R/C MODELER

THE LEADING MAGAZINE FOR RADIO CONTROL • SEPTEMBER 1967 • 60¢

EXCLUSIVE

PHIL KRAFT, U. S. TEAM WIN WORLD R/C CHAMPIONSHIPS

FRANK BAKER'S P-51D

KEN WILLARD'S HEADMASTER

PLUS ALL-NEW BEGINNER'S SECTION

THE PIPSQUEEK—FULL SIZE PLANS IN THIS ISSUE

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

Contributors:

Scanning by ser001

Editing by Hlsat.

Thanks Elijah from Greece.

RADIO CONTROL MODELER

Don Dewey Editor
Doug Tucker Managing Editor
Kathleen Acton Assistant Editor
Carol Ludden Circulation Manager
Patricia Crews Accounting
Dick Kidd Technical Art Editor
Ed Thompson Technical Editor
Bob Dance Art Editor
Jean O'Brien Reader Service

SEPTEMBER 1967 VOLUME 4 NO. 9

features

COMING NEXT MONTH!

- THE DICK OHM SPECIAL
  LARRY ROBERT'S EXCITING N.M.P.R.A. GOODYEAR.
- COMPLETE 1967 INTERNAT'S COVERAGE
- ERIN'S LASS
  DON DEWEY'S GLIDER FOR G.G.
- CHUCK CUNNINGHAM'S LIL SWINGER
- R/C HELICOPTER AREODYNAMICS
- **PLUS MUCH, MUCH MORE!**

ON SALE SEPTEMBER 10TH.

departments

The Pipsqueek, designed by Walt Reissig, is an .049 Goodyear resembling Phil Kraft's Go-Go Fli. Designed for the Airtrol system, it is a spectacular ship to say the least! Full size plans in this issue.

R/C MODELER CORPORATION, Publisher. Editorial and Business Office, P. O. Box 487, Sie Madre, Calif. 91024. Phone: (213) 356-1066.

Subscription service: All subscription correspondence should be addressed to R/C Modeler Circulation Office, P. O. Box 487, Sierra Madre, Calif. 91024. Please allow at least six weeks for change of address. Include your old address, as well as new — enclosing an address label from a recent issue wherever possible.

Editorial contributions: must be accompanied by return postage and will be handled with all reasonable care. Publisher assumes no responsibility for return or safety of art work, photographs, or manuscripts. Address editorial contributions to The Editor, R/C Modeler Magazine, P. O. Box 487, Sierra Madre, California.

Subscription rate: U.S.A. & Possessions one year, $6.50. Two years $12.00. Canada & Mexico, one year $7.00. Two years $13.00. All other countries one year $7.50, two years $14.00. Payment from all countries must be made in U. S. currency.

EDITOR'S MEMO

BEFORE turning the podium over to this month's guest editorialist, I would like to mention that the recent RCM Reader's Survey was overwhelming, in more ways than one! Although the thousands of individual returns have not been completely tabulated and analyzed, definite reader preference trends have been noted, and this issue reflects certain changes and additions based on this preliminary information. There will be more to come in forthcoming issues, and we hope you'll like them.

After all, that was the whole idea behind the Reader Survey — to find out what **you** want. You're the boss — the whole reason for the existence of this, or any other, publication. And we're going to make every effort to present, in those coming issues, that material which you requested.

●

Sometimes, in human affairs, situations exist which seem to have no apparent solution. Often, we deal with them by ignoring their existence — at least publicly. Never before has RCM ducked an irksome issue dealing with RC, and that record need not be broken with the following editorial by Jan Sakert, reprinted from the Hawaiian RC Club Newsletter. The author touches upon a provocative issue, broadly known, but not openly discussed. As always, RCM's purpose in printing Jan's thoughts is to elicit further frank discussion of the matter with the hope such openness will result in eliminating a problem hurting those on both sides of the counter! — The Editor.

●

THAT may seem like an alarmist type heading for an innocent editorial so let me assure all that may read this that it is not intended as a step-by-step instruction manual for the purposeful destruction of a hobby shop. What is intended is to point out what frequently causes a retailer to have to close his doors and look elsewhere for his bread and butter.

A hobby shop can be killed by the management, the consumer, or both. The management can kill a shop much quicker than the consumer and when they both inadvertently join forces then the shop can be assured that its end is in sight.

The manager of a hobby shop must be an expert in the field of each hobby that he intends to serve. That includes everything from Indian beads to R/C. If he is not an expert then he'd damned sure better be big enough to keep the necessary number of experts on his payroll. Lacking the necessary expertise, a hobby shop manager more often than not, is indiscriminate in his selection of stock and ends up with several thousands of dollars tied up in inventory. His shelves will be sagging under the weight of tons of stock that the consumer won't buy because he has no use for it. The management **has** to know what it is that a demand exists for. He can learn this by participating in the hobby or, by being in business long enough to become familiar with the necessary and hot items. Unfortunately, the length of time that he'll remain in business will be related to how expert he is in selecting stock. Usually he'll run out of money and have to close his doors before he can acquire this expertise. Hopefully, he'll hire someone who knows the good from the bad, either from previous experience behind the counter or by a close relationship or participation in the particular hobby. Most of us have gone down to different hobby shops to take advantage of close-out sales. You saw there an excellent example of thousands of dollars tied up in stock that they can't even sell at 50% off. The hundreds of battery boxes, scores of sets of molded ship fittings, stacks of odd sized props are just a few of the many specifics. These things enjoyed no consumer demand or else they wouldn't have been burdening the shelves and dragging down their working capital these several years. With proper knowledge the management would not have ordered these things, or at least not in that quantity, and would not have been forced to lose that sum of money. A corporation may be able to stand an occasional loss like that but an individual owner would have to have a tremendous volume or cash reserve to be able to survive such a loss.

So, improper inventory is a quick and sure way to go down the drain. Just as quick and just as sure is to give away the profit. When a retailer gives a discount to an individual or to a group, he is, in actuality, reaching into his pocket and giving money away right off the top. Most hobby items enjoy a 40% markup. Out of the 40% must come all of the expenses of keeping the store open and the profit that will keep bread on the retailer's table. If operating expenses burn up 35% of every dollar, the retailer is making a nickel to keep for his own. If you expect him to give you a 10% discount then you're expecting him to give you that nickel that he made plus another nickel that he doesn't have. Large volume and low overhead will sometimes allow the extension of a discount. It's doubtful whether you'll find more than a handful of hobby shops in the U. S. whose volume is great enough and whose overhead is low enough to allow this without severe consequences. Those that do offer a discount to a club usually have to rob Peter to pay Paul. In other words the nickel that it cost him to give you that 10% discount came from the Indian bead department. The result is that the R/C department shows a loss and the Indian bead department just barely broke even. No matter how you add that up the sum ends up in red ink.

(Continued on Page 6)

Retailer-consumer rapport, or, as it's called in the business, "good-will," is also essential. The majority of R/C flyers are very discriminate in their choice of materials and accessories. They can't be snowed when it comes to brand utility. When he asks for a couple of tubes of epoxy cement and a clerk tries to sell him a jar of library paste instead then that hobby shop is in deep trouble. R/C consumers digest page after page of model publications and manufacturers' mailers every month and they have a fairly precise knowledge of prices. If the retailer cunningly thinks he can add a nickel on to the fair price of a package of X-Acto blades and allow it to go undetected by the consumer he's dead wrong. The consumer won't make a big fuss about the extra nickel but you can bet he'll be insulted and feel exploited to some degree. The retailer can kiss this guy goodby because chances are good that he'll not return.

The most severe threat to a retail hobby shop is the well meaning hobbyist who uses his barbershop license and letterhead to buy from distributors. He doesn't intend to do harm or make money. All he intends to do is get a few "good deals" for himself and a few buddies or club members. However, for every dollar the barber turns over the local bonafide retailer loses about 40 cents off the top. Since his R/C department is not making any money for him he's forced to reduce his inventory or close it out completely. The consumer is the one who ultimately suffers. Sure, it's nice to get your fuel at $3.00 a gallon from Sam the barber but where do you get one litttle old glow-plug when you need it? The barber doesn't keep an inventory so you run down to the hobby shop. The hobby shop has closed out his non-profit R/C department and you'll now have to write to one of the mail order houses for the glow-plug that

EDITOR'S MEMO

(Continued from Page 5)

you want right now which you'll get in a couple of weeks. In any area where there is no adequately stocked hobby shop the Sam the barber type does a great and admirable service. If it weren't for this source then modeling would grind to a complete stop instead of a slow half-step. When we rely on Sam the barber and our other private sources, we're cutting off our nose to spite our face because we're preventing the development of a healthy hobby shop and the absence of a healthy hobby shop retards our own development. Pretty much of a stalemated dilemma isn't it? How to cure it? A couple of ways. The legitimate retailer can bring the law to bear and force good hearted Sam to stop his favors, or, the retailer can join forces with Sam and the rest of the modelers by making an honest appeal to them to help develop his business so that he can better serve them. He must admit that he won't be able to give them the "good deals" that they got from Sam but he will provide them with great service and adequate stock. This appeals to Sam in that his ordering for the boys was mostly an inconvenience to him and it appeals to the boys because they'll have a place to buy glow-plugs. The retailer now has a fair chance of developing a good business and everybody is happy. However, it doesn't end right there and everybody lives happily forevermore. The retailer must continue to serve and please the consumer and in return the consumer must remain loyal to and support the retailer. If this relationship breaks down people will start running to Sam and the triangle is again formed.

Now for an opinion, I estimate that I put about $50.00 worth of materials into each airplane I build. By dealing with Sam and the discount mail order houses I might save 10% or $5.00. To save this $5.00 I had to wait for indeterminate periods for orders to be filled, had to accept substitutions, and could not exercise the modeler's delight of selection. I had to take whatever the mailman brought. Ever see 18-pound balsa stock? Come to my house. I would more than gladly surrender that $5.00 saving for the convenience of running over to a hobby shop and buying what I wanted when I wanted it. I think the same thing goes for every modeler I've ever known.

ADDENDUM:

We are sorry to note the passing on Tuesday, June 13th, of Nils F. Testor. Mr. Testor was a pioneer in our industry in modern merchandising methods. He did much to expand the Hobby Industry through use of color, quality advertising, packaging, dealer displays, and promotions. He was born and educated in Sweden, coming to the United States in 1924. His training was in business and he could speak 7 languages. His goal had been to become involved in overseas sales for one of our large corporations, but when this did not work out, he took the job of stock room boy in a Woolworth's store at $17.00 per week. Within 4 years, he was store manager. In this position, he was a leader for Woolworth's in sales promotions and proved his value many times over. A friend of his had been selling a shoe cement, called Karlsons Klister, without too much success, and Mr. Testor saw the possibilities in this product. He bought out Mr. Karlson and started applying the Testor know-how. He even developed an inexpensive shoe press to aid in the use of his product. Sales boomed, but as you can only sell so much shoe cement, he had to expand. This time, he came out with the product that was to be his base product and to support him through good times and bad times. That is Testor's Household Cement. He developed a static display with different materials glued together that Woolworth's considered the finest display, most revenue producing, of any display they had to that time. He also continued to support and expand into the hobby field with the introduction of model cements, wood airplane kits, model airplane paint and even model railroad paint. Then he bought out the McCoy engine plant and really shocked the Hobby Industry by saying he was going to sell 100,000 engines in one crack. This was the McCoy .35 and he exceeded the figures he had set. We personally felt this was a tremendous boost for the Hobby Industry.

Because of Mr. Testor's high standards of conduct in business and his pride in his native Sweden, he was knighted by the Swedish government. They felt he was an example to all, of the best in Swedish tradition. Mr. Testor will be missed as a man by his friends and family, but he will also be missed by the Hobby Industry for his decisive enthusiasm and the dreams he made into reality.

CUNNINGHAM ON R/C

A GREAT amount of response to our reader interest survey sheet from the June 1967 issue of RCM has prompted a revision in my thinking, and in the thinking of most of the staff. I've been guilty of not remembering that each month our ranks are swelled by a number of newcomers. I've tended to go along believing that most of you readers were progressing at somewhat the same rate into this sport, and it just ain't so! Of course a lot of you are, and in the main, these are the ones that are not too much in need of help. But the beginner is another case. Each month, more and more men are finding out the joy that can be had by building and flying radio controlled aircraft, but are stumped by a lot of the inherent problems in a sport that, by necessity, appeals to the intellect as well as to the physical.

This is a roundabout way of saying that I'm going to back up and to try and extend a helping hand to these beginners and to try and smooth out some of the rough spots as well as prevent some of the crashes. Along the way I may have an idea or two that will be of interest to the more advanced reader as well as a couple of sport designs that will grab the Sunday flier. It's a big job, and it's going to be tough to tackle, and to do it right, I'm gonna' need your help.

For a great while the RCM office as well as each of the staff has been inundated by mail asking for advice on one thing and another. I have tried to answer the letters that have come my way as promptly as possible with either the answer, or help in where to find the answer. This has taken much time each month, but was, I felt, a necessary by-product of writing this column. The RCM office, with much more to do toward getting out an issue every month has found it almost impossible to answer even a small percentage of the letters, and as a result, a pile of mail has been built. We're sorry, but we felt that getting out the magazine was the first responsibility and this has been our main line of concentration. Now, in this column, we are going to establish a question and answer session to try and give you the replies that you need, and to share these answers with other readers in the hope that it will be of some help to them as well.

Of course, it will not be possible to answer all questions in the magazine each month, nor will it be possible for me to field all questions, but if I feel that your question has interest for a number of readers, then yours will get into print. If you need an answer quickly, and cannot wait, then enclose a stamped, self-addressed envelope and I'll try and tear myself away from the flying field or typewriter long enough to get off a line or two. Fair enough?

Along with this question and answer stint, I am going to work up a series based upon a normal progression of interest. This will start with a discussion of existing radio equipment, and what is a good investment for a beginner, available kits, and what type of radio equipment is best suited for them, hints and tips on building (from a non-model builder's viewpoint), how to fly anything from a single channel escapement operated ship up to a full house proportional ship, and, in general, a basic course in getting **with** this sport. Along with this will be a group of aircraft designed strictly for the sport flier. None of them will be of contest potential, but rather, they will be designed for specific equipment and specific types of flying. The first ship will be for galloping ghost using a .10 size engine. The next in the series will be a sport ship for either galloping ghost, 6 channel, or proportional gear with a .19 for power, and the last in the series will be designed around a .35 to .40 engine for 10 channels or proportional gear. The pages of time may be turned back just a little, but these ships will be pleasing to the eye, as well as simple to build, and relaxing to fly. For obvious reasons it will not be possible to accomplish all of this at once, and it may take a little time to work down through all of these models, but we'll get there.

For those of you wishing to write questions, it will save a lot of time and extra postage if you will send your letters directly to me, Chuck Cunningham, R/C Modeler Magazine, 5333 Wooten Dr., Fort Worth, Texas 76133. In conjunction with this column, watch for Don's new "Shop & Field" department, which is a continuing series on the basics of this hobby, designed for the new model builder. The third part of this package is Bernie's "Kits & Pieces" which will review the latest commercial items with appropriate "how-to's."

One thing that I will not attempt to do is to criticize any of the supplies now available to the modeling public. Of course there are some lemons around now and then; even General Motors has to take its lumps once in a while! I'll try and point up equipment that I am familiar with, and recommend a particular system from personal observation, but I cannot, in all fairness to you or to the manufacturers of kits and equipment, pass judgment on each item. If I don't mention your favorite piece of gear it is because I'm not familiar with it, not that I've tried it and it doesn't seem to work well. If I try it and fly it and like it, you'll hear about it.

I have been flying two vastly different rigs lately and enjoying both of them. The first one is one of the new Lanier Pursuits, and it is not only a good looking ship, but an excellent flier. All of the new Lanier kits are being equipped with stiffeners that can be stuck to the outside of the fuselage. These help greatly when flying from a rough grass field such as ours. The nose of the Pursuit is sporting an Enya .60 which I have found to be a tremendous engine. It starts easily, hot or cold, and develops a good bit of power. One of the best features about it is that you can get to the mounting bolts without taking contortion lessons. Radio gear in the plastic beauty is my faithful PCS rig.

The other craft that I have been flying is a galloping ghost ship with an Enya .09 for power and a Rand GG Pak for actuator. Radio control is provided by a Min-X receiver and transmitter. The new, lighter battery load of the Rand system makes for a very compact package, and jumping about of the aircraft due to throttle changes has been almost eliminated. If you blip down to low engine you can retard the throttle with almost no movement of the aircraft. The ship that is carrying this system is my design, the "Lil Swinger."

To get into the question and answer session for this month we'll start off with an easy one:

Q. "Where can I get the book 'Radio Control for Model Builders?' "

A. Kalmbach Publishing Co., 1027 N. Seventh St., Milwaukee, Wis. 53233. They carry all R/C books and primers.

Q. "Dear Sir, I would like to have some information on R/C jets. If you have published any articles on them would it be possible to get them?"

(Continued on Page 8)

CUNNINGHAM ON R/C

(Continued from Page 7)

A. As far as I know, no information has been published on R/C jets by either RCM or any other magazine. Some jet-like designs have been published, notably the Spiggen in the May '67 issue of RCM. True jets have not been too successful due to the very poor working of miniature jet engines for R/C use.

Q. "I'm a rank beginner in R/C. Currently I'm flying a Testor's Skyhawk. My biggest problem is one of disorientation. . . ."

A. This is not only a problem with beginners but with pilots of some experience. The hardest thing to do when learning to fly is to project yourself into the pilot's seat. This can be overcome to a great extent by painting the top and bottom of the wings different colors or by trimming them very differently. This allows you to tell at a glance which way the aircraft is banked. Also if you tend to fly close in, it is easier to see the ship and to tell which way it is going. If you are in doubt at any time, give it a gentle control and see what happens. Generally, it is a matter of experience, but it is hard to see all of the time. Flying a Belta brings this problem home more than anything else. Try to slow down reactions and to not over control.

Q. "Please give me the information that you have concerning the fiberglass Phoenix shown on the cover of the November 1966 issue."

A. This fuselage is available from Orange Blossom Hobbies. See back issues for their advertisements.

Q. "I am very interested in constructing the Digitrio. However I was unfortunate in not acquiring all the articles published in RCM. Is there a complete booklet or book which can be purchased that has all of the necessary info?"

A. Yes, a complete book on the Digitrio may be had by writing to RCM and requesting either the Digitrio book at three bucks, or the Digitrio-4 book (a supplement, not a replacement of the Digitrio) at two-fifty. Both books are offered in a combination package at five dollars. Thousands of Digitrios have been built around the country, both from scratch, and from the World Engines/Controlaire kits.

Q. "I am a beginner in Radio Control Airplanes, and have a single channel outfit. I'm interested in purchasing multi-proportional R/C. I would appreciate if you could recommend a good multi-proportional rig, and airplane kit (or ready made) that would be satisfactory for my purpose."

A. In the way of a general answer, any of the proportional rigs that are advertised in this issue will do a good job. Most of this gear is made by relatively large, stable companies and will give you good service. Kits for a beginner are a bit harder to prescribe since you didn't mention what size engine you own. However, the Falcon series by Carl Goldberg is a good way to start, or the Tauri by Top Flite. In the realm of ready-mades, only Lanier offers a ship that could be classed as a trainer, the Transit. The Stinger by Dee Bee is more of a pro type ship, as are the Lanier low-wingers like the Thunderball and the Bronco.

Q. "In the January 1964 issue an ad was placed by R. & L. Specialties. They were producing a kit of Cliff Weirick's Candy with a fiberglass fuselage. Are they still in business, and can I get one of these kits?"

A. To the best of our knowledge they are not now in business, and none of their kits can be obtained.

This last is a common condition in this field. Someone has a good idea for a kit, or a product and sees an easy way to make some extra cash from the sport. All too often the product is such a success that suddenly the enterprise finds itself swamped with orders, and from what was to be a few hours spent turning out a fiberglass fuselage turns into a nightmare, and after a few months of this the enterprise slips away due to the shear fatigue of the participants. It is a shame, because there have been some beautiful products put out in this manner. I have a fiberglass fuselage for a Taurus that was put out very briefly about two and a half to three years ago. The job was beautiful, but the price was too cheap, and so the overworked modeler simply had to give up.

These are all of the questions and answers for this month, but before signing off for this time, I'd like to pass along a tip from the top. A tip by Cliff Weirick: "When going out to fly in front of a judge, always look your best, have on a clean pair of pants, a clean shirt, your hat squared away on your head, and don't have a greasy old rag dangling from your hip pocket. Look like you know what you're doing, call out your pattern in a clear voice and in every way, let the judges know that you're going to put on a good flight. This creates a good impression in the judge's mind right off the bat."

No question about it, it's good advice. Trouble is, when everyone is looking like an ad for Hart Shafner and Marx, then the judge will have to look at the flying again.

'Nuff for now; be sure and send in those questions, because this column will only be as much use to you as you make it.

PIPSQUEEK

BY WALT REISSIG

Want to draw attention at the local flying field? Think you're a good proportional pilot? Try this .049 powered bomb . . . but don't say we didn't warn you!

FOR years the .049 powered RC ships have necessarily been rather slow flying, boxy looking aircraft, flown mostly rudder only, since they were incapable of lugging around the large heavy radio gear required for more controls. Airtrol's RE-1 has changed this. We now have available six ounces of airborne equipment, that will make these aircraft do everything but talk! While it is true that this still will not give us throttle control, most .049 engines available have no such facility available.

The "Pipsqueek" is a "bomb," and there is no way to tame it! While it is a practical, good performer, it will make jelly out of the knees of the best of proportional pilots! Designed as per the latest pylon and multi concepts, I think that we have come up with a real challenge to those who are looking for a change of pace.

If you are still considering undertaking this project, bend an ear to a few more facts. While the construction is typical and simple, many of the parts are small and difficult to handle. Nearly all of the accessories and fittings such as the fuel tank, bell cranks, push rod ends, etc. have to be custom made, since they are not commercially available. Light weight and warp free construction is mandatory, for you must remember that without a throttle, this is a "do or die" aircraft! Every ounce of excess weight is equivalent to half a pound on your favorite 800 sq. in. multi. As your 'Pipsqueek' is being built, the installation of **every** component must be done correctly. Such items as the engine, fuel tank, battery box, etc., are permanently built into the structure to save weight, and if the engine bolts come loose, or the fuel tank foams, you will have to cut into the model to get at them.

Getting discouraged? Don't be that way! It isn't nearly as difficult as it sounds. It just takes a little longer to build than most ½A ships.

So let's grab up a Cox .049 T.D. and a couple of boards of contest balsa and give it a go!

Construction Notes

We believe that this aircraft is only for those with considerable experience, so instead of a step-by-step construction procedure, we will stick to notes of particular interest.

The wing is of conventional construction. Build the frame first, installing the aileron linkage as you go. Make the bellcrank of .040" aluminum, and bend the ends down so that they will just stick through the balsa sheeting. The two small bellcranks are made from micarta or nylon. Solder small washers on the pushrods for keepers. The ailerons are cut out after the sheet covering is on. Drill two holes in the micarta aileron horns so that the epoxy will flow through, holding them securely. All bellcranks are mounted below the 1/16" plywood mounting boards.

No comments should be necessary on the tail surfaces.

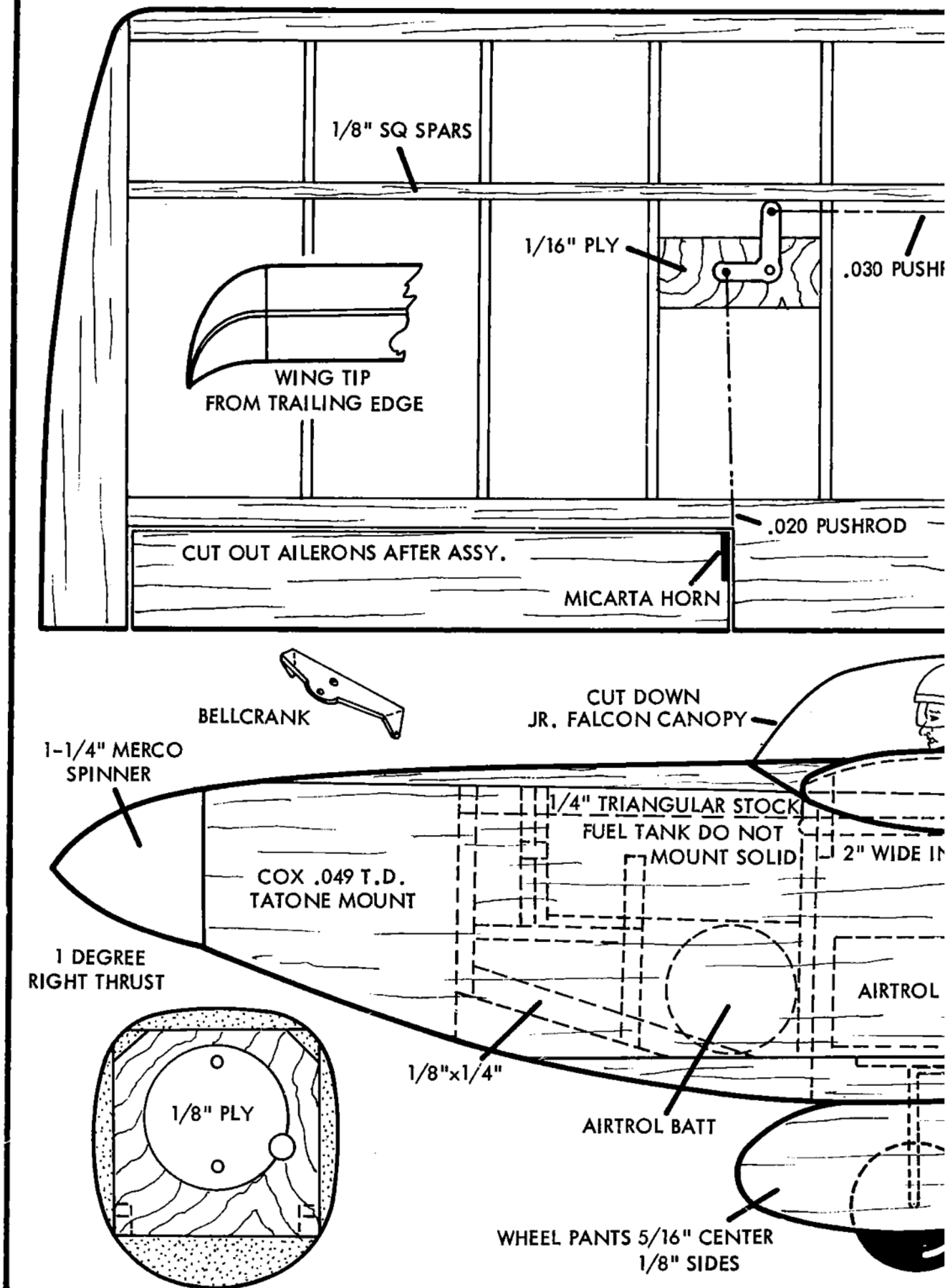
Before commencing the fuselage, construct the fuel tank. No commercial tank will fit. The thrust line, wing, and stab, are all at zero angle, so keep this in mind when cutting the fuselage sides. The 3/16" and 1/8" triangular stock will have to be custom made. All fuel proofing of the engine cowl, and tank compartment is a coat of epoxy. Don't forget to hook up the fuel line to the tank and through the firewall, before you seal the tank compartment. Incidentally, did you check that tank for leaks?

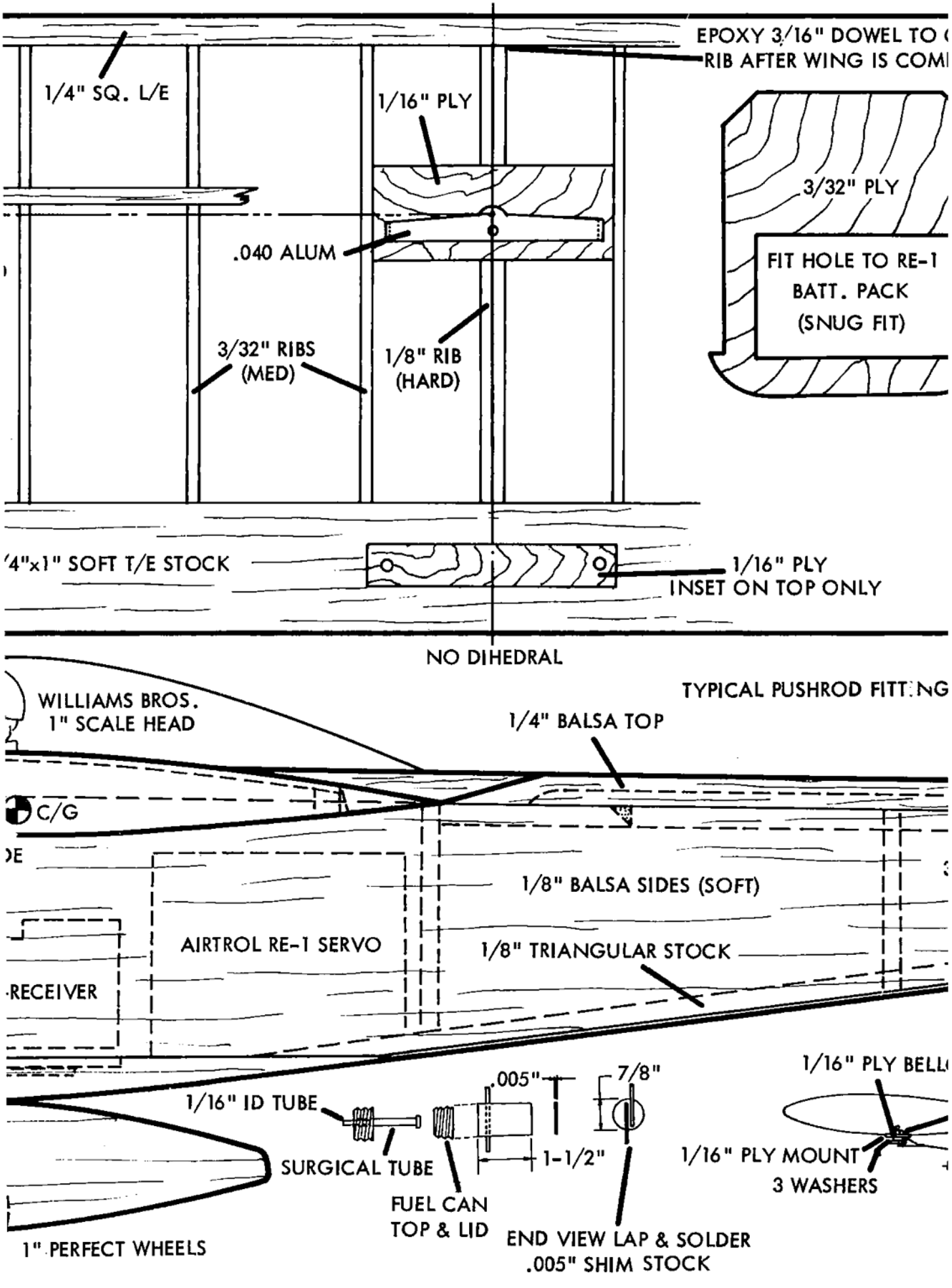
The only bad feature to Tatone's fine motor mounts, is that they will often be the source of vibration. The way to eliminate this entirely, is to fasten the mounts to the firewall while the fuel proofing coat of epoxy is still wet.

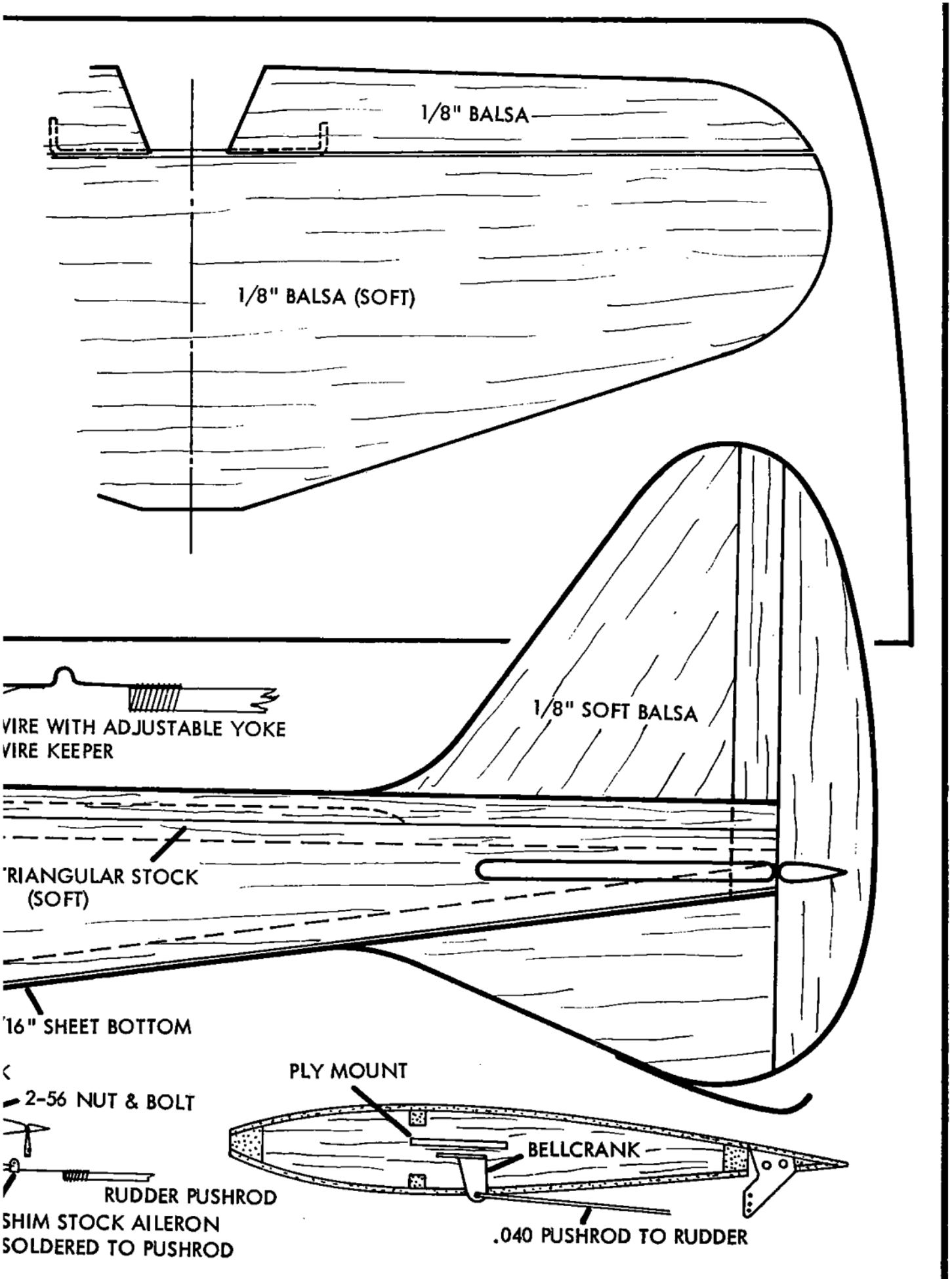
The finish is important! Keep it light! I used 2 coats of clear on the bare wood, 1 coat of talcum powder and dope, 3 coats of clear dope, and one of color.

When the aircraft is complete check everything carefully! Do not try to hand launch unless you have a 40 M.P.H. wind. A paved surface is almost mandatory for R.O.G. Keep it on the ground until sufficient speed has built up. Make that first turn to the right, since torque gives this airplane a terrific roll rate to the left.

When the engine quits, do the best that you can. It glides very flat and at about Mach 1!

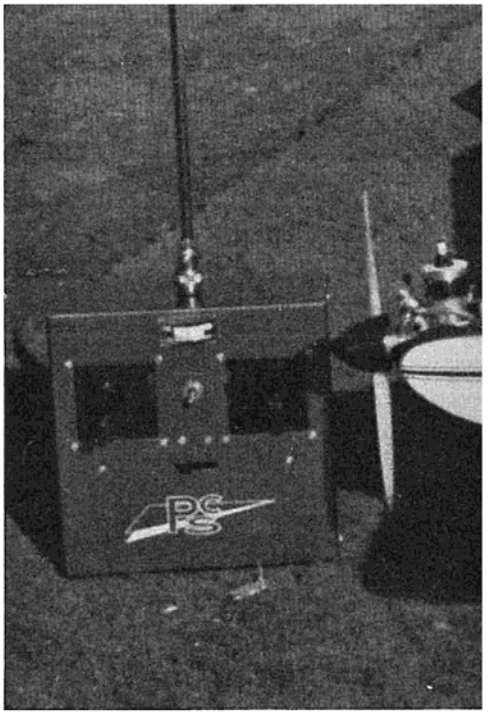

1/8" SQ SPARS
1/16" PLY
.030 PUSHR
WING TIP
FROM TRAILING EDGE
.020 PUSHROD
CUT OUT AILERONS AFTER ASSY.
MICARTA HORN
BELLCRANK
CUT DOWN
JR. FALCON CANOPY
1-1/4" MERCO
SPINNER
1/4" TRIANGULAR STOCK
FUEL TANK DO NOT
MOUNT SOLID
2" WIDE I
COX .049 T.D.
TATONE MOUNT
1 DEGREE
RIGHT THRUST
AIRTROL
1/8"x1/4"
AIRTROL BATT
1/8" PLY
WHEEL PANTS 5/16" CENTER
1/8" SIDES


EPOXY 3/16" DOWEL TO
RIB AFTER WING IS COM
1/4" SQ. L/E
1/16" PLY
3/32" PLY
.040 ALUM
FIT HOLE TO RE-1
BATT. PACK
(SNUG FIT)
3/32" RIBS
(MED)
1/8" RIB
(HARD)
'4"x1" SOFT T/E STOCK
1/16" PLY
INSET ON TOP ONLY
NO DIHEDRAL
TYPICAL PUSHROD FITTING
WILLIAMS BROS.
1" SCALE HEAD
1/4" BALSA TOP
C/G
1/8" BALSA SIDES (SOFT)
AIRTROL RE-1 SERVO
1/8" TRIANGULAR STOCK
RECEIVER
1/16" PLY BELL
.005"
7/8"
1/16" ID TUBE
1-1/2"
1/16" PLY MOUNT
3 WASHERS
SURGICAL TUBE
FUEL CAN
TOP & LID
END VIEW LAP & SOLDER
.005" SHIM STOCK
1" PERFECT WHEELS



LANDING GEAR IS BENT FROM 3/32" WIRE & SEWN WITH FISH LINE TO 1/16" PLY MOUNT

THE H



RCM's Chief Sunday Flier has come up with a four-footer that is one of the most versatile models ever designed. Prototypes have been flown on single channel servos, Galloping Ghost, and full house proportional, with engines ranging from .10 to .35. This one will put you at the head of the flying class!

"HEY! What's the big idea of discriminating against us?" It was Jim Sunday, our local friendly hobby dealer, greeting me as I entered the local friendly shop for some supplies.

"Whaddaya mean?" I bristled a little. "I've never discriminated against anybody. In fact, some people say I'm not the discriminating type."

"Well, when are you gonna come out with a design for us guys who like to fly larger airplanes than the Schoolmaster? We're Sunday fliers too, y'know."

"Yeah — I guess any guy named Sunday would have to be a Sunday flier — as soon as he learns to fly!"

"Ho-ho. I mean ho-hum. Big joke. But I'm serious. How about a big version of the Schoolmaster — one we can stick heavier gear in, and maybe add ailerons if we want to. And while you're at it, make the wing semi-symmetrical for better penetration and inverted flight? A lot of flyers would like to have a change from the low wing lookalikes —something sort of scale-like in appearance but with good performance."

"OK, Jim. I'll think about it." So I did — and the more I thought about it, the more I liked the idea — except I didn't go for the six-foot span. It should be medium size — about four-foot span. Thus it would be big enough to handle multi and propo gear, but still small enough for rudder-only flying with escapements or servos, or galloping ghost. And the basic design lends itself

HEADMASTER

by Ken Willard

to all three types of control, as evidenced by the variations in control systems used on the Schoolmaster.

So I sketched out a four-foot version of the Schoolmaster, with the modifications which Jim had suggested. As luck would have it, the four-foot size made it possible to use a Top Flite Tauri type wing, with the span shortened to four feet. Also, the Tauri landing gear fitted right into the plan. At first I thought it looked a little big, but I went ahead with it anyway, and the Tauri landing gear makes the model exceptionally easy to handle on the ground, plus the fact that it certainly reduces damage to the plane, and particularly the prop, in hard landings.

So what to call it? Well, the Schoolmaster of a big school is called the Headmaster. And that's what it is. You'll learn a lot about flying R/C from the Headmaster — and it'll forgive you for all but the most violent mistakes.

Construction is so simple and conventional that you can probably build it right from the plans without reference to any explanatory text. Also, during the building of one of the prototypes, my friend Bob Andris took several construction shots in sequence. There are only a couple of points which might bring up a question in your mind, so let's see if I can anticipate them beforehand.

FUSELAGE

This is a typical "slabsider," but you can disguise it. The 3/16" square longerons give an excellent gluing surface for the top and bottom sheeting, then, after the "box" is completed, you can round the corners. Section A-A shows how it appears in cross section at that point — and you can do the rounding all the way forward on the top to the rear of the wing, and the full length of the bottom, fairing it out slightly at the plywood plate where the main landing gear is mounted. The rounded corners also work very well in the top forward front area where the hatch is. Just spot glue the hatch in place, round off the top, and then cut the hatch away.

Incidentally, you may wonder why the hatch is shown as having a short section which slopes up to the simulated windshield. This is necessary in order to be able to insert and remove the four-ounce Williams tank.

The engine is shown mounted on a "breakaway" 1/8" plywood plate. Since there will be so many different engine installations suitable to the Headmaster, I haven't shown any specific mounting holes. Drill them to suit your engine. The plate will take any engine from a Max. 10 to a .35. Mount the plate to the 3/8" square hardwood engine bearers with either 3-48 bolts and blind nuts — or 4-40 if you go to the larger engine size like the .35.

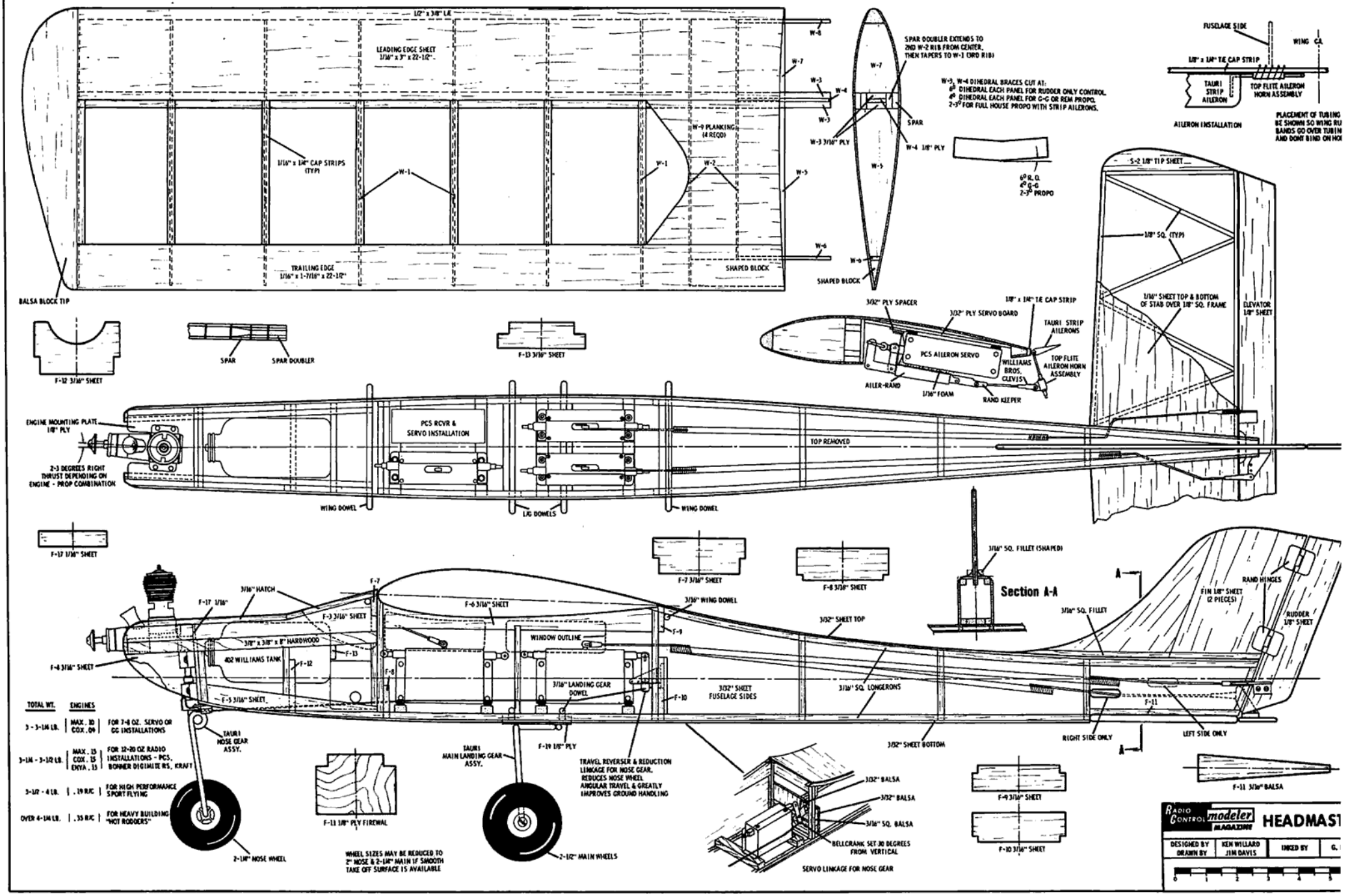
You can get the Tauri type landing gear in most hobby shops, or order it direct if necessary. Full instructions on the nose wheel installation are included in the Top Flite package.

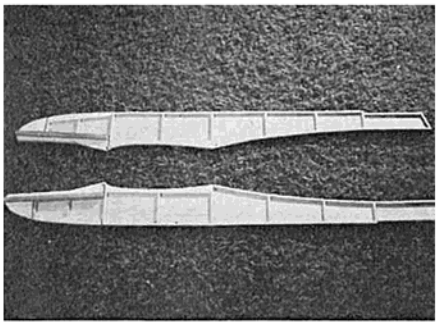
Another thing you might wonder about is the servo linkage to the nose gear. This serves two purposes — first, it puts the nose wheel pushrod takeoff at the rear of the servo, leaving more room in the center of the equipment section for the inevitable "spaghetti" pile of wires and connectors. Second, it is a reduction linkage which reduces the angular travel of the nose wheel. We had a devil of a time making takeoffs without this feature, since the nose wheel turned too much, even with the slightest servo movement, when a direct drive was used.

WING

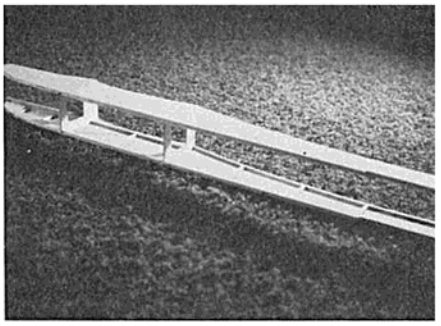
The wing is a variation of the Tauri wing, using the same airfoil. Since the model is slightly smaller and lighter than the Tauri, 1/16" sheet for the leading edge, trailing edge, and cap strips is plenty strong enough. For those of you who prefer it, the wing can be fully sheeted. Or, for those who don't want to take the trouble to build up a wing, Jack Doty, of Foamcraft, has standard Tauri foam wing cores available, and you can use them merely by cutting the span down to the Headmaster's 48 inches.

Note that several dihedral angles are suggested. Again, the reason is obvious. The more control you have, the less dihedral you need. The angles I've shown represent recommended average figures for the various types of control.

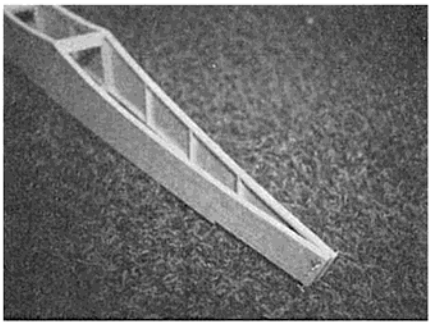

1/2" x 3/8" L.E.
LEADING EDGE SHEET 1/16" x 3" x 22-1/2".
1/16" x 1/4" CAP STRIPS (TYP)
W-1
W-2
W-9 PLANKING (4 REQD)
TRAILING EDGE 1/16" x 1-7/16" x 22-1/2"
SHAPED BLOCK
BALSA BLOCK TIP
W-6
W-7
W-3
W-4
W-5
W-3 3/16" PLY
W-4 1/8" PLY
SPAR DOUBLER EXTENDS TO 2ND W-2 RIB FROM CENTER, THEN TAPERS TO W-1 (3RD RIB)
W-3, W-4 DIHEDRAL BRACES CUT AT:
4° DIHEDRAL EACH PANEL FOR RUDDER ONLY CONTROL.
6° DIHEDRAL EACH PANEL FOR G-G OR REM PROPO.
2-3° FOR FULL HOUSE PROPO WITH STRIP AILERONS.
SPAR
6° R.Q.
4° G-G
2-3° PROPO
FUSELAGE SIDE
WING CA
1/8" x 1/4" T.E. CAP STRIP
TAURI STRIP AILERON
TOP FLITE AILERON HORN ASSEMBLY
AILERON INSTALLATION
PLACEMENT OF TUBING
BE SHOWN SO WING RU
BANDS GO OVER TUBIN
AND DONT BIND ON HO
S-2 1/8" TIP SHEET
1/8" SQ. (TYP)
1/16" SHEET TOP & BOTTOM OF STAB OVER 1/8" SQ. FRAME
ELEVATOR 1/4" SHEET
F-12 3/16" SHEET
SPAR
SPAR DOUBLER
F-13 3/16" SHEET
3/32" PLY SPACER
3/32" PLY SERVO BOARD
1/8" x 1/4" T.E. CAP STRIP
TAURI STRIP AILERONS
PCS AILERON SERVO
WILLIAMS BROS. CLEVIS
TOP FLITE AILERON HORN ASSEMBLY
AILER-RAND
1/16" FOAM
RAND KEEPER
ENGINE MOUNTING PLATE 1/8" PLY
2-3 DEGREES RIGHT THRUST DEPENDING ON ENGINE - PROP COMBINATION
PCS RCVR & SERVO INSTALLATION
TOP REMOVED
WING DOWEL
L/G DOWELS
WING DOWEL
F-17 1/16" SHEET
F-7 3/16" SHEET
F-8 3/16" SHEET
3/16" SQ. FILLET (SHAPED)
Section A-A
3/16" HATCH
F-17 1/16"
F-7
F-3 3/16" SHEET
F-6 3/16" SHEET
3/16" WING DOWEL
3/32" SHEET TOP
3/16" SQ. FILLET
FIN 1/8" SHEET (2 PIECES)
RAND HINGES
RUDDER 1/8" SHEET
3/8" x 3/8" x 8" HARDWOOD
WINDOW OUTLINE
402 WILLIAMS TANK
F-12
F-13
F-9
F-8
F-6 3/16" SHEET
F-5 3/16" SHEET
3/16" LANDING GEAR DOWEL
F-10
3/32" SHEET FUSELAGE SIDES
3/16" SQ. LONGERONS
F-11
RIGHT SIDE ONLY
LEFT SIDE ONLY
3/32" SHEET BOTTOM
TOTAL WT. | ENGINES
3 - 3-1/4 LB. | MAX . 10 COX . 09 | FOR 7-8 OZ. SERVO OR GG INSTALLATIONS
3-1/4 - 3-1/2 LB. | MAX . 15 COX . 15 ENYA . 15 | FOR 12-20 OZ RADIO INSTALLATIONS - PCS, BONNER DIGIMITE RS, KRAFT
3-1/2 - 4 LB. | . 19 R/C | FOR HIGH PERFORMANCE SPORT FLYING
OVER 4-1/4 LB. | . 35 R/C | FOR HEAVY BUILDING "HOT RODDERS"
TAURI NOSE GEAR ASSY.
TAURI MAIN LANDING GEAR ASSY.
F-19 1/8" PLY
TRAVEL REVERSER & REDUCTION LINKAGE FOR NOSE GEAR. REDUCES NOSE WHEEL ANGULAR TRAVEL & GREATLY IMPROVES GROUND HANDLING
F-11 1/8" PLY FIREWAL
2-1/8" NOSE WHEEL
WHEEL SIZES MAY BE REDUCED TO 2" NOSE & 2-1/4" MAIN IF SMOOTH TAKE OFF SURFACE IS AVAILABLE
2-1/2" MAIN WHEELS
3/32" BALSA
3/32" BALSA
3/16" SQ. BALSA
BELLCRANK SET 30 DEGREES FROM VERTICAL
SERVO LINKAGE FOR NOSE GEAR
F-9 3/16" SHEET
F-10 3/16" SHEET
F-11 3/16" BALSA
Radio Control modeler MAGAZINE
HEADMAST
DESIGNED BY
DRAWN BY
KEN WILLARD
JIM DAVIS
INKED BY
G.



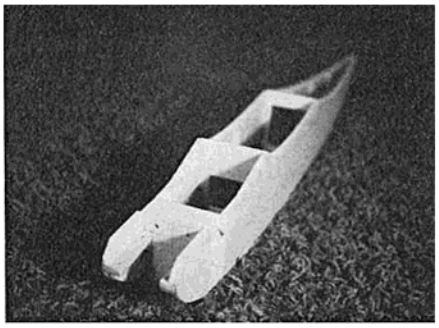
Sides and framework.



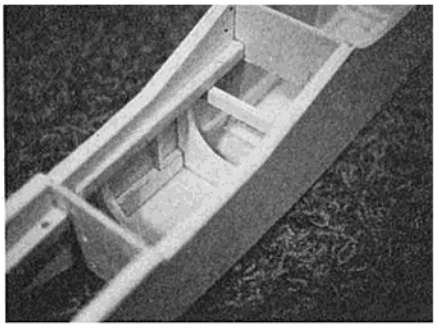
Joining sides.



Tail pulled together.



Nose pulled together.



Forward compartment detail.

Optional aileron well.

Pick the one that best suits your individual need.

Finally, some of you may want ailerons. The standard Tauri strip ailerons and fittings work very well. All that is necessary is to reverse the installation so that it is on the bottom of the wing rather than the top. Bob Andris installed ailerons on his prototype, using an "Ailerand" from Rand Manufacturing. There's no doubt about it — it certainly makes it easier to fly inverted, and the rolls are much smoother, if ailerons are installed.

TAIL SURFACES

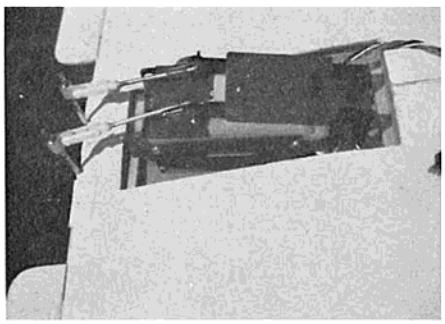
The fin, rudder, and elevator are all cut from 1/8" sheet. The fin is made from two pieces, butt jointed, and with the grain of the forward piece roughly parallel to the top forward edge of the fin, and the grain of the rear piece parallel to the fin trailing edge.

The stab is built up with 1/16" sheet bottom and top and a framework of 1/8" square in between. This construction has proven very sturdy and warp free. Rand "slip on" hinges fit the fin and rudder together very simply, and if you want to use them on the elevator-stab, add a 1/8 x 1/2 x 1 balsa block between the top and bottom sheeting of the stab at the elevator hinge points, then cut away the sheeting so the hinges slip over the blocks. Make slight cutouts in the elevator leading edge and the stab trailing edge where the Rand hinges are to fit, so the separation between the stab and elevator is reduced. Leave just enough room for the hinge pin to be inserted.

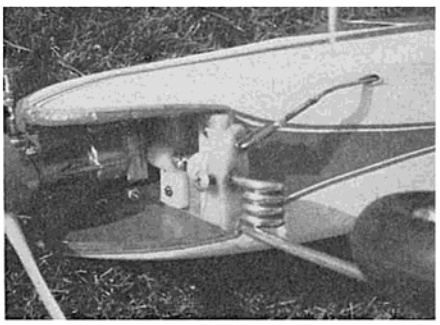
The fin is butt glued to the top of the fuselage, but before you do it, be sure the bottom of the fin fits snugly to the top of the fuselage line, then add the 3/16 in. square fillets before glueing the fin in place. This makes it easier to shape the fillet as shown in section A-A.

COVERING

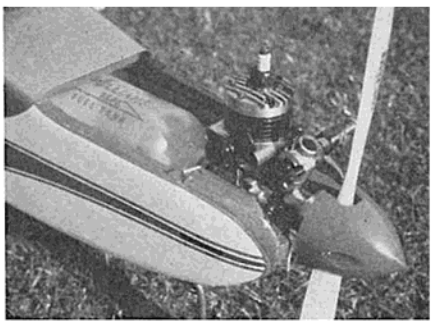
When it comes to covering I think I'll leave it entirely up to you. Silk, silkspan, dope, Hobbypoxy, lacquer, MonoKote — there are so many to choose from, and each modeler seems to have his own choice. As for me, I've become a solid booster for MonoKote — with an assist from Hobbypoxy. For me it is absolutely the quickest possible way to get an airplane finished and flying. I use Hobbypoxy on the wingtips, engine well and mounting plate, and stab tips — all of them are places where it's a bit tricky to make the MonoKote fit around the curves. I like to sand the tips, for example, give them a coat of Hobbypoxy "Stuff" and sand that down, then a coat of Hobbypoxy. Then put the MonoKote on the wing (after first covering the open areas with silkspan like the instructions for MonoKote say you should) and then cover the joining line between the MonoKote and the Hobbypoxy with a thin strip of striping cut from MonoKote, then paint the edge of the striping where it overlaps the Hobbypoxy with a layer of clear Hobbypoxy to seal it. After that, you can go as wild as you like with MonoKote trim strips — scallops, sunburst, lightning lines, dots — anything you want to dress up the finish.



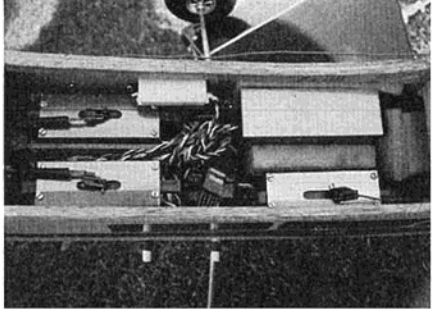
Ailer-Rand installation.



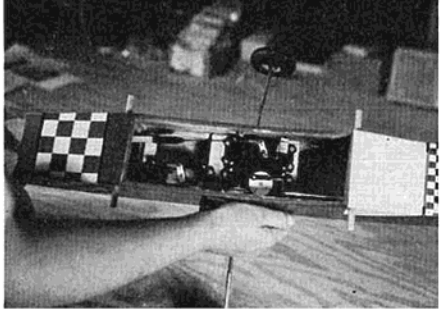
Tauri nose gear.



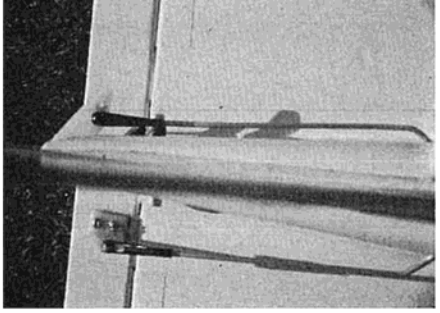
Tank and engine.



PCS installation.



Orbit servo installation.



Rudder, elevator linkage.

GUIDANCE EQUIPMENT

The Headmaster design is all purpose design — and on purpose. It can be flown rudder-only, using an escapement, or Royal Products or Hinode Servo. It can be flown with pulse rudder, using an Adams actuator. Any one of the leading galloping ghost installations, such as Rand, World, or Tomoser will make it perform well — just use the maximum throw position on the rudder horn (since GG action tends to reduce the mean effective angle of the rudder) and the minimum throw position on the elevator (to reduce the gallop when you pull full up and the pulse rate slows down). The downthrust angle of the engine keeps the nose down under power and aids the penetration when flying with rudder-only control, then when the engine quits, the nose comes up to give a very gentle glide angle.

The prototype, as shown on the plans, has a PCS proportional control system installed. Why? Because I was talking with Cliff Weirick one day during the construction period, and he says "Look. You've been saying for years that the only way to fly is with proportional control, but until somebody comes up with a proportional control system that can be installed in a small airplane, you're gonna stick with what's available in light weight gear. Well, you've gone to a slightly larger ariplane than you usually design and I've got a lighter weight proportional unit than most of the ones available, so why don't you stick one in the Headmaster and try it?"

I certainly couldn't argue with Cliff under those circumstances, so I did what he asked and installed the PCS gear, using rudder, elevator, and motor control. The all up weight of the prototype, with a Max. 15 in the nose, was slightly over three and a quarter pounds.

The very first test flight proved out the value of proportional control. After taxiing around a bit, I gave the Headmaster full power. Down the runway, about twenty feet from the end, I pulled slight up elevator, and the flight was under way. Great! Gingerly I tried out the response, and as soon as I knew it was good, started a few maneuvers. Right in the mdidle of one, off came the nose wheel! Wouldn't you know it — and on the first flight, naturally. Well, I throttled back, positioned the model for landing and carefully made an approach. As the model neared the ground I leveled it off, then as it slowed down and sank to the ground I kept increasing the back pressure so the Headmaster hit on the main gear. I held the nose gear, minus wheel, off the ground as long as possible, but finally the speed dropped to the point when the nose dropped, and the axle dug into the ground and brought the model to an abrupt stop — without any damage!

No one — and least of all myself — can argue with the basic premise that if you can afford it — and your airplane can carry it, a proportional system is the ultimate for flying. And now, with PCS at 18 oz., and Bonner's new Digimite RSat 12 oz., it has been amply demonstrated that a four foot airplane like the Headmaster, with a .15 or .19 installed, is an ideal Sunday Flier's sport R/C model. It's small enough to get in most cars without ousting the passengers, yet it's large enough to fly under any condition that a .45 or .60 powered model can handle.

But the problem of "affording it" still exists, and for those who can't quite make it, the proportional control which is available through the galloping ghost concept is certainly the next best — and it keeps getting better, what with decoders and separate actuators.

Finally, a word about power. The Headmaster, without radio gear installed, will weigh in somewhere in the 2½ to 3 pound range, depending on the balsa you use, the covering, and the finish. So, with a simple rudder-only servo, or escapement, or actuator, your guidance system may only weight 6-8 oz. Now, if you've built light, your airplane may weigh around three pounds. If so, a Cox .09 or a Max. 10 will handle it for gentle sport flying, and a .15 will make it very lively.

My prototype weighed 3¼ pounds, and with a Max. 15 I was able to perform outside loops. The second prototype, built by Bob Andris, weighed over four pounds, and was sluggish with a .15. Yet with a good .29 installed it performs almost like a contest job.

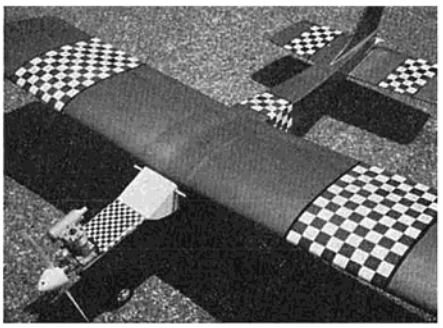
Actually, the wing construction which is used is strong enough that a .35 can be installed. Thus, the Headmaster has the versatility to handle almost any power and guidance combination that you may want to install in it. The only real limitation will be your own ability to handle the airplane if you choose to go the maximum power route.

So let me know how you make out. I would particularly like to hear from those of you who go the simple, lightweight route (rudder-only, with a .10 or .15) and those of you at the other end of the spectrum (full house, with a .35). The Headmaster should be able to handle even the most difficult students.

Especially those who go to Sunday school with him!

Tauri main gear.

Taipan .20, acrylic finish.



Bob Andris; 4 lbs., .35!

P-51D

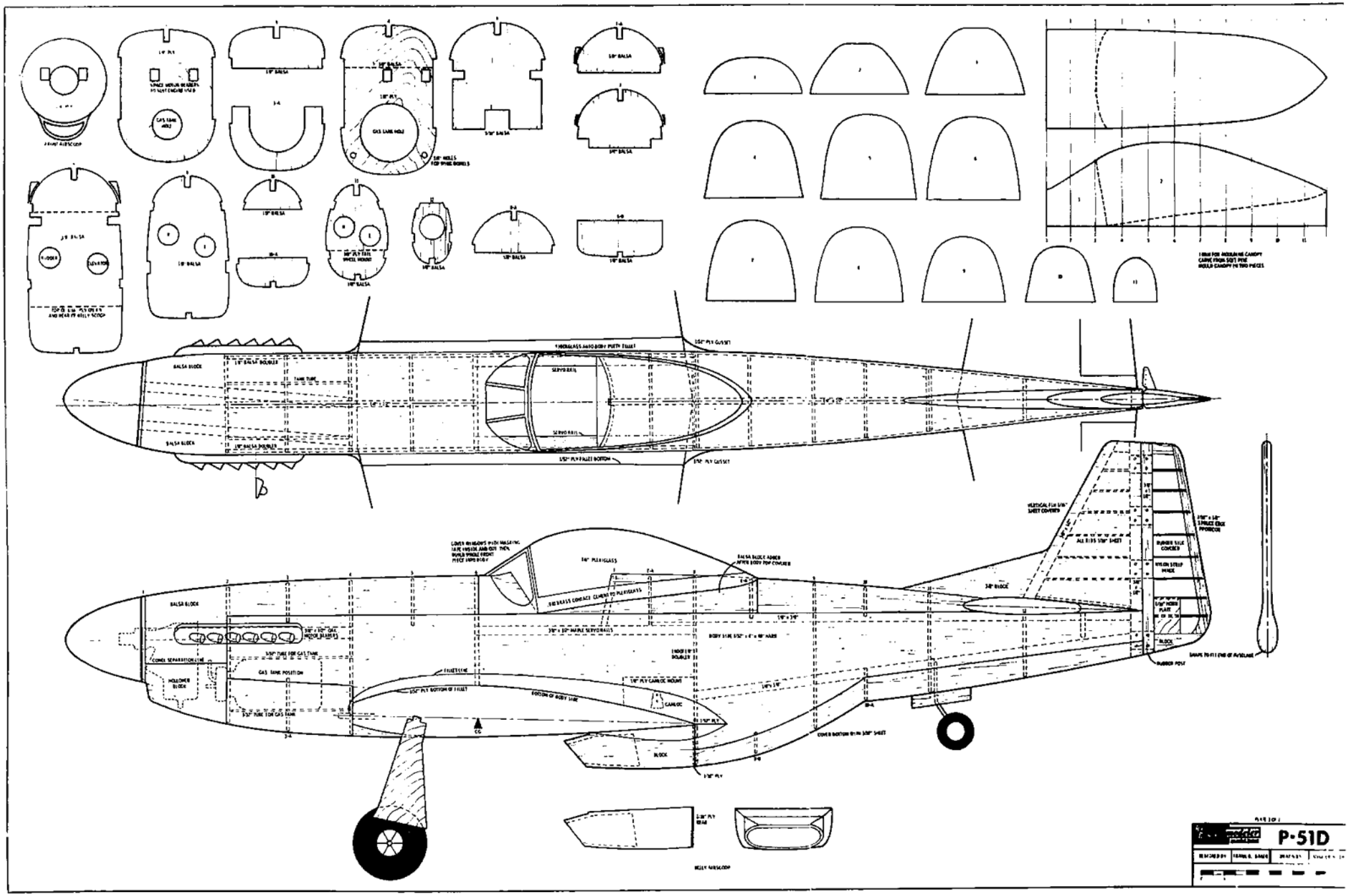
BY FRANK BAKER

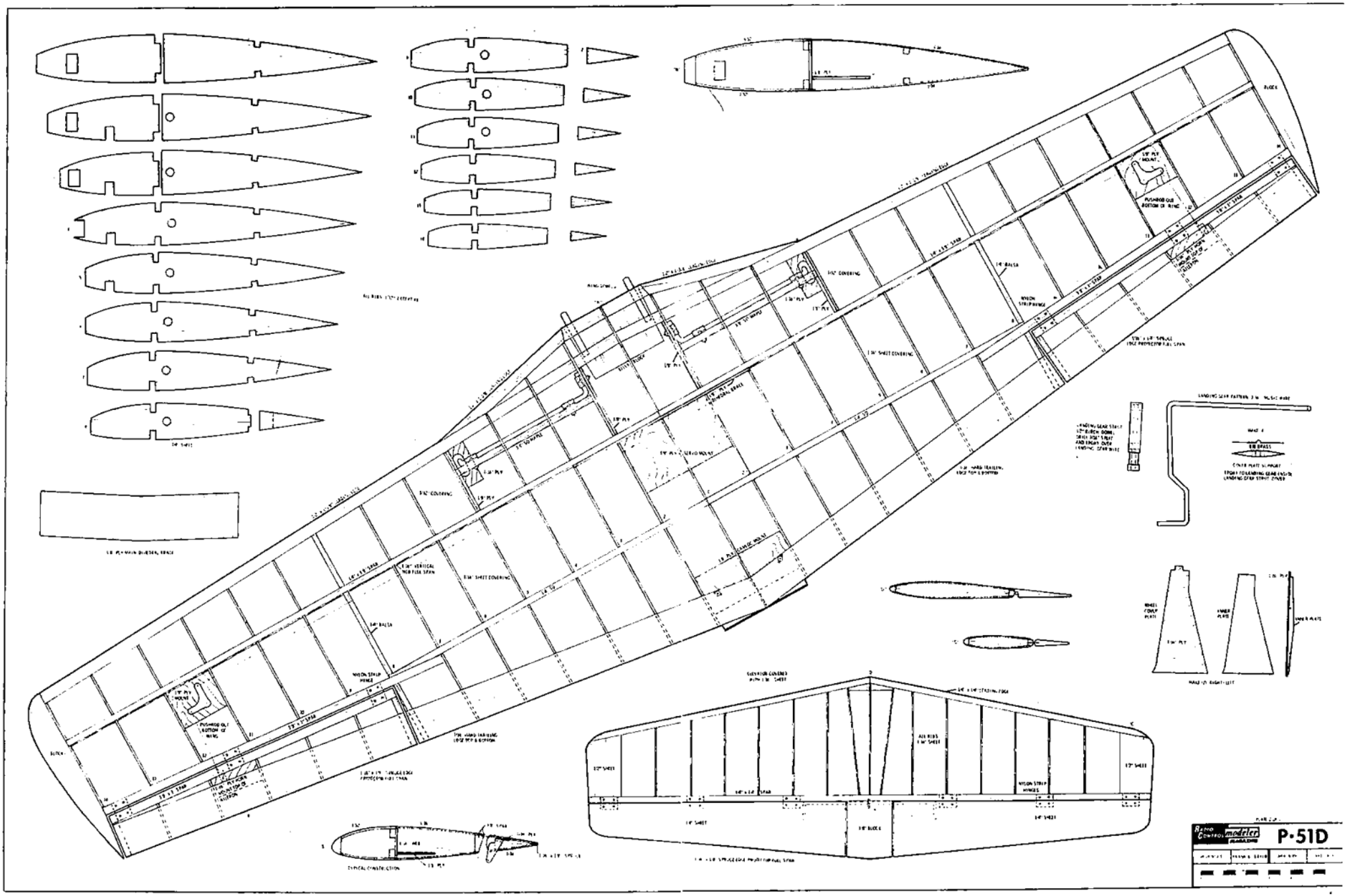
Pattern performance with an all-time scale favorite.

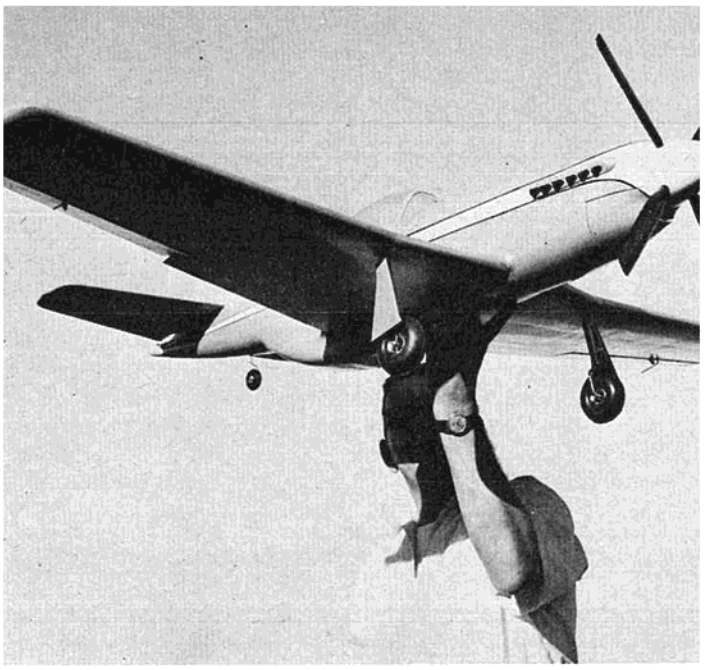
SEVERAL years ago I attended a major mid-west radio control contest which was typical of the major contests held throughout the country. There were 25 contestants in Class III multi; 24 of them were flying a Taurus or aircraft indistinguishable from a Taurus in the air. The 25th, "Red" St. Alban, was flying an aircraft from his own plans. The flying also was typical of major Class III contests throughout the country in that the 60-powered multi-bombs were zipping through their maneuvers at a frantic rate of speed and at 100 yards away you could not tell one plane from another. The flying was consistently of a high caliber and only a very experienced person could distinguish the millimeter differences between the maneuvers flown by the various pilots. An occasional tail-slide which did not hook in, or an occasional vertical-eight, which was a little wobbly, would be the difference between first and second place, or second and third place. Such consistency of performance between aircraft which are virtually alike does not generate a great deal of spectator interest or interest even among the pilots themselves. In fact most of the multi-pilots spent the day sitting in the shade or conversing with one another about radio equipment with very little attention being paid to the actual flying, except for an occasional glance at the score board to see the point spread between various fliers. The spectators were even less interested in that they could not tell one airplane from another nor one maneuver from another, and were content to let junior listen to the roar of the engines and watch an occasional toy airplane go zipping through the sky. Such was the contest for the major portion of the two days during which it was being held.

However, there was a glaring exception to this rather humdrum routine and this was generated by the 25th airplane entered in Class III. "Red" St. Alban was flying, as he usually does, a scale aircraft in the multi-competition. This particular year "Red" was flying a scale F4U Corsair painted in the colors of a post-war Thompson Trophy Racer a lá Cook Cleland. His Corsair was a brilliant red with white trim powered by a .60 engine whose propeller blades just barely cleared the edge of the radial engine cowling. From the minute "Red" started the engine of his aircraft, he completely stole the show. As he taxied out, even the most jaded multi-flyer got up out of the shade to watch this gross intruder into the multi-field. "Red's" takeoffs were extremely pretty and scale-like. Once in the air, his aircraft flew the complete AMA pattern slower, but with as much precision as any of the highly specialized contest-type machines. A few of his maneuvers, such as vertical-eights were a bit shaky to the expert eye; however to the spectator they were the same as the rest. The landings made by the scale Corsair were a thing of beauty in that "Red" did not slam it into the ground and hold it down with a nose wheel as is typical of multi-ships, rather he made a beautiful scale-like Navy approach in which he dragged the tail-wheel for a few seconds before the main gear dropped onto the ground. With the inverted gull wing and the tail down low, there was an extremely exciting landing with the aircraft wing tips wobbling just slightly as the plane settled down into the ground. Although "Red's" landing probably did not get as many points as the hot multi-planes, it nonetheless looked like a real carrier landing and the spectators in the crowd could appreciate that it was a good approximation to the way a Corsair actually lands. After watching "Red" steal the show from the major hot pilots in the mid-west, I was firmly convinced that multi-scale stunt is the only way to go.

The next summer I attended the Experimental Aircraft Association Fly-In at Rockford, Illinois, and had a chance to observe a large number of different aircraft, both antique and home-built. Much to my delight about a half dozen P-51's were also on display at this fly-in. During the air show portion of the afternoon, a flight of P-51's flew by in formation and then Bob Hoover's P-51 put


P-51D


Radio Control modeler
P-51D

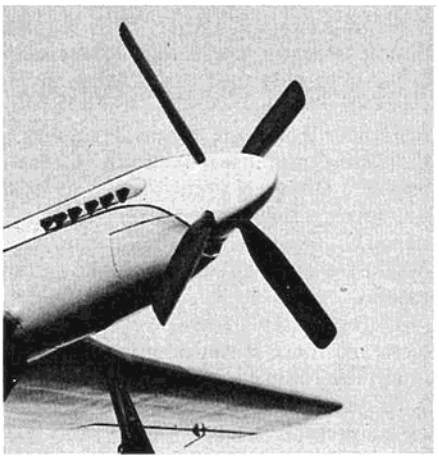


on an aerobatic demonstration which was like nothing I have ever seen. He came across the runway at top speed, no more than 5 or 10 feet off the ground as he did slow rolls the full length of the field, pulled up doing victory rolls, followed by a wingover, and right back down on the deck across the airfield again. The airshow with the P-51 was nothing less than spectacular. "Red" St. Alban had convinced me that multi should be scale and Bob Hoover convinced me that a P-51 was the perfect airplane.

Going back through my model airplane magazines, I found that although the P-51 is a natural stunt aircraft, as a radio control model it has been one of the most butchered designs. Typically, it is a hodge-podge between a misshapen P-51D fuselage, a P-51H wing without the wheel well bend, and a spinner which is a ridiculous one-third scale size. I was extremely disappointed at the lack of reasonable approaches to the P-51. Therefore, I decided to go ahead and design a P-51D of my own. As a source, I obtained the Morgan P-51 book which has a set of factory three-views in it with body cross-sections and also a Monogram plastic model of the P-51D (kit No. PA-77). In addition, at our local airport a privately owned P-51D was available so that I was able to compare my own plans and the real aircraft. Checking the plans of the P-51, I discovered to my delight that the moments were almost identical with those of a Class III Orion, the only difference being the nose moment arm was about one inch longer than that of the Orion. However, the relationship wing to elevator is nearly the same. Therefore, I decided to build an aircraft of roughly the same general size as an Orion. One other consideration was to draw it of such a size that the engine could be completely cowled. There is nothing more annoying to me than to see a scale aircraft with a big model airplane engine cylinder hanging out where it doesn't belong. Although the moment-ratios of the P-51 are nearly perfect for a model airplane, the airplane is typical of World War II fighters in that there is almost a one-to-one ratio of wing span to body length (37' to 32') which results in rather large fuselages for a reasonable amount of wing area on a model airplane. To get around this problem, I cheated just slightly in the design of the wing as it was lengthened approximately two inches on each panel and one inch of chord added to the wing. Such a differnece is so slight that unless one actually measures the plans, computes the wing span to body-length ratio for both the airplane and the plans, one would not be able to detect this difference. In addition, for model airplane flying, one needs a slightly larger elevator than is true of the World War II fighter planes. Here again, by maintaining the same ratio between tip-chord and center line chord of the elevator, the scale illusion is maintained. Unless one measures with a calipers, you will be unable to detect that the elevator is not scale size as it is proportioned properly. Other than these two slight deviations in the basic P-51 design, there have been no variations from scale in this model. I am sure that these deviations are smaller than those typically encountered in the usual scale event, let alone in the multi-stunt event.

Before discussing the construction of the P-51, a word or two about the resulting flying characteristics are in order. The actual P-51 is very sensitive to the controls and I also find it true of the model. I find that with my Digitrio it requires only very slight stick pressures to obtain various acrobatic maneuvers. It is not an airplane where one hauls the stick from corner to corner. If you do, you will find your aircraft is all over the sky. After having read the description of flying a P-51 in the Morgan book, I find that my scale P-51 handles much the same as the real aircraft. Rolls are performed with very minute pressures on the stick from one side to the other; for loops, one merely puts back the pressure on the stick and around she goes. One of the most spectacular maneuvers with this P-51 is to do a low fly-by. I usually do a 180° overhead approach and bring it down off the runway about two or three feet at full bore and then pull up doing a victory roll on the fly-out. Members of our Madison Area Radio Control Club who have been P-51 jockeys are swept with a wave of nostalgia as this maneuver is performed. Touch and go's with this aircraft are also extremely nice as the P-51 tends to settle in in a rather flat attitude, the landing gear looking as if it is reaching for the ground. As was the case with the real P-51, you do not dare firewall the throttle to get off the ground to continue a touch and go. If you do, you will very quickly discover the aircraft rolling sharply to the left and snagging a wing tip. Many a real P-51 pilot met his end with this maneuver. However, if the throttle is eased forward gradually and air speed built up properly, the aircraft goes straight on out in a normal touch and go. I also find that with a scale-type aircraft it is much more impressive to fly close in so people can see the canopy, the landing gear details and the registration numbers as the aircraft is flying by. My P-51 was powered with a K&B 45, which is less than optimum power. I would strongly suggest putting in a Supertigre .56 or possibly one of the new .60-size engines in order to get it to go through the vertical-eight with a little more ease. The current aircraft will do it; however, it is much like "Red" St. Alban's Corsair in

(Continued on Page 22)



P51D

(Continued from Page 21)

that they get a bit sleepy toward the top of a power maneuver. By and large the people who have seen this P-51 fly have been very impressed not only with its looks, but also with its flying characteristics for a multi-type aircraft. If you are now convinced that this is really the way to go, let us take a look at the construction of this scale P-51.

●

The body is a straightforward multi-type construction which is begun by cutting out the body sides from 4-inch wide 3/32" sheet and epoxying in the doublers which go all the way from the nose to the trailing-edge of the wing. The 3/8" by 1/8" reinforcers should also be installed. The P-51 is essentially slab-sided to a point about three-fourths back of the wing, at which point the body starts to round and by the time it gets to the leading edge of the elevator, the body is egg-shaped. Therefore, I normally start from the front and work towards the back. Glue in all the formers through former #8 and allow them to dry. Once the body from former #8 forward is firmly assembled, I soak the rear of the body sides in hot water and then glue in formers 9 through 13, holding the body sides in with rubber bands or masking tape. The remainder of the body, top and bottom is covered with 3/32" sheet. I am a balsa bender which is done by soaking the sheet in hot water and gluing it to the formers with white glue which is water soluble. No difficulty whatsoever was encountered in using one sheet of wood for each quarter-round area of the top and bottom of the body. One of the usual difficult problems in a scale aircraft is one of how to attach the front wind screen to the aircraft after the body has been built. On the actual P-51 the front windshield flows very smoothly into the body in a rather unusual curve and the windscreen does not look as if it were bolted to the frame afterwards. In order to solve this problem, the canopy was moulded out of 1/16" plexiglass in two pieces, the first piece goes from former #6 to the separation line of the canopy. This includes a portion of the body as well as the windows themselves. So what was done was to cover the window area on the plexiglass with masking tape and leave this masking tape on throughout the rest of the construction of the airplane. The plexiglass section was then glued into the body and Hobbypoxy stuff used to flow the body into the plexiglass in such a way that it looks as if the windows are built right into the airplane. The net result of this is to give you front and side windows on the P-51 windscreen which look like they do on the real airplane. The canopy also requires special treatment in order for it to fit the body. On the actual aircraft the body humps very sharply from former #8-C forward in order to meet the canopy which is coming down vertically. In order to accomplish this hump, I glued balsa blocks to the half round of the upper body from the body sides up to the point where the canopy meets the body and at this point cut them off level in order that the canopy fits properly on the fuselage. Then carve these balsa blocks so that they are flush with the body sides, the canopy, and also curved into former #8-C where the top of the body sheeting points the blocks. What happens here essentially is the body is flat as it comes around the canopy and then between former #8 and #8-C the blocks are carved down, flow into the half-round top of the fuselage. It is very difficult to describe how these blocks look; however, they are necessary in order to have a canopy which is essentially wider than the half-round fuselage, meet properly and also slide back. If you will notice the top of the plans, the blocking is straight all the way back to, roughly, former #8 so that as the canopy is pulled back and open, it has tracks to ride on. The only other feature of the fuselage which is at all different is that a hole is cut through formers #2, #3, and #4 in order to be able to insert a plastic gas tank through the wing opening. On this particular aircraft, I wrapped 3/32" balsa around a gas tank, glued it, and wrapped it with masking tape in order to maintain its shape. After this tube was dried, the masking tape is removed and the tube inserted inside the fuselage in order that the gas tank is supported throughout its full length. The tube also prevents fuel from leaking down into the fuselage where you can't get at it to wipe it up, etc. Another thing done at this point is to squirt GE clear-seal around the hole in former #2 and then insert the gas tank, without its cover, through this hole in order to form a nice silicone rubber seal. In use, the gas tank is inserted through the tube and then the cap is screwed on in the engine compartment. The hole in former #2 is not large enough to take the cover itself. There is, however, plenty of room to screw the cap on in the engine compartment. The rudder construction is also conventional, but one does have to be careful to watch that the body flows into the rudder below the line of the elevator. Although the rudder is relatively straight-tapered from its top down to the elevator, it then bulges quite a bit in order to complete the flow of the egg-shaped body out to the trailing-edge of the rudder. On the plans the rear rudder post shows how this flows. However, one should build the body first and then after having inserted the vertical fin, carve the rear post to match the body and the vertical fin. The dorsal fin should be covered with the same 1/16" sheet as the vertical fin in order to eliminate any sheeting joints which might appear where the dorsal fin joins the rudder.

Because the P-51 has an unusually large spinner, I was unable to commercially obtain a spinner for this aircraft and was forced to construct my own using the method advocated by the people who sell Hobbypoxy glue. I turned a spinner out of soft pine which was approximately 1/16" smaller than that shown on the plan, then wrapped this form with Saran wrap, or a similar household wrap, and then proceeded to use a very heavy grade of boat fiberglass cloth in conjunction with the Hobbypoxy glue and the balloon technique. One layer of cloth is not sufficiently strong for the spinner, so three coats of cloth and glue were used with a heavy sanding between each coat in order that the Hobbypoxy glue has something to grasp. After the final sanding, one more coat of glue was laid on and held down with a balloon until hard and this gives a very smooth, glass-like finish. Regular Veco spinner hardware was used to hold on the fiberglass spinner to the engine. There is real need for the manufacturers of spinners to produce some scale spinners for aircraft of this particular size. The spinner is approximately 3¼ inches in diameter which is bigger and slightly different shape than the usual commercial spinners. However, in order to maintain scale, it must be as shown on the plans. A commercial 2¾-inch blunt-nosed spinner as used on a typical multi looks ridiculous on the front of the aircraft so I strongly advise obtaining a scale spinner.

The elevator assembly is also conventional and is completely covered with 1/16" balsa. I believe the plans are quite clear on how to build it.

The wings are also constructed in a very conventional fashion and are covered from the wingspars forward with a 3/32" sheet and from the wingspars back with 1/16" sheet. One of the big problems in building a P-51 is to build in the bend in the wing which is required by the wheel wells without weakening the structure. After looking at this problem

for a long period of time, I decided that any system which would break the leading edge at this point would be exceptionally weak. I finally settled on the procedure used on the plan in which the leading edge of the wing is actually brought all the way through the center section ribs to the center line as if it were a conventional wing, except that it passes through the ribs and not forming a leading edge at this point. An additional leading edge is then inserted in front of ribs 1, 2, 3, 4, and 5. It is necessary to carve the shape of the leading edge from former #3 out through former #6, roughly, in order that one sheet of 3/32" can be used to cover the total leading edge of the wing. This requires some fairly tricky fitting in order to flow smoothly from rib 6 through rib 3. However, from there on, it is a very straightforward matter of getting the sheeting to match up properly. On my model I really had no trouble in doing this once I discovered that I needed to carve the leading edge as indicated previously. I also hate to build ailerons so that on the original model I actually laid out a trailing edge which is a 1/16" sheet all the way from the center section to the tip, installed the aileron spar in the wing, and also the leading edge of the ailerons as if they were spars within the wing itself.

After having completed the basic structure of the wing, a razor saw was used to cut through the trailing edge material and lift out the aileron. One should also install the nylon strip aileron hinges before installing the 1/16" sheet upper covering of the wing. In this way you will completely hide the hinges and will not have any ugly dowels or pinheads showing in the covering. You should also notice that a 1/16" plywood aileron bracket plate is mounted in the upper side of the aileron against the 1/16" sheet covering so that only a very small section of the horn hangs down below the wing. The aileron spar in the wing, and also the leading edge of the aileron are cut at an angle in order to provide a clearance for the aileron when it is in the down-position. There is no difficulty in the up-position as the approximately 1/16" gap between the aileron and the wing is sufficient for this movement. On my P-51 the ailerons have approximately 1/2-inch upward and downward travel which proves to be more than adequate for acrobatic maneuvers.

The only other part of the wing which requires any special care is the landing gear. On my P-51 5/32" music wire was used for landing gear, but I found it was inadequate as the landing gear tends to bend excessively on landings which are not perfectly smooth. Therefore, I have shown 3/16" music wire on the plans. Another scale point which has always bothered me is thin landing gear struts, and to hide the wire, a piece of 1/2-inch dowel is used. The dowel is drilled out to fit the wire and then split with a razor saw and epoxied back over the wire to give a scale-size oleo strut. At the same time this strut is glued on, one should also insert the four landing gear cover supports so they get epoxied inside the dowel. The wheel cover plate consists of two pieces — the outer piece is 1/16" plywood and the inner piece is pine. After installing the wheel cover supports in the landing gear, one should bend them over to fit between the inner and outer wheel cover pieces which are then epoxied together. This latter operation should be done after the airplane is painted so that you don't run into difficult problems of trying to finish the wheel cover plate with all the struts in the way, etc.

Once the wing has been completed, the cam-locks installed in the proper places, and the wing dowels installed, lay a sheet of Saran wrap over the center section and attach the wing to the fuselage in order to install the fillets. Prior to tightening the cam-locks down, a strip of 1/32" plywood, approximately 1-inch wide, should be glued under the edge of each body side in order to form the bottom of the fillet. On my P-51 I forgot to do this and photographs reveal a nice scalloped edge on the fillet which is highly undesirable. The 1/32" plywood will prevent this happening. A piece of 1/32" ply also is glued to the body side and out to the trailing edge of the wing to form the curvature where the top and bottom fillets join the body. The fillets themselves were constructed of fiberglass auto body putty which is available at Sears Roebuck, Montgomery Ward and any number of auto repair stores as it is used in fixing fenders, etc. I mix this up in a moderately fast-drying configuration and put it into place with an artist's pallette knife. It is not possible to get this completely smooth but you can get a reasonable approximation to the proper fillet by this technique. Once the fiberglass has dried, I find a rat-tailed wood file, with a rubber crutch tip slipped over the end so you don't gouge the body elsewhere, will smooth down the fillet to the proper shape very quickly. 220 grade wet or dry paper is used to feather the fillet into the body. On my P-51 it is impossible to see where the fillets flow into the body. This essentially completes the construction of the aircraft and there is nothing highly unusual about its construction other than one has to be careful to keep from the trailing edge of the wing back light as there is a lot of wood back there. The engine exhausts were made out of 5/16" birch dowel and the manifold coverplates from which they extrude were pieces of pine carved to fit the fuselage and epoxied on after the aircraft had been painted.

The finishing technique used in this airplane is one given to me by a member of our local club and I found it to be exceptionally worthwhile. In that the model is completely wood covered, it is necessary to get the wood smooth before putting on additional covering. Several coats of clear butyrate, sanded between each coat, will smooth out the wood itself. Then **spray** on one or two coats of Aero Gloss balsa filler coat and sand it down until a very smooth finish is obtained. Any little pit marks formed by pin holes and places where sheeting meets can be filled with balsa putty and sanded down. Once the airplane has a very smooth finish, then cover the complete airplane with lightweight silk. Three coats of balsa filler coat are then **sprayed** on over the silk and sanded between each coat. The color scheme is they sprayed on the aircraft. I mixed 1 bottle of Aero Gloss metallic blue with one bottle of Swift white to give me a sky blue or powder blue finish which had just a touch of metallic to it. Two coats of color were sprayed on and then the trim was added. Lay out the registration numbers using masking tape and spray on the white over the blue to get these numbers. The white stripe down the body was pin striped with the 1/16" wide black strip which is a very effective way of outlining the trim. After the trim was installed and the engine exhaust stacks installed on the side of the body, I then gave the entire aircraft two coats of clear Aero Gloss and compounded down the last coat of clear. This gives a finish which has some depth to it and also protects the color paint.

In that commercially moulded canopies were not available, it was necessary to try to mould my own. The canopy-moulding form was made by gluing together five or six pieces of extremely soft pine which I obtained from a cabinet-making friend of mine and then carving the canopy according to the templates given on the plans. You will find it quite advantageous to carve the canopy moulding block before one covers the top of the body as you then can carve it to fit the body sides, etc. However, this can be done afterwards just as well through the use of a caliper. Once the wooden form is carved properly to shape, and sanded down so that it is glass-smooth, we can proceed with the moulding. I mounted the form on two 1/2-inch dowels about 6 inches above a piece of 2 x 4 so that I could get some working room underneath the edge of the form. The front windscreen is moulded out of one piece of 1/16" plexiglass. I cut a piece of shelf paper somewhat larger than needed to see how it fits over the form so I know how to cut my expensive plexiglass. By drilling small holes in the outer edges of the

(Continued on Page 24)

(Continued from Page 23)

plexiglass strip and tacking a piece of wood on either side of the plexiglass, it provides one a handle to grab for forming purposes. Lay a piece of flannel in the 450° oven and leave the oven door slightly ajar so that you can watch the plexiglass. After the plexiglass gets to the point where it becomes limp, pick it up by the two wooden pieces on the end, center it over the form and then with a very quick motion push it against the form, pull it down around the sides and bend it under the edge of the form. Pull the form and plexiglass together out of the oven and let them cool in the air. This normally only takes several seconds, and then you can slide the canopy off of the form. In some cases if you wrap it around too hard, you may have to take a razor saw and cut it away from the edges. The front piece is extremely easy to form and my very first one is the one I used on the airplane. The back half of the canopy is not quite as easy to form and here again I found it necessary to do some experimentation in order to get the proper technique. What one needs to do is to cut out a pieces and in about 4 inches. Then use cloth to the canopy to decide how big a piece of plexiglass is necessary. Attach wood strips along the outside edges, except for the front edge, in a "U" shape as described above. Then drill two 1/16" holes in the plexiglass at about a 45° angle between the side and the rear pieces and in about 4 inches. Then use a razor saw to cut through the plexiglass to each of the small holes. Lay this large sheet of plexiglass in the oven until it becomes limp; pick it up and press it down over the front edge of the canopy from about the saw line back through its highest point and force the canopy to fit through this region. Remove the form and plexiglass from the oven. Wrap this portion of the canopy with flannel strips in order to insulate it from the heat of the oven. Expose the uncovered section to the heat of the oven until it becomes limp again, then pull down on the side pieces in order to pull in the canopy as it becomes narrower, at the same time pull down sharply on the rear piece which is now flapping free from the sides to form the rear point of the canopy. It is really done in two stages, one of which you form the front part and let it harden, wrap it with flannel cloth, then form the back part by pulling down and in on the side pieces and then after they are down and in, pulling down on the back piece in order to get it completely formed. This may seem rather complicated, but with my own hot little hands I was able to mold a rather large piece of plexiglass into a scale-type canopy. It is really well worth the effort as this model does not really look well without a clear canopy.

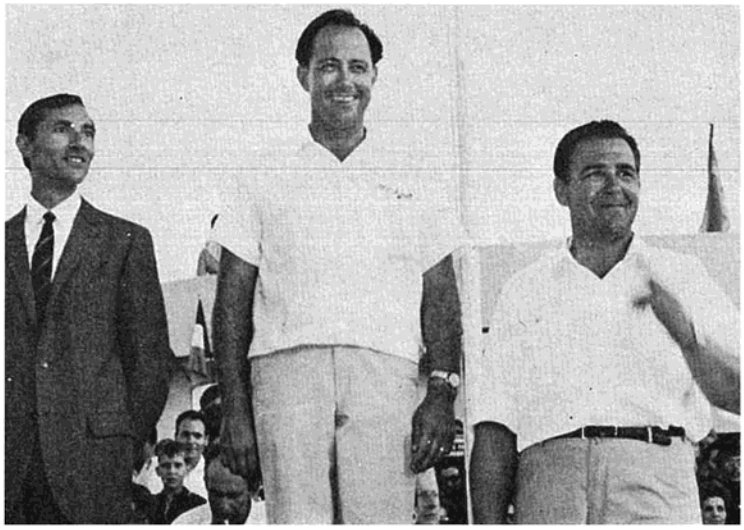
The original P-51D has a metal shroud around the edges of the canopy which contain the tracks, etc., for attaching the canopy onto the airplane. In my particular airplane, I cut a piece of .010 brass shim stock and contact cemented it to the canopy, letting the brass extend approximately 3/32 of an inch below the edge of the canopy. Brass was contacted to both the inside and outside of the plexiglass itself. In order to provide tracks for the canopy to slide on, I slipped .045 music wire inside of a 3/32" nylon tube of approximately 3 inches in length and bent the wire in a "U" shape with the legs of the "U" approximately 1½ inches long. I then spiral wrapped a piece of 1/16" wide .010 brass to the front and another one to the end of the nylon tubing and then soldered this brass to the insides of the canopy shroud. The fuselage was then drilled to accept the "U" wire. Glue was squirted in the holes with a needle-glue gun and the wires inserted in the holes. On the first flight of my P-51 air pressure was sufficient to move the canopy back on the tracks even though it was hard to move by hand. Therefore, small brass strips were installed inside the cockpit and 3/32" holes drilled through the outside shrouds to allow sheet metal screws to be inserted to hold the canopy in place during flight.

It is my fervent hope that this P-51 will be built by a large number of modelers throughout the country so that we can get multi-stunt back to where I think it really belongs, namely that it should be a scale stunt category. The performance of this P-51 and other scale models, such as the Hawker Hurricane published previously can be equal to that of today's currently highly specialized multi-stunt planes. If large numbers of scale multi-stunt planes appear at contests throughout the country, many more modelers will become interested in contests. Spectator appeal and our public relations with the general public should be vastly improved as the airplanes no longer look like mechanical toys but will look like replicas of actual airplanes.

Phil Kraft has just been awarded the World Championship R/C Trophy. U. S. National Anthem being played as American flag is raised at Corsica.

PHIL KRAFT WINS WORLD CHAMPIONSHIP!

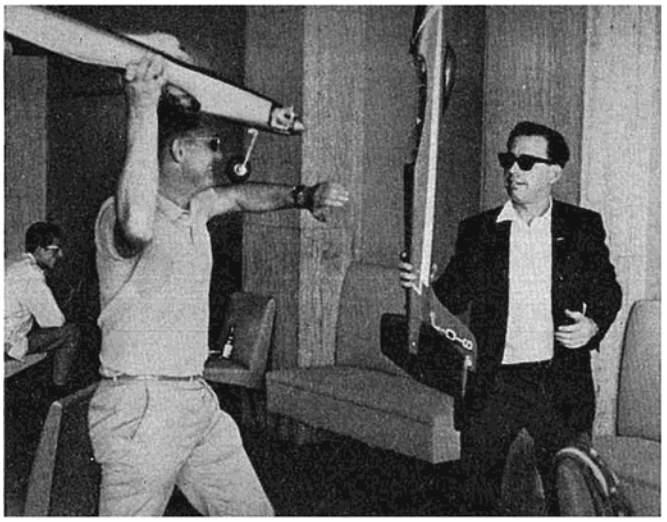
U. S. R/C team captures fifth consecutive victory at Corsica on June 25th. Spreng, Fourth; Weirick, Tenth.

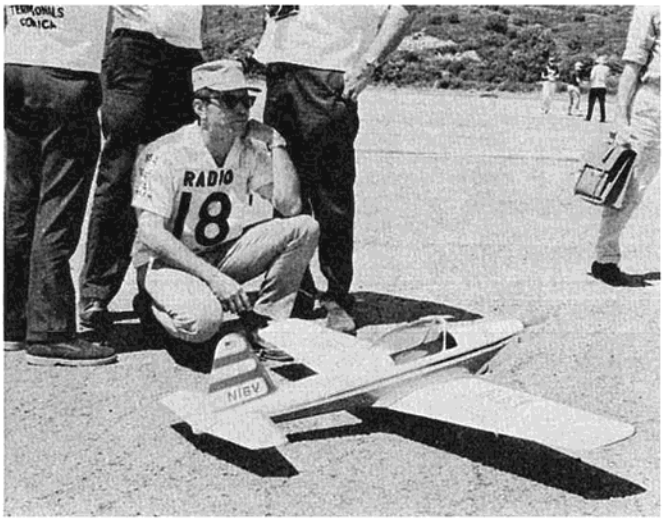


Marrot of France, 2nd place; Kraft of USA, 1st place; and Bauerheim of Germany, 3rd place; at awards presentation.

Pierre Marrot of France, second place winner and his original shoulder wing plane "Satanas."

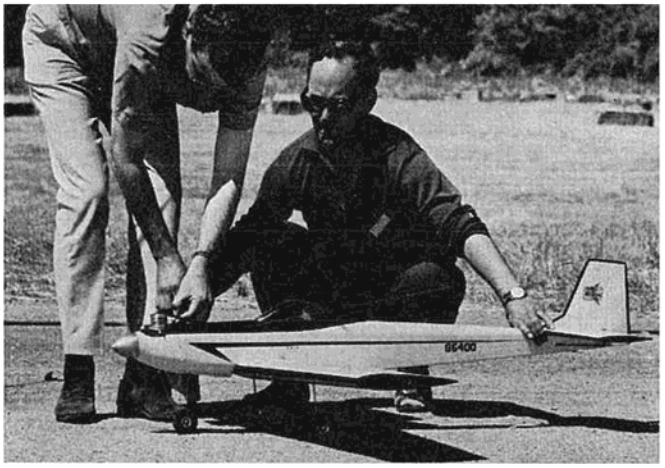
German vendetta fails as Kraft and Kwik-Fli win by massive 1200 point margin! France's Marrot second as Germany's Bauerheim nudges out Spreng for third place. Weirick, hampered by scale Chipmunk, takes tenth position. Complete Internat's photos and text in October issue.

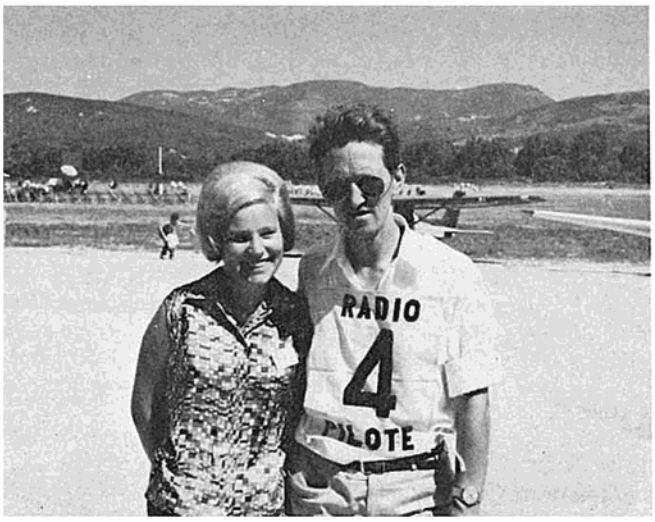




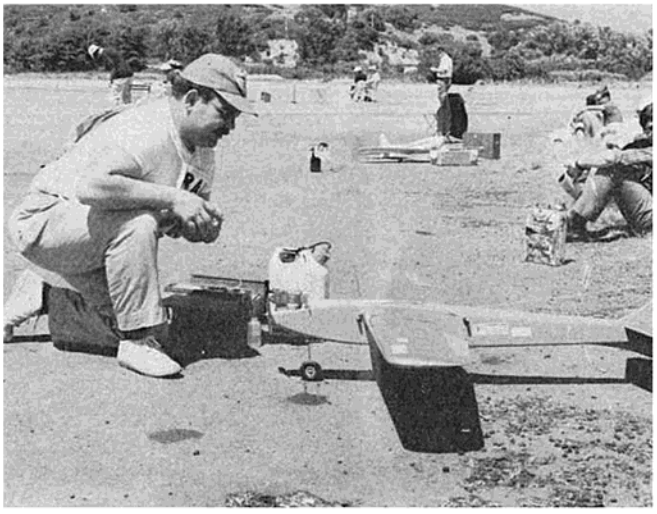
Above: Rich Brand of South Africa, 11th place, challenges Doug Spreng, USA 4th place, to a duel at Nice Airport. Below: Chris Olsen, 9th and Roger Hargraves of Great Britain starting Olsen's "Upset," possibly best plane in meet.

Above: Cliff Weirick, USA 10th place, with Chipmunk. Below: Dejected Fritz Bosch after interference aborted first flight, costing championship.





Fritz Bosch and wife. Bosch aborted on first flight due to interference.



Cousson of France, 12th place with Lucifer design. 13,212 points. French took third place team honors.

Walter Schmitz, 5th, and wife with original airplane "Happy." 14,705 points helped Germany take 2nd place in final team standings.

5th World R/C Championships Final Standings

Place	Name	Nation	Score
1	Kraft	U. S.	16,496
2	Marrot	France	15,265
3	Bauerheim	Germany	14,875
4	Spreng	U. S.	14,861
5	Schmitz	Germany	14,705
6	Matt	Liechtenstein	14,411
7	Sweatman	So. Africa	14,354
8	Giezendanner	Switzerland	14,286
9	Olsen	Great Britain	13,690
10	Weirick	U. S.	13,584
11	Brand	So. Africa	13,533
12	Cousson	France	13,212
13	Van Vliet	Holland	12,499
14	Thelin	Sweden	12,048
15	Haegeman	Belgium	12,035
16	Reda	Italy	11,936
17	Schenk	Switzerland	11,791
18	Oldenburg	Sweden	11,680
19	Stephansen	Norway	11,579
20	Reineri	Italy	11,353
21	Sekirnjak	Austria	11,325
22	Wessels	So. Africa	11,284
23	Waters	Great Britain	11,278
24	Bosch	Germany	11,143
25	Laline	Belgium	10,789
26	Pham	France	10,366
27	Gobeaux	Belgium	10,075
28	Guglielminetti	Italy	9,529
29	Michalovic	Czechoslovakia	8,727
30	Wallner	Austria	8,228
31	Von Segebaden	Sweden	8,187
32	Hammant	Great Britain	7,953
33	Rasmussen	Denmark	7,130
34	Gloor	Switzerland	7,103
35	Papspyros	Greece	6,929
36	Vostry	Czechoslovakia	6,788
37	Nottermans	Luxembourg	5,095
38	Behm	Luxembourg	6,033
39	Dettelbacher	Austria	5,466
40	Bertemes	Luxembourg	5,095
41	Tonnessen	Norway	2,601
42	Rapstad	Norway	110
	Andersen	Denmark	Forfeit

PRECISION PATTERN AIRCRAFT DESIGN

part V

A study in Class III Aerodynamics by

BEN HERMAN
JACK CAPEHART

BEFORE proceeding into the actual discussion on maneuverability we would like clarify our closing remarks in the last article. At that time, you will recall, we were discussing the oft-misunderstood concept of neutral stability, particularly with respect to the pitch axis. As we pointed out last time, an airplane that "stays where you put it" in response to a control surface deflection which alters the notion of the CG, is really not a problem of stability. We hope the following discussion will clarify this point.

Stability has already been defined as the tendency of the aircraft to return to its original equilibrium attitude when **momentarily** disturbed. This is referred to as static stability by the aerodynamicists. If the plane stayed in its new, "disturbed" attitude, it was termed neutrally stable, or more precisely, neutrally statically stable. It would appear that this is virtually impossible to achieve in the pitch axis, because once displaced, the forward motion of the center of pressure (for displacements increasing the angle of attach of the wing) will immediately cause an unstable condition. However, if one could achieve neutral static stability, the plane would stay in its new attitude for any momentary disturbance. This would prove most undesirable, we suspect, from the point of view of trying to maintain any semblance of a heading.

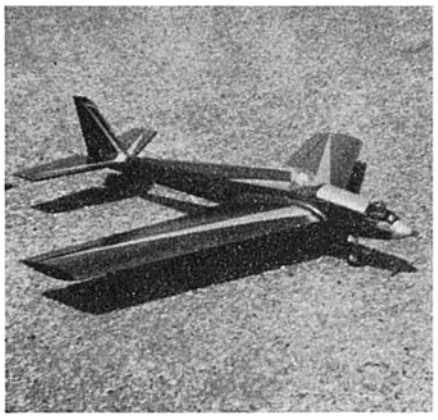
It would be particularly undesirable to have neutral **Dynamic** stability in the pitch axis. The term dynamic stability refers to the character of the damping of the oscillations induced by the static stabilizing forces as discussed earlier in this series of articles. Thus, a dynamically stable aircraft is one for which the oscillations about the equilibrium point are damped, while one for which the oscillations grow in time is called dynamically unstable. The in-between condition where the oscillations are neither damped nor grow in time is called **neutral** dynamic stability. It is obvious that this condition is also highly undesirable. Thus, we see that neutral stability, either static or dynamic, is not what we are after with our aircraft, at least along the pitch axis. Thus, pointing the nose where we want the plane to go by means of elevator deflection, and, having the plane go that way, does not imply a neutrally stable airplane.

Finally, we may note that a definite advantage of **static** neutral stability in the pitch and roll axis, is that no dynamic stability instabilities could arise, since the static, stabilizing forces which initiate the oscillations would never be present. Actually, we are probably close to this condition already in the roll axis. At any rate, the condition of neutral static stability would allow for more maneuverability as has already been pointed out. This situation, at least in roll and pitch, is probably tolerable in full-size acrobatic aircraft where the pilot has more time and instrumentation to maintain a heading. However with our toys we are not in such an enviable (?) position and things just happen **too fast.** Thus, in our opinion, a certain degree of stability along all three axes is required.

Thus, having concluded our sermon for the day, we can get on to more interesting subjects.

So far, we have been discussing straight and level flight only, and how we maintain this condition through stabilizing and damping forces. Now for some of you, this straight and level flight jazz may not be a problem, while for others, namely the authors, the ability to maintain this flight condition is more than a minor achievement. Seriously though, the achievement of straight and level flight is essential for performing any maneuver. In fact, the good book says we must fly straight and level for 50′ before entering and after leaving all maneuvers. It has been our experience, in fact, that getting the wings level before entry is one of the most difficult, yet crucial aspects of performing the maneuvers, particularly looping maneuvers. Obviously, the better the airplane maintains straight and level flight, the easier our job will be. This is equivalent to automation and frees the pilot to concentrate on what he has to do to perform the maneuver itself. This is the reason that so much time has been spent discussing stabilizing and damping forces, for it is through these factors that straight and level flight (or an approximation thereof) is at all possible.

We now want to focus our attention to deviations from straight and level flight caused by the pilot in order to achieve a given maneuver. To put the following discussion in proper perspective, we'll repeat our original statement in the first of this series of articles: Aerodynamics is such a complicated subject that to study it with any degree of thoroughness would require the use of a modern high speed computer. What we will try to set forth here are certain design considerations which we feel are important, and yet simple enough that they may be discussed. Further, because of this high degree of complexity there are undoubtedly, many alternative design approaches one can



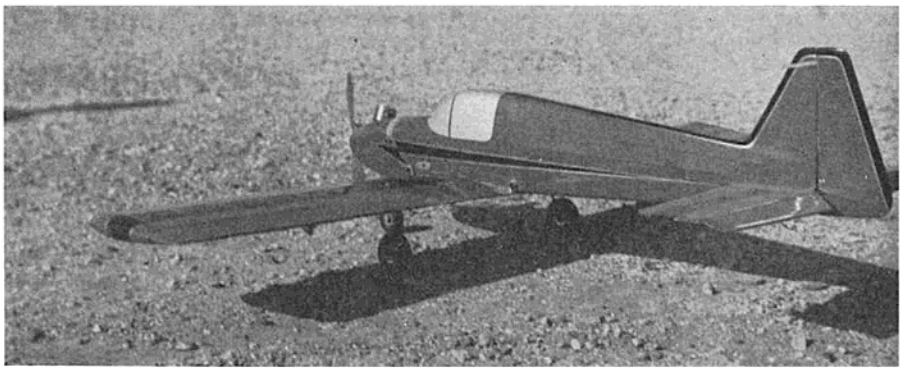
TRCC member Walt Schultz's original Swift-Wing. This is the latest in a series of swept-wing designs. Mid-wing with 25 degrees sweep per panel.

take to obtain superior performance. Therefore, what we have to say represents only those considerations which we have thought of and to some degree, experimented with. Undoubtedly, others will come up with different, but equally good approaches to achieve the same results. However, if what we have to say inspires some of you more creative types to original effort, then we will have achieved part of our purpose.

All maneuvers are introduced by the application of an unbalanced force in the form of a control surface deflection. If this initial, unbalanced force were all that we had to worry about, things would be relatively simple. Unfortunately, once the initial force is applied, additional forces are normally induced which serve to complicate what started out as a simple deviation from straight and level flight. As we shall see, most of these additional forces tend to detract from the precision of the maneuver and we therefore will need to understand them in order to minimize these effects. This is commonly called compromise even though Dewey, in a more optimistic age, had promised never to do this.

Perhaps the best way to discuss this subject is to consider what happens when one of the three primary control surfaces is deflected, and the deflection is held (the holding of the control is what distinguishes this discussion from the previous ones in which only brief, momentary disturbing forces were considered). As usual, we'll begin with the yaw axis. Ideally, with no interactions, a deflection of the rudder will result in a yaw. Some of our present class III aircraft actually approach this condition which, with our present AMA class III pattern, seems to us to be more or less desirable. We think you'll agree when you consider present maneuvers in which rudder deflection is necessary.

Okay, what does happen when we deflect the rudder? First of all, the plane starts to yaw in the direction of the deflection and a sideslip motion sets in. As has already been discussed, this sideslip motion together with dihedral and normal vertical fin placement above the CG results in the initial yaw being converted into a roll. We have been taken to task by certain members of the TRCC for not mentioning another effect here. During the course of a yawing motion the outboard wing moves faster and therefore generates more lift than the inboard wing. This effect would also tend to create a rolling motion. We are inclined to be dogmatic here and assert that this effect is relatively small. If it were of importance, our present low wingers with minimal dihedral should roll as well, or at least nearly as well as a class I ship with rudder deflection only. Our dogmatic attitude has several



Phil Kraft's new design seen at '67 Southwestern Regionals. Phil has gone to a larger vertical fin and fuselage side area. Our observations were that this essentially corrected the oscillations in the wingover associated with the Kwik-Fli II.

sources:

1. Try rolling your present class III aircraft with normal, minimal dihedral on rudder only — you'll be lucky if the darn thing even turns.
2. Try rolling a VK Cherokee with its large dihedral on rudder only — it does roll like the three we've had here in Tucson, doesn't it?
3. One of the unbelievers from Tucson constructed a flat wing for his DeBolt Jenny, after having flown it with the normal wing. He now is a believer.
4. One of the unbelieving authors of this unbelievable series in his "pre-expert" days, constructed a minimal dihedral class I ship, suffering from the delusion that this would improve the rolls. It was a delusion.

In view of the above, we are convinced at the moment, at least, that this effect is negligible. Thus we feel the main interaction here is a conversion of yaw to roll due to dihedral. Inverted, this effect may be so strong as to convert left rudder to left roll as has already been discussed. This latter effect would seem to be desirable for class I and II aircraft, of course. Interactions of the roll axis with yaw displacements are, of course, also present with sweepback as has also been discussed.

Well, is this effect really detrimental? Consideration of the present Class III pattern reveals that the only maneuver in which a yawing motion is required is the wingover. We consider this a key maneuver and thus will examine it in detail. At this point, however, we'll only consider the yawing portion. The perfect maneuver, according to the good (?) book, is one in which the plane climbs vertically, approaches a stall, does a 180° yawing turn, and returns, without the usual oscillations, **the wings always remaining in the same plane during the entire maneuver.** This latter statement requires that there be no motion about the roll axis. Let's assume that we have just applied left rudder at the top, while the plane has enough forward motion for the rudder to be effective. One of two things can, and frequently does, happen. If the forward (upward) motion of the plane is too fast, the left yaw will result in a left roll (with dihedral, and/or sweep), which requires a right-aileron correction all too frequently observed by the judges. If the first one doesn't get you, the second one will. If we start the yaw turn at too slow a speed (see fig. 32) the plane will start slipping **down** with a relative wind as shown in the figure.

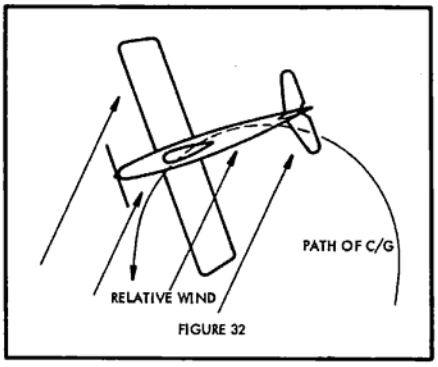


FIGURE 32

The relative wind, striking the normal "dihedraled" wing and high vertical fin will now tend to roll the plane to the right, requiring left aileron correction. Again the judges usually notice this. We might add that, although sweepback also produces the same rolling tendencies, it is our experience that, at least with moderate sweep (15° to 20° per wing panel) the rolling tendencies were much less. Here again, it is interesting to note the advantage of the symmetrical vertical fin (equal area above and below the CG). As was pointed out, the symmetrical vertical surface produces no rolling torques with yaw displacement. This is one justification for the current trend towards sub-rudders. It thus looks to us that the cure for the defects would be a non-dihedraled, non-swept wing with a symmetrical vertical surface. Here, compromise is required as the above configuration will not produce the necessary roll stability. We feel that the best wing configuration for this maneuver is little, or no, dihedral, and moderate sweep-

(Continued on Page **30***)*

back. The swept wing and symmetrical fin will enable us to enter the maneuver slow, as it should be, as this configuration will minimize the right rolling tendency shown in fig. 32. The slower entry speed may require more turning power, which can be secured by increasing the size of the movable vertical surface, which would be advantageous anyway.

Another factor peculiar to the wingover involves yaw damping. Most aircraft that we've observed, if they do a good, slow stall turn, will tend to oscillate about the yaw axis on the downward portion of the maneuver.

The character of oscillations of an aircraft in response to a stabilizing force (yaw stability in the case of a wingover) is associated with the dynamic stability characteristics of the plane as has already been noted. Let's look at this in a little more detail. Referring back to fig. 32, we see that the relative wind striking the plane during the turn portion of the maneuver, in addition to tending to roll the plane, tends to rotate the nose down in line with the relative wind. However, due to the slow forward (downward) motion of the CG, the relative wind, at least near the top of the maneuver, is slow, and the plane can overshoot its equilibrium position. In fact, about the only appreciable force tending to counteract the rotation about the yaw axis is the damping force by the vertical surface. If the plane goes through a series of oscillations about the yaw axis, it indicates inadequate yaw damping and should be correctable by increasing the vertical fin area. In fact we have substantially improved the Kwik-Fli II wingovers by adding a sub-fin. We highly recommend this modification for a number of reasons on the Kwik-Fli II.

Now let's consider the roll axis. The importance of clean, axial rolls and the number of maneuvers requiring them need hardly be stated here. In all rolling maneuvers, the book requires them to be purely axial with no change in altitude or heading. This is aerodynamically impossible as we will shortly demonstrate. However, what we can strive for is to make them as nearly perfect as possible.

We are of the opinion that very few people understand the rolling maneuver (after you read this, you may include us in this group). In order to understand rolls, we must, as we painfully found out, decide what axis the plane will roll about, upon undergoing aileron deflection. Apparently this is no simple question, or, if it is, the aerodynamicists are not able to explain it simply (to us at least). It can be established that the roll axis must go through the CG, at least for symmetrical airfoils. We say this, assuming that the increase of lift on the wing with the downward deflected aileron is exactly equal to the decrease in lift

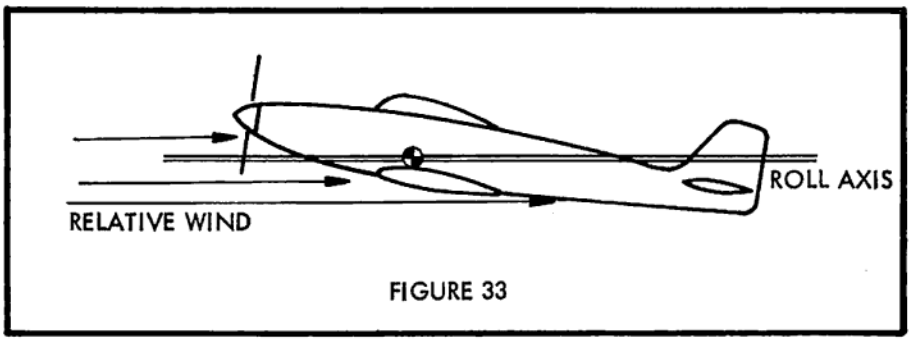


FIGURE 33

on the upward deflected aileron. Under these conditions, if the lifting forces balanced the weight before the ailerons were deflected, they will still balance the weight after deflection. That is to say, there are still no unbalanced **vertical** forces on the plane, and therefore the CG will not be displaced either upward or downward. However, because the lifting forces are now different on each wing, a rolling **torque** is established. Points on the axis of rotation do not move, and since, under the above assumptions the CG does not move, it must be one point on this axis. These conditions are probably not exactly met because it is unlikely that the increase of lift on one wing is exactly equal to the decrease in lift on the other wing, so that a small unbalanced vertical force is likely to be initially present at the instant the ailerons are deflected. This will result in a small upward or downward motion of the CG, so that the axis of rotation is probably not exactly through this point. However, since the unbalanced vertical forces are normally very small (they better be or the plane will climb or dive drastically during a roll) we'll assume the axis of rotation goes through the CG. Thus, we have one point of the roll axis, but it takes two points, to determine a straight line. Without going into any detail, we'll simply state that the roll axis is very nearly that line through the CG parallel to the relative wind, as shown in fig. 33.

Now, ideally, for purely axial rolls, the roll axis should be a line from the center of the nose to the center of the tail, as seen from both the side and the top. For a symmetrical wing we must fly (straight and level) with the wing at some positive angle of attack with respect to the relative wind. With the plane "zeroed" out, this requires a nose-up attitude as indicated in fig. 33. Thus, the roll axis will not go through the fuselage center line, again as indicated in the figure, and the nose will begin to describe a circle about this axis during the course of the roll. When we reach the inverted portion of the roll, we are forced to give down elevator to raise the nose back up to a flying attitude. Ideally, if we feed in elevator exactly right, we suppress the vertical component of motion of the nose with elevator, and all that is left are the horizontal oscillations back and forth, as seen from below (or above). Now, it can readily be seen that, the smaller the angle of attack, the more nearly will the roll axis go through the center line of the fuselage. How do we achieve this? Simple, speed which allows the wing to fly at a smaller angle of attack. We all knew this anyway. At this point you may say we can avoid this problem by setting the wing at the appropriate incidence so that in straight and level flight, the relative wind is parallel to the center line of the fuselage. But wait a minute! During the inverted portion of the roll, the wing incidence will now be twice as negative as with the 0° setup described earlier. This requires double elevator correction to maintain a flying attitude thus, for at least, giving the rolls a much "busier," or jerky appearance. The same argument applies to the semi-symmetrical sections, so that it appears, from our point of view at least, that the symmetrical section at 0° incidence will give smoother appearing rolls, but in no case will they ever be purely axial.

Unfortunately (for you and, particularly, us) there is much more to be said about the rolling maneuver. Next month we'll discuss adverse yaw, pros and cons of differential aileron throw, and yaw and pitch interactions during the roll.

TOP OUT

JERRY KLEINBURG

Don Jenkins — Memphis R/C Club — likes his Falcon 56. Uses a Min-X 3+1 and an OS Max 19.

CONTEST OPERATIONS. Ed Dolby, commenting in the April issue of the National Free Flight Society Digest, points up the need for strengthening control of contest operation into the hands of contest modelers and depending less upon AMA headquarters for decisions which directly have to do with implementing contest participation. Ed's remarks, while concerning free flight matters, could readily apply to any phase of modeling — including R/C — and therefore deserve some thought and consideration.

It's conceivable that AMA's staff — and here reference is to the salaried executives — for some time now might have wanted to back away from the more direct aspects of contest operations such as rules making, FAI participation, etc., and to allow contest fliers themselves to run such affairs. A desire for this sort of evolution might be hampered by the thought that contest types tend to focus strongly upon competition and model building and development, and therefore have little time or inclination for the communication and thought process necessary for guiding programs of a national scope. In addition, headquarter thinking may have run along the lines of — "There's the Executive Council and a few folks in the field we've come to rely upon who can provide enough advice and guidance so that HQ judgments could continue to be the best way to run these shows."

While all this may be the manner of things past, it's believed Ed's sustained interest — and a lot more like his — reflects a growing capability that HQ could just be starting to buy seriously. Of course there ought to be some skepticism, but rationalization, due to old habits, ought to be guarded against. And re-invigorated contest boards along with the new presidential Advisory Committees could give a significant reason for optimism that the troops in the field may now be able to cope with more than the flying aspects of competition management. However, this ability doesn't necessarily come automatically with the right to act, and Ed, in his statement points out, "Cliff stood up and stated his position. It wasn't an easy thing for him to do as he is sticking his neck out if the committee doesn't play fair." "Playing fair," of course, means giving recognition to more than just a narrow range of interests and working in depth to build the logical contest activity structure which so far has eluded all previous attempts. With this in mind, watching how the new R/C Advisory Committee functions ought to prove worthwhile. . . .

POWER PLAY. A pair of significant documents issued forth from AMA last month (May) and, while they were not necessarily intended to be directly related, they do have a lot in common. Reference is to the 5-page letter dealing with the problems posed by the desire to legalize bigger displacement engines, and the Publicity Guide for Model Clubs recently distributed to all Charter clubs. In the former, John Worth — the AMA Executive Director — ably outlines the rocky road involved in upping engine sizes. The competent work of George Wells provided the latter document which succinctly ABC's the ins and outs of modeling publicity.

In John Worth's letter, the principle problem in setting engine displacements appears to be the possible interference from the FAA with a secondary concern being AMA insurance coverage. Boiling it down, it amounts to an imposing of FAA regulations, licensing, and some form of equipment dictation for R/C if R/C'ing leads to serious accidents where FAA feels they have jurisdiction. The regulations are written and ready, John tells us; if we stumble they may be applied at any time!

In George Wells' 32-page jewel we learn of the working man's view of publicity and the media mills. This guided tour of the 4th estate warns about sport pages and their editors, and shows in detail how to make modeling news elsewhere in newspapers, radio, and television. In all, it's a fine primer and its earnest use is highly recommended. . . . Its use, however, is not recommended in meeting the type of governmental blackmail John Worth's letter draws for us in the matter of engine displacement!

While pleasant public relations are fine in order to tell folks about our flying and its "educational" advantages, a lot sterner action is required to handle "on the shelf" restrictions that, as John puts it, ". . . one scared FAA man" could apply against us. What's at stake is not engine displacement of .61, .71, or any other size (I personally think .45 is fine), but AMA's ability to go beyond merely containing or putting off governmental edicts. A strictly defensive posture isn't good enough. After all, we have a large industry, our adult membership, and a

(Continued on Page 32)

Left: A Windmill by Chuck Winchester, Del Rio, Texas. Uses Digitrio and a Max 50. Placed 2nd in Class I at Dallas in May. Below: Fred Morris' Great Lakes bipe. Mono-Koted, goes to 14 pounds with ST .71 — from Vic Custom Kit.

Dave Whitehead prepares pattern original for N.Z. Nats official. ST 56 and Micro-Avionics equip 2nd place winner. Micro-Avionics propo popular with New Zealanders.

(Continued from Page **31***)*

host of friends and relatives to counter such moves. And it might be there's a Congressman or two who have previously voiced disapproval of similar FAA arbitrariness if we remember the Senate sub-committee that sided with the parachutists in their tussel with Gen. Quesada who has since left the FAA scene. . . .

In any case, there are options aplenty to consider without assuming we face a blind alley and rush to unnecessarily cut off initiative and developments. Calm — but continued — consideration of our own power problem ought to be the order of business in this area.

DEMO's DEMISE

Despite AMA assurances that the proposed FAI demonstrations have its unofficial blessing, the several hundred backers of the proposal recently were informed that severe flying time limits at Ajaccio forced a decision to forego the Corsica trip by Thomas and Gardner. The risk of finding no time to fly — in view of the 6 AM to 8 PM timetable needed for official flights to take care of the record registration — was considered too great to warrant making the effort of the strenuous trip. While the large entry for the Internats was anticipated, a multiple flight line arrangement had been looked for to make the unofficial flights possible. Since this did not materialize as expected hopes for Class I and II flights faded. As one disappointed pledger stated, "We didn't know how they would run the show, but we had to be ready anyhow. . . ." Compensation for this disappointment, however, was the gratifying response and support not only for the project but for Class I and II in general. It should certainly aid in other efforts to maintain activity in these fundamental competition classes and encourage future projects of this nature. . . .

INTERNATIONAL ROUNDUP

● NEW ZEALAND. Russ Johnson of the Palmerston North Aeroneers follows up the N.Z. R/C Nats news carried here in July with added details of his club. In a city of 50,000 population their club has 40 members, and despite strict currency regulations which increase importation difficulties, the NZ'ers are strong on propo gear. Micro-Avionics is in the majority, Russ relates, with Digitrio also well in evidence. A six-man N.Z. Class III team is due to visit Australia in October and Russ promises pics and poop on that contest.

● AUSTRALIA. Lyell Winley's good wife Mary sends news of the Cumberland's club training ship, a Sr. Falcon on reeds. Besides the obvious benefits to beginners, Mary reports veteran fliers also enjoy the trainer since they trade lessons — a sort of "aerobatic conversation" where the pilots exchange examples of maneuvers. Lyell, president of the Cumberland R/C Modellers, is also senior VP of the New South Wales Aeromodellers Assn. The Cumberland group is 70 strong.

● CANADA. From the TORAC newsletter of Toronto and Bob Howey, we learn of their plans for a full slate fall meet on 16 and 17 September. Events for I, II and III, and Scale and Goodyear (modified) ought to attract local RC'ers as well as "south of the border" types who may also have Expo 67 in Montreal in mind. Bob Gorden is to be CD (12 Apsley Rd., Toronto 12, Ontario). Don McTaggart is the TRCC prez this year.

Over in Montreal, Bob Milne reports success of their Fairview Exhibit. An estimated 250,000 viewers crowded the Concours D' Elegance for the show. As many as 10 modelers were on hand at one time to answer questions of interested spectators. Ray Gareau and Carl Larson organized the exhibition and the Model Aeronautic Radio Specialists (MARS) are considering other similar offers to show their R/C craft. Maurice Meunier is president of the enterprising Montreal group.

Exceptional BT-13 Vultee Vibrator by Pat Massey of Ponca City, Oklahoma. Has 32 oz. wing loading, sports specially cast landing gear. Logictrol, ST 56, electric brakes are other details of the WW II trainer. Pat, well-known in ukie circles, now migrated into RC.

The June GLITCH of the Soo Modellers carries this item by editor Doc Campana: "Electronic Counter Measures. At our last meeting, Stan Lyons mentioned that Kincheloe AFB (in Michigan — Ed.) has a setup they use to send out radio signals at all frequencies in order to jam radio equipment of enemy missiles. There haven't been many missiles in the area recently, but the lads at Kincheloe have to keep their hands in, so they have practice alerts with ECM. If you've been hit lately, perhaps it was ECM—Enemy Common to Modellers." We quote this item in full to point out that such interference is more theoretical than a real possibility. However, there's no need to allow the possibility to worry fliers since a quick letter to the commanding officer of any military base acquainting him with the fact of R/C activity and the technical details (frequencies, ranges, types of transmission, etc.) of our equipment will easily help assure complete avoidance of such a problem. Base commanders will readily cooperate, but don't assume they know about R/C! Like ordinary non-RC'ers, they generally know little of this type of model flying. So protect yourself, speak up!

Windsor RC'ers (Sun Parlor R/C Flyers) enjoyed the perceptive wit of the man from Rand, Herb Abrams, who was guest speaker at the club's May meeting. Dave Henshaw, EMITTER editor, reports Herb sustained interest with modeling anecdotes and advice for beginner and expert alike on the subject — naturally — of LR3 actuators and the new GG Pak. Dave also included a special "Herb's" page in the EMITTER to commemorate the visit. Like a page out of the legend of Chick Sale. . . .

● VIET NAM. Lt. Col. Hank Walker sends word that Bob Scott and the Saigon area RC'ers are moderately active these days despite difficulties, proving RC'ers are a persistant bunch. At his base in Qui Nhon, Hank says no one seems to have ever heard of R/C, but nevertheless he's keeping his trusty Digimite and Veco 61 ready to go. Hank has a Lanier Thunderball in mind to match construction resources and facilities at his Army post.

● ITALY. Renato Ceccopieri of Rimini answers our query regarding Italian rudder-only glider rules. Here's a rundown:

1. Each attempt has 12 minutes .
2. Only 6 minutes of flying are judged.
3. Launching line is limited to 100 meters (about 325 feet).
4. A successful spot landing in the 50 meter circle brings a bonus of one extra minute flying time . . . to subsequent flights, presumably.

● JAMAICA. In Kingston Garth Drew says about ten fliers are active there in R/C. Most equipment is single channel with some Min-X and Controlaire pulse. Garth's own equipment currently is an Orbit 3+1 which is installed in a Goldberg Falcon 56.

● SOUTH AFRICA. Geoff Brooke-Smith, writing in FLYSHEET — news organ of the Cape and South African Assn. of Radio Flyers — tells of Trevor

Loxton's success with a 12′ multi slope soarer. Sporting a sleek fiberglass fuselage, his ship features a laminar flow 18% airfoil wing with a 12-inch sweepback. It's fully sheeted, has all controls and flaps. Neville Kelly is another flier in the silent flight world who is doing well, Geoff reports. Without help, Neville mastered his 8-channel reed radio and developed a full assortment of aerobatics, including inverted flight, with his 7′ soarer. Incidentally, C. Wannenburg is editor of the FLYSHEET, a substantial ediface keeping the 90 or so members up to date on the Association's widespread activities. Areas include Cape Town, Welkom, Salisbury, and Gwelo. Dries Welgemoed is the SAARF Secretary.

Another outstanding scale creation by Bud Atkinson, KCRC stalwart. Mentor trainer features glass cowl, Enya 60, drops chute. Flies scale, a serious Nats contender . . .

THE NATIONAL CIRCUIT

● NEW YORK. Bipes, as elsewhere, are finding favor with eastern R/C pilots. On Staten Island, Fred Morris is mighty pleased with his 78" Great Lakes built from a Vic Custom kit. Four others are in the works in Fred's neighborhood with his weighing in at 14 pounds. Mono-Kote and a ST .71 for power are other details.

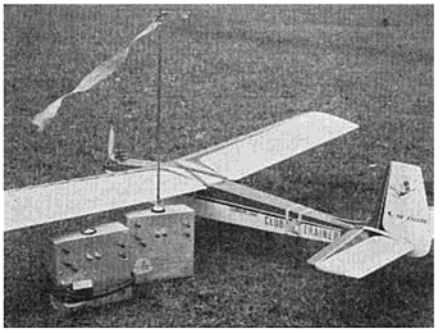
Up in Poughkeepsie, the IBM R/C club continues preparation for its WW I scale meet set for 23 September. Cole Palen's "Old Rhinebeck Aerodrome" in Rhinebeck, New York, will be the scene of the miniature aerial circus which will include a modified Scale event, WW I maneuvers, a team dogfight, balloon busting and bombing, and a spot landing contest. Dick Allen (former USAF team member, Stark Shark, etc.) and Ed (2-tube) Lorenz are collaborating on this get-together, set among antique aeroplanes, cars, and a tank — all of circa WW I. The mood is right, so it's one not to miss!

● NEW JERSEY. Interested in floatplanes? Phil Sieg, of the Rockland Country R/C Club, writing a first class article in PRINTED CIRCUIT of the North Jersey R/C Club, offers this advice for those interested in water operation: "Any well adjusted plane with a good rate of climb is capable of water flying. If power loading is not sufficiently high, the displacement will have to be increased to the next size. For 2½ to 3½ pound ships use .15 to .23 and 4 to 6½ pounds, use .29 to .45 displacement engines or higher. Elevator is not necessary for successful take-offs with a plane having good trim settings. Elevator will help for quicker take-offs or compensate for a poor ship or bad trim setup. Planes and engines last longer over water. There's no dirt, trees or rocks to run into." Phil also makes these points in his complete article for water birds:

Dope thoroughly to keep water absorption, weight down.

Assure good wing fit so sealing will be effective to protect equipment.

Aussie club trainer. Cumberland RCers find Sr. Falcon twin control ship good for beginners and experts alike. (CRCMC pic)



Kingston Jamaica RC pilot Garth Drew with Falcon 56. This one uses 3+1 Orbit radio. Single channel popular in West Indies.

Jerry Nelson, RC Contest Board chairman. Doing well in Goodyear circuit, here with "Tibro," Don Menzimer design for pattern.

Use Vasoline or silicon grease for pushrod exits.

Double plastic bags sealed are a must in salt water flying since air corrodes radio gear.

Total float displacement should be double the gross weight of the plane.

Floats should be rigidly mounted.

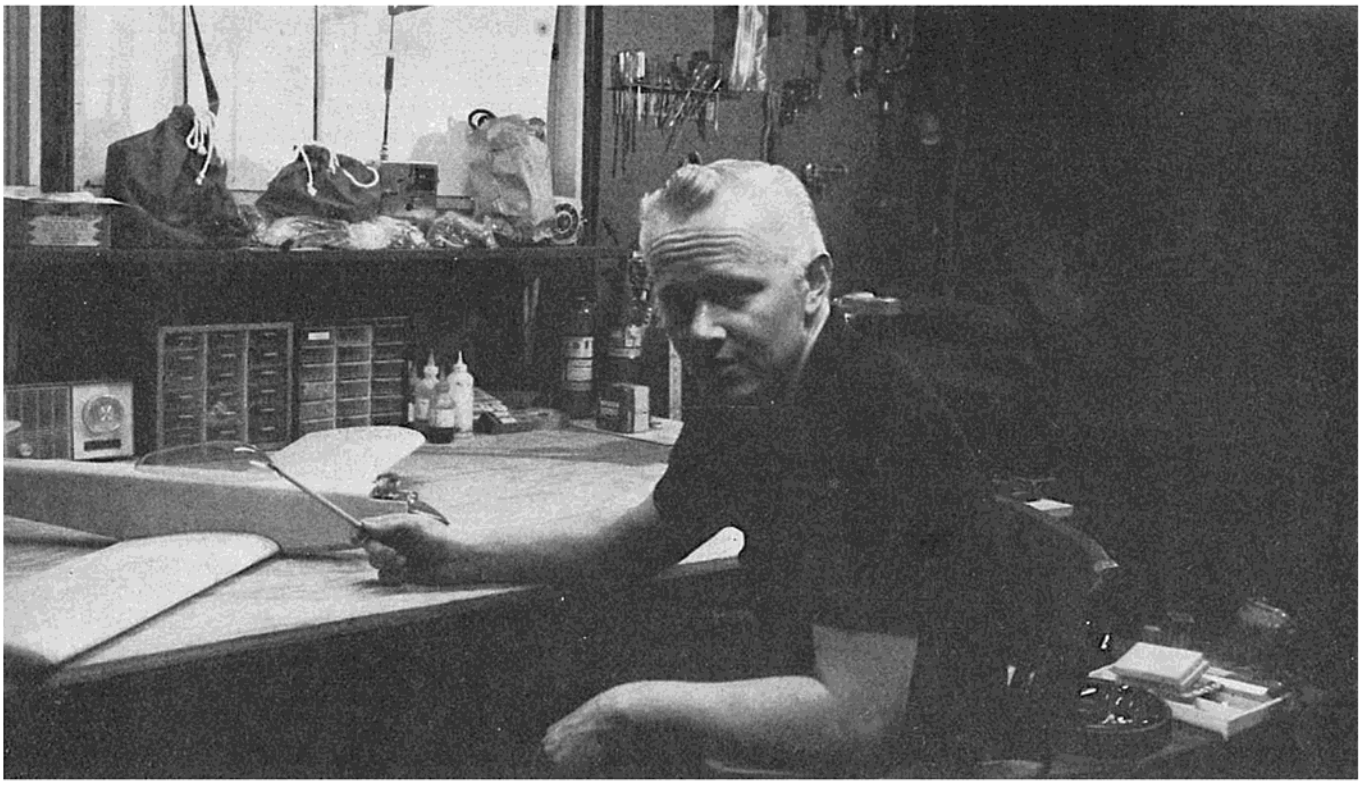
Add a sub-rudder of 30 to 50% if directional response in flight is poor.

Dick Sarpolus, president and newsletter editor of the Monmouth Model Airplane Club, is happy with the results of the club's April exhibition. Biggest problem at the Middletown Community Center was lack of space to display all the R/C craft that turned out for the gala night. John Robinson, John Sorge, and Rip Ripley aided in making the project such a success that Dick and the club are laying groundwork to make the next exhibition even bigger and better!

● PENNSYLVANIA. From HEAR YE of the Valley Forge Signal Seekers we get our "handy dandy" idea of the month. John Membrino — and many others — don't like the coiled way nylon goods such as tubing, push rods, etc., are packaged since it poses a curl problem. This is what John does to alleviate the condition: "In order to straighten the tubing permanently, I place a length of piano wire (proper size to match I.D.) inside the tubing. Then I get my handy dandy iron, set to "wool" (medium temp.), and then roll out the tubing over a clean, flat surface. Keep the iron moving back and forth, working from one end of the tubing to the other. It takes a few minutes to do this without melting the tubing. Let the whole thing cool down with the wire inside." (Then as a prologue, write the manufacturer and suggest straight packaging in the first place!)

● CALIFORNIA. The LARKS were host for the April 22-23 Goodyear Round held at Bakersfield where some real hot times were set. Joe Foster of the Pioneers turned in a 1:47.2 (over 84 mph) fastest qualifying time. Don Menzimer and Cliff Weirick followed at 1:54.4 and 1:59.1 respectively. Cliff went on to win the main event with his Midget Mustang, while Chuck and a low wing Cosmic Wind was second followed by Joe Foster using Rivets. Semi-finals winners were Gary Korpi, Steve Kosby, and Jerry Nelson.

● ARIZONA. To the Tucson RC'ers we give thanks for the ad noted in their May newsletter NOISE. "Wanted — Geography teacher that knows Tulsa is really in East Texas, not Arizona." OK, fellows, I'll admit I goofed by listing NOISE in Tulsa — that is, if you'll admit Tulsa is in OKLAHOMA, not East Texas! (Now we've got the Tulsa Glue Dobbers and the Oily Birds of Port Arthur riled up. . . .)



RCM's Editor, Don Dewey, in his shop. Plane on workbench is a 40" span full-house Class III Multi for the Bonner 4RS system. Design to be presented in R/C Modeler.

SHOP & FIELD

DON DEWEY
Editor

•

KATHLEEN ACTON
Assistant Editor

FUNDAMENTALS OF R/C • PRODUCT REPORTS • HINTS AND KINKS

Preface: This is the first in a series of monthly articles specifically designed to aid the newcomer to radio control. Virtually every phase of R/C will be covered with an emphasis on proper building and flying techniques. Although much of the material to be presented will seem extremely basic to the more experienced modeler, it is hoped that some of the ideas and techniques presented herein will be of benefit to the more advanced RC'er. RCM invites your inquiries concerning each monthly installment in this series.

BEFORE we actually get into the mechanics of building and flying, it is essential that we have a sound working knowledge of the necessary tools and materials at our disposal. The subject of this month's column is the basic tools with which we will be working. It must be remembered that what we describe here in the way of shop tools are merely recommendations, and that the simplicity or complexity of your shop will be determined by your level of interest and degree of participation in this hobby. As an example, I have, in years past, built many models with little more than a small flat board, a single edge razor blade, a few sheets of assorted sandpaper and a tube of glue. Today, our shop exhibits a greater degree of sophistication insofar as the tools are concerned. Some of these items would be an unnecessary expenditure for the Sunday flier with limited time and space for his hobby. The more elaborate shop tools aid the model builder in the areas of time and convenience, but do not, in themselves, offer an automatic guarantee of "better-built" models. The most exotic and expensive equipment will not be a substitute for a thorough understanding and working knowledge of fundamentals and techniques of model building craftsmanship.

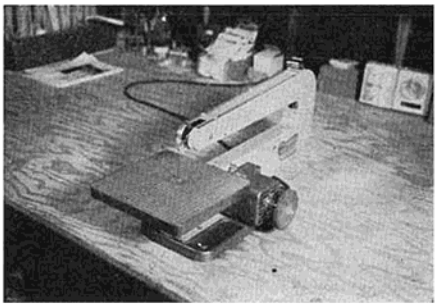
The ideal situation, of course, would be to have a specific area set aside for the model shop. Ideally, a separate room with adequate heat, ventilation, and electrical outlets would be preferred over a more temporary and portable arrangement. This of course, is not always possible, as in the case of apartment dwellers where the dining room table often doubles as the shop bench. A little forethought and planning will often result in a novel and unique method of providing a more convenient and permanent working area in even the most adverse circumstances. As an example of this, the new modeler with limited facilities would do well to obtain some of the photographic handbooks dealing with constructing a darkroom in extremely limited quarters. A study of the techniques used by these amateur photographers will give you some excellent ideas for similar facilities in our own hobby.

On the other hand, the modeler with a spare room or good size garage area has the ideal environment for his model-building area.

The first requisite for whatever area you have designated as your shop is a sturdy, and **true** work surface. There is nothing quite as distressing for example, as a well-built wing whose dihedral exactly matches the warped building board on which it was built. There have been many methods of setting up your working surface, and again, this depends on your interest and resources. Among the most widely used workbenches is the simple plywood slab resting securely on a sturdy table or built-in supports. Many modelers prefer to use a plywood slab to which is contact-cemented a surface of Celotex building board. This provides a surface which will readily accept pins, etc. In our shop we use a 7-foot by 4-foot slab of ¾-inch plywood, finished both sides, which rests on a heavy oak work table. For cutting and pinning, I use a standard soft-surfaced drafting board available from almost any stationery supply store. Still other modelers use a standard 3' x 6'-8" hollow core door available at the local lumber yard. If you so desire, this door can be sawn in two, the areas on each side of the center cut blocked in with scrap lumber, and the 2 sections hinged together. This, then, can double as an adjustable wing jig which can be blocked up to any desired dihedral angle. The latter building surface also provides easier storage of the building surface for the apartment dweller. Whatever method you decide upon, be certain to continually check the surface for any deviation from absolute level. This is best accomplished by checking your surface, prior to each new project with a carpenter's level.

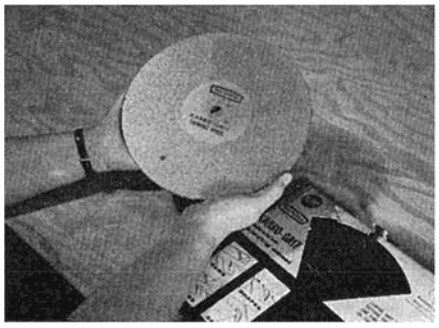
As we begin to discuss the various shop tools it must be remembered that the final selection will depend upon the individual's needs, level of interest, space, and finances. The single edge razor blade is still capable of doing a fair job for the occasional modeler. The most widely used cutting tools for the model builder is, perhaps, the line of cutting and shaping equipment manufactured by the X-Acto Corp. I personally have never found a use for their complete set, but will include as virtually mandatory for every serious model builder their small handle and a supply of #11 blades. Their larger handle is used for holding a razor saw, #34, which is indispensable for cutting hardwood strips, doweling, and other items requiring a heavier duty tool. The X-Acto handles we use are #1 and #5. Other X-Acto items which I find most convenient are their keyhole razor saw blade set #15-ST, as well as their set of precision swiss files.

Perhaps the most widely used item in the modeler's shop is the electric jig saw. If you wish to purchase such an item with a minimum expenditure, I strongly recommend the Burgess vibrator jig saw



which is available at most hardware stores for approximately $13.00. We used one of these units, almost continuously, for a period of two years prior to purchasing our present Dremel unit. The latter, priced in the forty-dollar range, is designed for heavier duty and is much more versatile for model-making purposes. It has a deeper throat, a table that is vertically adjustable, as well as having a power output for a grinder and sanding disc, and/or a flexible power shaft with a variety of shaping and cutting tools available. This unit is equipped with suction cup feet which adhere firmly to the work bench. If you use the Dremel Moto Shop, Model #57-2, available at most major hobby shops, you will find Dremel's #8029 blades most useful for cutting balsa, plywood, printed circuit boards, brass, aluminum and metal tubing. For heavier duty work, such as thick sheet aluminum, rod and bar stock, I recommend Dremel's blade #8030. Always make certain when inserting a new blade that the teeth point downward. If your hobby budget does not permit the purchase of a power jig saw, you can get by with the aforementioned X-Acto set of keyhole saw blades and a good coping saw.

If you wish to go the whole route, you can purchase a table saw with a ¾ h.p. motor and justify its expenditure by proving to your wife how much money you'll save by building all the household furniture! If you already own a table saw, the two most valuable cutting edges you could obtain for it is a Sears, Roebuck Craftsman Kromedge thin rim satin-cut blade, catalog #9-32537, and a Craftsman Karbo-Grit abrasive sanding wheel, catalog #9-30001. The first item makes extremely fine cuts in balsa and plywood without leaving the usual furry edge that gives the impression that the item was gnawed apart by a rat! The Karbo-Grit sanding wheel consists of tungsten carbide grit bonded to each side — one side being coarse and the other medium grit. This is one of the safest cutting tools for your saw and allows you to sand, shape, cut, and groove without changing wheels. It is excellent for cutting plywood, balsa planks, fiberglass, plastics, masonite, and other materials. It is also excellent for either end or edge sanding.

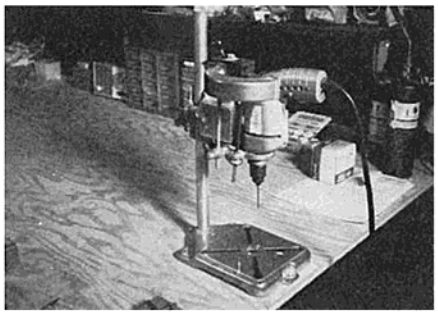


In the area of smaller shaping tools an indispensable item is a razor blade planer. This is a small hand plane with a straight and curved cutting edge which utilizes a standard double edged razor blade as its cutting edge. These are available from many hobby shops. This is an indispensable item for rough shaping wing tips, fuselage blocks, etc. For heavier duty work a small Craftsman plane is excellent. We use Craftsman model #107-37037 which has a 1" wide adjustable cutting edge.

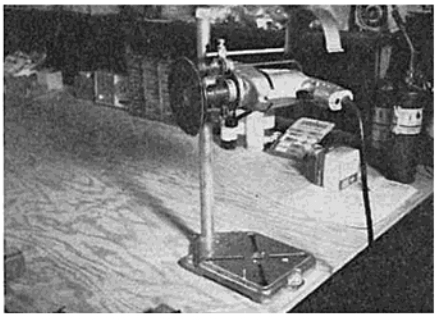
While we are on the subject of shaping balsa blocks one of the most indispensable and time-saving items is a vibrator sander. In the RCM shop, we use Dremel's electric sander, Model B. This

is an adjustable unit that uses stock sandpaper sizes and can be varied from fine to heavy duty sanding. There are heavier duty units manufactured by companies such as Black & Decker, but these are intended for general shop usage and are usually too heavy and cumbersome for modeling purposes.

Perhaps the most useful tool in any

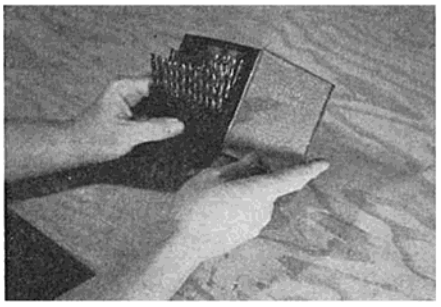


shop is the electric drill. I strongly recommend that you purchase the best unit you can afford, such as one of the models in the Craftsman or Black & Decker line. If you really want to be fancy, a variable speed controller will allow you to control the rpm of your electric drill while maintaining the full torque provided by your electric drill. Various attachments are available for your drill, such as sanding discs, grinding wheels, shapers, and the like. Although it would be ideal to be able to afford a regular drill press, this is almost totally out of the question for the average modeler. We use a Craftsman table-mounted drill press which accepts the standard electric drill, and converts to an extremely accurate and useful drill press. This unit is Craftsman model #335.25926, and sells in the $15 to $20 price range. It includes a grinding guard as well as a quickly interchangeable vertical to horizontal working surface, allowing you to use it as a drill press, sander, grinder, or

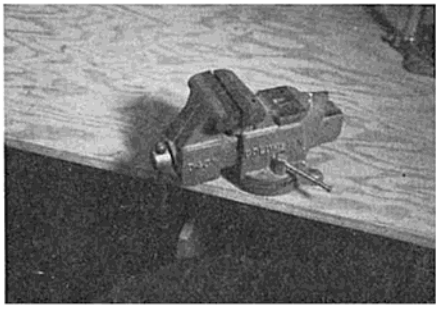


shaper. A word of caution at this point: When grinding any item be sure that you use a pair of safety goggles, a one-dollar item which may someday save your eyes! When using your electric drill as a sander you will find that the 3M Co. sells a complete line of sanding discs which they call their Production Sand-Pak. These packs are available in fine, medium, coarse, and extra coarse grade for any job you may encounter.

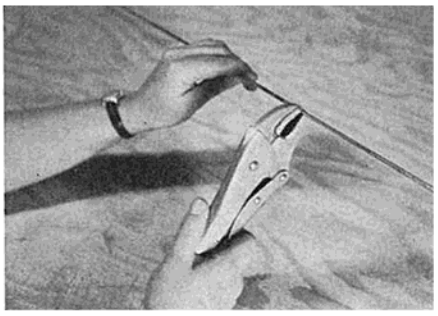
While we are on the subject of drills, I'd like to emphasize one point, that I have learned from hard experience. That is, that the drills you obtain at the 98c special counter of your local hardware store will turn out to be far more expensive in the long run than an initial expenditure for a good set of drills. The cheaper units are usually soft imported drills that will bend or break after only slight usage. For the average model builder we recommend that you purchase a set of fractional drills from 1/16" to 3/8" and of the best quality you can afford. For the RC'er who wishes a more complete range of drills, we recommend a complete set of number drills from 1 through 60. This will give you a decimal equivalent of .2280 through .0400. Unless you have the eyes of a hawk it would be advisable to purchase a drill index for holding your set of drills.



Another item for which you should spend the most amount of money allowable in your shop budget is the shop vise. A cheap vise is a total waste of money. Irregardless of the model you choose, it should be securely bolted to your workshop table and should be adjustable for 180° rotation. We use a Cleveland Vise with 3½" jaws which opens to a maximum depth of 4¾". This is most useful



for bending small sheet metal parts and forming music wire landing gears. We also recommend a small Stanley drill press vise, a portable unit that can also double as a soldering aid or third hand. In the same category, you would be surprised at the versatility of Peterson vise grips which take a great deal of the work out of wire bending. These are available at most hardware stores. The

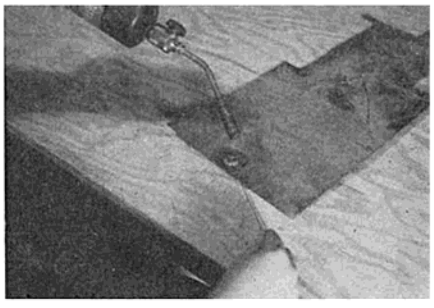


so-called wire bending jigs sold for hobby purposes are usually an extremely poor investment due to the fact that they are incapable of handling the larger wire sizes with soft stops that shear off under pressure.

A simple sheet of pegboard with stock pegboard fixtures will hold the various hand tools that you will accummulate from time to time. Among these should be a complete set of standard, as well as Philips head, screwdrivers, a complete set of regular pliers, side-cutting pliers, and long-nose pliers. One worthwhile acquisition would be a good set of wire cutters which will easily cut up to 5/32" music wire with normal hand pressure. This is a $6 investment that will prove invaluable to you. A good set of C clamps, small socket wrenches (such as the pocket socket from the F. R. Angel Co.), several fine hacksaw blades, a file card (for cleaning your files), an egg beater type hand drill, and several small hammers will round out your wall rack tool assortment.

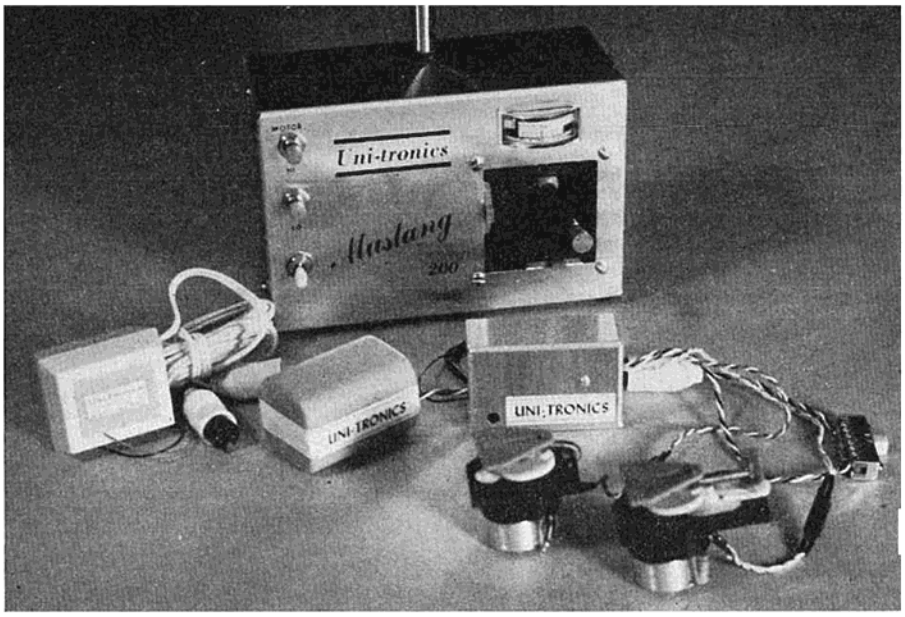
If you have ever built a warped wing you will soon come to realize the necessity for an accurate wing building jig. There are several commercial units on the market although we use the RCM wing jig which was presented in the August 1967 issue. This unit can be built in less than 30 minutes for under $2, and will accept up to a 70" wing of any type airfoil section. Remember, however, that the jig will be only as true as the surface on which it rests!

A most useful item is the Bernz-O-Matic propane torch and its accessories which permits soldering and brazing of items too large for normal soldering iron. This would include such items as landing gears, sheet metal parts, etc. The tank of propane gas will last the average modeler at least a year. Again, this item is available at most hardware stores.



While we are on the subject of soldering, and although we are not including in this list the range of tools the R/C electronics experimenter would normally use, we would recommend that you obtain a good soldering iron such as the Ungar Imperial with a fine chisel tip. We use a simple wire soldering stand which includes a brush for cleaning the solder-

(Continued on Page 45)



A Shop & Field Product Report

UNI-TRONICS MUSTANG 200

NEWEST ENTRY IN THE PULSE PROPORTIONAL FIELD

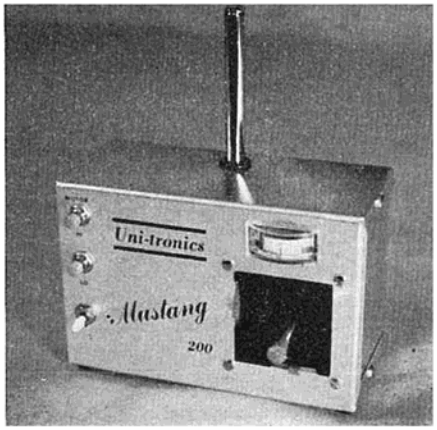
THE Unitronics Mustang 200 is the newest pulse proportional system to enter the R/C market. Extensive lab as well as field tests have been made on this unit, and the results are as follows:

Transmitter, Unitronics Mustang 200.

The Mustang 200 transmitter is a pulse rate, pulse width single channel proportional transmitter with a solid state all transistorized circuit. R.F. transmission is designed for the 27 MHZ band. The carrier is modulated with an 85% to 95% 700 cycle tone. A pulse rate of 4 to 12 pulses per second and 6 P.P.S. neutral and a pulse width change of 70% to 30% with a 50% to 50% neutral. The 2 servo model pulse rate 12-14 neutral.

Battery Requirements:

A 9-volt Burgess #D6 or Eveready #276 battery is required to make the transmitter operate properly. Total current drain of the transmitter is under 40 milliamps. The battery should be replaced when voltage drops below 8 volts. As the battery voltage decreases below 8 volts, range will decrease in proportion to the voltage drop.



Tuning:

The Mustang 200 is tuned and adjusted at the factory and should not require any additional tuning. Only qualified personnel with an F.C.C. license can tune the transmitter.

Antenna:

When range checking or preparing for flight, be sure to extend the antenna to its full length. While flying, **never** point the antenna directly at the model. Always keep the antenna orientated 90 degrees from the model to transmit maximum power to the receiver.

Stick Assembly:

Right and left motion of the stick assembly controls the pulse width (rudder) and up and down motion controls pulse rate (elevator). Rudder and elevator trims are located on the outer edges of the stick assembly. The lever on the left of the stick, controls elevator trim and the lever located at the bottom of the stick assembly, controls rudder trim.

Hi-Lo Buttons:

The push button switches on the upper left of the transmitter, controls the engine speed. When hi button is depressed, a full on tone is transmitted to the receiver to operate the engine throttle to high speed. When lo button is depressed tone is turned off allowing engine throttle to go to low speed or idle position. Intermediate positions are determined by the type of actuator used in the model.

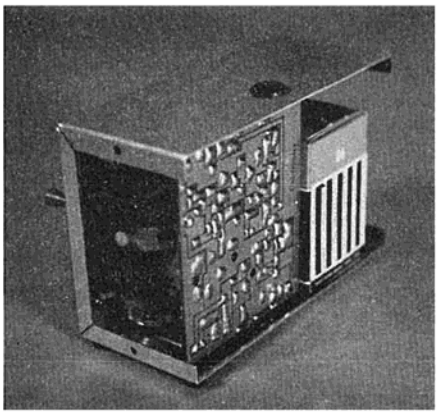
R.F. Meter:

The meter indicates the R.F. output in the antenna circuit as well as showing if the transmitter is pulsing. When depressing lo motor button a rise in output will be noted. This indicates that there is no tone signal modulating the carrier. When hi motor button is depressed a crease in the meter is noted. This inates that a full tone is modulating the rier. The meter does **not** read battery voltage. Its primary use is to show if the transmitter is operating properly.

TEST SAMPLE

DESCRIPTION: Hand Held Radio Control Transmitter
MFGR: Unitronics
TYPE: 200
FREQUENCY: 27 MHz citizens band xtal controlled
MODULATION: A. M. Pulsed Tone
FCC CLASS: C
POWER SOURCE: 9V Dry Cell
ANTENNA: Multi-Section Telescoping 53" Max.
R.F. POWER INPUT: 112 Milliwatts — Nominal at 9V
MOD PULSE: Variable in Width and Rate
MODE TONE: Keyed, Approx. 900 Hz

1. **Foreward**
   a. The test sample was subjected to the tests described herein and measurements taken during the test period.
2. **Conclusions**
   a. The test sample successfully met the requirements outlined throughout the test period.
3. **Test Results**
   a. **Frequency vs. Temperature:** The unit was subjected to tests outlined in Figures 1 and 2 and the frequency measured during the test period. The maximum devia-



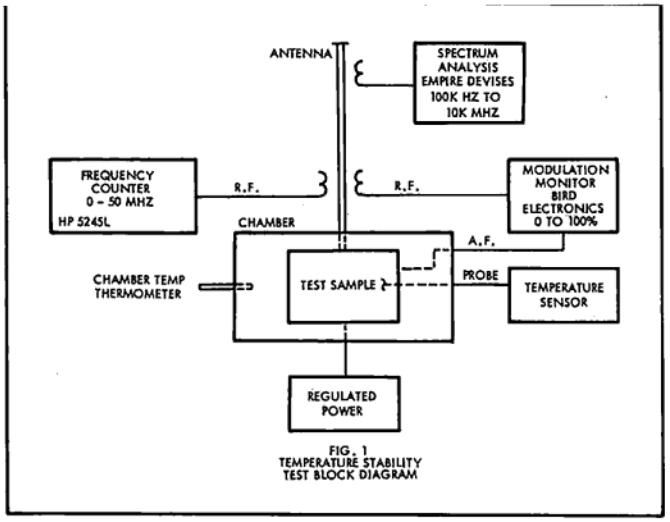


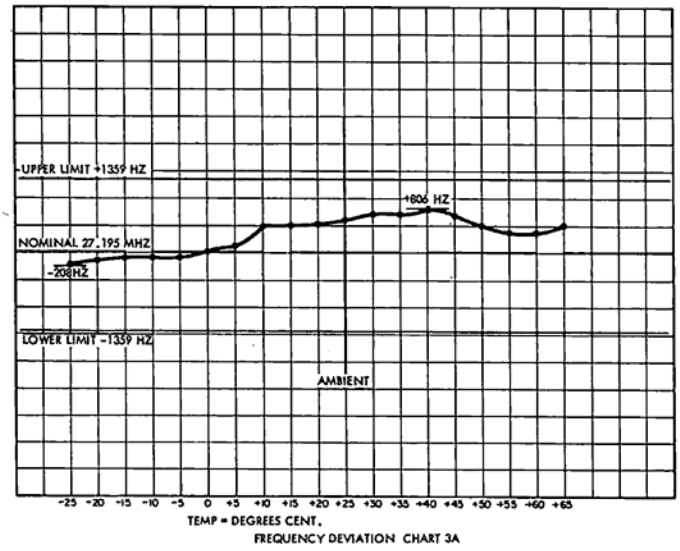
FIG. 1
TEMPERATURE STABILITY TEST BLOCK DIAGRAM

DATA LOG SHEET — TEMPERATURE:

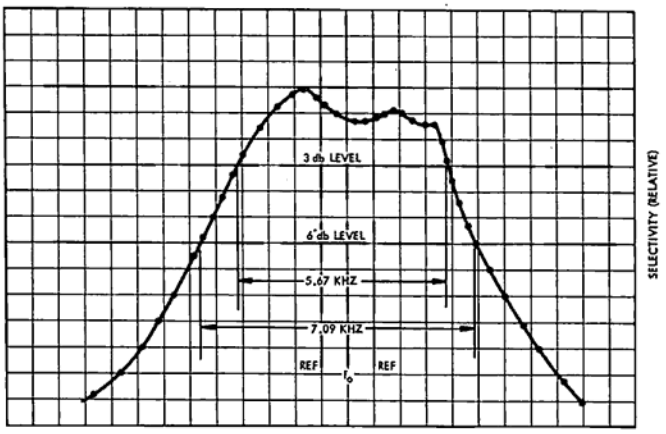
Date	Time	Temp °C	Freq. MH	Deviat. H	Mod. %	
5-12-67	1900	+25° C	27.195682	+682	87	
"	2000	+31° C	27.195781	+781	87	
"	2100	+35° C	27.195782	+782	87	
"	2200	+40° C	27.195806	+806	87	
"	2300	+45° C	27.195698	+698	88	
"	2400	+50° C	27.195499	+499	88	
"	0100	+55° C	27.195411	+411	89	
"	0200	+60° C	27.195420	+420	90	
"	0300	+65° C	27.195458	+458	90	
"	0600	+65° C	27.195509	+509	91	Stabilized
	Return to Ambient					
5-13-67	1300	+25° C	27.195676	+676	87	
"	1400	+20° C	27.195581	+581	87	
"	1500	+15° C	27.195522	+522	86	
"	1600	+10° C	27.195490	+490	86	
"	1700	+ 5° C	27.195117	+117	84	*Note 1
"	1800	0° C	27.195027	+ 27	84	
"	1900	− 5° C	27.194906	− 94	80	
"	2000	−10° C	27.194892	−108	80	
"	2100	−15° C	27.194894	−106	71	
"	2200	−20° C	27.194842	−158	67	
"	2300	−25° C	27.194803	−197	65	
5-14-67	0200	−25° C	27.194792	−208	60	Stabilized
	Return to Ambient					

NOTE 1: Oscillator required adjustment to sustain oscillations. System had previously been de-tuned.
NOTE 2: Measurements made with varying input voltage. Max. dev. noted 27 Hz.

FIG. 2



FREQUENCY DEVIATION CHART 3A



tions noted on log sheets indicated a total frequency spread of 1014 Hz. whereas allowable tolerance of +.005% of the specified crystal frequency of 27.195000 MHz permits 1359 Hz. Chart 3A reflects the frequency deviation.

b. **Frequency vs. Supply Voltage:** The unit was subjected to test conditions of varying supply voltage from specified limits of 8.5 VDC to 10.5 VDC during which time the fundamental output frequency was monitored.
The maximum deviation noted throughout the range was 27 Hz and within the limits specified in 3.a above.

c. **Amplitude Modulation Percentage:** The unit was subjected to test conditions outlined in Figure 1 and 2 and modulation monitored during the test cycle. Maximum modulation percentage encountered during this test was 91% relative and well within limits. Chart 3.c reflects the modulation readings.

d. **Frequency Modulation:** The unit was monitored while being subjected to test shown in Figures 1 and 2 and the F.M. component was below the 50 cps capability of the test instrument and well within the limits specified in 3.a above.

e. **Power Input:** The unit was monitored while being subjected to the test shown in Figures 1 and 2 and the power input to the final R.F. stage monitored as voltage and current. The maximum D.C. input power at maximum D.C. input voltage indicated 123 milliwatts and well within the 5 watt limits.

f. **Harmonic Radiation:** The unit was subjected to test throughout the frequency range of 100 KHz to 10 KMHz and found to be below 60 db in all harmonic and spurious radiations.

g. **Operational Mode:** The frequency determining network consisting of the crystal and related oscillator circuit was found to be functional only on the fundamental operational mode.

Receiver, Uni-Tronics SHG-200:

The SHG-200 superhet is a digital pulse width, pulse rate, single channel proportional receiver with a solid state all transistor circuit. The receiver is selective and has a high signal gain with full A.G.C. control. It was designed to fill a need in the single channel field where digital pulse and width are used to control a motor driven actuator, such as the Rand LR-3, HR-1, HR-2, Controlaire Gallophing Ghost actuator, Bellamatics, and other similar actuators.

Battery Requirements:

No additional battery pack is required for actuator operation. The actuator and receiver operate from the same 4.8 volt nicad battery pack. Models using .010 to .049 engines with small control surfaces can use a nicad battery pack of 4.8 volts @ 500 milliamps. For models with .09 and higher displacement engines, we recommend using 4.8 volts @ 600 milliamps. For engine sizes .35 and .40 and jr. pylon racing having larger control surfaces, we recommend using 4.8 volts @ 1.2 amp "C" size nicad battery pack. The reason for the above recommended battery sizes is that the motor driven actuator when it drives larger control surfaces with higher air loads, requires batteries with a greater current drain.

Receiver Output:

Switching transistors are used to drive the motor actuator eliminating the relay with all of its problems, like sticking

points, bounce, arcing, chattering and engine vibration. The SHG-200 uses dual transistor switches with 100% power cut off to the actuator motor. There is no feedback between the motor switching transistors, as commonly found in battery switchers, therefore, eliminating any current loss and any unnecessary drain on the battery supply, giving you 20% to 50% more flying time on the same nicad pack.

Actuator Noise:

The SHG-200 receiver is a well filtered unit, which will allow the flyer to use most any motor driven actuator. In some instances, however, an extremely noisy actuator motor will make it cycle through. The actuator motor can be filtered with a motor noise suppression kit.

Tuning and Antenna:

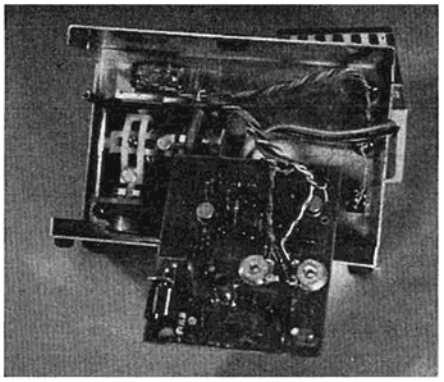
The SHG-200 receiver is tuned and adjusted at the factory. Only the antenna coil may need adjustment. After the receiver is installed in the plane, if ground range is adequate (1000 ft. or more), retuning is not necessary. Proper antenna length is 28 to 30 inches. If antenna length appears too long do not cut off, but let trail behind the model. When stringing antenna wire from receiver to rudder do not let wire rub or come near metal pushrods or any metal surfaces.

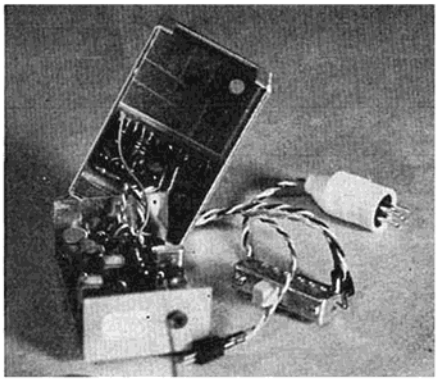
Control Hook-Up:

Use nylon horns on elevator and rudder, and a nylon quick link on engine throttle. Never metal to metal hook-up due to static interferences from metal surfaces.

Wiring and Hook-Up:

Use a **good** D.P.S.T. toggle or slide switch. Keep wires twisted and short as possible. Excessive or sloppy wiring will sometimes induce unwanted signals. Hook up actuator wires directly to actuator. Do not go through connectors or plugs, because of high current flowing back and forth to actuator.





Left: Transmitter with P.C. board and battery removed. Right: Miniature receiver showing decoder in case top.

TEST SAMPLE

DESCRIPTION: Airborne Radio Control Receiver

MFGR: Unitronics

TYPE: Superhet

FREQ: 27 MHz Citizens Band xtal Controlled

POWER SOURCE: 2.4 to 3 VDC Battery 4.8

ANTENNA: Insulated Wire

OUTPUT: Relayless — Direct Servo Drive on-off

Foreward. The following general tests were conducted to determine the operational characteristics of the test sample under specific controlled conditions.

Test Results

A. **Frequency** — Frequency determined xtal, at a nominal 455 KHz below the operating frequency. The xtal osc frequency measured for a desired frequency of 26.740 MHz or operating frequency of 27.195 MHz was 26,742,305 Hz. This resulted in a nominal intermediate frequency of 452.695 KHz. Since the difference in desired operating frequency and the actual operating frequency is 2.305 KHz the intermediate frequency may be shifted for the matching of a specific xmtr frequency.
Further, since the measured bandwidth is 5.67 KHz at the 3 dh points the operational frequency shift will permit satisfactory operation.

B. **Sensitivity** — The unit was tested for operation of circuit shown in Figure 1 for minimum level of input signal for reliable operation (19 out of 20 or better). The results indicated satisfactory operation throughout the range of 10 microvolts to 1.5 volts, while sustaining a 50% modulation level. This sensitivity decreased to 15 microvolts with 30% modulation. Increased modulation levels up to 100% did not appear to enhance the operation.

C. **Selectivity** — The selectivity curve shown in Figure 2 reflects the general characteristics of 5.67 KHz at 3 dh points and 7.09 KHz at 6 dh points.

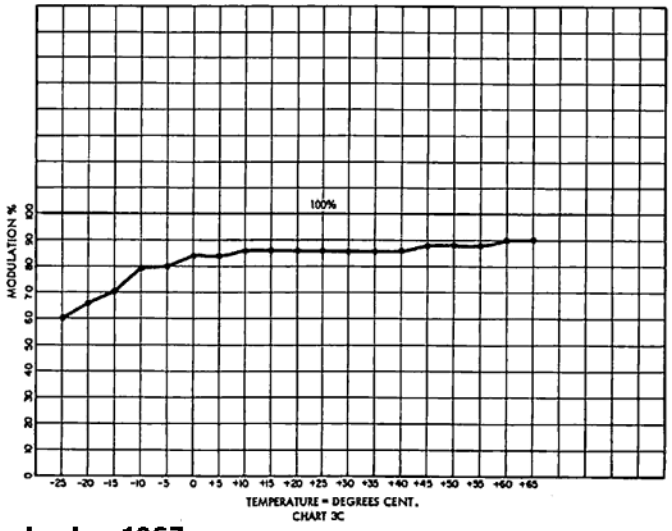
D. **Adjacent Channel Interference** — The unit was tested at various levels of adjacent interference and maintained operation with ratios of 10 to 1. This would permit operation with this unit in areas with other units running 10 times more power.

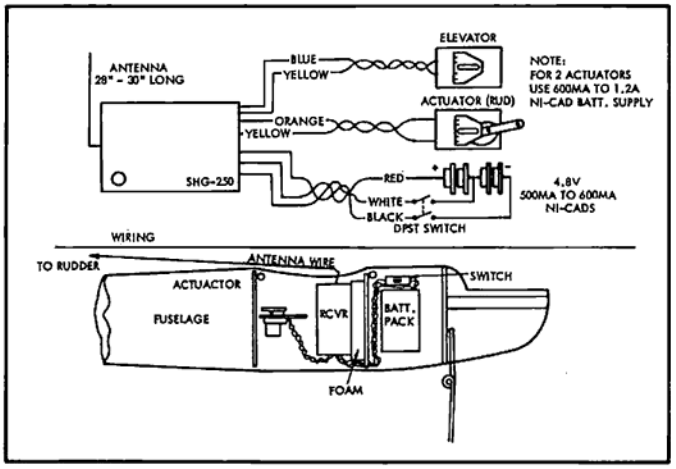
E. **Image Rejection** — Image rejection tests indicated over 40 dh.

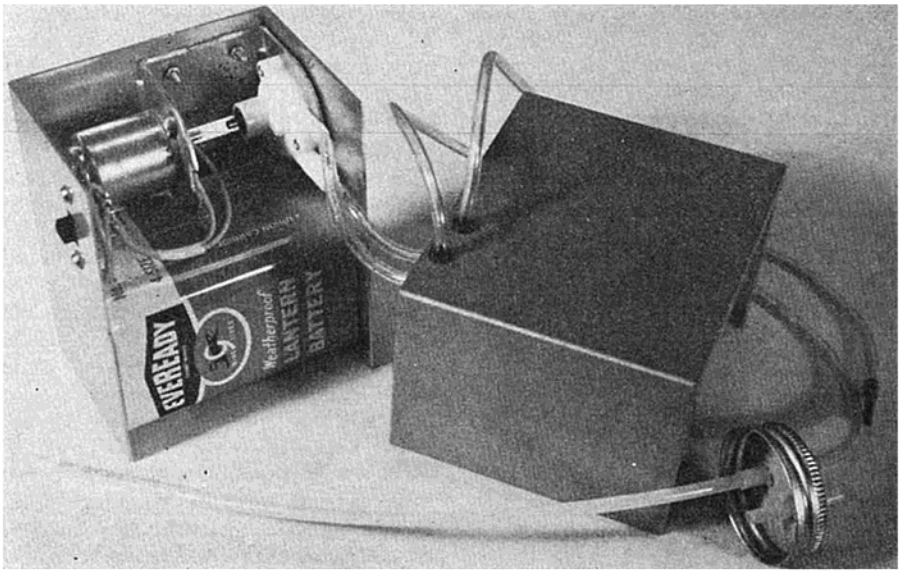
F. **Mechanical Stability** — The unit was subjected to operation while being vibrated from 40 Hz to 500 Hz at amplitudes up to 5 g's with satisfactory operation and no unwanted response.

G. **Spurious Radiation** — Spurious

(Continued on Page 45)







Completed fuel pump with case halves apart. 6V lantern battery can be used instead of flashlight cells.

You Can Build The Shop & Field

R/C FUEL PUMP

In One Evening and for Less Than $12

BY BOB LIEN & AL WILTZ

DURING the past year or so, we have noted with envy the flyers who, seemingly, are a bit ahead of the pack. Not necessarily because they are better flyers than we — although there sure are plenty of these — but because they have converted a routine chore into a thing of beauty and precision. We mean — electric fuel pumps! Holding one's finger over the vent of a pressure fill system long enough to fill a twelve ounce tank is not particularly interesting, at least to our way of thinking.

We are not claiming much originality in the following article, since such local pioneers as Ron Chidgey of Pensacola and Jerry Kelly, here in New Orleans, have been using systems similar to the one presented for some time. Probably, there are many others throughout the country who have their own systems in operation. As we said though, it sure does make tank filling fun!

The system is used with four "D" size flashlight cells wired in series to deliver 6 V. This has proven entirely adequate, and one only needs new batteries every ten gallons or so. The pump will fill a twelve-ounce tank in just under two minutes, which is pretty darned fast! Other power sources could easily be utilized, according to the builder's inclinations. Rechargeable nicads, motorcycle wet cells — even an automobile cigarette lighter fitting could provide a neat source of power. As we say, take your choice; we have elected to go along with the flashlight batteries for convenience and portability.

A few comments on the materials needed. The heart of the whole mess is the Ford windshield washer unit, purchased as pictured from your friendly Ford dealer. As for Part #C1AZ-17664-B, and make certain that what you get looks like the one in the photographs. Ford also makes a different "A" model which is a diaphragm system, and which won't work in our application. As a housing for the innards, we chose a Buo Box, #CU-2105-A, measuring 3" x 4" x 5". From the same radio parts shop obtain what seems to be a double pole, double throw switch. Well, anyway, get one that is OFF in the middle, and ON both up and down. Wired as shown, it will give both forward and reverse on the pump, thus allowing you to fill or empty your tank at will. Add four flashlight batteries to the deal and you are ready to go for a dollar or two less than ten bucks. For the pump tubing parts, it helps to have a friend who is a doctor, since the tubing system was made from discarded hospital intravenous drip assemblies. One can use ordinary hobby shop fuel tubing as well, but we prefer the hospital stuff, not only because it was free, but because most of these sets come with a little gadget attached which allows one to squeeze off the tubing and shut off the flow at will. Turning off the pump works equally well, however!!

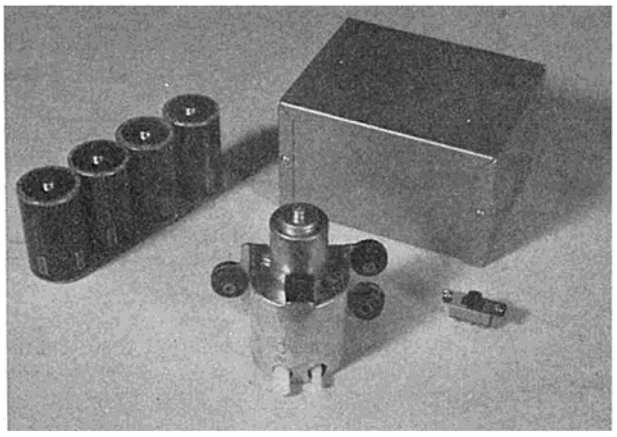
Assembly time for the whole apparatus will vary with your inclinations as to how fancy you wish the thing to be. In general, one has a choice of a separate unit, as pictured here, which is connected per the tubing to your regular fuel can, or an integral pump-fuel can assembly. Some of the fellows hereabouts are mounting their units on top of a gallon can, and this seems to work well.

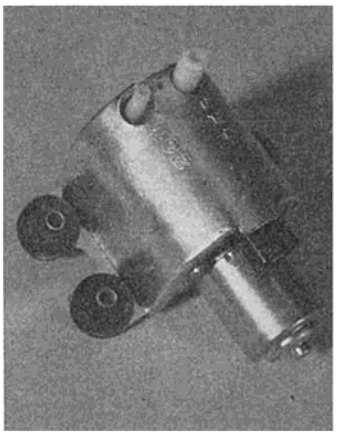
The little pump used is amazingly efficient, or so it seems to us. We use it to pump from a five gallon tank in the auto trunk into our one gallon field fueler, and of course, also to pump fuel from the field can into the airplane. It is very advantageous to have the reverse switch, since at the end of the day's flying, one merely reverses the switch and empties the tank back into the fuel can. We have in a pinch used the LIL' DUDE to fill our club lawnmower from a member's Volkswagen!

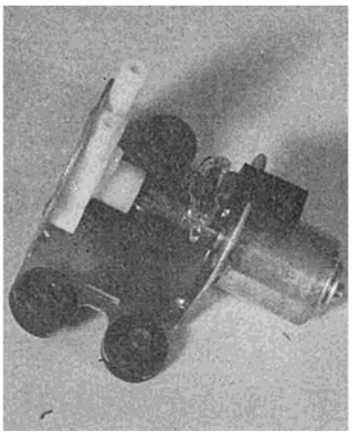
Construction

The photos and wiring diagram are pretty much self-explanatory, we hope. Depending on how fancy you wish to get, the unit ought to be pumping at a furious rate within an hour or so. First, remove the rural mail-box-like cover on the pump unit. Inside, the small lightbulb is unsoldered and removed. A word here — this bulb effectively drops the twelve volts in the auto electrical system to about six volts, so if you are planning that twelve-volt power source, better leave the bulb alone. We remove the large rubber grommets, and hack off the flanges on the pump chassis in order to make it fit into the Bud Box. Not necessary, of course, if you are using a larger container. The pump chassis is held in the box with a couple of sheet metal screws. Drill holes in the box cover for intake and output tubing, and for switch. We used a prop reamer to good advantage here. Solder up the switch and the batteries per the diagram. Wrap the batteries with tape, or in some way insulate the battery pack from the case, and you are ready to go. The large diameter tube on the pump is connected to your filler tube in the fuel can, and the smaller of the two tubes then goes to the tank in the plane. We use a filter on the filler tube in the fuel can, and none in the airborne fuel system.

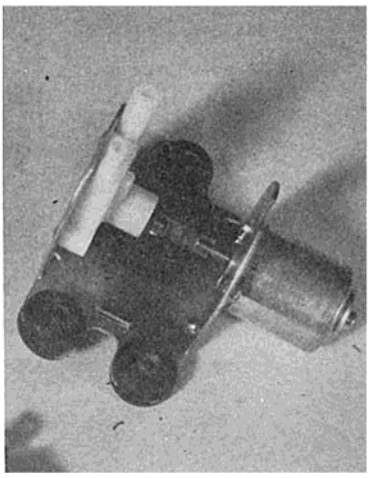
Y'all try one!!

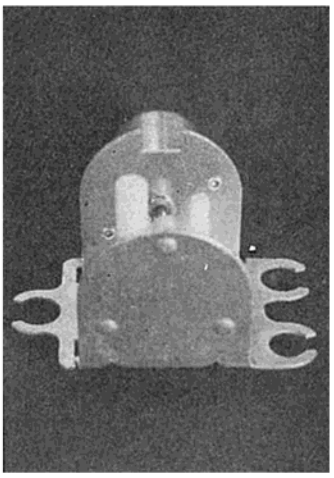


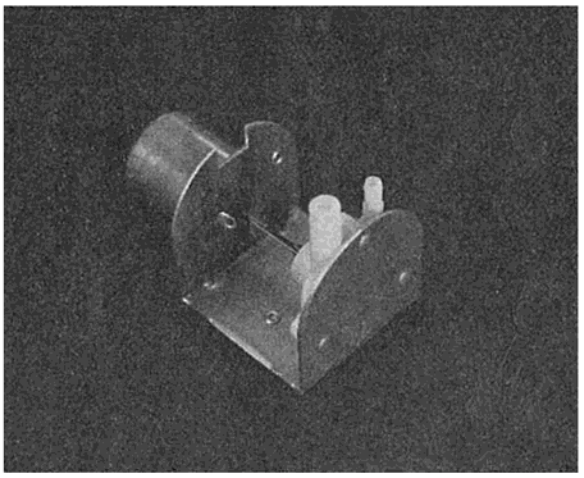




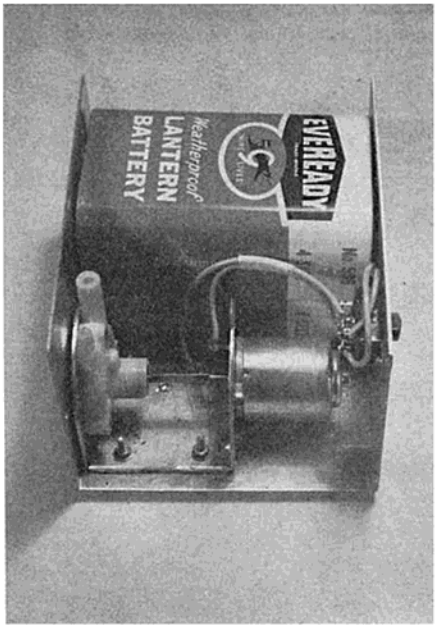
Above, Left: All major components of Shop & Field Fuel Pump. In order to reverse the pump action for emptying tank, be sure to obtain a double pole, on-off switch. Above, Center: Ford windshield washer unit before modification. Above, right: Casing removed and discarded.

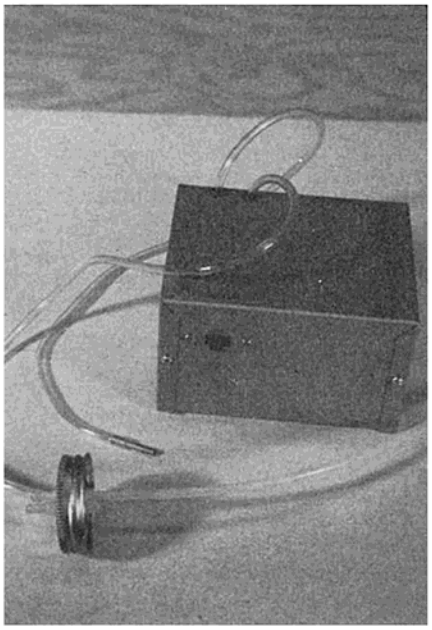


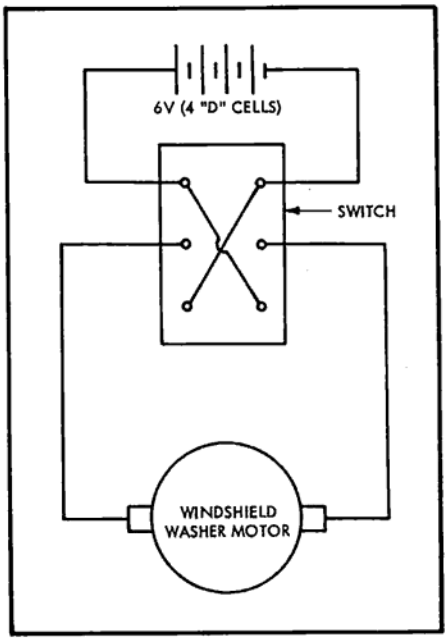




Above, Left: Remove the small light bulb and bracket. Center: Remove the large rubber mounting grommets. Above, right: The removal of the flanges on the pump chassis completes the modification of the pump unit.







Above, Left: Pump mounted to case with four 3-48 nuts & bolts. One center pole switch wire goes to solder tab to which light bulb was connected. Opposite side of center pole goes to any one of the 3-48 bolts. Center: Completed pump unit with line to cap for gallon fuel can. Pump is noisy until line is cleared of air and fuel is circulating through pump.

An original design glider rounds pylon at Sunset Beach State Park.

A new RCM monthly column devoted to radio controlled slope and thermal soaring.

THE Glider Pylon Event at Sunset Beach State Park hosted by the R/C Bees of Santa Cruz, California, started in fog. Picture if you will an eight-foot white sailplane being flown through a pylon course time trial in fog. About the time the frequency flag drops at the far pylon to signal a turn the ship would vanish from sight. Paul Forrette of the R/C Bees was not the only one to brave the fog during the early morning but he was the only one crazy enough to fly a white ship in it.

Luck prevailed with this type defiance and the fog cleared with a steady wind and sun on the surf. Time trials were completed with twenty-two ships qualifying with times ranging from 50 seconds by Ken Waldevogel (R/C Bees) with a gallopless ghost, to a swift 26.8 seconds by Dale Willoughby (Harbor Slope Soaring Society) with a foamed winged Bat.

There is something majestic about a sailplane that a powered craft just doesn't have. When you multiply this by four and five planes at once, and then have them silently race for that far pylon, the excitement and beauty is extreme. One unique feature of the sailplane race was the sailboat type start. The planes were launched prior to each race and were required to circle outside the start/finish line. As a clock count down was given, the planes jockeyed for position and dived across the start/finish line as the flag dropped. In a few instances a plane would cross the line too soon and would have to circle back for a restart which generally meant a lost race.

Merchandising prizes which had been donated by Sig, Hobbypoxy, and Tatone Products were given whenever the alarm clock went off. It might be for the plane farthest from the clock to the ship up with the shortest wing span to the next plane to be forced down on the beach. The entire atmosphere was one of sheer fun, but as the elimination narrowed down, the flying began to take on a serious note. Where planes had given ground earlier in the day on time trials, no quarter was given in the semi-main events. Gene Rusconi of the R/C Bees was cut from the air in a shower of debris as Bill Boone's (R/C Bees) Thermic lapped him on a return course and they met in a mid-air collision. This was closely followed by another mid-air as Jim Parsons (R/C Bees) Purple Parrot was run through by Tom O'Shaughnessy's winning Imperial.

Whitey Pritchard's Sand Piper II was doing battle with Dale Willoughby's foam Bat when they collided on the far pylon. No crash; each plane shook itself and took back off on the down wind leg. Dale Willoughby was well on his way to a win when the wind expired during a race, forcing the bat wing down.

Ten heats narrowed the contestants for the main event, the R/C Modeler Magazine Perpetual Trophy race, to three planes: Tom O'Shaughnessy's Red Thermic Imperial, Steve Kosby's (Pioneers) Toki Doki; and Gerry Wolfram's (Pioneers) modified Thermic 100.

Kosby and Wolfram were eliminated when they crossed the start/finish ahead of the clock and flag by a good fifteen feet. They both had to recircle the start as Tom O'Shaughnessy's Red Imperial headed for the far pylon on the first lap. O'Shaughnessy flew a good race with no lost distance on the pylon turns, his wings appearing to be the only part of the plane that cleared the pylons in order to qualify his turns. By the 5th lap Kosby had closed the distance on the Red Thermic but it wasn't enough. As O'Shaughnessy crossed the finish line and got the checkered flag, Kosby was ten feet behind. A good race by all with the final positions:

1st — O'Shaughnessy; Imperial 100
2nd — Kosby, Toki Doki
3rd — Wolfram, Modified Thermic 100
4th — Marra, Original
5th — Willoughby, Foamin Wingbat

RCM's perpetual gliding trophy being presented to Tom O'Shaughnessy.

Jim Sunday prepares to launch Wolfram's Thermic.

POWER & SAIL

EDITORIAL

THE calm waters of our little pond are beginning to show waves of a storm which really is a tempest in a teapot.

It seems that some of the boaters have finally awakened to the fact that the new 72 MHZ frequency is restricted to use with airplanes only. And now comes the hue and cry that the AMA has helped to scuttle our ship. There are those who would not allow boaters with AMA licenses to run in the open meets and that if a boater did not carry a license from some other organization he would not be allowed to run. It would seem that this type of thinking would be a poor way in which to penalize the AMA when actually all you have done is hurt one of your fellow boaters.

Let's take a look at this problem from the beginning. First of all, the acquisition of new frequencies was started by the airplane boys and properly channeled through the AMA. The AMA then carried the project to its completion with everyone interested being asked to support the request not only with words but with money with which to pay the attorney and necessary expenses of obtaining these frequencies. During this time the boaters sat back and did nothing. They did not take their desires for new frequencies to the IMPBA or other local organizations. Joe Average boater did not take the time or effort to make his feelings known to the AMA or to send a small contribution to help further the project. Gentlemen, it would seem that your hostility for the AMA is ill-placed. If hostility must be taken out on an organization, it should be the IMPBA and your local club for their inability to act on your behalf.

Now those of you who are on the AMA side of this issue can take the smiles off your faces because you too have a certain amount of guilt in this situation. The AMA should remember that what they do should be done for the benefit of the entire membership. And that while the AMA stands for the Academy of Model Aeronautics, nevertheless, they accept dues and issue memberships to modelers of other classifications. If they are to continue to accept memberships and dues from boaters then they do owe a certain amount of recognition and effort on behalf of the boaters.

Now this is all water under the bridge. The cry of "I didn't know" is too late. So let's pick up our toys, and be big boys and go out to the pond to enjoy the benefits of our hobby.

— Doug Tucker

BUILDING THE MAKO SKI BOAT

BY JIM WHITLATCH

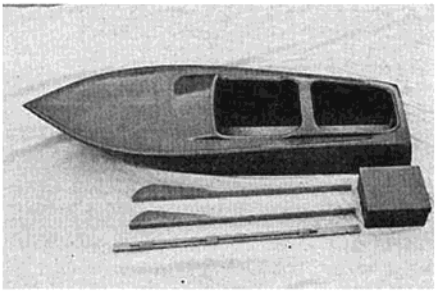
With the increasing popularity and availability of fibreglass model boat kits, coupled with my own keen interest in Ski boats it was inevitable that I obtain a Mako. This very fine molded fibreglass hull by Bara Boats, 656 Foothill, Pacifica, Calif. 94044, is available in three sizes: for .19-.29 power, for .35-.50's and the Mako for .60's. They are molded in two pieces, split at the deck line and available in basic white or in several gorgeous metal flake colors. The flake is right down to the glass — not just sprayed on the top. A word of advice — if you just want to race, get a white one, they're about ¾ of a pound lighter and you don't have to be quite so careful when assembling. But, I really think the extra work is worth it when finished, especially when you hear the oohs and aahs at your local pond.

Before getting into the step by step construction, let me describe the hull design. The Mako is a true scale of a full size racing type SK boat, specifically the famous Stevens 45-SK competition racing boat manufactured by Stevens Boat Co. of Gardena, Calif. Here's some of its records: National "SK" Champion 1962 and 1963; Second Place 1964 "SK" National Championship; First Place "SK" 1966 Western SK Championship; World Record SK-45, American Power Boat Assoc. 1962 and 1965. The plans were scaled down by Del Park and Bob Gregory to a 36" size for a K&B .29. Later Del blew up the plans to the present 42" size. Joe Barazoto decided to make one of these wood hulls into a "plug" and make a female mold out of it and thus Bara Boats was in business.

The methods and steps described here are strictly my own. However, I feel they would apply to other fibreglass boats as well as the Mako. There are several key things to keep in mind when working with glass boats. Although they are inherently stronger than wood construction they do not absorb or "dampen" the vibration as well. So be sure to epoxy everything down securely. Also, remember that a waxy surface will remain on all surfaces and must be sanded off — there's just no solvent that will remove it! And if it's not removed the epoxy or polyester resin you'll be using just won't stick. This goes for the inside as well as outside. The dimensions of the Mako are: Length 41 inches; 14¼" beam (widest point at deck line), 12⅜" at transom; waterline, 12⅜" at widest point (that is wetted); 17" from transom.

Step 1.

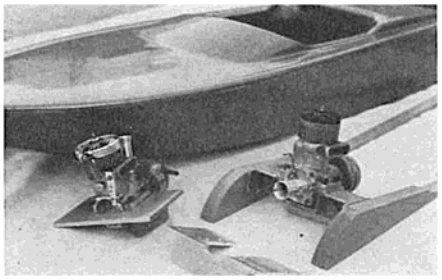
So let's get down to construction. The photograph shows the hull just "out of the box." The molded radio box and drive shaft are "extras"—motor mounts for a single cylinder engine are included. Although the deck and hull are joined I suggest **very strongly** that the seam be reinforced on the inside with a 1" or 2" wide strip of 6 oz. (or heavier) glass cloth generously glassed in place. The outside seam can be filled with polyester resin thickened with "Resin Thick" distributed by Standard Brand Paint Co. and other fibreglass companies. By mixing this powdery white groundup glass fiber with the resin a strong putty-like material will result. Sand very carefully since the metal flake once cut into will never look the same. A white (or your own choice of color) edge strip should be painted on later to cover the seam and putty filling.



Step 2.

The motor and prop shaft/strut mounting is probably the most difficult, and also most important, part of the project. The photo shows three types of motor mount: A Veco .61 on a flat 3/16" alum. plate, a Rossi .60 on an Octura 60 mount (to be inserted between the motor

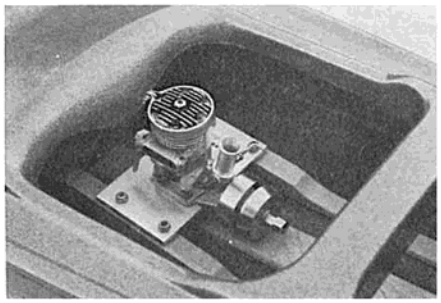
mount stringers as shown), and an "L" shaped aluminum mount for the Rossi which bolts to the top of the stringers as would the flat plate. I use ¼"-28 flat head machine screws to hold the plate, **but** I tap threads into the maple and use epoxy glue to hold them tightly in place. Countersink the heads. Since the motor mounts are sawed at the correct angle in order for the shaft to line up with the strut, no great pains need be taken — just be sure it is all centered. You'll probably have to remove some of the wood keel strip stiffener in order to clear the flywheel. Before permanently epoxying the motor stringers in place, I suggest inserting a solid ⅛" ply firewall or bulkhead to make a watertight compartment up forward. As an alternate you can pour in styrofoam. Fibreglass boats sink you know!



Step 3.

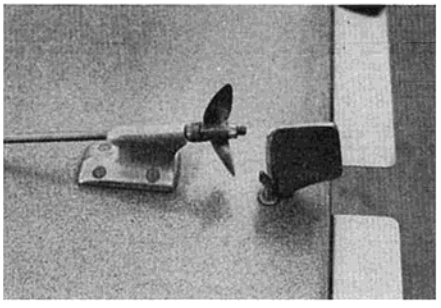
With the motor bolted to the stringers flat them in with a generous coating of epoxy glue. Sand the hull very thoroughly where they make contact. Insert the wedge pieces of wood between the deck divider crosspiece and the motor stringers to force a slight "rocker" or convex surface in the bottom of the boat. If you don't, the hull's flat surface bottom will "pull up," and when dry, you'll have a concave surface bottom which will catch and suck down on the water. This "rocker" should be about 3/16" to ¼" when wedged.

After drying for at least two days, and when the wedges or blocks are removed the hull will tend to straighten out and you'll have about ⅛" rocker, which is what you want. This "rocker" is measured fore and aft with a long straight edge (halfway between chine and keel) laid from the transom to where the hull "breaks" up towards the bow — approximately 18" from transom. Glass cloth strips should be epoxied or glassed in to fillet and strengthen the motor stringers to the hull bottom.



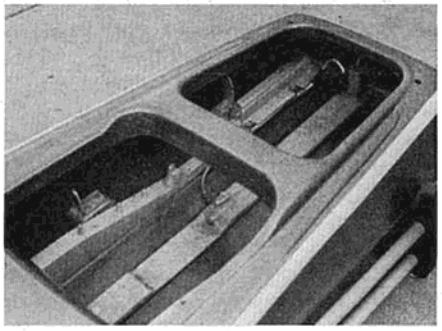
Step 4.

Pete Yanczer, Marcon Engineering, 21 Santa Fe Dr., St. Louis 19, supplied the stuffing box. Octura the flywheel, universal and motor mount. Pat's House of Hobbies, 5186 Mission St., San Francisco, Calif., has all the other hardware for the Bara Boats; strut with bushings, turn fin, cast rudder and post, water pickup and outlet, and ride plates. The strut is located 3½" from the transom to its back surface. Center it carefully and drill the four screw holes — don't glue it on yet. Insert a piece of 3/16" drill rod and mark the approximate spot for the stuffing box. Drill, gouge and file the slot for it. Make it big enough for a sloppy fit. Now with the shaft attached to the motor by its universal joint (Octura), through the log hole and through the strut you epoxy glue the strut to the hull. Don't use the screws! Let it set up first. This will assure that there is no binding. After all is dry run the flat head screws through, tighten them down and fill in with epoxy glue thickened with Resin Thick. Next, epoxy in the shaft log (stuffing box), again, using the prop shaft to align it. Now drill and mount rudder post (brass tubing) and water pickup. The water pickup should be in front of, and in line with, the rudder — I had to offset mine (as shown in photo) in order to get it back far enough to clear my radio box — poor planning! The turn fin can also be glued and screwed on — 15" to 16" from transom.



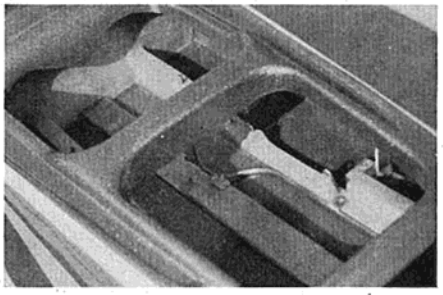
Step 5.

As seen in this picture the water pickup tube, tank mount pieces, radio box rails (with aluminum strips drilled and tapped for mounting Micro-Avionics boat rig) and motor control shaft mounting pads are installed. Also a piece of ¼" plywood is epoxied in the bottom rear for the 6-32 T nuts used to hold the ride plates. I fabricated the gas tank out of a 20 oz. metal can, the same shape as a pint can except 1" longer (or higher). I covered it with thin sheet stainless steel to make it pretty. Actually, for a single .60 a pint can (16 oz.) is big enough. I draw fuel out of a sump and vent it at both corners. Try to keep the sump and pickup in line with the needle valve. If the tank is off to the side the centrifugal force in a turn will make the engine run rich or lean depending on which way you're turning. The tank lays crosways right behind the engine.



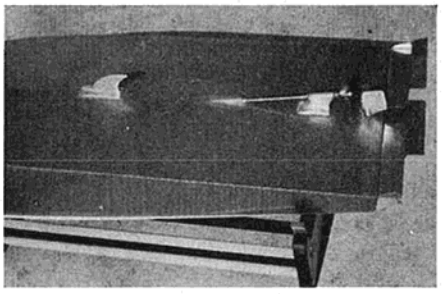
Step 6.

This shows motor mounts joining the firewall to add strength needed for the twin Rossi.



Step 7.

Bottom, ready to run. All screw heads countersunk, filled and smoothed, stuffing box epoxied in and sanded smooth. The trim or "ride plates" have bent down tabs on the ends to help cornering. Make sure they're not below the rear corner of the hull or they will cause tremendous drag.



Step 8.

The twin Rossi with flywheel forward allows engines and weight to be further back. The gearing reverses the rotation so the engines sit facing forward. Both are geared to the jack shaft which turns 25% faster than the engines.

Step 9.

If the Micro boat radio box is not used you'll have to make your own waterproof unit. The throttle and motor linkage will look more like the one shown by Frank Snowden. Note the flexible cable linkage to the throttle; rubber cushion mounting for homemade radio box. A side mounted tank works okay since it's under a crankcase pres-

SHOP & FIELD

(Continued from Page 39)

Radiations throughout the frequency range of 100 KHz to 10 KMHz indicated radiations below ambient conditions and general relative of — 60 dh.

H. **AGC Range** — Operation maintained throughout the input range of 11 microvolts to 1.5 V.

I. **Battery Range** — Satisfactory operation was maintained from 1.8 VDC to 3.25 VDC both sides.

Flight Evaluation: Uni-Tronics Mustang 200:

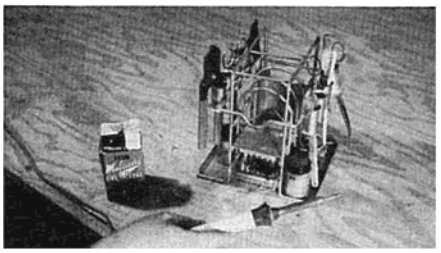
The Uni-Tronics Mustang 200 was flown extensively in powered aircraft from .09 to .19 size utilizing all available control functions, i.e., rudder, elevator and throttle. In addition, a scale model Ercoupe was flown using this system on ailerons, elevator, and throttle. The Uni-Tronics was also tested in an 84" slope soaring glider to note the effect of excessively large control surfaces as well as the feasibility of such a system in this type of aircraft. In all cases, Rand actuators were utilized with the exception of one series of flights where modified (Dee Bee) Bellamatic servos were used.

In all flight tests, range, performance, and reliability were excellent. Where the normal rudder actuator was used to actuate the ailerons, performance was exceptional compared to the normal rudder operation of a pulse proportional system.

In excess of 150 flights were performed with no equipment malfunctions excepting the loosening of one actuator motor, caused by improper seating of the motor hold-down screws.

Some interesting features of the Unitronics Mustang system include a relayless superhet receiver which is fully filtered to eliminate actuator, or other unwanted noise; no overloading or "swamping" of receiver even when the antenna was wrapped around the transmitter antenna; full AGC control with an "extra range" circuit; no elevator cycling through with motor command and no noticeable interaction between rudder and elevator commands; no overheating in switcher section; up elevator uses **high rate** pulse, thus eliminating "galloping" in up control; reduced battery drain partially due to no current feedback in switcher section; and base loaded antenna to reduce "in-flight glitches' caused by concentrations of low and high RF power.

The Unitronics Mustang 200, as manufactured by Uni-Tronics, P. O. Box 208, Covina, California 91722, has been tested, and is approved and recommended by RCM.



SHOP & FIELD

(Continued from Page 36)

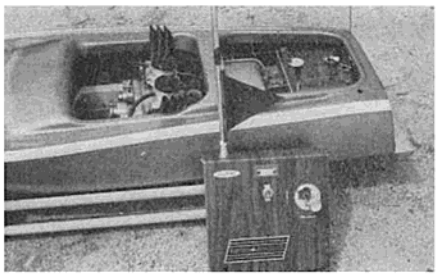
ing iron tip, as well as holding associated soldering tools such as a pair of wire cutters, wire strippers, a pair of fingernail clippers for clipping component leads, a toothbrush for cleaning PC boards, and a set of small component clamps.

There are many additional items you will undoubtedly want to add as you progress in this hobby. In fact, many modelers would consider a great many of the tools mentioned as luxuries. As we progress in this series of articles, other specialized tools, modeling aids, painting equipment, etc., will be discussed. We will attempt to describe various ways of using your shop equipment as well as some unique applications for the R/C modeler.

Next month we will discuss materials — balsa, plywood, and adhesives.

POWER & SAIL

(Continued from Page 44)

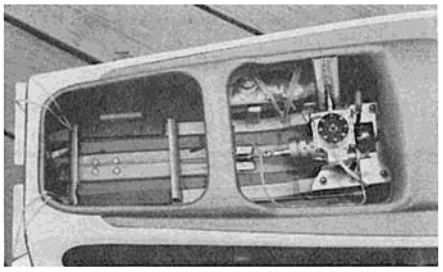


sure system.

Initial test runs should be made with a rich motor setting and only partial throttle. If the boat porpoises up and down, bend the ride plates down slightly.

The Octura X-50 or X-55 props work very well. The X-50 was used when the Mako set the W.A.M. and I.M.P.B.A. record of 29.34 M.P.H. The prop was set very close to the strut, in fact, as close as the Octura drive dog would allow. You can move it back to "loosen up" the hull, but you'll run the risk of flipping more easily. To help counteract the torque you can add weight to the left rear corner. This also helps bring the balance point towards the rear. Remember, on Ski boats try to get the C.G. as far back as possible as you'll have a flatter ride plus more stability. The Mako should balance between 13 and 14 inches from the transom.

Because of the drumming vibration effect on the bottom of the hull don't expect small mounting pads to stick if just glued on, even with epoxy. The ¼" plywood pads used to mount the throttle torque rod brackets came loose. I had to extend them from the motor mount stringers clear across to the corner



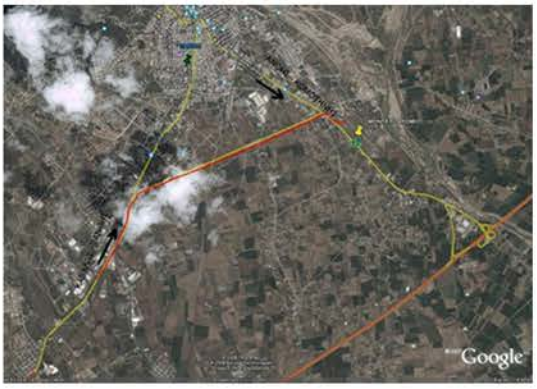
(chine) of the hull. Then epoxy glass cloth strips down over all the edges. This should be done around the firewall bulkhead, tank mounts, etc. Again, remember to sandpaper thoroughly any surface which you intend to glue, fiberglass, or paint.

In the photos you'll see that there is wood veneer on the deck and transom. It looks good but it's a lot of work, especially on the deck! In fact, the preliminary sanding, necessary to get good adhesion, was done carelessly and I broke into the metal flake so I'll have to paint the top!

With a .60 the Mako makes a good all-around competitor. On the Coast they win more than their share of trophies in speed obstacle, lap speed and multi boat racing events with a hot, **hot** .60, on pressure, speed fuel, etc., the hull has turned over 32 MPH. When the twin Rossi version of mine has been run a few more times and I figure out how to harness all the power and torque available without flipping, I'm confident it will go over 35 MPH. When it set the record it had been run only four times. The engines were in almost a full four cycle, so there's a lot of potential in it!

Good luck on your own glass boat project — Mako or other.

Airport Xanthi 1



Airport Xanthi 2

Airport Xanthi 3

Airport Xanthi 4

Airport Xanthi 5

Airport Xanthi 6

Airport Xanthi 7

Pilots (Hlsat,Savvas,Kostas)