is a standard Carl Goldberg retract. The single main wheel just swings free in a horizontally mounted nosegear bearing and is linked by a rod – via a Carl Goldberg retract servo to the nosegear which provides all the up and down lock forces, which speaks very highly for the quality and design of it. The nose unit retracts backward, as normal, and the main wheel swings forward to compensate the C.G. change.

All very simple and very ingenious.

HI-TORK STARTER

from page 16

ficulty, peeled the skin from the palm of his hand!

Matty thinks in depth, and as he unfolded his ideas of what a starter could do and how it should be designed, I could see he spent many hours pondering the best approach to solve the problems inherent in the present starters.

Months later, Andy Sullivan called me with the exploding statement, "Ray, we've got it!!" and another request to take a look at the results of their efforts.

When I visited them this time, Matty handed me a box and said "Go ahead, open it and tell me what you think." A flip of the lid exposed what looked like a jewel. I reached in and with a comfortable grasp, lifted out a starter that felt like part of me. Immediately my reaction was to squeeze the bar switch with my fingertips. This switch is enclosed in a Neoprene extrusion that is serrated to prevent slippage even with oily hands. The end bells are made of nylon, molded in the Pylon Brand yellow color. The front end bell has a safety flange that all but eliminates the possibility of getting your hand tangled-up with a spinning propeller. This flange also has a flattened portion that acts as a stand – yep, it keeps the starter positioned so that when you pick it up it is oriented for use. Human engineering – Right?

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ENGINE CLINIC

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Your Enya .29 and .35 should be getting at least 12 minutes on a 6 ounce tank. However, I believe you are barking up the wrong tree trying to solve the problem with carburation. Although some makes of carburetors will give better economy than others but no carburetor is going to double the fuel economy. You have a problem other than the carburetor. First, check the vent tube in your tank and make sure it is at the top of the tank so that you are actually filling the tank. Then make sure that fuel is not siphoning from the vent tube while the engine is running. Hold your hand behind the tank vent with the engine running and see if you feel any cold spray. If not, the problem would be in the engine. There is not much you can do here other than to determine the cause. If an engine is a gas hog it is usually caused by fuel leaking out the front bearing or past the sleeve and out the exhaust. Leakage out the front bearing is easy to see while the engine is running and a few drops now and then is perfectly okay. If the fuel sprays out like a spray gun, even getting the back of the prop wet, then this is the cause of your poor economy. Leakage past the sleeve and out the exhaust can be checked by putting some 3-in-1 oil in the exhaust port and turning the engine over slowly in the direction of rotation with the glow plug removed. If you detect bubbles between the edge of the crankcase and sleeve, then this is also contributing to your poor economy.

The Perry carburetor for the Veco .19 might work okay on the engine but is a little small and would result in some loss of power. This would, however, give you considerably better mileage. You might also have some problem with the .19 Perry passing enough fuel for the requirements of the .35 engine. If you are going to use the Perry you should use a model intended for the .29 – .40 size engine.

Dear Sir:

I have a question about model engines I would like to have answered.

Is equal torquing of studs, etc., of importance on cylinder heads, sleeves, front and back plates when assembling engines? After tearing down several new engines to clean out the burrs, shavings, etc., I am now a firm believer in this practice as well as wondering if some of the trash couldn't

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HI-TORK STARTER

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What's that? How about the blasted spinner cups that are so darned fragile? Well, they even went to nylon to keep their friends (customers) happy. The nylon spinner cups are almost indestructible, and to give the best performance, the inserts are made of the highest grade surgical rubber tubing.

One of the impressive areas of this new starter is the weight – plenty of iron for plenty of torque!

Take a look at the curves for this motor – compare it with the speed/torque of any of the others, and you will see the tremendous difference.

My first impression was, "Boy, this draws more current than the others." So, I decided to bother the neighbors trying the new starter that was given to me to test and evaluate.

Let's see – Sullivan's starter, Brand "X" starter, battery and the grumpiest

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HI-TORK STARTER

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.60 I have – better go to the back of the yard for this.

My first attempt to start "grumpy" would be with Sullivan's starter. To give it the real test, I engaged the spinner cup with the spinner to attempt to stall the starter. One squeeze and "Pow!" old "grumpy" was singing like a bird. That son-of-a-gun turned the balky engine over like it has never been turned over before. I quickly shut it down so that I could try Brand "X" on it. With the same test conditions, Brand "X" stalled. But with a running start, it turned the *!&$* over, but no fire. Try again – nope. Again – nope. Again and Voila! There she goes.

To try to confirm my results, I shut it down again and reverted to that black and yellow jewel. With the

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HI-TORK STARTER

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spinner engaged, I again applied finger pressure to the bar switch and "grumpy" sang again.

To avoid any prejudice, a trip to the field so that others could experience real craftsmanship proved to me that this starter was (quote) Out of this world. (unquote.)

The higher current draw that had me at first concerned seemed to be offset by the fast starts and very short periods of usage so that ampere/hour-wise I got as much usage per charge as before with Brand "X".

One thing we all noticed at the field was the ease with which the engines could be started at a low throttle setting. Unlike geared starters which turn over at about 1500 R.P.M. and tend to almost stall the engines when they do kick off, I found that the Sullivan starter, because of the direct drive, high speed, and high torque, would demonstrate it was turning over at a higher speed than the engines were running.

This was apparent by the drop in engine speed when the starter was removed from the spinner.

It is obvious, you cannot beat cubic inches of iron for torque and speed. It's kind of a flywheel attached to your engine.

Being still amazed with the power of the starter I wanted more opinions, especially from the flyers who put horses under the cowlings.

The chance came with a notice from the flying club telling of a

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HI-TORK STARTER

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Sunday meet at the local field. Unfortunately other plans were made for me that Sunday so I asked my close friend Dr. Jim McCord to do a stand-in for me. Jim was very happy to do this, and he made arrangements to use this starter for all of the flights during the meet. The results: – "Right-on," "Best starter I've ever used," "Man that has power," etc., etc. . . . .

I am now convinced that the results of my testing were not shaded.

Let's look at the pluses you get in the Sullivan starter – to deliver maximum power, the cordset used with this unit is of No. 14 A.W.G. rubber covered copper wire. The starter cup is made of nylon and is threaded to the shaft. This is backed up with a locknut giving a very secure mounting.

The bar switch is something else. It is provided with automatic sliding contact action to keep the contact area clean and free from burn spots when making and breaking contact. This is built for years of trouble-free operation.

Wait till you see the terrific guarantee. Yep! it's one of those unbeatable Sullivan guarantees. Two years, that is right – two years.

You will not have to worry when your guarantee expires.

You said it man – parts will be available (just in case it ever gets hit by an I.C.B.M. and possibly damaged).

So - - - in promulgating your esoteric cogitations – Aw nuts! Let's get with it!

Tested, Approved, and Recommended by RCM. □

SUNDAY FLIER

from page 12

about a great airplane the other day. All of the performance parameters were fed into a computer, the computer whirred, hummed, clacked and came up with a great printout of the expected performance. Came the day for the test flight. You guessed it; the airplane flew like a computer!

Back to the Alpha II. It weighs 2½ ounces, the 450 ma battery pack weighs 4½ ounces, and the MoControl unit weighs one ounce. Add it up, you've got eight ounces for the power

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SUNDAY FLIER

from page 100

unit - - and it puts out about the same power as a glow engine that weighs an ounce. Now, when I say power, don't misunderstand me; I'm referring to useful power - - thrust. And the thrust of the Alpha II with the 450 ma pack is roughly equal to the thrust of a Cox .020. However, it is distributed over a larger disc due to the diameter of the prop which is used - - nine inches compared to five. In answer to my query as to what would happen if a smaller prop were to be used, the manufacturer said I wouldn't get as much thrust, even though the motor would turn up faster. He was right; I tried it.

Well, since you have eight ounces for the power unit, and somewhere between six and eight ounces for a radio, servos and battery, you're already up to roughly a pound of weight. That leaves you twelve ounces to work with for an airframe if you want to weigh the 28 ounces which is recommended. Alternatively, if you go to the higher power batteries, they add four ounces of weight, so it sort of becomes a push, since the recommended weight in that case is two pounds.

The next thing to consider is the thrust and rpm which can be achieved. With the standard battery pack, the Alpha II will turn a 9/6 prop at 4200 rmp, or a 9/8 at 2800. A quick calculation shows that the former means the prop will progress through the air at 24 mph, or the latter at 29 mph, assuming no slippage. And if your propeller efficiency is in the 65-70% range, then you are going to need an airplane that flies at a speed of somewhere in the neighborhood of 15-18 mph. And what kind of airplane would that be? Naturally, one with a light wing loading. All of which leads to a design somewhat on the order of an auxiliary powered glider.

In order to get some flight tests in as fast as possible, after bench checking the unit and determining that it meets the specifications, I put together some spare parts I had lying around the shop and came up with a sporty little (little?) job that I christened the "Alpha Roamer, The Electric Flying Machine." Naturally, a few guys started calling me Tom Swift. Isn't it amazing how many fellows still remember those old books?

The Alpha Roamer has a six foot span, Clark "Y" wing section, 3.4 sq. ft. of wing area, and weighs 34 ounces, for a wing loading of 10 oz/sq ft. Had I gone to the trouble of building a model especially for this project, I could have shaved about four ounces off the total weight and come up with the recommended 28 ozs., but I was too impatient. As it turned out, I didn't really have to worry. Admittedly, the take-offs look like Lindbergh on his way to Paris, and the climb-out reminds me of the way my old "Big Breathless" went up with its full load of fuel when Bill Glick and I set the world's endurance record back in 1958, but I gotta' tell you it's a lot of fun to experiment with this new power concept (well, not new, but just coming into the forefront) and learn the limitations as well as the capabilities.

With all of its present limitations, electric power has a lot going for it. You've heard about it – no messy fuel, virtually no noise, easy starting (sometimes too easy, as Don Dewey

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And, it is affecting our model industry, as we mentioned last month. There is currently a drastic shortage of methanol which comprises the major portion of each gallon of model airplane fuel. Methanol is the basis for paints and certain printing inks and the allocation is going to those industries with virtually none left for model fuel manufacturers. In addition, paper, plastics, and even balsa wood are in short supply. While the balsa shortage is expected to ease with the opening of two new plants in Ecuador during 1974, the paper shortage is certainly not going to be solved as long as we're selling a large portion of our wood and manufactured paper to overseas buyers in order to obtain a higher price and subsequent higher profits.

It is not easy to read the daily newspaper or listen to the evening news without becoming somewhat depressed. It's not easy to start construction of a new model airplane only to wonder if you can buy fuel for it when it's finished. It's not going to be easy to try to install your radio equipment without the plastic accessories such as aileron bellcranks, control horns, and the like to which we have become accustomed. But, radio controlled model aircraft came into existence because modelers are ingenious and inventive craftsmen who have, since the inception of R/C, always found a way to "do it a little bit better." And, if we run short of plastic for our accessories, we'll find a way to make them out of plywood or aluminum, or some other substitute material. And, if balsa continues in short supply, we'll find ways to use other materials whether it be cardboard, hardwood, or aluminum. And, if model aircraft fuels become even harder to obtain, we'll find a way to adapt capacitor ignition to our engines, or revert back to ignition engines with a suppression band on our receivers, or use gasoline and a higher degree of nitro-methane as a fuel as we once did, albeit harder to start, and a resultant loss of power and somewhat hotter running engine. Quite simply, what I'm trying to say is that despite the obstacles in the months to come, we'll find a way around them - - - find a way to do it better with substitute materials. And, until these problems are resolved, we hope that you'll share your ideas with RCM readers everywhere in order that this sport and hobby may continue to grow and prove a source of relaxation and enjoyment for all of its participants in a time when such relaxation is sorely needed.

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Carl Goldberg Models, Inc., 4734 W. Chicago Avenue, Chicago, Illinois 60651, has notified us of the proper and recommended method for mounting their retract servo. Customarily, aileron servos are mounted in the top of the wing, so naturally retract servos have been mounted there, too. However, recent information shows that it is far better to mount the retract servo in the bottom of the wing. Many people have mounted it in the top and had great difficulty getting the retract units to lock solidly up or down. As the sketches show, where the servo is in the top, it drives somewhat **down** toward the retract units. This causes them to bind, and takes a lot more power to get positive locking. With the

servo in the bottom, the pushrods are in line with the retract units, and drive very efficiently.

In some cases, modelers have been able to get away with a top-mounted servo, but the inefficiency has resulted in running out of juice after only a few flights. Extension of the retracts could then not be completed, and the servo gears were damaged in a belly landing and the model was scratched up. With bottom-mounting of the servo, actuation of the retracts is so much better that in some cases it has been the difference between failure and success – between gears collapsing and gear reliability. According to Carl Goldberg Models, Inc., the only way to go at this time is to mount the retract servo on the bottom of the wing. Incidentally, where high nitro fuel (20-25%) is used, this swells the nylon and may cause binding of the nosegear. In this case, bearing holes should be slightly enlarged until the binding ceases.

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Our old friend, Nino Campana of Sault Ste. Marie, Ontario, Canada, mentions that the Soo Modelers R/C Club will be holding Canada's first sanctioned R/C contest in 1974 in Sault Ste. Marie, Ontario, on May 25-26. The group will be hosting the Upper Great Lakes Yearly Meet at Sinclair Park and will run Scale, Pattern, and Fly-For-Fun events. Inquiries for entry forms and other data should be directed to the C.D., Don Flannigan, 41 Edinburgh St., Sault Ste. Marie, Ontario, Canada. His phone number is (705)253-8246. All MAAC and AMA members are invited to attend. U.S. and Canadian frequencies are similar but will need D.O.C. or F.C.C. licenses.

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In closing, don't let the energy crisis and its attendant shortages frustrate you. As Jim Brown recently wrote, "real frustration is being half way through a Reverse Cuban Eight during the Nats and being told that your fly is open!"

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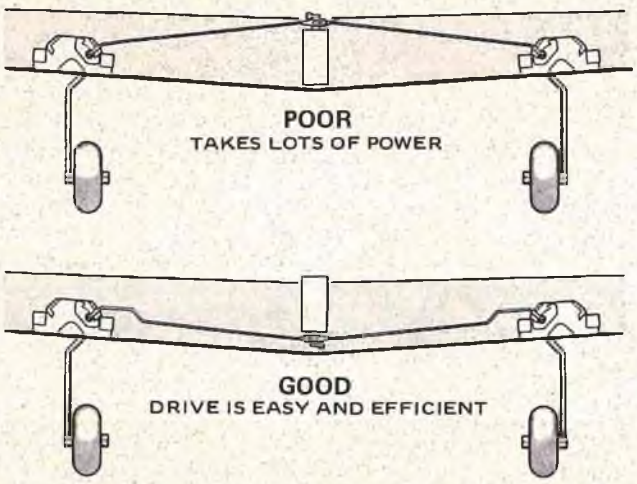
One last note – be sure to check Tenco International's ad this month for details on their exciting Wayfarer Contest – First Prize Value – $3000.00. □



SUNDAY FLIER

from page 104

mentioned, and I can confirm; it's disconcerting to accidentally connect the leads and have the prop suddenly whirr away in the shop!) and simple installation. Also, the ability to turn the motor on and off while in flight is good for a couple of reasons. I've caught a light thermal, shut off the motor, soared for four or five minutes, then, when the thermal petered out, turned on the motor and gone looking for another updraft. You can't do that with a Hi-Start! The other point is that when you're ready to come in and land you can shut off the motor, and if the prop happens to stop vertically, you can reset it by turning on and off until it is roughly horizontal. Note the photo of the Alpha Roamer gliding in with the prop at a slight angle, but not straight up and down.

There's one point that Frank Galler and I just don't agree on, however, and that's the use of either extreme rudder throw, or elevator throw to turn the motor on and off, as opposed to a separate servo. I'm a firm believer in the latter method, since I do not believe you can reliably limit surface movements by using part of the throw for control of attitude, and full throw for motor control. I've seen several modelers try that approach for other reasons, such as bomb dropping. What happens is that when you are in a tight spot and need full rudder, you will instinctively use it – and that's the wrong time for the motor to shut off! Alternatively, you may want to turn the motor on because you're in a tight spot – maybe too steep a bank near a tree, close to the ground, and that's no time to give a full throw rudder, or elevator, action. Yes, it can be done, but personally I don't recommend it. A third servo only adds a little over an once and is well worth the added reliability. But this problem may be solved later on as a new type of motor control becomes available. It will work right off a servo lead-out.

As with any new development, there are certain things that have to be learned. In the case of electric power, proper care of the batteries is paramount. It seems that nicads are very sensitive to charge rate (other than a "trickle" charge) and if you don't do it right, you can ruin a set of batteries without hardly trying. For example, since I use a third servo to operate the

switches on the Alpha MoControl unit, it seemed simpler to me to eliminate the MoControl entirely and have the servo operate a simple on-off switch. But no, that is not recommended, unless the only way you plan to charge the batteries is with the slow charge method, and that isn't practical. Who wants to go out to the field for just one flight? The reason given is that, in order to quick charge, the nickel-cadmiums must be discharged to just the right point. If you discharge them too far, something happens, like one cell goes reverse or something, and that's bad. Then, if you don't discharge them far enough, then when you connect the fast charge and leave it on for the specified time, you'll overcharge the batteries, and that can ruin them. The MoControl unit sees to it that the batteries are discharged to just the right level if you let them run down until the unit shuts the motor off, then you wait one minute, (having turned the MoControl unit off) and turn the motor back on and let the residual buildup get discharged. Then you can connect the quick charger up and be sure everything is just right.

Another point in the care and servicing of the batteries lies in the way they are installed in the airplane. I admit that I didn't do anything special in that regard, but that's because I was assured that for motor runs of less than four minutes the batteries wouldn't heat up excessively. So, I simply restricted flight time, since I hadn't made a specially designed battery compartment, complete with ventilation. Four minutes is plenty long enough for most fun flights, and since you won't get more than that out of a quick charge, there's nothing to worry about. But if you want to use the longer run which can be achieved from a full charge at the slow charge rate, it's easy enough to work out a vent system, like Don Dewey did with his Tom Swift design.

Finally, with respect to batteries, I never knew they were sensitive to temperature when charging. Like, don't slow charge if the temperature is below 55 degrees until you have warmed the battery up for an hour, or don't quick charge if the temperature is below 62 degrees without a warm-up of an hour.

One of the questions which I am asked when flying the Alpha Roamer is, "Doesn't the motor noise affect the receiver?" So far, I haven't had any problem, but I have heard that at

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SUNDAY FLIER

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longer ranges you might get some glitches, in which case a capacitor can be connected across the motor. Just ask for it.

Now, for the tough question. How much does it cost to fly electrically? Well, it ain't cheap – but it isn't as expensive as helicopter flying. So, I guess it depends on which type of flying you like, and how much of it you plan to do. And, in the future, if things keep getting tighter in the energy field, fuel can get scarce. So could batteries, I guess, but not quite so much. If you want to fly with an Alpha II motor, be prepared to put out about $110.00 – $61.25 for the motor and batteries, $28.95 for the constant current charger (you need one of these if you plan to put in more than one flight a day) and $18.95 for the MoControl unit. But you won't have to buy fuel, plane cleaner, starting batteries, plugs, filters, tanks, and all the other paraphernalia. And you can go out at lunch time, in your business suit, put in a flight nearby wherever there's a field, since nobody's going to complain about the noise (but watch out for the local ordinances; they don't differentiate between quiet models or noisy ones) and go back to work without having to change clothes.

Yes, I'm intrigued by electric power, and as it develops we should see some rather startling developments. Several firms are experimenting. Astro Flight is going one route, and Galler Electronic Industries another, and I'm sure others are pursuing even different routes. And if you have any special project in mind that needs special items of equipment, I'm told that Galler will provide special units for boats, cars, even helicopters (that sounds pretty far out).

So, if you're looking for something different in the way of a challenge, try electric power.

You'll get a charge out of it. □

ENGINE CLINIC

from page 90

have been removed before assembly, but I am wondering about the torque bit. It would be doubtful if a part would crack due to unequal torque but possibly the stresses could cut open and/or wear out an engine more rapidly.

Your help will be appreciated.

Sincerely,
Charles W. Beall, DVM
Ames, Iowa

It is of most importance that the head screws on an engine be tightened, or torqued, equally. The front and back plates are far less critical but should be tightened down evenly. When tightening the head screws you want to do so in a criss-cross pattern. Start by holding the head on the sleeve evenly with your fingers. Then lightly snug down the front screw followed by the rear, right front, left rear, left front, and right rear. Actually, the sequence here is not critical as long as you use a criss-cross pattern. Then go through the sequence and tighten the screws down tight, using the same amount of pressure on each screw. An improperly tightened head can result in a badly distorted crankcase and sleeve. This will not be detectable in a ringed engine, but can, many times, be felt in a lapped piston engine such as the K & B .15, Veco .19, etc. With the glow plug removed and the head loose,

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turn the engine over. Then tighten the head and check again. If you now feel drag or a bind as the piston reaches top center you have tightened the head unequally. You fliers running the .15's in 1/4 Midget Pylon and .19's in the RC cars take note of this. Some of those short lived engines you complain about are due to unequal head bolt tightening. With a distorted sleeve you are imposing drag on the engine that should not be there. Eventually the engine wears in but then has no compression due to a piston and sleeve that are anything but round!

Dear Clarence:

I have had a problem with an Enya .60 II (model 7032) that has bothered me the last two seasons. I have three Enya .60's and this is the only one that exhibits this problem. This engine seems to backfire when running at low speed, many times throwing the prop, prop nut, washer and spinner if used. When this occurs it makes a sound that is almost a metallic clank, which leads me to disassemble the engine for inspection. I could find only two things that were questionable; there were some rub marks on back of crankcase and the fit of the crank and connecting rod was slightly loose. The connecting rod was replaced (with a better fit resulting) and I could find no reason for score marks on the crankcase. No improvement was noted after rod replacement. The engine has relatively few hours and appears clean and in very good shape. I have been using "home brew" which is 22% Bakers Castor and 6% nitromethane. The engine has been swinging a Top Flite 11/8 wood prop. At any speed above idle the engine runs very well – at top end it hauls my Kwik Fly around very well. I admit not quite as well as my Enya III or Webra, but still does a reasonable job.

Please advise me on repairs for this engine. I hate to dispose of an otherwise good engine. Thank you in advance.

Sincerely,
Thomas Manopust
West Allis, Wis.

Kicking back at low speed was a characteristic of the earlier model Enyas. Some engines would be worse than others but they all did it to some degree. The crankshaft timing had a very late closing which, at low speed, would cause the engine to kick back and, quite often, run backwards. In the latter case, the late closing timing was actually early opening timing for reverse rotation. This usually ocurred when the engine was attempting to idle too low. Such as when trying to get a tick-over idle below 2500. Keep the idle in the 2600-2700 range with a full tank and it should help the problem. Some engines exhibited the tendency more than others due to variances in tolerances, etc. One engine will have a little higher compression ratio than another, etc.

Regarding the rub marks in the back of the crankcase – these are perfectly normal. The only thing that

When contacting an advertiser, be sure to let them know you saw their ad in R/C MODELER MAGAZINE

keeps the connecting rod on the crank pin is the back of the crankcase. It is bound to touch during the running of the engine from time to time, and especially during climbing maneuvers. The weight of the rod is going to let it fall to the rear of the crankcase.

Dear Mr. Lee:

In regard to your letter from Mr. R.E. Olson of Manitoba, Canada, I've also experienced burned front bearings on my O.S. Wankel, and having read your article I put Mr. Olson's suggestion of drilling two small holes in the bearing partition to the test. I now have very oily front bearings on an engine that only has three speeds — lean, extremely lean, and dead. It seems that the holes allow air to enter the rotor case where it apparently mixes with the fuel already in the combustion chamber, producing a no smoke (exhaust) lean condition as the throttle is closed. I just ordered a new front housing (and one case of 3-in-1 oil). I thought I'd drop you this note to possibly prevent some other ambitious, but unfortunate, novice machinist from contributing to the parts shortage crisis.

Well, the best laid plans and all that.

Sincerely,
John Pafford, Jr.
Texarkana, Arkansas

You are perfectly right, John. When Mr. Olson sent in the cure for his problem it seemed like the way to go — especially as it had worked for Mr. Olson. However, upon receiving your letter I pulled my own Wankel apart to double-check and see who is correct. Drilling the additional holes would allow air to enter the crankcase and lean the mixture.

If any of you other fellows have experienced problems with the front bearing in your Wankels running dry or burning out do not drill additional oil holes. There is a short seal section directly in front of the rear bearing. Take a piece of No. 360 wet-or-dry emory paper on the appropriate size dowel or drill shank and loosen up the fit slightly. Be sure and use a light machine oil such as 3-in-1 while doing so. This seal area is fit quite close on some Wankels and does not allow any leakage. Some leakage is necessary to lubricate the front bearing. This is sort of the opposite of the complaint many fellows have about too much fuel coming out the front bearing of their engines.

I have received quite a few letters the last few months related to problems modelers have been having after installing the Du-Bro muffler. For all of you guys who have written in, the following letter says it all. Read it and take heed!

Dear Mr. Lee,

In the September issue you had an item concerning the Du-Bro muffler being a

suspect cause of an engine problem.

The referenced letter mentioned that within 3 – 4 flights after the muffler was installed, the "beloved O.S. .60 had had enough."

This item brought back memories of problems we here on Okinawa have experienced with this muffler, and which may or may not tie in with Mr. Mayo's problem. One day at the field one of the flyers loudly announced the usual cry of "dead stick" and promptly brought his bird back to earth. Upon talking it up to find out what the problem was with that @*%$ mill up front, and trying everything in the book to get 'er to run again, I quite by accident mentioned the fact that the plates on the Du-Bro require regular cleaning (as per their directions). This brought out a puzzled look by the flyer, as apparently he missed reading that portion of the directions that come with the muffler. Sure enough, when we disassembled the thing you could hardly tell where any exhaust could possibly have been getting out. The symptom was a rather abrupt slowing down of the engine while airborne (heating up) and, finally, "freezing." In fact, that particular O.S. Max .40 heated up so badly that it froze the ring to the piston. My first experience wasn't so drastic as the one mentioned and I was luckier because I did know to clean those plates; I had experienced an rpm loss one day on my O.S. Max .60 which prompted me to check the muffler because it just "sounded" as if I had more back-pressure than normal. Since that time the rest of the flyers have gotten the "word" and now we know to keep those plates free of carbon build-up.

Sincerely,
SMSgt. Tom Botkin

CUNNINGHAM ON R/C

from page 6

final Center of Gravity fall where it should be on your aircraft is to build the bird complete, even down to the paint and the trim, and then locate the radio equipment within it. Even if you're building a model and are using the same radio equipment, and you locate it exactly as shown on the plans, you still may have a goofed up C.G. location. The wood that you used in constructing the tail section (even if it was supplied in the kit) may be a lot heavier than was intended, or perhaps you used several extra coats of dope or resin surfacer that caused the tail feathers to weigh an ounce or two more than they should. If you cram your radio into the aircraft, and then never take the time to check out the C.G. you are asking for a lot of headaches. Often times when a beginner asks a more experienced flier to help him learn to fly his aircraft, the "expert" checks over all of the control movements, and runs the throttle up and back, checks the surfaces for warps or misaligned control surfaces, but never bothers to check the C.G. location. This is especially true if it is

an aircraft built from a kit. Chances are that things won't be "too bad," but there is always that one chance that will leap up and bite you in the seat of your trousers! Another possible error that is difficult to detect is the model that weighs far far more than it was designed to weigh. Perhaps the original creation was designed to fly at an 18 to 20 ounce wing loading, and you have added an extra pound of finish to the aircraft, and the wing loading has jumped up to 28 to 30 ounces per square foot. Not only will the aircraft not fly like it was designed but, also, the recommended engine size just won't hack it. Be careful. When building that first aircraft, keep the weight low, and make sure that when you locate the radio equipment you locate it in such a way that the correct C.G. is maintained.

With today's radio equipment you don't need to be an electronic expert to have the joy and thrill of flying R/C. But, by getting into R/C today, you have missed some of the education that others of us gained by coming down the trail when many things were on a do-it-yourself basis. Early radio equipment utilized dry type batteries for both the transmitter and receiver. When nickel-cadmiums made their entry onto the scene the first use was in receiver packs only. Transmitters still were powered by dry batteries. And, come to think of it, those old transmitters were heavy, compared to today's super lightweights and the load that we used to carry around was tremendous. The receiver packs were recharged after flying, and many chargers were advertised in the pages of the model magazines. Later, when transmitter power requirements were scaled to the use of nickel-cadmium packs, a charging circuit was built into the transmitter, and now, today, all that you have to do to charge your battery pack is to plug the receiver and transmitter together, and then plug the line cord into the base of the transmitter. To all of you who believe that nothing can go wrong with your batteries . . . I wish the very best of luck . . . because many, many things can go wrong with your batteries, and you won't know a thing about it until the batteries decide to quit working and . . . "I ain't got it . . . " is the cry heard just before the crash.

Batteries can get out of whack from too much use, or too little use, or too much charging, or too little charging, too many hard (crash) landings, or

being dropped on the floor of your workshop by mistake. They can get messed up by a ruptured fuel tank spilling nitro-methane and methanol all over the pack, and they can become inoperative from engine vibration. How are you going to tell? How do you know if your batteries are taking a charge?

Most transmitters today have a small meter on the front of the transmitter case. This is better than nothing, and will tell you if the switch is on, and if the transmitter batteries are reading at the normal rate for your transmitter, but not much more. How about the receiver, where is the meter to tell you what is happening? Well, one is now available from EK Products that will check your battery under load and will allow you to discharge the receiver pack without operating the system for a couple of hours. It's called an expanded scale voltmeter, and can be modified to fit any system that uses a charging plug. If you don't wish to invest in this item, then it is a good idea to invest in a small voltmeter for use in checking your batteries, and a good charger is not beyond the realm of today's R/C builder. It is a good idea to check your batteries every now and then while you are in your workshop by turning on the transmitter and receiver and then working them for several hours. Two is plenty. If everything works just fine for two hours, then turn off the switches and recharge the packs again. You may be surprised to find that the battery packs won't last two hours. You may have only an hours worth of safe time on your packs. There are several views on the subject of whether a nickel-cadmium battery has a memory or not. I frankly do not know if they do, or do not. Memory in a nickel-cadmium is the term used to describe the condition that exists in a cell if its operating time is normally only one hour, rather than its normal discharge rate of two hours. If you usually use your batteries for an hour and then recharge, then after a time, your battery will have a memory of a one hour life, and will fail after this hour. As I said, I don't know if this is true or not, but I have seen several examples of short charge memories that actually happened. If you really want to take care of your batteries you should discharge and charge them at least once each week. To discharge without the use of EK's little gem you must turn on the transmitter and receiver batteries, and then work the

system for at least two hours, and then charge the two packs for at least 8 hours. If you fly once each week then this should do the trick, unless you have a short flying session, then perhaps you may want to do a little more discharging. You can care for your batteries in your aircraft by protecting the pack both from vibration and from fuel. Wrap the battery pack in a blanket of foam rubber and then re-wrap the pack in an overall covering of plastic such as Saran Wrap, or a small Baggie. Seal up the pack with masking tape so that fuel cannot leak into the pack. Don't wedge the battery pack tightly into the nose of your aircraft as it may pick up quite a bit of vibration from the framework of the fuselage. A loosely placed battery pack is much safer than a tightly wedged one.

It's hard to overcharge your batteries with today's systems, but awfully easy to undercharge them. A nickel-cadmium must not be allowed to discharge lower than 1 volt per cell. If more than this power is sucked out of it a voltage reversal could take place within the cell and then, when the pack is recharged, all heck could break loose. Sometimes a battery pack with a reversed cell will explode when it is charged.

More problems are caused in the modern day radio by the batteries than by a failure of electronic components, or an oversight by the manufacturer. The batteries are something that we as modelers can take care of without knowing really anything about electronics. Use common sense, and take the time to check them out every now and then. If you have stored a radio set away for the winter the chances are pretty good that nothing has changed in the radio itself, but something could happen to the battery packs. It's a good idea to check them out from time to time during the winter rather than to decide to go fly one day when the weather (or the gas problem) gives you a break only to find out that the battery pack is dead. I have had cells in a transmitter pack go bad, and receiver packs too – a bad cell can happen anytime, with very little warning.

I hope that you will take a little care both with your battery packs and with the C.G. location on your aircraft, and that we all can get a chance to go out and fly. See you at the School Ground.

Oh well, if we can't fly, there's always Volleyball . . . . □