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CDC

# Radio Control MODELER

NOVEMBER 1965 50c

AMERICA'S LEADING PUBLICATION FOR THE WORLD'S FASTEST GROWING HOBBY


JIM FIELDING'S MAGNIFICENT
HAMMERHEAD

KEN WILLARD'S
GOOD NEIGHBOR

THE RCM DIGITRIO—PART III

COMPLETE NATIONAL DATA SHEETS

THE NEW ERA IN R/C — FREE STYLE AEROBATICS

# RADIO CONTROL MODELER

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# EDITOR'S MEMO

## by DON DEWEY

THE National Model Airplane Championships are over for another year. What remains now is a "sorting out" of the data, the comments, criticisms, and suggestions. To the Academy of Model Aeronautics this data is vitally important to the planning of the 1966 Nationals. To the manufacturer, this compilation is an indicator of equipment and product trends. To the modeler, this information provides a valuable guide toward both aircraft design and equipment choice in the months to follow. For these reasons, RCM has again presented the data concerning the majority of contestants in the R/C portion of the 1965 Nationals. This data was compiled from individual data sheets mailed to the contestants following the conclusion of the annual event. Any omissions are due simply to the fact that the contestant did not receive a data sheet, or in some cases, neglected to return it to us.

What does not show up in the summary presented in this issue are the individual comments from the contestants, officials, and members of the press that participated at the Nat's. These comments, also taken from the same data sheets, were unanimous in their thanks to the A.M.A., and to the U. S. Navy, for their tremendous efforts in presenting this annual model spectacular. On the suggestion side of the ledger, these questionnaires also indicated an almost unanimous plea for regional R/C eliminations leading up to the Nationals in order to provide an adequate number of flights per contestant along with giving this portion of the once-a-year event an even greater significance. In this matter, we concur completely, and feel that such qualification meets are essential for future R/C portions of the Nat's.

The subject of judging again came under rather severe criticism from the vast majority of contestants — not in the form of individual complaints of unfair judging, but of inconsistency, with scores on a given flight varying as much as 50% between the judges. As one experienced multi pilot put it — "One of my high scores was 96 — it actually rated a 70." And thus, again, the need for experienced R/C judges is vividly pointed up.

So much for the general comments — for an interesting analysis of the data compiled, and for the general information concerning the entries at Willow Grove, see the data sheets in this issue.

And from R/C Modeler Magazine, a "thank you" to the A.M.A., its contest officials and planning staff, and to the U. S. Navy Willow Grove Naval Air Station for their hosting of the event this year.

In passing, Dick Gillette of College Park, Georgia, fourth place winner in Class III, wanted it known to all concerned that the South **has** risen again — quite evident from the final standings! Dick, who flew a Kwik-Fli (designed by Phil Kraft), put the following comment down on his questionnaire under 'Unusual Design Characteristics': "Phil Kraft has difficulty flying it." Phil, on the other hand, claims he was beaten only by Jack Daniels. . . .

●

On the Internat's scene, Dr. Ralph Brooke again won the World R/C Championships, in a remarkable exhibition of flying skill coupled with outstanding sportsmanship. Third and sixth places were also captured by members of the U. S. team to win the team event for the United States. A complete and exclusive report on the Internationals competition also appears in this issue.

●

In the unusual events department, we thought you might like the following letter, received from Lon Turner of Cochran, Georgia:

Dear Mr. Dewey,

Recently I had a rather unusual experience, and thought you might like to share it with your readers.

Thursday, July 8, I took my Mighty Mambo, equipped with F&M 10-channel reed equipment, out to our local airport for my second attempt at flying a multi-channel airplane. My first attempt had been quite successful (aside from missing the runway on landing, due to not turning the way the airplane was heading), so I was feeling pretty cocky.

I cranked up the K&B .45, and had a little buddy hold the airplane while I checked out all controls. So, I had him release the airplane; I revved up the K&B .45; and made a nice, smooth take-off right down the runway and up into the air. The six-ounce tank was topped off with R/C fuel extended with 10% Amoco white gas.

The airplane headed on out, and got just a few hundred feet from me, and I suddenly discovered I had no control over it at all! It was not quite trimmed out yet, and had a very shallow right circle built in. The wind was blowing fairly steadily, straight down the run-


(*Continued on Page 9*)


RADIO CONTROL MODELER MAGAZINE

NOVEMBER 1965 VOLUME 2, NUMBER 11

## WHAT HAPPENED TO OCTOBER?

Nothing. This *is* the October issue. . . . Our National newsstand distributor asked that our cover date be stepped up one month in order to assure a full four weeks newsstand exposure for each issue. This was due to the fact that we were actually two weeks late on the newsstands each month. Please be assured that you haven't missed a copy of RCM.

## FEATURES



## DEPARTMENTS



## NEXT MONTH:

RCM DIGITRIO: *Part IV – Constructing the receiver-decoder.* By Ed Thompson.

THE SHOWOFF: *A fully aerobatic biplane for .45 to .61 designed by Chuck Cunningham for the new free-style maneuvers.*

way, and while I stood there frantically wiggling buttons to no avail, the airplane climbed majestically into the sky to disappear into a large thunderhead.

One of the pilots at the airport was on his way to dust a farmer's field, and said he'd take a look and try to find my plane for me before he flew on out on his dusting job. He climbed to what he later told me was 8,500 feet in search of the model, but saw no sign of it anywhere.

By this time we naturally assumed that the engine had quit, and that the plane had landed, Lord only knew where. This took place at 5 p.m.

I came home extremely down-in-the-mouth, to say the least, inasmuch as I had sunk my last cent in this rig. And, after all, what can you do with a 10-channel transmitter and a battery-charger if you ain't got a flying machine to go along with them?!

The next morning I hurried back out to the airport, and one of the pilots, Alan Curtis (a former modeler, and therefore quite sympathetic to my cause), took me up in a Super Cub and we proceeded to make S-turns using the runway as a marker, in search of the model. No sign anywhere. This time I was thoroughly crushed. I was certain I would find my model sitting in one of the lovely farm areas surrounding Cochran; no such luck!

Friday night at approximately 8:00, I received a call from the Chief of Police of Dublin, Georgia (31 miles distant), saying that my plane was in his office! Here's the story as I got it.

On Friday morning (the day after I launched the airplane), a farmer went out to hoe the weeds out of his peanut patch, near Dublin. About noon it began to look a little like rain, so he knocked off for lunch. It rained until approximately 1:30 p.m., at which time the farmer went back out into his field, where he found my Mambo sitting placidly on its wheels, right where he had been working that morning! He swears that the plane was not there before he went in, and there was no sign of anyone else's having been around it. There was dirt splashed on the airplane from the rain hitting around it; therefore, it gave every appearance of having landed there during the rain.

This leads us to only one conclusion: The airplane must have been in the air from 5:00 Thursday till between 12:00 and 1:30 Friday! I've been a modeler for 26 years, and have never heard even a slightly verified case of this happening before. Upon discussing it with the pilots who helped try and find my plane, we came to the conclusion that, after the plane entered the thunderhead above 8,000 feet, it was kept circulating within that cloud all night long by the strong air currents usually found in that type cloud, and was released finally only when the cloud broke up into rain.

I find this very difficult to believe, and I do not ask, necessarily, that anyone else believe it either. Inasmuch as there were no A.M.A. personnel or other sanctioned persons witnessing the landing, or, for that matter, the take-off of the plane, I can't apply for any duration or altitude records, or anything like that! But the man who found it swears to his part of the story, and I certainly know when I launched the plane. And, true or not, I think you'll agree it makes an interesting story!

Forever Ambroid,
Lon Turner

●

In the errata category, here are three that were made on the Sampey 404 conversion article, as brought to our attention by Woody Woodruff, the author. First, the full-size P.C. board was shown upside down. This can be remedied by making a negative of same, then turning the negative upside-down on the copper for exposure.

Second, the audio coupling transformer T-2 is shown connected 180 degrees out on the twice-size drawing. The transformer should be turned around so that the **secondary** connects to the **collector** of the first audio stage, and the **primary** connecting, or feeding, to the **base** of the clipper stage.

Third, the side of the PC board having the outgoing leads to the discriminator should be trimmed off so that these leads aren't shorted to **black,** or common + 2.4 volts. The board should look like the twice-size drawing.

And if there were any more mistakes that could have been made, please be assured that we would have made them. . . .

Thanks, Woody.

●

On the humorous side, Jack Sellors of the Cleveland R/C Club sent in the following newspaper clipping:

UNCONTROLLED TOY DEFEATS MAN, BEAST!

In the London suburb of Hornchurch, Andrew Burton, 14, was playing with his model plane. It had a tiny gasoline motor and a four-foot wingspread. It climbed to 500 feet. Andrew controlled it by radio — or so he thought.

The plane failed to respond to Andrew's signals and disappeared.

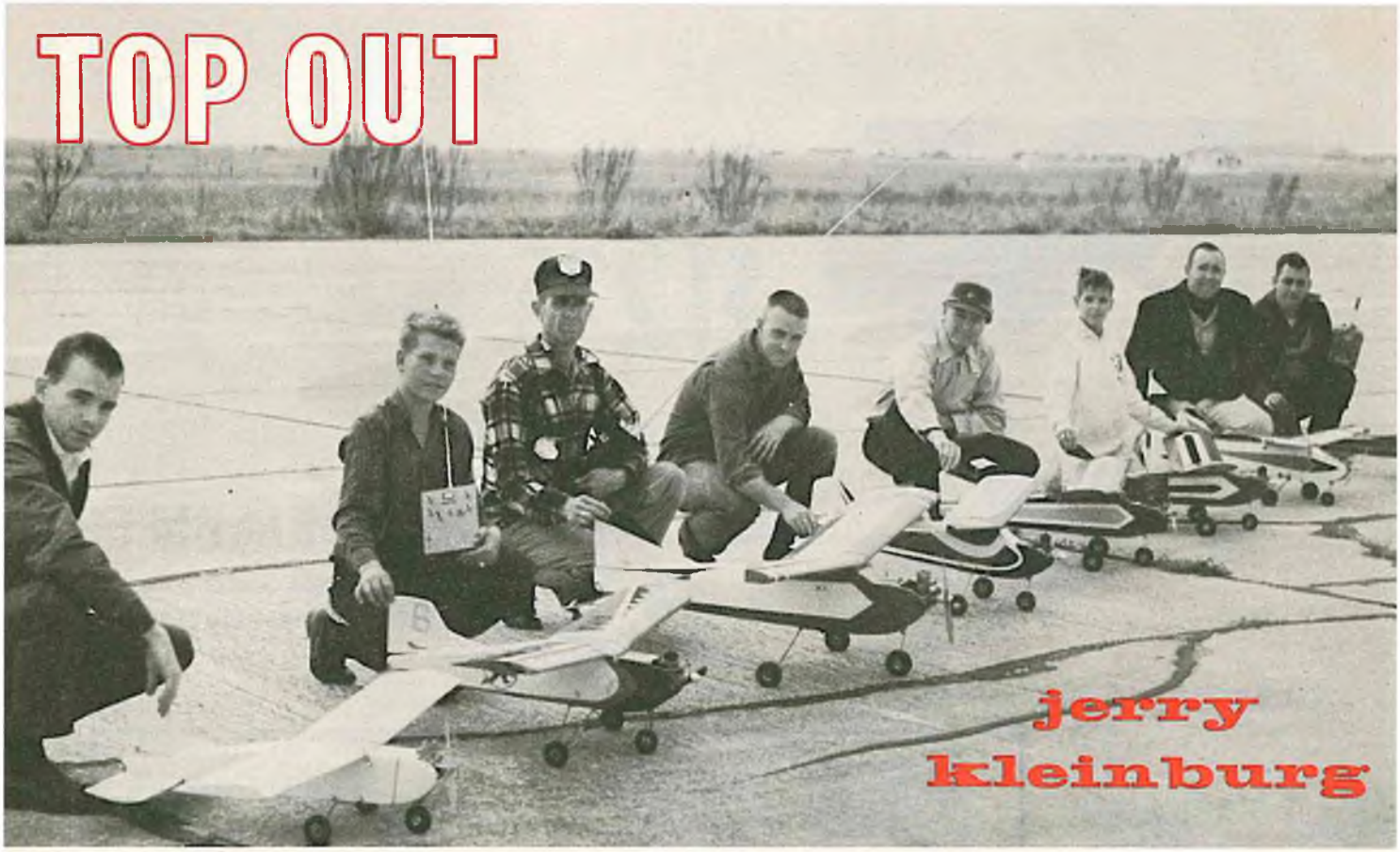
Five miles away it ran out of gas and nose-dived into farmer William Watt's pasture. On its way down it sheared off an 11,000 volt cable. The live cable dropped on four expensive pedigreed cows, all expectant mothers, and electrocuted them.

The broken cable blacked out Rainham village.

The plane bore Andrew's name and

*(Continued on Page 72)*

# TOP OUT




Rudder ships line up at Brooks AFB, Texas for a Saturday of sport flying and contest practice. Inactive runways provide ideal setting for these San Antonio fliers and their multi-reed equipt. Class I Craft. Capt. Tom Hollarn, 2nd from right, won 1965 AF Training Command rudder crown; Maj. C. P. Hart, 3rd from left, recently retired, opened hobby shop in Paris, Texas, where R/C is stressed. Note lone kit Falcon at far right, others are Texas spawned originals.

**NATS ROUNDUP**

First class — Class I! This was the sum up of rudder performance at the annual Nationals held in Philadelphia the last week in July. Twenty-seven entrants, the cream of Class I, logged almost 200 flights in mild wind and temperatures during six Pattern Event days and at the cost of only one major crack-up, took home 15 trophies for their expert efforts. While judging showed some unevenness and comment was made about the 6½ flight rounds afforded (compared to the 16 flights in 1964), contestants voiced general agreement that this 34th annual shindig was a well run meet. It was also a meet that saw record competition and scores with the first four contestants in the Open division compiling more than 100 points each!

First place crowns were divided between Jackie Gardner of Jackson, Mississippi, in Open, and Gary Davis of Hyattsville, Maryland, for the Jr.-Sr. division. Gardner's score of 125 points for two best flights earned the Min-X Radio Corp. Award and bested hard-pressing George Gorden and his 119.5 point tally and M. Reed's 105.5 point total. Harrison Morgan carried off 4th place at 103 points, while club-mate Armand Cote's score of 99.5 — usually good enough to win any contest — took 5th place honors.

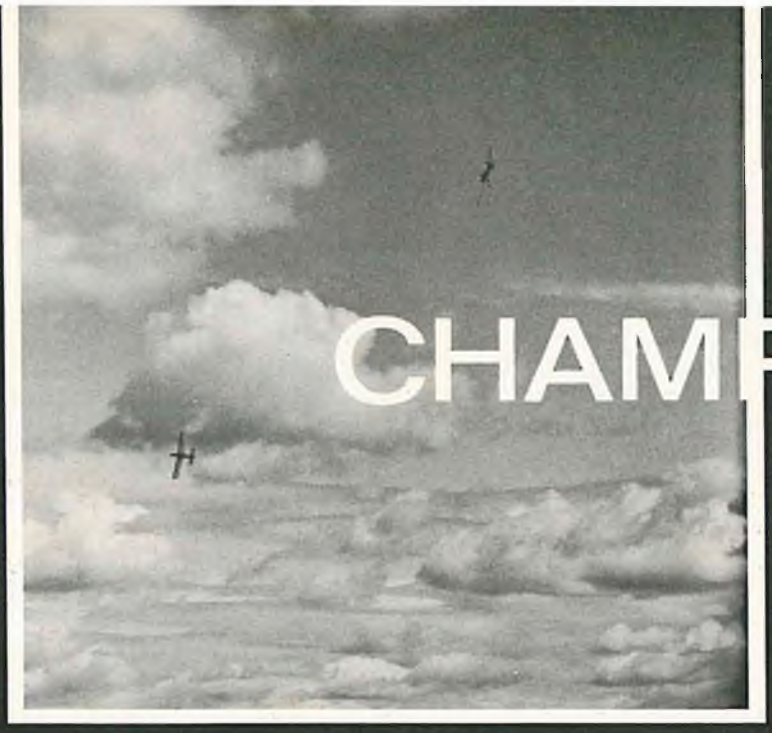
Following Gary Davis, who gained the Citizen-Ship Radio Trophy for his outstanding 89 point accumulation, was Dick Schmidt of the New York City Bronx, with 78 points. Steve Morgan, Harrison's 15-year-old junior RCer, made it a real family triumph by taking 3rd place with 64 points. Mike Ritter and Bobby Woods fought to 4th and 5th place respectively in the Jr.-Sr. division competition.

*(Continued on Page 53)*

Harrison Morgan, always a top contender, photographed at '65 Nationals.

Gary Davis accepts Nat's trophy for best single flight in Jr.-Sr. Class 1.

11 year old contestant, Robert Greer, gets his Nat's entry ready for qualification.



# 1965 WORLD CHAMPIONSHIP

FOR RADIO-CONTROLLED MODEL AIRCRAFT

| Team Results | 1st | Flight Scores 2nd | 3rd | Total |
|---|---|---|---|---|
| USA | 17,772 | 19,506 | 20,668 | 57,946 |
| Great Britain | 15,020 | 16,102 | 17,105 | 48,227 |
| Canada | 15,793 | 15,321 | 16,967 | 48,081 |
| Belgium | 12,212 | 15,635 | 15,742 | 43,589 |
| W. Germany | 15,497 | 13,455 | 13,677 | 42,629 |
| South Africa | 14,610 | 9,885 | 14,790 | 39,285 |
| Italy | 11,158 | 12,706 | 13,373 | 37,237 |
| Sweden | 12,419 | 11,274 | 12,263 | 35,956 |
| Denmark | 10,508 | 9,716 | 12,971 | 33,195 |
| Norway | 9,253 | 9,169 | 10,059 | 28,481 |
| Holland | 7,514 | 9,897 | 9,576 | 26,987 |
| Japan | 8,453 | 9,776 | 5,490 | 23,719 |
| Czecho-Slovakia | 1.274 | 2,072 | 1,339 | 4,685 |

## RALPH BROOKE, U.S. TEAM WIN 1965 INTERNATIONALS

An RCM Special

BY GEOFF FRANKLIN


**AUGUST 12 - 13 - 14**

**LJUNGBYHED · SWEDEN**

World Champion Ralph Brooke with his Crusader. Orbit Digital, Merco 61.

2nd Place, Chris Teuwen of Belgium, with S.T. 56 powered original.

Cliff Weirick led until engine sagged on 2nd flight. Finished third.

P. Stephanson of Norway, fourth. Merco 61 original. Bonner radio.


Great Britain's Chris Olsen and Pete Waters. Olsen, fifth.

Zel Ritchie, sixth, helped U. S. win team championship. Phantom IV.

Canada's Ron Chapman and seventh place Norseman.


Stu Foster and highest placing reed entry. Nimbus II powered by Merco 61.


Canada's Harry Tom and Cutlass design. Kraft proportional.

Jesper von Segebaden with Swedish Mustfire entry. Bonner radio.

Fritz Bosch, West Germany, with Tiger Bipe. 12th. Simprop radio.

Chris Sweatman of So. Africa with Merco 61 powered Decoder.

Warren Hitchcox, Canada, and Merco powered Norseman.

Georg Haegeman of Belgium with original Zinneken. Bonner Digimite.

Denmark's Nordahl—Rasmussen and S.T. 56 Beachcomber. Bonner radio.

Pete Waters, Great Britain, and Min-X reed Altair-6 design.

Erminio Corghi of Italy and X-18. Controlaire reeds.

Sousuke Kato and Super Thunderbird Orbit proportional.

Johannes Wessels and South African Taurus entry. Veco .45, Digimite.

Italy's Oreste Mantelli and Sirius design. Orbit 10.

Francesco Guglieminetti, Italy, and KK original. KB 45, Digimite.

Jan Levenstam, Sweden, and Merco .61 powered Mustfire. Kraft 10.

Jan van Vliet, Holland Blizzard. F & M proportional.

Masahiro Kato, Japan and Super Thunderbird. Orbit proportional.

Ulf Tonnessen, Norway, and Flint Stone. Home-made proportional.

Rolf Dilot, Sweden and Taurus. Min-X 10, Merco 61.

Joe de Dobbeleer, Belgium, and original Demoiselle. Digimite, S.T. 56.

Frans Matrens, Holland, and S.T. 60 powered original Rumpie.

Jiri Michalovic, Czecho-Slovakia, and original with home-made 9cc engine.

U. S. Team, Cliff Weirick kneeling next to Candy.

Manager Ed Kazmirski watches as Weirick goes through the F.A.I. pattern.

Two time champion — Ralph Brooke and victorious Crusader.


Close-up of Ralph Brooke's ship, Ritchie's Phantom IV in background.

Weirick, Candy, and — — — — friend.

RCM's Overseas editor, Geoff Franklin on right, talks with Cliff Weirick.

Zel Ritchie taxis Phantom as team manager Kazmirski looks on.

The flags of the many nations entered in the World Championship.

Noted R/C author, Windy Kreulen with RCM's Geoff Franklin.

The end of another example of International friendship and competition.

| Final Results | Aircraft | Motor | Radio | Flight Scores 1st | 2nd | 3rd | Total |
|---|---|---|---|---|---|---|---|
| Brooke, Ralph Charles, USA | Crusader<br>Centurion | Merco 61<br>Veco 61 | Orbit Digital<br>Orbit Digital | 6151 | 7008 | 7188 | 20,347 |
| Teuwen, Chris, Belgium | Trouble-Original | ST 56 | Bonner Digimite | 6168 | 7216 | 6609 | 19,993 |
| Weirick, Clifford Glen, USA | Candy | Veco 61 | Bonner Digimite | 6217 | 6403 | 7269 | 19,889 |
| Stephansen, Poju, Norway | Maximum 4 | Merco 61 | Bonner Digimite | 5997 | 6103 | 6779 | 18,879 |
| Olsen, Christopher H., Great Britain | Upset | Merco 61 | F&M Reed | 6005 | 6066 | 6257 | 18,328 |
| Ritchie, Zelbert W., USA | Phantom IV | Fox 59 | Orbit Digital | 5404 | 6095 | 6211 | 17,710 |
| Chapman, Ronald Edward, Canada | Norseman 4 | Merco 61 | CRC Electronics Propo | 5848 | 5013 | 6732 | 17,593 |
| Foster, Stuart Lawsen, Great Britain | Nimbus II<br>Nimbus II | Merco 61<br>Merco 61 | Orbit 10 Reed<br>Orbit 12 Reed | 5092 | 5476 | 5862 | 16,430 |
| Blauhorn, Karl, Western Germany | Taurus | OS-60 | Multiplex-Proportional | 4691 | 5313 | 6168 | 16,172 |
| Tom, Harold, Canada | Cutlass<br>Cutlass | ST 60<br>Merco 61 | Kraft Proportional<br>Kraft Proportional | 5616 | 5504 | 4930 | 16,050 |
| van Segebaden, Jesper, Sweden | Mustfire | Merco 61 | Bonner Digimite | 5186 | 4939 | 5600 | 15,725 |
| Bosch, Fritz, Western Germany | Delphin<br>Tiger | ST 56<br>ST 56 | Simprop-Proportional<br>Simprop-Proportional | 5654 | 2827 | 6974 | 15,455 |
| Sweatman, Christopher, S. Africa | Decoder | Merco 61 | Constellation 7 Propo | 4675 | 4958 | 5578 | 15,211 |
| Hitchcox, Warren, Canada | Norseman 4 | Merco 61 | CRC Electronics Propo | 4329 | 4804 | 5305 | 14,438 |
| Haegeman, Georg, Belgium | Zinneken-Original<br>Beachcomber | ST 56<br>ST 56 | Bonner Digimite<br>Sampey Starlite 500 Prop | 4649 | 5176 | 4454 | 14,279 |
| Nordahl-Rasmussen, H., Denmark | Beachcomber | ST 56 | Bonner Digimite | 4189 | 4934 | 5140 | 14,263 |
| Waters, Peter T., Great Britain | Altair-6<br>Altair-4 | Merco 61<br>Merco 61 | Min-X 12 Reed<br>Min-X 12 Reed | 3923 | 4560 | 4986 | 13,469 |
| Corghi, Erminio, Italy | X-18<br>X-26 | ST 51<br>ST 51 | Controlaire 10 Reed<br>Controlaire 10 Reed | 3966 | 5000 | 4438 | 13,404 |
| Kato, Sousuke, Japan | Super Thunderbird | ST 60 | Orbit Proportional | 4065 | 4826 | 4502 | 13,393 |
| Wessels, Johannes H., S. Africa | Taurus-Mod. | Veco 45 | Bonner Digimite | 4659 | 3862 | 4574 | 13,095 |
| Mantelli, Oreste, Italy | Sirius<br>Sirius-2 | ST 46<br>ST 51 | Orbit 10 Reed<br>Controlaire 10 Reed | 3826 | 4316 | 4413 | 12,555 |
| Guglielminetti, Francesco, Italy | KK Original | K&B 45 | Bonner Digimite | 3366 | 3390 | 4522 | 11,278 |
| Hakche, Jan, Denmark | Beachcomber | Merco 49 | Homemade 10 Reeds | 3469 | 3844 | 3927 | 11,240 |
| Bauerheim, Kurt, Western Germany | Corsar | ST 56 | Homemade-Proportional | 5152 | 5315 | 535 | 11,002 |
| Culverwell, Clifford A., S. Africa | Taurus-Mod.<br>Taurus-Mod. | Veco 45<br>ST 56 | Constellation 7 Propo<br>Constellation 7 Propo | 5276 | 1065 | 4638 | 10,979 |
| Levenstam, Jan, Sweden | Mustfire | Merco 61 | Kraft 10 Reed | 3590 | 3303 | 3749 | 10,642 |
| van der Burg, Arend, Holland | Hazwena'<br>Taurus | Merco 61<br>Veco 45 | Orbit 10 Reed<br>Orbit 10 Reed | 3708 | 2621 | 4127 | 10,456 |
| van Vliet, Jan, Holland | Blizzard<br>Firefly | Merco 61<br>Merco 61 | F&M Proportional<br>Bonner Digimite | 845 | 4569 | 4964 | 10,378 |
| Kato, Masahiro, Japan | Super Thunderbird | ST 60 | Orbit Proportional | 4388 | 4950 | 900 | 10,326 |
| Tonnessen, Ulf, Norway | Flint Stone-Original<br>Munin Original | Merco 61<br>Merco 49 | Homemade-Propoflex<br>Orbit 12 Reed | 3256 | 3066 | 3280 | 9,602 |
| Dilot, Rolf, Sweden | Taurus-Mod.<br>Taurus | Merco 61<br>Merco 49 | Min-X 10 Reed<br>Bramco 10 Reed | 3643 | 3032 | 2914 | 9,589 |
| de Dobbeleer, Joseph, Belgium | Demoiselle-Original | ST 56 | Bonner Digimite | 1395 | 3243 | 4679 | 9,317 |
| Andersen, Erik Rohde, Denmark | Original | Merco 61 | Bonner Digimite | 2850 | 938 | 3904 | 7,692 |
| Matrens, Frans, Holland | Rumpie-Original<br>Taurus-Mod. | ST 60<br>ST 56 | Orbit 12 Reed<br>Simprop | 2961 | 2707 | 485 | 6,153 |
| Michalovic, Jiri, Czecho-Slovakia | Original | Homemade 9 cc | Orbit 10 Reed | 1274 | 2072 | 1339 | 4,685 |


**WE ARE PROUD TO PRESENT THIS OUTSTANDING EXAMPLE OF MASTER CRAFTSMANSHIP AND WINNER OF NUMEROUS AWARDS, INCLUDING THE RCM EDITOR'S TROPHY. THE OPINIONS AND COMMENTS OF THE AUTHOR, HOWEVER, ARE NOT NECESSARILY THOSE OF A SANE PERSON . . .**

"Breathes there the modeler, with
soul so dead,
Who never to himself hath said,
I am an airplane designer?"

AND so it was by me. After years in modeling, with the last few in radio control, I had to try. Experience with several of the recent favorites, plus a few ideas of my own, sparked the Hammerhead. I wish I could give you a learned dissertation about why things are as they are, momentwise, and all that, but the plain facts are that I drew my dream unscientifically, decided it probably wouldn't fly, and then built it anyway to get it out of my system.

The first flight was conducted in secret, of course. Darned if the thing didn't go right off, and no witness. I had amazing luck for about 25 hours of flying and then, prang!

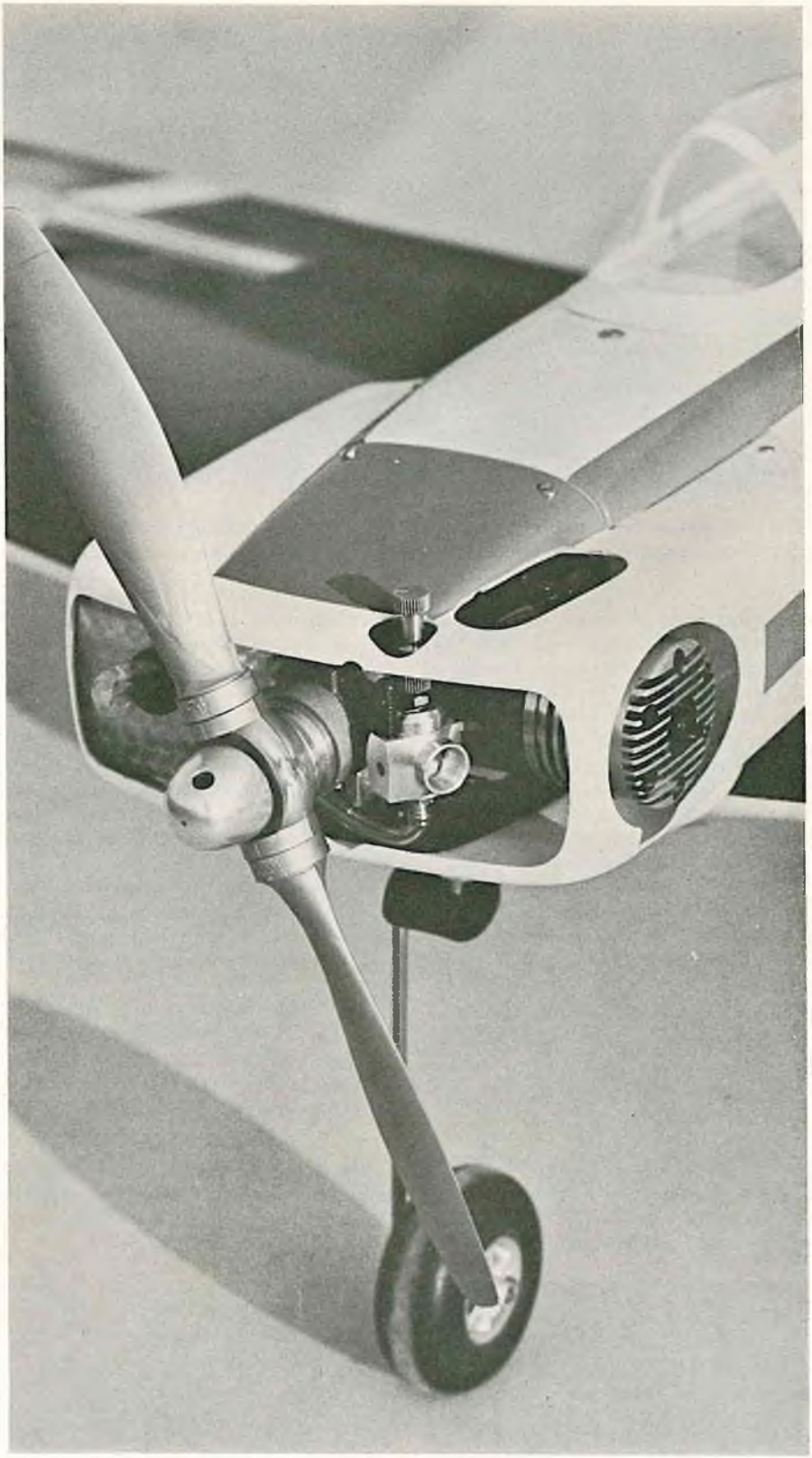
The second Hammerhead had "improvements." At 7-14 pounds, it was deliberately heavier by three quarters of a pound. I substituted a larger engine (which shall be nameless) for the Merco 49 which served so well in the first airplane, reveling in the heady promise of greater power at no increase in engine weight. Then several interesting things happened, some good, and some bad. When the engine ran well, the plane was breathtaking to fly, and capable of some marvelous maneuvers. Unfortunately, I was never able to master that engine and most of the time, it didn't run well. The fuel disappearance was also marvelous. I had to fabricate a 12-ounce metal tank that completely filled the right cheek, and 8 pounds was the weight at take-off. Flight was smooth and fast and I now believe that extra weight gives a definite edge in wind or rough air. However, all of a sudden rubber bands for mounting wings went out of style. I had no trouble in that department with the first plane, but speed plus weight equal lookout!

And how that engine did vibrate. I like to think I build fairly firmly, but things got loose quick. I tried different props and balancing to no avail, although Tony's "instant pitch" gave the best results.

Too late in the season, I was able to get a Merco 61 and life turned beautiful again. Like an electric motor it runs, compared to the other, with not quite as much power at the peak perhaps, but more than adequate. Fuel consumption seems scarcely greater than the 49, and an 8-ounce tank is plenty. Happily, grandly, carelessly flying along one day, Hammerhead Number 2 joined its ancestor, and now they both belong to the ages.

All things considered, they were good flying machines. I'm going to build more, and if you'd like to try one, here are some suggestions, but not a step-by-step formula.

You can see from the plans and pic-



BY JAMES FIELDING


The head called Hammer and a few of its many trophies. Editor's trophy at rear, left. Photo at right is Fielding's fluegenmeister. Clock wakes up dog on end of leash who bites Fielding who wakes up and lands Hammerhead. . . .

tures that some of my ways of building are different. Some say odd. Some say too much trouble. I say, no trouble at all, it's a hobby. My first suggestion then is suit yourself. Your methods are just as good for you, if not better.

The fuselage can be built in the conventional way if you like. You're on your own. I use fibreglass. I have made several fibreglass bodies several ways, but I like the method described here best.

The sides are balsa, built up flat, then joined for a basic crutch. The top edges of the sides are the reference lines for future rigging and alignment.

I **stretch** a piece of light glass cloth[1] over one side at a time and paint a slightly thinned (use styrene monomer) coat of polyester resin through the cloth into the base wood. I flow a goodly coat on as evenly as possible and never go back over the work. The resin should penetrate well and the texture of the cloth should show without puddles of resin filling up the surface. The stretch should be maintained till the resin is set, lest the cloth float and permit air bubbles or resin accumulation between cloth and balsa. Edges should be kept as square as possible. When cured, they can be trimmed with file and sandpaper block.

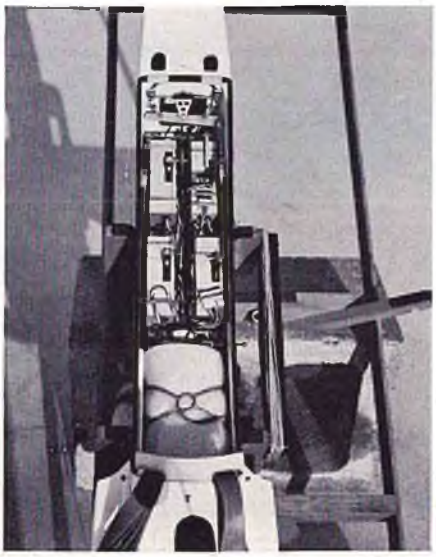
The front edges of the sides are routed to allow a flush lapped joint with the pre-formed fibreglass nose section. This is epoxied to the crutch assembly with tape over the outside joint to keep the epoxy tidy and hold the nose piece in place. Hobbypoxy glue cures quickly — others take longer. Whatever the cure time, it's best to wait till the nose is firmly set, because accuracy here determines fuse alignment and thrust lines.

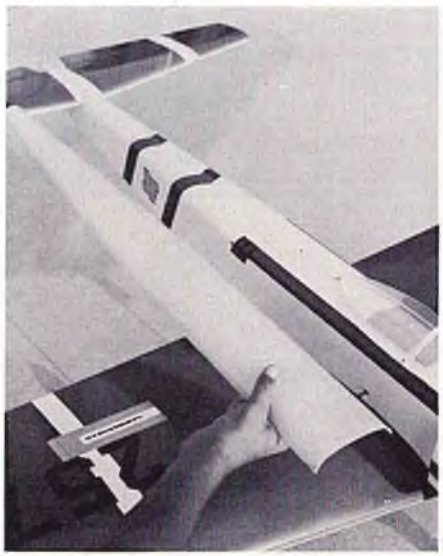
If you want some balsa formers, fit now and epoxy top and bottom fibreglass shells in place. I don't think the formers are really necessary unless you do a lot of fuselage squeezing in the vertical plane.

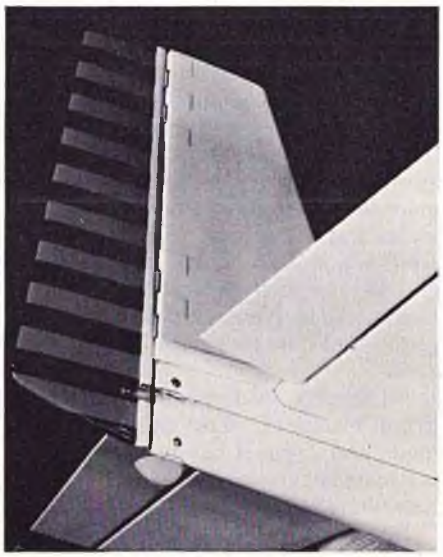
I leave the fuselage alone for a few days, the longer the better, and then sand the sides with a block, knocking the top off the texture without going too deep. I fill any imperfections in joints, top, bottom and nose with heavy-bodied epoxy glue. Then I flow Hobbypoxy filler thinned at least 50% on the sides, one at a time, holding them flat to per-

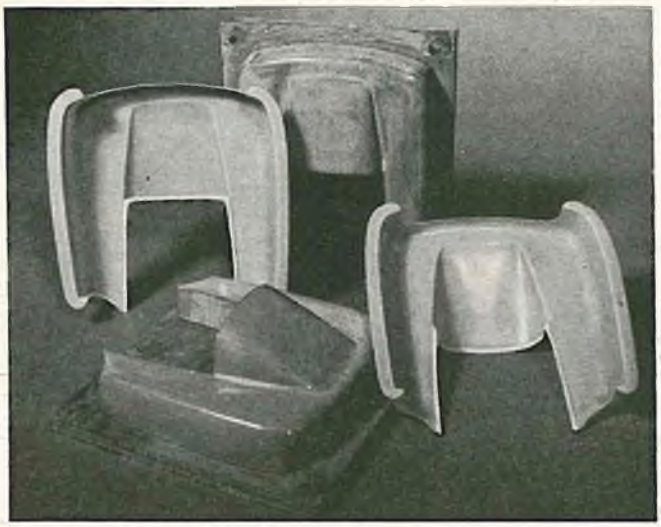
[1] Cope LP1240, roll width 60 inches, thread count 54 x 50, weight per square yard 2.8 ounces, thickness .004 inches, approved by FAA for airplane wing covering. Cope Plastics Missouri, Inc., 1157 South Kingshighway Blvd., St. Louis, Mo. 63110. Also in Alton and Moline, Ill. and Oklahoma City, Okla. A source for glass cloth and resin, as well as nylon, teflon, and delrin sheets, rods, tubes and other plastics and supplies.

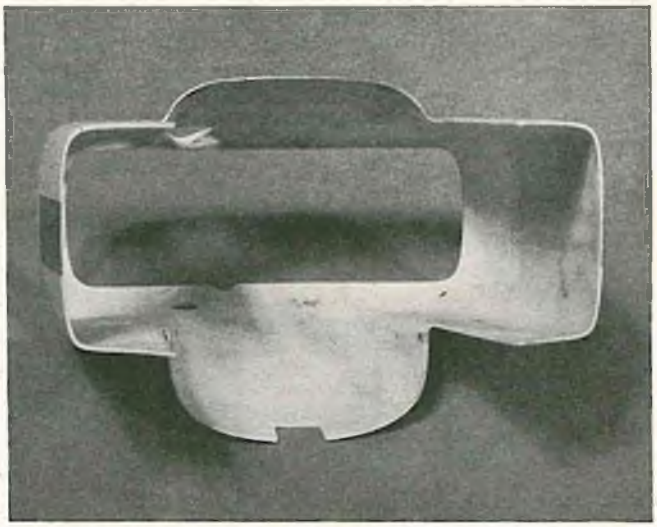
Left: Inside reed version. Servos at rear. Author's lunch wrapped in baggie in foreground. Center: Hand with typical turtle back. Right: How the tail flaps — 2-56 in rudder fitting turns free. ⅛" nylon rod fittings on cable tapped 2-56, permitting self-locking adjustment without twisting stainless steel fishing leader cable. Latter fits inside 1/16" O.D. alum tubing. Single 2-56 in rudder fitting allows removal of rudder-fin cable harness. Yeah.











Left: Balsawood and plywood masters from which fiberglass female molds are made from which cowl halves are made from which . . . . . Right: Airplane's view of cowling, looking out. Another RCM first (?).

mit filler to settle without runs. The formed fibreglass parts usually don't need filler. After sanding sides, minor holes in all surfaces can be spot filled with Stuff and a final sanding overall makes the fuselage ready to paint. We'll get to that later.

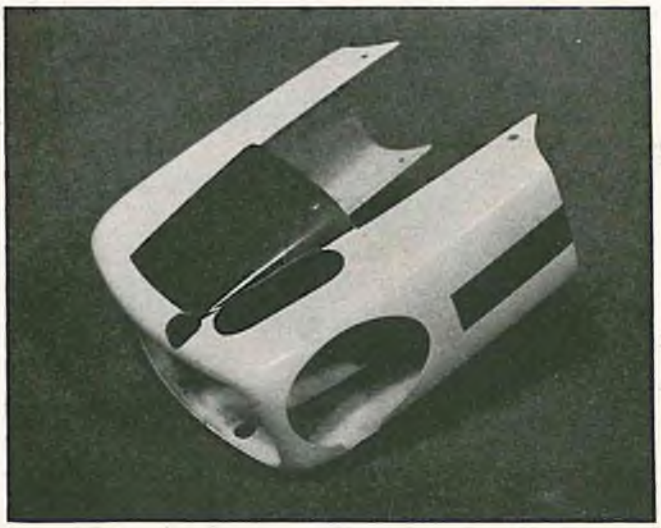
That's all fine you say, but what about the fibreglass parts? Dwight Hartman of Argenta, Illinois, has agreed to make the parts available to those who may want them for $15.00. You get top, bottom, nose section, cowling, and "cuff" for a Top Flite 8" canopy. All you do is trim, sand and fit. This sounds like a bargain to me considering the cost of materials and the work involved. I may get my futures from Hartman.

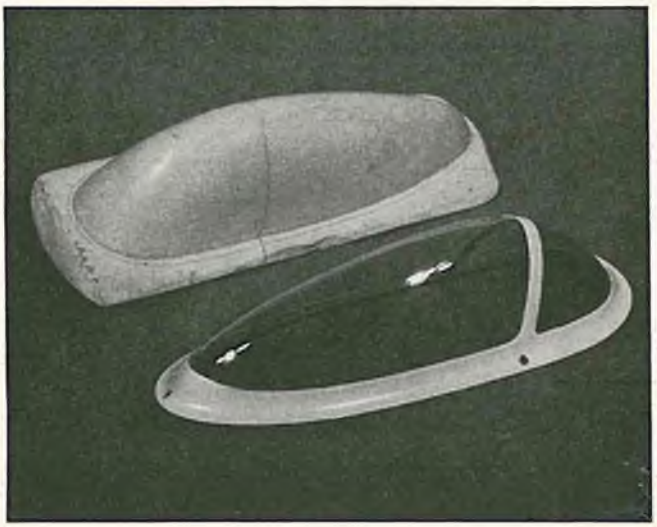
I am not trying to sell parts though, and if you want to make them, here's how. Make patterns or male molds for all parts needed to exact shape and size. Pine is good, but balsa will do. Seal with Hobbypoxy clear. Do any filling necessary to develop the finish you desire, remembering that the finish on the mold will be duplicated on the finished part. Spray a thin final coat of Hobbypoxy or any other paint that will not be attacked by the resin. Wax. Simoniz paste is fine. Coat with mold release. Try a polyvinyl water soluble release or any other (cuckoo) you like. Gel coat, meaning a coat of resin allowed to set. Using three or four layers of a cloth like Cope #181, 8.9 ounces per square yard, .0085 inches thick, to laminate a female mold of fibreglass over the pattern.

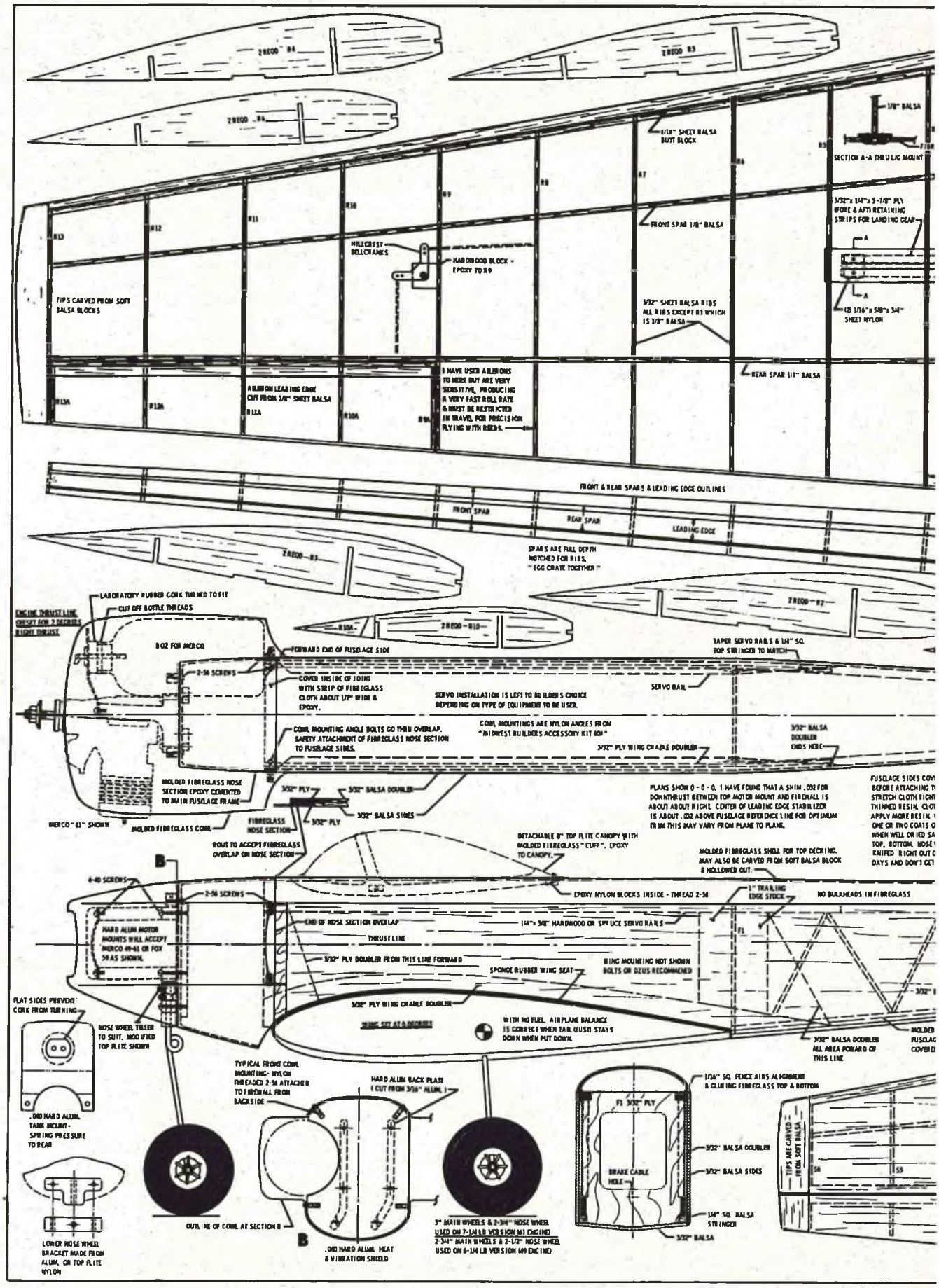
The cowl and nose section female molds have to be made in two halves. The cowl parting line is best horizontal, and the nose vertical. Lay up half of the mold with a flange against a dam on the parting line. Try modeling clay coated with the release agent. The parting line doesn't have to be perfect, because when the first half of the mold has cured, you strip away the dam, apply wax and release agent to the antidam face of the flange on the first half mold, and lay up the second half against the first. When molds are removed from the pattern, small imperfections in parting flange faces will fit together to index or align mold halves very accurately.

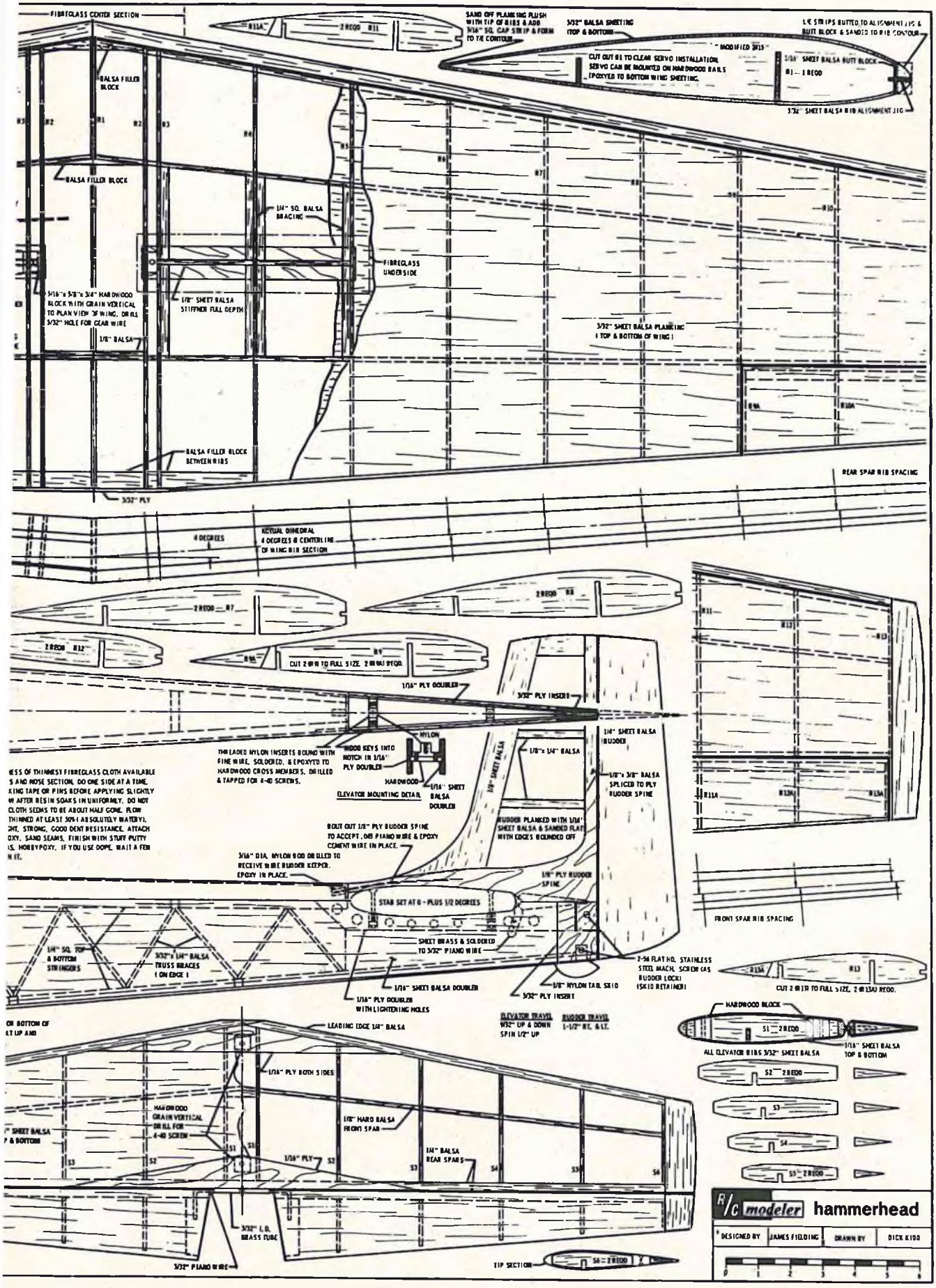
When female molds are finished, wax, apply release agent and lay up finished parts inside molds. Cowl and nose section molds are clamped or bolted together before layup starts. You should gel coat and apply one thickness #LP1240 and one thickness #181 or equivalent for top and bottom. The

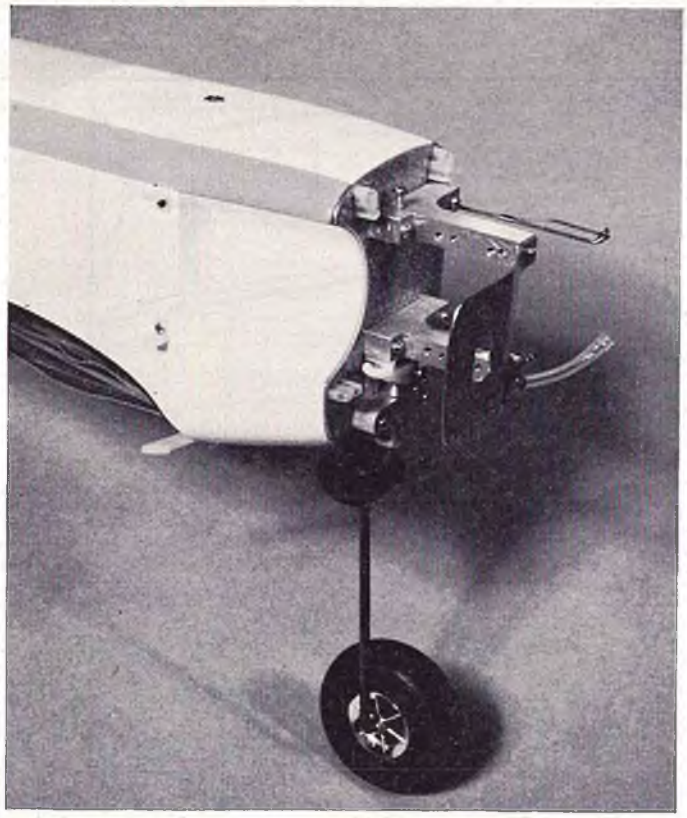
Left: Completed cowling thing with holes for mechanical protruberances. Right: The plaster mold over which the canopy "cuff" is laid up. The outside of the finished article must be sanded smooth. The inside fits canopy.






2 REQD R4
2 REQD R3
2 REQD R4
1/16" SHEET BALSA BUTT BLOCK
1/8" BALSA
SECTION A-A THRU LG MOUNT
3/32" x 1/4" x 5-7/8" PLY FORE & AFT RETAINING STRIPS FOR LANDING GEAR
FRONT SPAR 1/8" BALSA
MILLCREST BELLCRANKS
HARDWOOD BLOCK - EPOXY TO R9
TIPS CARVED FROM SOFT BALSA BLOCKS
3/32" SHEET BALSA RIBS ALL RIBS EXCEPT R3 WHICH IS 1/8" BALSA
(2) 1/16" x 5/8" x 3/4" SHEET NYLON
I HAVE USED AILERONS TO HERE BUT ARE VERY SENSITIVE, PRODUCING A VERY FAST ROLL RATE & MUST BE RESTRICTED IN TRAVEL FOR PRECISION FLYING WITH RIBS.
REAR SPAR 1/8" BALSA
AILERON LEADING EDGE CUT FROM 3/8" SHEET BALSA
FRONT & REAR SPARS & LEADING EDGE OUTLINES
FRONT SPAR
REAR SPAR
LEADING EDGE
SPARS ARE FULL DEPTH NOTCHED FOR RIBS, "EGG CRATE TOGETHER"
2 REQD - R3
2 REQD - R2
2 REQD - R10
LABORATORY RUBBER CORK TURNED TO FIT
CUT OFF BOTTLE THREADS
ENGINE THRUST LINE OFFSET FOR 2 DEGREES RIGHT THRUST
8 OZ FOR MERCO
FORWARD END OF FUSELAGE SIDE
TAPER SERVO RAILS & 1/4" SQ. TOP STRINGER TO MATCH
2-56 SCREWS
COVER INSIDE OF JOINT WITH STRIP OF FIBREGLASS CLOTH ABOUT 1/2" WIDE & EPOXY.
SERVO INSTALLATION IS LEFT TO BUILDER'S CHOICE DEPENDING ON TYPE OF EQUIPMENT TO BE USED.
SERVO RAIL
CORE MOUNTING ANGLE BOLTS GO THRU OVERLAP. SAFETY ATTACHMENT OF FIBREGLASS NOSE SECTION TO FUSELAGE SIDES.
CORE MOUNTINGS ARE NYLON ANGLES FROM "MIDWEST BUILDER'S ACCESSORY KIT #20"
3/32" PLY WING CRADLE DOUBLER
3/32" BALSA DOUBLER ENDS HERE
MOLDED FIBREGLASS NOSE SECTION EPOXY CEMENTED TO MAIN FUSELAGE FRAME
3/32" PLY
3/32" BALSA DOUBLER
3/32" BALSA SIDES
MERCO "61" SHOWN
MOLDED FIBREGLASS CORE
FIBREGLASS NOSE SECTION
3/32" PLY
PLANS SHOW 0 - 0 - 0. I HAVE FOUND THAT A SHIM .032 FOR DOWNTHRUST BETWEEN TOP MOTOR MOUNT AND FIREWALL IS ABOUT RIGHT. CENTER OF LEADING EDGE STABILIZER IS ABOUT .032 ABOVE FUSELAGE REFERENCE LINE FOR OPTIMUM TRIM. THIS MAY VARY FROM PLANE TO PLANE.
FUSELAGE SIDES COVI
BEFORE ATTACHING T
STRETCH CLOTH TIGHT
THINNED RESIN, CLOT
APPLY MORE RESIN, 1
ONE OR TWO COATS O
WHEN WELL OR HED SA
TOP, BOTTOM, NOSE
KNIFED RIGHT OUT O
DAYS AND DON'T GET
ROUT TO ACCEPT FIBREGLASS OVERLAP ON NOSE SECTION
DETACHABLE 8" TOP FLITE CANOPY WITH MOLDED FIBREGLASS "CUFF", EPOXY TO CANOPY.
MOLDED FIBREGLASS SHELL FOR TOP DECKING. MAY ALSO BE CARVED FROM SOFT BALSA BLOCK & HOLLOWED OUT.
B
6-40 SCREWS
2-56 SCREWS
EPOXY NYLON BLOCKS INSIDE - THREAD 2-56
1" TRAILING EDGE STOCK
NO BULKHEADS IN FIBREGLASS
HARD ALUM MOTOR MOUNTS WILL ACCEPT MERCO 49-61 OR FOX 59 AS SHOWN.
END OF NOSE SECTION OVERLAP
1/4" x 3/8" HARDWOOD OR SPRUCE SERVO RAILS
THRUSTLINE
F1
3/32" PLY DOUBLER FROM THIS LINE FORWARD
SPONGE RUBBER WING SEAT
WING MOUNTING NOT SHOWN BOLTS OR DZUS RECOMMENED
3/32" PLY WING CRADLE DOUBLER
WING SET AT 4 DEGREES
WITH NO FUEL, AIRPLANE BALANCE IS CORRECT WHEN TAIL JUST STAYS DOWN WHEN PUT DOWN.
3/32" BALSA DOUBLER ALL AREA FORWARD OF THIS LINE
FLAT SIDES PREVENT CORE FROM TURNING
NOSE WHEEL TILLER TO SUIT, MODIFIED TOP FLITE SHOWN
TYPICAL FRONT CORE MOUNTING - NYLON THREADED 2-56 ATTACHED TO FIREWALL FROM BACK SIDE
HARD ALUM BACK PLATE (CUT FROM 3/16" ALUM.)
1/16" SQ. FENCE RIBS ALIGNMENT & GLUING FIBREGLASS TOP & BOTTOM
F1 3/32" PLY
3/32" BALSA DOUBLER
3/32" BALSA SIDES
BRAKE CABLE HOLE
1/4" SQ. BALSA STRINGER
3/32" BALSA
TIPS ARE CARVED FROM SOFT BALSA
.040 HARD ALUM. TANK MOUNT - SPRING PRESSURE TO REAR
OUTLINE OF COWL AT SECTION B
.040 HARD ALUM. HEAT & VIBRATION SHIELD
3" MAIN WHEELS & 2-3/4" NOSE WHEEL USED ON 7-1/4 LB VERSION MI ENGINE
2-3/4" MAIN WHEELS & 2-1/2" NOSE WHEEL USED ON 4-1/4 LB VERSION 60 ENGINE
LOWER NOSE WHEEL BRACKET MADE FROM ALUM. OR TOP FLITE NYLON


FIBREGLASS CENTER SECTION
SAND OFF PLANKING FLUSH WITH TIP OF RIBS & ADD 3/16" SQ. CAP STRIP & FORM TO THE CONTOUR
3/32" BALSA SHEETING (TOP & BOTTOM)
L/E STRIPS BUTTED TO ALIGNMENT JIG & BUTT BLOCK & SANDED TO RIB CONTOUR
CUT OUT R1 TO CLEAR SERVO INSTALLATION. SERVO CAN BE MOUNTED ON HARDWOOD RAILS EPOXYED TO BOTTOM WING SHEETING.
MODIFIED R15
3/16" SHEET BALSA BUTT BLOCK
R1 — 1 REQD
3/32" SHEET BALSA RIB ALIGNMENT JIG
BALSA FILLER BLOCK
BALSA FILLER BLOCK
1/4" SQ. BALSA BRACING
FIBREGLASS UNDERSIDE
5/16" x 5/8" x 3/4" HARDWOOD BLOCK WITH GRAIN VERTICAL TO PLAN VIEW OF WING. DRILL 3/32" HOLE FOR GEAR WIRE
1/8" SHEET BALSA STIFFNER FULL DEPTH
1/8" BALSA
3/32" SHEET BALSA PLANKING (TOP & BOTTOM OF WING)
BALSA FILLER BLOCK BETWEEN RIBS
3/32" PLY
REAR SPAR RIB SPACING
4 DEGREES
ACTUAL DIHEDRAL 4 DEGREES @ CENTERLINE OF WING RIB SECTION
2 REQD R7
2 REQD R8
2 REQD R12
CUT 2 OFF R9 TO FULL SIZE. 2 REQD
1/16" PLY DOUBLER
3/32" PLY INSERT
1/4" SHEET BALSA RUDDER
1/8" x 1/4" BALSA
1/8" x 3/8" BALSA SPLICED TO PLY RUDDER SPINE
R11A
R13A
R13B
R13C
THREADED NYLON INSERTS BOUND WITH FINE WIRE, SOLDERED, & EPOXYED TO HARDWOOD CROSS MEMBERS. DRILLED & TAPPED FOR 4-40 SCREWS.
WOOD KEYS INTO NOTCH IN 3/16" PLY DOUBLER
NYLON
HARDWOOD
1/16" SHEET BALSA DOUBLER
ELEVATOR MOUNTING DETAIL
1/8" SHEET BALSA
RUDDER PLANKED WITH 1/16" SHEET BALSA & SANDED FLAT WITH EDGES ROUNDED OFF
ESS OF THINNEST FIBREGLASS CLOTH AVAILABLE S AND NOSE SECTION, DO ONE SIDE AT A TIME. KING TAPE OR PINS BEFORE APPLYING SLIGHTLY W AFTER RESIN SOAKS IN UNIFORMLY. DO NOT CLOTH SEEMS TO BE ABOUT HALF GONE. FLOW THINNED AT LEAST 50% (ABSOLUTELY WATERYL 2HT, STRONG, GOOD DENT RESISTANCE. ATTACH OXY. SAND SEAMS, FINISH WITH STUFF PUTTY S. HOBBYPOXY. IF YOU USE DOPE, WAIT A FEW K IT.
ROUT OUT 1/8" PLY RUDDER SPINE TO ACCEPT .085 PIANO WIRE & EPOXY CEMENT WIRE IN PLACE.
3/16" DIA. NYLON ROD DRILLED TO RECEIVE WIRE RUDDER KEEPER. EPOXY IN PLACE.
1/8" PLY RUDDER SPINE
STAB SET AT 0 - PLUS 1/2 DEGREES
FRONT SPAR RIB SPACING
1/4" SQ. TOP & BOTTOM STRINGERS
3/32" x 1/4" BALSA TRUSS BRACES (ON EDGE)
SHEET BRASS & SOLDERED TO 3/32" PIANO WIRE
2-56 FLAT HD. STAINLESS STEEL MACH. SCREW CAS RUDDER LOCK (SKID RETAINER)
1/16" SHEET BALSA DOUBLER
1/16" PLY DOUBLER WITH LIGHTENING HOLES
1/8" NYLON TAIL SKID
3/32" PLY INSERT
R13A
R13
CUT 2 OFF R13 TO FULL SIZE. 2 OFF R13A REQD.
OR BOTTOM OF
ET UP AND
ELEVATOR TRAVEL 3/32" UP & DOWN SPIN 1/2" UP
RUDDER TRAVEL 1-1/2" RT. & LT.
HARDWOOD BLOCK
S1 — 2 REQD
1/16" SHEET BALSA TOP & BOTTOM
ALL ELEVATOR RIBS 3/32" SHEET BALSA
LEADING EDGE 1/4" BALSA
1/16" PLY BOTH SIDES
" SHEET BALSA P & BOTTOM
HARDWOOD GRAIN VERTICAL DRILL FOR 4-40 SCREW
1/8" HARD BALSA FRONT SPAR
1/4" BALSA REAR SPARS
1/16" PLY
S2
S3
S4
S5 — 2 REQD
3/32" I.D. BRASS TUBE
3/32" PIANO WIRE
TIP SECTION
S6 — 2 REQD
R/C modeler hammerhead
DESIGNED BY JAMES FIELDING
DRAWN BY DICK KIOU
0 1 2 3 4 5 6



Translation: Charging jack at upper left. Molded nose section stops just in front of jack and fastens to the nylon angles at center left. Latter are cut from Midwest control horns and tapped 2-56. Cowl mounting blocks at top of engine mount are ⅛" nylon and tapped 2-56. 1/16" nylon hook on motor mount serves as top bearing for nose wheel strut and rubber band hold-down for fuel tank. Big holes in motor mounts for Merco . . . smaller foxholes for Fox .59. Nose wheel tiller is standard Top Flite with arm lengthened. Nose gear "boot" is G.E. "auto seal" to keep foreign material (dirt) out of coil spring. Nose wheel is big DuBro hub crammed in little DuBro wheel. . . .

cowl should have four to five thicknesses LP1240, applied in small overlapping pieces, and should weigh about 3 ounces when finished, without cut-outs for engine. The nose should have about five or six thicknesses LP1240 with extra cloth in the firewall and around front corners. The finished nose section should also weigh about 3 ounces, and the firewall should be between 1/16" and 3/32" thick.

The wing construction is conventional. I make spars first, egg crate with ribs, paint glue in joints, checking alignment frequently. I've tried various leading edges. The all-over sheet is a must for me. I like to leave the wing blocked or jigged in alignment for several days cure after the last gluing.

About ailerons. I don't happen to like strip ailerons, although I readily admit they're efficient, light, easy, and all. I seem to have a rule I unconsciously follow in model building — if there's a hard way, seek it out and do it that way. I've used top hinged conventional ailerons of 11½" and 14¾" span. Both were satisfactory. The large ones produced a faster roll rate and had to have travel restricted for smooth flying. The small ones had to have more travel for acrobatics, of course, but seemed to make for less twitchy normal flight.

I mentioned earlier that I recommend bolts or camlock wing mounting, but I haven't settled on a system yet, and none is shown on the plans. If you figure out a good one, let me know. When I used rubber bands, I had them pass through holes in the nose section's small formed bottom bulkhead, secured by a half round aluminum bar passing through the bands inside, but not projecting through the sidewalls of the nose section. The bands then hooked over 3/32" steel pins looking aft, anchored in the plywood bulkhead at the trailing edge station. "D" shaped holes in the fuselage bottom immediately aft of this bulkhead allowed access to the steel pins. About the best thing you could say for the arrangement was that it was out of sight and oil for the most part.

The stabilizer and fin bolt on as the drawings and photos show. This is another fetish with me. I just gotta be able to take everything apart or I'm not happy. The same applies to the canopy. When I try to glue a canopy on, all I get is trouble. So I bolt it on and live happily ever after. The cuff is fibreglass finish, painted white first. I accidentally discovered that a white epoxy glue, "Devcon 2 Ton" by name, attacks neither paint nor canopy, and can be smoothed and cleaned up with water, of all things. Maybe all epoxy is so, I don't know. (Ed's Note: Most are — epoxy is a hydrocarbon or something.) Anyway, you smear to your heart's content gluing canopy to cuff, and when finished, the excess can be banished handily with a damp cloth, and the glue forms its own fillets. How sweet it is!

The 2-56 machine screws for the canopy screw into small tapped blocks of nylon epoxied inside the top shell. The nylon is self-locking, and the battle of the bulge is won. The stab is mounted with two 4-40 steel machine screws into nylon blocks secured to the fuselage sides. If you have good luck gluing on tails and canopies, disregard the foregoing.

In the engine room — the mounts are made from 3/8" or 5/16" hard aluminum sawed by jig or bandsaw. I use a disk sander faced with medium carborundum paper to true up the engine mounting faces. Drill and tap holes and mount engine. I plug engine intake, exhaust, and other openings with modeling clay before grinding rear surface of mounts to proper thrust angles. In this way, a true surface on both mounts is easily obtained. The other sawn edges can be finished separately with file or any convenient tool.

The aluminum plate between engine mount and firewall protects the fibreglass. The aluminum engine mounts make a good engine heat sink and without the plate, the heat, vibration, and oil tend to soften the firewall.

I use two tapped 5/16" square aluminum bars on the back side of the firewall that span the 4-40 engine mount bolts and the nose wheel bracket bolts vertically. Once in place, retained by the wheel bracket bolts, the bars permit the engine mount assembly to be put on and off at will without fumbling inside with blind mounting nuts or what have you. The bars also reinforce the firewall. I've never had a failure with this system. The bolts that pass through the firewall should be tightened after each of the first few flights. Soon they will settle in place and need no attention other than an occasional check. I use no lock washers on the engine or mounts.

*(Continued on Page 60)*


# THE RCM DIGITRIO

## Part III: Transmitter Final Assembly

BY ED THOMPSON

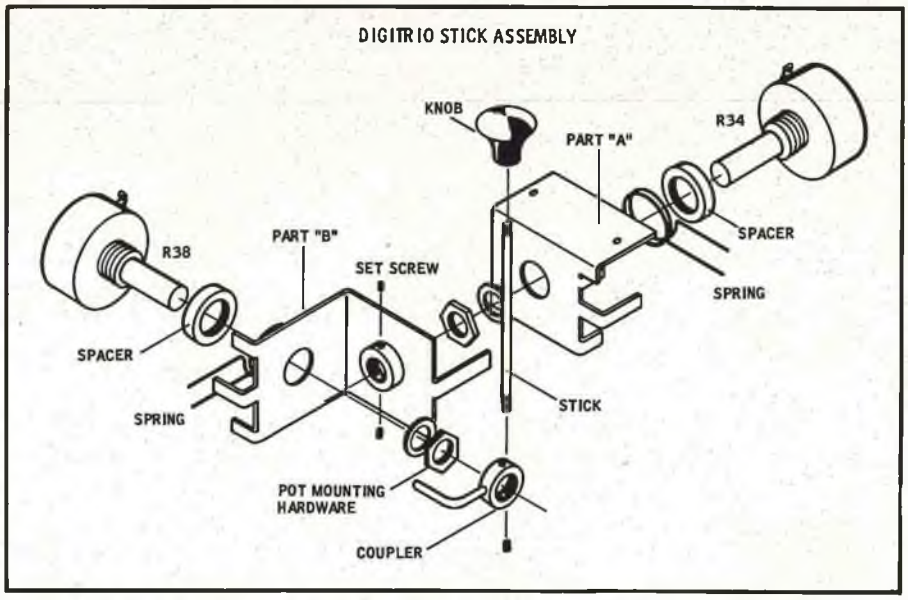
RCM Contributing Technical Editor

### The Transmitter Case

UNLESS you are a frustrated fender bender or ex-Navy machinist's mate, the miscellaneous sheet metal work involved with the transmitter case and stick assemblies will be the most tedious part of the entire RCM Digitrio system. We have tried, through experimentation with various prototypes, to simplify this phase of the construction to a point where it will require only a minimum of time and the normal shop tools. **Do** follow these instructions carefully, however, exercising care in your workmanship, so that each part of the mechanical work will be accurate, and at the same time, produce a presentable finished product.

The transmitters for the three RCM Digitrio prototypes were all fabricated from standard LMB #145 aluminum boxes, available at most electronic parts houses. Simply cut out the full size front panel layout illustrated here and paste it to the front of the LMB box with rubber cement. Use an electric drill and drill a series of holes around the inside perimeter of the main stick cut out, trim slots, and meter cutout. Punch out the excess metal, then trim to the actual dimensions of the cutouts with a file. Drill all remaining holes as specified. If you use a panel meter other than the one specified (Ace R/C), change this dimension accordingly prior to commencing fabrication. If you cannot locate the LMB box, the case can be fabricated from aluminum in a vise, using hardwood blocks to prevent surface damage. Alternately, all sheet metal work can be done at any local sheet metal shop for a nominal charge. We would suggest **not** drilling the antenna hole in the top of the transmitter can until final assembly in order that this hole will align properly with the antenna mount on the PC board.

After finishing the sheet metal work, use a fine file to true up all cutouts in the front panel. De-burr all drilled holes, then polish the can with steel wool, followed by a wet sanding with 400-600




wet-or-dry paper. The transmitter case can now be anodized or painted. RCM's three prototypes were anodized antique gold and orange-gold at a local plating shop. The minimum charge for anodizing is usually $15, with the price for anodizing a single case, five dollars. So, if you have a couple of friends building the Digitrio, take a minimum of three cases at once to the platers in order that they may be done for approximately five dollars a piece. If you are not choosey about the color, you may have it plated along with another customer's run and beat the minimum also. If you prefer, the case may be given a coat or two of primer followed by several thin coats of spray paint such as automotive enamel in aerosol cans, available at most hardware and paint stores.

**Control Sticks**

Carefully study all of the drawings for the control stick assembly and obtain a good mental picture of all the parts and the functions they will perform. Adhere as closely as possible to the dimensions shown or you won't end up with the stick centered in the case cutout. Use a coping saw with a fine metal blade, or a jig saw to cut out the parts. A hacksaw will prove to be pretty cumbersome for this work. Clean all cut edges with a fine-toothed file, and before making any bends in the vise, check the drawings once again. Be sure to use hardwood blocks in your bench vise in order to prevent surface damage to the individual parts. One easy method for transferring the templates to the sheet brass stock is by the use of Dykem Blue. The latter, available in 8 ounce cans in most hardware stores, is brushed on the surface of the sheet stock and allowed to dry to its natural dark blue color. The sheet metal templates can then be scribed on the surface, allowing the brass to show through the blue painted surface, giving you accurate lines on which to cut.

If you are long on ambition, but short on tools, you can make some substitutions for the parts shown. For example, the trim and control sticks can be replaced with ordinary 6-32 bolts cut to the indicated lengths. The couplers, which incidentally, are the only items requiring a few minutes of lathe work, can be removed from ¼" shaft couplers used by most "hams." The silver-soldered coupler on Part B can also be taken from a ¼" shaft coupler and bolted in place, although some excess "play" will result. Aluminum can be substituted for the brass parts, although the centering springs will eventually "dig in" and periodic adjustment will be necessary. The mounting posts can alternately be made from standard 5/16" brass tubing, available at most hobby shops, and threaded as indicated with washers to increase the shoulder area. If you utilize the latter substitution, make sure the overall length including the washers is the same as shown on the drawings.

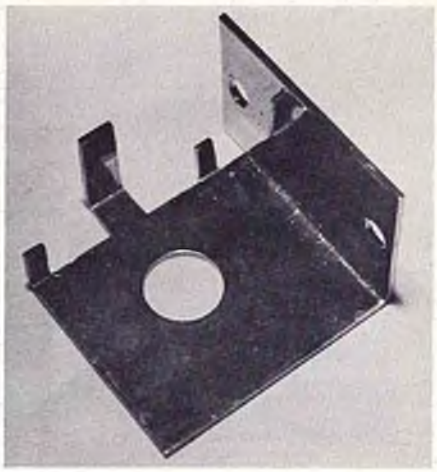
The curving arm on the one coupler can be a 6-32 bolt (with plain unthreaded shoulder), heated with a torch and bent as shown. Thread and solder it to the coupler as shown.

The pot spacers can be standard ⅜" pot mounting nuts rounded off with a file.

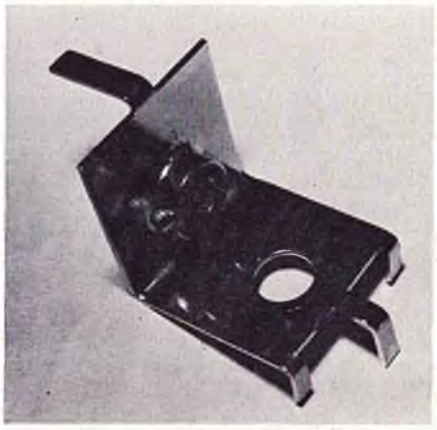
All of the above substitutions have been tried on one prototype, and although they are not as nice looking as the specified items, and though some play may be encountered in the control stick, they will enable the modeler with limited shop tools to reproduce this system with more-than-acceptable results.

So much for alternate ways of fabricating the control stick parts. When you get to the centering springs, this will be simply a matter of "bend and try" until you get the desired tension and action. Each one you bend will get progressively better until, finally, you end up with what you want in centering action.

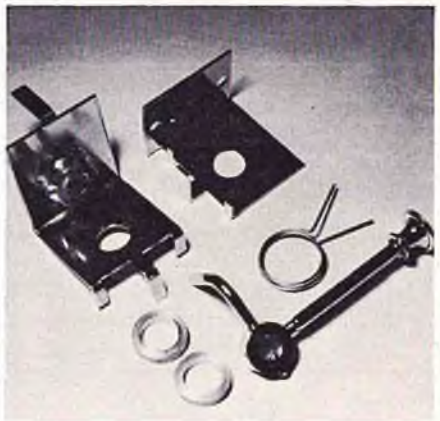
The "knob" on the control stick shown



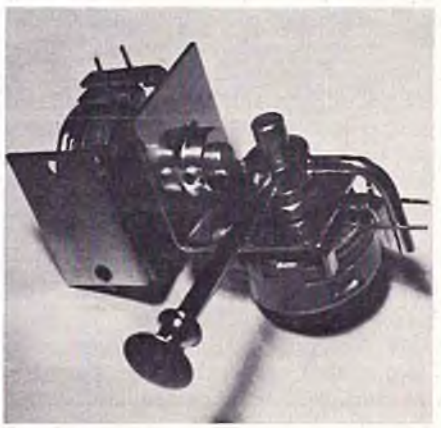
Part A, stick assembly.



Part B, stick assembly.

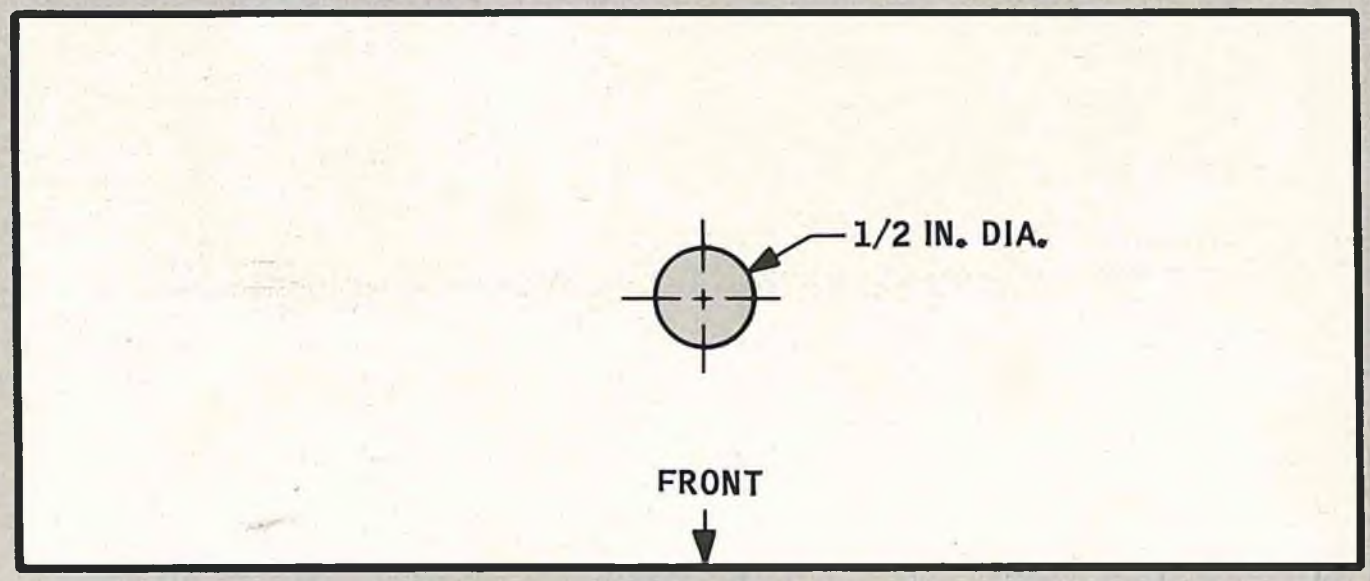


Stick parts prior to final assembly.



Completed stick assembly.

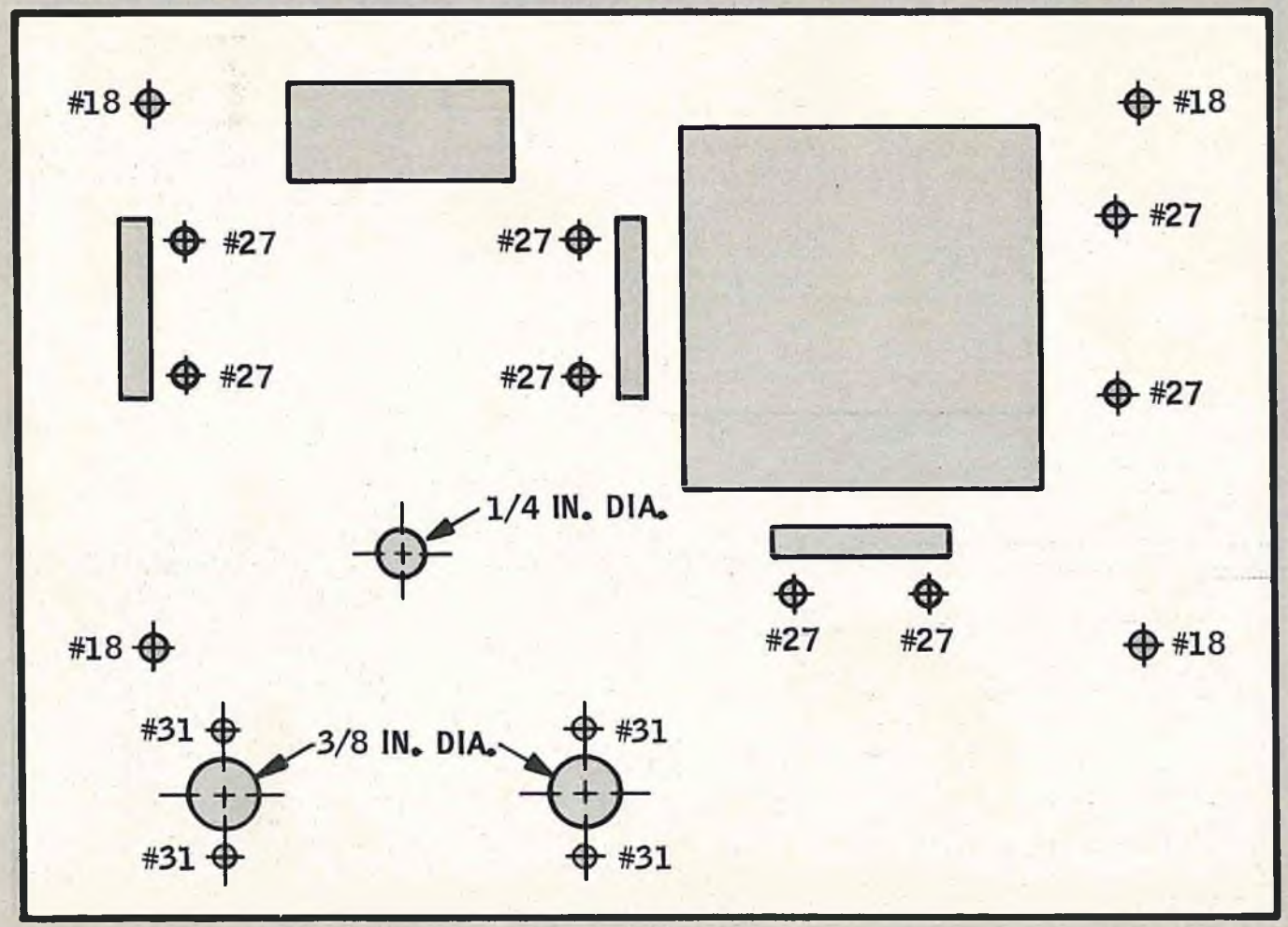
# RCM DIGITRIO: FULL SIZE TRANSMITTER TEMPLATES

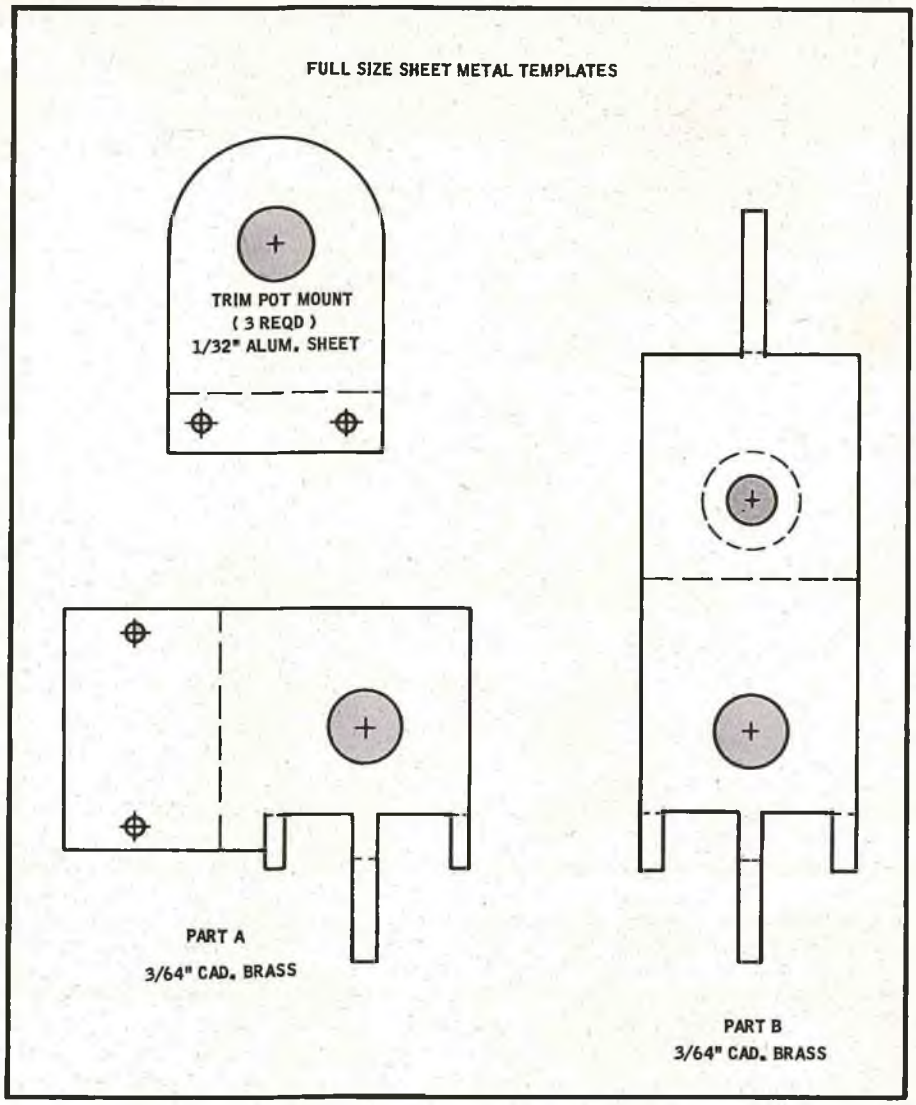



TOP VIEW

NUMBER BESIDE HOLE INDICATES DRILL SIZE OR DIAMETER.
PASTE ON LMB 145 CASE & REMOVE EXCESS MATERIAL.

FRONT VIEW






in the photographs was a chrome plated cabinet knob from the hardware store. On the RCM prototypes, we had all metal control stick parts satin chromed at the same time as the anodizing was done, with the exception of the trim levers and main control stick, which were bright-chromed, giving an excellent final appearance. Insofar as the control stick knob is concerned, almost anything that feels right to your hand can be threaded and installed in place.

By the way, when silver soldering the coupler on Part B, watch closely the temperature of the sheet brass – the melting point of the brass stock is quite close to that of the silver solder. Also, be sure to dunk the completed assembly in cold water while it is still hot in order to retain the original temper.

Now, saw the two pot shafts off at 5/16" and assemble the stick as shown in order to try it out. Adjust the springs for the desired tension and centering. Place one drop of it on each pot shaft bearing and work it in. Bend all of the pot terminals back to keep them out of the way during final assembly.

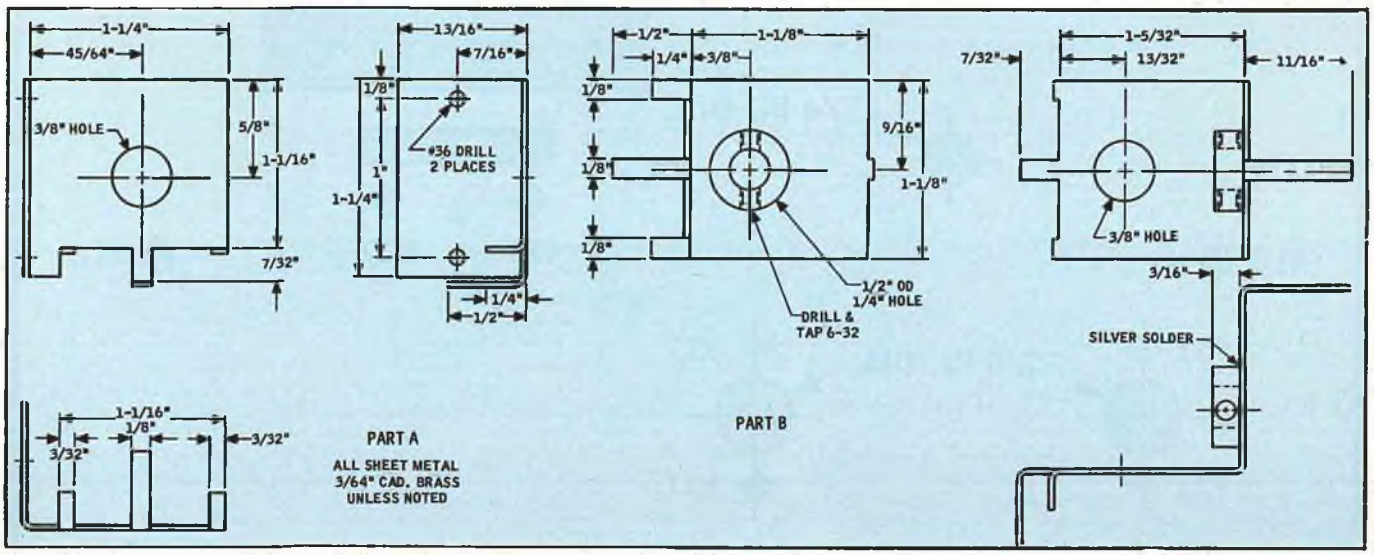
### Assembling Transmitter

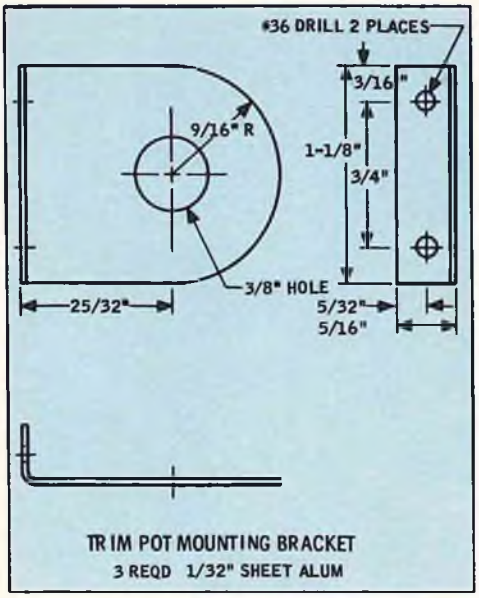
Prior to final assembly, saw the pot shafts to 5/16" and mount all the trim pots in their mounts (3 ea.). The lip of the mount should bend forward away from the pot. Now, file a notch for the locking lug. The terminals should be centered at the top (rounded portion) and bent back. Turn the shafts to the center of their travel, then slip a coupler over each shaft. Temporarily install and tighten the trim sticks so they point straight down past the mounting lip (centered in the cutout).

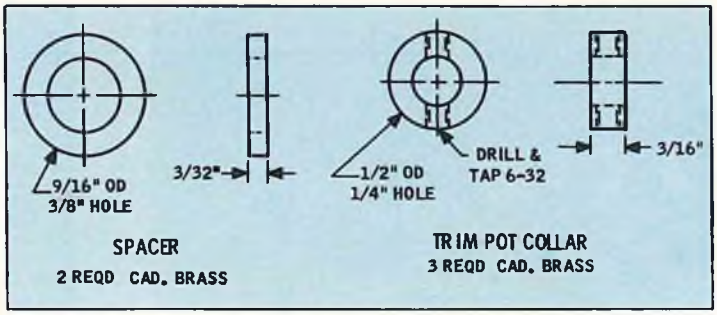
Loosen the shaft couplers on the stick assembly and use the following procedure for exact electrical center of the stick pots. Place your ohm meter on a scale which will read 5000 ohms around midscale. Connect one lead to the center terminal, then by swapping the other lead between the outside terminals while moving the shaft, obtain the same reading on both sides. There are other methods of doing this with batteries in a bridge circuit, but this will be accurate enough. Tighten the couplers securely and double check the pot settings. Repeat if necessary.

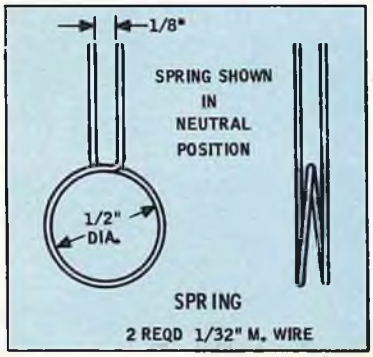
Mount the trim pots and stick assembly to the case with #6 sheet metal screws. Mount the switch and meter to suit the type you will use. Install the four PC board mounting posts to the front of the case with 8-32 x ½" bolts. Use internal lock washers under all bolt heads. Mount the two charging jacks with 4-40 nuts, bolts, and lock washers and bend the center lugs over. Cadmium-plated pan head bolts for all exposed boltheads will enhance the overall appearance of the transmitter.

This would be a good time to decide





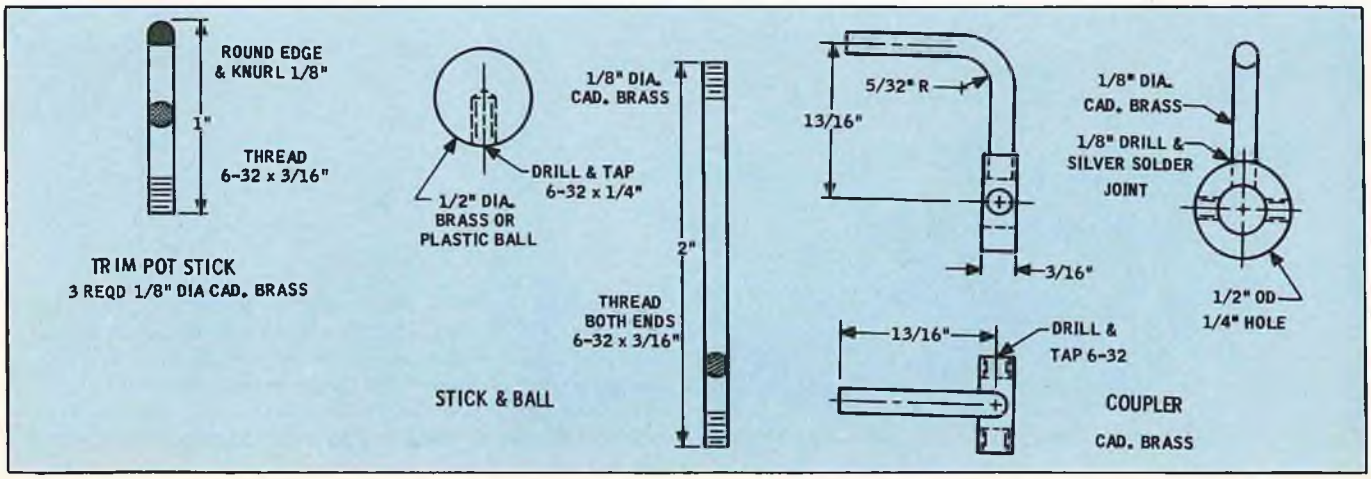

how to mount your battery pack. You can make a strap and bolt it to the bottom or front or however you wish. I used eight 600 mah Gould SCL Pencell Nicads wired in series and taped together with black electrical tape. Allow about 8" leads and color code them red for positive and black for negative. Make sure your mounting strap doesn't cut through the tape or protective covering of the batteries or you'll short some of them out. If you use the LMB box you won't have much choice where to place the batteries. The pack described will set neatly behind J1 and J2.

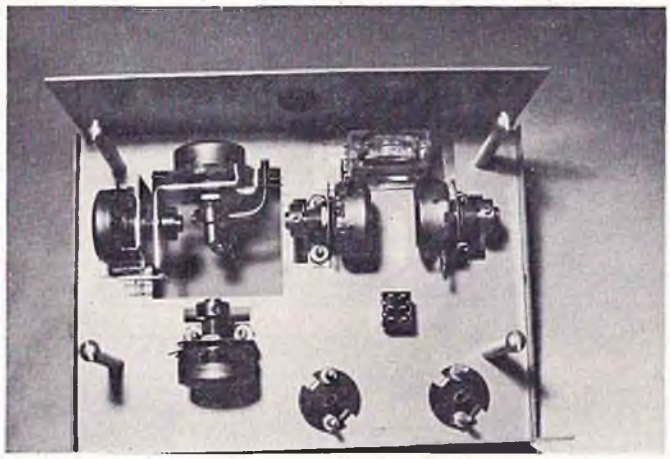
Cut a thin piece of felt and contact cement it to the bottom of the transmitter to prevent damage to the case when you set it on your best furniture. You can drill four holes in the corners and use small push-in rubber feet for this purpose if you can find them.

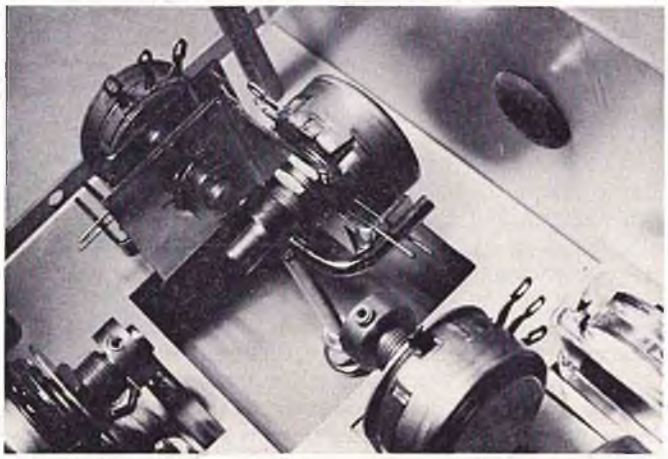
Now, place the transmitter case with all parts mounted, on its top and rear facing you. Place the completed PC board, component side down with L5 and antenna mount closest to you. Run all leads straight out the top of the PC board toward the transmitter (these leads should come from under the board). All the pot leads should be on the right-hand side. The switch and meter leads should be left of center.

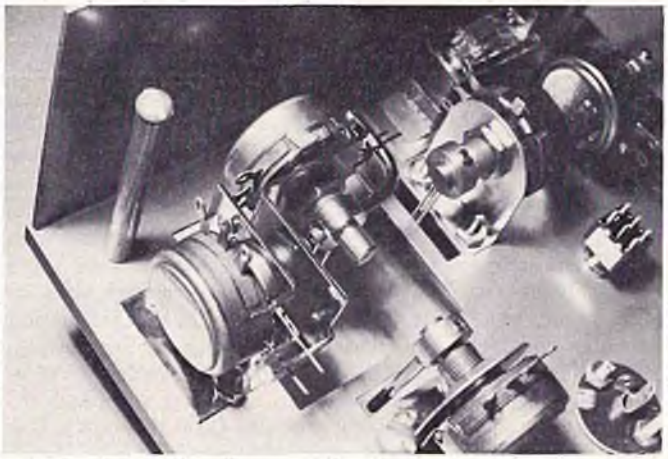
The objective of all this is to wire the leads to their components, and when we're finished, lift the PC board up by its rear edge and secure it to the mounting posts. This will also allow you to work on the transmitter later on without having a rat's nest of wires to contend with.

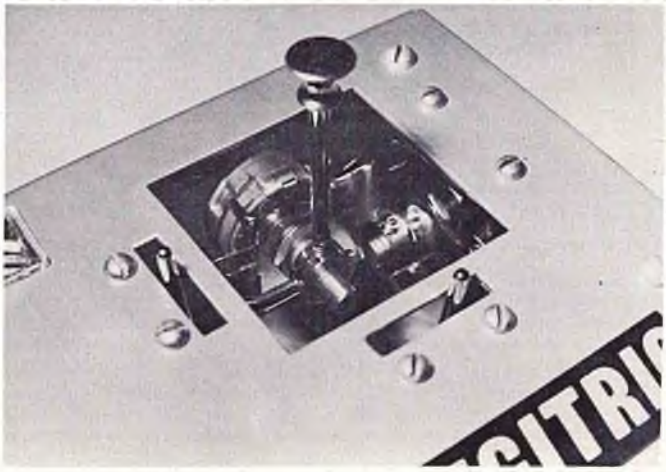
Adjust the board until it is about two inches from the case and maintain this distance throughout final assembly. When connecting pots, the odd colored wire always goes to the center terminal. The other two wires go to either outside terminal. Leave enough slack in these to reverse later. The white-blue-white wires on the far right side go to R34 which is the stationary stick pot. The yellow-green-yellow wires on the far right side go to R31 which is the vertical trim pot across the cutout from R34. Route this wire down, and left across the case at the lower case bend (as viewed now). The other white-blue-white wires go to the moveable stick pot and the other yellow-green-yellow wires to the trim pot, as viewed now, at the top of the cutout. Route this wire under R34 and keep it close to the case. Tie it off to the upper right mounting post (as viewed now). The orange-brown-orange wires go to the remaining trim pot (motor control) at the left side of the case (as viewed now). When connecting the leads to the stick and trim pots, allow enough slack so you can tie the wiring to the lower right PC mounting post (as it sets now) with the exception of the wires to moveable stick pot R38 – they must be free to move, so allow about 1" additional slack. After connecting R38's wires, route them behind R38's locking lug and tie them off to prevent breakage at the terminals (see photo). Tie the motor control pot wires to this same post (lower right) and run the wires across the bottom bend of the case (as it sets now) and secure them along with the vertical trim pot wires to the case with tape in a couple of places to keep them out of the way. Allow enough slack to tie it off to the lower left PC mounting post (as viewed now). Allow enough slack in the switch and meter wires to tie them off to the lower left-hand PC mounting post also (as it sets now). Use a short piece of Controlaire heat shrink

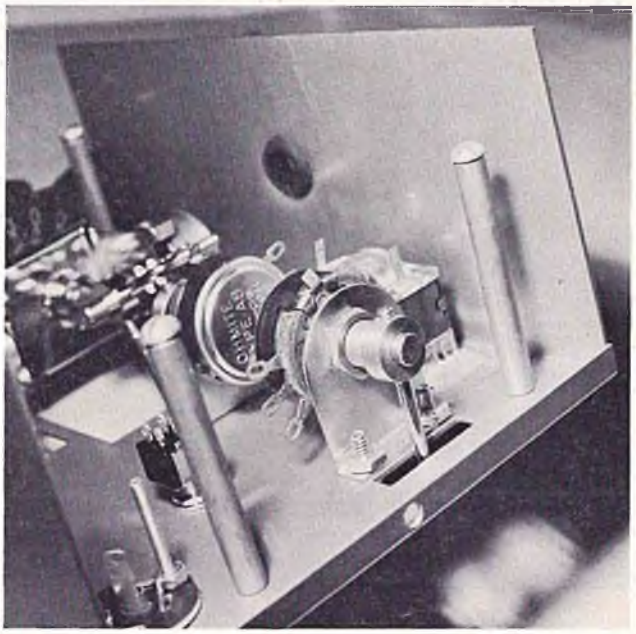


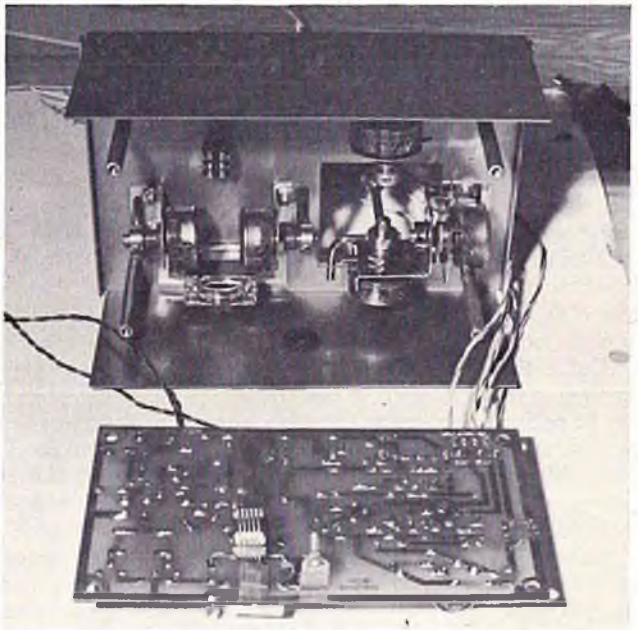












Left, top to bottom: Transmitter case with all hardware mounted. Second and third photos show detailed close-ups of stick and trim pot assemblies. Fourth photo, opposite, shows the completed stick from the front. Above, top; Throttle stick assembly and P.C. board mounting posts. Above: Proper position of transmitter and P.C. board during final assembly and checkout.

tubing 1" from terminals on all wires (large for 3 wires – small for 2 wires) for that extra touch. (See photo.) You can use plastic insulation stripped from hook-up wire for all "tie offs" or lacing cord or small strips of electrical tape.

Connect the red meter wire to the positive meter terminal and the black meter wire to the negative meter terminal. Connect red and black battery wires to the "on" side of the switch with red at the bottom as viewed now. Check the switch with an ohm meter to find the "on" side. It should be on the left side as viewed now if you use the World Engines switch. Wire J1 and J2 as shown in the schematic. Connect a red wire from the positive side of the "off" side of the switch to the center terminal of J2. (Right hand jack.) Run a black wire from the side terminal of J2 to the side terminal of J1 (left-hand jack). Run a black wire from the center terminal of J1 to the negative "off" side of the switch. Use some positive method of identifying the jacks as follows:

J1 "Receiver" (Left Side)
J2 "Charger" (Right Side)

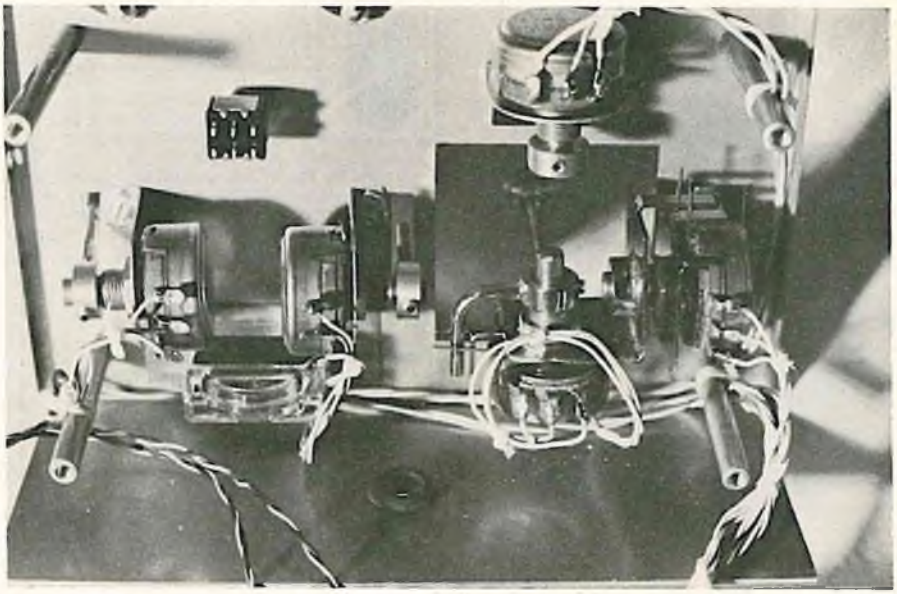
**This is important,** and if reversed while charging, batteries will be subjected to deterioration. With this arrangement the transmitter and receiver batteries can be charged simultaneously. In any event, the switch must be in the "off" position. You will probably have to increase your present charger's output, however. You can charge the transmitter independently if you insert a shorted plug in the receiver jack. In the latter case, be sure the charging rate is adjusted for use in this fashion.

**This is important.** Whenever, and however, you charge your batteries, always, double check the polarity, plug arrangement and charging current. Connect two 8" lengths of red and black wire to the center terminals of the switch and install the rubber antenna grommet. **Do not connect the battery yet.** Secure the PC board into place. All wiring, except J1, J2, and leads from the switch to the battery should loop over the top of the board (when right side up). Make final adjustments of wiring now to insure that no interference is encountered when moving the stick or when sliding the case together.

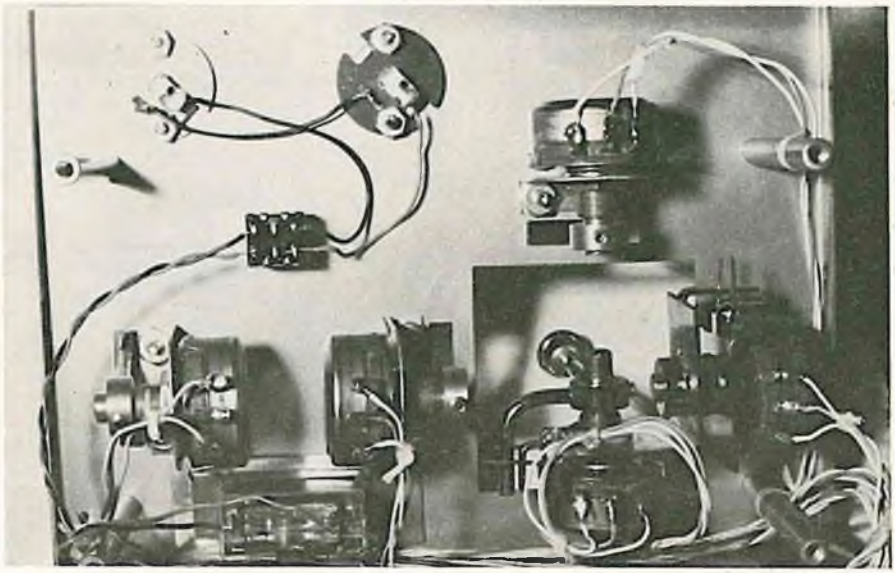
### Preliminary Checkout

Before installing the batteries and tuning the transmitter, let's double check the wiring. With the switch in the "off" position measure the resistance between the 8" red and black leads going to the center terminal of the switch. If you read anything other than infinite resistance you have either wired the switch backwards or have wired J1 and J2 improperly. Don't proceed until you have corrected your trouble. If you do read infinite resistance "throw" the switch to "on." You should now read

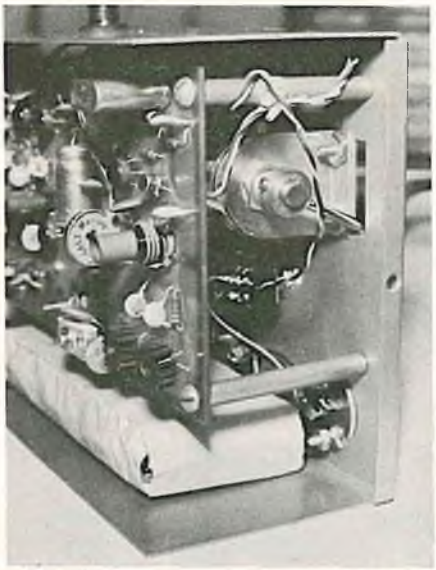
*(Continued on Page 48)*



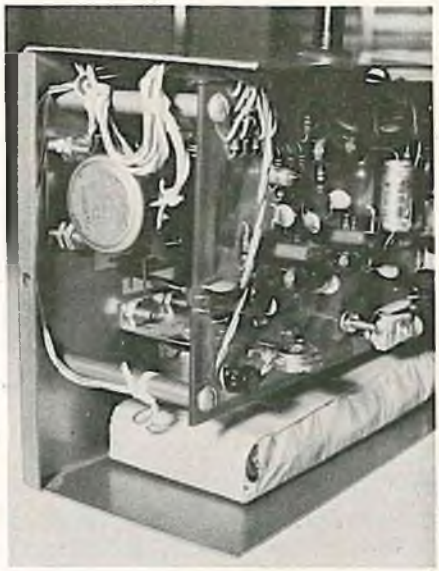
First stages of wiring. Note tie-off strain relief and cabling of wires.



Next stage of wiring with jacks and switch wired in circuit.



End view of completed transmitter.



Opposite end of completed transmitter.

# R/C: THE NEW ERA
## PART II

# FREE-STYLE AEROBATICS

Joe Foster and the Patriot

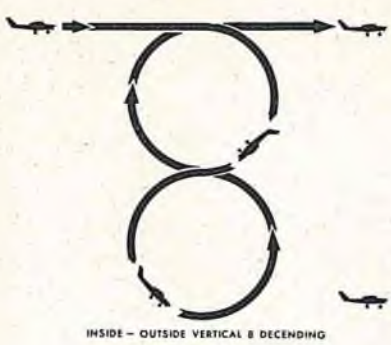
JUST as the New Era in R/C has brought with it a variety of new materials, methods, and design criteria, so has it introduced new and challenging events for the radio control enthusiast. First of these was the Goodyear Pylon category and the establishment of the National Miniature Pylon Racing Association. Hot on the heels of the midget racers for the number one spot of interest is the exciting and creative Free Style Aerobatic Event, designed to test the skill and imagination of each and every participant. Based on the full-sized international free-style competition, this new category holds all the thrills and excitement of its full-scale counterpart.

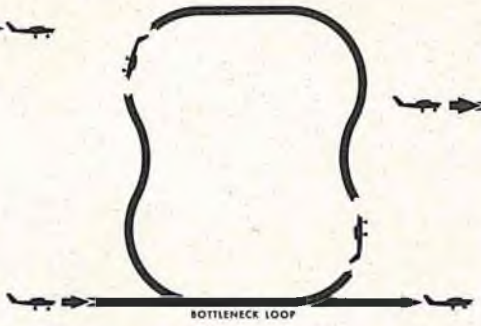
One of the prime reasons behind the concept of the Free Style Aerobatic event is to create an all new interest and enthusiasm, both on the part of the contestant and spectator. This enthusiasm has, for the most part, been buried in the stereotyped pattern class event which has dominated the R/C scene for many years. Except for a hard core of Class III contestants, contest participation has dwindled, and spectator interest has leaned more heavily toward scale and multiple ship racing rather than the pattern events with their repetitious maneuvers.

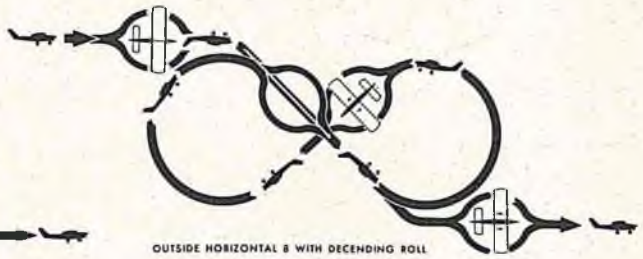
The new Free Style Aerobatic classification, on the other hand, offers the best that each individual pilot can create – and requires the utmost in coordination between man, machine, and radio equipment. Basically, there are two divisions—Obligatory maneuvers and Free Style Aerobatics—with two subdivisions, Novice and Expert. The individual contestant may use a substitute aircraft if desired, and the plane entered can be built by the contestant or any other individual. This is a **flying** event, testing the skill and creative ingenuity of the individual pilot. No restrictions are placed on size, design, or engine used. The plane however, must be used until such time as a malfunction or unsafe condition predicates the use of the secondary ship, if any.

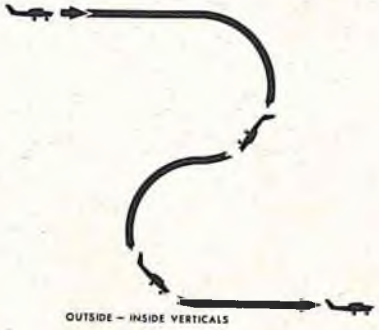
The first flight pattern to be performed would be the Obligatory group of maneuvers. Starting from the time the contestant is airborne and in position to start the set, he would have a predetermined time of say, five minutes, to complete the following:

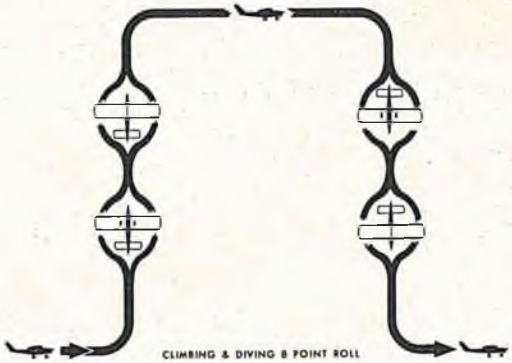
1. Slow roll to the left in horizontal flight.
2. Stalled turn to the right following a vertical climb.
3. Half roll to the left off the top of a loop.
4. Two turn spin to the right.
5. Slow half roll to the left during a 45 degree (or more) climb followed by a pull out recovery.
6. Roll to the right on a vertical climb followed by
7. An outside loop ending after passing the top point of culmination.
8. Three quarters loop starting at the lowest point and ending after having passed the top point of culmination.
9. Stalled turn to the right after a vertical climb in the inverted position.
10. Inverted sharp left-hand circle of 360 degrees.

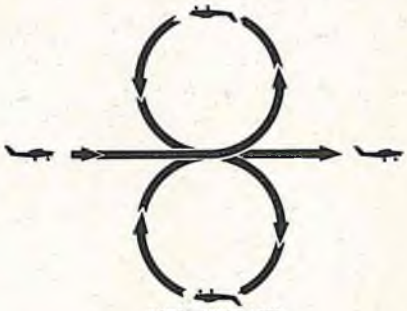

INSIDE – OUTSIDE VERTICAL 8 DECENDING


BOTTLENECK LOOP


OUTSIDE HORIZONTAL 8 WITH DECENDING ROLL


OUTSIDE – INSIDE VERTICALS


CLIMBING & DIVING 8 POINT ROLL


INSIDE – OUTSIDE LOOP

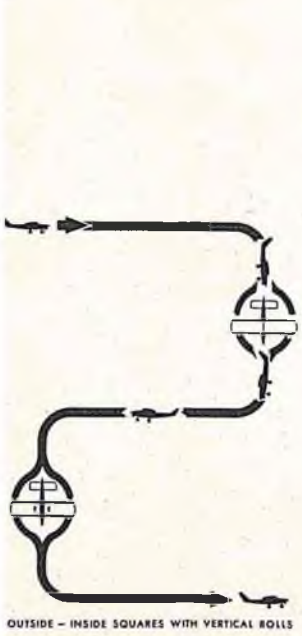
Any additional turning or correction of a completed figure in the original direction of the maneuver would be judged as not having been precisely executed.

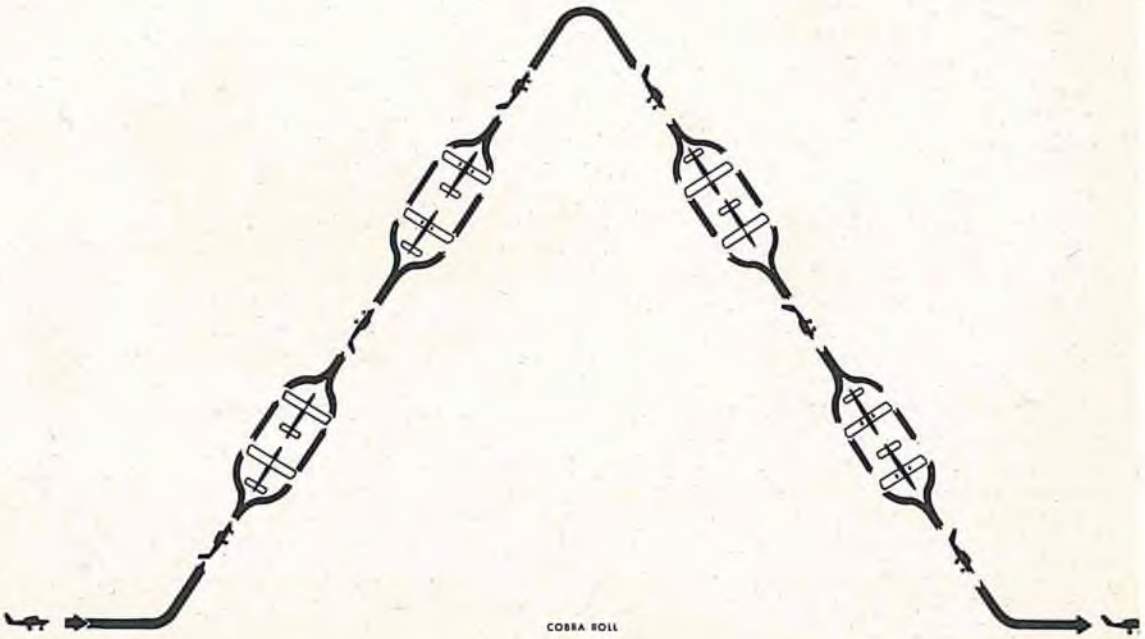
In the Free group of maneuvers, the pilot would pick his own maneuvers from a group, setting them up in the manner and fashion of his own choosing. The more difficult the maneuver, the more points would be awarded. There is also a time element involved, however, of six minutes total, with one point being lost for every five seconds over the maximum limit of six minutes. Thus, the pilot must select maneuvers not only to his own ability to perform them, but to his ability to perform them within a specified limit of time.

The following is a list of the Free Maneuvers as listed for the full-size aerobatic aircraft – a list which would serve as a basis for our own new event:

| *Free Style Maneuver* | *Points* |
|---|---|
| 1. Inside loop from inverted position. | 3 |
| 2. Square inside loop from inverted position. | 4 |
| 3. Eight point loop (octagon). | 3 |
| 4. Bottleneck loop. | 3 |
| 5. Inside loop with slow roll on top. | 4 |
| 6. Inside loop with snap roll on top. | 4 |
| 7. Inside loop with double snap roll on top. | 5 |
| 8. Outside square loop. | 9 |
| 9. Rolling loop with one roll. | 9 |
| 10. Square loop with half roll each quarter. | 10 |
| 11. Vertical S ascending from inverted position. | 5 |
| 12. Vertical Eight ascending from inverted position. | 5 |
| 13. Barrel Roll. | 3 |
| 14. Slow roll on take off. | 4 |
| 15. Knife edge flight. | 2 |
| 16. Knife edge, half slow roll, knife edged. | 4 |
| 17. Snap roll. | 2 |
| 18. One-and-a-half snap roll from normal to inverted. | 4 |

*(Continued on Page 70)*


OUTSIDE – INSIDE SQUARES WITH VERTICAL ROLLS


COBRA ROLL

# THE GOOD NEIGHBOR

## BY KEN WILLARD

*A Public Relations Special from the Chief Sunday Flier*

RECENTLY one of my neighbors asked if I would entertain a few of his guests with one of my radio controlled models. I had been flying a Schoolboy in my front yard on quiet evenings for some time, and the neighbors seemed to enjoy it, so this was not an unreasonable or unexpected request.

I fired up the .010, launched the model down the street, let it climb out over the houses, then did a few loops and rolls with it. The guests were properly entertained, and everything was going fine, but just as the flight was about to end – when I positioned the model to land it on the street – some inconsiderate guy on the citizenship band decided to call somebody. Naturally, since I have a superregen receiver, the Schoolboy responded by going ape. So, instead of landing in the street, the Schoolboy veered off, hit the neighbor's window a glancing blow and fell into the shrubbery. No damage was done – we wiped the window clean, and I was thankful it wasn't broken.

That started me thinking – if the model had impacted straight on instead of at an angle, I'd have a window to pay for – and perhaps the neighbors wouldn't care to have any more demonstrations! Let's figure out a solution – a simple little job that wouldn't do any damage except under the most extreme circumstances. In other words, a "Good Neighbor." One that can be flown not only from a school yard but from an average residential street.

As it turned out, the design evolved as a cross between the "Schoolboy" and the "Virus" with one added feature – a shock absorber on the nose. It also turned out to be a very fine sport flier. Why don't you build one?

### Fuselage

This is a standard box type construction, all straight lines for easy construction. The only unusual feature is that a sponge rubber – or styrofoam – chunk is used in place of a nose block. Glue a piece of the sponge, or styrofoam to the nose bulkhead, then trim it to shape with scissors or sanding block. Or, if you're not interested in the shock absorbing feature, use a balsa block. It's a matter of choice.

### Wing

The wing is actually just a small version of the "virus" wing – a single sheet, curved over the ribs. Use the construction technique as described for the Virus. I've repeated it here in case you don't have the January 1964 issue of RCM.

Before beginning, obtain a sheet of 6" wide, 3/32" sheet, 33" long. If your hobby dealer doesn't stock 6" sheet, get two 3" sheets, selecting two pieces that are similar in weight and grade and which butt together snugly along one edge. Be sure to select your material with care, rejecting those sheets that have a curvature to their edges.

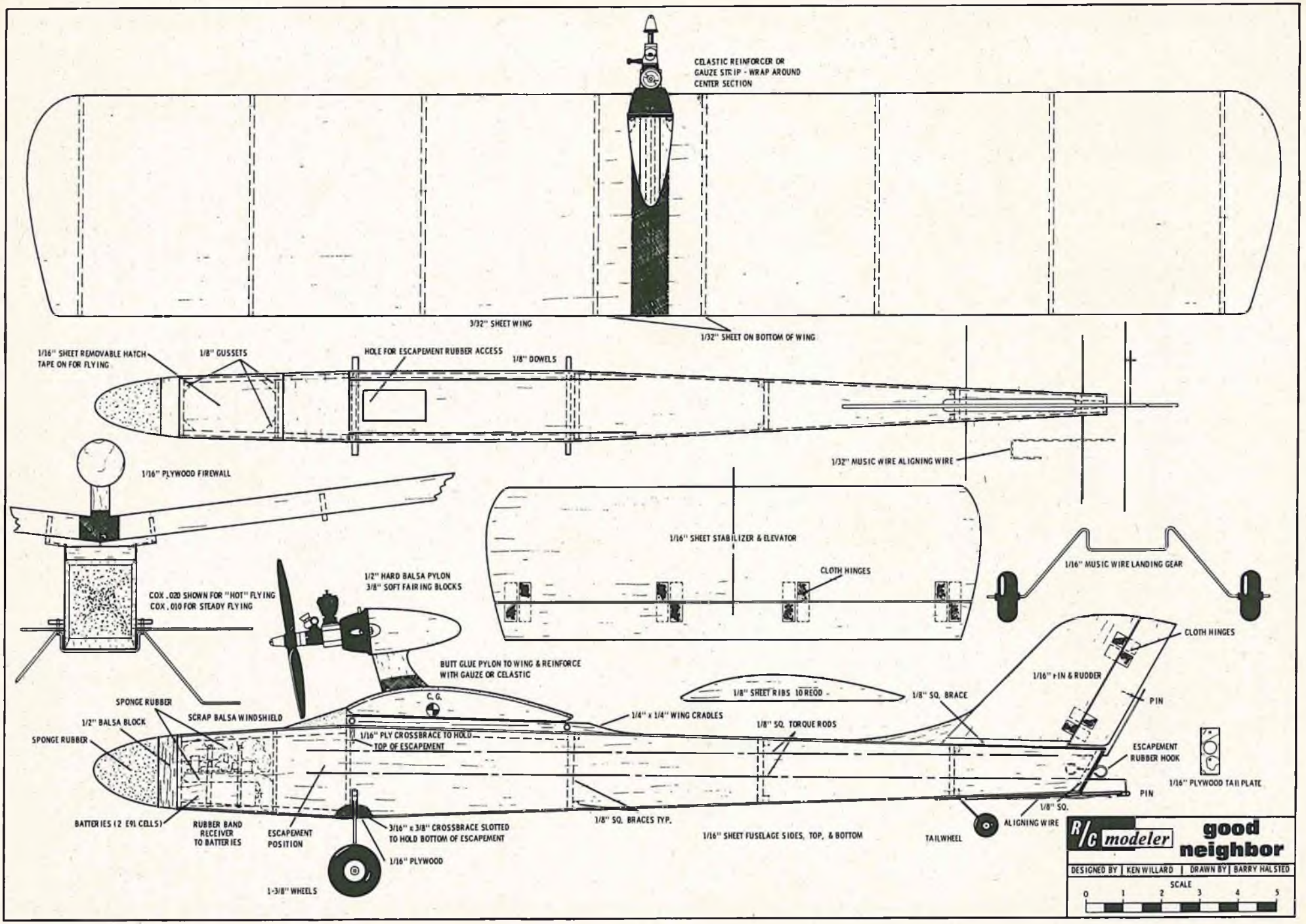
Step 1. Lay a piece of wax paper on your work table, then butt the two sheets together, and tape them with masking tape.

Step 2. Next, pick up the sheets, and using the tape as a hinge, open up the butt joint.

Step 3. Lay a "bead of glue" along the edge.

Step 4. Now lay the sheets down flat on the table, with the tape hinges down. The butt joint will close tight, and ex-

*(Continued on Page 72)*


CELASTIC REINFORCER OR
GAUZE STRIP - WRAP AROUND
CENTER SECTION
3/32" SHEET WING
1/32" SHEET ON BOTTOM OF WING
1/16" SHEET REMOVABLE HATCH
TAPE ON FOR FLYING
1/8" GUSSETS
HOLE FOR ESCAPEMENT RUBBER ACCESS
1/8" DOWELS
1/32" MUSIC WIRE ALIGNING WIRE
1/16" PLYWOOD FIREWALL
1/16" SHEET STABILIZER & ELEVATOR
CLOTH HINGES
1/16" MUSIC WIRE LANDING GEAR
COX .020 SHOWN FOR "HOT" FLYING
COX .010 FOR STEADY FLYING
1/2" HARD BALSA PYLON
3/8" SOFT FAIRING BLOCKS
BUTT GLUE PYLON TO WING & REINFORCE
WITH GAUZE OR CELASTIC
CLOTH HINGES
1/16" FIN & RUDDER
PIN
SPONGE RUBBER
1/2" BALSA BLOCK
SCRAP BALSA WINDSHIELD
C.G.
1/8" SHEET RIBS 10 REQD -
1/8" SQ. BRACE
1/4" x 1/4" WING CRADLES
1/8" SQ. TORQUE RODS
SPONGE RUBBER
1/16" PLY CROSSBRACE TO HOLD
TOP OF ESCAPEMENT
ESCAPEMENT
RUBBER HOOK
1/16" PLYWOOD TAIL PLATE
PIN
1/8" SQ.
BATTERIES (2 E91 CELLS)
RUBBER BAND
RECEIVER
TO BATTERIES
ESCAPEMENT
POSITION
3/16" x 3/8" CROSSBRACE SLOTTED
TO HOLD BOTTOM OF ESCAPEMENT
1/8" SQ. BRACES TYP.
1/16" SHEET FUSELAGE SIDES, TOP, & BOTTOM
TAILWHEEL
ALIGNING WIRE
1/16" PLYWOOD
1-3/8" WHEELS
R/C modeler
good neighbor
DESIGNED BY | KEN WILLARD | DRAWN BY | BARRY HALSTED
SCALE
0 1 2 3 4 5

# Academy of Model Aeronautics 1965 Nationals

## Radio Control Championships

# DATA SHEETS

THE information contained in the following pages was obtained from RCM's individual data sheets, completed by a majority of the R/C contestants at the 1965 Willow Grove Nationals. While every attempt is made toward accuracy, some discrepancies are bound to occur in the data listed.

As interesting indicators of possible trends in the radio control field, the following information was tabulated from this material:

The average contestant was 34.95 years of age with 9.3 years of experience in R/C, as compared to the 1964 Nat's "Mr. Average" who was 35.2 years of age with 7.5 years in R/C. Of the ships entered, 47% were original designs, 26% were built from magazine plans, and 27% were kits or modified kits. This indicates a 4% gain in original designs and a 4% loss in ships built from magazine plans over the 1964 Nationals.

In the power category, the perennial favorite of Nat's contestants in years past, the Veco .45, lost out to the Super Tigre 56 and 60 which comprised 43% of the engines used in Class III. The Veco .45 was second at 18%, and the Merco .61 third at 14%. Last year, the Veco was in top spot with 36%, with Super Tigre second at 14%.

In the fuel department, K&B retained the lead again for three straight years in a row, with K&B 100 the overall favorite and comprising 30% of the fuel used, although dropping down 10% over last year's lead. Home brewed fuel was again second, and totaled 18% of the total fuel consumption. Midwest Idle-X was in third spot at 12%.

Insofar as finish is concerned, this remained approximately the same as the Dallas Nationals, with a slight gain for the ever popular butyrate finish. Aero-Gloss was the overall favorite, with butyrate dopes comprising 82% of the various finishes used. Epoxy finishes remained at 15%, reflecting no change from 1964. Enamels and lacquers dropped to 3%.

The biggest change at this year's Nationals, as was expected, was in the radio equipment category, as the 1965 Nationals contestant swung over to proportional control. In 1964, 61% of the entrants used reed equipment and 39% proportional. This year, the figures changed completely, with 74% of the contestants using proportional equipment, and only 26% using reed gear. In the latter category, Min-X and Citizen-Ship totaled 40% of the reed equipment utilized with Orbit running a close third. Of the proportional equipment entered, eleven manufacturers were represented along with several home-brew rigs. Included were Orbit, Dee-Bee, Bonner, Space Control, Controlaire, Kraft, ACL, F&M, Min-X, Micro-Avionics and Logictrol. The nod this year went to the Bonner Digimite, representing 23% of the total proportional spread. Orbit was second with 20%, and Dee Bee third with 19%. In the Class III winner's circle, Bonner was 1st, Orbit second, and Kraft third, equipmentwise.

For the trends — study the data sheets and form your own conclusions. Here is the key to the coding used for abbreviation purposes: Plane, Source; O-Original design, MP-Magazine Plans, K-Kit, MK-Modified Kit. Controls used; R-Rudder, E-Elevator, M-Motor, A-Aileron, B-Brakes, F-Flaps, T-Trim. Receiver-Transmitter; P-Proportional, R-Reeds.

# The Roostertail

The Official Publication of the International Model Power Boat Association
General Office:
2405 19th Avenue Broadview, Ill.

A few red hot boats in the Middlewest are really making a mess out of the record book! Get out your copy of the IMPBA World Records, and bring it up to date with the following list of new records, current to July 30, 1965.

*Straight 1/16 Mile R/C*

F. Toth C-1 (.30) 0:12.33 sec. 18.3 MPH

M. Preusse D-1 (.45) 0:11.2 sec. 20.08 MPH

*¼ Mile Oval Course R/C*

R. Voelker C-2 (.30) 0:50.8 sec. 17.7 MPH

R. Buck E-2 (.60) 0:35.5 sec. 25.4 MPH

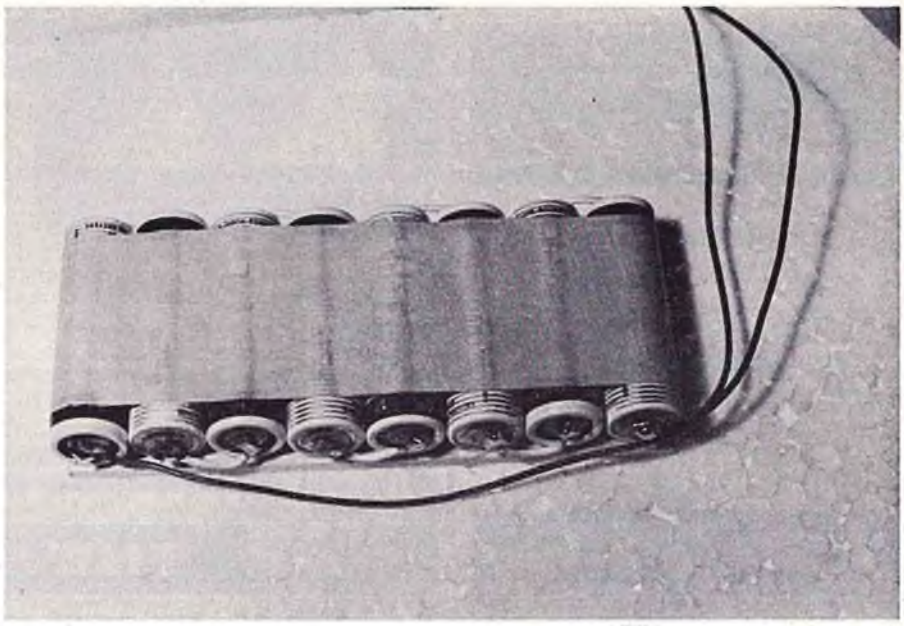
R. Schwiesow F-2 (1.2) 0:38.73 sec. 23.25 MPH

E. Mundt F-2 (1.2) 0:37.33 sec. 24.1 MPH

Ron Schwiesow, of Aurora, Ill. was the first man to break the 40 second barrier for the ¼ mile, and thus was awarded the second OCTURA Trophy of the season. Ron set the mark at Lombard Lagoon running a modified O & R Compact III, 1 HP engine in a "White Heat" four-point by Octura. The hull is fitted and trimmed for surface prop operation, and runs with a long roostertail.

Not to be outdone by this newcomer (Ron has only been running about a year), Earl Mundt proceeded to overrun the new mark within an hour after Ron set the new pace. Earl ran a G.E.M. Super Challenger glass hull, powered by a modified TAS P-7. One of the modifications to the TAS is to water cool the cylinder, then cut off the blower fins on the flywheel. Run with a glow plug. Thus eliminating the magneto coil, he used pins instead of screws to align the starter housing with the flywheel so it is removable after the

*(Continued on Page 51)*



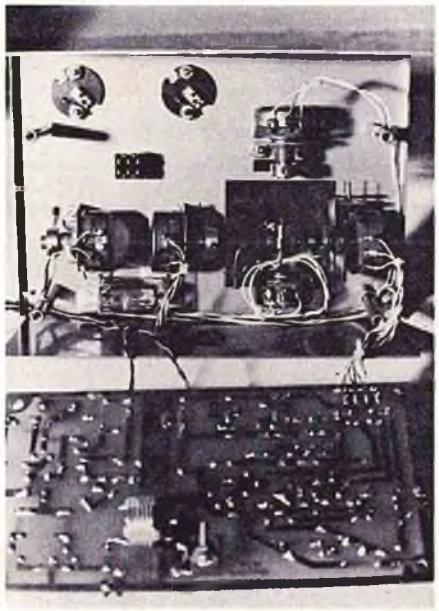
The transmitter battery pack — eight gould 600 SCL nicads. Available from Power, Inc.

## RCM Digitrio

*(Continued from Page 37)*

approximately 1000 ohms resistance. Again I recommend tapping down on your battery pack as we did previously during the PC board preliminary checks.

When completed, the P.C. board simply lifts up and is secured to the four mounting posts.



Throw your switch "off" and connect the battery pack, with your meter on the milliamp scale in series with the negative (black) leads. You should not get an indication on the meter at any tapping voltage. Throw the switch to the "on" position. You should read somewhere between 50 and 120 M.A. Again, if this is much lower, your oscillator is not operating and the slug in L2 must be adjusted.

If everything has gone well so far, we are ready to tune the transmitter. Insert the antenna and place the transmitter on a non-metallic table, and fully extend the antenna. There should be ten sections to the "Controlaire" antenna exposed including the section with the loading coil — count them. Insure that there are no metallic objects or wiring in the proximity of the antenna. With the switch "on" and meter in series with the negative lead, run L2's slug clockwise until it is at the bottom of the form. If your oscillator was running when you started, the meter reading should have read approximately 120 M.A. If not, bottom the slug and back it out slowly until the meter reading peaks.

Due to varying components values in the oscillator circuit some pruning of L2 may be necessary. The oscillator circuit, unlike most, has no critical setting and will operate over a broad range of adjustments. It packs a "wallop" by itself and would make a good RF section for a single channel transmitter. When your oscillator tuning is complete, L2's slug should be about halfway into the windings. If it is sticking out the back of the form, when you're through tuning, remove a turn from L2's primary and

try it again – remove enough turns (one at a time) until it peaks with the slug halfway as described. If the slug is completely inside the winding when you're through tuning, add a turn, or turns, to the primary until the slug is halfway as described.

Turn the switch "off" and remove the external meter. Make a field strength meter with it as follows: Wrap the leads of a germanium diode (1N34 is a good one) around the meter plugs and plug them into the meter. Extend the leads upward and connect them to the chandelier or tape them to the wall about 2-3 feet from the transmitter. Keep the leads separated by a few inches. Place the meter on its lowest voltage range.

Connect the batteries to the center terminals of the switch directly or with a plug and place them in their assigned mounting place. If you are using a 1 M.A. meter set R7 for maximum meter deflection. If you are using a more sensitive meter set it in the middle. Turn the switch on and grasp the transmitter firmly. With an insulated tool adjust the variable capacitor (C8) for maximum voltage on the field strength meter. If the F.S. meter reads backwards, reverse the diode or the leads.

Actually all this could have been done with the meter on the front of the case but this method proves out the "radiated" power and should be used for the initial tuneup.

Now get your favorite transmitter, or borrow one, and run a comparative test to further insure your Digitrio's radiated power. Unless you have one of the "King Kong" type presently splattering their way around the flying sites you should find that the RCM Digitrio has the edge. You will also note that the meter jumps around as you grasp the case then remove your hands. This is normal with the antenna system used – your body actually being part of the system. That's also why it is important to tune it up while grasping the case firmly.

Assemble the case and note the panel meter reading with the antenna fully extended while holding the case as you would while flying. This reading will be your reference to indicate proper output from this point on. If you are using a 1 M.A. meter and have set R7 for maximum meter deflection you should read in the upper 1/3 of the scale. Adjust R7 for your reference reading. Adjustment of R7 may affect tuning slightly so if you move it very far touch-up C8. Any major deviation of the meter from now on, either **up** or **down,** will indicate trouble somewhere in the transmitter. Since the antenna has been tuned with you grasping it, it will detune slightly when you set it down. For the following tests be sure you hold at least one hand on the case.

To demonstrate that the antenna is truly resonant place your hand about 6" from one of the bottom sections (below the loading coil) and slowly move it toward the antenna without actually touching it. You should note very little change on the F.S. meter. Do the same thing to one of the top sections (above the loading coil). The effect will be much more pronounced, indicating that your hand capacity is detuning the antenna.

Another test is to retract one of the lower sections of the antenna. This will not have much affect on the F.S. meter reading. Now retract one of the upper sections and you will see what happens if you neglect to extend the antenna fully – especially the section immediately above the loading coil.

Remember this last test, it might save your airplane. Why does the top section (above the loading coil) have more effect on the F.S. meter than the bottom section? An unloaded ¼ wave vertical at the frequencies we use would be about nine feet long. The antenna is loaded to this electrical length to make it resonant while being shorter. Since the bottom sections are only about two feet long we have electrically concentrated seven feet of antenna from the bottom of the loading coil to the tip of the antenna, or, roughly ¾ of the electrical length. This, plus the fact that the impedance rises from feed point to tip, makes the top section much more sensitive to length and body capacity. Prove this to yourself by running the checks we did previously over again. I'll let you take it from there.

From now on tuning can be accomplished with the panel meter – peak it up by adjusting C8. We'll cover final system tuneup in the last article of this series, at which time we'll adjust R29 and R13. For now, set R13 at center resistance. If you have a scope or access to one, you can check the coder against the waveform drawing. If you encounter any trouble tuning up the transmitter, consult your now ex-"technician-type" pal.

**Errata**

The following corrections should be made to Part II of the RCM Digitrio, which appeared in the September 1965 issue:

1. Figure 2: B should be the second waveform from the top on page 23 – not the third.
2. Schematic, Page 27: the wire from the bottom half of the on-off switch should be shown going to point Y.
3. Schematic, Page 27: The wire connecting J1 and J2 should be labeled *black.*

NEXT MONTH: Constructing the receiver-decoder.

## ROOSTERTAIL

(*Continued from Page 47*)

engine has started. The resulting reduction in weight and drag have apparently been just enough to win the record. That's all it takes. Now it is up to someone else to take it away from Earl!

Marianne Preusse set the new D-1 mark with a new fibreglass Cobra by G.E.M. This Cobra is about ⅔ the size of the standard Cobra and is powered by a Super Tigre 40.

Bob Voelker of Des Plaines, Ill., topped the old mark with an Octura White Heat 30, powered by a Super Tigre .29 and guided his craft with a home built proportional rig.

Ron Buck, who is still in his first season of R/C boating put his "White Heat 60" through its paces at the IMPBA Annual Regatta at Cape Coral over the 4th of July weekend. A red hot Rossi .60 makes this hull ride the tops of the ripples.

Several new ideas were presented at the annual meeting which are open to suggestions—YOUR suggestions. Discuss them at your next club meeting, and have your club secretary send in the results.

*Point #1* – Henceforth, should we have separate times and places for the Annual R/C Regatta, and the Annual Tether Regatta? To date, the Annual Regatta has included both divisions. If the races are separate, how should the annual business meeting be held? One of the reasons for having separate regattas is to relieve the host club of the burden of phoviding facilities and officials for a type of racing which is not run by the club. For example, an R/C club trying to get ready for a tether meet, or vice-versa.

*Point #2* – That some minimum, perhaps one year, or more, be established for a club to have been conducting regattas, so that there would be a minimum of confusion on race day. The annual regatta is just a king size regatta, and requires only to make accommodations for out of town guests and some place to conduct the annual regatta. If you have run an invitational regatta, it is simple, but the annual regatta is hardly the place for a new club to try to learn the ropes.

While on the subject of the annual Regatta, bids are now being accepted for the 1966 Regatta.

●

Left hand, or right hand, that is the question. The amount of mail for each direction is about equal. It seems that the West coast is in favor of Left hand turns for Multiple boat racing, while the rest of the country is in favor of Right turns. This does not make either direction wrong, but rather points up the fact that it must be made perfectly clear, when the race is publicized, the direction of the turn. Henceforth all requests for sanctions for Multiple boat regattas must include the direction of the turn to be run. This way, the host club can run the way they please, and all participants will have ample time to prepare for the event. In the event that Multiple boat racing is run at the Annual Regatta of the IMPBA, the host club will have the option of choosing the direction of the turn.

●

The ROOSTERTAIL is written by, and for the model power boat enthusiast. If you have anything you would like to see discussed, send us your ideas. Since we all like to look at pictures, why not send us a few pix of your boats, equipment, gadgets etc., and let us all take advantage of the fellowship of the IMPBA.

# ATTENTION

**The Eastern Championship Miniature Pylon Racing Committee and the Remote Control Association of Central Florida regret to announce the postponement of the 1965 Eastern Championship Miniature Pylon Race for the following reasons:**

- The Committee and the NMPRA feels that this meet is premature to present activity.
- An AMA sanction for this event is a must and is not available as yet.
- The NMPRA has only about 150 members to draw from.
- Of the seven district directors of the NMPRA, only two have Goodyear planes ready to compete.
- Only 3 or 4 districts have organized Goodyear activity at present.
- At least 50 entries are needed to make this meet a success. To our knowledge these are not presently available.
- The committee further feels that to hold this meet prematurely could possibly do unrepairable damage to the NMPRA and their desire to obtain an AMA sanction.

**Our plans for this meet at a later date, and possibly on a national scale, are going forward. We sincerely urge you to support the NMPRA and the AMA. Goodyear pylon racing is a much needed shot in the arm for radio control. Build one of these planes and see for yourself. The following questionnaire is submitted as a survey of interest:**

**N.M.P.R.A.**
**c/o Walt Schoonard**
**2080 Sharon Road**
**Winter Park, Florida**

**Name** _____

**Address** _____ **City** _____ **State** _____

**(A) Would you like to see the NMPRA pylon event become an AMA sanctioned national event? Yes No**

**(B) Are you planning to fly a Goodyear plane competitively? Yes No**

**(C) Are you interested in large meets with cash prizes? Yes No**

RCM PRODUCT REPORT:


# CITIZEN-SHIP PROPORTIONAL SYSTEM

THE full production availability of Citizen-Ship Radio Corporation Analog Proportional Control System a few months ago prompted the greatest number of letters that RCM has yet received concerning a single radio control system. These letters were primarily from sport, or "Sunday" fliers, wanting to know the "hows", "why's," and any "if's" about this new proportional rig that sells complete for under $250.

RCM wondered, too. We began our inquiry by obtaining a stock production AP system. This was followed by a conversation with Vern McNabb of the Citizen-Ship Corporation. With regard to the latter, we wanted to find out just what the new system was intended to do – what were its limitations and drawbacks, if any. We also wondered how this system could be sold for a list price of $250, and even less through some of the hobby discount houses.

### APT Transmitter

To begin with, the Citizen-Ship AP series proportional control system provides the modeler with two continuously variable simultaneous channnels and a third trimmable channel. The two proportional channels are recommended for elevator and rudder, or elevator and coupled ailerons-rudder. The trimmable function, of course, is for motor control. The Model APT transmitter is a high power, all transistor transmitter utilizing a silicon power output transistor. The APT 100% collector modulated with a fixed 3750 CPS tone using variable rate 20-60 CPS and varying width of tone burst to obtain two proportional controls.

A two stick configuration is used on the Citizen-Ship APT with trim levers located directly adjacent to the appropriate sticks. A multi-channel reed type lever switch is used for the trimmable motor control function. The two main control sticks traverse an arch of 30 degrees to either side of their spring-loaded neutral position. The trim levers give 20% of the movement of the main sticks. The motor control lever switch is used by beeping for small changes in engine speed, exactly as is done with reed equipment. Holding the motor control lever switch depressed for 1 second gives full speed change, l.e., low to high, etc. Rudder and elevator servos return to neutral when either high motor or low motor is signalled. The Apt is crystal controlled and intended for use on all of the available 27 mc RC frequencies. Crystals utilized are ground to a tolerance of .0025% to insure proper operation and to allow changing frequencies by simply plugging in a crystal without the necessity of returning the transmitter.

The APT transmitter has low battery drain of 60 ma and requires only a standard Burgess D6 or Eveready Type #276 9 volt dry battery. Two to three months of normal flying time can be expected from this supply, discarding the battery when the voltage reaches 7.5 volts with the transmitter turned on.

Nicads can be used in the transmitter, if desired, simply by connecting seven 450 mah cells in series.

### APR Superheterodyne Receiver

The Citizen-Ship Model APR is a selective superheterodyne proportional receiver which responds to rate and width changes of single movement of the transmitter stick. The APR receiver is an all transistorized unit that will fit

*(Continued on Page 62)*

Gordon, second in open Class I.

## Top Out

*(Continued from Page 17)*

George Gorden, flying his well-known Sigma 7, added laurels to 2nd place honors by garnering the Highest Single Flight C & S Distributors Trophy with a 69 point Pattern flight. To demonstrate that consistency counts, M. Reed took the Highest Total Points Du-Bro Products Trophy along with 3rd place. Among the younger set Gary Davis scored for the F & M Electronics Highest Single Flight Trophy while Steve Morgan ably collected two more honors – the Citizen-Ship Radio Best Junior Performance Award and the C & S Distributors Highest Total Points Trophy, the one he (and his dad) most likely prizes the most! Incidentally, the Best Jr. Performance Award was a new category for 1965 and follows a national trend to recognize the little guys where they have to compete in combined age group events.

*(Continued on Page 55)*

Reed . . . highest total points in open Class I.

## Top Out

*(Continued from Page 53)*

Equipment, as predicted, was mainly reed multi-channel gear, relayless servos, and large tri-cycled cabin or high wing aircraft powered by 35's or larger. Class I will continue along these basic lines with changes appearing primarily in the form of shoulder-wing designs a la Sigma 7, Zeus, etc. A slow increase in the use of proportional radio equipment is expected to be seen among Class I fans to gain rudder trim and even better motor control. The new magnetic brake will lead as an innovation (that is, when we can get them!) and the clamor for more dependability in carburetors may also result in new products soon. Cored wings and stabs show increased use in rudder ships although airframe durability continues as a prime requisite in Class I construction techniques with weight as a more secondary consideration.

While there's natural reluctance to criticize a meet where the long hours of hard work and dedication in preparing and managing the contest were abundantly evidenced, there are a couple of flaws that need airing to benefit the future. The 6½ flight average was unfortunate and reflected more of a relaxed attitude to flying than limitation of air space or facilities. Where fliers log only a single flight a day the validity of contest results to reflect predictable skill may be questioned. R/C flying is highly athletic, dependent as much upon physiological tuning as tuning of our radios. No one expects a baseball pitcher to come into the game without a warm-up — it's recognized that best effort requires a mental and physical adjustment to nerves and muscles, not to mention minor things like aircraft and engine trim, etc. While the ideal is not possible (can you imagine a couple test flights for each contestant?) a **minimum** of two flights per day is a reasonable expectation. To bring this about, all parties concerned, contest managers as well as contestants, must recognize the necessity of establishing this very minimal goal as a proof that a valid contest for all did indeed occur.

The other flaw, involving the uneven judging, stemmed partly from the reduced number of flights. Judging takes practice and experience and it is obvious that with more flights R/C judgment would mature proportionately. Mathematically speaking more flights result in a higher percentage of scores representing "matured" judging ability and therefore nullify or balance judgments rendered during earlier inexperienced periods. Analysis of scores, admittedly incomplete at this time, however indicate a difference in points given between the two flying sites. Whether or not sufficient judge rotation was effected will be analyzed closely to provide future guidance.

As usual much discussion went on between flights and during the evening hours, with primary topics among rudder-ites after technical talk centering on two of our favorites; separate Class I flight lines, and FAI R/C enlargement. Gratifying agreement was noted from many Class III fliers for the separate Class I flight facilities to make rudder flying distinct and more competitive. It appears that support is growing toward its realization for the Chicago Nats in 1966. Meeting this challenge will not only benefit R/Cing in general but will result in substantial progress in bringing forth more of the potential obtainable from Class I.

Initial coverage of this year's brawl cannot be closed without notice of the significant help of Tom Williams and

Jerry Jackson who labored and lent their Class I "savvy" willingly to improve coverage of this Nationals. While a page of names could be devoted to list those who officiated and made the annual affair possible by their efforts, at this point we're going to simply say well done, and thanks!

**CLASS I and FAI**

In thinking over the possibility of including a single control event in the R/C Internats, it should be borne in mind that so far these meets have been held on the old-fashioned basis using a single flight line. This is scheduled to continue despite existing technical ability to put up more planes simultaneously. Using the now common practice of multiple flight lines, it would be readily possible to carry on a Class I event without interrupting Class III flying (or vice-versa) by assigning separate sets of frequency spots to each event. Thus from a technical standpoint additional events are feasible.

Perhaps it will be pointed out that in the past financial limits have dictated the quantity of events and not the technical problems. While money matters have indeed been troublesome there are many who believe Class I offers a good chance for enlargement of FAI interest and that this enlargement will more than carry the financial share of the added activity. In this way Class III stands to gain from the move also. Present efforts to promote Class I will help test the validity of these beliefs and will give Class I fliers a chance to be heard on the subject.

The following letter was sent AMA to obtain initial action. Additional cards or letters to Maynard Hill, the FAI Coordinator, are important at this time to acquaint him with your views – it will aid in evaluating general support for the move and will back up AMA's proposal to the CIAM, the FAI group that establishes modeling events.

*Maynard L. Hill*
*FAI Program Coordinator*
*2001 Norvale Road*
*Silver Spring, Maryland*
*July 4, 1965*

*Dear Maynard,*

*It's time to consider Class I for the FAI Internats. Since AMA eliminated radio equipment limits, planes and talent have reached a point where continued exclusion of Class I is based only upon habit and not upon the realities of performance capabilities. It's realized that FAI R/C has problems which prevent establishing a Class I event in a short time, but a formal start should be made as soon as possible since it could be two years before action is completed.*

*The basic factor behind the continuing success of Class I flying stems from equipment simplicity and aircraft ruggedness as well as lower over-all cost. All this creates a broad base of activity starting from relayless super-regens and bang-bang actuators to the ten channel contest rigs of the veterans. It is this wide appeal that FAI R/C activity requires to enhance its development. It would seem a wise move to take steps at this time to sustain the increase in FAI interest — and Class I is available to aid in this movement.*

*The November CIAM meeting in Paris is an appropriate time to offer the matter for study and consideration. It is expected countries with participation structures similar to ours will be receptive to a single control event. Thus England, Germany, Japan, Mexico, France, and perhaps Italy may also be interested along the lines of commonalty.*

*Your support is therefore sought in bringing a proposal for examination of the matter before the FAI Aeromodeling Committee. My own assistance in any useful way is offered, of course. Since this matter may readily affect all R/C activity favorably it is hoped these efforts will be afforded serious consideration so that a Class I team may be a reality to help represent the U. S. in 1967.*

*Cordially,*
*Jerry*

**THE FEMININE SIDE**

Last month the wifely prose of Martha Beason, editor of the Shreveport, La. R/Cers Newsletter, SHARKS SPARKS, was introduced here. This month as we pick up the gals in their conversation, the discussion covers servos. Listen:

"You might feel this hobby is a pain in the neck sometimes, but really it just takes a bit of understanding. One way is to get to know some of the terms these

men are always throwing around – it'll surprise them, too! One of the most often used words in R/C is SERVO.

"A SERVO is a little gadget about the size of a penny match box (or half of a stick of butter is perhaps more exact) that he has to have in the airplane to make it do everything. At one end they fasten the radio receiver with a wire and then they hook a long stick (called a PUSH ROD, or something) to the end with a metal device and hope it works. Most of the time SERVOS come with the little wheel or gizmo on top fastened on backwards (a common manufacturers' fault) and they have to start all over again. SERVOS come in assorted sizes – the most popular being the expensive ones. They cost about a week's groceries – if you're not dieting! Other sizes are too big, too small, or sideways.

"If you have listened to their crack-up explanations, you realize it's these SERVOS and **not** the pilot that are the major causes of most model crashes – you see, the SERVOS get stuck in left, or something! There are some very nice rich men living in California and New York who seem to keep inventing new kinds of SERVOS. Someday they will come up with a fool-proof model that will do anything. Till then, the best way to greet these guys when they come home from a day of flying (and shame on you if you didn't go, too – it's fun!) is to ask, 'How was the flying?' If they answer, 'Rough!' then say consolingly, '– too bad about those SERVOS.' – and see how he reacts!!!"

Incidentally, the Shreveport Sharks are an active contest group, winning many trophies this year. Headed by John Hitt and Dave Williams, the club reflects a lot of togetherness – a half dozen husband-wife teams are included among its 30 members. . . .

**CONTEST TECHNIQUE**

– and here we go with more "inside" on Class I flying. Recall, the take-off was covered in the July issue, which now brings us to the "flat" portion of the pattern. This starts with the –

**STRAIGHT FLIGHT OUT.** The key to this maneuver occurs before it really starts. Engine speed, altitude and heading should be well established **before** the plane passes over the transmitter (and make sure it does pass **right** over – it'll help in the point-earning department). To assure this good prepositioning, during your "boning" up sessions practice both right and left turns after take-off in varying wind speeds to attain a "hands off" condition as soon as possible in the turn-behind-the-transmitter maneuver. The term "hands off" is another key goal in this Straight Flight Out maneuver since corrections will mainly be needed to doctor faults in positioning and power settings. Fight the tendency to over-control – you'll be surprised how well the average trimmed

ship will do on its own! (To check this, during a practice run turn the transmitter **off** and see how well that ole ship'll do. Generally if it doesn't track out you have a trimming job to do.) Heading corrections, if you must, should be gentle but definite. Don't settle for a 10 or 20 degree off-wind penetration – discerning judges frown on it. If she wants to drift off like that, then give it a firm correction **one time** – don't nibble at it. Power miscues usually won't give much trouble if you're on multi-channel servos and the turn-behind-the-transmitter is wide enough. Just gentle the throttle in the necessary direction (usually to increase – to catch a stall over the transmitter which comes from building too much speed in the turn-behind-the-transmitter).

Now, once heading right, as the plane passes overhead call the maneuver to the judges and leave it alone for the 500 foot upwind flight. How long is that? Usually 10 to 13 seconds for average aircraft and wind. During this time count to keep occupied whatever you (or the judges) decide is the correct timing and use the same count in succeeding flights as long as conditions remain constant. The flight out should be at a constant altitude (75 feet is fine for top contest flying) and this means getting used to an apparent altitude loss as the ship gets further away. Between the count of 8 to 11 check for a landmark to mark the line of flight out since you'll be using it as a terminal goal to gage the Procedure Turn coming next. After noting the landmark, mentally store it and get back to finishing the Straight Flight Out. This consists of calling out "Procedure Turn!", nudging power up a notch (you can't depend upon sound here – this is where previous practice counts!), waiting a count and then commencing a left turn as the Procedure Turn starts.

**PROCEDURE TURN.** This maneuver consists of a 90° left turn immediately followed by a 270° right so as to place the plane back on the original path it flew out on. The basic problem here for Class I fliers is to achieve correct power changes to maintain constant altitude turns. Remember the first power correction started just before turning from the Straight Flight Out? If it was the right amount **and** if you waited long enough for a momentum build-up, then the left 90° turn should go well. The turn should begin slow and increase to a medium (45°) bank followed by medium rate roll back to the right to attain level flight when the plane hits the 90° left turn point. In high wind (20 to 35 MPH) anticipate this point since drift from the wind will take care of the last 30-40° of left turn.

As the ship rolls level, drop the roll rate but continue to roll into a 30° right bank and let her stabilize for a moment. In high wind this part of the bank may have to be steeper to gain penetration

and the roll will have to be quicker, too. But be careful not to rush or overdo it or you'll find yourself sawing on the power. Incidentally, this is no place to start a severe gallop so take it easy on power changes. If you're a beginner or just rusty, do the Procedure Turn under a slight climb setting and let the altitude control come later.

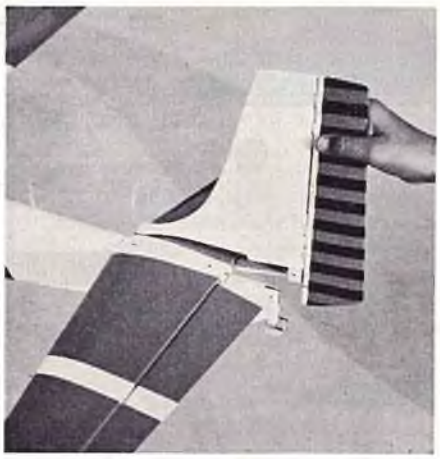
With the bank held at 30° let the ship come around about 120° and then start an increase in the bank. Pick up that landmark you established on the trip out and make good on this entry point for the trip back. This will dictate the remaining turn rate and bank. When there is about 45° remaining before completing the 270° turn, pull power back to the trip out setting. Be sure to lead in this way with the power reduction to avoid ballooning when the wings roll level as you start downwind. When the wings reach level call for Straight Return Flight.

**STRAIGHT RETURN FLIGHT.** As in the flight out, the return trip comes off best when it is set up to fly "hands off." If a gallop is avoided as the ship is leveled at the end of the 270° turn, the flight back should be routine requiring no additional throttle changes and where points may be racked up. But don't expect many points if you're not coming back on the same track as going out! (Work on this during practice sessions — this is one of the spots where precision and self discipline may be gained that'll put you in the trophy circle.) Since the ship is traveling down-wind it won't take long to reach the point right over the transmitter. The plane will also be traveling at the highest level speed attained during the pattern so look to anticipate and allow for this in preparing for the next maneuver, the Overhead Eight.

**OVERHEAD EIGHT.** Let's face it, for Class I ships this one is tough! In high wind it may even be dangerous since part of the maneuver is invariably over contest spectators. Many fliers, knowing this, fly the maneuver "safe" where crowds are involved by "just going through the motions" when the wind is high or they make a poor start. This involves keeping constant throttle and making larger circles at higher than the usual 75 foot altitude. (Because of safety problems, Contest Board action is pending to eliminate the Overhead Eight or substitute a double concentric circle maneuver away from crowds. This column supports such changes although the Eight as it is offers a challenging exercise and is well worth practicing where safe to do so.) Meanwhile, back to the flying. . . .

With the ship kiting toward you, to make sure of not carrying the first turn too far downwind start it a moment **before** the point over the transmitter is

*(Continued on Page 64)*



*(Continued from Page 30)*

The tank mount is sheet aluminum with a flat sided hole for the cork, mounted with two 4-40 machine screws into the flat front ends of the motor mounts. It is bent in such a way as to provide spring pressure to the rear when the tank is installed.

The cork is turned down from a #4 rubber laboratory stopper. Find the center and drill a #44 hole. Insert a length of ⅛" music wire and chuck in a drill or lathe. Make at least a ⅜" cut with medium and fine sandpaper blocks to a diameter suitable for the neck of your bottle. Reverse, and leaving a ⅛" shoulder, cut to approximately 9/16" diameter to fit the hole in the tank mount. Cut flats back to the shoulder with a sharp knife or razor saw. Shorten cork to taste. Drill another #44 hole for vent and use center hole for supply. I silver solder tubes together to prevent vent from rotating, and insert in cork from rear. The neck should be cut off the 8-ounce bottle back to the raised rim at the base of the threads. With this tank arrangement, I never connect the fuel line until I am ready to start for obvious reasons. Choking is not necessary. A few drops of fuel in the exhaust port start the engine readily, and once running, the fuel pressure of a full tank seems to present no problem. This applies to the Merco 49 or 61. I can't testify about any other engine except the Fox .59, but it started and idled well enough with this arrangement.

The cowl fits closely, and the engine location must be right or you'll have trouble passing the cowl back over engine and mounted tank. The cowl is secured by four 2-56 machine screws in tapped ⅛" nylon blocks bolted to firewall from behind. Also, four 2-56 machine screws go into angle brackets of nylon cut from the control horns in a "Midwest Builder's Accessory Kit." These are tapped and bolted to the fuselage nose section just forward of the fuselage joint. To assure locking, tap in a slightly undersized hole.

The landing gear is a stock design. I used 2¾" main wheels on the light airplane and 3-inchers on the heavy one, with DuBro brakes.

As for equipment, the first Hammerhead used an Orbit 10 and transmites. I have had a Logictrol 7 going for about 5 gallons now and I'm sure glad I waited for this. I had delayed the proportional plunge 'cause I never saw anything that inspired my confidence til K C last year. My rig has been absolutely perfect. I haven't done a thing except install, fly, and charge batteries. I've never had a glitch or other malfunction and I'm sure I'm the envy of all the boys in the neighborhood.

Learning to fly was no particular problem, but at this point, it still works better than I do, although I'm gaining. I think the transition was eased by the superior location of the elevator trim lever. Us exreeders can gain quite a bit of confidence from having at least one of the up handles where it ought to be.

Speaking of trim, the servo resolution is fantastic. I made some "click stops" out of 1/16 sheet teflon for the trim pots with notches about 3/64ths apart all along and a slightly bigger notch in the middle. So help me the airplane responds to every one of those notches, and the middle is alway the same the same the same. . . . Try that on yore ole brand X proportional.

*(Continued on Page 66)*

## Citizen-Ship

*(Continued from Page 52)*

into some of the smallest RC models. A highly selective audio filter tuned to 3750 CPS is utilized, rejecting most of the noise and interference (electrical) most commonly encountered in RC model aircraft. Crystal frequency is 455 Kc below transmitter crystal frequency.

The receiver should ideally be powered by four 450 mah nickel cadmium cells. Center tapped, these four cells are also utilized for servo reference voltage. Pencell batteries are adequate and can be used if desired. For lightweight installations, 225 mah nicads can be used since receiver drain is approximately 40 ma.

Mounting the receiver in the airborne installation is simplicity itself, since its operation is unaffected by vibration. It is suggested that the receiver be surrounded by foam rubber and mounted with the printed circuit boards in the same direction as the fuselage bulkheads.

The airborne antenna is the key to reliable performance with the Citizen-Ship system. Although several antenna configurations are shown in the Citizen-Ship AP manual, their choice, and ours, is a 30" length of .045 music wire mounted vertically approximately 6" behind the trailing edge of the wing. Do not, *under any circumstances*, use the more common hook-up wire antenna running to the vertical stabilizer. We have conducted extensive tests with the Citizen-Ship proportional system and have *never* experienced a fail-safe or "glitch" of any kind using this form of antenna. If you use another antenna system, you *will* experience an occasional fail-safe – causing neutral controls and low motor – usually occurring only when the model is within 100-150 feet of the transmitter. We discussed this vertical wire antenna with several electronic engineers and RC technicians – and the unanimous opinion was that this is the singularly most efficient antenna for RC usage and would definitely improve the operation of *any* proportional system. Apparently, "fail safes" are in part, caused by phase shift interference. Here is a quote from Vernon McNabb of Citizen-Ship:

"Probably the first thing anyone will hear when the subject of proportional systems is being discussed is the term "fail safe," or "glitch." It seems that when you are flying proportional, sometimes for no apparent reason, and when the plane is not very far out, it will go into "fail safe", which is an indication of the fact that the receiver lost the transmitted signal. Even more strange, this seldom occurs at extreme range, but usually always occurs when the plane is considerably within its reliable range.

The answer is that it is not a function of sensitivity, or power, although increased transmitter power could help, as evidenced by some of the more elaborate transmitters going up to one watt. Rather, it is caused by phase shift interference from signals traveling by different paths and cancelling each other out when they arrive at the receiver. How this occurs so close to a model plane is a little hard to understand, but apparently a signal going out from the transmitter and hitting a foreign object and bouncing off, will arrive at the receiver 180 degrees out of phase from the transmitted signal. Obviously, this signal will be weaker than the transmitted signal, and therefore, the condition is most likely to occur when the transmitter antenna is pointed at the plane, and would be particularly bad if the plane also had a straight antenna that was parallel, or almost parallel, to the fuselage. In this case, the reflected signal and the transmitted signal might be very close to the same strength and cancel each other out, thereby giving "fail safe."

In the AP System, we know that from a range angle you can fly this equipment as far as you can see it, and seldom do you get a "fail safe" at extreme range. It always seems to occur closer in, and strangely, sometimes happens only 100 feet away. From the experiments that we have run, the best solution for preventing this is the proper installation of your antenna – in which the lead from the receiver runs back through the fuselage to about 6" behind the trailing edge of the wing and then a 30" stiff vertical wire erected at this point. We have never had a "fail safe" with this particular installation.

And, here at RCM, utilizing the recommended vertical "whip," we have not experienced any fail-safe conditions or range problems.

Under the receiver Warranty, no retuning of the receiver or transmitter is permitted, and is not necessary. All sets have been double checked at the factory for frequency, sensitivity, and output, and no tuning is necessary.

### APC and APM Servo

Although designed for use with the Citizen-Ship AP system, the APC and APM servos may be used with any analog proportional system meeting the input voltage requirement of + and – .65V for full travel. The Model APC servo is a feedback proportional actuator featuring small size, rugged construction, very low electrical noise, and linear output. The total output arm movement is ⅝" linear. Battery requirement is two 4.8 to 6 volt supplies, center tapped.

The model APM servo was designed to give trimmable motor control from the AP proportional system. This means that the servo is not supplied with a continuous input signal and moves only when a motor control signal is received. Positive input voltage runs the servo to one end, negative to the other. Travel time, lock to lock, is one second. In the Citizen-Ship system, the positive or negative voltage is obtained from a pulse omission detector. Input voltage requirement for the APM servo is + and – .75 to 3 volts. Total output arm movement is ⅝" linear, and requires a battery supply of one 4.8 to 6 volt center tapped battery. Servos can be mounted flat or upright with the Tinnerman nuts and 4-40 x ¼" machine screws furnished. Standard Kwik-Links or Annco type retainers can be used for the pushrods.

The total battery for the two (or three, if CAR is used) APC and one APM servo is four 450 Mah nicads, separate from the receiver and reference supply. In small installations, 225 Mah cells can be used. We have received reports of completely successful operation of the Citizen-Ship AP system on one 450 Mah nicad pack of four cells using a 70 uh choke between the plus's and another 70 uh choke between the minus's, although we found no problems for reducing the recommended complement from that recommended by the manufacturer.

Airborne weight of the entire system, batteries and four servos included, was 20 ounces.

### Findings

The Citizen-Ship AP analog proportional system is not only in somewhat of a unique position, it is also amazing in its performance. Vern McNabb of the Citizen-Ship Corporation commented to us that the system was intended to provide the sport flyer with proportional control for a minimum cost, and that it was *not* intended for competition flying. He also went on to say that there would be certain limitations to the system when compared to the $600 rigs, for with the AP's intended market in mind, you cannot put $600 worth of materials into a system that sells for less than $250.

Let's take a closer look at the AP system. First of all, proportional design dictates that we forget our earlier concepts of "single" and "multi" channel. But if we are to use this familiar terminology, the AP system is a "single channel system" in the more traditional sense. We say this, because it utilizes a single tone, varying the width and rate to obtain the two channels of control, rudder and elevator. A pulse omission detector calls upon this single tone for even one more function – motor control. Upon the absence of the tone, the throttle moves in one direction – a solid tone, conversely, applies the throttle move-

*(Continued on Page 74)*

(Continued from Page 59)

reached. This allows for momentum and when timed right results in a legitimate turn track. Incidentally (not so incidentally, really), check the rule book and make that first turn to the LEFT relative to the aircraft – it's an automatic zero score if you don't! Back to the turn – roll smoothly, but at a high rate, into a steep banked turn of about 75 foot radius. Keep a close watch as the downwind momentum plays out and bring up the power momentarily to maintain penetration and altitude. The stronger the wind, the greater the downwind and upwind speed differential – thus the power problem, and challenge of this maneuver. At about the 120° mark, ease up on the bank – this will help the penetration, will allow "sweep" to produce a round circle that is far enough out and upwind. At the 210° point (the flattest banked portion) bring on another momentary power surge and gentle in more bank. Steepest bank is then reached at about 240° and should be enough so as to bring the ship around over the transmitter. Hold the bank to about the 325° mark and start the rollout so that wings are level at the point you finished the straight flight back.

Continue the roll into a right turn, and maneuver to duplicate the pattern of the left hand circle. Considering torque, this may require steeper banks and a finer touch on power applications to avoid galloping. Torque may account for right hand circles tending to be larger in Class I flying – watch for this along with those critical power boosts which are normally required sooner, terminate sooner than those of the left circle. (Beginners should concentrate on making good even circles and go after altitude control later. As in the Procedure Turn, fliers with less proficiency should set power to allow the ship to gain altitude slowly and not worry over it until bank and turn control comes readily.) As the right circle is finishing, work to not under or over turn the original line set by the Return Flight and that wings reach level smack over the transmitter. Do this last bit with a definite motion for best point gains – it lets the judges and everyone else (other contenders, too) know the Overhead Eight is completed.

Next month: The Prop Buster (or, more points are lost this way!) – The Touch and Go.

**WHAT'S IN A NAME?** – heard what Handsboro, Mississippi's leading RCer, Lou (Mr. Engine) Penrod, named his latest creation? It has a Quik-fly wing combined with a Rapier fuselage – calls it Quik-Rape! It figgers. . . .

## Hammerhead

*(Continued from Page 60)*

Incidentally the first couple of times out, I was eager and went in marginal weather. I was caught in the air by rain twice with no adverse. I have heard that some proportional systems don't like humidity or rain in the face . . . or was that an Indian?

Forsooth, mayhap you will notice other non-standard knick-knacks in the photo. The piggy backer is Fielding's Flitetime Figurer. You see I get carried away and can't remember numbers of flights so I don't know when to quit. (I have been known to outlast batteries.) With this Jim dandy 4 ounce accessory, that is all in the past.

The watch is a Galco 12 hour Register that starts and stops by pressure on the stem. It has a big black hand that counts seconds and a smaller red hand that counts minutes on the big outer dial. The littlest hand counts hours up to twelve. To use, you start the watch when turning on TX and RX and stop it when you turn off. Thus the watch cumulatively totals system on-time during a flying session. I arbitrarily quit after 2 hours.

The outer white dial (1/16 teflon again) with three pointers is manually indexed to the red minute counting hand and can be used for timing each flight. Reading clockwise, when the first large red pointer is the index or start, the small black pointer indicates three minutes or don't pass go, don't collect $200.00. The other large red pointer indicates 11 minutes or end.

Reset to zero is done at end-of-session with a probe in a small hole on top. I found that if I left that second button exposed, I couldn't leave it alone, and wiped myself out.

Some aluminum golf-tee-shaped handles with serations around the edges were better for me than the standard levers.

The black holey thing under "off" is for the neck strap. It's made out of a Midwest nylon rudder horn dyed black. There's another one on the upper left hand corner. That's for alternate hooking to provide a more convenient carry when you have to portage both transmitter and plane on a windy day with greasy hands. It's also handy for dual instruction when you or he don't trust him enough to let him hold the box all by himself.

The aforementioned, on the upper left is attached to an aluminum block to which is epoxied a female Dean's plug, the parking place for the shorting plug so you don't lose it so much.

The shorting plug has a ¼ inch dowel

epoxied on to provide a handle and its streamline shape makes for easy polarity reference. It also covers up those bare wires across which I would get some metal object sooner or later. But the four small holes still allow access for metering. It's painted yellow for the frequency, for finding when it's lost, and because it's pretty. (It's finished by the Hobbypoxy Easy-Does-It Method, as is the watch box, made of 1/16 plywood, ho ho.)

The strap from the dog leash store is modified. It's something I started using long ago after a greasy handed transmitter drop cost me an airplane. I think it makes for steadier flying, too, especially propo. Besides one of my arms is put together with screws and I'm really only half safe, graspwise.

So ends the gripping story of "One Man's Transmitter." In a way, I'm sorry that E and K are raising L because soon everybody will have one and I won't have an edge anymore. But back to the Hammerhead. . . .

The last thing I do is cover and paint, after all structures have aged. The fuselage, at the stage described earlier, is ready and two coats of color should do it.

The wing and tail get a coat of Hobbypoxy clear on bare wood, after the final sanding. Twenty-four hours later, I brush or smear on a coat of Stuff. Sand away all Stuff possible with a block or pad, always. Spray a very light coat of Aero Gloss clear. Incidentally, I understand that all dopes are not completely compatible with Hobbypoxy, but I've never had any trouble. Then lay on wet silk and work taut and wrinkle free. Control drying while working with a judicious hand atomizer spray of water. When satisfied, let the surface get almost dry and brush dope first around edges and then over all, avoiding heavy brush marks or accumulation of dope. Leave it alone for 24 hours. Trim. Brush or spray a fairly light coat of dope. Sand with fine sandpaper. Using a brush and very little dope, secure any frayed edges, et cetera. Spray another light coat of dope. By now, the surface should be sealed and smooth. Put it away for at least 72 hours. Apply a coat of Stuff and sand. If needed, give another Stuff coat and spot any stubborns with full strength Stuff. Wait another 24 hours. Do final fine sanding. Use a tack rag. Spray coat of Hobbypoxy color. Wait 24 hours. Wet sand with very fine paper. Stuff any holes. Wait 24 hours. Touch up stuffed holes. Spray final coat of color. Cuss all trapped dirt. Put it away for as long as you can stand it, hopefully a week, but at least 24 hours.

If you want stripes or whatnot, use bond paper underlying all but 3/16" of 1/2" cellophane tape in applying masking, and spray. As soon as paint sets up — 15 minutes or so — remove masking. Be extra careful with tape if you couldn't wait a week because it can pull the green finish right off.

Now you rub. The longer you let the paint cure before starting, the better. Use fine rubbing compound, and finish with Wright's Silver Cream. Any extra big dirts may have to be etched away with a sharp knife or small bit of sandpaper before the final rub and wax.

Balance. On a level surface, with fuel tank empty and main gear as shown on plans, balance so that tail just stays down when put down. As soon as any fuel is added, nose should come down. With fuel tank empty, support airplane by the tip of the prop and a flexible connection like tape to the top of the fin. Wings should be level. Add tip weight if required. The first Hammerhead refused to do tailslides, falling off to the left consistently. When balanced as above, by adding 5/8 ounce to the right wing tip, tailslides were as consistent as anybody's. I used all the heavy sticks in the right wing of the second one, and lucked out, needing no weight for balance.

I recommend starting with control surface travel as follows: Elevator—with root trailing edge centered on reference line — Up is 9/32", Spinup is 1/2", Down is 9/32", Trim up is 3/32", and Trim down is 3/16". An RGA printed circuit board inside the elevator servo with a micro switch on lowest engine gives Spinup. Rudder travel is 1 to 1½" R and L depending on spin results. Large ailerons move ½" up and 7/16" down at the root. Small ailerons move 7/8" up and down.

For statistics lovers, the following were obtained by measuring #1.

Weight, dry 6½ pounds (104 oz.)
Overall length, 51"
Wing: Span 67", root chord 14.25", tip chord 6.5"
Area 705 sq. in., 4.9 sq. ft.
Loading .1475 oz. per sq. in., 21 plus oz. per sq. ft.
Dihedral 4°, incidence 0°. Airfoil: 2415 modified, thickness: 14%
Aileron area 75 sq. in., 10.6% of wing area. Span 14¾"
Stabilizer — Elevator: Span 28", root chord 7.5", tip chord 3.75"
Total area 157.5 sq. in., 22% of wing
Elevator area 35.75 sq. in.
Airfoil, symmetrical, thickness 13%
Incidence 0° to plus ½° (empirical)
Fin-Rudder: Height: 8"
Approximate Area Total 50 sq. in.
Rudder: 20 sq. in.
Thrust: 2° right, 0° to ½° down (empirical)

If rigged and balanced as suggested, your ship should fly off in a slight climb with full up trim. Be ready to steer with aileron and curb the climb if it's too steep.

Good luck and Happy Hammerhead.

## R/C: The New Era

*(Continued from Page 41)*

19. Inverted spin with a minimum of two turns. 3
20. Immelmann on take off. 3
21. 4 point hesitation roll (count 3 on each point). 5
22. 360 degree slow roll. 5
23. Outside-inside vertical S. 5
24. Outside-inside square S with vertical rolls. 5
25. Cobra roll. 5
26. Inside-outside 8. 4
27. Outside horizontal 8 with descending rolls. 4
28. Split S. 2
29. Climbing and diving eight point roll. 4
30. Outside Immelmann. 3

And there you have the free group of maneuvers from which to select your own individual presentation within the prescribed time limit. The following is shown as an example of the full-sized aircraft presentation, and is the routine which won the U. S. Aerobatics Contest at Reno, Nevada Air Races last September for stunt pilot Duane Cole:

1. Outside loop with slow roll on top.
2. Hammerhead stall, inverted recovery.
3. Outside Cuban eight.
4. Outside-inside loop (vertical eight).
5. Outside-inside Cuban eight.
6. Inverted hammerhead stall.
7. Hammerhead turn with half rolls going up and coming down.
8. One-and-a-half snap roll.
9. Outside square loop.
10. Slow roll in a 180 degree turn.

When you consider that approximately twenty maneuvers of this type are presented in seven minutes or less, you can appreciate the precision and skill required of these full sized aerobatic pilots. The same type of skill and creative presentation will be required in the Free Style Aerobatic event for R/C, as each individual pilot selects his own individual presentation, adding embellishments and flairs of his own particular liking.

So here is the newest and hottest event challenging the R/C'er of today and tomorrow — an event destined to become the most popular of all, both from the standpoint of the contestant and spectator alike. As the event is tried, and as individual skill is gained, RCM will report the results to you in these pages. For now, we offer you this new challenge from the all New Era in R/C. We also wish to express our appreciation to Frank Capan and the Valley Fliers for their pioneering efforts in behalf of this event, and for the background material for this article.

*(Continued from Page 9)*

address. The farmer and Andrew's father are now engaged in lively discussion.

●

We were pleased to have Chuck Cunningham visit us this past month—Chuck on loan from the state of Texas, is RCM's newest Contributing Editor, and has planned a variety of articles we're sure you'll like. Among them is a fully aerobatic biplane designed for the new Free Style Aerobatic event and an N.M.P.R.A. trainer so that you can learn the new Goodyear event without having to tackle the hot midgets while trying to get around the pylons the first time. Chuck's lovely wife, Jan, is quite pleased about the whole thing . . . now she doesn't see him at all! While they were visiting California, Jan broke her toe.

I didn't dare ask how it happened.

●

I wish for you happiness . . . this can be more clearly defined as forgetting to turn on your receiver and having your plane land safetly beside the swimming pool in Diana Dors' backyard. . . .

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*(Continued from Page 42)*

cess glue will squeeze out. Wipe it off, then tape the top together, so both sides are now firmly held together in the flat position, and let dry.

Step 5. When dry, cut into two 16½" wing panels, shape tips and proceed.

Step 6. Cut out the ribs from medium ⅛" stock. Note rib depth is ⅛" greater than the airfoil curve of the sheet. This makes the ends project out at the leading edge and trailing edge.

Step 7. Pin the ribs of each panel in place on your flat table. Insert the pins at the leading edge so the leading edge of the sheet will fit tight against the pins when the sheet is placed in position.

Step 8. Lay a bead of glue along the ribs, using reasonably slow drying glue. Any of the regular brands will do — just don't use the "extra fast" type designed primarily for on-the-spot field repairs.

Step 9. Pin the leading edge of the sheet in place with a second pin, at all the ribs, then gently press the sheet down to fit the rib curve. Pin the trailing edge down. Let dry.

Step 10. When dry, pick up the wing panel assembly and trim off the ribs at the leading edge and trailing edge.

Step 11. Then make a wedge shaped piece of wood to join the panels together at the center. The angle of the wedge, **14 degrees**, determines the dihedral, which is **7 degrees** for each panel.

Step 12. Glue this center piece to the center rib of one panel. When dry, trim the top to fit the airfoil curve.

Step 13. Block up the tips to **2½"** and glue the other panel to the center piece.

Step 14. To strengthen the center, cover the joint from leading edge to trailing edge on top with a 1" strip of either strong nylon cloth, or preferably, "Celastic," a hobby material available in most hobby shops.

Step 15. For additional strength, cover the bottom of the center section from the center to the first ribs with **1/32" sheet.**

Step 16. Wing is now finished, except for sanding and doping, and is ready for the engine pylon.

### Pylon

Cut the engine pylon from ½" hard balsa, glue two ⅜" cheeks on either side, shape, add the 1/16" plywood firewall, then glue the whole assembly to the center of the wing. Reinforce with strips of celastic at the butt joint.

### Tail Surfaces

Stab, fin, rudder and elevators are all made from 1/16" sheet, with cloth hinges. The fin is reinforced at the base with ⅛ sq. supports, trimmed at an angle of 45 degrees for better appearance.

### Landing Gear

The strap-on landing gear is still the simplest and best for this size model. Note the celastic reinforcement on the fuselage where the landing gear fits.

### Adjusting and Flying

The Good Neighbor is very easy to adjust, but be prepared for a little surprise, that .010 may look small, sitting up there on that pylon, but the full "thrust disk" of the 3" prop is effective, and the model has plenty of power and speed. In fact, by dropping the elevator slightly, the model flies very firmly even in a relatively strong wind. Flight trim can be achieved just by hand gliding, since the model is small and light. If you position the C.G. as shown on the plans, longitudinal trim is done by adjusting the aligning spring wire on the elevator. Because of the relatively long moment arm the elevator is pretty sensitive, so make adjustments of the trailing edge 1/32" at a time. Start with the elevator right in line with the stab. This is fine for all normal flying. Droop the elevator 1/16" and you'll find the model penetrates the wind right along with the big jobs.

For the "power hounds" the pylon is designed to take an .020 — but be ready for a real zippy flight, particularly if you use the Cox "hi-thrust" prop.

Before you try flying the Good Neighbor in a confined area, take a tip from me and practice at a large field. Set up some stakes, or markers, and practice until you can consistently fly within the markers.

Even so, when you decide to try a flight in a small area, you'll find the boundaries seem to be reached faster than you expected, and you may run into one of the obstacles. But the model is rugged, and the only damage will be to your ego. And you can repair that.

So try it.

# THE LAST WORD

*Bob Bochy looks at R/C . . . and if this cartoon sequence isn't familiar to you, you're probably an HO railroader at heart . . .*

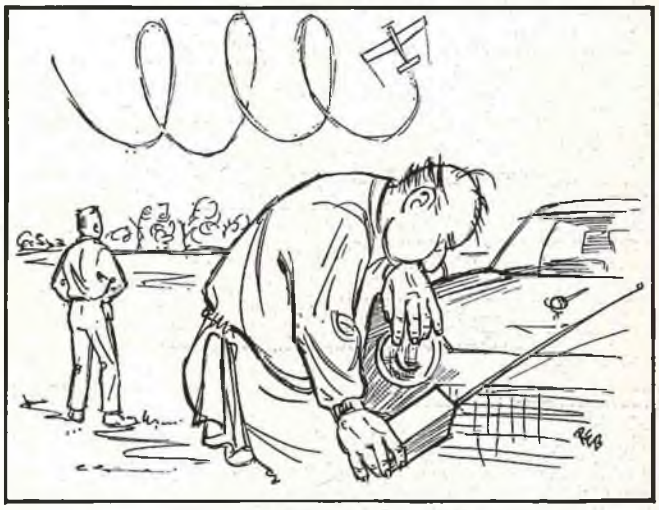
"Dad, you better start giving it some up elevator!"

"Oh, shut up!"

"Pardon me sir, but have you seen a —"

"Okay, little boy, stand ba — !"

"Gee, Dad! You're really doing good!"



## Citizen-Ship

*(Continued from page 62)*

ment in the opposite direction. Therefore, it stands to reason, that your primary control surfaces will neutralize during that fraction of a second (or full second, if total throttle movement from low to high, or high to low) the throttle servo is in motion. To the serious competition pilot demanding the utmost in timing and precise settings, this would be a disadvantage. To the sport flier, it presents no problem at all.

In other words, Citizen-Ship has taken a single channel of control and carried it to what could be termed, its finite form, as we know it today. As an example, we flew the system first in the small Royal Coachman design presented only recently in RCM. The gear was installed and flown. No problems of any kind were encountered.

The second test ship utilized is a design by Phil Kraft intended for all-out competition flying on the Class III circuit. This in effect, was a test of the Citizen-Ship AP system for which the system, itself, was never intended — a Class III competition design. We are still flying this system in this model with more than satisfactory results. Response is precise and instantaneous. Range is out-of-sight, and no "fail-safes" or "glitches" have been experienced.