FEBRUARY 1969 75¢

R/C MODELER MAGAZINE

THE WORLD'S LEADING PUBLICATION FOR THE RADIO CONTROL SPORTS ENTHUSIAST

A few words about me.

I am Electronic Engineer and this is my day job.

From tender age two things attracted my interest and I managed to have them in my life.

The first was electricity and the second the bluesky.

I´ve found the model airplanes hobby in October 1973.

I love the wooden structures from scratch airplanes and boats also.

I started collecting plans, articles, books and anything else that could help the hobby of many years ago and have created a very large personal collection of them.

Since 2004 I became involved with the digitization and restoration of them and started to share the plans from public domain with my fellow modelers.

Now after all this experience I have decided to digitize, to clean and to re publish in digital edition and free of all issues RC Modeler magazine from 1963 to 2005 and others books and magazines.

Certainly this will be a very long, difficult and tedious task but I believe with the help of all of you I will finish it in a short time.

I apologize in advance because my English is poor.
It is not my mother language because I am Greek.
I wish all of you who choose to collect and read this my work good enjoyment and enjoy your buildings.

My name is Elijah Efthimiopoulos. (H.E)
My nickname Hlsat.

My country is Greece, and the my city is Xanthi.

Λίγα λόγια για μένα.

Είμαι Μηχανικός Ηλεκτρονικός και αυτό είναι το αληθινό μου επάγγελμα εργασίας.
Από μικρός δυο πράγματα μου κέντρισαν το ενδιαφέρον και ασχολήθηκα με αυτά.
Πρώτον ο ηλεκτρισμός και δεύτερον το απέραντο γαλάζιο του ουρανού και ο αέρας αυτού.
Το χόμπι του αερομοντελισμού το πρωτογνώρισα τον Οκτώβριο του 1973.
Μου αρέσουν οι ξύλινες κατασκευές αεροπλάνων και σκαφών από το μηδέν.
Ξεκίνησα να συλλέγω σχέδια, άρθρα, βιβλία και ότι άλλο μπορούσε να με βοηθήσει στο χόμπι από τα πολύ παλιά χρόνια.
Έχω δημιουργήσει μια πολύ μεγάλη προσωπική συλλογή από αυτά.
Από το 2004 άρχισα να ασχολούμαι με την ψηφιοποίησης τους, τον καθαρισμό τους αλλά και να τα μοιράζομαι μαζί σας αφού τα δημοσιοποιώ στο διαδίκτυο (όσα από αυτά επιτρέπεται λόγο των πνευματικών δικαιωμάτων τους).
Σήμερα μετά από όλη αυτήν την εμπειρία που έχω αποκτήσει, αποφάσισα να ψηφιοποιήσω, να καθαρίσω και να ξαναδημοσιεύσω σε ψηφιακή έκδοση και ελεύθερα όλα τα τεύχη του περιοδικού RC Modeler από το 1963 μέχρι το 2005 και κάποια άλλα βιβλία και περιοδικά.
Σίγουρα είναι μια πολύ μεγάλη, δύσκολη και επίπονη εργασία αλλά πιστεύω με την βοήθεια όλων σας να την τελειώσω σε ένα καλό αλλά μεγάλο χρονικό διάστημα.
Ζητώ συγγνώμη εκ των προτέρων γιατί τα Αγγλικά μου είναι φτωχά.
Δεν είναι η μητρική μου γλώσσα γιατί είμαι Έλληνας.
Εύχομαι σε όλους εσάς που θα επιλέξετε να τα συλλέξετε και να τα διαβάσετε αυτήν την εργασία μου καλή απόλαυση και καλές κατασκευές.
Το όνομα μου είναι Ηλίας Ευθυμιόπουλος.(Η.Ε)
Το ψευδώνυμο μου Hlsat.
Η χώρα μου η Ελλάδα και η πολη μου η Ξάνθη.

RCM Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) Plans building plane removed and hyperlinked.

3)Articles building plane removed and hyperlinked.

4)Pages reordered.

5)Topics list added.

Now you can read these great issues and find the plans and building articles on multiple sites on the internet.

All Plans can be found here:

Hlsat Blog RCModeler Free Plans and Articles.

http://www.rcgroups.com/forums/showthread.php?t=2354459

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

Hip Pocket Aeronautics Gallery Free Plans.

http://www.hippocketaeronautics.com/hpa_plans/index.php

James Hatton Blog Free Plans and Articles.

http://pulling-gz.blogspot.gr/?view=flipcard

Vintage & Old-Timer RCM Free Plans.

http://www.rcgroups.com/forums/showthread.php?t=2233857

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Thanks Elijah from Greece.

R/C MODELER MAGAZINE

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Lovely Arlene Radillo, a student at Santa Ana Jr. College, poses with Bill Wiley's scale 1934 F11C-Z Navy Goshawk. Veco .61 power, Kraft proportional, polyurethane enamel finish, 9½ lbs. 4" x 5" Extachrome transparency by Bob Ramirez.

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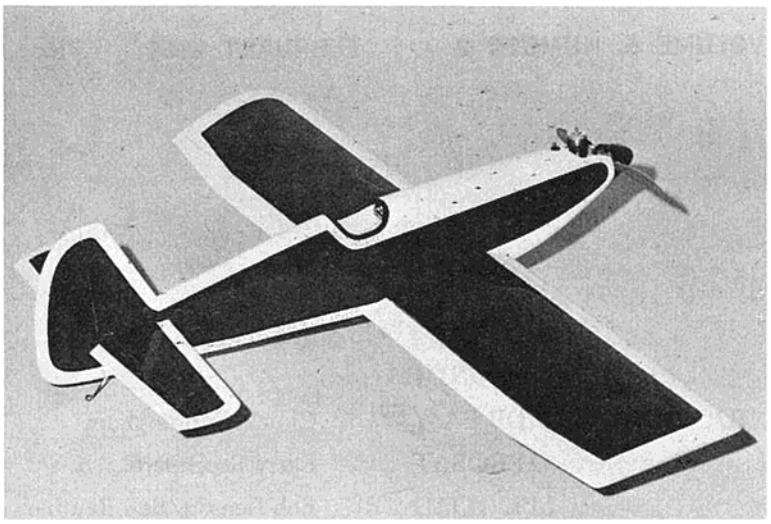
EDITORIAL



R/C Modeler Magazine, and its staff, is continually trying to improve the quality of this publication. In order to improve, we must know what YOU WANT to see in this YOUR publication, and the only way we have of knowing what you want is to ASK you. The Editors of RCM have devised the RCM READER SURVEY which appears in this issue. We hope you will take the time to complete this form and return it to us. You will notice that it is designed so that the entire page can be carefully cut out of the magazine without destroying any of the content of the issue. No postage stamp is necessary – we will pay the postage. Simply fill out both sides carefully, fold and staple where indicated, and drop it in the mail to us. All information will be held confidentail. Your reply is needed – we want to know what YOU want in RCM – now is your chance to let us know. The information will be compiled by our staff and the results will determine what will appear in future issues of this publication, so please let us know your likes and dislikes. In addition, the compiled statistics will be provided to the manufacturers and distributors in the radio control industry in order to furnish them with a valuable guide as to what you would like to see produced in the months to come. These manufacturers are awaiting the results of this survey as anxiously as are we. The last Reader Interest Survey that we conducted almost two years ago guided this publication since that time. As an example, if you're a scale modeler and don't bother to complete the questionnaire, and another interest field such as pulse proportional, sends in a great number of completed survey forms, don't be surprised if future issues are short on scale material. We must be guided by the results of this Survey, which, to us, represents a cross section of our readers and their interests. The percentage of replies in the various interest categories of radio control will be presented in accordance with the proportion of reader interest evidenced by the results of this Survey. So PLEASE, take the time to remove the questionnaire from the magazine, fill it out carefully and completely, and drop it in the mail to us. We thank you in advance for helping us to form our editorial policies in the months to come in order that we may give you EXACTLY the type of magazine you want.

In the December issue of RCM we published the Rimfire by Jan Sakert, the smallest full-house airplane ever presented. This has been a spectacular little airplane, and invoked a great deal of interest on the part of our readers. For those of you interested in this model, or designing other models of similar size and characteristics, here is a letter from Dick Riggs, of Orbit Electronics, who did the bulk of the original flight testing, and who asked that we pass on these additional comments concerning subsequent flight tests and modifications to the Rimfire:

Dear Don;

I thought I would take this opportunity to pass on to you, and your readers, some additional information and comments regarding Jan Sakert's "Rimfire" which was featured in the November issue.

As mentioned in my initial report to Jan concerning flight characteristics of this tiny machine, its biggest failing was the pitifully small power generated by the Fox .07 originally installed. Subsequent ground checks using a Fowler Vibra-Tak for comparison showed conclusively that a Cox TD .049 would out-turn the .07 by a WIDE margin SWINGING the same prop, in this case a Tornado 7/4 nylon. The logical conclusion therefore is that the "Rimfire" would be adequately powered by any HOT .049.

However, since there are a reasonable number of good quality .09 engines available with throttles, the decision was made to replace the Fox with some variety of .09. Frank Johnson of Costa Mesa came to the rescue with a Cox Medallion .09 in prime shape, for which we purchased the accessory throttle assembly. This is very easy to install and, mechanically, works to perfection. The Cox was installed with very little effort, and a few test runs at home indicated that "Rimfire" was indeed going to be hotter'n a dog! Saturday was three days away when all preliminary checks were completed, so by the time the big day rolled around, yours truly was in a fever of anticipation. The weather was perfect for the occasion with barely perceptible breezes, and a cloudless blue sky. The fuel tank was topped with K&B 100, the Cox torched off and needled in carefully, and take-off ccomplished from a full power standing release. I say "take-off" ill-advisedly since this generally accepted term is much too prosaic to describe this instantaneous metamorphosis from inanimate object to blinding blur. The action resembled a sustained explosion! With less than a pound and a half of airplane, the Cox wasn't aware it was pulling any load at all. After a run of

thirty feet or so on the ground, the up-elevator was squeezed in and the airplane slowly rotated to about an eighty degree angle from the horizontal while climbing and it was "up, up, and away!" Air-speed is not excessively high (due to low pitch 7/4) being estimated at around 60 mph, but "Rimfire" gave the impression of attaining maximum speed almost instantly.

All in all, this combination is a very satisfying experience to fly, and the increase in power and performance has in NO way detracted from the generally docile characteristics of the airplane. In fact, this performance margin makes it much EASIER to fly. Understand please, that I am NOT saying this is an ideal airplane for beginners any more than a .60 powered Kwik-Fli is considered so, but to those with a modicum of experience, it's a real gas! I have sparkles in my eyes over .09 powered pylon racers. YUM!

Now for the negative side. Yes, it IS true that there is always bad with the good. The additional power of the Cox HAS to come from somewhere, and it shows up as prodigious fuel consumption. As mentioned in the magazine article the Fox .07 would run for nine and a half minutes on one ounce of fuel, but the Cox is not QUITE that good. Would you believe THREE minutes? I hasten to add however, that on this particular example, the main bearing is pretty sloppy and a large quantity of fuel is being pumped past the crankshaft. (Which makes the airplane an atrocious mess.) Also, with the airfoil as shown on the plans, the "Rimfire" will not outside loop. Repeated attempts to do so result in a sudden whip into inverted snap rolls. But outsides are the ONLY thing it will not do. Snap rolls, both upright and inverted, and spins and inverted spins AND reversals are all in the little ships bag of tricks. Incidentally, spin recovery is practically instantaneous upon releasing of control stick.

I would like to pass on a coupla' pearls learned from the experience of "Rimfire" and two other tiny types that have been extensively flown. Number one, and in my estimation, extremely important, is that the small airplanes (less than 350 square inches) MUST have the CG location further forward than normally accepted practice, REGARDLESS OF AIRFOIL SECTION! This is necessary to achieve some smoothness and damping effect in the pitch moment. The "Rimfire" shows best characteristics with the CG at 18%. This is in some degree due to the flat-bottom airfoil, but this high lift section is very likely the reason the airplane flew AT ALL with the poor power of the Fox.

Secondly, do NOT underpower the small ships. The reason for this is a "combination of ingredients" and somewhat lengthy to expound. However we have a good load of gas going here, so expound it shall be, and hope for the best.

Consider please, that in the course of the past nine years, a generally accepted pattern of wing loading figures has evolved for multi-channel stunters. This being a formula of approximately 16 ounces (one pound) per 100 sqaure inches of wing area. Personally, I do not agree, feeling this is too heavy a loading figure, but as a rule of thumb, is adequate for say 600 square inches with .60 power. This size airplane and engine will achieve airspeeds that give good performance, but if a .45 were used in the same airplane at the same weight, results would be unacceptable. Assuming that the smaller engine means less power, hence less air speed. This is NOT always the case, but we will not go into the merits of particular engines regarding horsepower output. What's happening is that airspeed is being used to increase the LIFTING ability of this specific wing area. The gist is that at 80 mph or thereabouts, the Reynolds numbers effect is approaching a reasonable level. BUT, experience has shown that once you drop below about 400 square inches, you sure better figure on using a lighter loading than the one pound per 100 square, or go to even higher relative airspeeds. (Hence the admonition against underpowering.) The key word here is RELATIVE and requires explanation of a further phenomenon know as "scale effect." Imagine an average .60 powered stunter with an over-all fuselage length of forty-eight inches at a given speed of sixty miles per hour (88 feet per second) this airplane covers a distance equal to its own length, twenty-two times in one second. Or if you prefer, its own length in one twenty-second of a second. At the same speed of 60 mph, a small airplane of half the length (twenty-four inches) covers its own length FORTY-FOUR times a second, or two feet in one forty-fourth of a second. (Sounds quick, huh?) So relatively speaking, the small one is traveling at TWICE the airspeed, and this is the saving factor for tiny types. If you were to use the same relative air-speed (in this case, 30 mph) the little ship would have to have an EXTREMELY light wing loading for

(continued on page 7)

any chance of success.

Indications are that, as wing area goes down, relative air speeds must go up beyond the two times figure given as an example. For instance, should the opportunity present itself, observe someone checking out a hot .40 powered pylon racer. These airplanes generally have high wing loading figures, since most average five and a half pounds plus on 450 square inches of wing area, but notice that most are capable of superlative stunt performance. The reason is their tremendous 110 to 125 mile per hour air-speeds, in which region the Reynolds numbers effect is obviously becoming very favorable.

Another example, of personal experience, is a small .19 size ship currently being flown. This airplane grosses two and a half pounds on 290 square inches area and, in initial flying sessions, exhibited indifferent stunt capabilities despite tried and proven planform and good airfoil. But when propped for higher engine revs with coarser pitch in the blades, airspeed went up dramatically and so did stunting ability. Its ACTUAL air-speed is a noticeable notch above the average 60 powered balloon, and it will now fly a stunt pattern with the very best, limited only by the pilot's capability. The engine was originally asked to twist an 8 inch diameter, 6 inch pitch prop, but is now flogging a 7 inch diameter, 8 inch pitch, and this proved to be the margin.

More bad with the good, though. Two major disadvantages are manifest in small airplane experiences so far. First is maintenance of visual contact. Because of small size and air speeds, at least in comparison to big ships, it seems most of the flight is spent turning the airplane to keep it in sight. But of more significance is the much higher landing speeds. The tiny types simply cannot be slowed down to the low speeds desired and stay flying. It's that Reynolds numbers hang-up again!

And that about sums up the whole schmear for this go-round. I really did not intend for this epistle to assume such length, but it seemed a good opportunity to pass on some observations of this last summers experiences.

Thanks for your patience Don, and we'll do it again sometime soon.

Balsa wood forever,
Dick Riggs

While we're on the subject of the December issue of RCM, we would like to extend our apologies to Dave Lyons who provided us with the excellent Ektachrome transparency which appear-

EDITORS MEMO

(continued from page 6)

ed on the cover of that issue. The photographic credit for that cover photo, as listed on the contents page was erroneously attributed to Jack Capehart. Dave Lyons, as many of you know is the proprietor of Dav-Ons Models, manufacturer of a very unique and functional servo mounting system for the various proportional servos most commonly used.

As a parting shot, I would like to mention that one of the most interesting aspects of the Editor's job is reading the club newsletters that are sent to us from around the country. I read each of these in order to keep in contact with the activities of all the various clubs then pass them on to Jerry Kleinburg for use in his column, TOP OUT. I really didn't realize how wide the influence of RCM was until I read in one club newsletter their facetious method of finishing a model with several coats of creosote thinned out with buttermilk. Apparently, someone has seen our Resident (Chuck Cunningham) Buddha's airplanes.

Til next month, good flying.

ENGINE CLINIC

BY CLARENCE LEE
RCM Contributing Editor

This month we'll kick the column off with the pros and cons of radial mounting your engine. We'll also answer a few questions that I have been asked the most often at the flying field, at bull sessions, and in personal correspondence. Due to magazine lead time – the magazine having to be made up 90 days ahead of publication date – it will be another month before the answers to the questions you have sent in will start appearing.

Some of the "good guys" that purchased Veco .61's noticed in the instruction pamphlet a line that said "radial mounting is not recommended." I have often been questioned about this, especially as Phil Kraft recommends radial mounting in the instructions that accompany his radio systems. When two manufacturing personalities – characters might be a better description – have different opinions, it only leads to confusion for the troops in the field. So I'm going to tell it to you like it is, and let you make up your own mind.

First, for an engine to develop its full power potential it must be rigidly mounted. Radial mounting does not exactly do this. It allows the engine to shake and jump around. If there is any doubt about this, just watch your engine at idle some time. Count the number of glow plugs you see! If it is radially mounted, you will see quite a few. I discovered many years ago that I could get higher rpm readings from an engine mounted on the bench test stand than I could from the same engine in an airplane. The reason for this is understandable. Everytime the engine fires, the piston exerts a force that turns the crankshaft. If the engine housing is solid, all of this force goes into turning the crankshaft. However if the housing can twist in the opposite direction, then some of this force is lost. This tendency for the engine to twist opposite to the propeller rotation is commonly referred to as torque. At idle, the problem becomes even worse. Momentum is barely carrying the engine through on each stroke. If a lot of the power impulse is being absorbed by sponginess of the mounting, then you are going to have idle trouble. This is particularly true with many of the plastics. I would like to see the front ends of some of these bombs beefed a little more.

I have often been asked "does radial mounting harm or damage the engine?" You had better believe it, Dad! Your propeller and crankshaft are a very powerful gyroscope. Most all of us, as a kid, have had one of the dime store gyroscopes that you spin up with a string and then set on the edge of a drinking glass, etc. If you held it in your hand and tried to change its plane of rotation it would almost tear itself out of your hand. This same force is also happening in your airplane. The propeller wants to stay where it is. If the engine is shaking and bouncing around the poor old crankshaft is being given quite a work out. The end result is a damaged front ball bearing, the bearing coming loose in the housing, and at the worst, a broken crankshaft. Several years ago, when the Veco .45 first came out, I was naturally interested in any problems that might occur with the production engine. I kept a real close check on any that came back to the factory for repair. In the first year a little over 3,000 engines were sold and we received several back with broken cranks. I contacted the owners and in every case they had been radially mounted. (Excluding those that had taken the big plunge, naturally.) The next run of crankshafts had slightly smaller holes that increased the wall thickness. This problem was not just common to the Veco. I have seen all the other makes break a crank at some time, and in the majority of the cases, they were in, or had been used in, radially mounted ships. The constant flexing of the shaft causes it to fatigue at the port. Shaft breaking and bearing damage are extreme cases. Most common damage is

extreme wear of the carburetor and all carburetor-to-exhaust linkages. I have repaired several thousand engines in the last eight years since the advent of the Lee .45. I can always spot the ones that have been radially mounted simply by the badly worn carburetors and carburetor linkages. To some this may not seem like any real problem. However, when the linkage gets so bad that the carburetor can move about a third of its travel before the exhaust baffle starts to move, you've got problems! The relationship between the opening in the carburetor and the exhaust baffle are very important. If the carburetor opens too far before the exhaust baffle, the engine will not idle. This has been the cause of a lot of engines that had been idling well to start giving trouble. We'll go into this more fully in a later column.

You have heard the facts AGAINST radially mounting your engine. What are the advantages? Only one. By allowing the engine to shake, rattle, and roll ahead of the firewall, less vibration is transmitted to the airframe itself. This means less vibration is transmitted to the radio, servos, etc. Naturally from the radio manufacturers point of view this is most desirable. However with the present size and weight of the radio gear we are now using, I can not see where vibration is much of a problem any more. Your engines are also considerably smoother now than they were just a few years ago. Unfortunately, there are those that will pay no attention to the instructions that come with the radio telling you how to properly mount the servos. They already know all the answers – the manual was written for the OTHER guy. They will then proceed to bolt the servos down tight enough so that you couldn't budge them with a crowbar. These guys WILL have vibration problems and have been known to crash quite frequently. I'm on my third year with the same set of servos using a Kraft KP-6. One that old Phil, himself, hacked out. A year ago I had the pots and racks replaced as a precautionary measure even though they were not too badly worn. With well over a thousand flights, and that a conservative estimate, I don't think vibration is a real problem. One other small advantage is ease of building. It is a little easier to slap a plane together without mounts.

Okay, so what do we do with all the plastics, the Kwik-Fli, Pappy deBolt's Pea-Shooter, etc. All is not lost. Use either the Tatone mount or one of the Tee mounts that both Sig and Midwest put out. They don't eliminate the problem entirely, but do minimize it to a point that is acceptable. Mounting the engine by the lugs, as was intended by the manufacturers, helps to stop the jumping up and down and shaking from side to side. Mounting the engine directly to a plate by the back cover bolts is a real bad scene. Especially as a lot of fliers use only a 1/8" plate barely larger than the back cover itself. If you must mount directly to the back cover, use a ¼" plate and make it large enough to have some bearing area on the firewall.

Anybody with opposing ideas on this subject will be given equal time if they have something worth saying.

Now, let's answer a few questions.

Question: *"How can I get a little more go out of my K & B .40?"*

Boy, have I been asked this question a lot lately. Probably a hundred times in the last two months. I could devote a whole column just to this question alone. Fuel, prop, glow plug and the whole bit are involved. In a future column I intend to go into more detail, but for this issue will keep it a little shorter.

The K & B .40, as you receive it, is a real hot piece of machinery. It's the end result of one heck of a lot of development work. There isn't another .40 that can match its output. I know there are a lot of Tigre owners that will take exception to this, but the facts are there. The K & B will turn more prop, and that's what makes the little plane go. The HP .40's are just starting to be released as of this writing so it will remain to be seen whether they will out perform the K & B or not.

The one single thing that you can do that will turn that already hot engine into a real fire breathing monster is put on a larger carburetor. The engine comes with a carburetor that has a .290" inside diameter. This is fine for a sport engine, but not near large enough for racing. The rat race version, which is the same engine with a regular venturi rather than a carburetor, has an inside diameter of .350" which is a lot more realistic, although .350" is bordering on the large size for our use. We carry more fuel and subject the plane to higher "G" loads going around the pylons, etc. You can safely use a venturi diameter of 11/32" (.343"). If you go larger than this, you are on your own. If you want to run pressure you can go up to 3/8" (.375") but as the fliers are finding out, pressure has more problems than any good you will derive from its use. It's not always the fastest ship that wins the race. You cannot drill the K & B carburetor out any larger. The base of

the carburetor has had a sleeve pressed on to make it large enough to fit the .40, the carburetor being the same one that is used on other engines in the K & B line. Bill Wisniewski, head Honcho of the engine section at K & B, tells me the engine, along with other refinements, will be coming out with a big carburetor about the first of the year. However, in the meantime, here's what you can do for a big bore carburetor. There are several that can be drilled out and the base turned down to fit the K & B. Among them, the Veco .61 works out very well. Most modelers can handle the drilling out, but the big hang-up is the turning down, as this requires a lathe. About the best thing you can do is become good friends with somebody that has a lathe. The only carburetor available ready to fit on the K & B is the Kavan which has a .312" venturi. This is a step in the right direction but not quite enough. The spray bar in the Kavan is also slightly larger in diameter than normal due to the principal of operation. This also in effect reduces the venturi area. Mr. Kavan has thrown the modelers a real curve in that the carburetor cannot be drilled out. On early models the threaded tube that is part of the barrel could be removed and the barrel drilled out slightly. Not much though, as the wall thickness on one side of the barrel would become too thin. Later models have the tube staked with a steel pin and it cannot be removed. This was evidently done in an effort to cut costs and drop the price from the original $14.95 to the present $9.95.

Providing you have found a way to get the carburetor modified, you are going to get quite a surprise at the sudden jump in the output of the engine. Now buy yourself a can of Supersonic 1000 or Cox racing fuel in the red can. Both have approximately 30% nitro content. Stop trying to race with the cold stunt fuels! Also, throw out that idle bar glow plug and use the K & B KB-1S plug. This is the short plug which seems to stand up better than the long even though they both have the same element. The Fireball regular also works very well. You can go to hotter fuels, but the problem then comes up of keeping the glow plug for ten laps. It doesn't do you any good to go like a bomb for eight or nine laps and then flame out.

In a later column we will have an article which deals with the smaller refinements such as rotor fit, checking the fit of the lower end, etc. But for now, the carburetor, right fuel, and correct plug will give you the largest power increase you are going to get. One final thing – be sure and check the head screws after every flight. I have seen a lot of sick .40's that had nothing wrong other than a loose head. When you start burning hot fuel and turning high rpm, they will have a tendency to loosen. If the head starts to leak, the engine will go lean. You're out of the race and have possibly done permanent damage to the engine.

Question: *"What effect will inverting the engine have on its running? Will it idle and where should the tank be located?"*

Inverting the engine will have no effect on the running of the engine as far as power output is concerned. However it will naturally flood easier and be a little harder to start if you are not careful. The solution here is to be sure and have a HOT battery. The plug should glow orange. Just red is NOT hot enough. A plug that glows red will be drowned out as soon as fuel runs into it. An orange plug will boil the fuel right out. If you are going to run an engine inverted I would recommend using two dry cells wired in parallel. I don't recommend using 1.2 volt nickel cadmium batteries. They work fine right off of charge, but after several starts are not hot enough.

The tank should be positioned the same as for an upright engine, or slightly lower. This means the center line of the tank should be 3/8" to 1/2" below the needle valve. This also means the actual center line of the tank, not where the pick up tube comes out. Most tanks have the neck in the center, but the blue 11 ounce World Engines tank does not and I have seen fliers make this error.

Question: *"Occasionally my Enya .60 will backfire and run backwards. What causes this and how can it be cured?"*

This is a problem quite common to the Enya .60. It is caused by a very "wild"crankshaft timing. The port in the crankshaft closes 55 degrees after top dead center. This is more advanced than most of yourracing engines. As an example, the K & B .40 closes 45 degrees after top center. Both the McCoy .60 and the Rossi .60 close at 50 degrees. These engines were intended to develop their maximum horsepower at over 16,000 rpm. Why the Enya brothers chose to use such advanced timing for a stunt engine is hard to figure. Maybe they were thinking big. This late closing will actually let the engine run backwards if something can get it started going that way, such as backfiring. This is usually caused by trying to idle the engine too slow and a little too lean. You have probably noticed that it happens most when you are taxiing back or are nearly out of fuel. Normal idle speed is about 2500 to 2600 rpm with a full tank. Idle the Enya a couple of hundred rpm higher and keep the idle on the rich side. This will make it hesitate and sputter a little on acceleration with a full tank, but will stop the running backward.

Question: *"How can I clean the goop off of the head of my engine?"*

The best product I have found is Sunbeam Metal Kleen. It comes in a ½ pint blue can and can be purchased in any large grocery store. In the Los Angeles area I have purchased it at both Von's and Ralph's. It is intended for cleaning waffle irons, etc. It comes with a brush for brushing on – what else – but I have found it to work the best by placing the head on a piece of newspaper and pouring some directly on the head. Take a toothpick and work it down between the fins. Let it set half an hour and wash off under the kitchen faucet. It will remove all the gooey brown stuff. The baked on black from running your engine too lean will probably take a little scraping and a second application. I have noticed that it seems to remain active for only about half of the can. When you get below half, it begins to lose it power, even though the can has been kept tightly capped. Now buy yourself a can of silicone spray. You can get it at any auto supply, hardware, or Sears store. Give the head a shot of this and it will help to keep it clean and make it easier to clean the next time.

Well gang, that's it for this time. In the next issue we'll talk about engine maintenance. We'll tell you how to get your engine apart for cleaning without the use of vice grips and a crowbar. We'll also touch on fuel formulas and ingredients. Send in your questions and we'll see if we can be of some help. If you have any suggestions or ideas that may be of help to others, send them in as well.

DO IT NOW!

PLEASE COMPLETE THE RCM READER SURVEY ON PAGES 87-8 OF THIS ISSUE AND DROP IT IN THE MAIL TO US RIGHT AWAY.

YOUR HELP IS NEEDED!

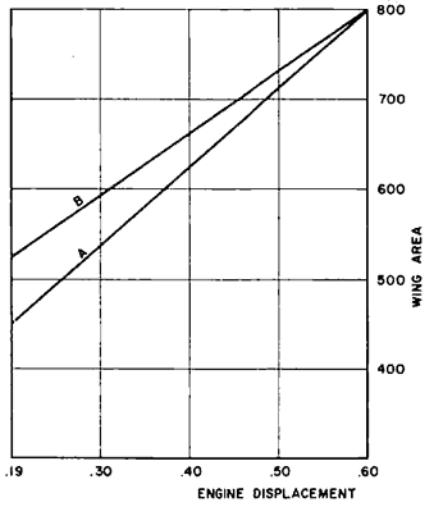


CHART NO. I ENGINE DISPLACEMENT VS. WING AREA

dive into a climb, and the center section of the wing just can't stand it. Wham, it rips apart.

This then, to my way of thinking, points up two or three faults of the training aircraft. One, the wing should be made heck-for-strong in the center section; two, fly around at reduced power while learning to fly; three, a proper trainer should have some built in recovery features so that the beginner will not have to fight it all of the time until he has learned to control it.

Items number one and two are pretty easy to solve on most aircraft, even if you're building a kit and it doesn't call for additional beefing at the center section. Take the time to add a 6" wide strip of fiberglass to the center section applied with fiberglass resin. You can get 6" wide fiberglass tape through Montgomery Ward's catalog along with the resin. This investment will cost you about fifty cents per aircraft, yet will save you a hundred bucks or so in a stronger model. Even if you have purchased a completed model from one of your friends, or from an older more experienced flier, check out the center section muscle and if it doesn't seem quite strong enough add the fiberglass to the outside. It sure does help in the pull-outs. Number two speaks for itself, when you are learning to fly resist the urge to fly around at full throttle. Pull it back to one half and learn to fly at a more comfortable speed. Number three is tough unless you have selected a trainer type aircraft rather than a competition ship.

Let's take a look at a trainer and see what a simple successful one should look like. Let us begin with the fuselage. The moment set-up of the fuselage can be exactly the same as the competition model. A force set-up that will give you a good flying pattern aircraft will also give you a good flying trainer. Therefore, if we use the same ideas as expressed previously we will design our fuselage so that twenty per-cent of its total length is given over to the nose moment, or the distance from the rear of the propeller to the leading edge of the wing. Allow the next space for the wing chord, then set aside forty percent of the length for the distance from the trailing edge of the wing to the leading edge of the horizontal stabilizer. The remainder of the fuselage is taken up by the horizontal stab. The easiest thing to remember is to keep the tail moment about twice as long as the nose moment. If you are working with a .60 engine, a tail moment of about 18" to 20" will give you very good results. If you are designing around a smaller engine set a tail moment of a minimum of 12" for best all around results.

Since the force set-up of the fuselage is the same as in the competition multi, where do they differ? Well, in the first place the wing setting should be a bit different. The leading edge of the wing should have a slight positive setting in relation to the horizontal stabilizer. Draw a line down the side of the fuselage, passing from nose to tail, we can use this line as a reference line. I like to set the engine at zero thrust for most designs, though this does not hold true all of the time. Consider that the

PART II

R/C DESIGN MADE EASY

BY CHUCK CUNNINGHAM

Last month we presented our ideas and charts on designing a competition style miniature aircraft. We asked that you not design a trainer from these figures as you just might have a tiger by the tail when you got through. This line of thought is not because the aircraft itself is so much different, but mainly because the size of the aircraft should be different. That is, for a trainer, you need a good amount of power, but you don't need nearly as much muscle as is needed for a competition aircraft.

Over the years I've assisted many men in learning to fly, both through this column and at the flying field. One of the lessons that I have learned from this is that all too often the beginner has built, or purchased, an aircraft that is just too much for him to handle. It is either too squirrely, has way too much power, handles very badly on landing, or, if he's lucky, is a pretty good ship. I couldn't begin to count the number of folded wings that I have seen plummeting from the air. Most of the time these folded wings were from popular kit models that had not been designed to take the added strain that a beginner can put on them. This strain is brought about by the beginner suddenly finding himself in a power dive right at the ground. His normal reaction is to give it UP. He commands full up by yanking the stick all the way to the bottom of the box. This yanks the unfortunate aircraft from a straight down high speed

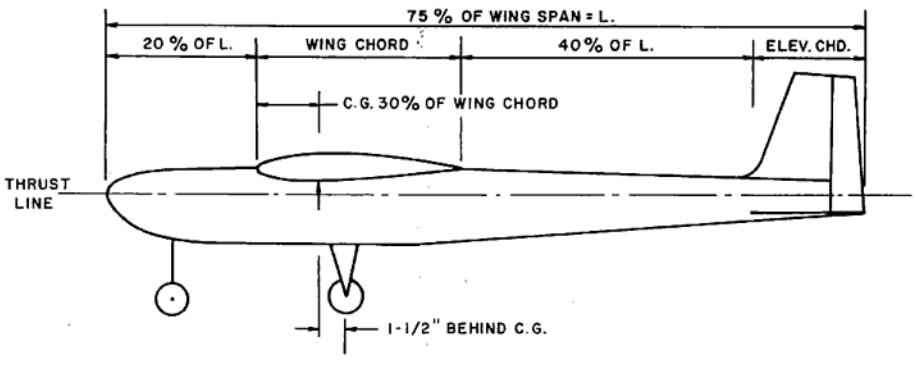


CHART NO. 2

line that you have drawn down the side is the engine thrust line. This line is drawn from the center of the engine shaft out through the tail. For a successful trainer, build a shoulder wing ship. Therefore, the wing will be above this line, and the horizontal stab will be below this line. If you are designing a low wing ship, the wing will be below this line, and the horizontal stab will be above it. Locate the position of the wing. Now, rather than draw in the wing center line parallel with the thrust line place this line about 1 degree positive to the thrust line. You can even use two degrees, depending upon the type of airfoil you are using. Next determine the location of the horizontal stab and draw this line parallel with the thrust line. What you have done is to design a force set-up with positive decalage in it.

Leave your fuselage drawing for awhile and let's take a look at the wing and tail surface and then we will come back to finish off the fuselage design. The main difference in the wing of the trainer and the wing of the competition ship is in the total wing area. A little more area doesn't hurt at all, and is actually quite a big help to the flying ability of the aircraft. Chart number one shows a handy relation between engine size and wing area. You will note that it is somewhat larger than the same chart for the competition aircraft. About a hundred square inches of wing area has been added for each engine size. This will result in a slower flying, more forgiving model, but will not give you a ship that lumbers around the air like a coal barge. For a .19 we find that we have jumped the area to about 450 square inches and the .60 tops out at about 800 square inches. A much larger gain for the .19 than for the .60. Actually, a lot depends upon the radio gear that you are using. The 800 square inches holds quite well for any type of radio gear, but in the smaller size ships if you are carrying older style radio equipment such as reeds or heavier proportional, then you need a lot of wing to carry this weight with the smaller engines. For that reason I have drawn two lines on the chart, line A is for the newer, lighter radio equipment, and line B is for the heavier gear. Thw two lines come together at the top but give you a margin of safety in the smaller engine range.

Now that you have decided upon the wing area the next relation to figure is the span of the wing in relation to the chord of the wing. A shorter, broader wing may not look quite as pretty as does the long thin wing, but it is a lot stronger. For all around easy work let's pick a wing that has a span five times as long as the chord. This gives us an Aspect Ratio of 5:1. Last month we gave you the formula for finding each of these unknowns, the span "S", the chord "C", when you know the area. This formula is $A = 5C^2$, and $S = 5C$. You can see from working out this relation that for a wing of 800 square inches we have a wing span of 62" and a chord of 12.6". If you're rusty on square root figuring you can purchase a book of square root tables for almost nothing, or buy a slide rule with a square root scale for about a buck. If you picked out a wing area of 665 square inches for a .45 engine then the span works out to 58" and a chord of 11.5". For a .19 and a 450 square inch wing the span/chord relation is 47.5"/9.5".

The relation between the tail surfaces and the wing area is the same as we found last month for the competition type aircraft, the horizontal stab should be about 20% to 25% of the total wing area, with 22% being the preferred figure, and the vertical stab area about 7.5% of the total wing area, or about one third of the horizontal stab area. The control surfaces should not be as large as on a competition aircraft as you want a built-in safety hedge against the tendency of over controlling. Keep the rudder portion of the vertical stab about 20 to 25% of the total vertical stab area. The elevator portion of the horizontal stab will give you good smooth response at about 10%. You might want to go to .15% but keep in mind that a large elevator is great for things like a loop with a snap and a half and so on, but a smaller elevator will give you much less problems when coming in for a landing.

On the same subject of elevator area, one of the biggest, most overlooked item of R/C hardware is a good elevator horn. Are you listening, manufacturers? There are many fine horns on the market today, that are well-made, sturdy and easy to attach, but they are not made long enough for many many aircraft.

Take our trainer for example. the standard kit aircraft has a much larger flipper but we have settled upon a smaller elevator area to keep us out of trouble. Couple this with most of the small horns on the market, and you get over-control. A longer horn would solve many of these problems. In the Formula I and II racers the long control horn is a must. Most of the very hard to control aircraft that I have seen and flown have been caused by short moments, too large surfaces, and way too small an elevator horn. What is needed is a horn at least two inches long. Two and one half inches wouldn't be bad. It could be cut down. A lot of material has to be designed into the throat of the horn since it needs to be strong at this point.

Back to our aircraft design and the fuselage. Now that we have the wing and tail surface areas we can finish the design of the fuselage. A good way to determine the length of the fuselage is to take 75% of the wing span for the total fuselage length. This can be changed somewhat to fit circumstances, but working around this percentage will give you good results. With a wing span of 62" we have a fuselage length of 46". 20% for the nose gives us 9", plus a chord of 12.6", plus 18" tail moment plus about 7" for the elevator portion and we have our total length.

The depth of the fuselage has a lot to do with the ultimate flying of the aircraft. A deeper fuselage will tend to be much more groovy than a slim fuselage. This is the reason that you are now seeing many new designs with more cockpit area. as well as prettier looking. When laying out the design of the side area allow plenty of room for your equipment, both radio and fuel tank. If you are designing a shoulder, or semi high wing for a trainer, and I hope that you are, then keep the line of the elevator chord at least 1" below the thrust line of the engine. More will not hurt. This, by the way, is my theory on the now famous Kwik Fli II "Dance". When the elevator was moved away from the thrust line and put below it, as on the III, the Dance all but disappeared. The same could be accomplished with the II kit by lowering the thrust line. Place the wing chord line above the thrust line, and allow plenty of room for the aileron servo to fit into the wing, yet still have room left in the fuselage for all of the other goodies. Don't skimp on the space. If it means splicing on a piece of balsa wood to get the job done in building, then do it. Don't sacrifice the design of the model to fit into existing sizes of balsa wood. Dig out the glue pot and make the wood fit the design.

Chart number two lays out the basic of the trainer model. This chart has been the basis for the design of the Instructor, the Professor, the Swinger, and several other shoulder wing ships that were designed and flown years ago.

The one main thing to consider, and to reconsider when setting about to build a trainer, is to have the finished

(continued on page 19)

If you want to build an airplane
that flies well,
look like your favorite
"PT Something-or-Other",
gets by on a six ounce tank,
and is a real atention-getter
down at the field, try . . .

LARRY ROSENBERG'S AEROBAT

If you want to build an airplane that flies well, looks good, gets by on a six ounce tank, will take either the new small radio gear or the older "big" stuff (I don't know about the rest of you, but it is awfully expensive to try to keep up with the latest), and is a real attention getter down at the field, try the Aerobat. I have never had a ship attract as much attention at the field as this one does! Everybody that sees it is reminded of their favorite PT-something or other. Although scale-like in appearance, it is not a scale model but is merely my idea of a stunt ship concealed in a between-the-wars configuration.

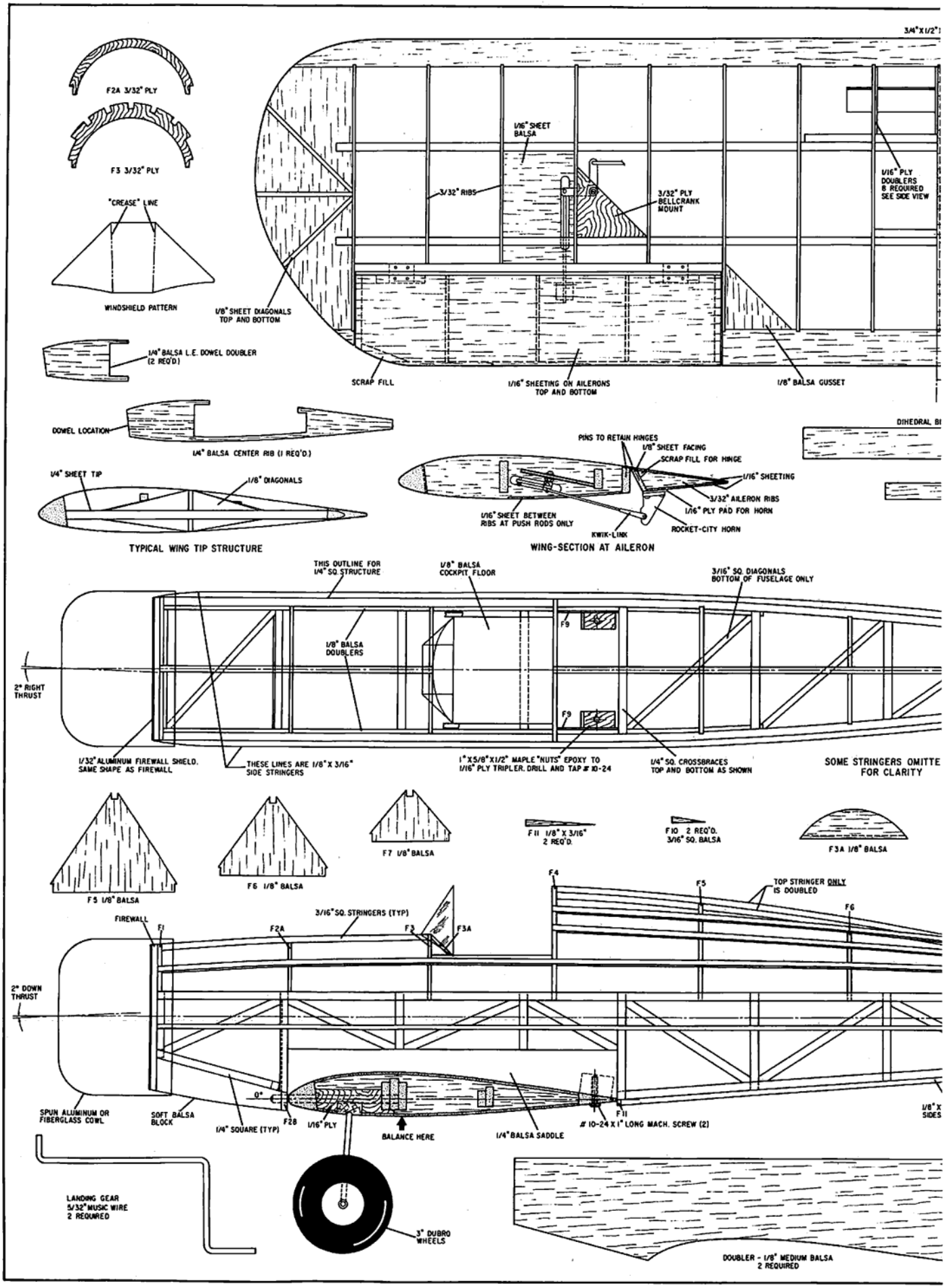
A few years ago I decided to try my hand at designing my own airplane and the result was the Kwiksilver, which was published in the Nov. '66 RCM. The most important thing that I learned from the Kwiksilver was the fact that it is a tremendous thrill to watch an airplane of your own design take to the air and fly. I have only built one kit airplane since that time, kits just aren't any fun any more! I find that like most flyers, I haven't the practice time, money for equipment refurbishment, or travel time, necessary to be a top contest flyer. (I don't know about the rest of you, but I find that I haven't the talent either.) Believe me though, you can really get your kicks out of trying your hand at designing and building your own airplane, it's great therapy.

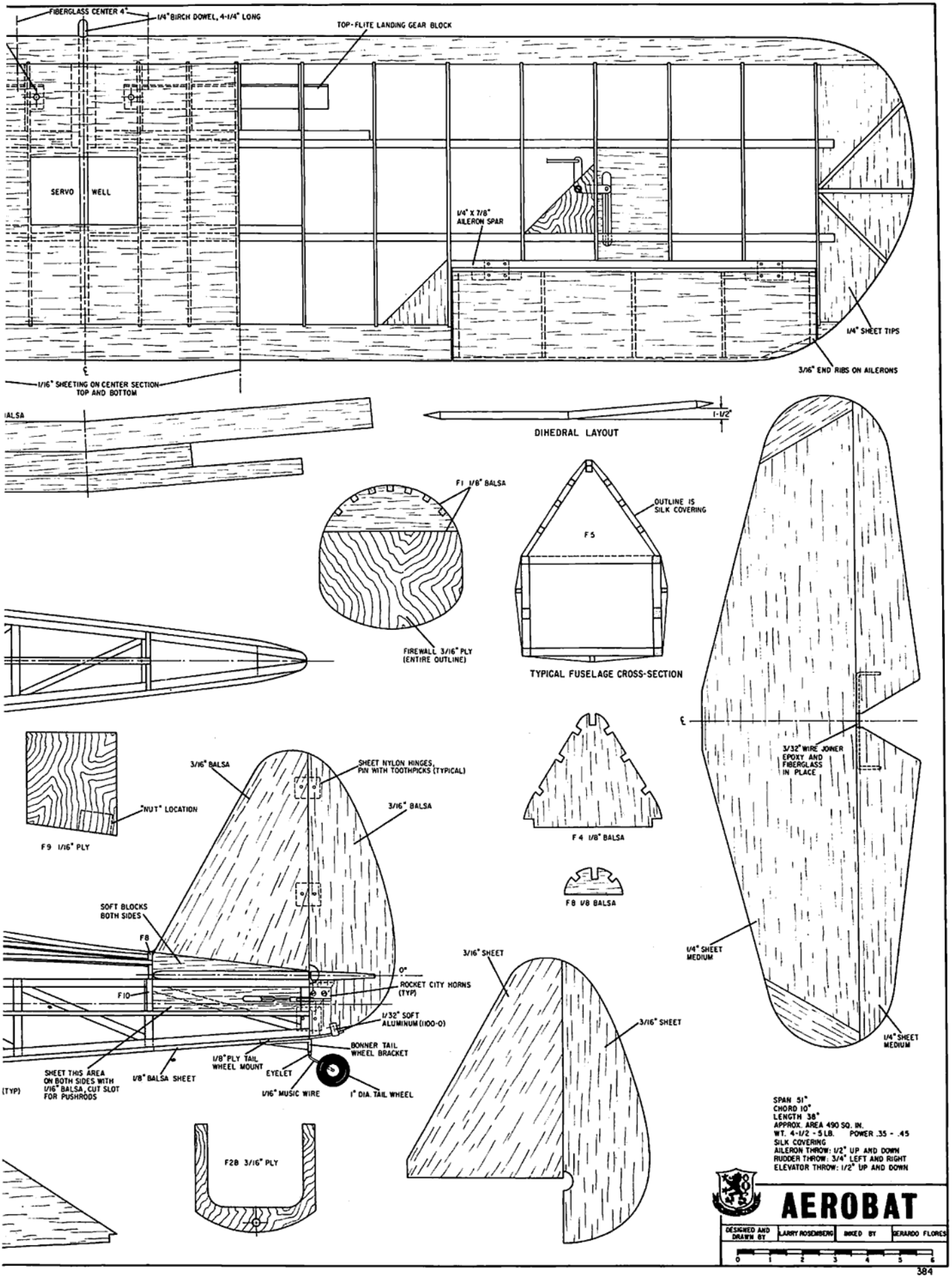
My latest ship, which is presented here, was designed to fit into the semi-scale type of stunt ships that are just beginning to become popular. I feel that this area of design is going to develop quite a bit in the next year, and the Aerobat is my offering to you for this type of aircraft.

The Aerobat was designed to fit my preference in maneuver style. There are two basic methods for flying the pattern maneuvers: The big, smooth, fast maneuvers such as a military jet might perform; or the tight, slower, low-level maneuvers such as the free-style or aerobatic pilots perform. I prefer the latter and the Aerobat was designed specifically for that type of flying. I decided that a 4½ to 5 pound airplane with a healthy .45 in the nose, lots of drag, not too much wing area, and lots of fuselage side area was just the ticket. As for looks, I have always had a soft spot for the between-the-wars type of airplanes, hence the general configuration. Everyone that looks at the airplane (and believe me, it

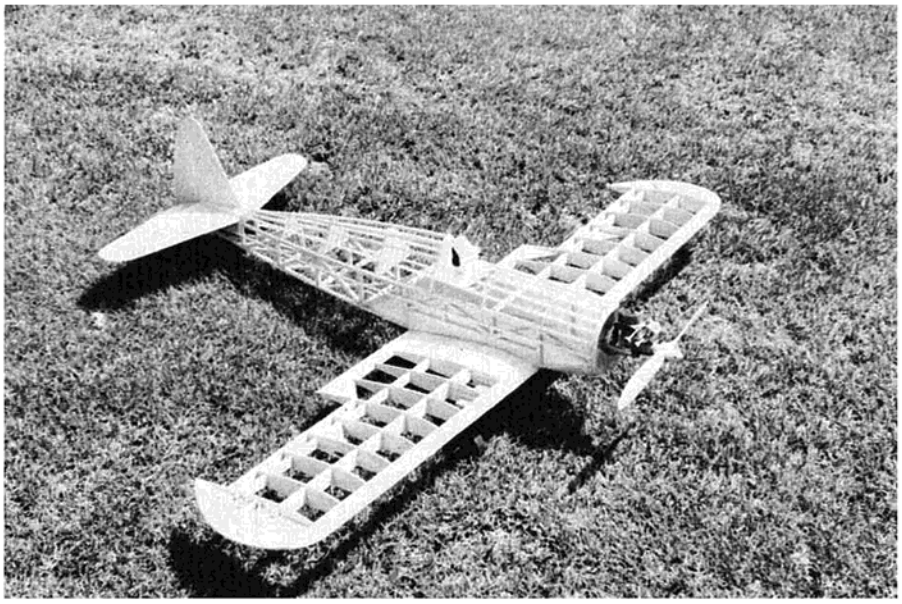
PHOTOS BY REED PACKARD

The author and his Enya .45 powered Aeroboat. Clear doped yellow and blue silk over an open framework is quite a contrast to the popular slab-sided plywood and balsa machine. A beautiful sight in the sky, there isn't a maneuver the Aerobat won't do, and do well.


F2A 3/32" PLY
F3 3/32" PLY
"CREASE" LINE
WINDSHIELD PATTERN
1/16" SHEET BALSA
3/32" RIBS
3/32" PLY BELLCRANK MOUNT
1/16" PLY DOUBLERS 8 REQUIRED SEE SIDE VIEW
1/8" SHEET DIAGONALS TOP AND BOTTOM
1/4" BALSA L.E. DOWEL DOUBLER (2 REQ'D)
SCRAP FILL
1/16" SHEETING ON AILERONS TOP AND BOTTOM
1/8" BALSA GUSSET
DOWEL LOCATION
1/4" BALSA CENTER RIB (1 REQ'D.)
1/4" SHEET TIP
1/8" DIAGONALS
TYPICAL WING TIP STRUCTURE
PINS TO RETAIN HINGES
1/8" SHEET FACING
SCRAP FILL FOR HINGE
1/16" SHEETING
3/32" AILERON RIBS
1/16" PLY PAD FOR HORN
1/16" SHEET BETWEEN RIBS AT PUSH RODS ONLY
KWIK-LINK
ROCKET-CITY HORN
WING-SECTION AT AILERON
DIHEDRAL BR
THIS OUTLINE FOR 1/4" SQ. STRUCTURE
1/8" BALSA COCKPIT FLOOR
3/16" SQ. DIAGONALS BOTTOM OF FUSELAGE ONLY
1/8" BALSA DOUBLERS
F9
F9
2° RIGHT THRUST
1/32" ALUMINUM FIREWALL SHIELD. SAME SHAPE AS FIREWALL
THESE LINES ARE 1/8" X 3/16" SIDE STRINGERS
1" X 5/8" X 1/2" MAPLE "NUTS" EPOXY TO 1/16" PLY TRIPLER. DRILL AND TAP # 10-24
1/4" SQ. CROSSBRACES TOP AND BOTTOM AS SHOWN
SOME STRINGERS OMITTED FOR CLARITY
F5 1/8" BALSA
F6 1/8" BALSA
F7 1/8" BALSA
F11 1/8" X 3/16" 2 REQ'D.
F10 2 REQ'D. 3/16" SQ. BALSA
F3A 1/8" BALSA
F4
F5
TOP STRINGER ONLY IS DOUBLED
F6
3/16" SQ. STRINGERS (TYP)
FIREWALL
F1
F2A
F3
F3A
2° DOWN THRUST
0°
F2B
1/16" PLY
BALANCE HERE
1/4" BALSA SADDLE
F11
10-24 X 1" LONG MACH. SCREW (2)
1/8" X
SIDES
SPUN ALUMINUM OR FIBERGLASS COWL
SOFT BALSA BLOCK
1/4" SQUARE (TYP)
LANDING GEAR 5/32" MUSIC WIRE 2 REQUIRED
3" DUBRO WHEELS
DOUBLER - 1/8" MEDIUM BALSA 2 REQUIRED



FULL SIZE PLANS AVAILABLE — SEE PAGE 70



attracts lots of attention) says that it looks like some airplane that they have seen, but none can quite place it. The tail dragger style was mandatory for me as once you have learned how to handle one, it is truly the only way to fly. When this ship taxis out to take-off, or taxis back after landing, with the good old Enya .45 popping away in that aluminum cowl, it is as realistic as can be. My Enya is the old .45 with two needle valves, no exhaust baffle, and no exhaust cutout in the cowling. Sounds just great.

The structure, as you have probably noticed by now, is all open ribs, stringers, and what have you. It is NOT tough to build. The structure is specifically designed to be reasonably fast building and I'll bet that this will be one of the few multi RC jobs that you ever build with a true fuselage. My ship is covered with blue and yellow silk and finished with clear dope. Costs less, weighs less, and I like to see the sun shining through the silk. The Finishing Touch decals really do add the finishing touch to the airplane, although it would be nice if the stars and the lettering were available by the piece, rather than buying an entire sheet and using just part of it.

The flying characteristics of the airplane are excellent. I make it a point to give other people an opportunity to fly my new designs, after I have test flown and trimmed them, in order to get some unbiased opinions of how the airplane really performs. I haven't had any bad comments on this ship yet. As the acid test, I may let the Valley Flyer's Les Kesner try this one out. (He is our local expert at returning ships to kit form and his newest maneuver, the inverted immlesplatt, has to be seen to be believed!)

I can still remember the first test flight on this ship. It was sitting in the pits at the Sepulveda Basin, right next to a beautiful, bright red Fokker DVII. I cranked up my faithful Pratt and Whispery, Snoopy cast a glance at the Fokker, and we taxied out to take off. I lined the ship up on the runway, took a deep breath, prepared for a siege of ground looping, and slowly advanced the throttle. The "Bat" started its roll as the throttle crept open, staying in a perfectly straight line. I was so surprised that I inadvertently let out the right rudder that I had fed in prior to starting the take-off roll. This made no difference to the airplane and about the time I hit ¾ throttle the tail popped up. The ship just rolled merrily along on its main gear until I eased it off the runway. The climb-out was good and away we went.

After zooming around for a while I decided that this was about the best first flight that I had ever had with a new airplane. I also decided that it was about time for a landing. As I set the airplane up for the approach, the wing began to look smaller and smaller. I lined up on final and just stood by and watched as the small stab allowed the tail to sink and the ship greased in on all three. I then taxied back to the pits, parked next to the Fokker, killed the engine and nonchalantly lit up a cigarette. "Flies great", I said to the gang, "Just as I knew it would." All the while my knees were still shaking.

The Fokker was not about to take all of this quietly, so while Snoopy was getting his goggles wiped off, the Big Daddy Enya .60 barked to life and the DVII taxied out and took off. After a fairly short flight, it came in for a beautiful 4 point landing (the glo plug, top wing tips, and the fin). Snoopy chuckled all the time he was getting gassed (up).

Seriously though, this really is a fine flying airplane. I haven't found a maneuver that it won't do well. I have taken it off and landed it in 90° crosswinds with no problems. The rolls are good with very little down elevator required when inverted. The four pointers are particularly good and the eight point rolls give me more trouble than they do the airplane, a competent pilot (not me) does them well. The knife-edge is good due to the side area of the fuselage. The loops, be they insides or outsides, are again one of the airplanes better maneuvers, but you cannot just pull in elevator and hold it, you must work the stick on the way around (just like the real airplanes do). I have done 5 consecutive outside loops with no aileron or rudder correction and the airplane has come out straight and level. (Of course I lined up with the wind!!) On the outside loops you will find that you are almost at neutral elevator going over the top.

If you like snap maneuvers, step right up. This baby snaps well and will drop into a very fast, very tight, spin after about two snaps. The normal spins are also good. The rudder IS effective and really helps in a slide slip. Maneuvers such as the Rolling 8 or the Cuban 8 are aided by the rapid roll rate possible with the low aspect ratio wing.

The airplane is very close to a constant speed machine, which is what I was after, and it seems to go up almost as fast as it comes down. It is sensitive to the controls but it is not jumpy and can be handled by anyone with some multi experience. The two critical periods of flight occur during take-off and landing and even though the pictures show what appears to be adequate wing area, they are deceptive. That wing is really quite short. On a calm day it is adviseable to come in with some power on. Do not try to stretch the glide, it won't do it. However, neither will it snap roll in on a stall. The stall characteristics are amazingly gentle, she just mushes forward and the nose falls straight through. The airplane seems to automatically seek low altitude, tight maneuvers and these really show it off at its best.

Design-wise the airplane is pretty conventional. Approximately 490 square inches of wing if you count the centersection and about 446 inches if you don't. The wing loading is then about 22 oz per square foot or 24 1/2

oz per square foot. I never have been able to decide if the wing centersection that is blocked by the fuselage, should be counted as wing area. It doesn't seem to bother the airplane though, so take your pick. The stab is smaller than the normal 25% of the wing area and is of a bit higher aspect ratio than is usual. This, coupled with a slightly forward C.G. seems to make these smaller ships groovier. Although the fin and rudder look small, the fuselage side area more than makes up for it. My prototype weighs 4 3/4 pounds with a .45 in the nose swinging an 11-5 prop. This seems to be the right combination. If you have one of the newer, lighter, radio rigs, the weight will drop by 4 to 6 ounces and a little more propeller pitch would probably be called for.

The cowling on the original is a 5 inch diameter, spun aluminum cowl that I picked up in the local hobby shop for $1.98. This diameter leaves a gap all around the cowl where it fits over the nose and allows the exhaust to escape. No overheating problems have been encountered. I really think that a fiberglass cowl would be a better choice and well worth the work, for my aluminum cowl has already begun to crack from vibration.

Soooooooo, if you want a ship that presents a little challenge building wise, is a great attention getter at the field, and flies like a dream; try the Aerobat. I think that you will really like it.

CONSTRUCTION

WING: The wing on the original is a much modified Falcon 56 wing. There is enough information on the plans to scratch build the wing, but you would be hard put to duplicate the nicely machined leading edge that comes in the wing kit. The span is reduced to 45 inches plus tips. Begin construction by laying out the parts required, ribs, etc. You will need six ribs trimmed down 1/16" for the planked centersection. Cut out the 1/4" thick center rib and the two rib doublers, then epoxy these three parts together. Cut out the 1/16" ply landing gear mount doublers, the 3/32" ply aileron bellcrank mounts, the 1/8" balsa gussets, and the 1/4" balsa wing tips. Notch the tips to allow the spars to slip in 1/2". Now build the two wing halves following the directions on the plans. Cut out the three dihedral braces, trim the spar slots, and join the two wing halves at the proper dihedral angle. Add the tips, tip diagonals, bellcrank mounts, landing gear mounts, torque blocks, and the ply landing gear doublers. Now cut out the ailerons as shown on the plans. The aileron cutout will leave a small piece of trailing edge stock on the trailing edge of the wingtip, leave this piece on the tip. Glue in the 1/4" X 7/8" aileron facing to the rib ends at the aileron cutout. The ailerons are now built up of 3/32" ribs with 1/8" facing and 1/16" sheeting. Glue a piece of scrap trailing edge stock in each aileron at the tip end.

No servo installation is shown on the plans due to the wide variety of equipment in use today. Gimmick up your favorite servo mount and pushrod arrangement and hook up all of the linkage. Sheet between the ribs (bottom of wing only) where the aileron pushrod exits. When you are completely satisfied that all linkage works well, sheet the centersection. Sand the wing well and fiberglass the center 4 inches.

EMPENNAGE: The fin and rudder are cut out of medium 3/16" sheet. Sand well and hinge using sheet nylon hinges pinned with toothpicks. I still haven't found a better hinge.

The stab and elevator are cut out of ¼" sheet, medium. A good trick to use on these split elevators is to take a sheet of ¼" balsa long enough for both elevators. Then, before cutting the elevators out, inset the wire joiner and epoxy and fiberglass in place. NOW cut the outline. This is the best way that I know of keeping the two halves of the elevator perfectly in line. Again, hinge with nylon and toothpicks. Sand well and epoxy the rudder assembly in place on the elevator/stab assembly. Do not dope this assembly yet.

FUSELAGE: Now the fun begins. The fuselage structure looks quite impressive but believe me, it really is a snap to build. Just follow the sequence as given here.

First build up two fuselage side frames (yeah, one at a time) over the plans. The ¼" balsa wing saddles should be cut out very carefully to maintain the 0^{o} incidence shown. It is of prime importance to cut and fit all of the pieces of an open framework structure very carefully, the better the fit, the stronger the joint. The top ¼" square longeron and all members forward of the wing trailing edge are fairly hard balsa, the remainder may be medium. Next add the 1/8" balsa fuselage doublers to the inside of each side frame. Be sure to make a left and a right side. Now, invert the sides over the top view and pin down on the plans. Add the ¼" square cross braces where shown, draw the tail together, add the 1/8" ply tailwheel mount, the lower rear 1/8" sheeting, and the 3/16" square diagonals to the fuselage bottom. Note that since you are assembling the fuselage box upside down, the 3/16" square diagonals will run in the opposite direction to that shown on the plans. The bottom stringer (1/8" x 3/16") can be added now, as well as the two F11's at the wing trailing edge. These give you a place to glue the silk down. While all of these sticks are drying, cut out the formers, firewall, etc. I used a 1/32" aluminum firewall shield behind the engine mount, to protect the firewall from fuel, etc. Drill the mounting holes for your Tatone engine mount, keeping the engine off-center to the left (when viewed from the tail) about 1/8 inch. When the engine is installed with the proper sidethrust, the spinner will be centered. Install the blind nuts for the engine mount.

The fuselage box should be dry by now so remove it from the plans and

(continued on page 18)

(continued from page 17)

add the formers, firewall, etc. Next add the top, rear, stringer (3/16" square). When dry, add another 3/16" square stringer directly on top of the first one. This doubling will keep the silk from pulling in the top stringer and spoiling that nice S curve. The next stringer down on each side fairs into the top stringer af F7. The next (second) stringer down on each side butts into F8. The forward stringers should be left long enough where they enter the cockpit area to be trimmed off with a razor saw when the instrument panel (F3A) is added. Add the cockpit floor. Add the 1/8" x 3/16" side stringers and the lower nose block. Epoxy F2B in place. The 1/4" square cross braces from the cockpit forward can now be cut out to permit equipment and tank installation, they are no longer necessary. Assemble the two F9, ply doublers and the birch or maple "nuts" and epoxy in position. Add the two F10 fillers (one on each side) to the rear of the fuselage. These are again placed to provide a glue-down point for the silk. The rearmost, upper portion of the fuselage sides from F8 back and from the bottom of the stab to the top of the side stringers, are sheeted with 1/16" balsa and slots are cut in these for pushrod exits.

Now sand the whole mess well, beveling the edges of the firewall to match the fuselage shape at the nose. Epoxy the stab/rudder assembly in place, not forgetting the bottom rudder hinge. Carve the two filler blocks for the stab/rudder junction and cement in place. The fuselage is now complete. See, that wasn't so bad. Sand well and give about 4 coats of Sleek to the entire structure.

One comment here, the fuselage could probably be built of 3/16" square spruce, rather than balsa, but would you believe that the gluing surface area of a 3/16" x 3/16" joint is 44% less than a 1/4" x 1/4" joint? Yup! If you do use spruce, better use 1/32" ply plates on all of the joints.

EQUIPMENT INSTALLATION: Now is the time to fit all of your gear in, the tank, pushrods, etc. With the open framework, this is really a snap. I have not shown any equipment installation of the plans. There are so many rigs on the market now that it would be impossible to depict an installation for each type. Follow your radio manufacturer's instructions TO THE LETTER!!!! My ship has my trusty old (3 years + old) Micro Avionics installed with the "large" servos. It fits in well and any of the new, smaller, rigs will be lost in the fuselage. I used a six ounce tank installed high in the nose, as my .45 has a rather high intake. Lately, I have gone to using 3 tube tanks on my airplanes and I really believe that they work better. On a ship such as this, with most of the engine cowled, a three tube tank makes fueling up much easier.

I imagine that it would be wise to sleeve all metal to metal contacts with nylon tubing. Most rigs are touchy about this. My Micro seems to be completely immune to any problems in this area but I still try to sleeve where applicable. My pushrods are 1/4" square balsa with music wire ends. Not too sophisticated, but extremely reliable.

ASSEMBLY: Might as well get all of the pieces fitted together before covering, it's much easier. Tape, rubber band, strap, or what-have-you, the wing into its proper position on the fuselage. I left the 1/4" diameter hole in F2B small and filed it out at assembly to get exactly the incidence that I wanted on the wing. The 1/4" dowel leading edge retainer fits into the wing from the leading edge clear back to the dihedral braces. It is plenty strong. When the wing is seated properly, and squared away with the fuselage centerline accurately, drill the two mounting screw holes using a number 25 drill. Remove the wing, tap the two "nuts" no. 10-24 and drill the holes in the wing out to about .200 inch.

Take the two landing gears that you have bent and bend the wheel mounting leg to give about 2^{o} toe-in. This really does wonders when it comes to eliminating ground loops. Also helps to slow the ship down on the landing roll-out. Try it. Now you are ready to cover and finish.

COVERING AND FINISHING: Here we arrive at a real builder's choice. The prototype is covered with dyed silk and finished with clear dope. The fuselage is blue, wing and tail are yellow, and the only color doped portion of the airplane is the striped rudder. I first gave the entire structure about 4 coats of Sleek, sanding lightly between coats, then wet silked it.

One of the newer covering materials could be used on the fuselage, but I wouldn't recommend it on the wing. The open structured wing requires a covering that will add torsional rigidity. Most of the plastic materials that I have tried do not add this property. Take your pick but please use silk or silron on the wing.

I used the Finishing Touch between-the-wars decals and they really do dress the airplane up. This airplane just seemed a natural for U.S. Army markings.

TRIMMING AND FLYING: Set up all of your control surfaces with the amount of throw called out on the plans. Zero trim settings should be neutral control surfaces. DO NOT OMIT THE SIDE AND DOWN THRUST SHOWN ON THE PLANS. Too many people seem to avoid putting side thrust in a tail dragger airplane and then they wonder why the airplane goes around in circles on the take-off run. The two degrees of side thrust shown, coupled with the 2^{o} toe-in of the main gear and a gentle hand on the throttle, will result in beautiful take-offs. DO NOT slam the throttle wide open, ease it open.

Allow the airplane time enough to build a good head of steam up before lifting off, the wing is small. When flying on a windy day, do not proceed to make a 180 immediately after take-off. I have seen many a ship go in due to this maneuver and there is no need for it to happen. Our models, just like a real airplane, require a certain minimum velocity RELATIVE TO THE AIR THEY ARE FLYING IN to stay airborne. If your airplane has a stall speed of 25 mph and you do a 180 immediately after taking off into a 25 mph wind, it is going to fall out of the sky. Give the ship time to build up some airspeed before bending it around the corner.

For the first few landings you would do well to come in with a little power on until you get the feel of the airplane. As I have already mentioned, the stalls are very gentle and are straight ahead, but that won't help if you stall out five feet off the ground! A run-off the runway and into the weeds rarely hurts a model, so let it come in hot if you have to.

That about does it for now so try this airplane out, I think that you will really enjoy it. If you have any questions, or any comments concerning the airplane, contact me in care of this magazine. Good Flying.

R/C DESIGN MADE EASY

(continued from page 11)

product do the job and do it well. Several other points that we haven't touched on yet but do need to be considered are to have adequate dihedral in the wings, about three degrees in each panel is more than enough, and, build it strong! There is a great fetish now to build light models. I have several friends that are so concerned with the weight of the aircraft that they weigh each piece of balsa that is used, and know to the gnat's eyelash just how much weight each coat of paint adds to the finished craft. But, they are building competition aircraft, both pattern and racing, where added weight is a handicap. For our trainer, we want something rugged. A ship that will fly, bang the ground, and live to fly another day. This can only be done by building in strength as we go. Use plywood wherever you think that high stress will occur. Use lots of glue, epoxy or Titebond, and don't be afraid to add a brace here and there. The worst thing that I can imagine in a trainer, and I have seen many many that have come out to the flying field this way, is to have a lightly built ship with no extra wing braces, etc., sporting a twenty coat dope finish. The pretty paint job added about a pound or more of weight, lots of work, and no strength at all. In fact, that lovely paint job will just make the aircraft much harder to fly along with adding more butterflies to the tummy.

Keep 'em simple, strong, functional, clean, both in design and paint, and you'll have a trainer that will teach you how to fly, not how to build. Good luck, and let me have pictures of your efforts.

Next month we'll go into the design of biplanes and galloping ghost aircraft.

LI'L TOAD

A FASCINATING, HIGHLY MANEUVERABLE THIRTY INCH SPAN DELTA ESPECIALLY DESIGNED FOR A SINGLE PULSE PROPORTIONAL ACTUATOR AND .10 TO .15 ENGINES.

BY BOB BENSON AND BOB REUTHER.

The July issue of R/C MODELER MAGAZINE described some of the problems which a beginner faces in using pulse proportional equipment for the control of model aircraft. Typical aircraft chosen by the beginner are relatively stable which allows the beginner to develope confidence as a pilot. Soon after gaining confidence there is always the challenge to experiment with more maneuverable aircraft. An example of what can be done was discussed in the December issue of R/C Modeler which described the use of single actuator and double actuator installations in the Top Dawg airplane. The performance of such an airplane using ailerons and elevator is a challenge even to the highly skilled flyer.

All hobbyists are faced with the cost of upgrading their equipment to the best available performance after they have mastered the fundamentals of their hobby. This is the third in a series of articles which shows the versatility that can challenge the model airplane enthusiast with a minimal investment in equipment. The Super Sport transmitter and receiver is the first pulse proportional system designed to provide equipment which satisfied the needs of the beginner and is yet useful for controlling highly maneuverable aircraft. The equipment incorporates a wide range of pulse rates and widths that are adjustable to all actuator systems working on these principles. The improved performance of the fast pulse rate actuator systems is gratifying to the beginner after mastering flying with the slower pulse rates. The selection of aircraft which is capable of carrying the added weight of double actuators allows for performance such as was achieved in the Top Dawg. This article is concerned with a fascinating aircraft especially designed for a single actuator unit operating at the slow pulse rate.

The single actuator is a mechanical decoder which responds to two aspects of the radio signal with little interaction of one control on the other. It is reasonable to design a highly maneuverable aircraft around a single control element compatible with the single actuator concept. It features gratifying performance under control of elevons which proved directly compatible with the mechanical action of a single actuator.

Almost everyone is fascinated with the high performance and flight characteristics of the Delta-design aircraft which have emerged over the past few years. The present aircraft is a simple Delta configuration having a wing span of thirty inches. The plans illustrate the simplicity of construction where the basic design is a symmetrical airfoil in the shape of a Delta.

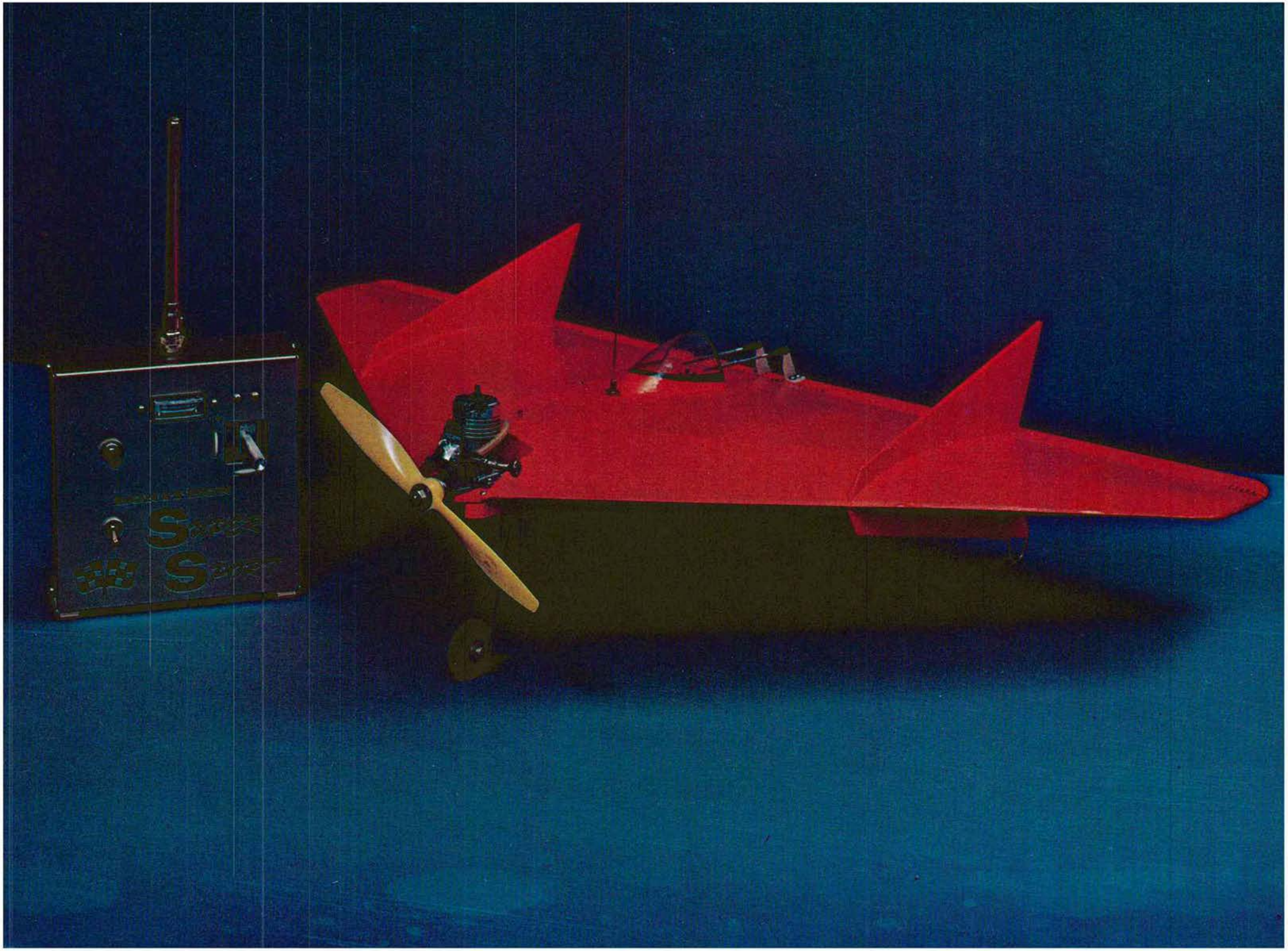
In order to stabilize the Delta wing, two vertical fins are placed on the top of the wing and two additional fins on the bottom of the wing. The bottom fins also serve as skids for the aircraft on the ground. A single fixed wheel is mounted on the front of the aircraft to guide the airplane on take-off.

The central compartment of the wing section is designed to contain the engine, the fuel tank, the receiver and battery pack and the actuator. The actuator mount is unconventional in the sense that s special plate is used that is free to move forward and backward in slotted hardwood rail mounts. The take-off, which is normally used for elevator motion, is rigidly anchored to the airplane frame. The resulting motion of the actuator is a back and forth motion at the normal pulse rate with the rudder action superimposed on the top plate of the actuator.

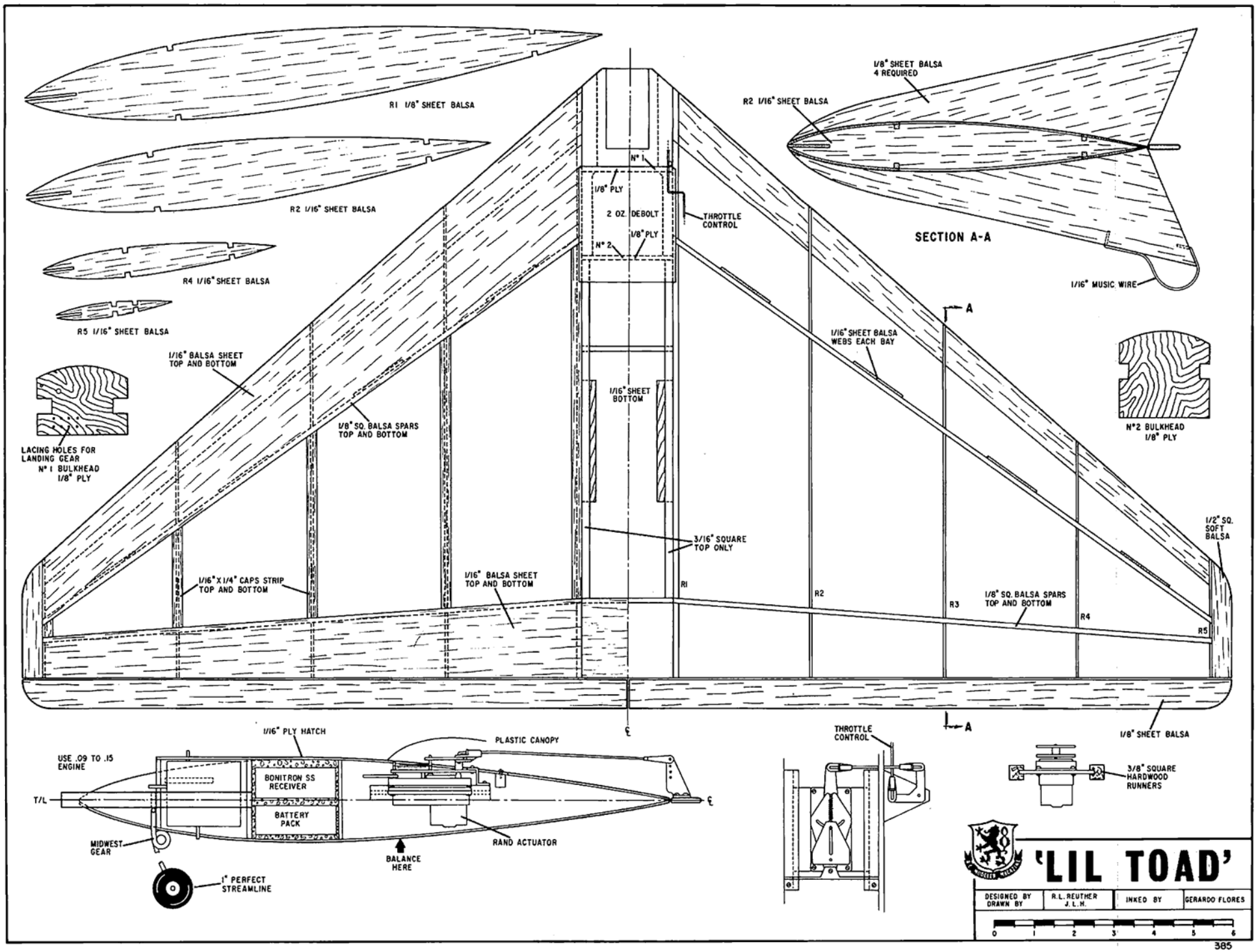
Strip elevons extend across the entire rear of the wing and are connected to the two sides of the rudder take-off by horns mounted on the top of the elevons. In normal pulse proportional systems the actuator is fixed and the pushrods must come underneath the elevator in order that the airplane will fail-safe into up-elevator rather than down. In the present case, since the actuator is free to move, the elevons are connected from the top so that the aircraft will again fail-safe up rather than down. The elevons follow the same motion as the rudder take-off on the actuator which results in both up and down and right and left with single control surfaces.

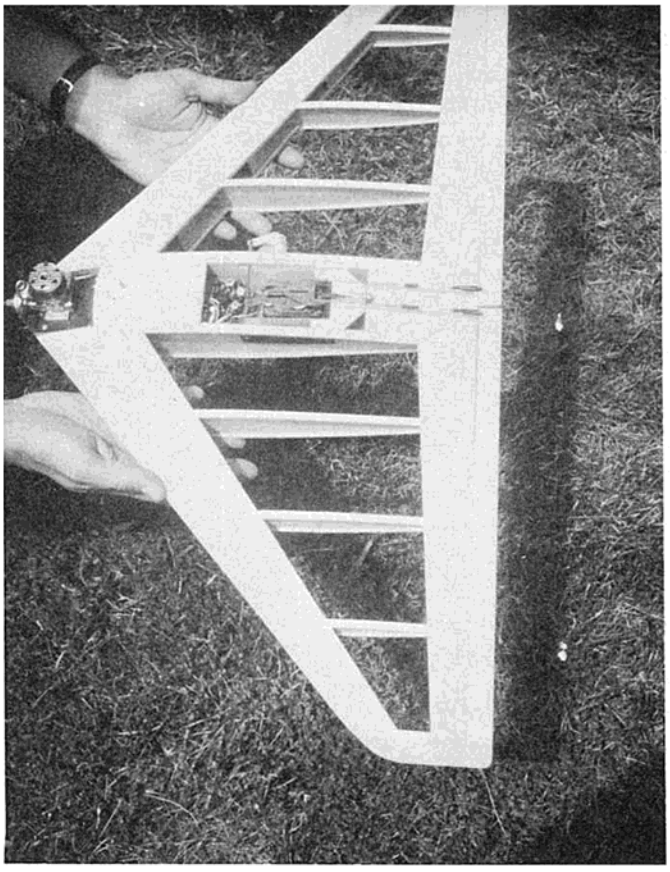
After finishing the model sufficient suspense was created and considerable comments were available concerning its probable flight characteristics. As those of you who have designed your own conventional models know, there is always some concern about the major question, "will it fly?" Our chief test pilot, Bob Reuther, had the utmost confidence in his design and assured us of success. His caution at the flying field gave some doubt as the the AMOUNT of confidence but, nevertheless, his confidence was rewarded.

The airplane was powered by a .15 engine and the all up weight ready for take-off was just under one-and-one-half pounds. If this seems to be overpowered, it is! The speed is comparable to most 60 powered pattern ships. Prospective builders should not let the speed scare them off because the ship is super stable and groovy with deadstick landings a breeze.

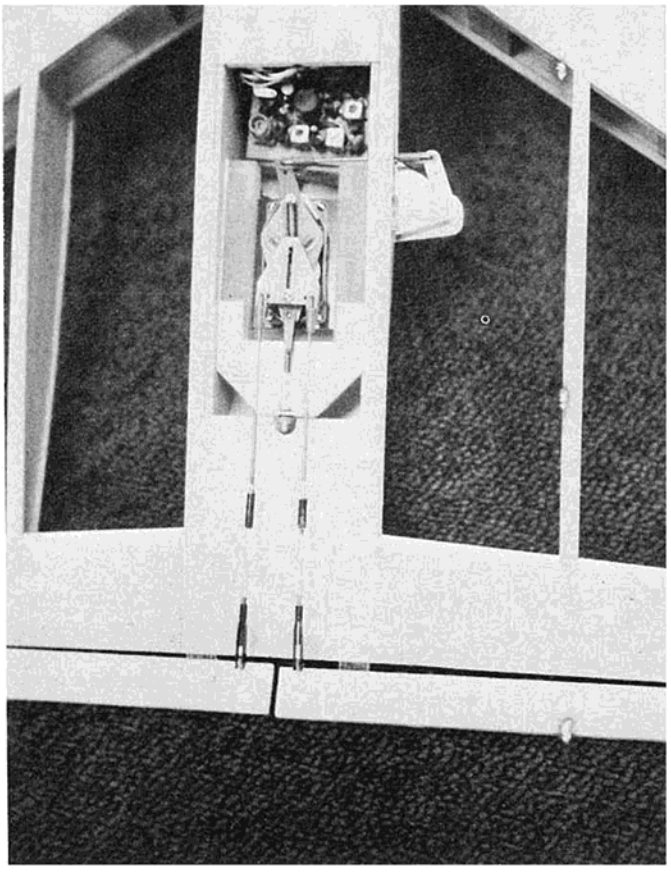


FULL SIZE PLANS AVAILABLE – SEE PAGE 70





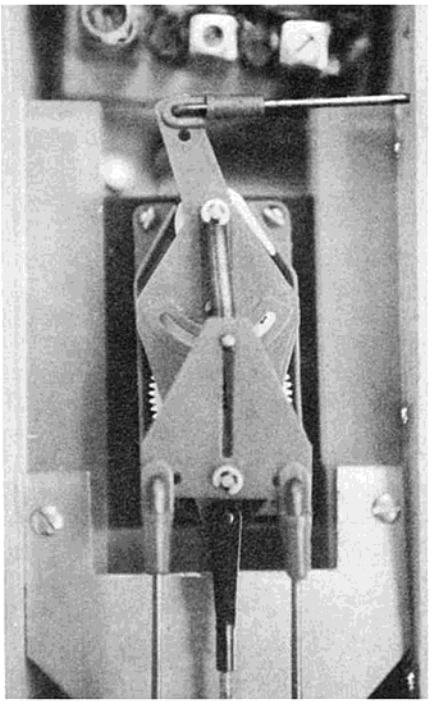
The author holding the quickly built, simple delta framework. Note radio compartment with Bonitron receiver and single Rand LR-3 actuator.



A closer look at the actuator compartment. LR-3 elevator take-off, fastened to framework, allows actuator to move back and forth.

For the first flight the elevons were mechanically set for considerable down trim since the worst thing in flying a new airplane of any sort is to have too much up-stall on take-off and crash. The conservative method is to have too much down and fail to get airborne. This was our course since we really wanted the airplane to fly. On the first attempted take-off, the aircraft skidded approximately fifteen feet with no indication of getting airborne. The mechanical linkages were reset by three to four turns of the linkages on four successive attempted take-offs. On the fifth adjustment, some fifteen turns on the mechanical linkages, Lil' Toad was airborne for about fifty yards. Since Bob was holding almost full-up he decided to let the aircraft settle back to the ground.

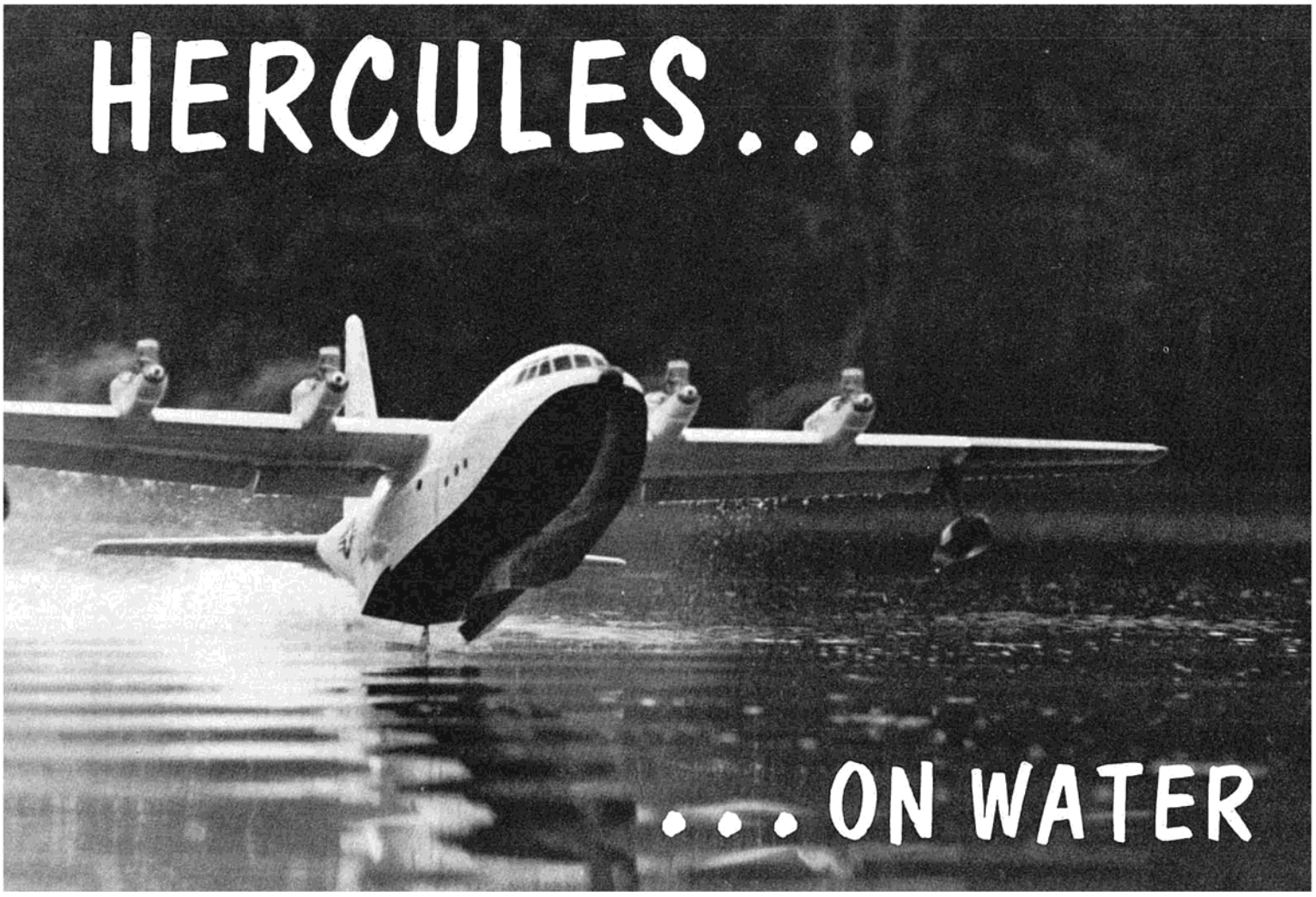
Three more turns on the mechanical linkage to compensate for the lack of up motion and the Delta became airborne. By this time he had used most of a tank of fuel but was able to fly for a period of approximately two minutes. It was still necessary to hold about one-half up so that the control surfaces had considerable motion and the aircraft gently rocked about its roll axis at the slow pulse rate. Right and left turns were accomplished easily and up and down motion appeared sufficiently sensitive. When the fuel ran out the airplane gently settled back and gracefully landed for the completion of our first successful flight.



Close-up of Rand actuator. Note metal Kwik-Link in foreground. This is fastened to delta framework, allowing actuator to slide. Throttle linkage at top of photo.

Having gained confidence, the elevons were trimmed three more turns of up so that the pulse rate could be increased for neutral flight. The take-off was accomplished routinely in about one hundred feet and Lil' Toad climbed like a large jet aircraft at an angle of about 45°. Her performance was truly astonishing, executing turns, climbing and diving like the best Delta designed aircraft. Attempts at performing rolls were somewhat disappointing in the fact that the aircraft lost considerable altitude when upside down. More work with the adjustment of the neutral position of the elevons should correct this maneuver. The speed and handling characteristics of the design were sufficient reward for this challenging application of a single actuator pulse proportional system.

Lil' Toad has proven to be one more application in the pulse proportional field which justifies our choice of the name SUPER SPORT.



AEROSPACE AND R/C INDUSTRIES TEAM-UP ON SUCCESSFUL TEST PROGRAM FOR LOCKHEED'S GIANT C-130 HOW PROJECT.

Last April, the Aerospace Daily reported that Lockheed-Georgia had released details of its proposal for a C-130 HOW (Hercules on Water). The Naval Air Systems Command had previously awarded Lockheed a $25,000 contract to study the concept in January. Lockheed, stated that the aircraft would be useful in spacecraft recovery missions and as a long-range search and rescue vehicle. Specifications called for the C-130 HOW to be powered by four T-56-A-14's, the same engines used on the Lockheed C-130E. The prime difference between these engines and the standard C-130E engines that they would be mounted on the top of the wing for greater clearance above the water.

The new C-130 would feature an aluminum hull which would extend back from the nose 66 feet. To facilitate water landings, the aircraft would be fitted with a single hydroski. This ski, shaped to conform to the hull bottom, would be 21 feet long and 3½ feet wide. Operating hydraulically, it would have a maximum extension of 10 feet for landing or taking off in moderate seas. The main ski would be assisted by two auxiliary wing floats which would serve a dual function as stabilizers and as fuel pods. Each would have a fuel capacity of approximately 400 gallons. The aft cargo doors would be modified to serve as water rudders to assist in steering the aircraft. The maximum land take-off weight of the C-130 HOW would be 175,000 pounds. The design sea landing and take-off weight, with a 25,000 pay load, would be 132,000 pounds with a maximum land-to-sea pay load of 39,000 pounds. The C-130's endurance at sea level, for search and rescue missions, would be 4.6 hours with an operating radius in excess of 1,000 nautical miles. The maximum range for the empty aircraft would be 4,100 nautical miles, and with a 25,000 pound pay load, this would be reduced to 3,350 nautical miles.

One unique factor of the C-130 HOW contract was the specification for the construction of a one-sixteenth scale radio control model of the full scale aircraft. Constructed at a cost of $9,000 by Lanier Industries of Gainesville, Georgia, well-known to RC'ers for their ARF models which have enjoyed wide spread popularity, the Hercules prototype features a six foot fiberglass and plastic fuselage with a styrofoam core wing covered with laminated plastic. The wing span of the prototype is 8'3".

During the first week of October, 1968, with representatives of the U.S. Navy Air Systems Command in attendance, the model of the C-130 Hercules taxied out on Lake Lanier, fifty miles northeast of Lockheed Georgia's Marietta plant,

took off, flew a prescribed air pattern, and successfully landed on the water.

Jack Dunn, RC pilot of Lockheed's Hercules on Water model, stated that the "results of the test . . . exceeded our fondest expectations." In addition to being one of Lockheed Aircraft's test pilots with over 2,000 hours in C-130's, Jack is also an ardent RC flyer, and served as one of the "test pilots" for the early Lanier RC prototypes. Jack must have combined the skills from both fields in flying the HOW model and comparing its performance with the full scale C-130.

Witnessing the first live demonstration in the Hercules on Water project were Captain Richard A. Hoffman, and John C. Vaughn, representing Fred W. S. Locke, executive aircraft design engineer for the Advance Systems Concepts Division of the Naval Air Systems Command in Washington D.C. The more than two score series of flights covering three weeks at Lake Lanier were conducted under the direction of Roy Lange, manager of the Advance Concepts Department, Lockheed-Georgia Company; B. H. Lightfoot, project leader; and Rollo Smethers, who originated this concept. Prior to the flight tests, two areas of prime concern proved negligible said Project Leader Lightfoot after the tests. From still flotation the four Super Tigre .40 engines propelled the model through moderate waves at 25 miles per hour. Ski-unporting was made in an estimated 100 feet and the 32 pound model was airborne in 200 feet. No attempts were made to achieve high altitude with the flight tests consisting of straight take-offs and landings. Airborne speeds attained were 30 to 40 miles per hour with tests ranging from a few inches above the water to heights of 25'. As previously mentioned, flights were restricted to point to point landings and take-offs due to the heavily wooded shoreline that offered a potential danger to this costly model. According to the Lockheed-Georgia Company News Bureau, the four ST .40's generated a total thrust of 10½ pounds. Since four of these engines will produce more than 10½ pounds of thrust – and closer to 16 pounds at full power – Lockheed must have been using an adjusting device of some type to produce a lower thrust so that the model would be "dynamically scaled" insofar as the thrust of the engines are concerned.

A close examination of the photographs show a full span leading edge slat and flaps which appear to be set at approximately20 degrees. The slat was undoubtedly used to give the model wing a lift characteristic similar to that which would prevail at the Reynolds number of the full scale aircraft.

Another interesting feature which is evident in the photographs is the water rudder, previously mentioned. This was undoubtedly needed for control at taxi speeds and during take-off, since the hydro-ski appears to be well forward of the C.G., and the strut would cause an unstable yawing movement if once disturbed from a straight course.

Limitations imposed by the transmitter, a Kraft Gold Medal six channel proportional, required that all four engines be controlled by a single throttle, another factor that made extensive airborne operation undesirable, especially in strong cross wind or headwind conditions. A 10 knot headwind on the model is equivalent to a 40 knot headwind with a standard full-scale C-130 Hercules, Jack Dunn explained.

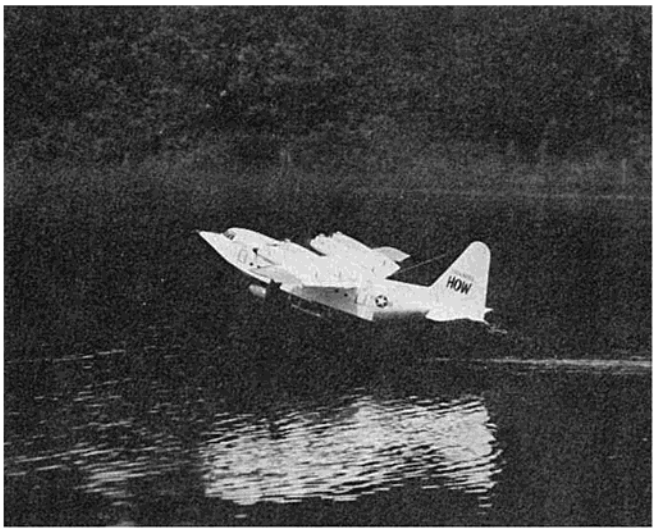
As a result of these preliminary findings, Lockheed-Georgia is proposing a continuance of tests with the present model which will undergo modifications, according to representatives of the Company's Marketing Organization. If these, and previous data prove out, the Company proposes further studies of modification of the Navy C-130 Hercules into the HOW configuration for full logistics air-rescue operations.

Lockheed's Ben Lightfoot, kneeling, and Jack Dunn, pilot, make final pre-flight check of C-130 model, as company engineers and Navy Advanced Systems Concepts official look on.

Lockheed's Hercules on Water model tests, in our opinion, dramatically illustrate how far we've come in radio control. About 20 years ago, Convair built a dynamically scaled model of one of their flying boat designs. Special radio gear was designed and developed, costing many thousands of dollars – maybe as much as $100,000 in terms of today's monetary standards. In contrast, Lockheed used a Kraft 6 channel "off-the-shelf" unit – the type used in today's sport RC flying. It did the job, and saved a lot of money for all concerned!

It is also interesting to note that the model was subcontracted to Lanier Industries, manufacturer of the popular "plastic fantastics" such as the Transit, Bronco, Pursuit, P-51, etc., which have brought many new enthusiasts into the sport of radio control – men who don't want to build and just want to fly.

The Lanier-built C-130 model, powered by four ST .40's, takes to the air under the guidance of a Kraft Gold Medal Series six-channel.



SEAFOAM

RCM'S CHIEF SUNDAY FLIER COMES UP WITH HIS NEWEST OFFERING . . . THE SEAFOAM , A 44" SPAN AMPHIBIAN FOR .09-.10 ENGINES THAT IS EQUALLY AT HOME ON WATER OR LAND.

BY KEN WILLARD

What do you think about when designing an amphibian? Lots of things, of course. But there's one thing you have to think about more so than the other items, and that's water. Yes, water. Why? Well, because most of the requirements regarding hull line, angle of attack of the wing when on the step, positioning of wing floats, etc., are pretty well established – but everytime you put a flying boat hull in the water, unless you've considered every possible source of leakage or seepage, that old bugaboo water finds every little pinhole, opening, or crack, gets inside, soaks up the wood, thus adding a lot of weight, and may even get into your radio system and short it out. So, when designing a plane that's going to operate off of water, make water protection one of your prime concerns.

Water invasion of the wing and stabilizer surfaces is equally troublesome – particularly if water gets in one wing panel and not the other.

With all of these things in mind, I thought I'd try to design an amphibian that would minimize the water problem, yet be very easy to build. It also should take advantage of some of the new products which are commercially available.

Selection of the first commercially available items was easy. I would design the model around the Midwest foam wing and stab combination. I had flown several models which used the foam wing, and its 44" span was just right for what I wanted. By selecting this wing and stab combo, the problem of water seepage was instantly solved insofar as the flying surfaces were concerned. And there was the side benefit of not having to build a wing or a stab, thus eliminating about one third of the construction time.

I'll discuss the other commercial items as they come up during the construction sequence.

HULL

After you've studied the plans for a while, you won't need much help regarding the basic structure. The hull is a simple box – two sides of 3/32" balsa, with plywood bulkheads, a couple of 1/8" balsa braces in the aft section, 1/16" balsa top and bottom except from the step forward to the nose block, where the bottom is cut from 1/16" plywood, since this is the part that takes the beating, especially when you fly the model as a land plane.

The windows and the windshield area are cut out for appearance, or you can leave the wood in place and paint the windows in if you prefer. It may depend on what you use for covering material.

LANDING GEAR

This is optional, really. If you're going to be flying off water all the time you can leave the landing gear fittings off entirely.

But if the lake is some distance away, and your local flying field is handy, you may want to fly the Seafoam as a land plane. The conversion is very simple. Note that on the main gear, three blind nuts are imbedded in 3/8" squares of 1/8" thick hardwood which are glued to the plywood bottom of the hull. Holes are drilled through the hull to accommodate the 2/56 bolts which bolt the landing gear wire to the hull, using Top Flite nylon wire guides. Be sure to locate the guides on the wire BEFORE you bend it – they won't go around the bends.

The nose gear wire passes up through a brass tube which is imbedded in the noseblock. The top of the wire extends up above the top of the hull about 1/4" and a wheel collar slips over it. Use a wheel collar large enough to hold not only the landing gear wire, but also have another wire inserted, which has a hook on it as shown. They you cinch the wheel collar down tight, lining up the nose wheel first, and hold the nosewheel in alignment with a spring or a rubber band extending from the hook to a screw which has been inserted into the noseblock about 1¼" ahead of the nosewheel wire. This doesn't give you a steerable nosewheel, but if you use a light spring, the nosewheel will caster when you apply rudder and throttle, and you can steer the model on the ground, although it isn't as good as if the nosewheel were tied in with the rudder. But that would take some doing – so I didn't do it.

Note the 1/8" plywood skid at the rear of the hull. Also, note that the rudder is in two pieces – the main rudder and the sub-rudder. When flying as a land plane, remove the sub-rudder, otherwise it will get all beat up if your runway, like most of them, is a little rough and occasionally the model rocks back on the tail skid.

Attaching and removing the sub-rudder is simple. Use a couple of strips of MonoKote – the "wet" type.

MOTOR PYLON

This has to be tailored to your engine. I've shown a setup which fits the Max .10. The aluminum legs are bent to fit the sides of the hull, and up at the top the width is determined by the mounting hole spacing of the engine. The tank sits on a plywood tray which fits between the motor mounts and is bolted to the crosspiece section of the legs.

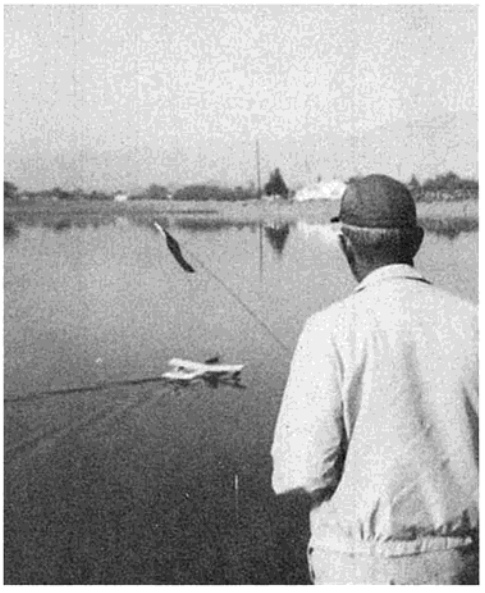
Some of you with sharp eyes will note that the photo of my prototype shows a slight variation in that the rear of the motor mounts has a slight drop in it, and the tank tray goes above the rear leg and below the front one. Well – that was a straight goof on my part – I cut the leg too short. This has been corrected in the plans.

The cowl for the engine and tank can be built up as shown in the plans, or you can make it by hollowing out a balsa block if you prefer. The built up version was easiest for me since the bottom is left open from the rear of the motor mounts to the forward end.

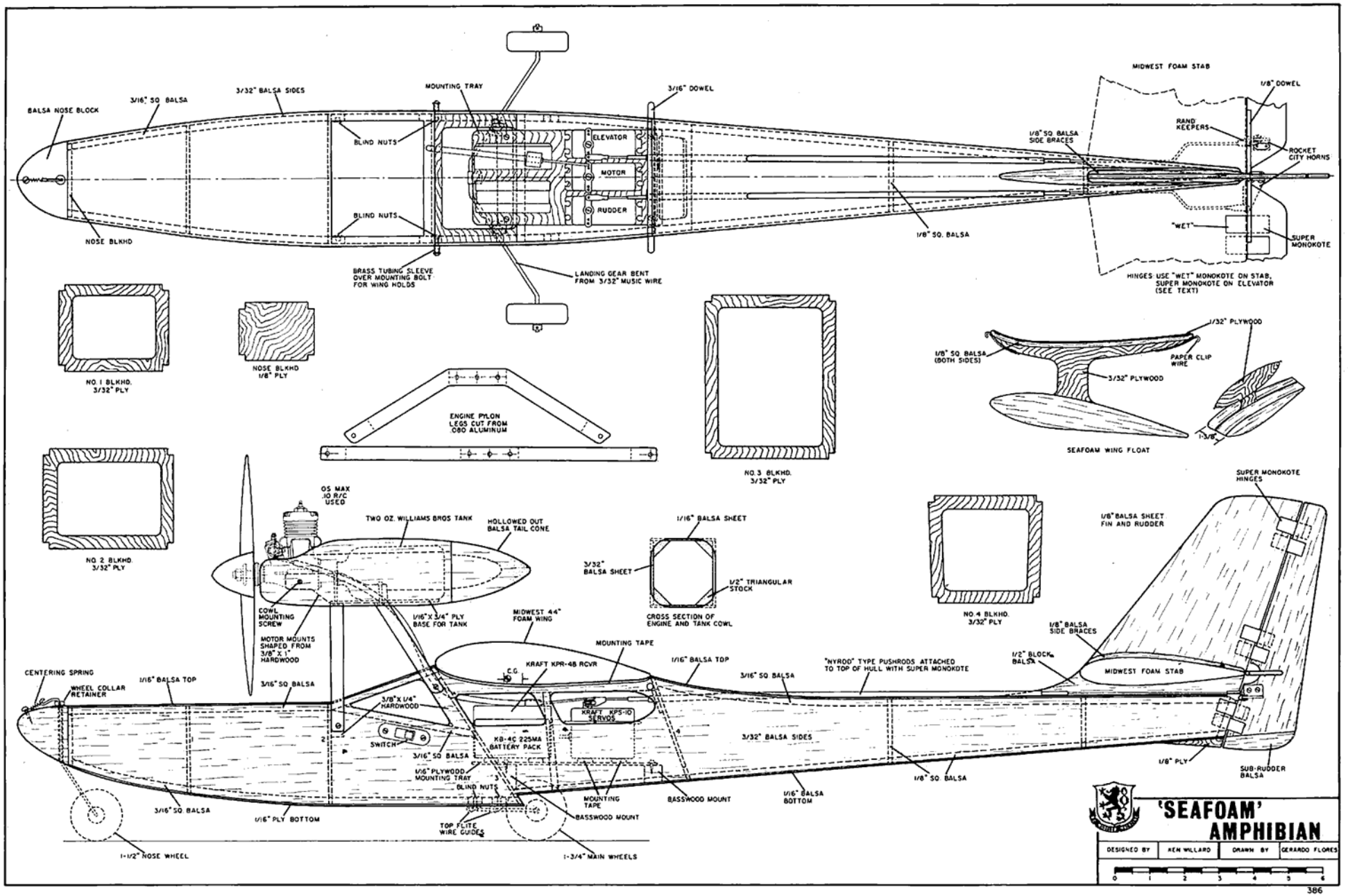
TAIL SURFACES

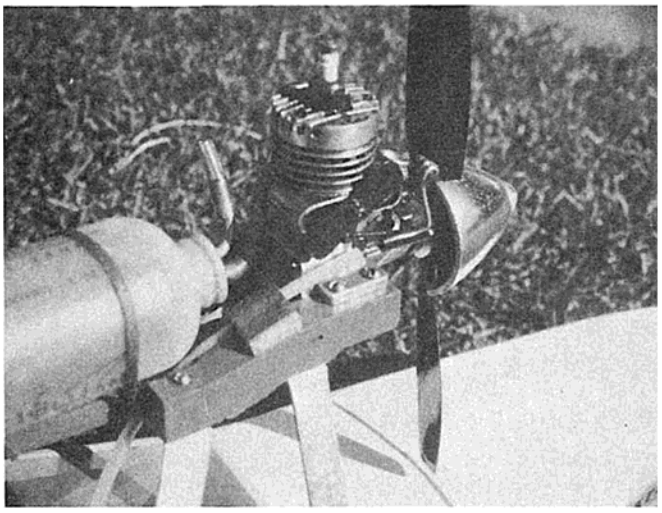
Since the stab is a standard Midwest foam stab, all that is necessary is to make elevators from 1/8" balsa, joined at the center with a 1/8" dowel, and attach them to the stab with hinges. The prototype has the elevators covered with SuperMono-Kote, so it was logical to use MonoKote hinges. However, the part of the hinge which is attached to the stab must be the "wet" type, since you can't use the iron to attach it because the heat would melt the stab surface. "Wet" MonoKote adheres very well to the foam just by pressing it firmly in place. The joint at the hinge line between the "wet" MonoKote and the SuperMonoKote should be about 1/8" overlap.

Some people don't like to use MonoKote hinges – they believe they won't stand up under vibration and heavy use. Maybe so, with a big .60 powered job, but I've never had any trouble with any model using up to a Max .15. There are hinges available that can be used if you prefer; I happen to find the MonoKote hinges simple, fast, and reliable.

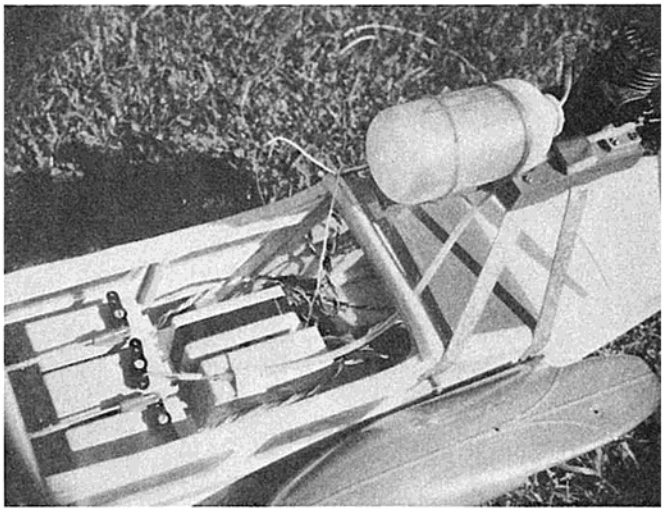


FULL SIZE PLANS AVAILABLE – SEE PAGE 70





Detail showing engine and tank mount. Note flexible throttle shaft taped to motor mount.



Seafoam equipment installation showing Kraft servos. Rand Swing'N Keepers used.

Most of the photos were taken when I was experimenting with a vertical fin cut from half of a Midwest foam stab. It worked all right, but I found that the size was too small, and at slow speed the Seafoam had "dutch roll" instability. So I increased the fin area to the size shown on the plans, and it has eliminated the problem.

EQUIPMENT INSTALLATION

The plans show the setup for a Kraft system, using the KPS-10 servos and the 225 ma. battery pack. Flight tests have shown that the model has plenty of excess power using the Max .10, and the model could easily carry the larger servos and battery pack.

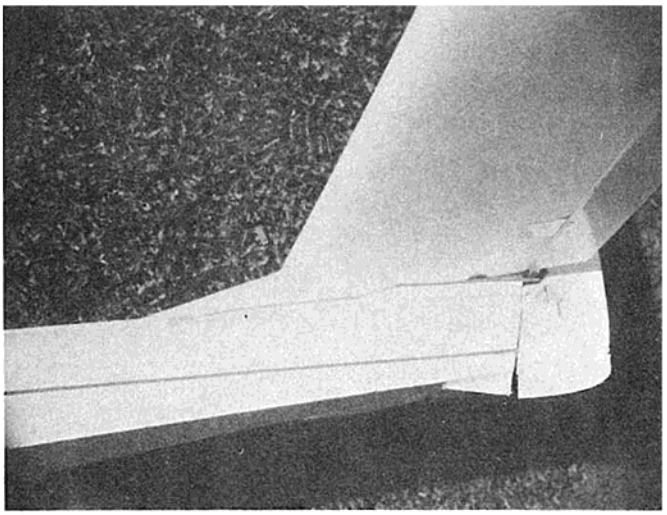
For pushrods, I used 1/8" nylon tubing inside 3/16" nylon – slightly smaller than the standard Nyrods. The wire at both ends of the nylon tubing is cut from a standard large size paper clip. This is relatively soft wire, but holds its shape well enough for this purpose. Also, to connect it to the nylon inside tubing, all that is necessary is to put a slight crimp in the wire, then force it into the nylon tubing about 3/8" to 1/2". It won't come out without pulling very hard on it – much harder than any flight load which will be imposed.

Note how the tubing is held in place behind the servos by passing through a crosspiece of 1/8" balsa, then it emerges through the top of the hull and runs along the top of the hull back to the rear, where another wire cut from a paperclip is inserted in the end and then fits into the hole of the elevator horn and the rudder horn, held there by Rand Swingkeepers. Adjustments to the rudder and elevator settings are made by making bends in this wire as necessary to lengthen it or shorten it.

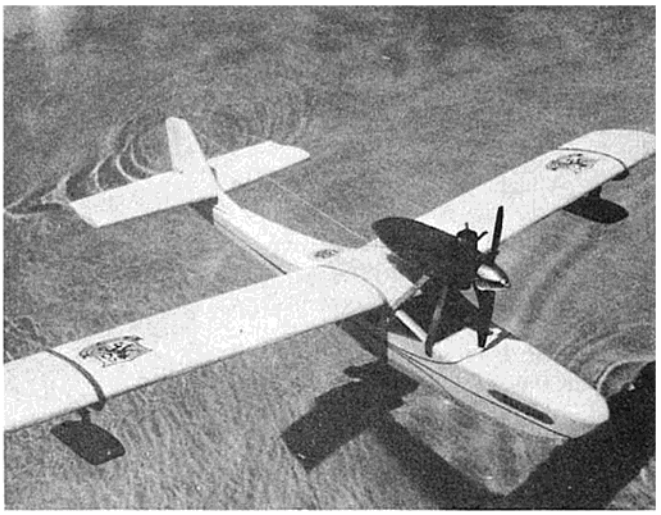
The nylon tubing is fastened to the top of the hull simply by ironing a strip of MonoKote over it and ironing the strip directly to the hull. This seals the opening where the nylon goes through the hull as well as holding it in place.

The flexible rod going to the motor is held in place with mounting tape holding it to the top of the receiver case just ahead of the servo, and also with mounting tape holding it to the right motor mount just behind the motor. I used a flexible wire inside nylon tubing for this pushrod, because the bend in the tubing is fairly sharp, and the wire handled it with less friction than an inner nylon tubing would have. Connection to the throttle arm on the motor required a bit of fitting and adjusting. Here again a piece of paperclip wire was soldered to the flexible wire, and this makes it relatively easy to adjust the linkage for high and low throttle just by bending the wire. *(continued on page* **30***)*

Detail of sub-rudder and rudder control linkage.



The Seafoam at rest after series of test flights. Author recuperating from 400 yd. swim!



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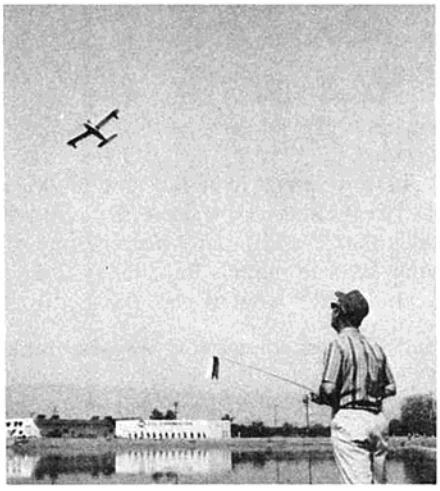


Bud Freeman flying the Seafoam. This was his first experience with a flying boat, and he loved it!

No matter what control system you use, be sure to set it up on a tray – or use some of the commercially available holders in such a way that the servos, receiver, and battery pack are up off the bottom of the hull. No matter how hard you try, sooner or later water will get inside due to a bad landing shifting the wing from its cradle (note the cradle is sealed by using mounting tape and snugging the wing down tight on it) and if your radio system is up off the bottom it is less likely to get wet other than for a couple of drops splashed over it.

I like the tray arrangement, with the units mounted to it with doublestick mounting tape like Rand's or Rocket City's. It's quick, easy to install and remove, and the units can easily be removed from the tray for use in another model when the occasion arises.

HINTS AND KINKS

If you install the removable landing gear fittings, it's easy to change from flying boat to landplane, and the reverse. You may think a bit about sealing the holes where the bolts go through, but all you do is cover them with a piece of scrap MonoKote – which is easily pulled off if you want to put the gear back on, but will seal the hole against water seepage.

The legs of the motor pylon are bolted to the sides of the hull, using blind nuts as shown. At the bottom of the rear leg, note that a brass tube sleeve has been fitted over the mounting bolt. This sleeve, about 3/16" long, holds the head of the bolt out away from the hull, and this allows you to use the bolt as the forward anchor for the wing rubber bands.

If you are careful in making the engine and tank cowl, it will fit snugly against the motor mounts, and a couple of mounting screws are all that are necessary to hold it in place. Slides on and off in a hurry.

The plans show the switch mounting just below the lower brace for the window area. If you decide to paint your windows in, you can mount the switch a little higher. I haven't had any trouble with the existing setup, but the higher location would reduce the possibility of the switch getting wet.

I covered the prototype with Super MonoKote, and to make windows, all I did was to clean off the adhesive in the open area, using methylethylketone (MEK) solvent. Instant windows.

WING TIP FLOATS

The wing tip floats and struts shown in the plans are slightly shorter than those used on the original prototype. You'll note in the photos that the wingtip floats were fairly far out on the wing. However, I subsequently moved them in and raised them slightly for better take-off performance. The floats should be mounted to the wing about 9" in from the tip.

On the prototype I used adjustable struts so that I could try various lengths and angles. The plans show the best setup as proven by the flight and take-off tests.

The strut is cut from 3/32" plywood with the bottom shaped like the float, then balsa block, cut to that shape, is glued to the strut on both sides. The 1/8" balsa brace at the top gives a base for the 1/32" plywood cradle to rest on.

The hook for the rubber band which straps the strut and float to the wing is cut from paperclip wire and glued to the plywood. This strap-on arrangement makes it easy to remove the floats for landplane flying.

FLYING

Seafoam is one of the best performing flying boats I've had. On the water the handling characteristics are excellent; the water rudder (sub-rudder) steers it very well at idling speed, and when you give it full throttle the model comes up on the step and take off practically unassisted. Full power of the Max .10 is more than enough to lift the model off, even in glassy water where the surface tension tends to hold the model down, or in rough water where the model has to plow into the waves. Naturally, since this is a relatively small model, you can't expect it to handle a two foot chop, but on a normal sized small lake, where a ten mile breeze kicks up ripples about four inches high, Seafoam has no trouble at all.

In the air the performance is spectacular. Inverted flight is easy with the foam wing, and the speed is very evident. There's only one thing to watch out for, and that is the characteristic of the wing, since it is tapered both in planform and thickness, to have a rather sharp wingtip stall at high angles of attack. This becomes very apparent when landing the Seafoam; if you flare out for a landing and slow down a little too much, one wing will drop out on you and you've dumped the model into the water. It happened a couple of times to me before I realized what was going on; since then I've been careful to make the flareout into a flat, but not nose high attitude.

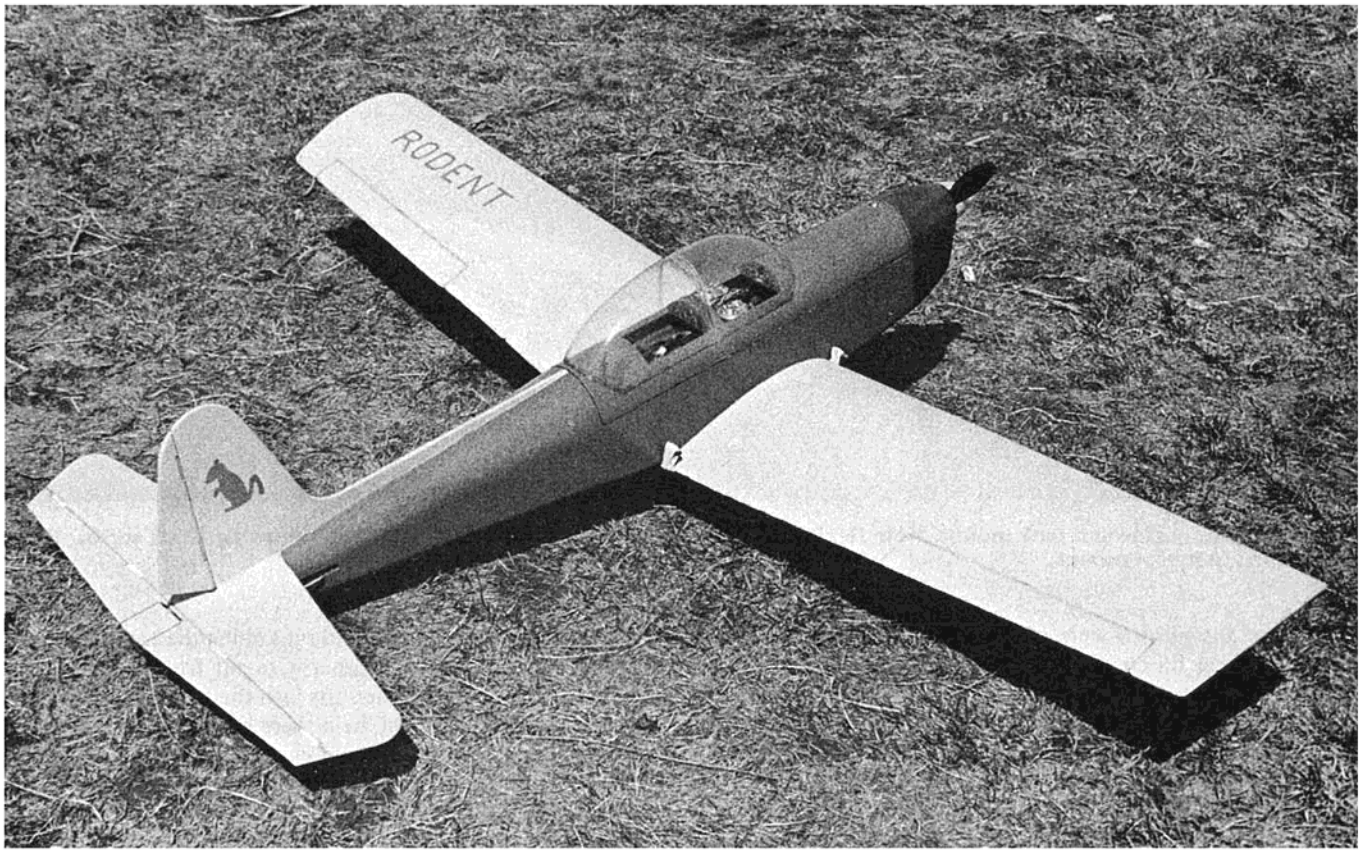
You'll find that your flights with Seafoam are mostly short ones, for the simple reason that it flies very well, and the most fun is taking off and landing on the water, and making touch and goes.

Incidentally, it seems like there are always some modelers who want a larger version of some small job that I've designed, and the probability is that some of you may want to build a larger Seafoam. Here's a suggestion, if you happen to be one of those; Lanier makes a 66" wing with matching stab that you can buy. It would make up into a 1.5 size Seafoam. My guess is that you would have to use about a .35 for engine – maybe even a .45 if you build heavy.

In any event, whether you build a 44" Seafoam or a bigger version, I'll lay odds that it will rapidly become one of your favorite models for Sunday flying.

And that's what it was designed for.

Bud Freeman taxies the Seafoam back after flight.



The Rodent, capable of full stunt performance on pulse proportional, utilizes the Lahti Decoder and Rand actuators operating throttle, elevator, ailerons and rudder. Soon to be presented in RCM, this .10 powered design offers sophisticated performance for a minimum of expense.

The LAHTI DECODER

A HIGH PULSE RATE PROPORTIONAL DECODER SYSTEM THAT PROVIDES 'FULL-HOUSE' PERFORMANCE WITH AN AIRBORNE WEIGHT OF ONLY SEVEN OUNCES.

BY ABBOTT W. LAHTI

This pulse width-rate decoder was designed to satisfy the following requirements:

1. Very low system current drain so as to provide long flights with a light weight battery pack.
2. Suitable for ½A as well as larger aircraft.
3. Relayless operation.
4. A high neutral pulse repetition rate.
5. Light decoder package weight.
6. Relative simplicity.
7. A minimum of adjustments.

FIGURE 1 represents the simplest form that this decoder may assume. Q_1, Q_2 and Q_3 take the place of the receiver relay and drive the rudder servo. Rate information is obtained by the differentiation of waveform **b** by C_1 and R_1

FIGURE 9: The complete system with two Rand actuators, Controlaire receiver, decoder, and light-weight battery pack.

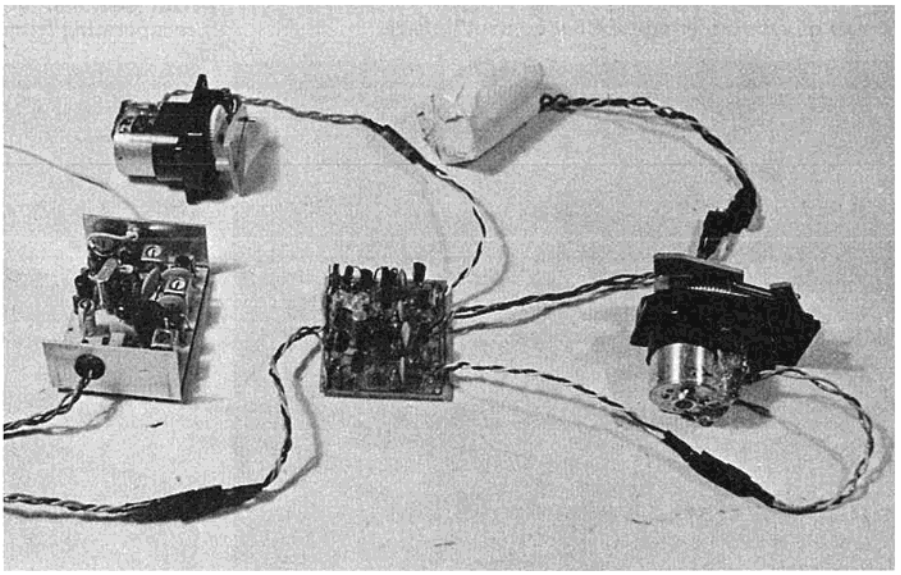


FIGURE 1. SIMPLEST DECODER

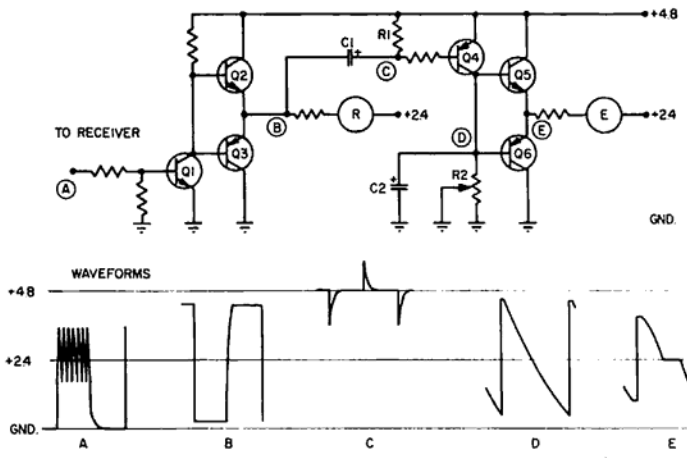
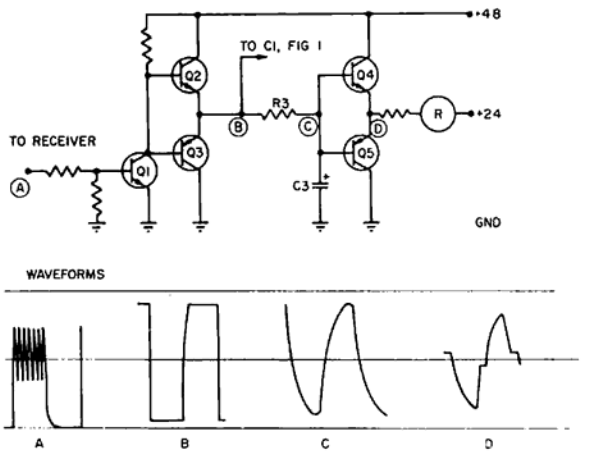


FIGURE 2. PULSE AMPLIFIER ADDITION



giving waveform c. Only the negative going spikes of c turn on Q_4. The positive going spikes at the collector of Q_4 are integrated (stretched) by C_2 to give waveform **d**. R_2 is adjustable so as to balance the waveform about the + 2.4 volt level at the selected neutral pulse repetition rate. This centers the elevator. Waveform **e** drives the servo. Q_1 and Q_4 are of opposite polarity so that under no signal conditions only Q_2 and Q_6 are turned on and the servos are powered by each half of the battery, rather than both on one half. This enables low-motor to cycle easier if the signal is lost and the battery is weak. Notice that the drive to the rudder servo is a full square wave which dissipates extra power while the elevator servo receives an integrated waveform which gives less dissipation. This decoder could be used with the low drain TO-5 motors.

In order to reduce the dissipation in the rudder servo it would be desirable to integrate its square wave drive. This can be done by means of a capacitor connected from the collector of Q_1 to ground. One problem with this technique is that this integrated wave will be poorly differentiated by C_1 and R_1, hence there will be no rate signal.

FIGURE 3. DRIVE CIRCUIT

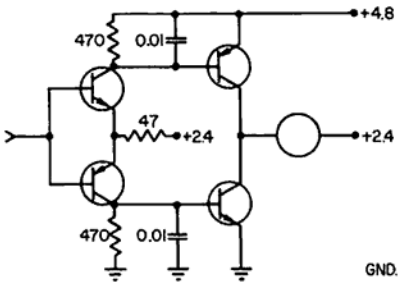


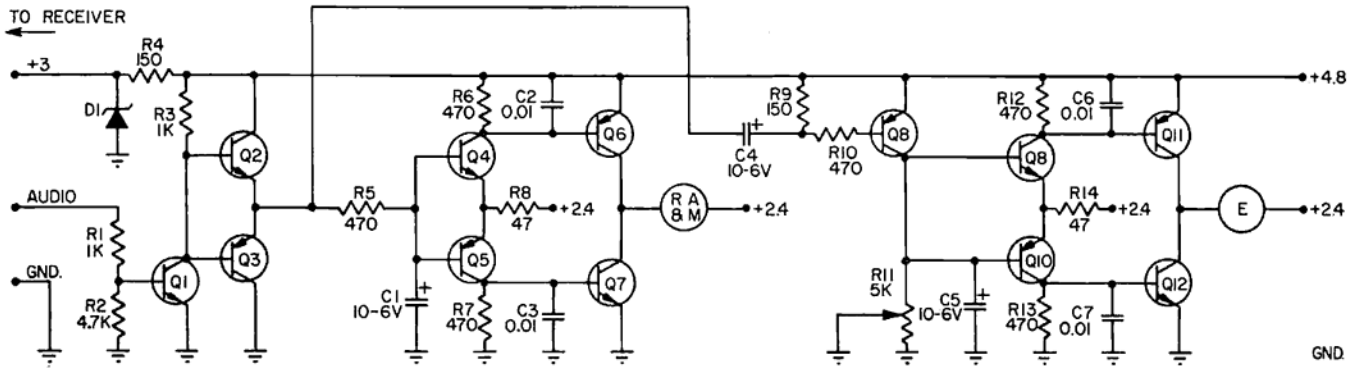
FIGURE 2 represents a way of circumventing this problem. A pulse amplifier consisting of Q_1, Q_2 and Q_3 drives C_1 directly and drives the rudder complementary emitter followers via R_3 and C_3 which provide integration and hence less current drain. The elevator circuitry remains the same.

The complementary emitter follower servo driver has insufficient swing to drive servos such as the Rand or Controlaire, etc., so the drive circuit of figure 3 is used. This basic power amplifier is quite conventional except for the 0.01 microfarad capacitors across the output transistor base resistors. These capacitors slow down the turning on and off of the output transistors, removing a great deal of the "hash" otherwise generated which can be a source of interference.

FIGURE 4 is the schematic of the complete decoder. A resistor and a low voltage Zener diode are included to supply a regulated and decoupled power source for the receiver. The Zener diode should have a sharp "knee" in the 5 to 10 ma range. Table 1 is the list of materials for the decoder. The system power supply is 4.8 volts with a tap at 2.4 volts.

FIGURE 5 shows the output stages

FIGURE 4. COMPLETE SCHEMATIC



C8 10-6V ON RECEIVER

K = TIMES 1000

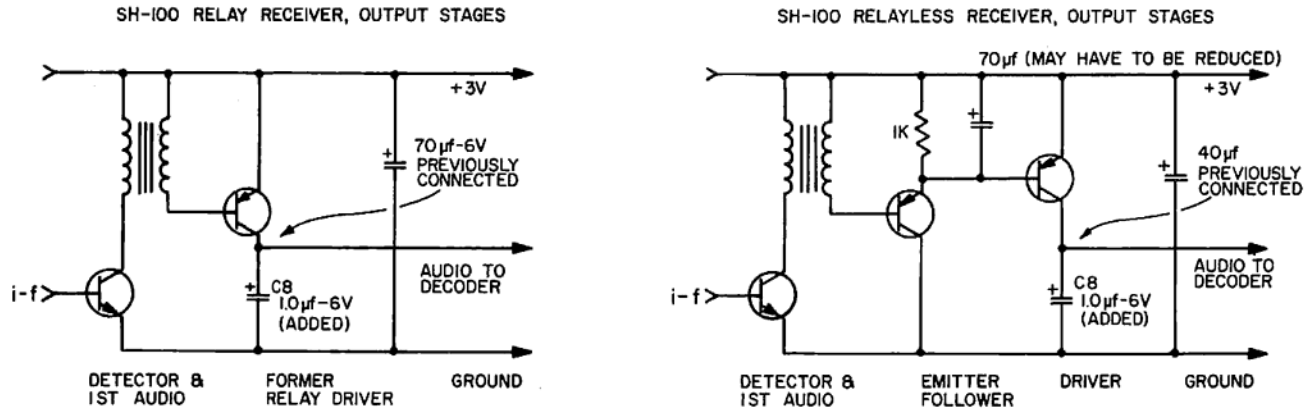
CAPACITORS IN MICROFARADS

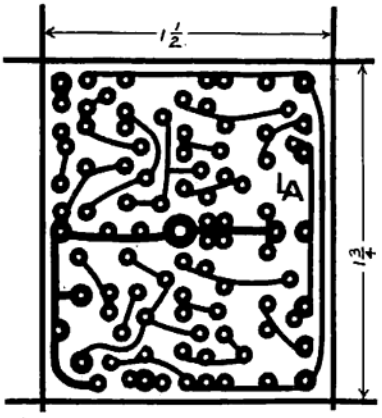
NOTE:

FOR LOW RUDDER SERVO POWER REQUIREMENTS, R5 MAY BE INCREASED TO 1K OR 2.2K.

FOR GREATER SERVO POWER, REDUCE R8 & R14 TO 22Ω OR 15Ω.

FIGURE 5. RECEIVER MODIFICATIONS





ACTUAL SIZE PC BOARD

of the Controlaire SH-100 relay and relayless receivers and their connections to the decoder. Since the Zener diode does not have as low an impedance as the NiCd cells, it is wise to reposition the 40 or 70 microfarad capacitor in the receiver (formerly across the relay or output transistor) to be across the plus 3 volt to ground power lines to the receiver. This removes the receiver generated pulse and tone noise. It will be necessary to cut the printed circuit foil

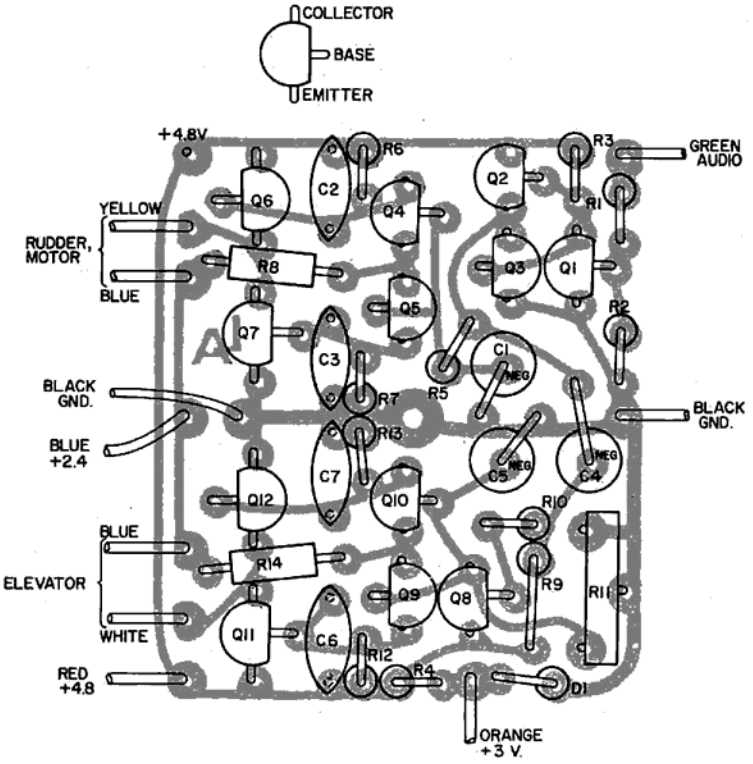
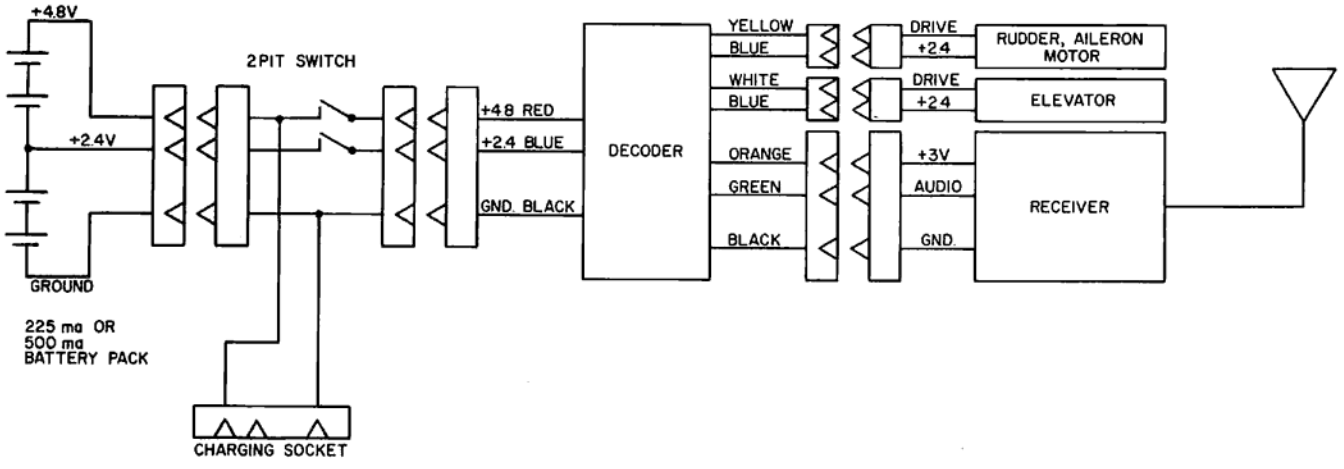


FIGURE 8. COMPONENT VIEW

FIGURE 6. SYSTEM WIRING DIAGRAM



at the capacitor positive terminal and add a jumper from that point to the plus 3 volt lead. Add the 1 microfarad, 6 volt capacitor as shown.

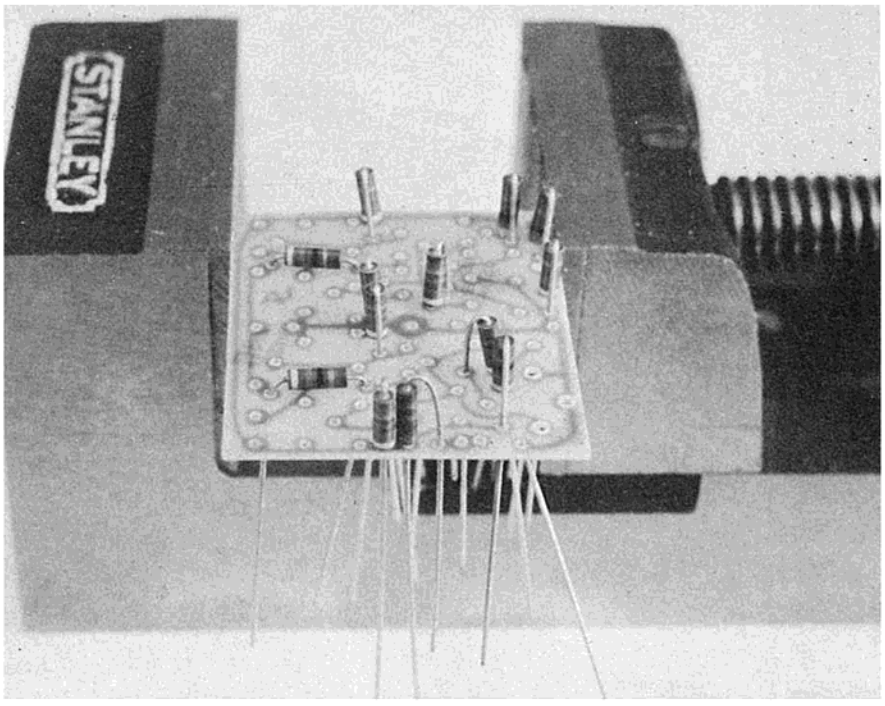
FIGURE 6 represents the system wiring diagram. The servos are connected via nonpolarized connectors to facilitate the phasing of the actuator motion.

The decoder plus receiver power supply has been mounted on a 1½" by 1¾" by 1/32" G10 glass epoxy printed circuit board. **FIGURE 7** is a view of the copper side of the board and **FIGURE 8** is the component view. The layout provides room for TO-5 packaged output transistors, although the suggested devices are recommended. **FIGURE 9** is a photograph of the system. **FIGURE 10** and **11** are additional views.

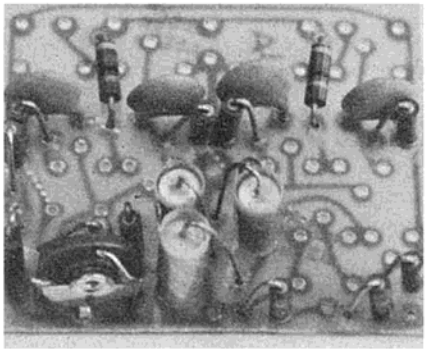
The entire decoder weighs one half ounce. Total flying weight of an SH-100 receiver, four 225 ma NiCd button cells, a Rand HR-1 and HR-2 (with 1.5 volt, red dot color coded motors), the decoder and wiring harness and switch is approximately seven ounces. This is an equivalent weight to a conventional Galloping Ghost system but with proportional, noninteracting control.

A continuous run was performed with the decoder and Rand actuators without the receiver, using a freshly charged power source of four 500 ma GE button cells. A pulse generator supplied the signal. The neutral pulse repetition rate was 20 hertz. Two hours and five minutes later the battery voltage had diminished to the end charge point of 4.4 volts. Motor control (rudder-aileron servo go-around by either tone on or off) was still functional at the end. During the test, the pulse width and rate were changed and the motor control operated about every ten minutes. Using a 225 ma NiCd battery pack and with the receiver, the test ran 55 minutes before the end of charge point was reached. Width changes and cycling were done every five minutes. There was negligible control surface drift with battery voltage changes.

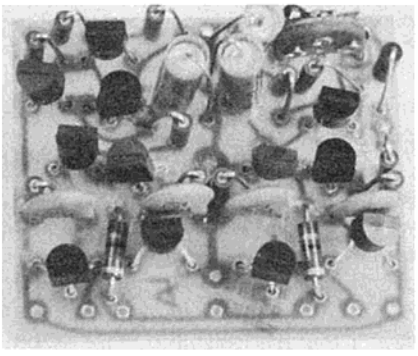
If desired, the decoder may be used with a relay receiver. The decoder input is connected to the armature contact, one stator contact is connected to the receiver negative supply and the other stator contact is connected to the receiver positive supply. The receiver negative supply must be connected to the decoder ground circuit. Because the relay receiver has a higher current demand than the 3 volt supply of the decoder can provide, it must have its



All resistors placed in position. Drill press vise used to hold PC board.



Capacitors added to PC board.



All transistors in place.

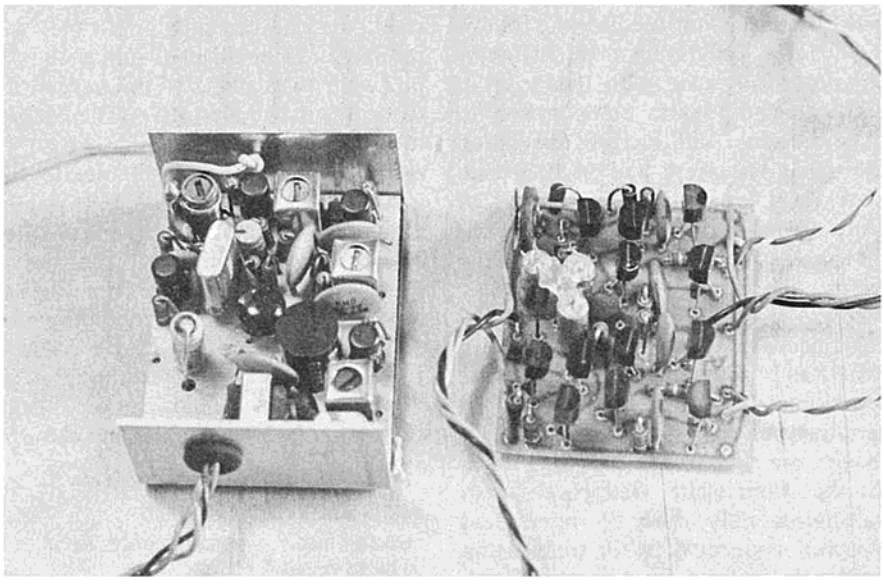
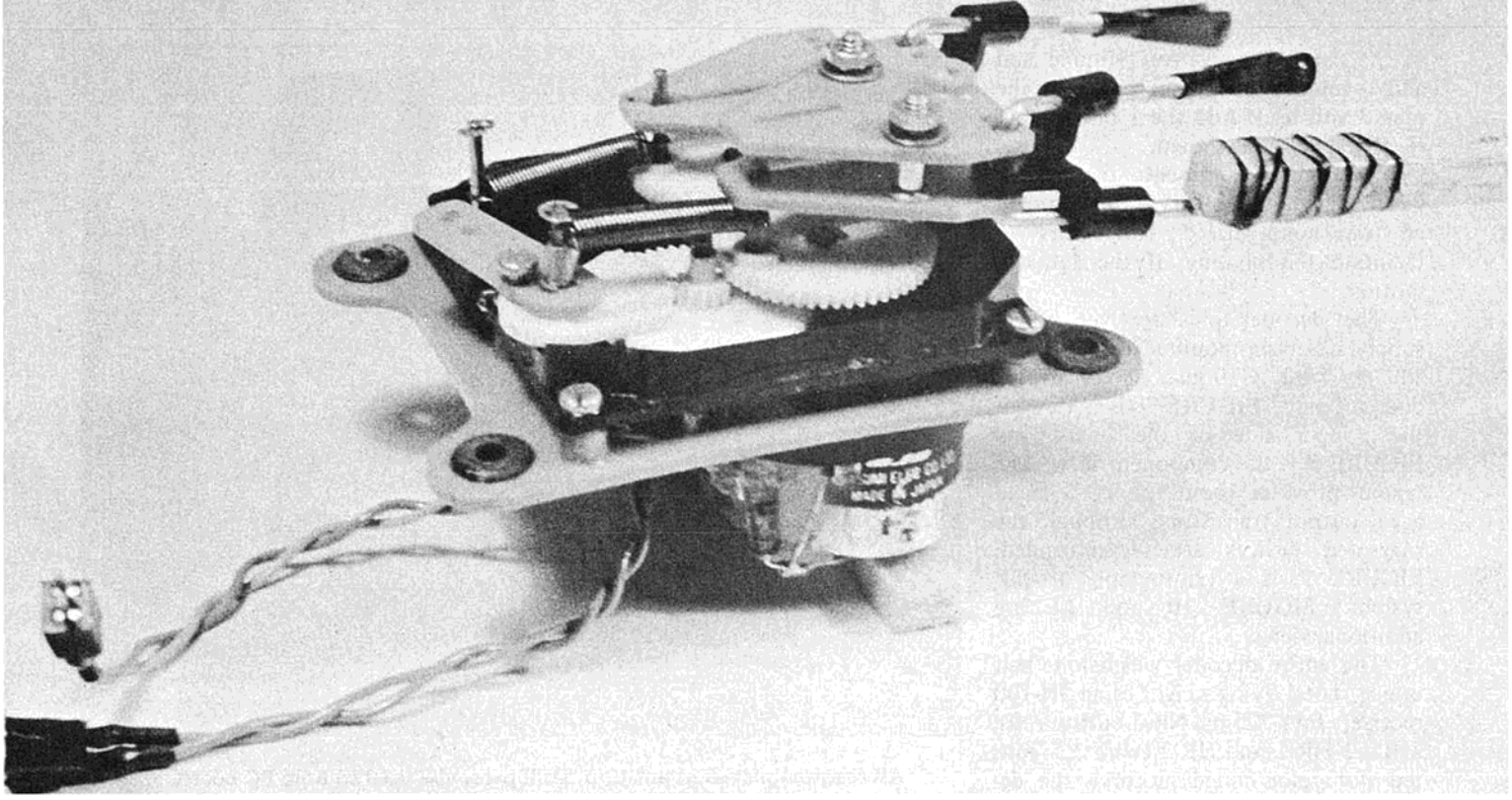


FIGURE 10: Converted Controlaire SH-100 receiver and completed decoder.



A close-up photo of a method for easily obtaining coupled ailerons and rudder using a Rand actuator. Two Rand rudder plates are stacked and spaced 3/16" using the ferrules supplied in a Rand mounting kit and are held together with 3-48 x 1/2" machine screws using lock washers. Kwik-Links connect to the ailerons. This particular system used in the author's low-wing Rodent. The elevator pushrod is not connected in this photo.

own power source of two one-half pen cell size 1.5 volt alkaline cells.

Although twelve transistors are used, only four are directly concerned with signal processing. The remainder comprise the two push-pull servo driver amplifiers. They are all low cost plastic silicon devices. The output transistors have a 600 ma capability. The circuit is noncritical and component tolerances have no effect on its performance.

A non-tapped 3.6 volt three cell NiCd battery is not used for the following reason: The regenerative switching circuits usually used with that type of battery require extra complication to drive the servo with the low dissipation integrated waveform and in their simplest form usually have a 100 ma or more current drain per function without the servos being attached, With the servos, the total current drain may exceed 700 ma. By comparison, the Lahti decoder system current drain with two Rand actuators and receiver is approximately 200 ma when using a 20 hertz neutral pulse rate. The transmitter changes are simple. The following refers to the Controlaire Galloping Ghost transmitter only. The 15 microfarad capacitor connected to the unijunction emitter is replaced by a 5 microfarad, 15 volt capacitor. This increases the neutral pulse rate to around 18 to 20 hertz. The pulse width ratio is increased by paralleling the 10 K resistor from ground to the rudder pot with a 5 K pot (a Mallory MTC-1-5000 is suitable). The 4.7K resistor leading to the other side of the pot is replaced by a length of wire. Other transmitter manufacturers will undoubtedly supply information pertaining to their equipment upon request.

System alignment (to be done after the transmitter modifications): Plug all servos into the decoder and connect the receiver and batteries. Turn on both the transmitter and decoder system switches. The rudder and elevator servos should be vibrating slightly but they will probably not be aligned. Adjust the 5K pot which was added to the transmitter to center the rudder servo. Then adjust the 5K pot on the decoder board to zero the elevator servo. Operate the transmitter motor control. Both servos should cycle around and if one of them is a LR-3 or equivalent, the motor control bar should move. Make notes as to which way the servos move for right-left, up-down and motor control. The system is now ready to install in an aircraft. There should be very little interaction between rudder and elevator control.

The performance of this decoder indicates that the design requirements have been met.

ADDITIONAL NOTES:

If your transmitter has a neutral pulse rate in the 10 to 15 Hz range, the value of C5 should be increased to 22 uf-15v (Sprague 150D series, 20%, tantalum) or to 20 uf-6v (Sprague TE1090, aluminum) to avoid running out of adjustment range of R11.

If desired, C1 and C4 may be increased to the same value to avoid buying two capacitor values. In this case, R5 should be increased to 1000 ohms and R9 decreased to 47 ohms.

When using the Lafayette VC-58 pot for R11, be sure to bend the center tab underneath its body so that when it is mounted its screwdriver slot will be to the outside of the PC card.

In general, the system current drain lessens as the neutral pulse rate is raised and the servo power increases as it is lowered. The following table illustrates good compromises between current drain, servo power, pulse rate and aircraft size:

ENGINE SIZE	NEUTRAL RATE, Hz		C1,C4,C5	R5	R9	BATTERY Ma
0.02 to 0.049	18 to 20		10uf	1K	150	225
			20uf	470	47	225
0.049 to 0.15	15 to 17	or	20uf	470	47	225 or 500
0.15 and larger	12 to 14		20uf	680	47	500

NOTE: If the elevator response is sluggish, then the neutral pulse rate is too high for the actuators used. If the rudder response is sluggish, then R5 should be decreased in value.

R/C MODELER MAGAZINE'S

1968 WINTER NATIONALS

TUCSON R/C CLUB HOSTS NATION'S LARGEST R/C MEET AT MARANA AIR PARK. TONY BONETTI, JOE BRIDI SCORE VICTORIES IN HOTLY CONTESTED PATTERN, GOODYEAR COMPETITION.

Contestants from 16 states gathered at Tucson, Arizona, November 29, 30, December 1, for what evolved as the nation's largest RC meet – R/C Modeler Magazine's first Annual Winter Nationals. Over 100 fliers representing the states of Arizona, California, Colorado, Indiana, Massachusetts, Michigan, Nevada, New Jersey, New Mexico, New York, Ohio, Oklahoma, Oregon, South Dakota, Texas, and Washington competed for the highly coveted awards in Class A, Class B, Class C Expert, and Novice pattern events, as well as Formula I racing categories.

The seemingly tireless efforts of the Tucson RC Club provided all contestants with one of the most outstanding flight facilities in the nation – Marana Air Park – a site characterized by concrete runways, clear surrounding areas, a snack bar at the flight line that offered coffee, food and cold drinks, as well as excellent motel facilities at nearby Tucson, with bachelor and family facilities at the Air Park.

With many of the nation's top pattern fliers in attendance, the East and Southwest scored victories over West Coast fliers as Tony Bonette, flying his original "Troublemaker" design, bested the large field of entries in Class C Expert pattern competition. In a three way fly-off for the Grand Champion Perpetual Trophy, third place winner Ted White scored a win over both Bonette, and second place winner Phil Kraft. Phil Kraft, it might be noted, was flying his newest design the "Slik-Fli", a design that featured coupled elevators and flaps similar to that used in U-Control stunt competition. Ted White was flying his well-known "El Gringo". Joe Bridi, entering his now famous Sun Fli 4 design, captured fourth place in the heated competition.

In Class C Novice, Bror Fabor, Dan Santich, and Harry Gould captured the first three slots. In the Class B event, Ray Pisar, of R/C Engineering, Steve Buck, and Bill Cranston were the winning trio. In Class A, Allen Coomber, of Orbit Electronics, entering his first contest, scored a two point win over second place winner James Malik, Randy Wright was third.

The Formula I competition would possibly be called the highlight of the meet, since the nations top Goodyear fliers turned in heat times that had to be seen to be believed. With spectator interest at a peak, Joe Bridi, and his Stafford "Minnow", turned in heat times of 1:52.7, 1:53, 1:53, 1:55, and 1:58 consecutively, with straight-away speeds in excess of 120 miles an hour, to best the field of entries. In second place was Granger Williams and a time of 1:58, flying his "Miss San Bernardino." Don Yockey, flying a Midget Mustang turned in a time of 2:00.5 to capture the third position. Cliff Weirick also flying a Stafford "Minnow", was fourth with a time of 2:04, followed closely by Ed Rankin, with a "Midget Mustang" and a time of 2:06.4.

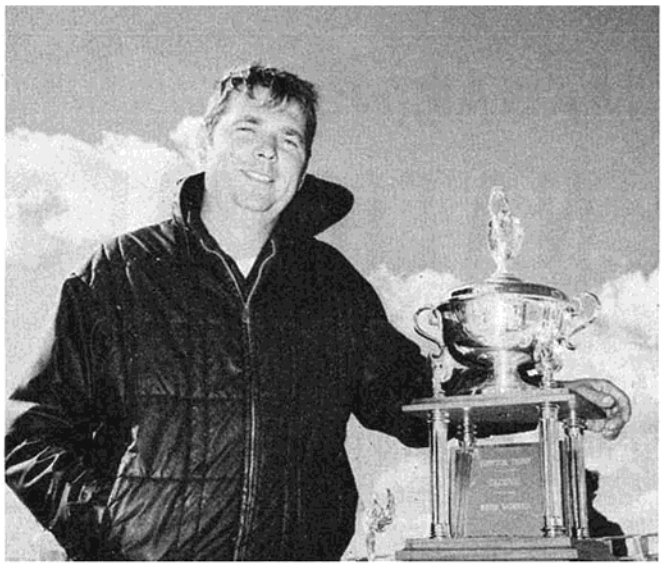
In both Pattern and Formula I categories, the calibre of flying was the highest seen all year, and was outdone only by the outstanding sportsmanship of the nation's top fliers who competed at the Winter Nationals. One interesting element of this contest was the fact that there were a great number of fliers entering their first contest. Despite the pressures of competition, however, the atmosphere at the desert meet was both relaxed and congenial.

The 1968 RCM Winter Nationals was topped off by a banquet on Saturday evening, which included the presentation of the N.M.P.R.A. Annual Awards, as well as entertainment, and a brief talk by outgoing AMA President Cliff Weirick.

In addition to the trophies provided in all categories, merchandise awards were presented by the following contributing sponsors: Advance Model Products, Angel Mini Flite Company, A-Justo-Jig Company, B-K Model Products, Broadfield Air Models, G & K Mfg. Inc., Heath Company, Model Covering Company, Orbit Electronics, Phillips Custom Models, Radiomodels, Rand Mfg. Company Inc., Jensen Enterprises, Rocket City RC Specialties, Sturdi-Built Model Mfg., Superior Signal Co., Su-Pr-Line Products, Tatone Products, Top Flite Models Inc., Walteria Hobby Shop, Warner Industries Inc., and World Wide Radio Control. All of these contributing sponsors, many of whom were in attendance or represented at the 1968 Winter Nationals by their generosity, helped this contest achieve the success it enjoyed. Four complete proportional systems were among the awarded prizes.

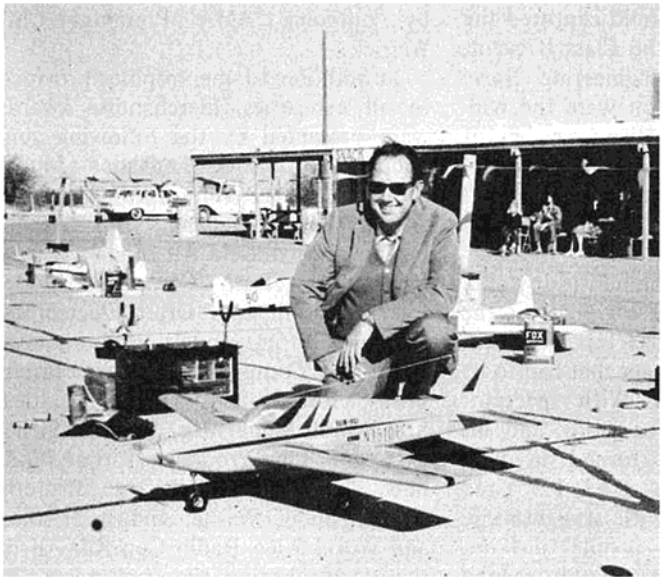
This exclusive photo coverage of the Winter Nationals tells the whole story – if you missed this year's event, plan now to attend in 1969. Tentative scheduling for the 1969 R/C Modeler Magazine Winter Nationals calls for a 5 day meet to be held near the end of summer at Marana Air Park and will include Scale competition as well as all categories of Pattern flying and Formula racing.

R/C MODELER MAGAZINE would like to extend its sincerest thanks to the hardworking members of the TUCSON RC CLUB, the contributing sponsors, and the fliers, many of whom travelled a great distance to attend the competition. If you missed this year's Winter Nationals, we'll see YOU in 1969.

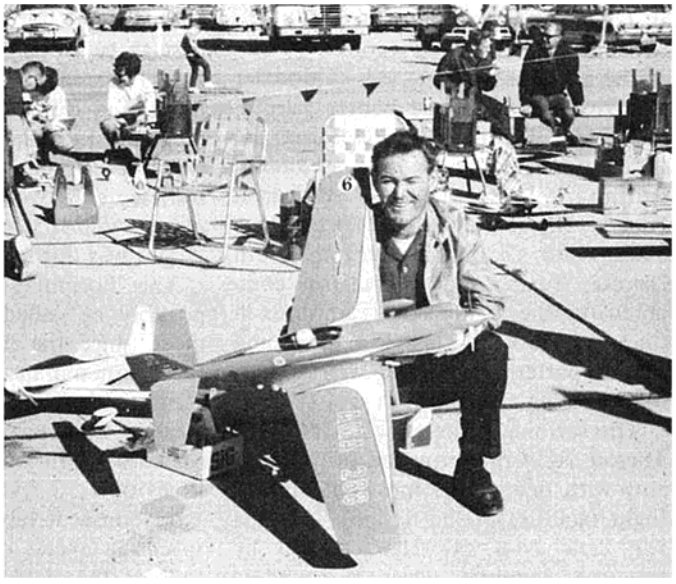


Ted White and Grand Champion Pattern Trophy - well earned in post-contest fly-off between Tony Bonette and Phil Kraft. Victory margin was 1.625 points!

Class C Expert was east-west battle won by Tony Bonette of N. Jersey RC Club. "Trouble-maker" was Webra powered, used Kraft radio. Great in wind.



World Champ, Phil Kraft, 2nd in Class C Expert, bowed to Bonette by less than 6 points. 'Slik-Fli' featured coupled flaps-elevators.



Joe Bridi with winning 'Minnow' and time of 1:52.7. Over 120 mph in the straightaways. KB .40 with ST carb, pressure.

Bror Faber, Class C Novice winner, gets helping hand from John Elliot during Formula I race. Bror, President of BIRD Club, newcomer to pylon, did well in hot event.

Ray Pisar of Phoenix gets helping hand with first place trophy for Class B. Marilyn, holds attractive hardware.

Allen Coomber, Orbit staffer, won Class A in first contest. Also showed promise in Formula I.

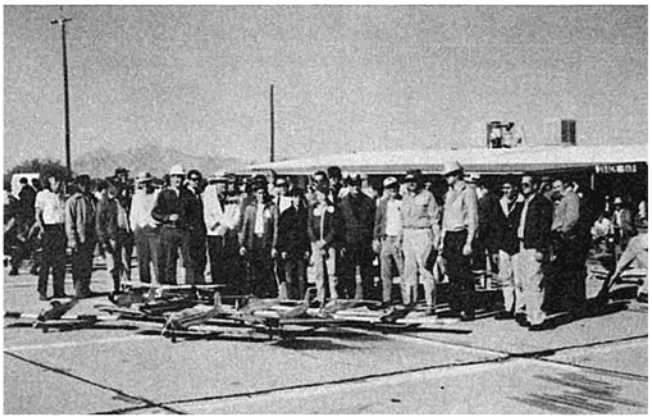
Typical pit area at 1968 Winter Nationals.

"A little dab'l do ya," says Cliff Weirick. Cliff 4th in Formula I.

Bob Francis, Gil Horstman, and Ted White readying aircraft in Goodyear heat.

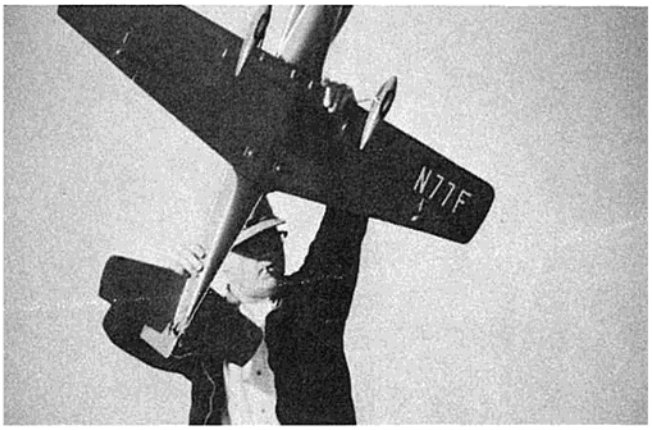
Trophies and prizes to be presented to contestants. Orbit propo and three Heathkits awarded.

Bror Faber's 'Midget Mustang." This was BIRD's Club prexies first attempt at Formula I.



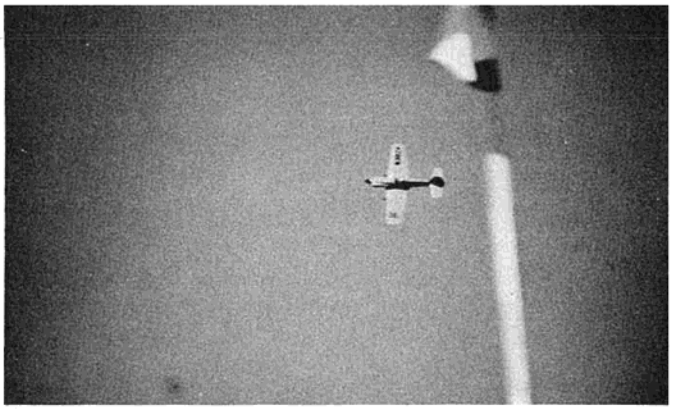
The Phoenix ARCS pose for photo at Winter Nationals.

Jim Simpson gets pylon call assistance from Lloyd Nickolsc during Formula I heat. Capt. Jim just back from Guam toi with B-52 SAC. Classic propo flawless.



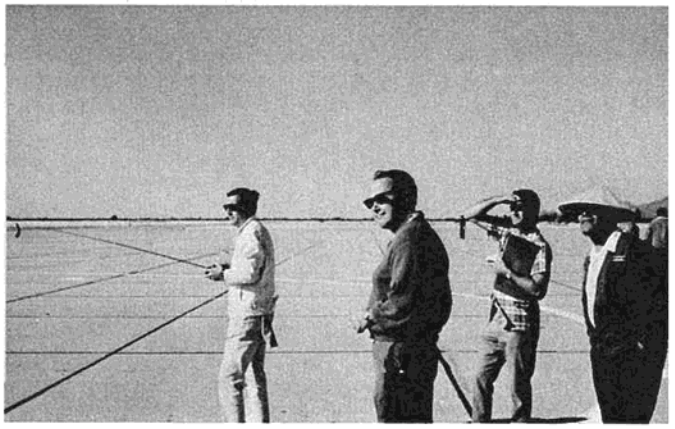
Past NMPRA prexy, Ed Shipe, identifying aircraft fo flagman in Formula I.

John Elliott calling for Joe Bridi during Formula I heat.



Formula I racer rounding number two pylon.

Mel Santmeyer with three-quarter size Sun Fli 4.

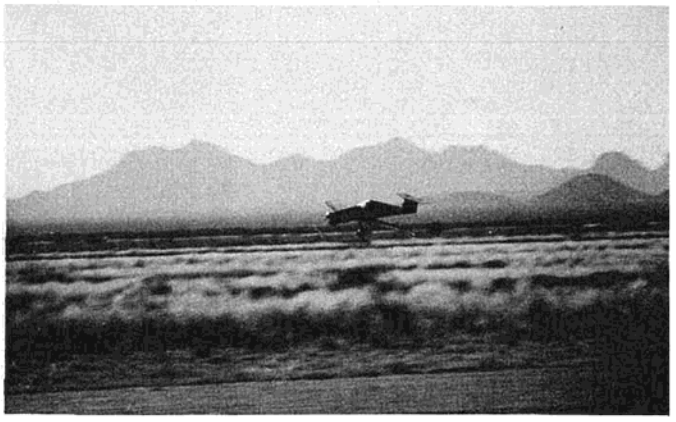


Tony Bonette flying 'Troublemaker' with Phil Kraft calling.

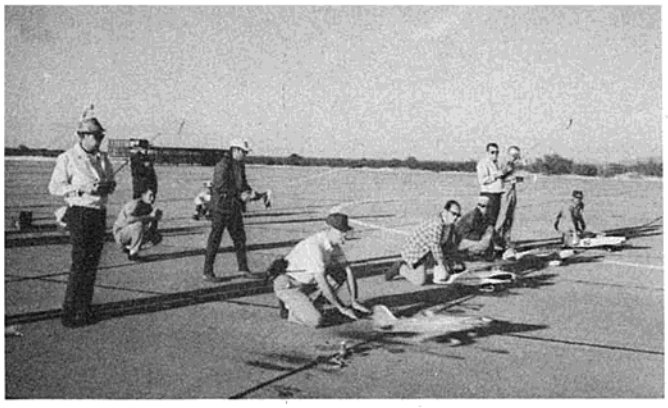
Jerry Krause, Ft. Worth, 5th

Phil Phillips with Ram, being kitted by PCM. Note tip dihedral.

Granger and Larry Williams with La Jollita— 2nd in Formula I racing.



Rivets landing after Formula I heat.

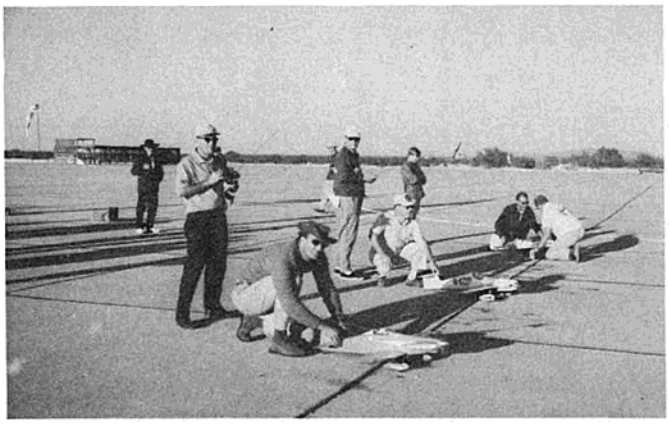


Ed Shipe releases Bob Francis' Ballerina, Weirick tenses, and Simpson and Watkins wait at start of pylon heat at Winter Nats. Weirick-Francis duel fantastic.

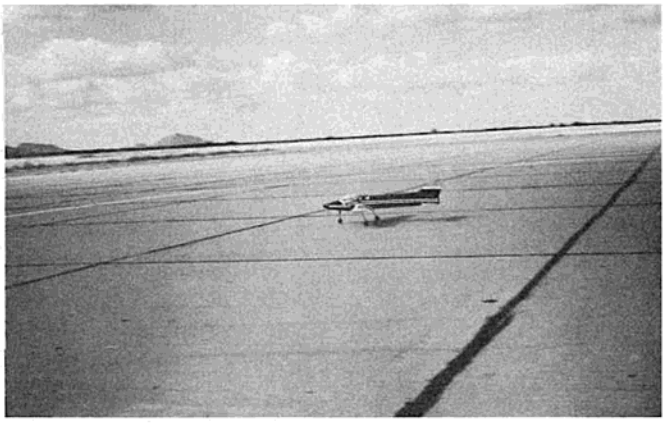
Maurice Woods of Oklahoma readying Midget Mustang.

Young Witt Stockwell with Stafford 'Minnow'.

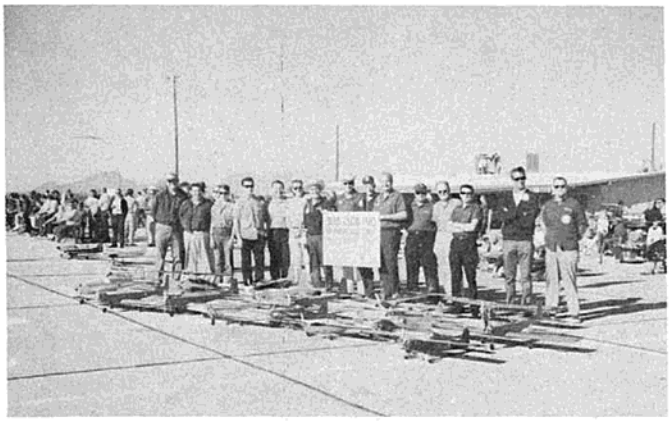
Dennis Sawyer with Angel Mini-Flite ARF aircraft display.



Formula I was another California-Texas duel. Here Joe Bridi readies for release against Texan Bob Pearce and his fast Rivets. Woods, from Oklahoma couldn't start.



Tony Bonette and 'Troublemaker', getting ready to make trouble for Western fliers.

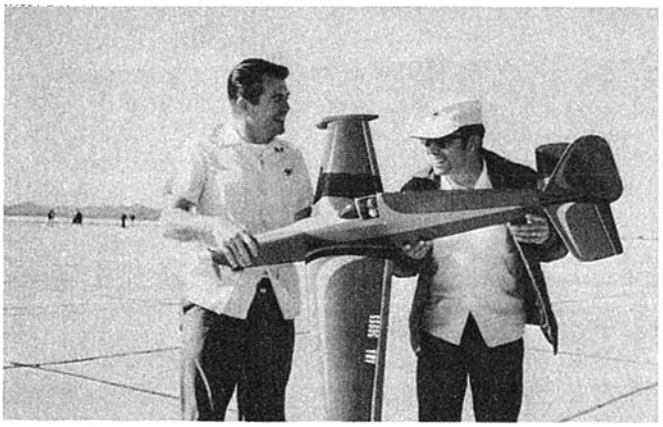


"The BIRDS Are Coming!" was more than slogan at 1968 Winter Nats. Long Beach, Ca. club had 15 contestants at Marana, provided lively competition, conviviality.

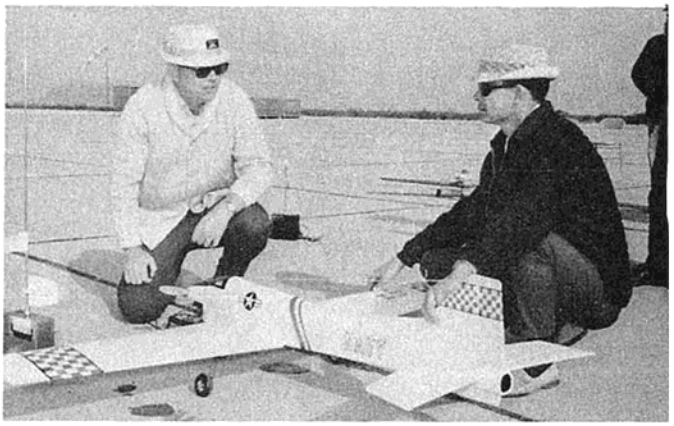
"Trigon" was original pattern stunt ship by Dennis Kohlman of Phoenix ARCS. Featured tandem gear, outriggers and foam delta wing. Impressive performer.

Interesting sidelight was unlimited speed plane of Bruce Kunaschk. Ship powered with "ABC" S.T. 65 de-stroked to .60. 38" span, 3½ lbs., jumped dolly on attempt at 220 mph

Don Sump came from Lewiston, Idaho for Tucson Winter Nats Meet. Flew old reliable rudder ship in Class A stunt event. Merco powered, Logictrol.

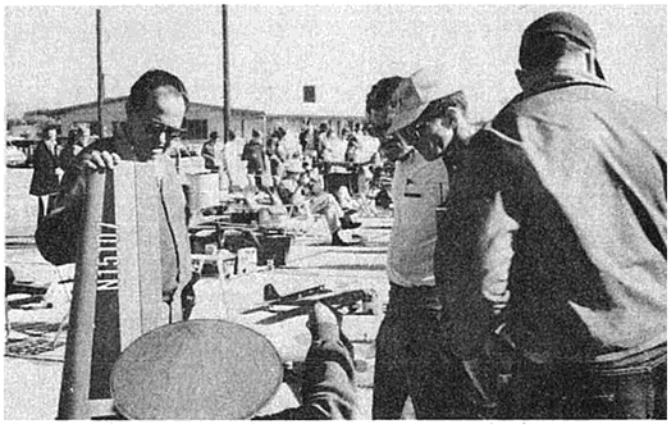


"Henchman" of Art Gyles, Tucson RC sparkplug, gets Cliff Weirick inspection for its fine finish, interior detail. DuPont acrylic'd beauty passed.



Roger Breedlove (L) of Eugene, Oregon Aeronauts flew Crusader in A Pattern event. Roger edits lively newsletter, Aeronauts Chatter.

Granger Williams (L) was presented 1968 Grand National NMPRA Formula I Championship during festivities of RCM Winter Nats. Larry Williams helped haul loot.



Phil Kraft discussing techniques of flap-elevator arrangement on Slik-Fli.

Dan Santich, Oklahoma City TORKS flier, won Orbit 6-12 propo raffle. Charleen Weirick, PCS hallmark queen, does honors at Winter Nats banquet at Marana Air Park.

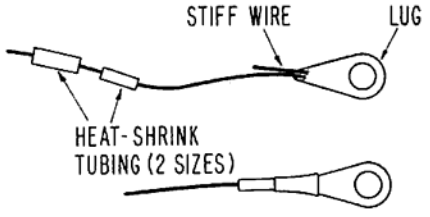
Aerial view of Marana Air Park, site of 1968 Winter Nationals.

FOR WHAT IT'S WORTH

Source credit for reprinted items will be given. Original hints and kinks are invited and a two year subscription to RCM will be given for each idea published.

RCM, P. O. Box 487
Sierra Madre, Calif. 91024

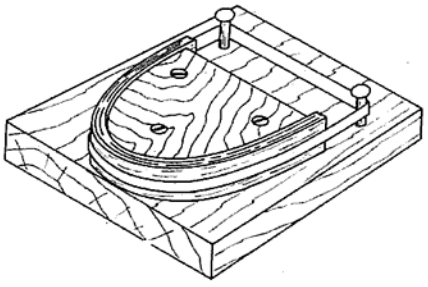
One method of making pushrods is to first drill a piece of 1/4" birch dowel directly down the end with a 1/16" drill. This is best accomplished by center punching the dowel, and as you drill, keep turning the dowel to keep it centered. Rough up the end of your Kwik Link wire, or 1/16" music wire, with a file. Next, heat the wire over an open flame until hot then roll in a stick of hot glue and push in the end of the dowel. To make a neater installation, sharpen the drilled dowel end in a pencil sharpener after drilling. *--Richard Slye, 3426 236 S. W. Alderwood Manor, Washington 98036.*



Here is a reliable, fatigue-free method of attaching a terminal to a single, loose wire. It can also be used for attaching the receiver antenna wire to a vertical whip antenna: It involves soldering a piece of stiff wire to the lug, then sleeving the whole assembly with heat-shrink tubing. This gives a smooth transition from the free part of the wire to the rigid solder joint, and avoids stress concentration at the edge of the solder. *--Ralph Jones, 2026 Rockdell Drive, Fairborn, Ohio 45324.*

If you're tired of those sick looking yellow nylon props, try the common household dye known as Rit. This material is completely compatible with nylon parts and is a simple way to make control horns, NyRods, and other accessories blend into the color scheme of a scale or pattern model. Since the manufacturers of most nylon props recommend that they be boiled for a short period of time to relieve molding stresses, this dying process accomplishes this and produces a more attractive prop to boot! To dye nylon props follow this procedure: First, make a trip to your local discount store and pick up a cheap aluminum cake pan, just large enough to accept whatever you want to dye. Next, select the color of dye you wish to use. Place this pan on the stove with about one inch of water in it. Bring the water to a boil and add about one half package of Rit, stir to dissolve, shut off the heat, and add the pieces you wish to dye. Allow the parts to remain in the dye for about 30 minutes. Remove from the solution, rinse in cold water, and you have really attractive nylon accessories. *--Reprinted from the "Clanking Armor," Lincoln Sky Knights.*

The sketch shows an excellent way to make laminated wing tips. The pattern should be slightly longer to give added stock for trimming. This is mounted on a wood mounting block. The nail shown should be in line with the edge of the last lamination and are used to secure the wide rubber bands which will retain the laminations until they are dry. The pattern is made from 3/4" plywood allowing for lamination thickness. To form a rough tip, six laminations of 1/16" balsa work best. Wax the pattern and mounting block to keep the glue from sticking. Cut the desired number of laminations to width and slightly longer than the periphery of the pattern. Soak the laminations in a solution of 90% water and 10% ammonia for 15 minutes. The ammonia helps break

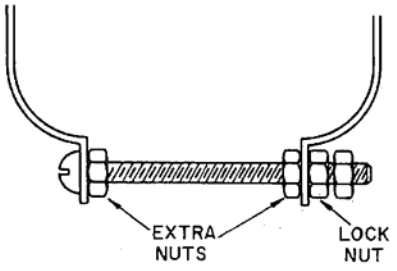


down the fibers for easier bending. Dry off the excess water from the laminations and coat with Titebond or white glue. Wrap the laminations around the patterns and secure with rubber bands. Allow overnight drying time and the next day you will pick up the strongest wing tip you have ever made. *--Robert Hensler, Reprinted from the 'RC Spirit' Spirit of St. Louis RC Club.*

Have you ever come back from a session of flying and wondered how to clean the glop off of those rubber bands used to hold on the wings? Well don't reach for the liquid cleaners, instead just shake those messy elastics in a container of cornstarch, remove, and snap clean. While on the subject of cleaning, Jack Irey, of the San Diego Drones recommends plain old gasoline for removing the mess from your plane. It works well, and we know you're smart enough not to do this in a closed garage with the water heater nearby! *--Reprinted from the 'Static Sheet,' San Diego Drones RC Club.*

Having used Super MonoKote on all sorts of planes with great success, we still have come up with one problem with this material in the hot weather we experience in Tucson, Arizona. After a wing is properly covered it is virtually air-tight. The hot air, trapped inside open bays, expands and they look as though they will burst. My solution is this; stack all your wing ribs and drill a small hole through the entire pile. Once the wing is covered, pin prick the bay closest to the wing tip and the wing can then "breathe." *--Roger Claude, 2822 N. Tyndall, Tucson, Arizona.*

If you have experienced difficulty in holding that Super Tigre muffler in place here is an idea that is guaranteed not to allow it to loosen under vibration. The extra nuts prevent the metal strap from stretching, but must be tightened "just right." *--Reprinted from 'Hear Ye,' Valley Forge Signal Seekers RC Club.*



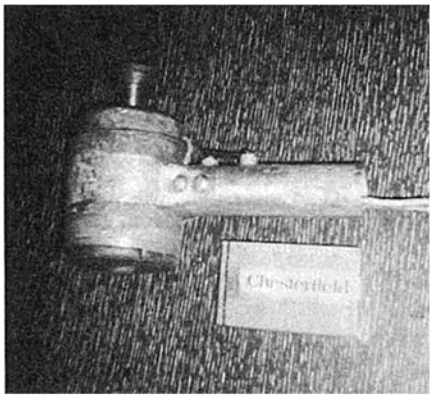
One sure method of ascertaining that your dope is thoroughly mixed, or your two part epoxy paints are thoroughly stirred, is to take an 8" length of 1/16" music wire and make a one inch right angle bend in one end. This is then inserted into your electric drill. This handy stirrer can either be used manually, or in your shop drill press. Whichever way you prefer, it will thoroughly mix your paint in a fraction of the time that it would take to do by hand. *--Bill O'Brien, RCM Staff.*

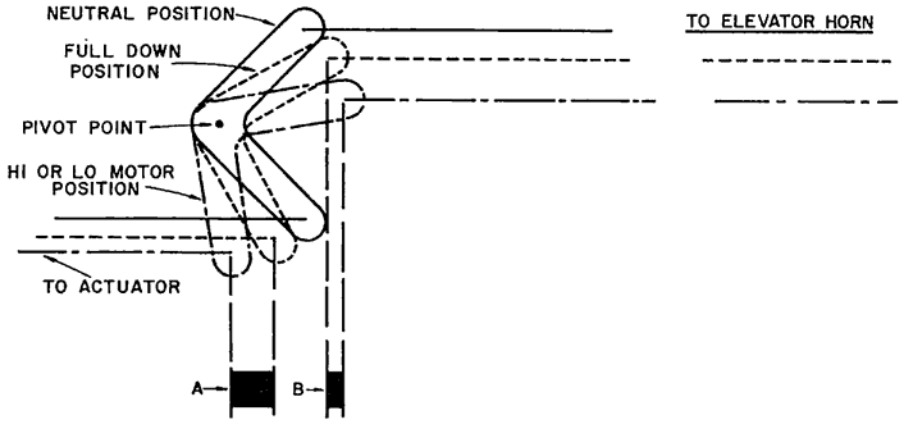
(continued on page 43)

FOR WHAT IT'S WORTH

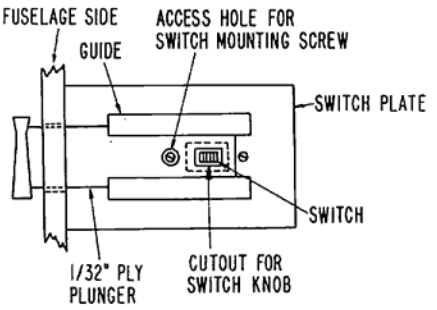
(continued from page 42)

Here's an excellent homemade engine starter which is small but quite efficient. The motor is from a two speed axle on a truck and will run in either direction. The old models are six volt while the later versions are 12 volt. These units cost about $10.00 new, although the one in the photograph was picked up at a junk yard for $4.00. The coupling is formed out of cold rolled steel with a set screw to hold it on the shaft. *--Tiny Harley W4YBC, 318 East Ave., North Augusta, So. Carolina 29841.*

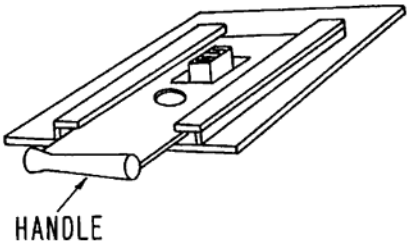




This is a boon for Galloping Ghost enthusiasts. The bellcrank shown (in each of three positions) is commonly used to reverse the direction of throw of the pushrod. If the geometry used by the modeler is correct, an important incidental benefit is a tremendous reduction of kick in the elevator when the pilot touches his motor control switch or button. Because the rudder kick-up is reduced to a very small motion at the end of the throw, the plane is not pitched nose up, and over. The plane still bucks as the motor speed changes, but the bucking is very sedate as opposed to the violent lurch more commonly seen. A & B depict the reduction in movement effected by the use of this system. Although the linkage is used by some modelers, it is recommended to all GG exponents if they want to refine their flying. Either a 90 or 120° bellcrank may be used. Remember, when using this system, the control horn is on the top of the elevator – good for models with stabs on the bottom of the fuselage as seen on the Top Dawg and Skylane. *--Reprinted from the 'Glitch,' Soo Modellers RC Club.*



Here is an excellent method of mounting your switch inside the fuselage, away from the exhaust residue. The switch, along with the 1/32" plywood plunger, is easily removable, since only the guides on the switch plate keep them connected. The "handle" on the end of the plunger is just a piece of



dowel shaped to resemble a venturi tube, used on some full scale airplanes to power vacuum driven gyro instruments when the engine doesn't have a vacuum pump. *--Ralph Jones, 2026 Rockdell Dr., Fairborn, Ohio 45234.*

found Walt Staff collecting his third trophy of the meet followed by Gene Worsham, Dick Northam, and Bud Pannier.

Oklahoma. Interested in seeing 800' of 16mm narrated color film of the 1968 Nats? Randy McGee and Roy Freeland are making their outstanding Nats production available to clubs for a $10 fee and mailing costs. Clubs wanting to show this entertaining film which shows just about the complete Scale event which WAS the Nats this year, in addition to highlights of the other RC events, should write immediately to:

Roy Freeland
10 N. Lee St.
Oklahoma City, Ok. 73102

New Jersey. Don Martin of 7 Grenlynne Dr., Grenlock, N.J., feels we were in error in reporting the performance of Jim Witt's .09 powered racer in the August issue. Here's what he says:

Dear Jerry,

I have been an avid RC nut for years and, as such, an interested reader of all the hobby publications. R/C Modeler is tops in the field as a source document for the straight dope in our hobby. It was therefore with some surprise that I read the following statement in your column of the August issue; "Jim's practiced flying showed the mini-racer to best advantage, while its drag characteristics actually made it faster than the Goodyears on the upwind leg."

I have no comment on Jim's flying, but the rest of the statement is simply not correct. You are not alone in this misconception concerning the effect of wind on aircraft performance. I have read similar remarks by other RCers. Let me attempt to explain how wind effects an aircraft, big or small, glider or commercial jet, so that others who share the misconception might have the matter clarified.

Any aircraft with a given power setting in level flight, is capable of a certain speed. This speed is determined by the aerodynamic balance of engine power available and drag on the airframe. This speed, within the air mass in which the plane is operating, is called True Air Speed (TAS) and is defined as the speed of the airframe relative to the air around it. On a calm day, the TAS of a plane is the same as its speed with relation to the ground or Ground Speed (GS). All this is fine up to this point; TAS = GS on a no wind day. Now let's crank in some wind and follow through on its effect. As far as the plane is concerned, and its speed within the air mass (TAS) there is absolutely no change in its performance!

If a plane is capable of a TAS of 100 mph on a calm day, it will have a TAS of 100 mph on a windy day. What does change is its GS or speed in relation to you standing there with your transmitter in your hands. The degree of difference between TAS and GS is dependent on the velocity of the wind and the direction of the wind with relation to the heading of the aircraft, and has absolutely nothing to do with the drag characteristics of a given airframe. Therefore, if one aircraft is capable of a higher TAS than another, it will be faster than the other in level flight going upwind, downwind, or crosswind!

Sincerely,
Don Martin.

Anyone like to add any comment? We've written separately to Don giving our theory on why Jim's plane was faster on one leg than the other relative to the other planes sharing the same air mass. We even made the problem tougher by correcting one small error where we had Jim's plane going UPwind instead of DOWNwind as those that witnessed the flight agree. But since according to Don's theory this doesn't make much difference – and we agree – this is a small point. But we did want the record straight as far as possible before going on with the discussion. Who's right? How about you fellows who fly a lot, have you noticed planes flying together being faster or slower on one leg than the other? What's your opinion? Don't be shy or hesitant, speak out – it's all in fun anyhow and nobody's gonna get heated. So let's hear!

THE NEWSLETTER ROUTE

Want to welcome a few added newsletters and their editors into the 'club':

COMET'S TALE Ventura Co. Comets, Cal., Cornelius Hays

DELHI NEWS Delhi, India Hobby Club, P.C. Banerji

OMAHAWKS Omaha RC Club, Lloyd Wood

ORLANDO MYC Orlando RC Yacht Club, Mary Reynolds

MISSISSIPPI Mississippi MAC, John McLellan

REV-UP Radio Operated Auto Racing Association

SIGNAL Signal Chasers RC Club, Mo., Bob Underwood

FOREST CITY Forest City Flyers, Ltd., V. Gianelli

RIVER CITY NEWS River City RC Club, Iowa, Kurt Renner

Along with the fine newsletter, the River City RC Club has just organized although many of the members have been flying with one another for a long while. Finally deciding that acting together is the best approach to overcoming common problems and to help and encourage newcomers, Harold Varellas, Kurt Renner, Bud Blake, E. P. Bartelt, Jim Biddle and others in the Mason City, Iowa area, finally took the "plunge" and amalgamated on August 15, 1968! Meridith Wilson fans will recognize the "River City" name as being from "Music Man", and since Meridith is also from Mason City, the club felt the name is a natural and familiar sound. All RCers, new and old, are invited to contact Harold Varellas at Rt. 1, Oakwood Park, Clear Lake, Iowa 50428, to join in the fun. One catch. . . bring your own trombone!

From Connie Hays of the Ventura Co. Comets, this word:

Dear Jerry,

We would like to extend a cordial invitation to all in and around Ventura Co., as well as out-of-towners, to visit and fly at our facility, located just north of Ventura, Cal., at Lake Casitas, with its newly paved runway, taxi strips, and pit area. We fly as a club every Sunday, but the model airport is open 7 days a week. Bring the gliders, the slopes of the lake offer great soaring. Immediately adjacent to the new site, we have beautiful picnic areas, camping grounds, boating, and hiking for family recreation. In short, we fly, eat, and have a ball!

Sincerely,
Cornelius Hays, Jr.

Sounds fine, what else need be said? Thanks, Connie. . .

ARCS Newsletter (Chuck Watkins, Editor – Phoenix, Ariz.)

Das Ugly Stik: It may be ugly but it sure flies good! That seems to be the opinion of quite a few ARCS members, judging by the number of U/S seen at Aux. II each weekend. From the accompanying photo, no less than 10 are being flown right now, and more are being built! According to Phil Kraft, U/S's designer, the original concept was to design an RC aircraft which could be built in a minimum of time. Its purpose was to provide a test-bed for new propo control developments and an all-round shop airplane which could be used as a 'loaner' for visiting flyers, testing repaired equipment, and any use requiring an 'expendable' airplane. Performance-wise, it cannot be classed as an all-out competition model, however it has been used by good flyers to win several contests. Its main virtue is as a trainer for the beginner in proportional control, but a couple of RC nuts, namely George Sing and Chuck Watkins, seem to think it makes a good pylon racer. To prove this, these two recently had a neck-and-neck race for 10 laps around the course. So take your pick – the Ugly Stik is an airplane of many uses; excellent as a trainer, beautiful for fun flying, good for pattern, and downright amusing as a pylon racer!

. . . And we would like to add to Chuck's comments, that the kit Jensen markets of the Ugly Stik is a credit to Jim Jensen and to the industry. In other words, it's great, just what a beginner would need!

The ARCS of Phoenix, Arizona, gather their Das Ugly Stik fleet for a full day of fun, pattern, and pylon. Popularity reflects building ease, utility of Phil Kraft's offspring.

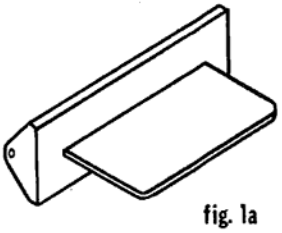


fig. 1a

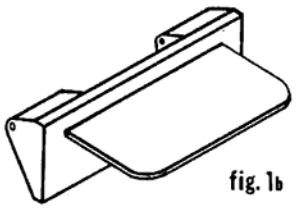


fig. 1b

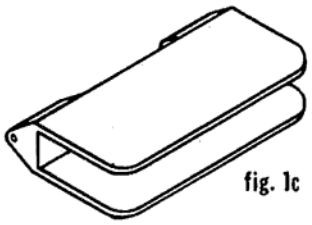


fig. 1c

HOW TO INSTALL HINGES

BY PETE WATERS

THE SIMPLE HINGE, OFTEN A HURRIED AFTERTHOUGHT, CAN LITERALLY MAKE OR BREAK YOUR R/C MODEL. HERE'S HOW TO PROPERLY HINGE THOSE SURFACES.

The following is a step-by-step instruction article on how to install the new Rand Nylon Hinges. These hinges have been engineered with a new outlook on the hinging problems in our hobby. They are engineered so that they become a structural part of the airframe and should be installed during the construction, i.e., before covering and doping. This means that once doping is completed, the surfaces will fit together with no additional cutting, digging and touching-up. The advantages of these nylon hinges over other types are tremendous:

(1) They are wear-proof.
(2) Unharmed by fuel.
(3) Seal the wing completely.
(4) Extremely strong – unbreakable.
(5) Friction-free, yet without flutter.
(6) No electrical noise at all.
(7) Easily dismantled for surface maintenance.
(8) Quickly built-in, forming part of the structure.

There are three (3) types available for different hinged areas:

Fig 1a. Center Flanged in two width sizes: 5/32" & 1/4"
Fig 1b. Top Edge Flanged for ailerons & flaps.
Fig 1c. Double-Flanged for 1/8" thick sheet surfaces

I shall deal with the first type in detail, but much of the instructions apply to the other types as well.

STEP 1. The hinge-joint is a pin type. The edges of the surfaces must be shaped into a VEE with a plane and/or sandpaper. Make the angle about 20 degrees. (Fig. 2)

STEP 2. Slit each edge where you want the hinges to be inserted. Use a thin bladed modelling knife. Slit along the centerline. (Fig. 3)

STEP 3. Work on one hinged part only. Push the hinge into the slit up to its flange. (fig. 4)

STEP 4. Use your knife again and mark the ends of the hinge onto the edge, cutting in about 1/16". (Fig. 5)

STEP 5. Cut out the 1/16" triangular strips from the VEE'd edge on each side of the hinge web. (Fig. 6)

STEP 6. You can now push the hinge right into its seat. Check that the hole for the hinge wire is on center with the apex of the VEE'd edge. (Fig. 7)

STEP 7. After installing both halves, take the opposite surface to be hinged and insert the other hinge halves as on Fig. 4. Check the position of these against the mating halves and adjust their fit by sliding the hinge in the knife slots. (Fig. 8)

STEP 8. When it is positioned correctly, repeat steps 5, 6 & 7.

STEP 9. Remove the hinge pieces and drill or punch 3 to 5 1/16" holes in the webs for better glue adhesion. (Fig. 9)

STEP 10. Glue the halves into place with epoxy and when dry, trim off any surplus:

STEP 11. Cut off the head of the pin & bend it as shown. (Fig. 10) Now mate the hinged surfaces and slip the pin into the holes. Check for easy movement. Then disassemble for painting.

STEP 12. Dope the model and when complete, remove any surplus dope from the hinges.

STEP 13. Reassemble. Lastly, make a small knife cut alongside the end of the female hinge part, bury the wire in it and cover it with a drop of cement. This makes it easy to remove at a future time. (Fig. 11)

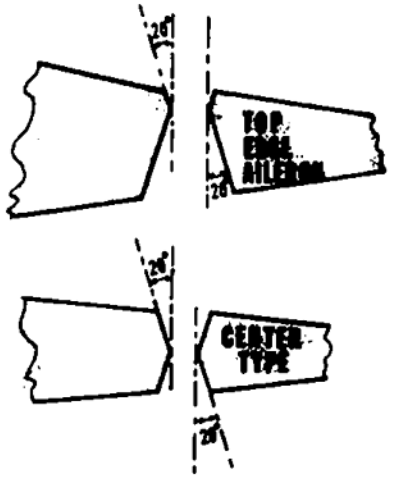


fig. 2

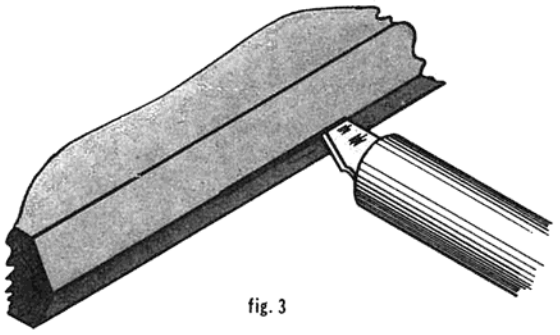


fig. 3

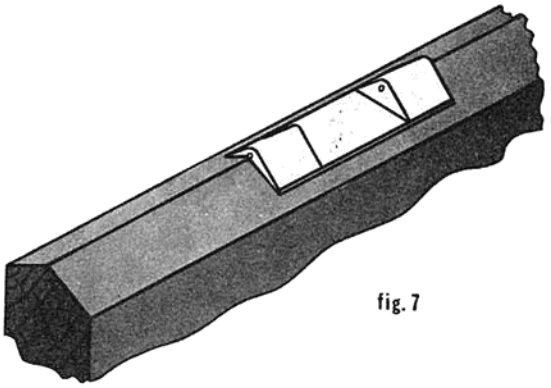


fig. 7

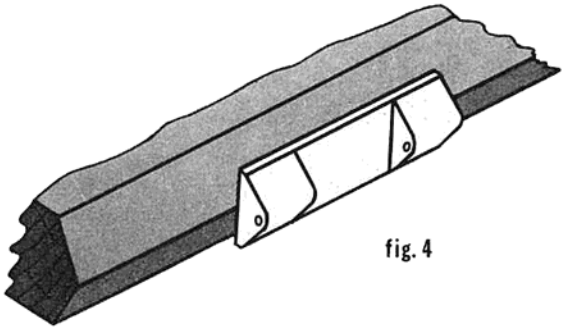


fig. 4

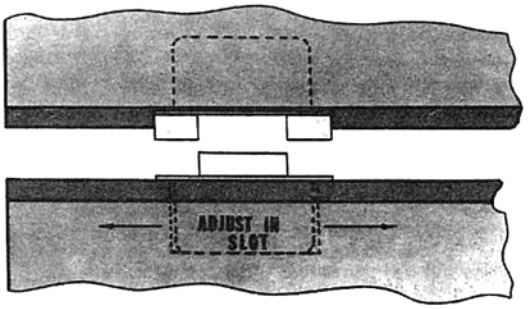


fig. 8

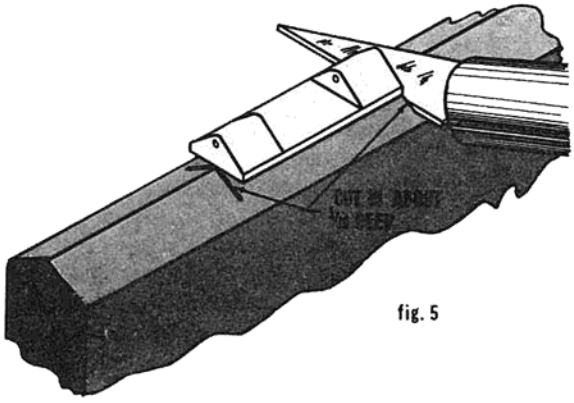


fig. 5

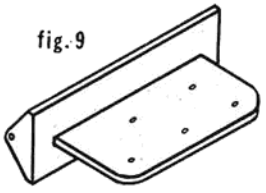


fig. 9

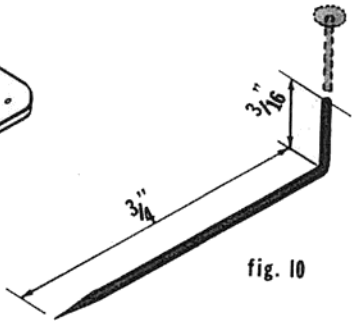


fig. 10

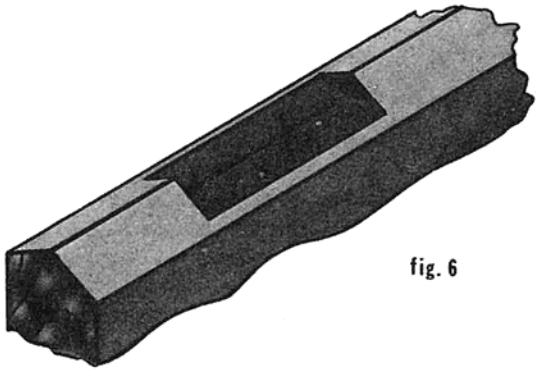


fig. 6

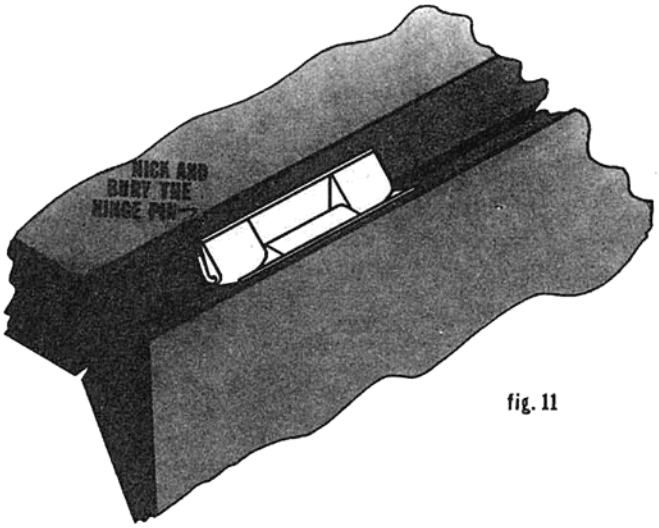


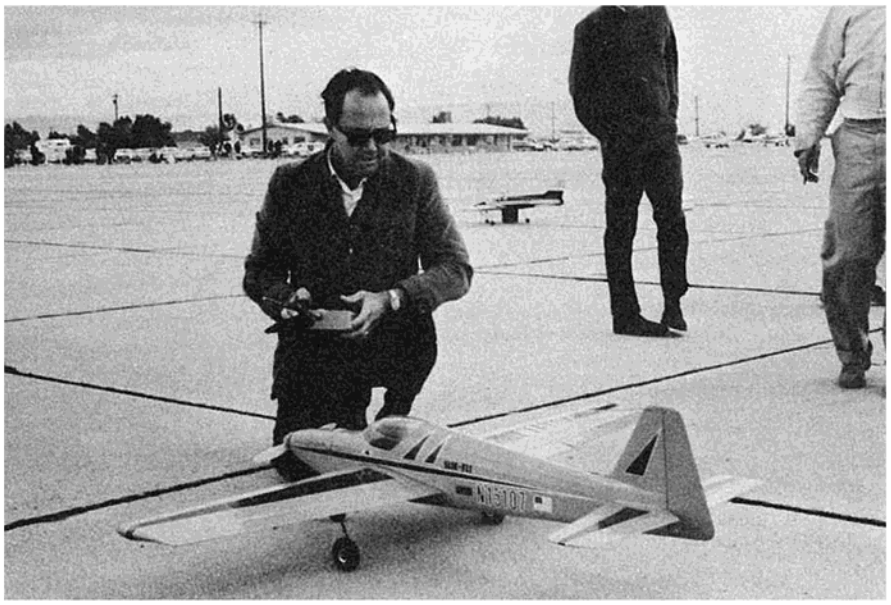
fig. 11

The RCM Flight Training Course

And now your RCM Trainer is finished. You've polished the aircraft for the umpteenth time with your wife's can of Pledge until you're afraid the polish is going to add another 6 ounces to the overall weight of the plane! Your engine is thoroughly broken in, much to the dismay of your neighbors on either side of you, and you're ready to go after that first flight. Or are you?

For a couple of nights before the morning that your knees turn to jelly, we strongly urge you to practice some "dry flying" in order to familiarize yourself with your radio control system. With your proportional rig fully charged, set the aircraft on your workshop bench, or on the coffee table in the living room turn on your transmitter switch and then your airborne equipment switch. Practice using the controls and noting the response from the control surfaces. Visualize the take-off with your RCM Trainer; for example, actually go through the motions of flying. Visualize, if you will, a 360° turn to the right, and then a slow, easy figure 8 over the transmitter. In your own mind, get used to flying the aircraft towards you, one of the most difficult problems that the beginner will encounter during his first flights. Remember, if an aircraft is flying toward you, and as you're facing it, you notice that one wing is down, move your stick gently in that direction. This is the easiest method for the apprentice flier – moving the transmitter stick in the direction of the wing that is down in order to level off the wings when the aircraft is flying towards you. Practice a gentle pressure on the sticks, – no erratic yanking or pulling of the control sticks. If you are flying a two-stick system, grasp the transmitter firmly with both hands, with one thumb resting on the end of each control stick. Learn to move the stick gently and visualize the aircraft in flight. Nothing is more disasterous than for a beginner flier to drastically over-correct, and then, seeing the results of this action, to violently over-correct in the opposite direction. Before you know it, the

The contest . . . The ultimate dream of a great many RC'ers. A dedication to the mastery of R/C techniques and continuous practice could put your ship in this line-up of Goodyear racers awaiting the start of competition.



Phil Kraft checks out the controls on his Slik Fli design at 1968 RCM Winter Nationals. Attention to details such as pre-flight check-out characterizes the competition pilot.

aircraft is describing a series of gyrations that will thoroughly confuse you! Remember – set the control surfaces on your aircraft for minimum throw, and then apply gentle steady pressure on the sticks – flying the **aircraft** and **not** the transmitter! Make the aircraft do what **you** want it to do and don't be trapped into spending all of your time merely fighting to stay airborne! Spend several hours at different times practicing this "dry flying." You'll be very glad you did when you arrive at the field for your first flight.

The next stage of the "pre-flight" process is take your airplane, your field box, and your transmitter to a large open paved area, or smooth dirt area such as a parking lot or school yard. Here, you should practice taxiing your aircraft around, learning just what it takes to steer the plane on the ground. Treat the airplane as if it were a car – and as if you were taking your driving test. Try taxiing the aircraft at various speeds, turning smoothly, throttling back, and stopping the aircraft when you want it to stop. Mark off a line, or visualize a place where you want to stop, and try bringing the aircraft to that point each time. Try a few "high speed" simulated take-offs, throttling back before the aircraft leaves the ground. Keep practicing this until you can steer that airplane at any speed without veering all over the field. When you are satisfied that you can handle the plane on the ground without any difficulty, it's time to pack up and go home.

Prior to the day you intend to solo, make sure that you have charged your battery pack for 24 hours or according to the instructions accompanying your proportional system. One good idea, if you can afford it, is to buy a spare battery pack – once you get the "bug" to fly, you'll be glad to have a spare pack along rather than to lose valuable flying time later on. While you're proportional system is on charge, check your field box and make sure that you have all of the items you will need at the field – prop wrench, fresh starting battery, fuel and fuel pump, clean rags, spare glow plugs, spare rubber bands in various sizes for wing, landing, gear, and hatch hold-down's, a can of airplane cleaner, and an assortment of tools such as screwdriver, pliers, X-Acto knife, spare nuts and bolts and wheel collars, and a few short lengths of 1/16" balsa sheet scraps in case you need to shim the wing of your airplane. (Shame on you! We told you to check the wing incidence!) If you're using a rechargeable nickel cadmium starting battery, make sure that it, too, is fully charged the night before you go to the field.

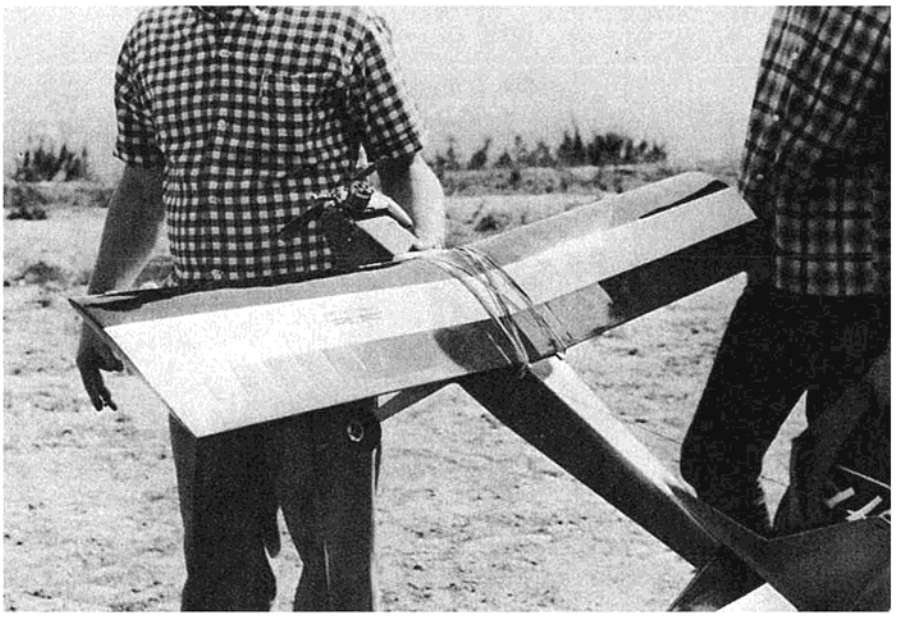
And now the day is here. It's a beautiful sunny Saturday morning and you feel as if you're about to make a debut in Carnegie Hall. Your stomach is upset, your knees have turned to rubber, and your hands are shaking so bad you could probably get proportional control out of a reed rig! Of course, Orville, your wife sees only a calm, cool, and collected Ace of the skies, and couldn't possibly suspect how you feel as she watches you put on one black and one brown sock and your pants on backwards.

Once you arrive at the field, you're horrified to find a number of other fliers already there. Resist the urge to put everything back in the car (or, alternately, never take the stuff out in the first place), for they've all been through the same routine (and experienced the same feelings of insecurity) as you are feeling now. If at all possible, bring your instructor to the field with you, or ask one of the more proficient fliers (one with a good degree of patience and tolerance is preferable) to help you with your first flights.

If you think you're to fire up the engine and take-off into the wild blue yonder, you're going to have to persevere a bit longer. If you've ever flown in a light plane you know that the pilot spends a certain check-out period physically looking over his entire aircraft before he takes off. You, with your new RCM Trainer, are not excepted from this rule. Your airplane (and somebody elses life) might just depend on this check-out period. So even though it may seem unnecessary to you, make a careful ground check, and give yourself a fighting chance once you get into the air. Before ever turning on your transmitter for the first time, whether it be to simply check your throttle on the ground, your control surfaces, or in preparation for an actual flight, be absolutely certain that you're flying the proper frequency flag for your transmitter frequency. **Never** turn on your transmitter without first checking the flight line to ascertain that your frequency is cleared. Do not turn your transmitter on under any circumstances if you see a flier on the field flying the same color frequency flag as you are carrying on your antenna. Secondly, make sure that when you fire up your engine in the pit area, you're not directly in front of another modelers airplane – there is nothing more disconcerting than to have someone fire up a big .60 and spray gooey fuel all over your clean ship, transmitter, and field box. The same goes true for another individuals automobile – stay completely clear of other modelers property when you are firing up your engine. This is no more than common courtesy, and just what you would expect, in return, from other fliers. Now that you have a spot in the pit area, check the balance of your wing before you strap it on to the fuselage. What we mean here, is to be sure that the balance point of the wing is in the center section of the wing. If one wing panel is heavier than the other, that wing will drop during maneuvers at full

throttle. The proficient flier can correct for this by retrimming during full power maneuvers, but you are going to drop enough wings accidentally without having to fight an out-of-balance condition on your Trainer. If one wing panel is heavier than the other it is a simple matter to add a small amount of weight to one wing tip. This is best done by drilling a small hole in the tip block, adding a few lightweight lead shot, and filling the cavity with epoxy and a dab of paint. While you have the wing off the plane, sight down the trailing edge of the wing from each wing tip and check for any warps. Warping of the wing should be corrected before you attempt to fly. If you had noticed these warps in the shop, you could have held the wing over a heat source, twisting the warp out of the wing with your hand, and when sufficiently hot, holding the wing under cold water to temper the wing into the true position. At the field, however, you can hold the wing at the exhaust pipe of your car, with the engine running, which will provide enough heat to enable you to twist the warp out of the wing. Continue to hold the true position for a couple of minutes after removing the wing from the area of the exhaust heat. You may have to repeat this procedure several times until the warp is corrected. Similarly, check your stabilizer and fin and rudder for any such warps, and remove in the same fashion. In many cases, warps do not show up until several weeks after you have doped your plane and the dope has finally cured all the way down to the wood. Once brought out into the warm sun, a warp will appear quite rapidly.

Strap your wing onto your plane using a minimum of six rubber bands crossing over the wing as well as going fore and aftto the wing hold-down dowels. Once the wing is properly seated on the wing saddle hold the plane up in front of you and sight along the fuselage to make sure that the stabilizer and wing are properly aligned. If necessary add a small balsa shim between the wing and the wing saddle if one side of the wing is low. Now check the wing and tail decalage to make sure that your incidence settings are as per the plans. Make sure that your fin and rudder are at right angles to the stabilizer and the fuselage, and not canted off in one direction or the other. Check the thrust alignment of your engine to make sure that the right and down thrust shown on the plans are proper. Lift the plane at the specified Center of Gravity near the fuselage using one finger on each

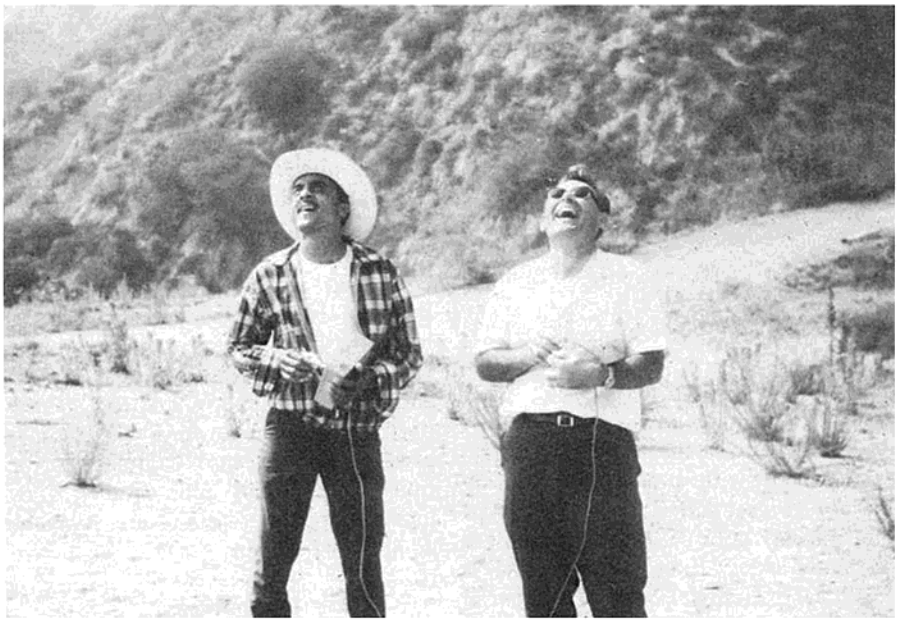


The RCM Trainer after a successful flight in long series of flight tests prior to presentation of Flight Training Course. "Headless" individuals are Don Dewey and Chuck Cunningham.

side – make sure that the plane balances at the specified CG – adding weight, or shifting your battery pack as necessary to achieve the specified balance point. If your CG is slightly forward of that shown on the plans, this will not be too disasterous. But **do not** attempt to fly if the CG is behind the specified point – you won't stand a chance on your first flights!

Next, check to see if your frequency is clear, then turn on your transmitter and airborne equipment, and check all control movement and direction – make sure you haven't hooked up the servos improperly and find that rudder control is operating your throttle! Be certain that when you move the stick to the right you attain right rudder and not the opposite. Operate your throttle, and make sure that you have a good idle setting that is neither too high, nor so low that it dies after a few seconds of operation. Recheck your throttle, and move your aircraft forward out of the pit area to check your landing gear for proper tracking. If your landing gear is not centered properly, it will be necessary to use excessive amounts of rudder control on take-off to correct the ground travel, presenting an additional problem you certainly don't need on your first few flights. Since we're assuming you have not flown before, make a range check of your system in accordance with the prescribed methods of the manufacturer of your radio equipment. Again, be always alert to another person on the same frequency so that you do not interfere with another flier. If during these range checks, and during the time you are checking your control surfaces for proper travel and throw, you notice any erratic reaction from your radio, **do not attempt to fly!** If necessary ask someone for help to see if the problem can be corrected at the field. You may be encountering noise problems, such as metal-to-metal contact somewhere in your linkages; your antenna wire may have inadvertently become wound around the pushrod, etc. Whatever the problem, **do not fly** under anything but optimum conditions. You have put a lot of time and effort into your model, not to mention the expense of the equipment and the plane, and it is better to go home and correct the problem, if necessary, and come back to fly another day, rather than lose your model on the first flight.

Once again, check your controls through several full movement cycles, operating each control in each direction to make sure that they are functioning properly. Check your transmitter to make sure that your trim levers are set in neutral. Adjust your engine, so that it is not fully peaked out for your first flight. It should be slightly on the rich side and can be best checked by holding your airplane straight up and down in the vertical position, which will cause the engine to lean out. If the engine dies when held in this vertical position, your engine was set too lean and you should back off on the needle valve until it will hold full power when held in the vertical position. Set your plane back down, throttle back and adjust your throttle



Joe Bridi, noted contest flier and RCM Contributing Editor, and Willie Richards, demonstrate W. S. Deans "buddy box" system of flight training.

with the idle and air bleed screws. Run the throttle from idle to high several times to make sure that it does not kill when advancing and retarding the throttle. Once your airplane has been fully checked out, kill the engine, shut off your airborne pack, and then your trnasmitter, and return to the pit area.

Now, we're finally ready to fly. Refuel your engine until you have a full tank. Check the wind direction and make sure that you will start your take-off into the wind. It may seem silly to the more proficient fliers to caution the beginners to take-off and land into the wind, but we have seen numerous new RC'ers try to take-off downwind and/or land down or crosswind. The following short dissertation on this subject is well worth reading and including with this flight training series, and was authored by Vernon Smith and reprinted from the York Area RC Club Newsletter:

"We have a hypothetical wind factor of 10 mph from 360° north. Our modelers latest work is a high wing, under-powered aircraft with a stall speed of 13 mph. The modeler takes off or is launched into this breeze and here is where the math comes in. How fast must his aircraft be moving in relation to the ground to become airborne on a permanent basis? The answer is three miles per hour: 13 mph stall speed (minus) 10 mph **headwind** *= 3 mph flying speed* **in relation to the ground.**

Now, let's suppose our modeler elects to take-off downwind for some unknown reason. The math follows as such; 13 mph stall speed (plus) 10 mph tail winds, equals 23 mph threshold of flying speed in relation to the ground. No one in our club can run 23 mph! Therefore, a hand launch is out of the question and it is doubtful if our modelers aircraft with its screaming .19 could achieve a take-off speed of 23 mph taking high grass, numerous chuck holes, and dragging wheels into account. The usual result? Semi-disaster!!

Now let's look at landings where the wind component becomes even more critical. The same math will show us that landing into this 10 mph breeze can result in a 3 mph stall in relation to the runway. This is a very attractive situation because it's practically impossible to badly damage a model when it comes into contact with the ground at 3 mph even if you've decided on a 1 point vertical descent type approach!

The same formula gives us a downwind **minimum** *touch down speed of 23 mph in relation to the runway. I have yet to see a highwing underpowered aircraft that exhibited good ground handling qualities at 15 mph let alone 23 mph! Result – a severe swerve left or right followed by 2 or 3 balsa crunching cart wheels.*

This innocent little 10 mph breeze has some nasty lessons for us when we're safely airborne as well. As an example, a normal take-off into the wind, the aircraft breaks ground at 3 to 5 mph, climbs out while increasing speed to approximately 10 mph (all speeds in relation to the ground). Now, our pilot decides upon a crowd pleasing tight 180° turn. The result – the aircraft speed in relation to the ground will change little. The aircraft's attitude in relation to the wind direction has been abruptly reversed. What was a comfortable edge of 7 mph in excess of stall speed suddenly turns into an airborne abortion!

Math: 10 mph ground speed (minus) 10 mph tailwind - 0 miles per hour flying speed. The result is an immediate and drastic loss of altitude. If the altitude is insufficient to regain flying speed (not 23 mph in relation to the ground), we have a groaning pilot."

Now, you know you're supposed to take-off into the wind, your airplane completely checked out through the entire pre-flight check list, it is now time to **stop** and throttle back for a moment so that you can hear yourself think. As our friend Jack Immelman says, "At this stage you are very keyed up for your First Flight, your hands are shaking, and your thoughts are in a whirl. Just relax for a few moments, take a few deep breaths, then **visualize your take-off actions**. Think: I will push this lever forward to advance the throttle. I will be ready on the rudder stick to steer the model after I nod for release. If anything goes wrong I pull back **this** stick to abort the flight. But if it runs straight and true I pull back a little on elevator--so--and keep the wings level--so! This is the pause that pays. Think your actions through. All clear in your mind? **Now** – advance your throttle, let the engine clear to a healthy roar – and give that nod!"

Head your RCM Trainer down the runway correcting for any tendency to turn. A small application of right rudder might be necessary due to the torque of the engine, if you have not used the proper amount of right thrust. If excessive amounts of rudder are required, retard the throttle and abort the flight. You may have inadequate right thrust, or an improperly aligned nose wheel. If your aircraft is tracking straight and true, and the engine is not too lean, allow the airplane to gain an adequate amount of ground speed then **ease back** the elevator stick without yanking it! Only moderate back pressure is required to break ground. Again, we repeat – **never** yank back the elevator stick. Only a minimal amount of back pressure should be necessary to get your ship airborne once flying speed is attained. Excessive back pressure will only cause a stall and a resultant crash.

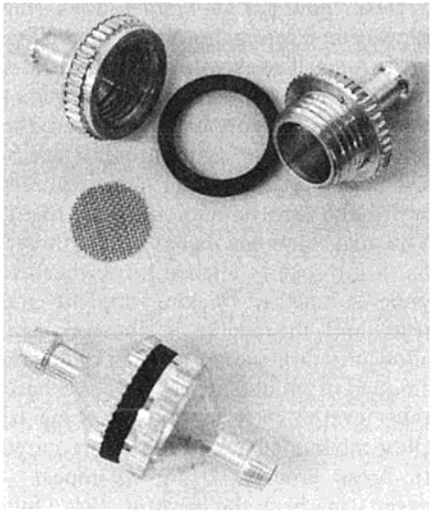
You are now airborne on your first flight, and next month we'll go into trimming out that first flight.

PRODUCT NEWS

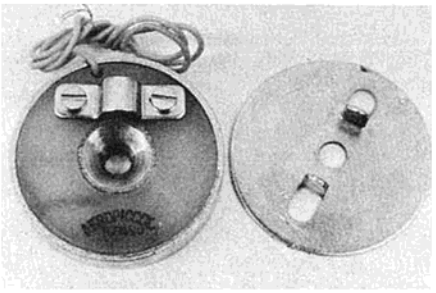
Micronic, Hastskovagen 7A, Lahall, Sweden, has produced their new Micronic 6 channel proportional system. This is the fail-safe system that worked without a flaw at the Internationals in Corsica last year and is now becoming quite popular on the Scandinavian market. No further details or prices are available as yet. For further information write directly to the manufacturer.

Another new proportional system has been announced by O.S. – the O. S. Digitron DP-4. This dual stick system consists of a transmitter, receiver, 4 servos, 5 volt nickel cadmium airborne power pack, battery charger, and vinyl transmitter carrying case. For further information on this system contact their U.S. distributor **World Engines Inc., 8960 Rossash Ave., Cincinnati, Ohio 45236.**

Several new items have been received from **Hobby Lobby International, 2604 Franklin Road, Nashville, Tennessee 37204.** The first is a Kavan Fuel Filter. This unit is of turned aluminum with two threaded halves that give access to the bronze filter screen for cleaning. This is undoubtedly the fanciest fuel filter ever made for model airplane use, but is very reasonably priced at 59c.



The second item is the imported Aeropiccola electric brake, the strongest-acting electric brake we've tested to date. This unit gives positive braking with 3 to 6 volts and is durably constructed of steel, nylon, and a fiberglass braking surface which is unique. One of the best features is the method of fastening the brake to the vertical por-

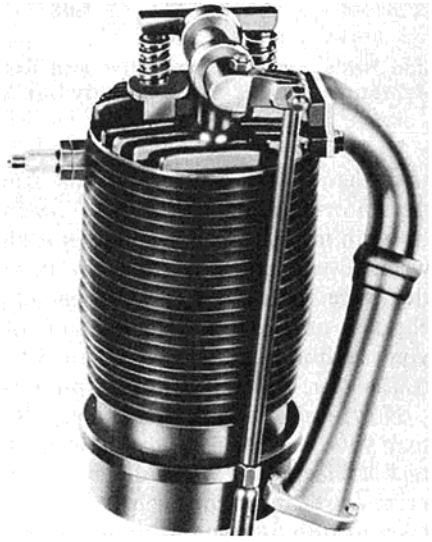


tion of the landing gear strut. The brake cannot twist with the wheel, a problem encountered with brakes mounted by the use of a set screw. The thickness of the brake is only 3/8" enabling its use on short axles. Price of the brake is $5.95 each. Hobby Lobby's new special doping brush has been especially made for model aircraft dopes. It carries more dope to the airplane in each stroke without leaving bursh strokes and it lasts indefinitely. The brush handle is unfinished to prevent discoloring of the dope when the brush is dipped into the can. A very minor shedding of the hairs occurs on the first usage only. Hairs have appeared to be stable from that point on. Price of the brush is $1.95 each. The last item is a "Slimline" 4-amp hour nickel cadmium wet cell that's slim enough to slip into your hip pocket, and gives good hot starts all season without recharging. Shipped filled with electrolyte. Price of the cell is $2.95. All items have been tested, approved and recommended by RCM.

Proctor Enterprises, P.O. Box 9641, San Diego, Calif. 92109, has a set of complete plans, construction manual, and parts list for their brand new Nieuport. The price is $14.95 and well worth the money. Available direct from Proctor Enterprises. Tested, approved and recommended by RCM.

A new product from the **Borden Chemical Company, New York, New York 10017,** is their Elmers Fast Dry Contact Cement. Designed for bonding plastic laminates, installing plywood wall panels, or for bonding dissimilar materials, this new contact cement dries in 10 minutes in 65° temperatures. The drying time can be further reduced to two to five minutes by force drying at 150° to 250° by the use of an electric hair dryer or other suitable heating element. This is an extremely powerful contact cement that is ideal for our usage in laminating doublers to fuselage sides or for sheeting built-up stabilizer surfaces. Tested, approved and recommended by RCM.

Williams Brothers, 6719 Salt Lake, Bell, Calif. 90201, has produced their third engine cylinder, the "Le Rhone." This is an authentic replica of the famous old style engine of World War I used to power Sopwiths, Nieuports, and Moraines. After the War it was popular in powering surplus planes used in barnstorming as well as in private planes. As with their previous releases, this engine cylinder is moulded of durable high impact styrene and is minutely detailed. It is available in 1", 1½", and 2" scale and sells for 65c, 85c, and 98c, respectively. Packed one to a carton in a plastic bag, the card includes instructions for assembly plus detailed drawings for mock up of crankcase. Available at all hobby dealers.



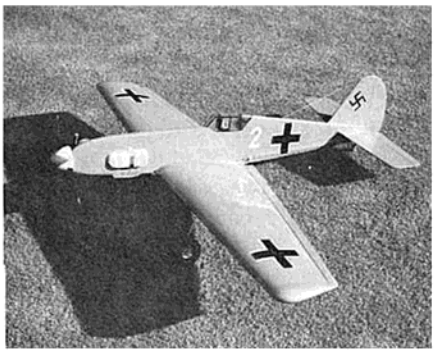
Bob Holman Plans, P.O. Box 741, San Bernardino, Calif. 92402, has the imported Complete-A-PAC. This is a semi-kit with a 49" span for a single channel or lightweight proportional systems. This is designed for .15 to .35 engines. Kits are cut from top grade English Solarbo Balsa, and include accurate pre-bent landing gear wire. These kits are available in limited quantities only. RCM readers are advised not to send cash, but to place your order and be advised by post card approximately when your kit will be in, in case they are temporarily out of stock. Price is $19.95.

Aristo-Craft Distinctive Miniatures, 314-5th Ave., New York, New York 10001, announced new prices of their giant biplane radio controlled kits of $29.95 effective immediately. Materials and labor on these prefabricated kits have been rising for the past year and, with a further rise in cost, the increase became unavoidable. The Aristo-Craft range consists of the Boeing PT-17, Grumman F3 F1, and Curtiss Hawk F11 C-4, all of which are 48" wingspan as well as a Beechcraft which has a 40" span. These biplanes have all wood parts cut out and prepared for rapid assembly so that even an amateur can easily and quickly assemble the plane kit into an exciting model of which you can be justly proud.

Tab Books, Blueridge Summit, Pa. 17214, has published ACW Saunders' new title – "99 Ways To Use Your Oscilloscope." Available at $6.95 in hardbound version, or $4.95 in paper bound edition, this is one of the most useful test equipment guide books to be published in recent years. Its pictured-text guide, with step-by-step instructions, encompasses just about every service application for the oscilloscope. This book consists of 192 pages with over 100 illustrations, plus more than 200 waveform photos. Available direct from Tab Books or at your local electronic book shelf.

Rand Manufacturing Company Inc., 8909 Hubbell Ave., Detroit, Michigan 48228, has produced a new improved fiberglass tape. With the current trend toward smaller aircraft, Rand felt that there was a need for the thinner fiberglass tape for reinforcing wing center sections, nose sections, and landing gear areas. The tape features interwoven edges to prevent unravelling. Three width sizes are avilable: 1½", 3", 6". Rand item No. 1004, Fiberglass Reinforcing Tape is available in individual packages of 60" of tape for 90c. Tested, approved, and recommended by RCM.

Sterling Models, Sterling Building, Belfield Ave. & Wister St., Philadelphia, Pa. 19144, completely sold out their first production run of the Profile ARF Mustang and has now completed and test flown the second in the profile series, their Messerschmitt ME-109. The Messerschmitt is very similar to the Mustang kit in content, but one exception being that the wings are covered with high gloss red plastic instead of the high gloss white that characterized the Mustang. Finished in all red with WW II German Air Force markings, this model is truly a spectacular sight on the field



and is sure to draw raves from the RC crowd. Its flights are equally spectacular and radio controlled "dog-fights" will become a reality because of the excellent radio equipment and this new form of simple and rugged aircraft.

A/L Specialties, 8960 Reseda Blvd., Northridge, Calif. 91324, has been appointed exclusive distributor for the Micro-Duro Electric Fuel Pump. This new electric fuel pump has a much greater pumping rate than many similar units now on the market. Voltage required to operate the unit is 1½ to 4 volts. The price is $8.95. The Micro-Duro Pump is distributed in leading hobby shops exclusively by A/L Specialties. Tested, approved, and recommended by RCM.

Snappy Products, Reseda, Calif., is producing a Coating Resin and acetone, the former which has been specially formulated for model aircraft usage. This is an exclusive formula manufactured for Snappy Products by one of the leading plastic chemists in the country, Hastings Plastics Inc. Also available from Snappy Products is a special Resin brush which is designed not to deteriorate during usage with plastic resins. Tested, approved and recommended by RCM.

R/C MODELER MAGAZINE

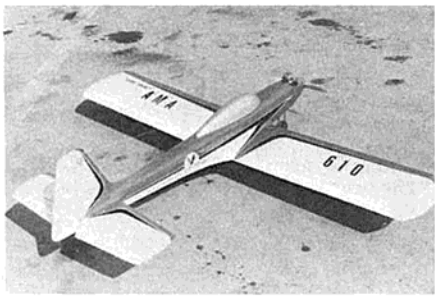
SHOP & FIELD

PRODUCT REPORT

This new monthly feature will contain a series of short product rating evaluations. Each individual evaluation of a product will contain a short description of our findings as well as a rating scale. As an example, if we are reviewing a kit, this kit will be rated in one of the following categories: **** represents a rating of Superior. *** represents a rating of Excellent. ** represents a rating of Good, while * carries a rating of Fair. In each category, i.e., a kit, engine, accessory, etc., will be reviewed first on its own merit, then compared to a commercially available product in its own field which has been pre-selected by RCM as the judging standard for Superior. It must be remembered by the reader that these ratings are the personal conclusions of our staff reviewers and are based on a single item furnished by the manufacturer, or purchased from a normal distributor outlet. As an example, the individual kit which might be reviewed and which evidences excellent die-cutting, might be one of the first kits off the production line. If you were to purchase number 5,000 off the production line, the die-cutting might not necessarily be as sharp as indicated in the review of the first production kit. Thus, these product reports in the months to come are intended simply as a guide for RCM readers and is offered as a consumer service, from RCM.

**** Bob Palmer, 9161 Morehart Ave., Arleta, Calif., is producing some of the finest fiberglass fuselages we have seen. Bob builds the scale wind tunnel models for one of the West Coast's largest aircraft companies, and in our opinion, his fiberglass fuselages evidence

the same high quality of workmanship demanded in his profession. His latest project is a Kwik Fli (Phil Kraft design) and a Sun Fli (Joe Bridi design) fuselage with built-in wing fillets and engine cowling. Each of these fuselages weighs only 17 oz. complete. Price of each fuselage is $35.00.



*** Major Model & Manufacturing, P.O. Box 74, Smithtown, N.Y. 11787, is producing highly prefabricated semi-scale kits of the Eindecker E-III and the 1915 Saulnier. Originally designed by Nick Ziroli, and presented in the October 1967 and March 1968 issues of Flying Models Magazine, these kits are priced at $25.95 each postpaid. Our test kit was the Eindecker, and has a wing span of 53" with an overall wing of 550 sq. inches. Fuselage length is 40" and the kit is designed for .19 to .45 displacement engines. The kit included extremely high quality precut parts of what apparently is hand-picked balsa, accurately formed wire parts, a package of hardware, and decals. The kit was highly detailed and accurate, and the individually packaged, pre-cut parts were of exceptional quality. The fit of the pre-cut parts, some of them part of a complex assembly, all fitted extremely well. This kit is well worth the price, and is an excellent effort by a new company in the kit manufacturing business.

* Fliteglas Laminates Inc., 1211 Thompson Ave., Santa Cruz, Calif. 95060, has released their scale model Phoebus RC Sailplane. This kit is said to be scaled from one of the world's most efficient sailplanes, and sports a wing span of 102" with a wing area of 668 sq. inches. The length is 46" with a flying weight of 3 lbs. The glide ratio is claimed to be 34 to 1. Designed for slope or thermal soaring the kit consists of a fiberglass fuselage, plans, canopy, and hardwood and balsa parts. This was a difficult kit to rate, since the fiberglass fuselage was of high quality, although the balance of the kit left a lot to be desired. As an example, the plans illustrate a method of control linkage for the T-tail glider, but is completely lacking in instructions on how it can be accomplished. This is definitely not a kit for the beginning flyer, since the lack of instructions accompanying the plans, and the necessity for purchasing specialized hardware, as well as making numerous individual decisions as to just how this plane will be built, takes this out of the average flyers category. The quality of the balsa wood included with the kit was of high quality, and although the fuselage, alone, may well be worth the $35.00 price tag by itself, we had to evaluate this as a complete kit, and as such, in our opinion, does not come up to past Fliteglas standards.

**** John Perry, 6248 Farmdale Ave., North Hollywood, Calif., is setting up production for an all new type of carburetor. This carburetor is completely new in design concept, and has a patent pending. This unit does not use the standard type needle valve and does not resemble any commercially available stock or custom carburetor now on the market. It's outstanding features include a simple adjustment for idle and top end RPM, at which time the flyer will not have to make another adjustment unless he changes brand of fuel, glow plugs, or flies in an extremely different altitude. In addition to this feature, the top end RPM of the stock engine is considerably increased. Today, engine manufacturers are claiming higher RPM than their engines, in fact, will actually produce. As an example of this, a great many manufacturers of .60 engines claim an average of 12,000 RPM on the top side. We have yet to find, with our tachometer, any stock .60 engine (with the possible exception of a few HP .60's) reaching this figure. The closest to this that we have found is the new Super Tigre .56 which tached out at 10,700 RPM. The new carburetor by Perry produced an increase in excess of 1,000 RPM on the Super Tigre .56 and Veco .61 that we tested. In addition, the idle on both engines was vastly improved, and both units retained their idle and peak RPM settings without further adjustments. Price is expected to be $11.95, when commercially available. Clarence Lee will have a complete report and test results of this all new carburetion system in a forthcoming issue of RCM.

**** Kraft Systems Inc., 2466 Seaman Ave., So. El Monte, Calif. 91733, produces the Kraft Gold Medal Series Digital Proportional Systems. Available in a variety of stick configurations, and in 4 and 6 channel versions, RCM has conducted extensive flight tests on both the 4 and the 6 channel units. Both of our test units, during several months of testing, have used the smaller of the two available Kraft servos. We will not delve into the electronic design of these systems, and can only say that both systems have performed flawlessly during the entire test period, and equalled or exceeded the specifications established for all flight tests. No problems of any kind were encountered with either system, and at no time did either system fail, run out of range, or lack in servo power and/or resolution. Both systems were purchased from the manufacturer and were stock production units. During the course of the test program, 25 Kraft servos were used in various aircraft from the smallest to the largest conventional model, as well as used in gliders. The Kraft Gold Medal Series Proportional System is rated by RCM as being superior in every respect.

C-VUES

By
BEN HERMAN
and
JACK CAPEHART

ADDRESS ALL CORRESPONDENCE TO:
C-VUES, c/o R/C MODELER MAGAZINE
P.O. BOX 487
SIERRA MADRE, CALIF. 91204

This month we'd like to deviate slightly from our normal ramblings, and talk about the subject of radio "skip". Almost every modeler (radio control type, that is) has heard of "skip", and most feel that somehow this mysterious monster is responsible for many of his woes. This feeling has been contributed to, to no small extent, by many magazine articles, particularly now that we are entering a period of high sunspot activity. So much that we have read and heard about skip has been erroneous, that we thought it pertinent to point out a few facts concerning this phenomenon.

First of all, what is "skip?" Simply put, it may be described as the reception of radio waves at a point far removed from their sources, due to their reflection from the ionosphere. To be more precise, any skip conditions on our frequencies (both 27 mhz and 72 mhz) are more likely due to refraction WITHIN the ionosphere rather than reflection FROM it. So what, you say, I don't know what all that means, but skip is real, and it caused me to crash. Okay, let's go into a little more detail.

First of all, what is the ionosphere? Again, simply put, it is a region of free, unattached electrons, arranged more or less in layers, from heights of 60 to 90 kilometers up to about 400 or 500 km. Now, normally most electrons that for one reason or another find themselves floating freely about, become quickly attached to air molecules and are thus, no longer free. This is the state of affairs of the lower atmosphere. However, in the high (above 60-90 kilometers) fringe region of our atmosphere, high energy particles from the sun, in the form of X-rays or ultra-violet radiation, are continually bombarding the air molecules and knocking electrons loose from them, a process called ionization. These high altitude collisions absorb most of the ionizing radiation, so that in lower levels very few free electrons are produced by this process. Further, during periods of high sunspot activity which we are currently undergoing, the amount of high energy, ionizing solar radiation is increased, so that the number of free electrons are increased in the ionosphere.

Okay, so now we know that in the ionosphere there are large numbers of free electrons. What does this have to do with skip? It can be shown that, for any number density of free electrons, there exists a critical frequency for electromagnetic waves. For frequencies LOWER than this critical frequency, the waves will be reflected. Further, the higher the number of free electrons, the higher will be this critical frequency. Now, during normal sunspot activity, the critical frequency for reflection turns out to be about 1 mhz. For frequencies between about 1 mhz and 15 mhz, refraction, or bending of the rays back to earth, can occur instead of reflection. Since all of our permitted RC frequencies are higher than 15 mhz, we normally would not expect to experience skip. However, the 27 mhz band is close to the upper limit for refraction skip, and can occasionally occur. As mentioned above, however, during periods of high sunspot activity, with its accompanying increase of ionizing solar radiation, the free electron density increases to the point where the 27 mhz band may be well within the range of skip frequencies, if not by total reflection, then certainly by refraction.

Okay, we have shown that skip at 27 mhz can and certainly does occur. let's examine its consequences. One of the universal laws of nature is the so-called inverse square law applicable to many phenomena, but in particular to electromagnetic radiation. Since radio waves are part of the electromagnetic spectrum, they fall under its grasp also. Thus, if we consider no other form of attenuation of a radio signal, we still must deplete its strength according to this law. In words, the inverse square law says that the strength of a radio signal will fall off inversely as the square of the distance. We can put a few numbers into this law with some simple examples, and the results, I think, will be quite interesting. Let's consider a citizens band hotshot, operating illegally on one of our 27 mhz frequencies, and putting out 100 watts, at a distance of 500 miles from us. Let's further assume that skip conditions are present, so that his signal will be returned to earth, right where we're flying, and right on the same frequency. Our illegal C'B'er would have a power density of about 10-12 watts per sq. ft. Let's assume our RC'er has a typical output of about .5 watt and his plane is about 1000 ft. (1/5 mile) away. His power density would be about $.5 \times 10^{-7}$ watts per square foot, or about 4 to 5 orders of magnitude greater than the skip signal. This would give a skip signal down 50 db from the RC'ers signal. Note in this calculation that we have not allowed for any other attenuation, other than the inverse square effect. Also, allowing a CB'er to put out 100 watts is quite generous, although there are undoubtedly many around who are doing this. Dropping the output signal to a more nominal 10 watts would, of course, improve the above figures. You might further ask as to what happens if the CB'er is closer than 500 miles. Well, if he were too much closer, a skip signal would not be too likely as on these frequencies, skip is primarily by refraction, as mentioned above, and the first skip zone is most likely to be a few hundred miles from the source, the exact distance depending upon conditions in the ionosphere at the time.

We have heard the argument many times that, if skip is so weak, how come I can receive a station 1000 miles away, but I can't hear my buddy in town, 10 miles distance. The answer to this is quite simple. You receive your buddy in town via a ground wave, which is severely attenuated, while the skip signal is essentially a "free space" propogated signal, with only the inverse square law as its primary attenuating factor.

Now, all this is not to say that there are not certain conditions under which skip could become a factor to contend with. One of these is so-called "ducting", a condition occasionally observed with radar. Under conditions of ducting, the radio signal becomes "trapped" in a temperature inversion layer, and can be propogated long distances without undergoing severe attenuation. These instances are not too frequent, however, and are not examples of "skip" anyway, which pertains only to ionospheric reflection or refraction. Another, even more rare condition is one in which the ionosphere acts like a huge parabolic mirror and actually focuses the reflected signal onto the ground. This condition requires the ionospheric reflecting layer to actually take on the shape of a parabolic mirror, and further, that our flying area be located right at, or very near, the focus. This set of conditions would be so rare, as to not even warrant discussion.

From the above analysis, we are led to conclude that skip, as a real form of interference on our allotted frequencies,

is a relatively rare occurence. Certainly the noise rejection capabilities of present day receivers should eliminate almost all skip signals. We have never seen, nor heard of an instance where such a signal has been suspected as a cause of a crash, or of even detectable interference on our receivers. If any of the readers have any proof otherwise, we would certainly be interested in hearing of it. Perhaps some of the manufacturers could add a few comments to this.

Well, so much for that. Let's get back to model aviation. We mentioned in our December article how impressed we were with Pierre Marrot's mid-wing models, designed by J. Bronais. We have always felt, and our articles have certainly expressed this feeling, that the mid-wing configuration was ideal for our present precision aerobatic maneuvers. Along these lines, we were very pleased to note the superior performance of Marrot's plane. We're sure that much of the credit must also be given to Pierre himself. It so happens that, just recently Uncle Don gave us the job of translating the plans for Marrot's plane from the French to what we call English. During the course of the translation we had the opportunity to examine this design more closely, and it started our normally dormant brain cells working. It occurred to us as it does to all true modelers looking over any set of plans, that since this mid-wing design was so good, why not go to the limit, and see what would then result. By the "limit" we mean a mid-wing of the theoretically most ideal conventional configuration. Conventional here, means no pusher props, twin booms, or swept wings.

First of all, why do we (the authors) prefer mid-wings? As we discussed more thoroughly in our earlier series of articles on design, the mid-wing gives us a configuration which most nearly approaches aerodynamic symmetry. The advantages of aerodynamic symmetry for precision aerobatics should be obvious. In a word, it minimizes the number of compromises which we require. Other less obvious advantages are the theoretically lower drag at the wing-fuselage junction, its ease in allowing the thrust line-wing chord-stab chord to be on a line, with the use of an inverted engine, and the more nearly symmetric fuselage area distribution about the thrust line. This latter point, of course, allows us to reduce the yawing effect due to the spiralling prop wash (this is, for those who believe in this effect; for those troops who still don't allow for a spiralling slip stream, neglect this last statement). Why, then, don't we see more mid-wing designs? It is our belief that the cause lies in the more difficult construction required of this configuration, to say nothing of the landing gear problem. Bud Atkinson, one of the few advocates (besides us) of the mid-shoulder-wing, solved the gear problem by hanging "economy" sized struts from the wing, a-la a typical low wing configuration, thus gaining the same torsion effect. However, we're sure that even Bud would have to admit that only a mother could love the looks of this set up. A more aesthetic solution would be to go to a tail-dragger set up, thus permitting shorter main gears, which could still be mounted on the wings for the torsion effect, and yet give the necessary prop clearance. With the new rules for 1969, which eliminate the "kiddy-car" maneuvers, we think that tail draggers will be more in evidence anyway.

Well, in the course of our daydreaming, we have evolved a "quote" dream design mid-wing. It ideally would have a 1/3-2/3 elliptical planform wing, but for the hot-wire advocates, one might settle for a 60% tapered wing (tip chord = 60% of root chord). It would have an inverted engine for ease in aligning the thrust line with the wing and stab chords, as well as for streamlining. As can be seen from the side view (fig. 1) this arrangement allows for

FIG. 1

nearly equal vertical fin area above and below the thrust line. Fig. 2 shows our conception in perspective. Although we show conventional ailerons, strips could be used on the tapered wing version for ease of construction. As the perspective shows, inverting the engine allows for a mid-wing design which definitely rudder correction and the airplane has come out straight and level. (Of course I lined up with the wind!!) On the outside This is not at all bad, for we've always felt that any of the current Goodyear racers would, with increased wing area and appropriate airfoils, make exceptionally good pattern planes.

In summing up, what then, does this configuration offer? In spite of the theoretical advantages of mid-wings, they're as rare as a Sunday flyer winning a Class C expert event. As we pointed out above, one of the main reasons for this is the ugly duckling look of most of these designs. This configuration definitely is not in that category, and the factors contributing to its eye appeal also have functional value. We present it as an effort to encourage some of you to depart from the "low-wing establishment." So join forces with RCM, fight the establishment, rush out to your nearest clothing haberdashery, buy a short-sleeved Nehru jacket (with locket), light up a cigarette, dye your hair blond, and get started on your mid-wing.

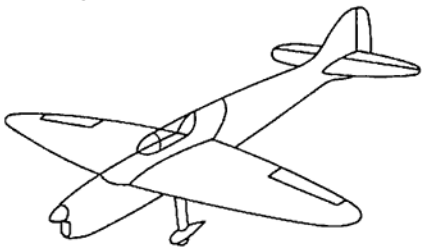


FIG. 2

"Wagger", said Walt, as he eased his bulk down onto the half-completed fuselage I had just laid on the chair, "when is our hobby going to grow up? We keep griping that the AMA doesn't serve the needs of the modelers, but we never get around to setting up the machinery to enable the AMA to be **responsive** to our needs!"

I snorted while I re-evaluated my new design with the flat, high fuselage. "Don't **start** with the AMA, Walt. That organization couldn't be responsive to your needs with 50 persons working full time to spend a budget of 3 million dollars, and I'll tell you why: You modelers don't **know** what your needs and desires are and, even if you did, I'll bet that most of the intelligent comment would get lost in just plain **griping.** You don't have the most **rudimentary** form of making long-range decisions that reflect the feeling and interest of the average hobbyist."

"Not true!" yipped Walt. "Competition is the basis of all growth, and if we can make the AMA-sponsored competition serve **our** needs we will make the hobby develop the way it should!"

"Walt", I snorted in return, "when will I make you understand that competition is a two-edged X-Acto knife: It spurs development, but also a development of **sameness** because **only** sameness can be judged fairly. You doubt me? Then **why** do all free-flights, Nordics, Ukie speedsters, Class C machines and combat wings all look so much alike that you have to look at the date on the cover of the magazine to find out whether it is a new design? And Walt, consider this: What are you doing about the tremendous reservoir of talent that prefers to get in ten flights in a country field while you're waiting for one flight at a contest? Maybe what **they** are doing would interest the youngsters more that what **you** do."

"That's possible," admitted Walt. "However, there is no way to nationally coordinate sport flying or such odd-ball activities as Galloping Ghost semi-scale sessions. Besides, how could you judge the competition?"

I groaned again. "Walt, how can I make you understand that people **will** get together to enjoy their hobby without competition? Barbecues, demonstrations, participation events; you **can** have interest and organization without the **sameness** of competition. You want to serve the needs of the hobbyist? All right, let's serve the **non**-competitor once in awhile."

Walt stood firm. "Competition is the basis of all growth," he said.

"Nuts," I replied.

class III Novice meet with the ship which only spans 5 feet, weighs 6¼ lbs., and uses an ST 60 S/R fitted with a Kavan carburetor and swinging a screaming 11x7 prop. Radio is a Micro Avionics DS 500. A symmetrical airfoil for the wing employs an NACA 0018 (%) at the root tapering to an NACA 0015 (%) for the tip. Special attention was given knife-edge flight in the ship's development which gives smooth results, Poldo relates.

Poldo Pergher and Andromeda M-31, his latest original. Span 60", 6¼ lbs., ST 60 with Kavan carb., Micro Avionics. Extra fin to give smooth knife-edge flying. Poldo, active RC writer.

Holland. From "Windy" Kreulen we hear added word regarding accelerated development and marketing of foreign propo radio gear. Kraft is now produced by Rowen of Germany under license, with Simprop and Grundig already marketing sets. Other countries active in development are Switzerland, Belgium, Italy, England (Sprengbrook, etc.), and France (Radio Pilote). Japanese products have also been with us some time (O.S., M.K. Custom) with others also coming from prolific producers. (Add to this general picture a couple sets being made in Sweden and it seems as crowded as it was in the U.S. for awhile about 2 years ago. Ed.) Windy also reports about reaction to publication of plans of Das Liddle Stik:

"The May issue of RCM created a lot of cries as it arrived in my shop. You see, the previous winter we built a similar model to Das Liddle Stik and I use it a lot to demonstrate 3 servo digital sets in it. This model caused a lot of interest as I flew it at almost every flying field here. We have too little rudder on our plane and it has a tendency to lose directional control, so from the magazine we now have an example of a bigger fin. . ."

Sweden. Arne Arvidson sends added details of his club, the Malmo Radioflygare. The club is fortunate to be able to fly from the Swedish Defence field in Malmo itself, but in addition recently acquired a "place in the country" about 17 miles from Malmo. This site affords

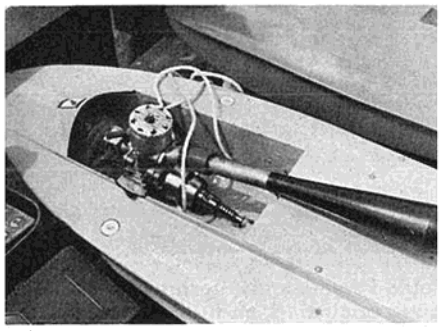
"Windy" Kreulen and predecessor to Das Liddle Stik, also inspired by Kraft's Das Ugly Schtik. Ueda .19, M. K. Custom digital (Japan). Ship very light and maneuverable. Windy, active flier and model merchant in Holland.

picnicing for the family and swimming close by. Plans include a club house on the new site rented for $60 a year. Average age of the 20 member club is 34 years. Propo equipment is almost universal now with U.S. imports slowing with the advent of a **"couple very good proportionals made in Sweden."** Beginners are welcome in the club and given close help and care in checkout by the club's 3 instructors and test pilots. Interest in scale is growing along with soaring and plastic ready-to-fly planes. Most popular engines are the Merco, Enya, and Webra, all in the .60 sizes. Arne invites U.S. visitors and servicemen to drop by and enjoy a visit with him and the Malmo Radioflygare anytime.

Malmo Radioflygare's Arne Arvidson and mufflered Merco powered Lanier plastic. Min-X propo. U. S. propos may give way to Swedish and foreign made equipment.

Germany. Via Germany and Holger Schweizer we hear details of the International regatta at Innsbruck, Austria. Of interest there was the Italian creation of S. Merlotti where his enlarged British designed Pirana, powered with two OPS 60's ran well and attracted attention. The OPS engines are a new Italian

S. Merlotti's single engine version of the Pirana seen at the International Regatta at Innsbruck, Austria. Engine is the new OPS made by the Officina Meccanica of Monza, Italy. (Pic by Holger Schweizer)



product made by Officina Meccanica in Monza, Italy. Of special interest was Merlotti's use of Wisnewski tuned pipes for exhaust augmentation.

From Col. Jack Albrecht in Germany

General view of Trier, Germany Fly-In line-up. Rain and overcast and rough grass field typical conditions. Lots of flying anyway.

we learn that his Classic radio continues to receive regular workouts in his Kwik-Fli mainstay during his tour in Europe. He also attended a fun-fly recently at Trier where he noted a lot of flying goes on despite overcast and rain, and the spectators. . . Jack's address these days is:

Col. Jack R. Albrecht
4th Bn. 6th Artillery
c/o APO New York 09123

Try this . . . Manfred Gerard hand launches 9 lb. F-102. ST 60. Transmitter in other hand.

Brazil. Cesar Gama of Rio de Janiero provides a progress report on his first RC project, a Cunningham designed Professor. Powered by a Veco 45 mounted on beams and a break-away plate, the plane used Orbit propo for radio gear. The regular Orbit servo tray

From Brazil, Cesar Gama shows progress with his Professor (RCM, Jan '68). Veco 45 powered, Orbit. (That Cesar's Brazilian-built DKW on the right for auto fans.)

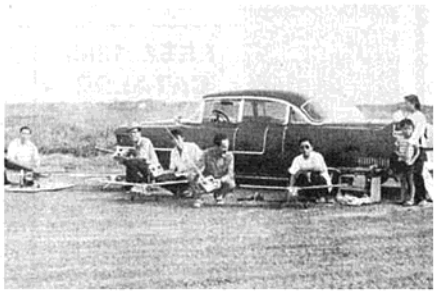
is employed in a very serviceable arrangement in the Professor which is being constructed when Cesar finds time from ukie stunt flying, his other love. The Professor is creating a lot of interest among local modelers since RC is growing in popularity in Rio and elsewhere in Brazil.

Vietnam. Modeling continues to survive and be flown in war-torn South Vietnam. A letter from Nguyen-Quang-Ru, who heads the Model Aircraft Section of the Civil Aviation Dept. of RVN, outlines the history of recent modeling in Vietnam. Early efforts are traced back to 1955 where the first models were shown at Tan-Son-Nhut airport. In 1958, the first class graduation saw

Vietnam model beginnings. Scene, Tan-Son-Nhut in 1955, with models sponsored by the First Official Service for Aeromodelism, managed by Nguyen-Quang-Ru.

French advisors join with Vietnamese Civil Aviation officials to mark the occasion which included showing results of RC developments to that date, an activity the French found interesting. . . In 1960, along with formation of the Vietnam Model Air Club, an RC club was started in Saigon with flying taking place at a private field next to Tan-Son-Nhut airport. Planes were mainly high-wing cabin jobs, but there were a couple low wing multi planes and even a scale P-51 Mustang! With the increased tempo of war activity, RC flying reflected the impact of U.S. servicemen and civilians such as Bob Scott, Stan Armstrong, Lt. Col. Hank Walker, and many others, all of whom helped Vietnamese modelers

And in 1968, flying continues at safe times. Nguyen-Quang-Ru, second from left, still is manager of RVN Model A/C Section. Propo equipment prized, flying limited.

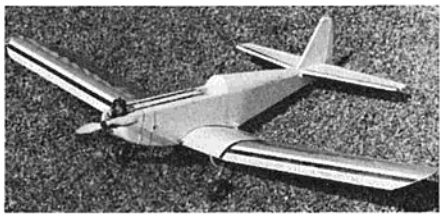


obtain late radio equipment and supplies to support their diminishing activity. In 1967 an impressive line-up of planes took place for a TV show at the present flying site which is located about 20 km from Saigon on the Bien-Hoa highway. In a limited way, flying continues even now at the Bien-Hoa highway location proving the devotion and tenacity of modelers such as Nguyen-Quang-Ru. Our sincere best wishes to them all. . .

Australia. Vern Kerr, of Charters Towers, writes regarding his experience with the "Georgia Cracker" he built from RCM's plans by Walt Mitchel that

appeared in the August 1967 issue. He used a Glo-Chief 29 for power which turned out to be more than enough for the large 52" rudder only ship, so a 19

From Australia, electronics technician Vern Kerr shows his 52" Georgia Cracker (RCM Aug '67). Initially flown rudder-only, elevator is being added. Engine is Australia made Glo-Chief 29.



was substituted. Incidentally, the Glo-Chief is Australian made by Gorden Burford... Vern flew his "Cracker" successfully on rudder only on initial flights but now plans to incorporate elevator since the ship was originally designed to allow adding other controls as preficiency grows. A real easy ship to fly, Vern agrees, including a good amount of aerobatics, despite the seemingly small engine.

From Pymble – in New South Wales Charley Peake (Banshee - Apr. '68) fills us in on formation of the Sydney RC Society. Australia is also experiencing a rapid growth in RC with new clubs reflecting the organizational aspect of such growth. The new Sydney group numbers about 20 members who use propo equipment in a wide range of well done planes. Activity so far includes demonstrations at a Sydney race car club where pylon and aerobatics proved a popular 'tween races show. Further demonstrations are planned in addition to regular club flying and contests in the growing Australian and New Zealand RC action picture.

AROUND THE COUNTRY

Pennsylvania. Need a field starter? Dick Levitt, secretary of the Bucks Co. RC Club, came up with the idea to adapt the new Honda portable generator for the job of cranking those cranky engines. These Honda 'packages' are small, light, and convenient to use and give 40 watts of 115 volt (220 V. for European users) electrical power in addition to being used for starting engines – which incidentally, only takes the addition of an adapter to the output shaft upon which the starting hose is clamped. Dick says the club has used theirs for heat lamp power to speed epoxy repairs at the field as well as for small soldering irons. Lighting is also available of course, from the 16 lb. 10x9x7 inch pack. Power is generated from a 4 cycle single cylinder gas engine of 1.05 cu. in. displacement turning at about 3900 rpm. They're available at Honda dealers (at $40) and you'll have to look twice at this well made and attractive multiple use package to make sure it's really a gas engine driven generator. Clever, these Japanese! Incidentally, president of the Bucks Co. RC Club this year is Fritz Mueller, with George De Jesus as VP and Art Kice Jr. the treasurer. It's a 40 member group devoted as most are to "Sunday type fliers." Mascot of the club is 13 year old George De Jesus, Jr. who after only 1½ years in RC is "fast becoming one of the club's top fliers." George recently gave an RC aerobatic show at a Philadelphia Navy base in stiff wind which didn't stop the young veteran in his presentation of the tough FAI pattern.

Newly formed Sydney, Australia RC Society members and planes. Models feature ducted fan original by Chas. Peake and butterfly-tailed aerobatic ship

Tennessee. From Memphis and Joe Huggins, results of the Memphis annual shows Ron Chidgey, Bryan Lakin, and Phil Kraft were 1-2-3 in CX pattern during the Labor Day weekend contest. Phil was back to using his "Flea Fli" half-size ship, and is still working out the kinks in finding the best way to make those usual presentations that spelled victory with the bigger ship at the Nats and Internats. But it's fun... In CN, Herm Stroup, Bob McCoy, and Jim Rake scored, while in B it was Bill Dowdle, Bob Gardner, Sr., and Harold Bronstein in from Long Island, N.Y. and his wins at the LIDS meet. In Class A we find Buddy Hord (who says editors don't fly!), Bobby Gardner (remember that name), and John McWorter. Pylon was also featured with Bud Atkinson, Ron Chidgey, and Jim Edwards sharing the speed honors. In Scale, Harold Bronstein settled for 2nd place with his Stits Flutterbug behind the "Bug's" designer, Bud Atkinson, who scored top honors again with his unusual pusher Dornier 235. Prof. Miklos Bencze was 3rd with his SE-5 WW I ship. Keith McClure was CD for the affair again with Joe Harris as assistant CD. They were assisted by the usual group that help to make the Memphis annual a notable event each year. About Bobby Gardner we mentioned, here's what Joe Huggins wrote; *"Little Bobby Gardner (our 7 year old flier) took that 2nd place in A pattern ALL on his own, out*

At 7 years, 'cool' Bobby Gardner, Jr. concentrates on the A pattern he's flying his Sr. Falcon through. L'il guy took tough 2nd in Memphis Annual, flew 9 flights without mishap. Know any younger flier?

of a field of at least five! He completed 9 flights without a mishap or abort. His daddy was right behind him but never touched the stick. Bobby flies a Senior Falcon that's bigger by far than he is. . . He never loses his 'cool'. . ."

Memphis winnners included McCoy, Chidgey, Kraft, Atkinson, McWorter, Edwards, Lakin, Rake, Bronstein, Hord, Stroup, Bencze, Gardner Sr., Dowdle, little Bobby Gardner. Plane was raffled, won by young Guinn hanging onto it!

Utah. Additional contest results come from the 9th Annual USA contest in Salt Lake City where Gene Worsham and Walt Staff topped B pattern, while Dick Northam, D. Koger, and Bud Pannier shared C honors. Scale went to Walt Staff for his Shoestring and to Gary Flandeal for his Fokker DVII. Pylon racing was hotly contested and

Walt Staff sets needle on Scale flight during 9th Annual USA meet. That's "Crash" Mitsui helping. Walt also trophied in Pylon and B Pattern.

Greece City Xanthi by Night

Old City Xanthi Street

Old City Xanthi House

Xanthi Central Square

Xanthi Lake Vistonida

Xanthi River Nestos

Xanthi Old House M.Xatzidakis

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