# EXCLUSIVE NATIONALS WINNERS

# RADIO CONTROL MODELER

RM

SEPTEMBER 1964 50c

## SABRE HAWK IV

by ED IZZO

B and D SUPERHET CONVERSION

NICADS: PART 1

BASIC MULTI INSTALLATIONS

# DEAR RCM:

**R/C MODELER MAGAZINE P.O. BOX 487 SIERRA MADRE, CALIF.**

### Juniors and The Classes

I started building models at the age of 12 in 1932. In those days the hobby was different than we know it today. You weren't able to find hobby shops in every town and hamlet. We purchased most of our supplies from hardware and lumber yards, such as brads, spruce, casco glue, etc. The point is, there is too much regard to "where the Juniors are." Most of the kids today have so much and so many different things to do, that even if we handed them trophies on a silver platter it wouldn't help much. A real, dyed-in-the-wool Junior modeler doesn't need to be tempted and bribed like a spoiled child into staying in the game. It seems that the commercial people are the ones who are really worried the most. On the matter of competition classes, I have sat and read, listened and evaluated, what has been said during the ten years I have been in R/C, and what appears will continue forever. In the beginning, it was a pleasure to go out and fly on Sunday, or go to contests and really enjoy yourself, even if you tried all day and didn't fly. But as time went by, and equipment (and money in some cases) became easier to come by, some sharpies started drifting into this wonderful hobby of ours — those who would twist and change things to their own way just for the sake of winning — looking for the loopholes and even making a simple rule like building your own model a federal case. This isn't a war, but a truly wonderful sportsman hobby of the highest order. It seems to me that with all these ideas about complex handicaps and skaty-nine different classes, we are a lot worse off than when we started changing them. Why don't we have classes by individual weight like prize fighters and get it over with! I can't for the life of me see why simple rules can't be followed like two servos, rudder and motor, nothing else in Class I; three servos, rudder, elevator, motor, steerable nose wheel and mechanical brakes, in Class II (no trim allowed); and anything goes in Class III. Those who can't fly with the top men in Class III, drop down to another class or keep trying. I would rather lose in competition against the best men, than win in a group of the worst.

Fred Romano
Maplewood, N.J.

### Reader Service

Several times in the past I have requested additional information from your Reader Service card, but have as yet, not received the requested data. I must commend you on your publication — I am just getting into R/C and find your mag a wonderful help to my sometimes disastrous adventures. I realize from reading your mag that you deal mostly with advanced RC'ers, and I would truly like to see an article just for beginners.

Arthur Gallant III
Roslindale, Mass.

*RCM's Reader Service program consists of forwarding each of the thousands of monthly requests to the individual manufacturers on gummed labels, and accompanied by a letter of transmittal stating the data required. In many cases, the manufacturer is temporarily out of the brochures, catalogs, or technical sheets requested, but will fill the requests as promptly as possible.*

*(Continued on page 39)*

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**SUPER MONOPERM** — Heavy duty, ball bearing electric motor with built-in on-off reverse switch. Ultra high efficiency.

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1—4 volt delivers 6000 RPM per volt—Drain 200 MA to 800 MA
3—12 volt delivers 2000 RPM per volt—Drain 80 MA to 400 MA
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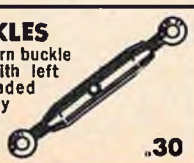

**.30**

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**Nickel plated brass propellers**

3/32" dia. shaft 2¼" dia. 2 blades R/L **95¢**
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⅛" dia. shaft 1½" dia. 2 blades R/L **55¢**
1½" dia. 3 blades R/L **65¢**

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|---|---|---|---|
| 13.7" long | $1.95 | 12" long | $1.50 |
| 11.8" long | 1.60 | 10" long | 1.45 |
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Drilled sizes available in 3/16", 3/32", ⅛"—Please specify size on each end.—**65¢** **$1.25**

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3/16"-3/32"
3/16"-⅛"

**SPRING TYPE**
3/16"-3/16" —**65¢**
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Connected pair 7/8" long. **$.15**

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Relayless Multi-Servo Transistorized **$24.95**

Relay Multi-Servo **$10.95**

**SPECIFICATIONS:** SIZE: 1¾" x 1¼" x ¾"
DRAIN: 180 to 450 MA.
WEIGHT: less than 2 oz.

**LINEAR TRAVEL—¾"**
**TRANSIT (ARM TRAVEL TIME) ADJUSTABLE**
**POWER REQUIRED—2.4 to 3.6 VOLTS D.C**
**CONVERTIBLE TO SELF NEUTRALIZING OR TRIM**
**HEAVY DUTY TRANSISTOR AMPLIFIER**
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- No expense has been spared to evolve a servo which will give positive and unfailing response to every command.
- **Strong enough for the fastest .58 powered model, yet light enough for an .049 multi. The Geni is a gem.**

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|---|---|---|---|
| **100 ma** | | | |
| 2 Cells | ½" | .7 oz. | $2.90 |
| 3 Cells | ¾" | 1. oz. | 4.20 |
| 4 Cells | 15/16" | 1.3 oz. | 5.50 |
| 5 Cells | 1 1/16" | 1.7 oz. | 6.80 |
| **225 ma** | | | |
| 2 Cells | ½" | 1. oz. | 3.50 |
| 3 Cells | 1 1/16" | 1.3 oz. | 5.00 |
| 4 Cells | 1 5/16" | 1.8 oz. | 6.50 |
| 5 Cells | 1¾" | 2.3 oz. | 8.00 |
| **500 ma** | | | |
| 2 Cells | ¾" | 1.9 oz. | 6.00 |
| 3 Cells | 1 1/16" | 2.9 oz. | 9.00 |
| 4 Cells | 1 5/16" | 3.9 oz. | 12.00 |
| 5 Cells | 1 7/8" | 4.9 oz. | 15.00 |

Rechargeable. Indefinite life. Constant voltage output. 1.25 volts per cell. Welded pacs in durable plastic sheath with mounting lugs at each end. Light and compact.

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**1000 MA AVAILABLE**
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Self neutralizing multi Servo built-in clutch protects motor and gear train. Excellent as a single channel proportional actuator.

## BOTOMATIC

Single channel boat servo. Produces right-left steering and forward-stop-reverse motor control from one set of drive batteries. May be mounted in any position. Self neutralizing. Unaffected by vibration. 3V, low drain. Ultra dependable.

**Suitable for all sizes of radio control boats**

Size: 1½" x 2½" x 3".
Weight: 3⅛ oz.

**$12.95**

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# EDITOR'S Memo

Don Dewey

*Since the summer months annually harbor the majority of RC contests throughout the country, they are usually followed by a hue and cry about poor attendance, and so-called "professionalism" in the winners' circle, ad nauseum. Of course such despair would be frought with waste without a few choice words about the Builder of the Model Rule and "What Happened To The Juniors This Year?" Since the latter proverbial tear-jerkers will probably be resurrected and dissected again in a few thousand repetitious words or less, we'll look at the former by way of reprinting a most outstanding critique by Carl Mohs, editor of the Madison Area Radio Control Society's publication. Herein is the real problem — and a real solution.*

In considering what we learned from our recent Flyfest, or "contest," I think that some pretty important ideas are here for others to pick up and promote in their locales. Contest flying, while not everyone's "cup of tea," should still be appreciated and encouraged *by all* for the same reasons that the Indianapolis 500 is good for automobiles, and air races are necessary for the development of aircraft. If it were not for the stimulus of competition, our hobby would still be back in the dark ages — we wouldn't have the Taurus or Stormer for the non-contest flyer to fly and enjoy. We wouldn't have the reliable equipment we have today if it were not for the pressure put on manufacturers by the contest flyers and the modeling press when it publishes the results of contests — the Nationals in particular.

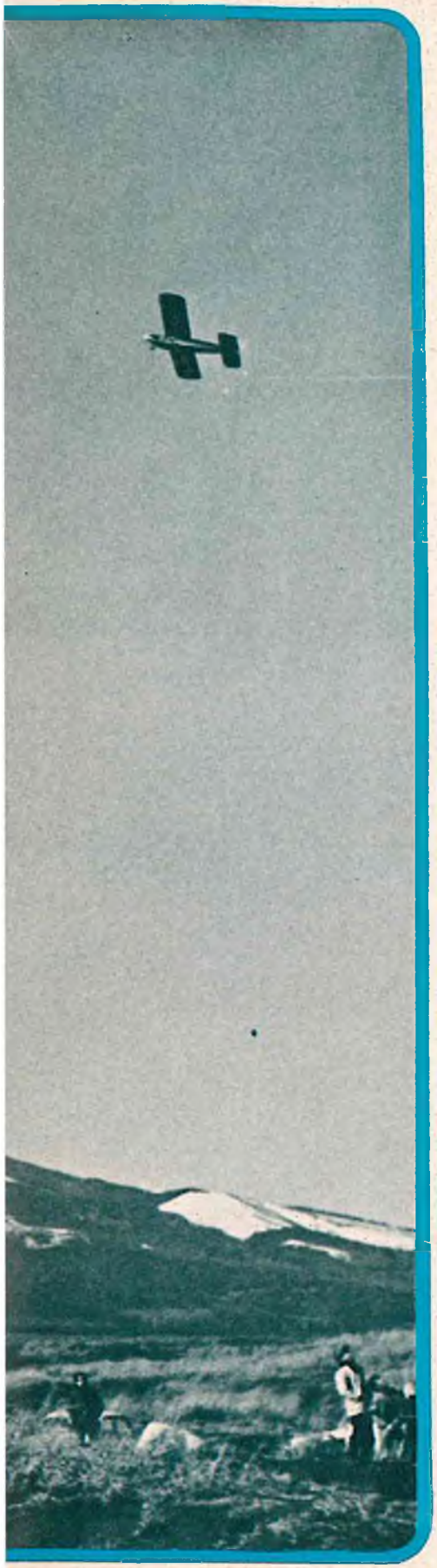
There has been growing concern about poor attendance at contests in the last few years, with the most frequently advanced reason being that the "experts" win them all. I don't believe that this is the real reason — it is just the handiest. When you get right down to it, fellows, isn't the real reason that some of us wouldn't enter a contest, even in our own back yard, because we're afraid we'll make a fool of ourselves while others watch? Maybe we'll goof the pattern, or possibly signal right instead of left on final approach and be laughed at. We couldn't care less that our chance of winning a big prize is small, if in fact, non-existent. This brings us around to our recent "contest."

It was a *big success* because we had good attendance and everyone had fun — there were *no* gripes. We enjoyed attendance comparable to Chicago and Minneapolis, yet this was limited to Wisconsin residents. WHY? Because this was billed as a fun flyfest without the pressures of a "contest." There were no big prizes to be had and no one expected any. Fellows came and flew the AMA pattern that had never attempted it before — and found out *it is fun to fly in a contest.* For readers who may not have seen the plans for our contest in past issues, I'll explain here that everyone had to fly and be judged on the AMA pattern as a qualifying flight before participating in the spot landing and limbo events. The scores on the pattern were available, but meant nothing insofar as prizes which were awarded in the spot landing and limbo events only.

Incidentally, I was pleasantly surprised at the interest by all contestants in the judge's critique of the pattern event, following the last flight. The most common errors were pointed out — errors that would have cost the individual flyers many points in a full scale contest.

In other words, this informal fun fly approach was in reality a training ground for contest flyers. This is the idea which I hope will be promoted by clubs all over the country — what a boon for future contests and for RC in general if every club would have a fun fly day and introduce new people to the fun and excitement of contest flying. After all, isn't contest flying just what we are all striving for — getting the best performance out of plane, equipment, and pilot?

*This month's cover, an interpretation of the Dallas Nationals, is an original painting by Douglas Ettridge, renowned free-lance aviation artist. Born in London, England, Mr. Ettridge is a member of the Society of Aviation Artists and the famed London Sketch Club. His paintings have been exhibited at the Royal Society of British Artists, the Society of Marine Artists, and other London and Provincial Galleries. Mr. Ettridge, who now resides in Southern California, has a large number of oils and water colors in private and company collections.*



*September 1964*

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R/C modeler





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# BY KEN WILLARD

The phone rang.

"Ken? This is Don Dewey. Chuck and I were talking about future material for RCM, and we want you to write a column."

"A column! What about?"

"Anything about models that you want to talk about — maybe a new design, a gimmick, or some letter you received, or a letter you've sent. You know — the type of thing that might interest the R/C modeler."

"Well-l-l," I welled, "I don't know. I've written a lot of articles, but not on a regular basis. Maybe I might not have enough good ideas to warrant a column every month."

"We've thought of that," replied Don. "But we get a lot of letters from guys who are interested in the sport—or hobby — of R/C modeling. They've got problems that seem to fall into a pattern. They're not really interested in contest flying, except as spectators, but they like to know what's new in the contests. They also like to know the answers to their own problems. Then they like to build new designs—so long as they aren't too tough. We figure you can write in most any field of R/C and the readers will react. And we want to serve all aspects of R/C. Since the sport flyers — or Sunday flyers — the guys you write for most of the time; are the most numerous, we'd like to have a column devoted to them. How about it?"

"For the Sunday flyer, eh? And other writers will cover the deep technical stuff?"

"That's the idea, Ken."

"Suppose I run dry of material?" I asked.

"Then just say so, and we'll omit the column until you're ready."

"Okay, Don, I'll try it."

So here I am — trying. And I'm gonna need some help — from you. But before you "help" me to drown in my own ignorance, let's set a few limits.

First off, this column is intended for you "Sunday Flyers." I figure you're like me — you are interested in every phase of the hobby, but your time is limited, so for the most part, you'll buy the equipment and use it right out of the box. If it doesn't work, you don't have time — nor are you deeply interested in tinkering with it. But you're curious — and maybe I

*(Continued on page 50)*

KEN WILLARD

*Noted designer, former Nat's Champion and world's R/C endurance record holder, Ken's list of credits would be almost endless — his contributions to model aeronautics playing a major role in advancing the state of the art. He is, however, more comfortable in the role of co-pilot to the newcomer and sport RC'er — the Sunday Flyer for whom this column is written.*

# AMA

By George Wells

"The "pros" are winning all the hardware."

Next to not having enough frequencies, this is the R/C lament of 1964. It has even elbowed aside the time-worn problem of what to do about Class II.

Charlie Muchbucks goes out and buys a 32 channel proportional system just like the one with which Norman Conquest is winning all the local meets. At the contest, Muchbucks proto taxies into his field box, destroying a $4 fuel bottle, his ni-cads, and a box of cigars. From the back of the gathering at the trophy presentation he mutters, "A guy with my experience doesn't have a chance against these experts."

Gerald Gadgeteer has been stumping the contest trail for centuries, it seems. He's been flying the same airplane for seven years, each year discovering a new combination of pulse rate, width, tone, and no signal to produce another control function. All things considered, he does quite well in Class III, placing 16th out of 20. As happens every third year or so, his equipment worked all the way through the meet. This personal triumph, nonetheless, did not forstall his saying to an intimate at the back of the trophy presentation, "It isn't like the old days. A guy who likes to play with electronics hasn't got a chance."

Soft-spoken, conservatively dressed, immaculately manicured, wide-eyed, B. Ginner shakily strides out to the flight circle. He carries his neatly painted, cleanly wiped, true-to-the-kit in every detail, single-channel Schoolmarm. In his previous four contests he: 1) couldn't get the engine started, 2) decided it was too windy, 3) spent day trying to tune equipment, 4) wife got disgusted and insisted on being taken home. Got back in time

*(Continued on page 45)*

# The Roostertail

**The Official Publication of the International Model Power Boat Association**
**General Office: 2405 19th Avenue Broadview, Ill. 60155**

The family plan for IMPBA Membership is really catching on. A surprising number of new members are taking advantage of the special rates. Since the additional membership is only 50¢ for 12 months, for each member of the family, it just makes good sense to let the whole family enjoy the sport of model boating and get everyone to participate in the activity.

Family membership brings up a new question about boat ownership. Until this time, only the owner of the boat, or a bonafide proxy could operate a boat in competition. There is no present ruling on the IMPBA books to cover a situation of running the boat of a member of the family. Here-to-fore, proxy running has only been permissable under certain conditions, and the condition of a boat by anyone other than the owner is generally not allowed. It seems to me that few families can afford several complete sets of equipment, and since our purpose is to further the interest in model boating, I see no reason why all members of a family should not be permitted to participate in competition and run common equipment. Why not let everyone in the family enjoy the excitement of competition?

My own children have grown to the age where they no longer require constant attention from my wife and she has become more interested in my hobby, now that she has the time to enjoy it. Since she runs my boats when we "run for fun," she would like to compete along with the rest of us when we have a regatta.

It is only sensible, if other members of a family are interested in model boating, that they should be allowed to participate in competition without the expense of an additional complete rig. All modelers are not willing to chance their equipment in the hands of others, but those who are willing to share with the family should be permitted to do so. Maybe you fellows who are shaking your heads in the negative are afraid your wives will win more hardware than you do! Perhaps you are afraid your wife will run your boat up on rocks or in the weeds for you. Well, why should I be the only guy to have his wife put a boat in the weeds? Lets have some comments. Do you think we need any rules which would permit operation of a model by any member of the family who is a member of the IMPBA? Should this be left up to the local club? Should this not be permitted at all? What about it?

One new record has been put on the books for this year. Mert Mischnick, Class F-2, ¼ mile oval, 46 seconds flat. Boat: Trident, Engine: Ollsson Compact, Radio: Controlaire "10" Superhet.

Until the new world record applications are printed, the IMPBA number of the applicant, the sponsoring club, the course, the engine class, and the hull type, whether Radio or Tether, the date and place of the regatta, times recorded by each of the 3 judge-timers signature, and the signature of the host club Commodore to verify that all facts are true.

*(Continued on page 38)*

# INTERNATIONAL Circuit

By Cliff Rausin

**Great Britain** Frank Van Den Bergh, George Bradley, and Chris Olsen were the winning trio for the S.M.A.E. Trophy at the recent British Nationals. With ideal weather conditions prevailing, the Annual event drew a record number of both entrants and spectators. Scale was won by Jack Morton and a DH 82 Tiger Moth, with 2nd and 3rd places going to D. Bryant and a Miles Sparrowhawk, and D. Thumptson and a Sopwith 1½ Strutter, respectively. From all indications, George Bradley is the flier to watch, having risen all the way up the ladder to 2nd at the Nationals and followed by a win at the Woburn Rally.

Having lost many of their fields due to the noise problem, next season will see a requirement for silencers on all engines. This should put the big 10 c.c. mills up front for R/C use.


**Switzerland** The regional eliminations for the Swiss FAI RC team saw five of the first eight places being captured by Kraft reed equipment, two by F&M gear, and one home-made rig. Among the finalists were Bernhard and Gerd Huber of Fehraltorf, the former using his 1963 Nationals winning Mark 4 model. Brother Gerd's new design, an exceptionally good-looking and somewhat unusual configuration, also proved to be an excellent multi machine. Both ships used Kraft Custom reed equipment and Bonner Transmite servos. with Veco .45's for power.

The scale Skyraider, one of the finest WWII scale jobs we've seen, was built by Franz Meier of Ruti. Spanning 76" and using a modified NACA 2417 airfoil, the AD6 weighs 4.1 kg and is pulled aloft by a Fox .59. Equipment used is a Kraft Custom 12 with ailerons, flaps, rudder, trim, elevator, and motor control used.

**South Africa** As part of a program to promote RC flying and the formation of local clubs throughout the Union of South Africa, the STARS (Southern Transvaal Aeronautic Radio Society) are visiting the various smaller centres with scheduled lectures and flying demonstrations. During the long Memorial Day weekend, STARS member's visited the Kimberly (Diamond City) RC Club, leaving Johannesburg on Saturday morning and traveling 320 miles to Kimberly. During the demonstrations and informal fly-in, Chris Steyn of Bloemfontein endeavored to break Gordon Hamilton's South African spin record of 60 turns, falling short of that mark with 54 turns achieved. No artificial visual devices may be used, such as binoculars, in this event. The ship must be in plain sight at all times.

**CLIFF RAUSIN**

*is an RC'er whose export business, the largest of its kind in the hobby industry, keeps him in constant touch with virtually every corner of the world. The network of contacts Cliff has created contributes greatly to RCM's ability to present news of radio control activities wherever, and whenever, they may occur.*

# 1964 NATS WINNERS


# Cliff Weirick Wins Championship!

*'Candy' Bonner Proportional Winning Ticket*

1964
NATIONALS

Dallas, Texas

## Class III

| | | | |
|---|---|---|---|
| 1st | Cliff Weirick | 179.0 | |
| 2nd | Zel Ritchie | 172.5 | (80.5) |
| 3rd | Ralph Brooke | 172.5 | (79.5) |
| 4th | Phil Kraft | 171.0 | |

## Class II

| | | |
|---|---|---|
| 1st | Lloyd Sager | 119.0 |
| 2nd | Don Crow | 116.0 |
| 3rd | David Burt | 99.5 |

## Class I

| | | |
|---|---|---|
| 1st | Tom Williams | 82.5 |
| 2nd | H. Petrie | 75.0 |
| 3rd | M. Santmyers | 72.0 |

# 1964 NATIONALS

## DALLAS, TEXAS

*Gary Leonard and Mark I 1st in Jr. - Sr. Class I*

# Dale Nutter Breaks Own Pylon Record

## *New World's Record 0:59.25 Set At Dallas*

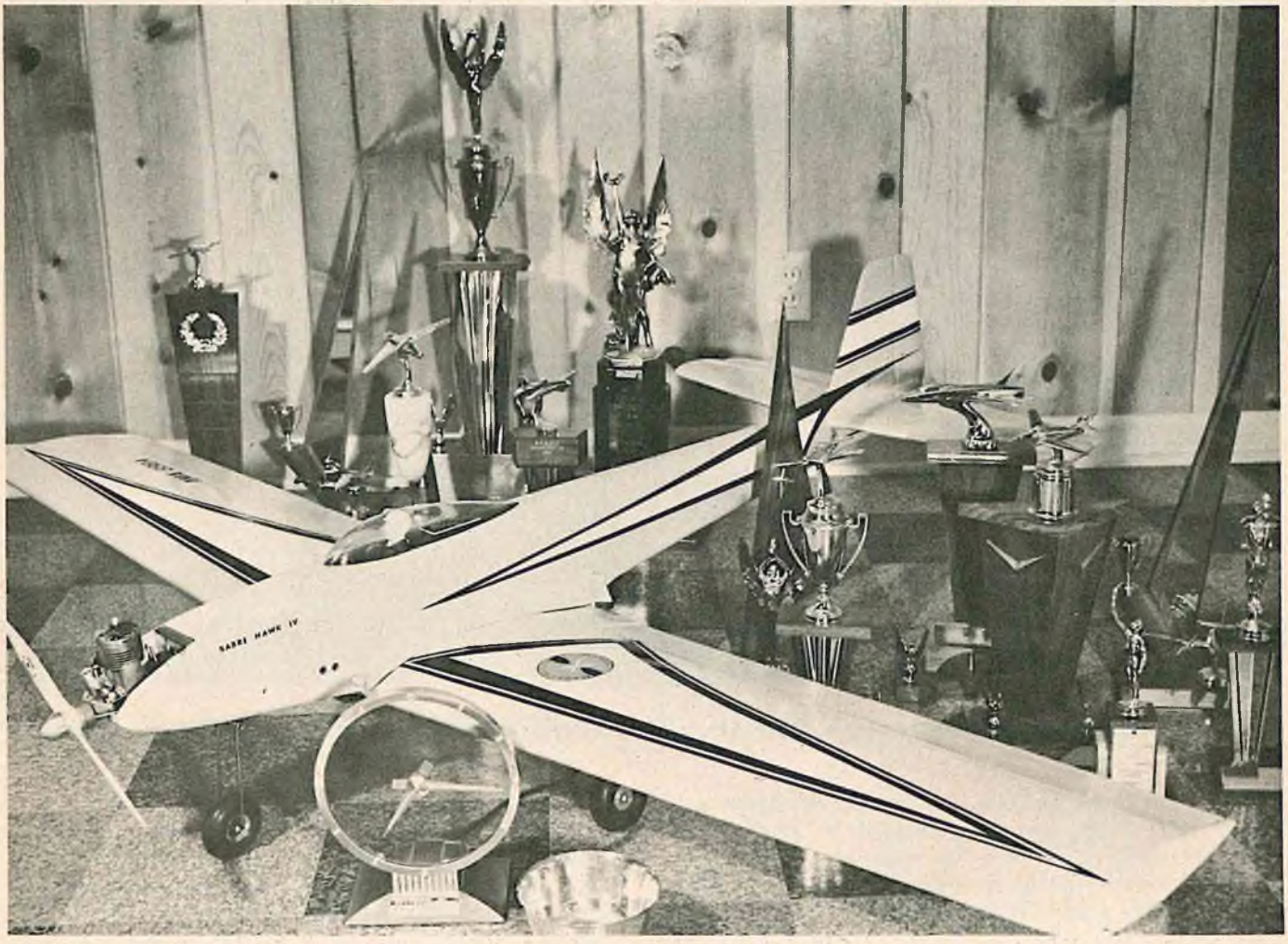
*Dale Nutter and Sidewinder—1st in Pylon*


*Lloyd Sager and Bonner Proportional—1st in Class II*



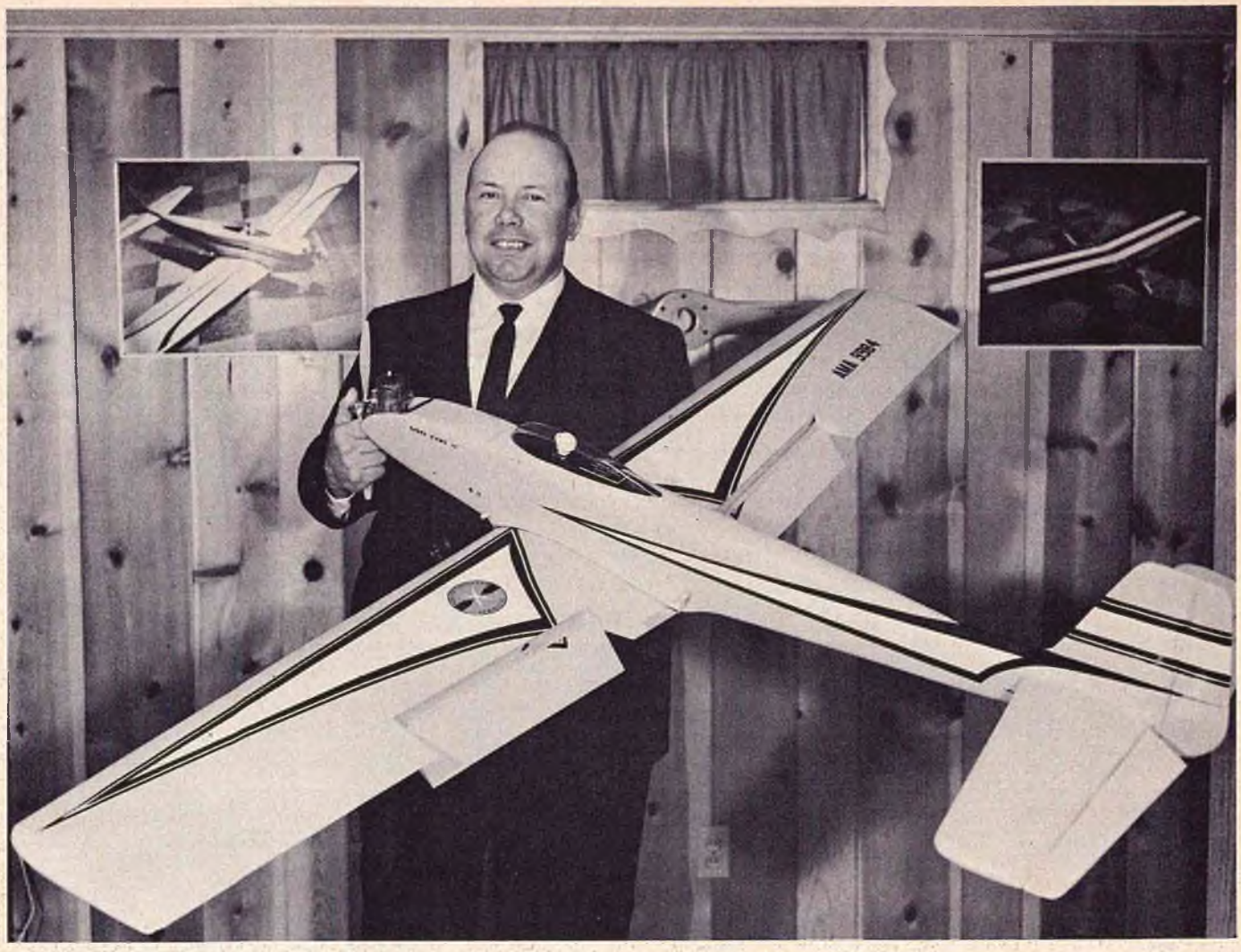
Continued on Page 44

# SABRE HAWK IV



by
Ed Izzo

NEW YORK STATE CHAMPIONSHIPS
1st — 1962 2nd — 1963
BUFFALO BISONS INVITATIONAL
1st — 1962 2nd — 1963
NEW ENGLAND CHAMPIONSHIPS
1st — 1962
AERO GUIDANCE SOCIETY
1st — 1962 1st — 1963
LONG ISLAND DRONE'S INVITATIONAL
1st — 1963



***Full Size Plan Available***

The Sabre Hawk was first designed for the flying season of 1960 — the four years spent in its development being well rewarded in that this airplane has won more major RC contests in the East during the past two years than any other single design. The Sabre Hawk's contest achievements illustrates its inherent consistent performance.

Prior to this design, I had flown an Astro Hog, which performed well, but was large and heavy. With the design of the Sabre Hawk I, I attempted to build a smaller and lighter airplane. It's configuration has remained intact except for changes in the airfoil and moment arms. Although I have flown this airplane exclusively for contest work, a number of Sabre Hawk's have been built by non-contest fliers, and has proved to be a good transition airplane for its average flier.

We often hear descriptions of aircraft moment arms along with the many different interpretations placed upon them. The correct interpretation of the tail moment is the distance from the CG of the plane to the hinge line of the elevator, divided by the mean chord of the wing. My interpretation of the nose moment is the distance from the CG to the trailing edge of the prop. You will note that the Sabre Hawk utilizes a very long nose moment, which I feel has the following distinct advantages: (1) it gives a better grooving airplane in the inside and outside loops, and (2) allows you to stay level in banking turns without any hooking-in tendencies. Another advantage is the fuel tank placement it allows, giving you a more pronounced rearward moving CG as the tank empties. It is obvious that the latter is an advantage in the present contest pattern event because the maneuvers requiring a rearward CG are all at the tail end of the pattern when the fuel is low, e.g., the spin, tailslide, verticle eight, traffic pattern, and landing.

Another myth I would like to attempt to dispel is the present consensus of opinion that entirely different designs should be used for proportional and reeds. The Sabre Hawk has been flown with both control systems with no discernable difference in flying characteristics with the exception of the flying ability of the pilot. The Hawk, as shown in the plans, was set up for 12-channel reed equipment. This includes use of either fine-throw, self-neutralizing aileron servo, or the use of flaps, the latter providing a pronounced advantage in landings and takeoffs. In the latter part of this article I will cover the use of these two features with respect to general flying and contest work.

### Fuselage Construction

Start with two 3/32" x 4" x 48" evenly matched fuselage sides. Then glue doublers, ½" x 45 degree pieces, nose doublers, and engine mounts in place. Except for the side doublers, I use white glue exclusively in the nose section and for all plywood parts. The three formers are glued in place using a flat surface to insure the alignment of the fuselage. Dampening the outside surface of the fuselage sides will allow you to form them more rapidly. The top block is hollowed out in areas previously marked by test-fitting it to the fuselage. The bottom block of the nose, with the plywood landing gear support preglued in place is installed along with the bottom sheeting of the tail section. The fuselage is now roughed to shape with a razor plane. The latter is an excellent tool, allowing you to shape balsa parts very rapidly with little chance of undercutting. I use two of them, one being adjusted for coarse cuts, and the other for finer work. The rudder outline is cut out and the fillet pieces glued to both sides and rough-shaped. A little time spent in shaping the fillets of both the rudder and wing saddles will pay off with a final appearance of a smooth-flowing, well-shaped aircraft.

Next, glue the rudder and wing fillets in place. The fuselage is now ready to be completely sanded. Follow with two coats of clear dope and then apply your silk.

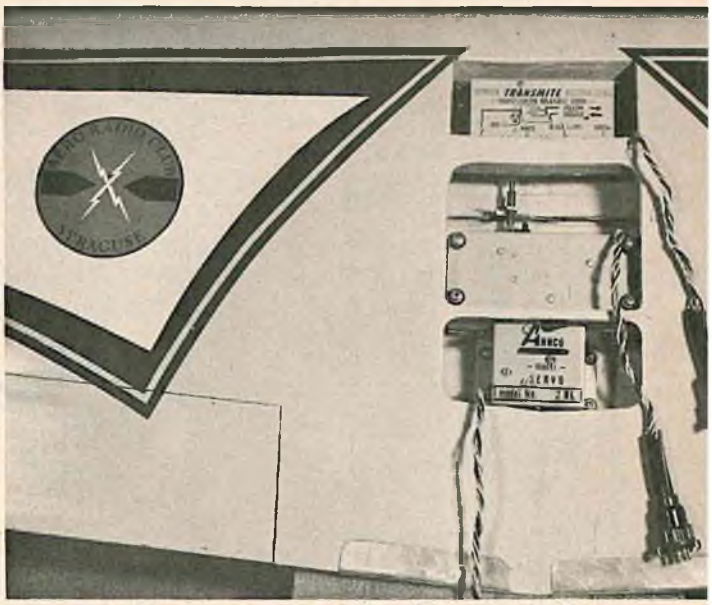
I'd like to give a hint at this point — one which has reduced silking time and insures a wrinkle-free silking job. Use a soft cloth folded into a pad approximately 4" x 6" square. Drape the dry silk over the fuselage and dope through the silk on the top surface of an area approximately 2" wide by 8" long. Using this pad, wipe off the doped area in long, flowing strokes. This leaves a minimum of dope, which will dry rapidly, and leaves the silk pressed tightly to the balsa structure without wrinkles. This method works especially well in concave and convex areas.

Plank the stabilizer with 1/16" medium soft balsa sheeting on the top surface first. When gluing the bottom sheeting on and pinning it in place, use a flat surface with shaped pieces to fit the leading and trailing edge of the top surfaces. This will give you a warp-free stab. The advantage of sheet planking is its ability to lock up the structure when the final piece is glued in place.

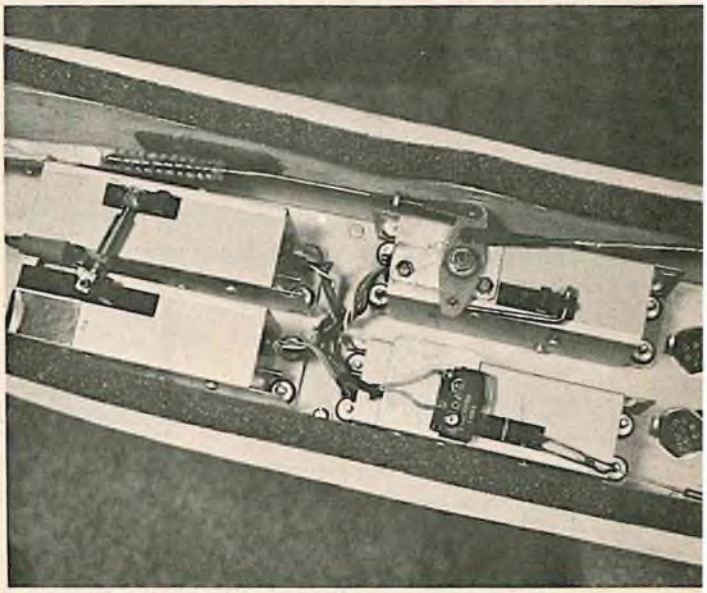
The elevator is then cut and shaped, and the stab and elevator are given a final sanding and two coats of clear butyrate prior to silking. You will note the long elevator horn which gives an important advantage in adjustment. I silver-braze the elevator horn to a 3/32" piano wire, using silver brazing wire and flux purchased from Sears. I highly recommend the use of a small propane torch and silver brazing wire for connecting steel linkages and fittings in your R/C plane. I will withstand the vibrations and jolts more than soft soldered connections.

A template is made for the center section of the stabilizer. This is used to mark off the area to be removed from the fuselage in order to glue the stablizer in place. I use leather fillet material between the fuselage and stabilizer, glueing it in place with white glue and wiping off the ex-

*(Continued on page 22)*

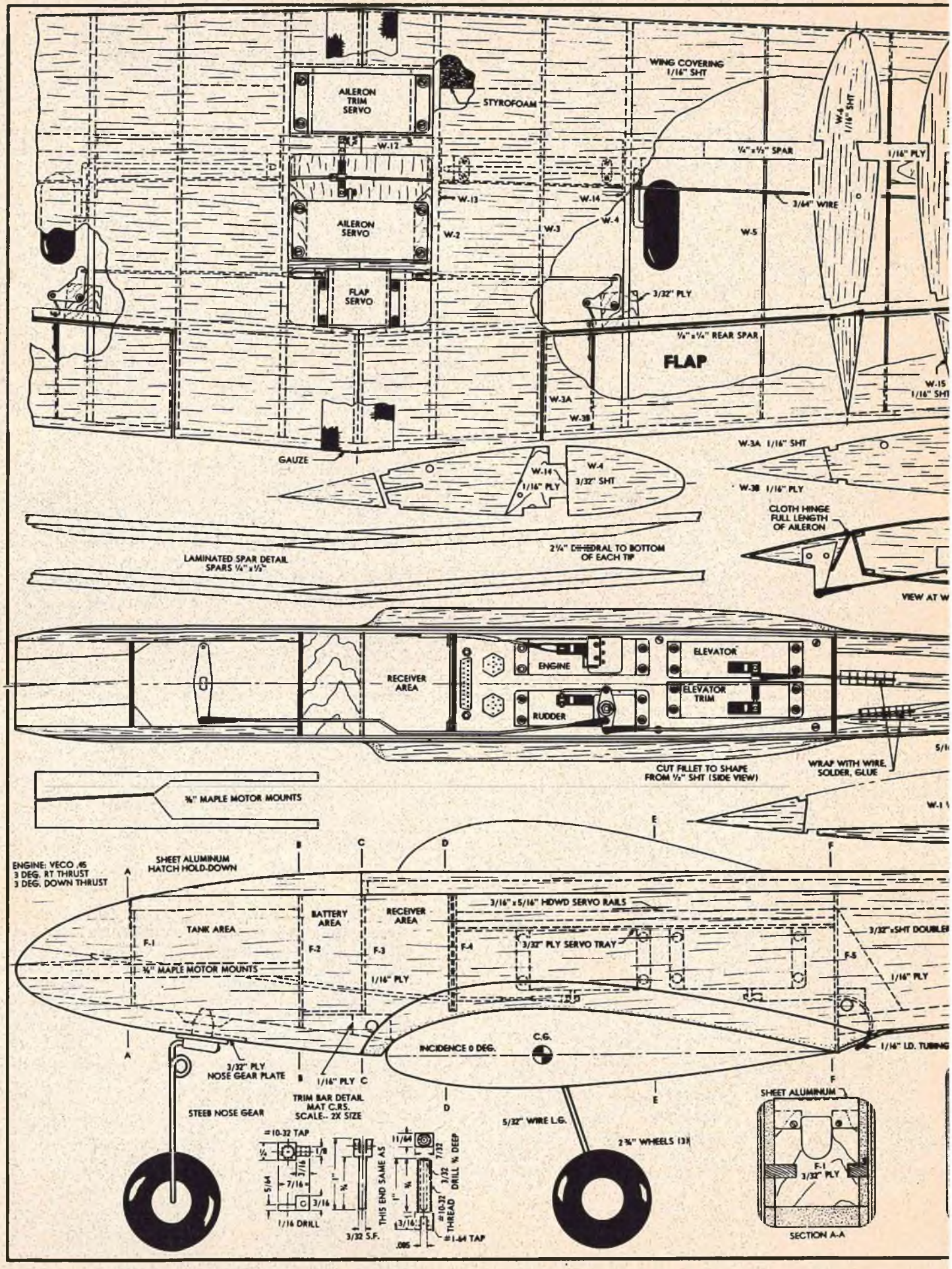


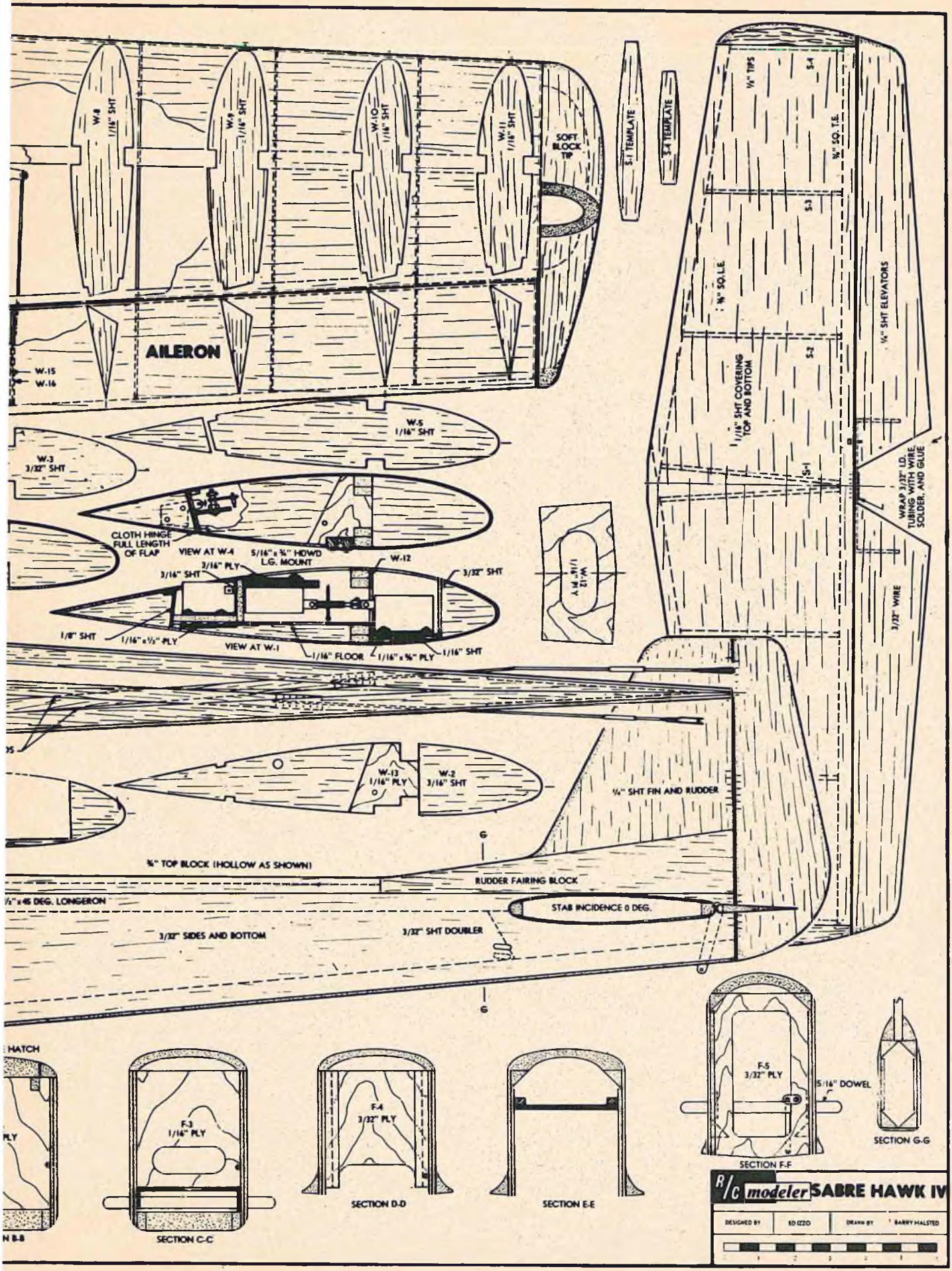
*Wing center section showing servo installation.*



*Neat, functional servo mount. Plans detail trim bar.*

*Nose section — clean, trim lines with adequate space.*


AILERON TRIM SERVO
AILERON SERVO
FLAP SERVO
STYROFOAM
WING COVERING 1/16" SHT
W-1
W-2
W-3
W-4
W-5
W-12
W-13
W-14
1/4" x 1/2" SPAR
1/16" PLY
3/64" WIRE
3/32" PLY
1/4" x 1/4" REAR SPAR
FLAP
W-3A
W-3B
W-15
1/16" SHT
GAUZE
W-14 1/16" PLY
W-4 3/32" SHT
W-3A 1/16" SHT
W-3B 1/16" PLY
CLOTH HINGE FULL LENGTH OF AILERON
LAMINATED SPAR DETAIL SPARS 1/4" x 1/2"
2 1/4" DIHEDRAL TO BOTTOM OF EACH TIP
VIEW AT W
RECEIVER AREA
ENGINE
RUDDER
ELEVATOR
ELEVATOR TRIM
CUT FILLET TO SHAPE FROM 1/2" SHT (SIDE VIEW)
WRAP WITH WIRE, SOLDER, GLUE
3/8" MAPLE MOTOR MOUNTS
ENGINE: VECO .45
3 DEG. RT THRUST
3 DEG. DOWN THRUST
SHEET ALUMINUM HATCH HOLD-DOWN
TANK AREA
BATTERY AREA
RECEIVER AREA
F-1
F-2
F-3
F-4
F-5
3/16" x 5/16" HDWD SERVO RAILS
3/32" PLY SERVO TRAY
3/32" x SHT DOUBLER
1/16" PLY
3/32" PLY NOSE GEAR PLATE
STEEB NOSE GEAR
TRIM BAR DETAIL MAT C.R.S. SCALE-- 2X SIZE
#10-32 TAP
1/16 DRILL
THIS END SAME AS
3/32 S.F.
#10-32 THREAD
DRILL 3/4 DEEP
#1-64 TAP
.085
INCIDENCE 0 DEG.
C.G.
1/16" LD. TUBING
5/32" WIRE L.G.
2 3/4" WHEELS (3)
SHEET ALUMINUM
F-1 3/32" PLY
SECTION A-A


W-8 1/16" SHT
W-9 1/16" SHT
W-10 1/16" SHT
W-11 1/16" SHT
SOFT BLOCK TIP
S-1 TEMPLATE
S-4 TEMPLATE
AILERON
W-15
W-16
W-5 1/16" SHT
W-3 3/32" SHT
CLOTH HINGE FULL LENGTH OF FLAP
VIEW AT W-4
5/16" x ¾" HDWD L.G. MOUNT
3/16" PLY
3/16" SHT
W-12
3/32" SHT
1/8" SHT
1/16" x ½" PLY
VIEW AT W-1
1/16" FLOOR
1/16" x ¾" PLY
1/16" SHT
W-12 1/16" PLY
W-2 3/16" SHT
¼" SHT FIN AND RUDDER
¾" TOP BLOCK (HOLLOW AS SHOWN)
RUDDER FAIRING BLOCK
STAB INCIDENCE 0 DEG.
3/32" SIDES AND BOTTOM
3/32" SHT DOUBLER
G
G
¼" TIPS
S-4
¾" SQ. T.E.
S-3
¾" SQ. L.E.
1/16" SHT COVERING TOP AND BOTTOM
S-2
¼" SHT ELEVATORS
S-1
WRAP 3/32" I.D. TUBING WITH WIRE, SOLDER, AND GLUE
3/32" WIRE
HATCH
F-3 1/16" PLY
F-4 3/32" PLY
F-5 3/32" PLY
5/16" DOWEL
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
R/C modeler SABRE HAWK IV
DESIGNED BY ED IZZO
DRAWN BY BARRY HALSTED

cess with a damp cloth.

### Wing Construction

The steps used in constructing the wing are as follows: First, glue the ribs to the bottom and top spars. Soak the leading edge in hot water and form over a bent-up leading edge section made up of aluminum sheeting. The dried leading edge forms are glued in place, along with the top and bottom trailing edge pieces.

With all aileron and flap linkages installed, the top center sheeting is cemented in place. The wing is reversed and the bottom sheet is fitted and cemented. All alignments should be checked before locking in the last piece. The wing may be constructed with just a single servo for aileron control, and with or without flaps. The Sabre Hawk has been flown without flaps and fine-throw ailerons.

Completely sand the wing, using 240 and 320 grit paper, then apply two coats of clear dope before silking.

### Equipment Installation

If I had to venture a guess, I would estimate that approximately 80% of equipment malfunctions are due to faulty installation. I would like to emphasize that a little extra time spent in planning and installing your equipment will pay off greatly in reliability and consistent performance. I sleeve all of the wires to insure against vibration and fatigue breakage of connections. In the area where the receiver antenna passes through the fuselage, a strain relieving connection should be made by wrapping this area with ¼" wide masking tape and coated lightly with dope, allowing enough flexible length between the inside of the fuselage and the receiver. I have seen many examples of well-padded receivers with all of the strain on the antenna lead!

Try to keep to a minimum the number of times the engine is removed from its mount. Each time the engine is reinstalled, its crankcase is distorted in a slightly different direction than its previous mounting. This is evidenced by the black gunk from the exhaust after reinstalling the engine.

You will note on the plans that a linkage is connected to the rudder servo. The reason for this is to give increased rudder movement for the spin, plus decreased nose gear movement for smoother taxing. I use an R.G.A. kick-up elevator board that is energized when the motor servo is in low motor position. I have also been using a sponge wrapping around the fuel tank and noted that this application was described in an excellent article on engine idling by Clarence Lee. The height of the fuel tank is adjusted by shaping the polyurethane block used under the tank.

### Flight Adjustment

I set up the aileron linkage so that the up-movement of the trailing edge of the aileron is 17/32", and the down movement is 13/32". The up and down of the elevator should be approximately 3/8" each direction, with the elevator trim adjustment up and down 1/8" each way. The fine aileron movement should be 1/4" up and 3/16" down, measured at the trailing edge. I usually stick a pin in the trailing edge and use this as an indicator against a scale. I always record the amount of movement to be used as a reference for subsequent adjustment.

To obtain the proper aileron adjustments, I trim out for level flight. I next make a right and left banking turn, noting whether the airplane hooks-in either way. If, for example, during hte right bank the nose hooks-in, it is an indication that the left aileron should be raised ½ turn on the DuBro adjusting link. It should be noted that the aileron opposite from the turn that has the hooking-in tendency should be adjusted, the reason being that this aileron will be the one that is raised, therefore having less effect in high speed maneuvers. It has become quite evident that trimming the aileron in level flight is not sufficient, and that additional trimming may be necessary for banked turns and high-speed, looping maneuvers. I usually set my elevator trim so that full-up is the landing attitude in calm weather, with full-down giving a slight climbing trim in level, inverted flight. I use a slight amount of down-trim for takeoffs. This insures a smooth, "no-zoom" takeoff.

When flying with the fine throw aileron, I set it up to be used with the 11th and 12th channels of a 12 channel rig, using it in the pattern segment of the contest flight. You will be amazed at the very smooth, proportional type turns that can be executed by using this feature with reed equipment.

### Flaps

I set the flaps so that they drop to a 25 degree angle. Some of the unique characteristics that I have encountered while using the flaps is the ability of the airplane to have a very low forward speed with full flaps, engine in ¼ throttle, and a slight amount of down trim. Whenever the flaps are lowered, a nose-up attitude is taken and down-trim is required. To find out what would happen with full power on, I lowered the flaps — the plane immediately started to loop, and continued looping until the flaps were raised. Consequently, **do not lower flaps for any engine setting above medium throttle!** When using the flaps in a contest, I wait until I'm in the downwind leg, place the engine in low throttle, and simultaneously hit the down-flap and the down-trim levers. This gives a smooth transition from powered flight to flaps down, slow flight.

The first time I used flaps in competition was at the Buffalo Bisons Meet at Buffalo, N.Y., and I had the good fortune of leading throughout the contest until being overtaken in the last round. I might add, the weather was calm in the morning and the field rather short. The flaps allowed me to make steep, slow-speed approaches and very short takeoff runs. You will be surprised, that with the flaps fully extended on takeoff, a run of only ten feet is required!

In closing, I would like to state that I have been flying the Sabre Hawk with styrofoam wings of the same configuration. I find this to be a faster building and sturdier wing with no undersirable flight characteristics. I wish you luck in building and flying the Sabre Hawk, for I have enjoyed many hours of good flying and have received numerous comments about its smooth, clean lines.

# Reed Bank Adjustment

*Simple Reed Adjustments for Optimum Multi-Channel Performance*

Multi channel transmitter levers operate two controls each. The switches close contacts connected to a capacitor. A potentiometer and capacitor across each of these capacitors provide a fine tuning adjustment to allow tuning to the receiver reed bank. These tuning pots are normally located on the back of the transmitter's printed circuit board and are identified to match the control functions operated by the lever switches. Rotating the pots clockwise raises the tone frequency applicable to that particular control, while rotating the control pot counterclockwise would lower the tone frequency.

Unmatched units, that is to say, transmitters and receivers of different makes, or of the same make but purchased separately, will in most cases tune to the average receiver's reed bank. However, because reed banks vary in tone frequency range, the transmitter tone adjustments may not cover all reed banks even of the same manufacture, and may require minor tuning capacitor changes. For this reason, it is always desirable to purchase a matched transmitter and receiver.

Most modern multi channel reed transmitters are simultaneous. This means that two control functions may be obtained at the same time. The controls are normally arranged so that the left hand control switches may be used simultaneously with the right hand switches. However, two switches on the same side of the transmitter may not normally be used together. Adjacent reeds do not operate well simultaneously, therefore, certain simultaneous combinations will not operate smoothly. For example, on one specific manufacturers ten channel unit, aileron and motor controls operate adjacent reeds. On the twelve channel, auxiliary and motor operate adjacent reeds, and on the six channel, motor and rudder operate adjacent reeds. These functions are not normally used in flying, and for this reason the reed selection has been made to allow good simultaneous operation of the controls which are most often used together.

A reed bank has metal fingers equal to the number of "channels." These, together, are called the reed comb. This comb is mounted above a coil and a magnet. When an alternating current is introduced in the coil at a frequency equal to the resonant frequency of a metal reed finger, the finger will vibrate. When it does, it hits the upper adjustable screw contact acting as a vibrating switch. The magnet of the reed bank provides a magnetic bias which improves reed drive in a manner similar to the principle used in the magnetic speaker commonly found in a home radio. While it would appear that the frequency of the metal finger of the reed bank would be determined solely by its length, this is not true. The frequency of a reed is primarily determined by its length, but also influenced by the distance between the reed and the pole piece on which the reed coil is wound. In production of a reed bank, stresses are introduced in the metal reed fingers. As the reed bank is used, these stresses tend to relieve, and the position of the reed in relation to the reed pole piece, as well as the adjustable screw contact, changes. The closer the reed finger is to the pole piece of the reed coil, the lower its resonant frequency will be, and the harder it will drive. The further away it is, the higher its frequency and the weaker its drive. Consequently, changes in the relationship between the reed comb and the pole piece will change the frequency response of the reed bank and may necessitate retuning.

In extreme cases, the gap between the reed and reed adjusting screw may also require readjustment. It is very important to note, however, that the gap between the adjustment screw and the reed does not influence the reed's frequency. It does, however, affect the starting ability of the reed and its dwell time, and has a decided effect on operation. Minor reed adjustment may be required from time to time. The gap between the reed and reed adjustment screw should be checked with the reed vibrating to observe the distance of the reed swing. This swing will be smaller for the shorter reeds and wider for the long ones. Normal swing observed at the end of the reed will be approximately 1/32" to 3/64" for the short reeds (Medco reed bank) and 3/64" to 1/16" for the longer reeds. Excessively close spacing will result in poor reed response (slow starting ) and poor simultaneous operation.

With the reed spacing approximately correct, the next step is tuning the transmitter to the reeds. This is done in the following manner: if reed operation is good simultaneously, it naturally will always be correct for non-simultaneous operation. Therefore, reed tune-up should be done while holding simultaneous controls. For example, hold left rudder and up elevator. Rotate the up elevator control potentiometer to the right to increase the reed frequency. Key the up elevator switch as the pot is rotated until the reed does not start. Then, holding the up elevator switch, rotate the control pot slowly back counterclockwise, or to the left, until the up elevator reed starts again. Continue rotating to the left slightly beyond this point. Repeat this process now with the left rudder control pot and with the up elevator switch held on. This tuning adjustment should be repeated for every simultaneous combination. Once the reed bank has been tuned in this manner, the various controls should be actuated together simultaneously and the reed action observed carefully. There may be slight interaction during simultaneous operation of two reeds with a third reed. Slight retuning of the combination causing the interaction will be necessary to eliminate this interaction.

During adjustment of the reed bank, servos should be disconnected. In the case of matched combinations, the reed banks have been very carefully adjusted and matched to the transmitter by the manufacturer. Readjustment should only be attempted when changes in the reed bank so indicate. Generally speaking, once the reed bank has been used for a few hours, and then retuned, it will set in. Their readjustment will not be necesary for long periods.


# from the GROU

**Brother Ted's arrived at RC the wild blue . . . . .**

. . . . . so, where were we?

For the past two weeks I've tried in vain to assemble the right choice of words which would bridge the gap between yesterday and tomorrow, insofar as t. strader (boy R/C bungler) and his haunted typewriter are concerned.

. . . . . and it "ain't" happened yet, But, time and magazine deadlines wait for no man! The circumstances surrounding my popping out of one place and popping in here are of little actual value. Suffice to say that I'm very proud to have become a member of the RCM team!

Essentially my function here will still be to get as many prospective pilots off the ground — R/C wise — as before. However, I hope to make this monthly RCM get-to-gether a composite of everything RC from the simplest Rudder Only to the most vexing Multi, with a healthy helping of things experimental in-between.

With this in mind, I hope to hear from you by letter, card, or carrier pigeon. Pictures, information, sketches and ideas of what you're doing or planning will be most appreciated. To save time, feel free to write me c/o P. O. Box 2555, Schenectady, New York 12309. This will save much time and remailing. Club secretaries, please take note: I want every scrap of info regarding the activities your mob is participating in, too.

With you in mind, we'll spend the next couple of issues setting a format, tossing out some idea, (running a few of them up the flag pole to see if anyone salutes!) and generally discussing R/C from one end to the other. Some of the projects I'm working on at the present time will be brought up in the near future—those which involve designs will be featured in forthcoming issues of Radio Control Modeler (at the discretion of the Editor!). Design-wise, the next bomb will be the Scorpion, for those who like their ships on the larger side. I know this 56" shoulder-wing scamp is tough 'cuzz I've already tried to screw it into the ground! Straight down, full bore, hard clay, all stops pulled! Damage: two, soft internal bulkheads gave way to the irresistable force of receiver, batteries, and servos which displayed a strong desire to "get ahead." Aside from this, no marks or serious damage to the entire structure. And, though the Scorpion was not designed with beginners in mind, its resistance to such "shocks" should put it in good stead with newcomers to the "art" of multi and/or dual proportional!

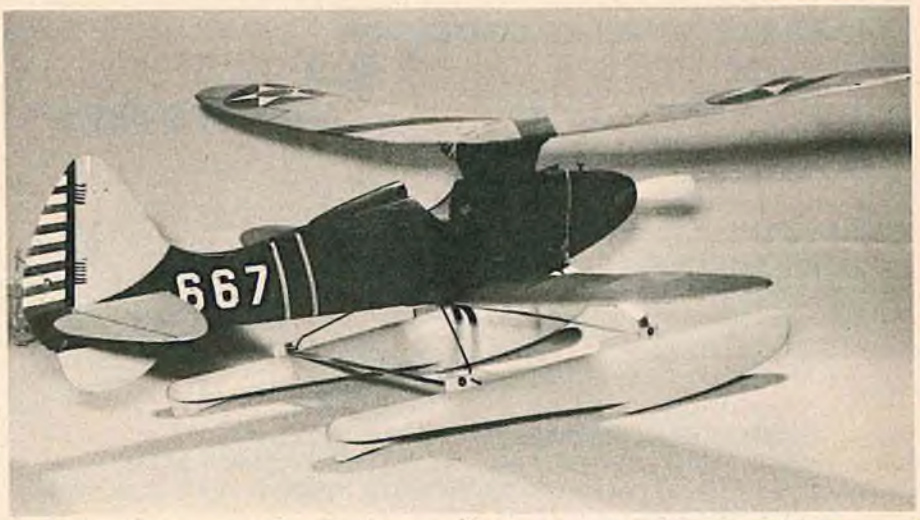
On the 15th of June, Dale Springsted and I drove over to Northampton, Mass. to attend the Hampshire

*Cliff Piper, MC of Hampshire Country RC'ers Rally, reading off lucky ticket in raffle which netted over $200 for AMA/FCC Fund.*

by TED STRADER

# ND UP

**oin him in his monthly venture in**




*Don Foster's Gee Bee Float equipped Chicken Hawk dolled up in P6 colors and ready for water.*

County Radio Controllers HCRC AMA Rally-Conference. The theme for this meeting, essentially, was to raise money for the AMA-FCC Fund. The underlying hope of the HCRC'ers is to initiate a yearly affair much in the same vein as the Toledo get together or the DCRC Symposiums . . . . and with their enthusiasm, they should build up to this status!

In the money department, the group was able to turn $215.50 over to the AMA-FCC Fund! Not bad work for a club of 17 members!

The highlight of the evening was a most convincing talk by John Worth, AMA Executive Director, on all phases of the present day AMA. Of prime interest to the 150 RC'ers present, of course, was the work AMA is doing with regard to relief in the congested frequency department. It looks very encouraging — however, this is no time to let up. The work may take three years and the AMA-FCC Fund will continue to need your financial as well as moral support!

As an interested spectator, I could not help feeling a sense of relief, knowing a modeler of John's caliber with drive, determination, and ability is setting in the AMA driver's seat!

It was also very encouraging to note that there were several young modelers attending the HCRC AMA Rally-Conference. Cliff Piper, anchor man for the evening, and his entire club are to be roundly applauded for not only getting some youngsters interested, making them welcome, but also devoting a part of the evening to them.

. . . . . and the many manufacturers who donated merchandise to the club, but who were unable to attend, can be assured that their donations were greatly appreciated and prominently displayed for all to ogle!

All in all, the evening was most enjoyable. Adding to the atmosphere was the presence of such well known modelers as Lew Andrews, Dick Jansson, Harv Tomasian, Dale, John Ross, Harrison Morgan, Lee Renaud, and Walt Schroder (Ed's Note: Who?) and his son, John. The air was heady with model talk!

*Walt Schroder, MAN's Man-At-Work, and HCRC guest speaker, watches as son John prepares projector to show "home" movies of John's piloting skill.*

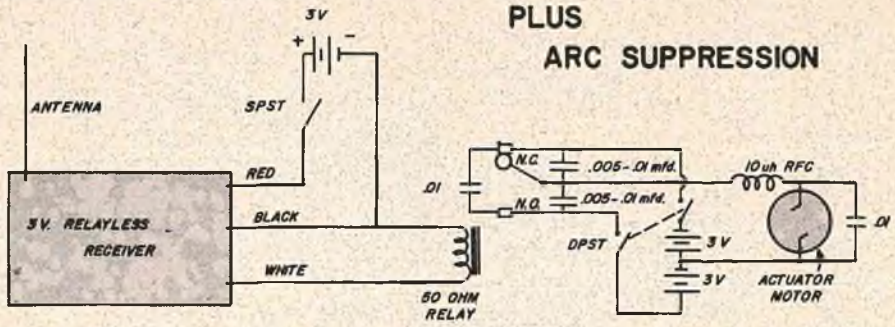
Received a letter from Bill Bartley, Jamesburg, N. J., about pulse in general and battery drain and uneven pulsing of motor-type actuators in particular. This is a common, though oft-times easily solved problem, if a series of checks are performed on the entire pulse system.

Just for the moment, let's switch the scene to mention that an arc suppressor circuit we're including in this month's column may also solve the problem of erratic actuator action while enabling you to place some of today's most inexpensive receivers into pulse service. When we get around to describing the arc suppressor, we'll point up why some systems are off-center.

Now, back to Bill's problem:

Though the problems were encountered while using a Du-Ac, they are common to all types of actuators,

## RELAYLESS TO RELAY CONVERSION PLUS ARC SUPPRESSION




- CONNECT RELAY COIL AS IF IT WERE AN ESCAPEMENT
- MOST CAPACITORS CAN BE INSTALLED TO RELAY CONTACT PLATE
- AN ADDITIONAL 10 UH RFC (CHOKE) CAN BE INSERTED IN OTHER MOTOR LEAD

even magnetic, if all parts of the system are not in harmony.

Let's take it step by step, shall we? Just what causes off-center pulsing? Actually, it can be caused by the pulse box, the receiver relay, either set of batteries in a two-set power supply to the actuator, the receiver, or even the linkages to the control surfaces. In other words, just about anything can cause it, so the entire system must be systematically checked to determine just which part is the culprit. (In Bill's case — and lucky for me — he discovered that this problem was the relay, not the Du-Ac! I was geting prepared for a hanging!)

More often than not, the relay causes off-center movement of a motor-type actuator — not because the relay is not operating as it's designed to — but rather, because it hasn't been properly adjusted to accommodate pulse service. As built, R/C relays are designed and set for use with either escapements or servos. They pull-in upon receipt of a predetermined amount of current and drop-out when this currrent is either diminished or removed.

In pulse operation, this same relay has to be "balanced" to give satisfactory service. The balance, in this case, is to get an equal pull-in and drop-out movement and contact pressure. The better the balance, the better the actuator will work — all other components being up-to-par. (We didn't realize how lucky we were, years ago, when the only relay available was the big Sigma 4F. It had a hair spring type adjustment to balance the pull-in and drop-out of the armature which made balancing an actuator as easy as possible.)

A word of caution — if you find that your relay is needing some fine adjustments! Use extreme care when bending the spring retainer tab on today's tiny relays for more or less tension. They are delicate items which are not designed to withstand much "horsing around."

One other case of uneven actuator movement is an electric motor which, because of uneven magnetism in the field magnet, has a tendency to pull more in one direction than in the other, even with equal battery supplies on either side and all the rest of the system checking out A-OK. In checking and using a few thousand tiny electric motors, we've rarely found one where this condition was so pronounced that it couldn't be corrected by relay armature adjustment.

Thorough system checking will usually isolate your "culprit" either in the relay tension or one or the other of the actuator's battery supplies. However, don't rule out linkage friction.

We've all gotten quite a bit of help lately by the appearance on the RC scene of high quality electronic pulsers which have built-in centering adjustments. This fact was graphically demonstrated to me just a few evenings prior to this gab session when I decided to see if it was possible to use at least one of my three idle relayless receivers. One is a three year old Citizen Ship LT3 and the other two are kit models and very inexpensive — the Ace 3VK and Controlaire 5. On separate occasions I've hooked each to a 50 ohm relay (relay replacing an escapement with black and red leads from receiver hooked to coil of relay) to see if any one would pulse, as is.

With the relay attached, but no actuator wired into the points, each receiver was noted to accept pulses as fast as my pulse box could send them out. But, when a motor type actuator was attached to the relay, each receiver began to run wild, indicating that the electrical "spikes" generated by the motor of the actuator (in this case, a Go-Ac) triggered the receiver. Tests with other types of motors in different makes of actuators and/or servos resulted in the same erratic type behavior.

On the evening in question, I'd decided that some experimenting was to be done to see if at least one of these receivers could be quieted down and pressed into service. (Now, it should be reaffirmed that each receiver works perfectly with escapements — the primary function each was designed to perform!)

A simple test harness was made which included a 50 ohm relay, three two-pencell battery boxes, and a female plug which corresponded with the three pronged male plug being used on the receivers. I don't recall which receiver started the test, and it doesn't matter, as the final results were unanimous.

With the transmitter nearby, antenna collapsed, batteries in the pulse test harness, and all systems ready, the entire bit of business was turned on. One by one, the components (see sketch) were added until the first receiver quieted down and began following the stick of the Ace Phelps pulser faithfully. But this was only one-third of the test. We were certain that this arc suppressor network would need alterations for each of the other two remaining receivers to operate — if they'd operate at all.

As luck (?) would have it, the other two accepted this network compatibly with no alterations. The added luxury was supplied by the Rudder Trim feature of the pulser. Under normal circumstances, using one relay for three different receivers would have meant an armature adjustment to the relay each time the receiver was changed. (The reason is that each receiver would deliver a different amount of current to the relay, resulting in more or less amount of armature pull-in as compared to a

*(Continued on page 50)*

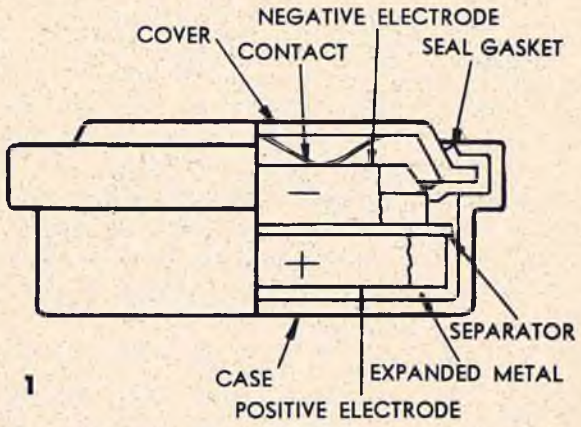
# NICKEL-CADMIUM RECHARGEABLE BATTERIES


# NICADS®

*Part I of a comprehensive reference and data source for Nickel-Cadmium cells for R/C use, compiled by RCM editors in cooperation with Gould-National Batteries, Inc*

Hermetically sealed and rechargeable, nickel-cadmium cells and batteries offer the RC'er many distinct advantages previously not obtainable in primary and secondary battery systems. Invented and brought to a high degree of development by European manufacturers shortly after the close of WWII, research into nickel-cadmium cells was extensively supplemented by the American firm of Gould-National who acquired exclusive manufacturing and sales rights for this completely new "sealed cell" battery source. Because these cells are rechargable, small in size, require no maintenance, and are available in a wide range of types and sizes, they are ideally suited for RC use. Economy of operation is another prime factor, the nickel cadmium cell being considerably lower than that of any other primary cell or battery on the market. Under normal conditions, hermetically sealed nickel-cadmium cells and batteries of pressed electrode construction have a life expectancy in excess of 200-500 complete cycles of charge and discharge. Sintered plate construction nicads have an even longer life expectancy in excess of 750 complete charge and discharge cycles. An additional factor is the simplicity and low cost of charging equipment. In many cases, such as multi-channel power packs, the charger is built right into the battery pack itself.

Gould Nicad cells are constructed of nickel-plated steel to provide high resistance to severe shock, vibration, and other environmental conditions. Current carrying members are secured by resistance welding to insure a low electrical resistance. Although all cells employ nickel-cadmium electrodes and potassium hydroxide electrolyte, two basically different types of plate constructions are utilized. The first is known as a pressed/pocket type, wherein the plates consist of pressed active materials either enveloped in an extremely fine nickel wire mesh or permanently held in finely perforated steel pockets locked into welded frames. This method of construction is designed primarily for average discharge current loads and a reasonably long cycle life period.

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The second, or sintered type plate, method of construction is one wherein active materials are held in place in the fine pores of a microporous sintered nickel plaque of extremely high surface area. This type is designed for high discharge current loads and extremely long cycle life, and is preferred for radio control power supply purposes.

The operation, or electro-chemical reactions of the sealed nickel-cadmium battery differs fundamentally from those of the conventional vented type alkaline battery. At the end of charge, the open or vented type of battery will liberate both oxygen and hydrogen gases, as well as electrolyte fumes, these being vented through a valve positioned in the top cell. For obvious reasons, this is a most undesirable condition for radio control use, both in the airborne system, and/or in the transmitter power supply. In the Gould Nicad sealed nickel-cadmium cell, such gassing, both on overcharge and during reversal, is either prevented or disposed of within the cell itself. This is accomplished due to the state of charge of the negative electrode in the cell at the time the cell is sealed, this electrode never becoming fully charged causing the evolution of hydrogen gas to be completely surpressed. When being charged, and the posi-

tive electrode reaching its full capacity, oxygen is evolved. Oxygen, which is channeled through the porous separator to the negative electrode, oxidizes the finely divided metallic cadmium to cadmium hydroxide. At the same time, the cadmium hydroxide formed in this manner is continuously electro-chemically reduced to metallic cadmium. An equilibrium oxygen pressure is set up inside of the cell and the rate of evolution of oxygen gas established equal to the rate of recombination with the metallic cadmium. The level of pressure thus established is determined by the charge rate used, normally in the magnitude of 7 to 15 PSI.

Where individual cells are series connected for higher voltage battery use, such as the common six volt receiver/servo pack, the possibility always exists that during discharge, one or more cells, which may be slightly low in capacity compared to the others, will be driven to a zero potential and then into reverse. It is of fundamental importance, then, that reversal protection be built into such cells, since during reversal, hydrogen gas may be evolved by the positive electrode and oxygen gas liberated by the negative. All Gould Nicad sealed cells are built with such reversal protection, the mechanism functioning in much the same manner as that of protection during overcharge. That is, the evolution of hydrogen gas from the positive is completely surpressed — oxygen, liberated by negative during reversal, is recombined with the positive electrode.

For optimum performance in radio control applications a constant voltage supply is required. Nicad sealed cells in batteries exhibit a constant discharge voltage of approximately 1.22 volts under normal current loads. Because of this, and their low internal resistance, they are especially suitable for applications that require a stable voltage supply.

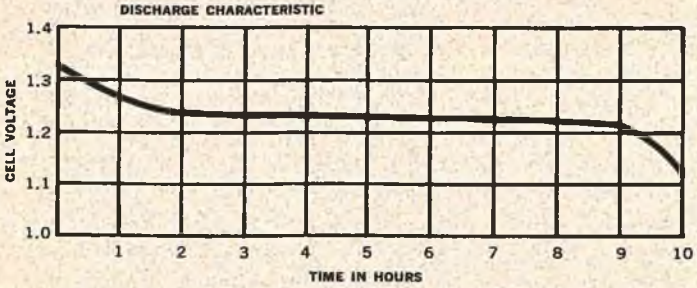
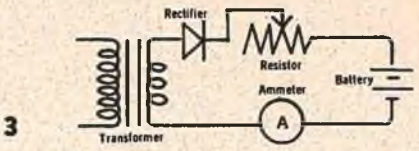



**FIG. 2: DISCHARGE CHARACTERISTICS**

*Typical curve showing discharge characteristics of Nickel Cadmium cells discharged at the ten hour rate (10 hour rate = 1/10 of rated cell capacity).*

Hermetically sealed nickel-cadmium batteries are fully rechargeable using the constant current or constant potential type charge procedures. Depending upon the size and type of battery and type of charge procedure used, charging may be accomplished in from five to fourteen hours. Of importance to the RC'er is the sealed cell overcharge characteristic. That is, when charged at the proper rate, the batteries can be kept on charge for extremely long periods of time. Float, or trickle, charge applications are ideal. Chargers for the cells and batteries are readily available, and in most cases, simple in design. A suitable charger is low in cost and may be assembled from standard components that are readily available. For example, the charging

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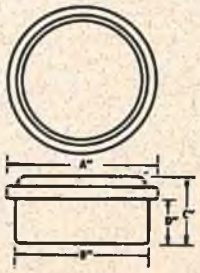
circuit shown may be used for designing your own charger. When selecting component values for the circuit, the transformer should have a secondary voltage of at least twice the rated battery or cell voltage. The rectifier should be chosen so that its peak inverse voltage (PIV) rating is at least double the voltage of the transformer's secondary winding. The variable resistor's wattage should approximate the product of the secondary voltage of the transformer and the recommended charging current (E sec. x I charge). The ohmic value should approach the quotient of the secondary voltage divided by the charging current (E sec./I charge). The ammeter selected should have a full-scale deflection of no more than twice the recommended charging current.

Sealed nickel-cadmium cells are currently manufactured in three basically different configurations: Button type cells of 20 through 50 milliampere hours capacity, cylindrical type cells of 100 milliampere hours through 4.0 ampere hours capacity, and rectangular prismatic cells from 1.5 through 23 ampere hours capacity. The button type cells, stacked in series and available as batteries in capacities from 100 mah to 500 mah and in voltages from 2.4 to 12.0 volts, are normally employed in RC operation for receiver/servo power supplies. In the case of pulse proportional systems where continuous servo operation requires a higher capacitance, cylindrical "C" size cells of 1.2 ampere hours are normally used, as for example, in the DeeBee Quadruplex 21 and the Glass City Multiplex. Another use for these larger nicads are in rechargeable transmitter power supply applications. The prismatic cells, with their characteristically higher capacitance have been gaining recent acceptance as engine starting batteries, replacing the old dry cell.

As an example of the characteristics of nicads, let's examine a sealed cell that is most widely used in series as a multi-channel, reed receiver and servo power supply — the .500 ampere hour capacity high rate cell. This is a button type unit with pocket type electrodes, the positive electrode being of nickel and the negative of cadmium. The hermetic seal is by mechanical pressure, and the container is of nickel plated steel. The service capacity of this unit (Gould 500BH) at the 10 hour rate is 500 milliampere hours. Recommended charge is 14 hours at 50 milliamperes. The float, or trickle charge, rate is 5.0 milliamperes. Maximum charge voltage is 1.5 volts. The op-

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500 BH
A 1.340 +.002 −.000 D
B 1.252 +.002 −.000 D
C .374 +.019 −.000
D .248 ±.002

**500BH BUTTON CELL BATTERY (500mAH HIGH RATE)**

| BATTERY TYPE | NO. CELLS | DIMENSIONS—(IN.) HEIGHT | DIAMETER | WEIGHT (OZ.) |
|---|---|---|---|---|
| 2.4V/500BH | 2 | .791 | 1.361 | 1.85 |
| 3.6V/500BH | 3 | 1.179 | 1.361 | 2.79 |
| 4.8V/500BH | 4 | 1.567 | 1.361 | 3.72 |
| 6.0V/500BH | 5 | 1.955 | 1.361 | 4.65 |
| 7.2V/500BH | 6 | 2.343 | 1.361 | 5.58 |
| 8.4V/500BH | 7 | 2.731 | 1.361 | 6.52 |
| 9.6V/500BH | 8 | 3.119 | 1.361 | 7.45 |
| 10.8V/500BH | 9 | 3.507 | 1.361 | 8.38 |
| 12.0V/500BH | 10 | 3.895 | 1.361 | 9.32 |

erating temperature range is (charge) 32 deg. F to 115 deg. F, and (discharge) −5 deg. F to 115 deg. F. Storage temperature range is −40 deg. F to 140 deg. F. The charge retention, stored at 70 deg. F (higher temperature will decrease charge retention during storage. Charge prior to use for full capacity) is one month—75%; 3 months—70%; and 6 months—60%. Cell weight is 0.90 ounces. The internal resistance is 0.16 ohms (initial load voltage for high rate discharge equals open circuit voltage, 1.33 volts, minus load current times internal resistance. Vl = Vo − IR). The internal impedance of the fully charged cell is 60 CPS = .040 ohms (for semi-discharged cells impedance increases approximately 20% for fully discharged cells, increase value by a factor of 3).

The curve of available capacity in ampere hours vs. discharge current rate (load) is illustrated in Fig. 5. For example, at a .100 ampere current load the 500BH cell will supply .485 ampere hours of capacity (hours of operation = ampere hours divided by discharge load).

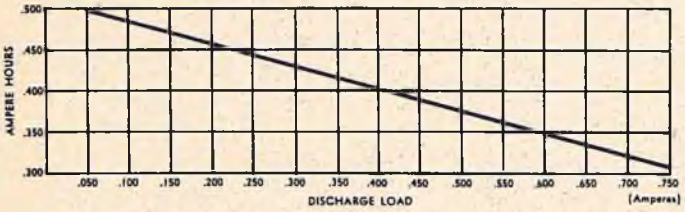



Fig. 6 illustrates the curve of initial, average, and final discharge voltages of a fully charged cell versus discharge current rate (load). As an example here, the discharge of a 500BH cell at .100 amperes equals the initial voltage of 1.31 volts, average voltage of 1.23 volts, to a cutoff voltage of 1.09 volts.

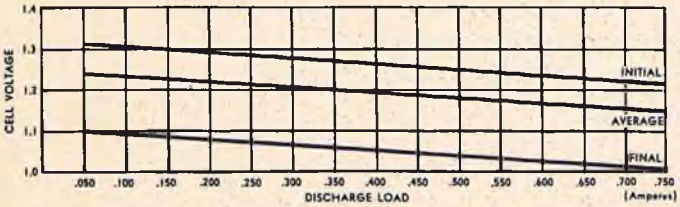



Fig. 7 is the curve of voltage versus the time for 500BH cell at the three, five, and ten hour discharge rates. Fig. 8 gives the curve of voltage versus time for the same cell at the thirty and sixty minute discharge rates. All data is based on constant load with average current values.

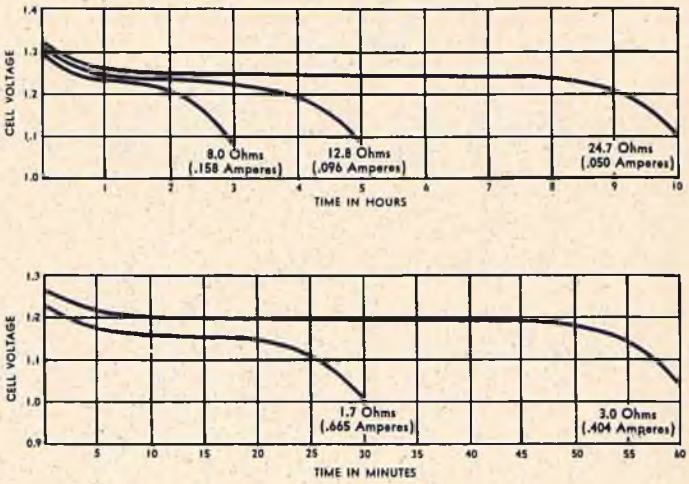
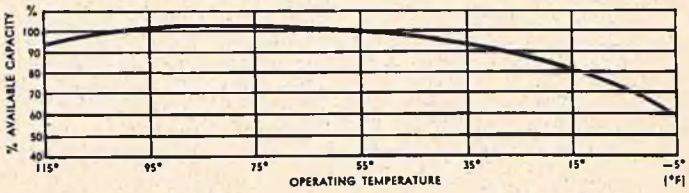
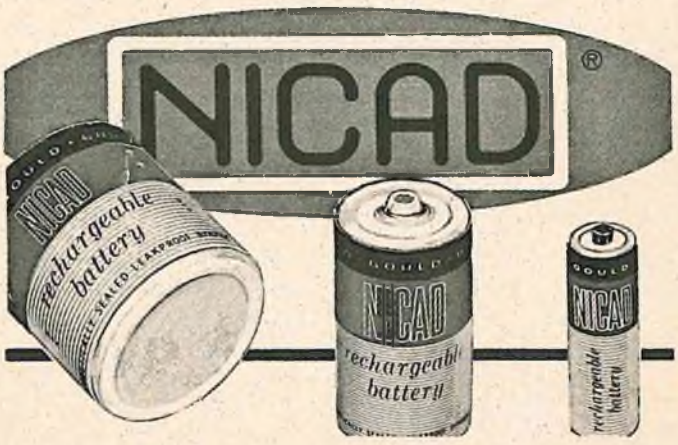



Fig. 9 illustrates the curve of available capacity versus operating temperatures for the discharge of a 500BH cell at .050 amperes. In all cases, figures are nominal.




Although a knowledge of the inherent characteristics of the popular sealed nickel-cadmium cell is not essential to its use in RC applications, a basic understanding of this material will enable you to select the right cell, or cells, for a given application. In addition, a familiarity with these same characteristics will enable you to know what your nicads will, or will not, do — a knowledge that could very well save an expensive model from costly damage due to battery failure.

Part II of this series will consist of a brief description of the cylindrical nicad cells, including the newer .600 mah pencell size nicad, plus a reference and data chart of sizes, dimensions, weights, and values for all of the cells and batteries most commonly used in radio control applications.



# Multi INSTALLATIONS

*The Key to Maximum Performance and Reliability*

Virtually every construction article, manufacturers instruction manual, and general discussion of multi channel flying will stress the fact that a very large percentage of equipment malfunctions are due in great part to faulty, or careless, wiring and installation. Every model publication has, at one time or another, published a number of articles on methods of wiring and installation, and no great and startling revelations will be made here to add to this fund of knowledge. Due to the number of requests received daily for this type of article, we have selected a six channel and ten channel rig of popular manufacture, and will use it to illustrate a straightforward, practical hook-up, sans gimmicks.

To begin with, buying cheap equipment is false economy. Purchase the best multi-channel gear you can afford, based on what you see flying week after week, with reliability and consistency, at your local flying site. In other parts of the country, other makes of multi equipment may be predominant, but selecting your own equipment on the basis of what the experienced multi fliers use in your area will, for one thing, assure you of experienced help if difficulties should arise. Following this advice, we have selected the Kraft Custom 6 and 10 channel for illustration purposes.

Before commencing your wiring and general installation, stop and reflect for a moment on the time you have spent in building your model, whether it be a sport, scale, or contest ship. You can't put a dollar value per hour on the time spent on building your newest creation, but if you were to mentally pay yourself a minimum wage of $1.25 per hour, the total sum for labor could well be staggering! So take a little time, an extra hour or so, to carefully wire and install the equipment in that expensive beast, and you'll be rewarded with many hours of troublefree flying.

First, decide what type of installation you want to achieve. A contest flier, flying one of the many similar low-wing, monoplane designs with fairly uniform equipment installations, may use a servo mounting printed-circuit board such as the RGA Servo Solver. In this case, your servo mounting requirements are predicated by the board itself, and the versatility of your installation is limited. The Servo Solver is excellent for this type of installation, but is limited in its flexibility. The Justin Micro-Tie printed circuit board is also available, allowing you to select your own servo installation, but eliminating the necessity for the numerous plugs and corresponding solder joints. The third alternative, and the one described here, is the common method of wiring from unit to unit with standard plug connectors. Whichever method you choose, do it carefully!

The Kraft 4 and 6 channel receivers illustrated have the servo and battery wiring pre-cabled. Here, it is only necessary to match the wire colors of the servo cables to the color coding of the wires from the servos. Follow the wir-

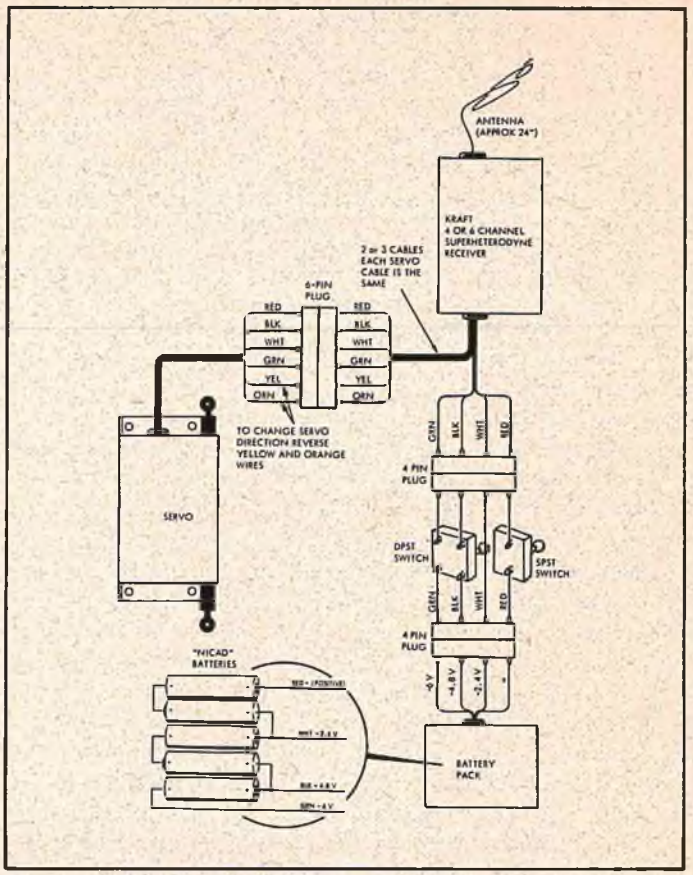
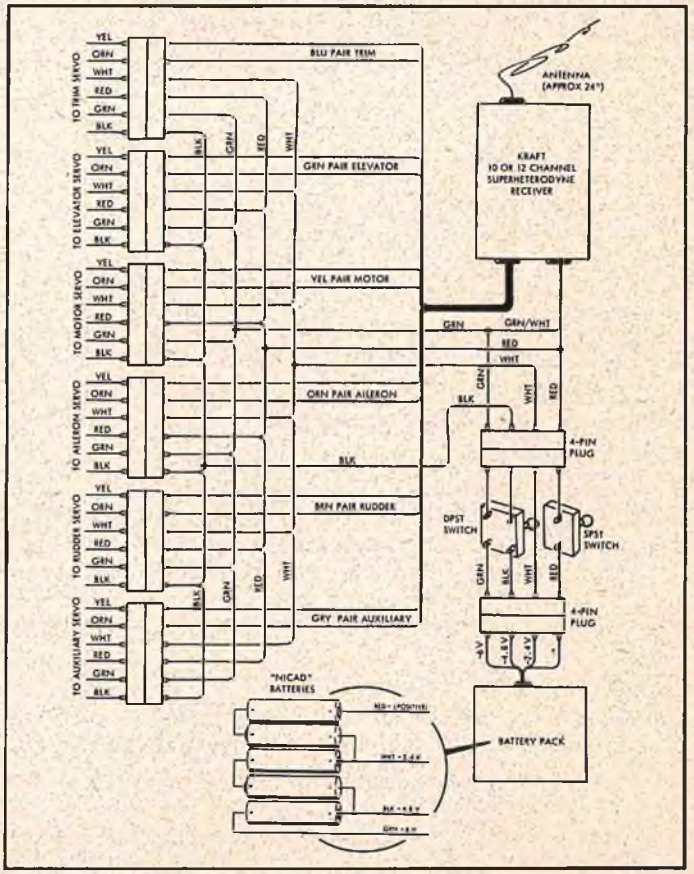



*Fig. 1. 4 and 6 channel wiring diagram.*

*Fig. 2. 10 and 12 channel wiring diagram.*



ing diagram carefully and be sure the four-wire power cable is correctly wired to the battery pack. We use 8-pin Orbit-Brunner polarized connectors for the receiver-servo connections, and a Medco 6-pin plug and socket connector for the receiver-power supply connection. Careful, neat soldering is absolutely essential for reliable operation. Always use a high quality 60-40 resin core solder and small-tipped soldering iron of 25-40 watt capacity. Never, under any circumstances, use acid-core solder! When soldering the wire leads to the connectors, first strip approximately 3/16" insulation from the leads. Slip one of the color coded insulation sleeves on the wire, then tin both the wire and the plug pin. Touch the hot iron to the exposed wire tip, remove the iron and solder. Do the same with the pin to be used. Never apply solder directly to the tip of your iron (except when tinning a brand new tip) and carefully wipe the tip on a piece of wet sponge rubber after each soldering application. This will keep your iron clean and assure good solder joints without an excess of solder. When both the pin and the wire are tinned, hold the two together and touch with the hot iron, causing the solder to flow. Be sure the connection is bright and shiny — a dull gray, or flaky condition indicates a cold solder joint that will break or vibrate loose. Slide the insulating sleeve down over the joint and repeat this procedure with each connection to the plug. It is recommended that #26 nineteen-strand wire be used, stripped back only far enough to make a connection, and that tight fitting sleeving or thermoshrink be used to protect against vibration at the soldered joints. After you have completed the wiring of each plug, make sure your servos run in the proper direction to the transmitted command. If not, simply reverse the yellow and orange wires at the servo plug. Once this is accomplished, and assuming all your connections are satisfactory, you can "pot" the wires to the plug with General Electric Clear Seal, or its equivalent, available at most hardware and building supply stores. The latter is a translucent silicone rubber that is completely flexible, yet prevents the solder joints from breaking by removing the strain at the plugs. Its one disadvantage is that you no longer have access to the soldered connections, so if you choose to use this material, make absolutely certain your connections are as you want them to be in the final installation.

The ten and twelve channel Kraft receivers illustrated in the drawings do not have the servo wiring precabled due to the fact that the resulting large bundle of wires to the light superhet receiver would tend to transmit vibration, possibly causing reed problems. There are twelve or fourteen wires coming from the receiver. The red wire is connected to the plus six volt side of the battery pack. The green and white striped wire is connected to the minus six volt side. The other ten wires are from the reed bank and are divided into five color pairs, each pair corresponding to a suggested control function. For example, brown pair: rudder; orange pair: aileron; yellow pair: motor; green pair: elevator; blue pair: trim. This reed selection matches the tone selection of this *manufacturers* transmitter. Be certain to check the manufacturers color coding for the units you plan to use. You will note that the drawing illustrates a pair of auxiliary gray wires — these are for use with the Kraft twelve channel unit, and employed for flaps, spoilers, aileron trim, twin engine control, etc.

Before progressing to the actual installation, a note about servos. There are three popular makes of multi channel servos for use with modern relayless equipment — the Bonner Transmite, Annco, and Kraft. The Bonner unit is by far the most widely used to date, and the largest in physical size. Travel is non-linear. Both the Annco and Kraft servos feature linear travel, with the Annco the smallest of the two. The newer Kraft unit features lower battery drain with a higher powered industrial type motor and resultant higher thrust to the flying surfaces. All are good servos and have standardized color coding. If you must experiment with one of the less popular, or foreign servos, make sure you check the color coding and recommended method of wiring. Again, look to see what the local fliers are using — it's a good guide.

When installing the receiver in your ship, use a minimum of one-half inch of foam rubber surrounding it on the sides, top, and back. Three-fourths inch minimum is desirable on the front and bottom for maximum protection. *Do not* pack the receiver tightly in the foam — it should be able to slide loosely into its foam-lined compartment without compressing the foam around it. The position of the reed receiver is not important except that, whenever possible, it is desirable to mount the can vertically with the base of the receiver facing forward. When installing the antenna, be sure to keep the wire clear of other wiring, servos, pushrods, and the like. Unless you use a metallic finish on your ship, an 18" to 30" length of #22 wire can be glued inside the length of the fuselage during construction. You can cut off the antenna wire at the receiver to a length of about 3" if you desire, soldering the internal antenna to this lead, or using a tight antenna plug connector. If you solder the two wires together, be sure to cover the splice with a length of tight sleeving or thermoshrink.

Servos may be mounted to the sides or bottom of the ship, or to a plywood mounting board installed on servo rails. Use whatever method is recommended in your construction kit and following the servo manufacturers suggestions for actual mounting. Be sure to use the rubber servo mounting grommets for proper shock absorption. Don't tighten the servos down so tightly that the grommets are completely compressed, defeating their intended purpose.

Make certain that all pushrods are free to travel with no binding whatsoever. Wire ends of pushrods should be bound securely with hinge thread and then cemented with Duco cement or equivalent. Spring wire keepers and Dubro links should be held together with plastic tape to prevent them from coming loose from the control horns during flight. Check to be sure that your pushrod ends do not bind against non-linear servos such as the Transmite.

Before tuning the receiver, connect all servos, switches, batteries, etc. Due to many faulty switches appearing on the market, a popular trend is to eliminate switches altogether, simply connecting the power supply plugs when ready to fly. If you do use switches, be sure to bend the wires back, then tie them against the switch body with tape or hinge thread to

*(Continued on page 52)*

# B & D Superhet Conversion

by Chuck Fondacaro

*From Cal Tech's Jet Propulsion Laboratory RC Club, a group effort resulting in a highly successful superhet conversion for the popular B & D proportional system.*

Approximately a year ago I decided to build the B & D proportional system featured in the March, April, and May 1963 issues of Model Airplane News, utilizing the superregen front end as shown by the designers, Beeler and Dickerson. The end result performed exactly as the authors predicted. Not having an engineering background, I follower the detailed instructions, which included packaging the pulser and transmitter in one case. This presented a problem insofar as space was concerned, and it was at this point that I decided to utilize Dick Jansson's transistor powered transmitter (Grid Leaks Aug. '63).

The B & D pulser output was fed directly into the modulater as shown. A static inverter was designed by Jim Riccio for the plus and minus 22 volts, with the four nicads supplying the modulator voltage.

Hugh Clark constructed the transmitter case, associated hardware, and printed circuit boards evident in the photographs.

After flying the superregen version, it was felt that a superhet conversion would give this excellent system more recognition from the average modeler. First, an amplifier was needed to increase the audio signal at the output of the superhet detector. The Kraft front end was used in conjunction with the original B & D decoding circuit and the amplifier design furnished by Hank Giunta. For the sake of simplicity, we utilized the original printed circuit boards for the system, available from Ace Radio Control.

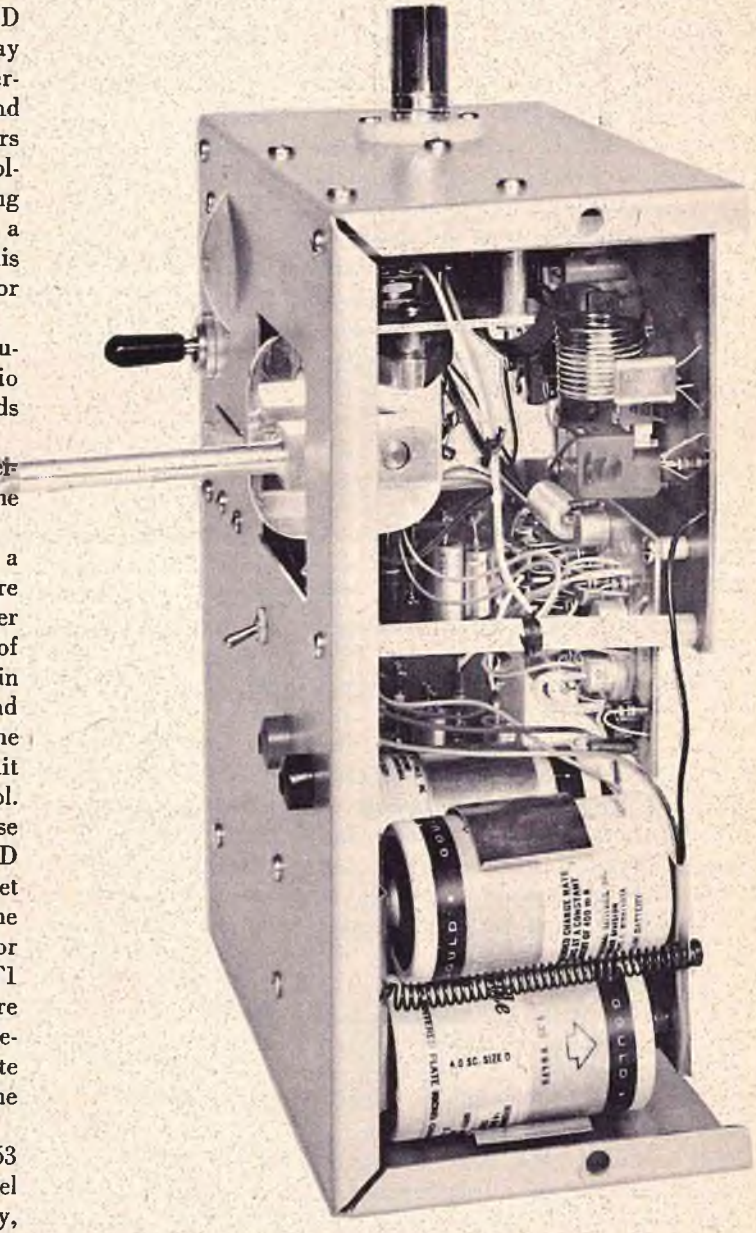
The schematic shown should be self-explanatory. Please note that the receiver ground does *not* connect to the B & D common (refer to Grid Leaks article on the Kraft Superhet Aug. '62). T5 in the receiver is the same as TR1 in the audio amplifier except for different resistor and capacitor values. Also, note that there are reversed windings on T1 (ST11 or any 10K-1K transformer). No other changes are necessary to either the receiver or the original B & D decoder to perform this superhet conversion. For complete schematics on the entire system as described, refer to the following:

Transmitter: Dick Jansson, Grid Leaks, August 1963

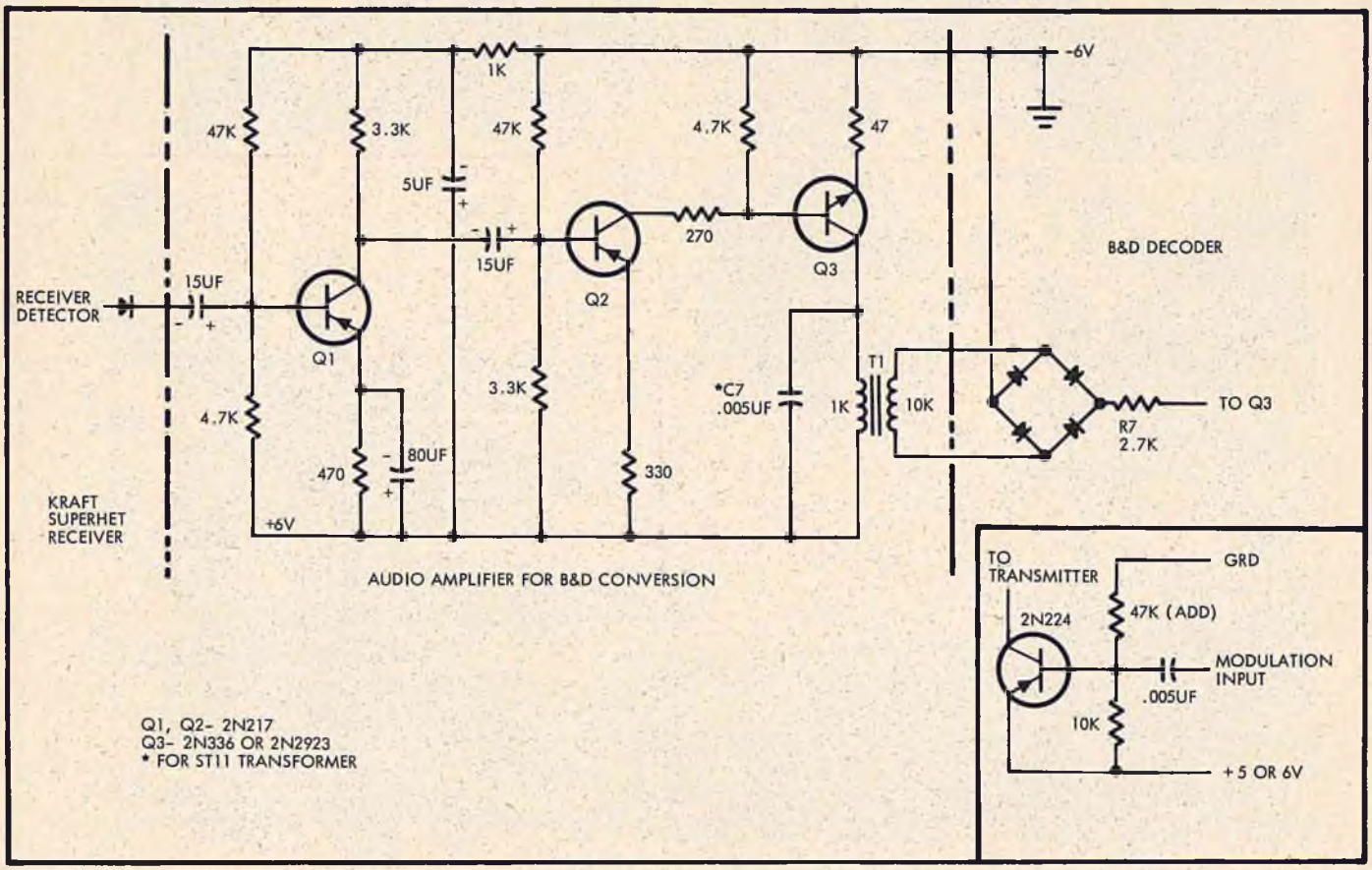
Pulser, Receiver, Servos: Beeler & Dickerson, Model Airplane News March, April, May 1963; July, August 1964

Superhet front end: Standard Kraft Custom superhet

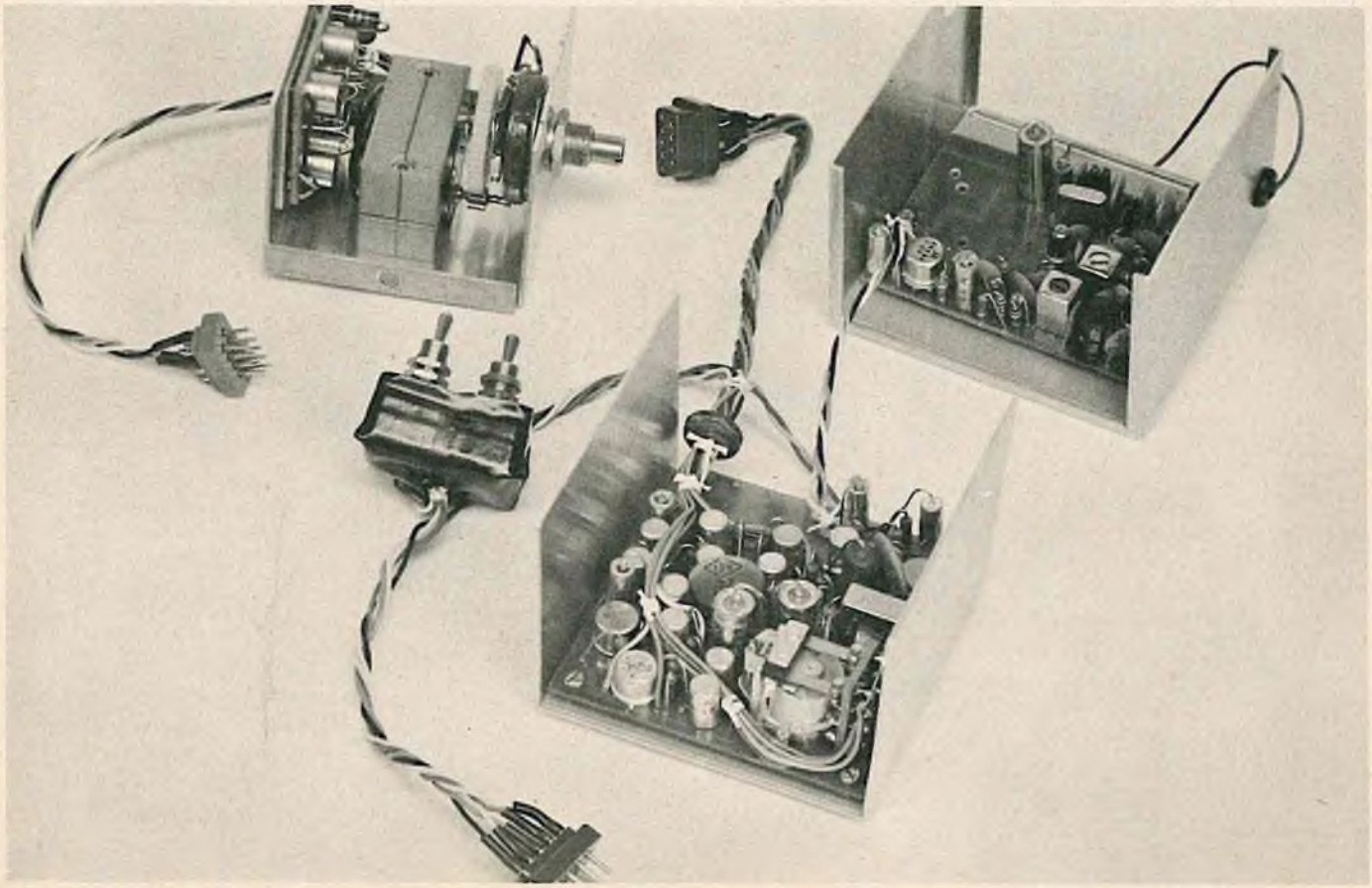
Do not hesitate to contact the author in care of R/C Modeler if you run into difficulty, or if further information on this superhet conversion is required.

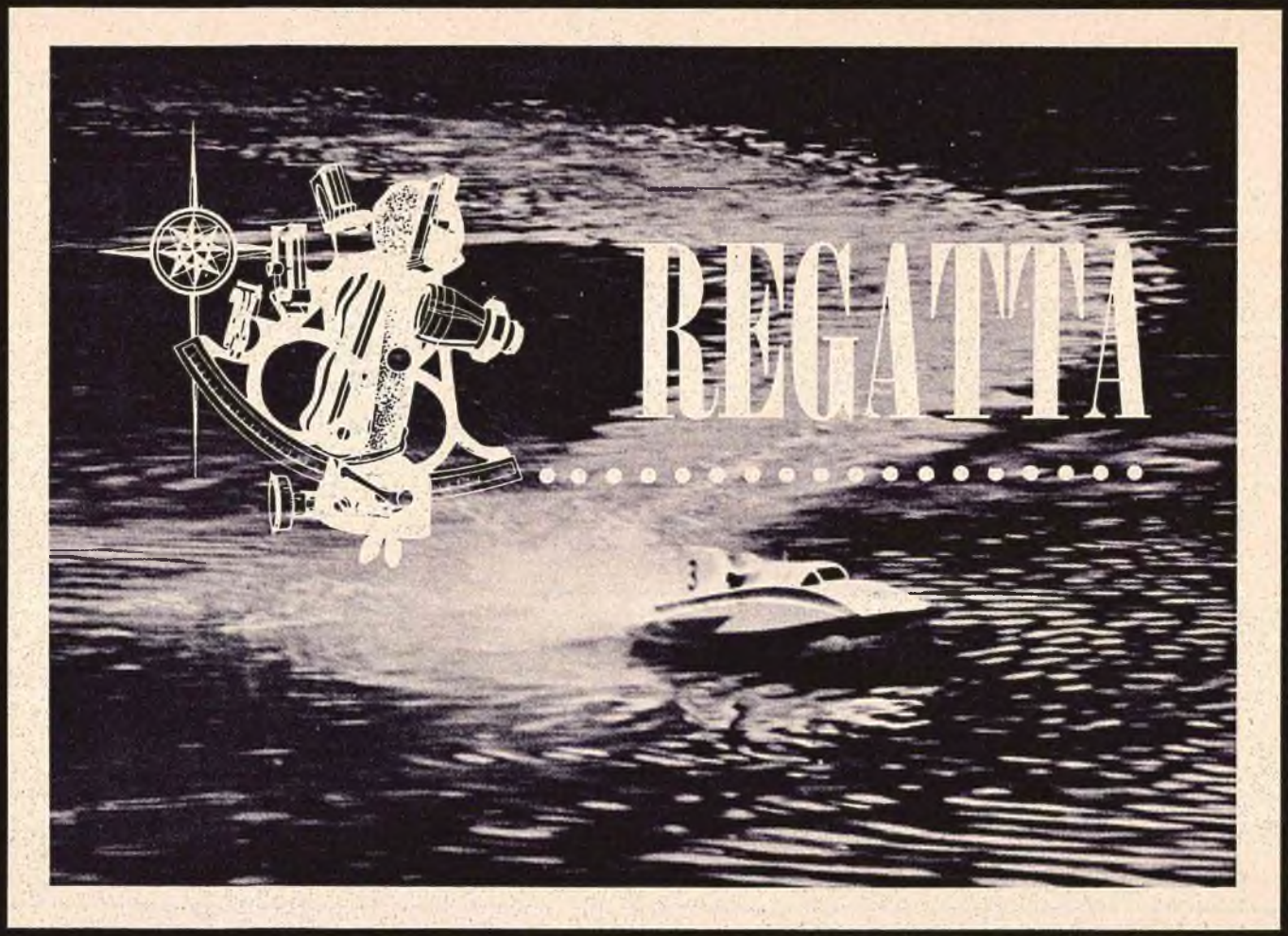


*Cutout photos illustrate design modifications to Jannson transmitter used with B & D system.*




*Above: Schematic shows B & D superhet conversion utilizing Kraft front end. Below: All components ready to go —one servo shown.*






*Mert Mischnick's record-setting run — somewhat comparable to riding a polo pony and then entering it in the Kentucky Derby!*

The Skipper's R/C Model Boat Club of Lyons, Illinois held their 5th Annual Regatta on June 14 at Cermak Pool in Lyons, Illinois. In the Precision event, first place was taken by Frank Toth, second by Joe Stachnick, and third by IMPBA Prexy Mert Mischnick.

The photograph of John Zwack's modified Norco cruiser shows it rounding the marker buoy to take 2nd in the ¼ mile oval at 1.05. John, of Kalamazoo, Michigan, has modified the Norco cruiser to a runabout configuration. Power is provided by an air-cooled 0&R Compact driving a #9 aluminum prop on an Octura steering strut. John's boats are always eye-catching due to the careful attention he pays to finishing the interior and exterior. To demonstrate his ability to handle the boat in something other than the ¼ mile circuit, John entered the same boat in the Giant Slalom and captured first place with a time of 1.48:8!

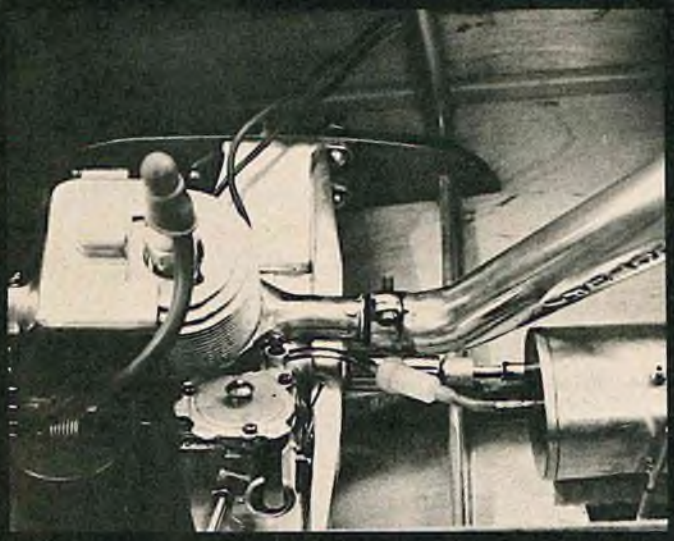
With this sort of a challenge, Mert Mischnick decided to try his luck and skill in these two events. Using an 0&R powered three-point Trident design, Mert negotiated the Slalom course in 1.47:3. He then swung the boat on to the ¼ mile oval, and without changing his carburetor setting, prop, or any additional adjustment, proceeded to run the course in .46:0, for a new world's record — in our opinion, something equivalent to riding a polo pony in one event, then entering it in the Kentucky Derby!

In the .30 displacement and over ¼ mile, third place was taken by Roy Northrup of Beloit, Wisconsin. In the under .30 cu in event, the only contestant to finish was Scott Jordan.

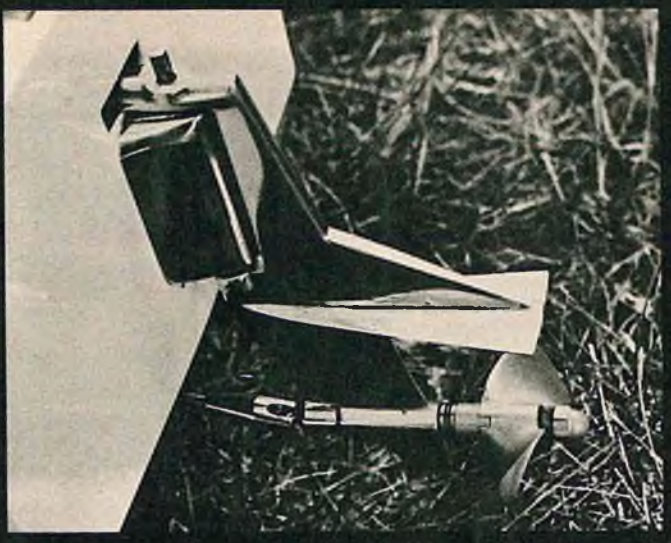
In the balloon busting course, Mert Mischnick scored another first, Bill Richrath second, and Marianne Preusse, third.

Tough luck awards should have been made to Sam Newman of the Skippers R/C whose 0&R powered 3-point threw a set screw out of the universal and put him out of the running; to Dick Meisner of Racine Wing & Hull RC Club who swung wide on a turn, hit bottom with his prop, and split the lower universal on his White Heat V; to Harold McGowan of Aurora, running a new 0&R Compact in his Susie B, who picked up some static on his prop causing it to cavitate; to Fr. Zimmerman of Amboy, Illinois, who encountered reed vibration while accellerating out of a turn, causing him to run aground with minor damage; and to Lee Pender of the Minute Breakers whose .35 powered Challenger cut inside of a marker buoy requiring a re-circling with resultant time loss. To these, better luck next time. Congratulations to the Skippers for a job well done and a Regatta enjoyed by all of the forty plus entrants.

The past several years have brought many advances to the art of R/C boating. Most of the advances have increased both cost and complexity. How about turning the coin over and building a new rudder control sys-



*Air-cooled O & R Compact in John Zwack's Norco Cruiser.*



*The Norco's aluminum prop on an Octura steering strut.*

tem which is simple, reliable and different?

The new rudder control can be used with relayless single channel receivers, using a solenoid to turn the rudder instead of a servomotor. This unique system has several advantages over a servomotor such as: 1) no electrical contacts whatsoever, 2) no electrical interference noise generated, 3) increased reliability, 4) simplicity, 5) faster response.

Figure 1, shows the inside of Mert Miscchnick's "Li'l Softie". The major components visable in the boat are Spacetron's Opal 400 receiver and battery pack, a power transistor, the solenoid (Guardian Type 28), and the rudder linkage. The solenoid battery is not shown in this compartment. When the solenoid is activated, the armature is pulled into the solenoid coil and the linkage causes the rudder to give a right turn. When the solenoid is de-energized, the springs pull the armature out to a fixed stop, and returns the rudder to neutral.

This system has only two rudder positions—neutral and right. Although the two position system seems to have a disadvantage in steering over the standard three positions (right, left and neutral) available on servomotors, the two positions system has some distinct advantages.

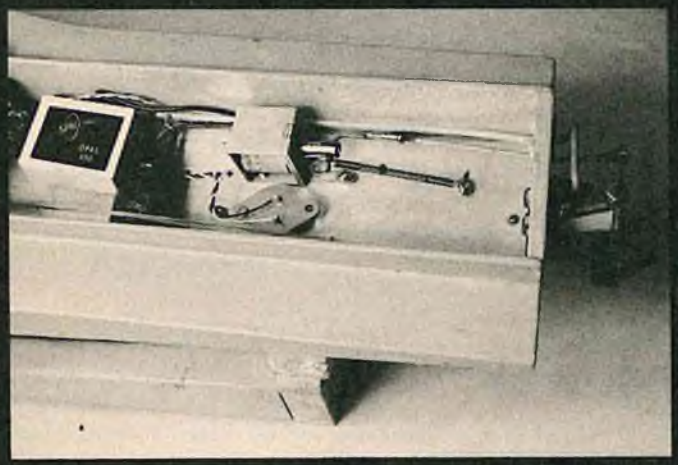
The two position solenoid system was developed after it was discovered that several of the IMPBA speed record holders converted their three positions servos to two position units.

In the two positions system, the neutral is given a very slight left rudder trim, when racing a clockwise oval. Pressing the transmitter tone button caused a standard right turn. In the straight portion of the oval the transmitted tone button is tapped occasionally to correct the left trim, and at the ends of the oval the button is held for a full right turn. The purpose of the left trim is to correct any over-control caused by holding the tone button too long.

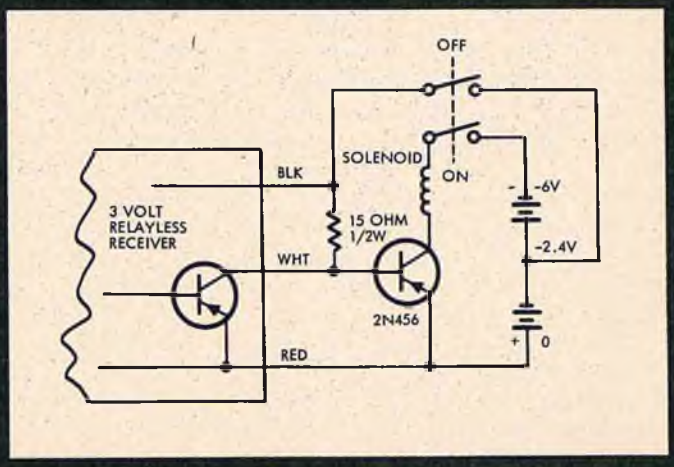
This system permits the use of a single channel equipment, and eliminates the necessity of sequencing and passing through undesired rudder positions in order to achieve the correct position. Also, there is no need to remember if a right or left rudder is next on the servo.

In non-contest boating, the two position system can be set for right and left, instead of right and straight. A straight course can be steered by pulsing the transmitter tone button. A quick thumb often works as well as the more sophisticated pulse boxes!

*(Continued on page 40)*



*Spacetron receiver and miscellany for solenoid unit.*




*Schematic for rudder control.*

# FLY-IN

CONTEST DATA
CLUB NEWS


*Granger Williams and beautiful radio control scale Mike.*

**Doug Spreng and Phil Kraft** racked up a tie for first place in a dark horse upset over the seemingly invincible team of Cliff Weirick and Willie Smith at the Independence Day weekend Pt. Mugu Invitational. Both Spreng and Kraft were flying Kraft's Kwik-Fli design with Kraft proportional gear, the two fliers scoring 339 points. Second place went to Jerrry Pullen flying a Candy with Kraft proportional equipment and a score of 338. Third place honors were captured by Cliff Weirick with a Candy and Bonner Digimite proportional. Willie Smith, the other half of the favored team of Weirick and Smith, suffered the total loss of his new Torero after reported failure of his proportional system.

**Charlie Reed,** along with eight of his fellow Kansas City Radio Control Association (KCRC) members won almost half of the first five positions in five events at the recent 1964 Lincoln Sky Knights Fifth Annual Contest. First in Class II and Class III, Reed flew a Veco 45 powered modified Aristo-Cat with Kraft reed gear to win the former event, and another Veco-Kraft combination in a modified Wind Jammer to victory in the latter. Courtney Smith, flying his original Mark I (RCM June - July '64) with Veco 45 and F&M radio, was the champion in Class I. The Mark I design also took second and fourth positions in Class I at the hands of Gary Leonard and Bob Williams. Third was taken by Dick Hansen. Bud Atkinson, flying an Aristo-Cat with Orbit reeds was second in Class II, with Leonard McCoy and a Stark Shark running third. Romayne Sizemore and Lawrence Jensen were second and third in Class III, respectively. Loren Tregalles placed first in scale and second to Romayne Sizemore in Open Pylon.

**John Carden** of Atlanta, Georgia, nosed out Hal deBolt for first place in Multi Class III Expert at the recent Middle Tennessee Radio Control Society Invitational. Blake Honeycutt was third in this category. Class II Expert was taken by the Nashville trio of Nick Neville, Bill Satler, and Joe Willems. Another Nashville threesome copped the honors in Expert Class I as Red Schofield, Everett Floyd, and Dick Wangler racked up the winning scores. Pylon was won by Bill Satler, Blake Honeycutt, and Hal deBolt, in that order. Nick Neville was presented with the Scale award and Blake Honeycutt the honors for Best Finish. As if to make a clean sweep, Blake also was the winner of a Super Tigre .60 as Door Prize!

**The 1964 Barnum Festival Air Circuit Meet** at Bridgeport Airport, Bridgeport, Conn., on June 28, sponsored by the RC Club of Connecticut, awarded top prizes to John Gravina

for first place in Expert Class III and Bob Dennis for first place in Novice Class III. Jerry Wagner and Pete Reed were second and third, respectively, in the Expert division, while Al Sager and Fran Mitchell walked away with these two spots in the Novice event. Phil D'Ostilio and Herb Kohler were CD's for the Air Circus.

**The rubble in the background** of the photograph of the Alaska Radio Control Society proves that not even an earthquake can deter avid RC'ers. Posing in front of the remain of the Four Seasons Apartments, a six story building under construction when the recent disastrous earthquake struck Alaska, the club has sixteen active members. From left to right, the stalwart members are Jack Risch, Don Lee, Bob Powell, Joe Cline, George LeBaron, Burt Golberg, Joe Harris, and John Smith with two of his children. Bob Powell (30-341 B Cherry Drive, APO 942, Seattle, Washington) is secretary-treasurer of the group.

*The Mox Nix — spelled backwards, reads Falcon.*

**Recognize the original design?** Jim Kloker's Mox Nix is a twin-engine Goldberg Falcon with a pretty fancy paint scheme. Using eight channels of control (no ailerons) and two Max .19's for power, most of the changes to the original configuration are evident in the photo. Jim extended the center section wing planking to accept the nacelles, the latter being built with the same form of construction and thrust line as the fuselage. An increased rudder area is employed, along with sub-rudders offset three degrees for single engine operation. According to Jim, the Mox Nix handles well with both engines, although it becomes somewhat trickier on single engine operation if you're not quick with the throttle! Overall, the twin Falcon is fast, performs the maneuvers well, and can be slowed down to a surprising degree for landings.

*Earthquakes, airplanes — Alaskan R/C members.*

**A 48" span modified Mambo** with CitizenShip ten channel radio operating Bonner servos on rudder and motor was the winning combination for Pete Petrie of San Antonio at the recent Memorial Day weekend RC meet at Longview, Texas. All-up weight was 3¾ pounds with a McCoy .35 for power.

Tom Williams of Oklahoma City was second with a 3¾ pound deBolt Jenny and 10 channel F&M gear on two Bonner servos. A K&B .35 supplied the muscle.

Third place went to Roger Barton of Corpus Christi with a 56" span original designed Zeus. 4½ pounds, Orbit 10, Veco .35, two Annco servos.

Jerry Kleinburg of San Antonio took the fourth position with a 48" Separator at 4¾ pounds, C&S 10 channel superhet, Veco .35 and Bonner servos.

Ben Harr of San Antonio, creator of the Separator design, ran in the fifth slot with a 4½ pound prototype, 10

*(Continued on page 42)*

## THE ROOSTERTAIL

*(Continued from page 12)*

Multiple boat racing has been a dream of R/C model boaters for many years. As far back as 1958 several of us in the Skippers R/C made a feeble attempt at multiple operation. We did it by putting 3 electric boats, responding to different tones, in the water at the same time. The receivers were all regenerative types, and the transmitters had to be off the air unless you were controlling your particular boat, since two transmitters "on" at once would block both signals. This made the operation rather wild and wound up with each man doing his best just to get h's boat back, without hitting the rocks. And I mean rocks — we sail in an old stone quarry!

Superhet radio receivers have only recently found their way into R/C racing boats. This is principally due to the fact that R/C superhet equipment is quite expensive and when placed in a racing boat is subject to dunking. A receiver can survive a hard landing or crash if well protected by foam rubber. However, I am afraid foam rubber does very little to keep the receiver from getting thoroughly soaked after mishap in the water.

At the end of last season, multiple operation of gas boats became the rule instead of the exception. So much so, that this old salt went out and bought a superhet rig over the past winter, just so that he could get into the fun. So far, this season, it has worked like a charm and I have no need to test the water proofing system I employ.

The only official IMPBA race for multi boat operation is the "Gold Cup" which is 15 miles long or 120 laps over the standard "International Oval Course". This may be more plausible than you may think, since early this spring we ran a boat 88 laps or 11 miles without a stop. The gold cup course calls for a minimum of 4 pit stops which would permit refueling if necessary. The 88 laps run this spring were done in one shot without any refueling.

The rules of competition for the Minute Breakers multi event will be as close as possible to the existing rules. A few rules will have to be added and the experiences encountered will point these out.

New rules will have to be written into the IMPBA to regulate multiple boat racing. This will be done before the next boating season starts. All R/C rules, changes and additions will be processed by the Vice-President of the R/C Division, John Zwack, Richland, Michigan. However, he doesn't write all the rules. He cannot, because he doesn't know all the conditions that exist throughout the world. This is where you, the IMPBA member have a voice. **Right now** is your chance to help write rules for multi-boat operation. You can write a rule as you think it should be written or you can send an experience which you have had so that we may write a rule to account for such a situation. You may also anticipate a problem which may arise so we can preclude any argument about that point at a contest. Members will have to abide by the rules after they are written — Why not help write them?

**Application for membership to the I.M.P.B.A. for 1964**

I.M.P.B.A.
2405 S. 19th Avenue
Broadview, Illinois 60155

Annual dues 50 cents plus $5.50 for a year subscription to R/C Modeler Magazine. (See subscription rates for outside USA). Family Plan: 50 cents per person plus $5.50 for a single one year subscription (one address only).

Name_____

Address_____

County_____ State_____ Country_____

IMPBA LIFE #_____ Interest: R/C_____ Tether_____ Club_____

I have a current subscription to R/C Modeler: Yes__ No__ Fee Enclosed__

## INTERNATIONAL CIRCUIT

*(Continued from page 14)*

Monte Malherbe, pictured with his Radiant, displays the popular Constallation 7, designed and manufactured by Dr. Derek Maypole of South Africa. RCM was fortunate in that we recently had the opportunity to examine this seven channel proportional system, finding it quite remarkable in many aspects.

**New Zealand**

Russ Johnson, Palmerston North, R/C Club, provided the photographs of a recent R/C rally held in the city of the same name. The Spitfire, King Cobra, and Aircobra were flown in formation for the benefit of the many spectators — quite an achievement with Class III ships, not to mention scale jobs! All three craft sported Merco .49 engines and 10-channel gear. The Spitfire, a Sterling kit, was constructed by Dave Whitehead. The Russian marked King Cobra was the project of Mike Kendrick.

Challenging Walt Staff's (Utah State Aero Modelers) claim to fame for the longevity record for a single model, is the Comet Clipper from Laurie Ackroyd of the Hawera Model Aero Club of New Zealand. The photographs show Laurie's original Clipper, taken in 1939 when he was 16 years of age. The original model was powered by an Ohlsson & Rice Gold Seal ignition engine, and built from the original $4.95 Comet kit. Hundreds of flights were made using 45 and 30 second engine runs and no dethermalizer — the latter item, or rather the lack of it, resulting in one Clipper missing for two days! Today,

as the accompanying photos show, the Clipper is still flying, this time with an E.D. diesel of one third the capacity of the original O&R. Orbit four channel gear is used. Despite a few repairs and a slightly modified nose, the old Comet Clipper is still flying — having seen 24 years of continuous service! This one will be hard to top!

**Belgium**

Les Aiglons De Belgique (The Eagles of Belgium) is an up-and-coming RC club located just outside the city of Brussells. Club prexy is Luc Mommer, a professional jet jockey in his spare time! Although the accompanying photo illustrates a variety of aircraft design, all members, without exception, fly with Kraft radio gear.

## DEAR RCM:

*(Continued from page 4)*

*As for the articles for beginners, Art — suggest you read the past series by Ken Willard, "Blueprint For Beginners."*

**Correction**

I would respectfully draw your attention to an anomly in your report on the South African Nationals reported in the June-July issue. I won second place with a Min-X 10 channel superhet using their transistorized transmitter, not a Kraft 10 as reported. Third place winner Johnny Wessels also used an identical outfit. My number two ship, also a Taurus.



was fitted with Kraft gear, but did not use this model in the competition. The latter was flown in a demonstration afterwards. I have written to Bob Schmidt of Min-X reporting that (their equipment) placed 2nd and 3rd at the South African Nationals, so he too will be pleased if you will correct this report.

Now that the main reason for my letter is done, I would like to take this opportunity of congratulating you on an excellent magazine. We look forward to each issue, and being RC only, modelers read them from cover to cover. Unfortunately, at present, RCM is in short supply, so those fortunate enough to get a copy have to pass them around when they have read them — sometimes before, if they are not quick about their reading!

C. A. Culverwell
Johannesburg, U. South Africa

## REGATTA

*(Continued from page 35)*

There are many unexplored possibilities utilizing a solenoid rudder control. One idea that occurs to us is that by using a Spacetron waterproof receiver and battery pack, and by waterproofing the solenoid with lacquer or epoxy, a submarine could be built without the need for a waterproof compartment! This isn't a bad idea, either, for surface boats with nasty habits of getting the equipment soggy!

Let's take a look at the wiring diagram. The output of the receiver is connected to a 2N456 power transistor which drives the solenoid. The particular solenoid employed has a 6 volt, 7.7 ohm coil and is powerful enough for most applications, especially if a balanced rudder is used. The boat illustrated has less than 5% dynamic balance and works very well. Using the components shown, the system operates from 20° to 140° F.

The solenoid is de-energized when the transmitter is producing a tone and energized when the tone is removed. This means that the tone button is held in the straight-away and released for a turn.

As this solenoid draws .78 amperes when energized, be sure that adequate battery capacity is provided. We used five 450 MAH ni-cads. When a boat with an electric motor is used, the same battery that powers the motor can power the solenoid. This keeps the system extremely simple.

The range of an R/C boat is usually limited by the electrical noise developed by the drive motor and the servomotor. In a gas boat, changing from a servomotor rudder to a solenoid could double the range. In an electric boat, a range increase can be obtained by locating the receiver antenna and associated wiring near the rear of the boat. The object is to keep all the receiver wiring away from the drive motor and its wiring. Generally, in an electric boat the drive motor is at one end of the boat and the servomotor is at the other end. This normally makes it quite difficult to isolate the receiver from the noise sources. The noiseless solenoid provides a quiet spot at the rear of the boat for the antenna system.

Here then, is a control system for the experienced racing fan, the Sunday Seaman, and the novice. Safe, sure, inexpensive,—why not give it a try?

In the realm of new products of interest to boat enthusiasts, here is a hot item for RC'ers that use large amounts of fuel from gallon containers and have no pump.

Now available, a sturdy *liquid pump;* has all metal construction and is furnished with 36 inches of neophrene tubing, with a check valve nozzle. Universal cap fits any one gallon can. Available from Gratiot Automotive Supply Corp., 12917 Gratiot Ave., Detroit 5, Michigan. Price $4.85 PP. Sorry No CODs.

**Long-Life Sandpaper** — Flex-I-Grit — This kit contains five sanding bases and interchangeable handles for contour sanding of almost any material at a wear rate 9 times longer than regular sandpaper. More information: X-Acto Precision Tools, Inc., 48-41 Van Dam, Long Island City, New York.

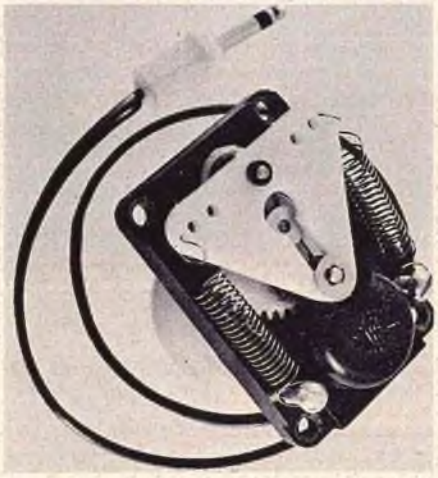
**Micro-Files** — 18 file kit consisting of files ½ inch and 6 inches long. Feature is a file that is only 0.008 inch in thickness. More information: Tacony File & Hardware Co., 7154 Wissinoming Ave., Philadelphia, Pa.

**Polishing Discs** — Wool felt discs, 1/16" thick available in ¼, ⅜, ½, ¾, 1 and 1½ inch diameters can be used with diamond compound or rouge for finishing all flat surfaces, radii, and contours. Pressure-sensitive adhesive is pressed against a rubber holder on a metal shaft for use in any high speed hand drill. More information: Bacon Felt Co., Fifth St., Taunton, Massachusetts.

Already well known for its wide spread use in larger R/C model boats, the O & R compact engine has been further improved. Roller bearings on the wrist pin, larger exhaust ports, plastic feather valves, and a full complement of rollers on the crankpin have been added to this proven model marine power plant. R/C boat modelers will appreciate the increased performance of the improved version which still retains the two piece crankshaft mounted on four roller bearing assemblies. The improved engine can be identified by the four small lugs on the top of the cylinder.

The new improved O & R compact engine, a motor mount for mounting the engine in a R/C model boat, a universal coupling for connecting the engine to a 3/16" drive shaft, a cast aluminum exhaust stack or a V-8 tubular manifold, as well as a cable for connecting the carburetor to the servo plus suitable marine propellers are available from Octura Models, 8148 N. Milwaukee Avenue, Niles, Illinois 60648. Send stamped self-addressed envelope for literature and price list.

### Modifying The Bellamatic For Pulse Operation



**A highly successful method of modifying the Bellamatic servo for pulse proportional systems, as recommended by Tom Dion and shown in the photograph, incorporates the simple addition of two lightweight springs for logarithmic action. Two 2-56 x ½" bolts are self-tapped into slightly smaller holes drilled on each side of the motor housing. Two additional holes are drilled in the bellcrank directly opposite to the two outside pushrod locating holes. A short length of light coil spring is then attached to each side. No other changes to the servo are necessary, the addition of the springs providing more positive centering and servo return.**

## FLY-IN

*(Continued from page 37)*

channel C&S radio, Veco .35, and two Bonner servos.

The aircraft winning the first three positions in the Longview meet were trimmed to "tread" lightly through light to moderate wind, using little space and altitude for all pattern work and maneuvers. The Separator designs in fourth and fifth position were weighted and trimmed for all-weather flying and required more space and altitude for their faster-moving aerobatics. Due to the high power loadings, all of the rudder only ships could readily perform the looping maneuvers, and the touch-and-go was the rule, rather than the exception. The most difficult maneuvers for these rudder-only configurations were the Cuban 8 and Tail Slide.

**The Tenth Annual RCNC Invitational** may well go down in the pages of RC history as one of the finest meets of its kind. Although, by press time, a list of winners had not arrived, the meet certainly didn't suffer for lack of planning or facilities. As an example, the flying site sported a fifty foot high crow's meet to spot flyways; sunken starting batteries were provided along the flight line; a frequency indicator was provided, serving its function well; a concession stand was utilized by all, along with a camping area, comfort stations, fresh running water — all in all unusual flying site conveniences appreciated by spectators and contestants alike.

Highlight of the two day affair was the Saturday night banquet and award dinner. Blake Honeycutt was presented with the outstanding Service Award; Bob Yates, originator of the Yates proportional system was honored for his achievement in this field; plus many additional awards given for Scale, Craftsmanship, Most Outstanding Flyer, and a class of Gag awards for a light sprinkling of humor. Ever-popular Pappy deBolt, attending the weekend Invitational, along with three Jenny's (shoulder wing, low wing, and a Jenny bipe), won the Travel award for covering the greatest amount of terra firma to attend the fly-in. Dr. and Mrs. Walt Good were also on hand, and accepted a check for $153.-50 on behalf of the AMA-FCC Fund. All in all, an outstanding event from an equally outstanding group of fliers who have contributed substantially to the high standards of sportsmanship in this hobby of RC.

**There is little doubt** that the Southern California Council of Radio Control Clubs has made its debut. Formally recognized by the AMA, LAHMA, and its northern California counterpart, the NCRCS, the newly formed organization has already made significant achievements in obtaining two new flying sites plus a member club total contribution of $756 to the AMA-FCC Fund. Zel Ritchie is president of the association of Southern California RC clubs.

**The Indianapolis West Side RC Modelers,** a relatively new club of approximately thirty members, is anxious to exchange publications with other RC clubs throughout the country, according to "Doc" Griffin, Publicity Chairman. We suggest that Club Secretary's contact Leslie W. Griffin, M.D., 3203 West 57th St., Indianapolis 8, Indiana. Elmer Boos is prexy of the midwest group, while Floyd Willever serves as Secretary-Treasurer. Roland Rhein is CD.

### FLYING JOE

*by Fran D'lemico*

There was a young fella named Joe
Who was crazy about airplanes and flying you know,
Each night he'd have supper and run to his den
Gone from his family, the whole night again.

"What," his wife pondered, "am I going to do?
I feel just as useless as a worn old shoe."
She offered him coffee and goodies . . . and things,
Maybe he'd weaken and give up his wings.

Her bribes they were useless, he didn't give in,
The wheels in her head then started to spin.
There is an old saying its tried and its true,
So this is what Joe's wife decided to do.

She got out his magazine and learned all the facts,
Now she's a nutty modeler and so they both can relax.

The moral is — if you can't fight 'em, join 'em. Head's up gals!

# 1964 NATIONALS

## DALLAS, TEXAS

*World Champ Ralph Brooke and Crusader—3rd in Class III*

*Don Crow and Stormer—2nd in Class II*

*H. Petrie and Separator—2nd in Class I*

*Jerry Nelson and Patriot*

*Don Brown—1st Flight of Nat's*

*Ed Kazmirski prior to flight*

## A.M.A.

*(Continued from page 12)*

for one flight. Forgot to turn on switches and flew away. Returned home at midnight, airplane still lost. Today, in his fifth contest, after leaving his rubber bands at home and borrowing some, he got through the procedure turn, but his escapement stuck in the overhead eight. The airplane would have been demolished on the runway except for a slow-moving judge, whose flailing arms intersected a wingtip, thereby diminishing the final impact. G. Ginner got his first official flight and a total of 3 points, and would have been happy, except he noticed the guy who won it had more than 60 points, five years experience, and $200 worth of radio equipment. B. Ginner thinks, "How proud my wife would be if I could bring home just one itsy-bitsy trophy."

R/C people are very serious about the problem, and the preceding narratives are not intended to treat it lightly. The Academy of Model Aeronautics reports that an increasing number of sanctions for R/C events are coming in with "Novice" events listed. AMA President Maynard Hill, John Worth and Frank Ehling are studying the Novice question, as it may apply to AMA, to determine what, if anything, the Academy can do to be of assistance. The subject was also considered by the Academy's Executive Council at its Dallas meeting during the Nationals.

Basically, suggestions reaching the Academy boil down to three possible solutions. One would be to license fliers according to their past contest performance as novice or expert. Once a pilot had scored sufficiently in novice events, he would then be graduated to the expert class. Perhaps novice members would have a different color license than the experts, or perhaps a punch card system could be employed; several innovations are being studied.

The second alternative would be the reverse. There could be established a "professional" class of licenses for the top fliers in the country. This classification would be based on Nationals performances, AAA meet performances, or similar criteria.

The third possibility would be for AMA to establish guidelines for contest directors to handle the situation locally. Deciding who is a novice and who an expert is a difficult question to answer universally. Local contest directors most likely are in the best position to make this determination. The general consensus in such events sanctioned to date is that a person is a novice unless he has placed third or better in a AAA meet or larger.

Semantics is a problem, too. Many persons have expressed a dislike for the terms novice and professional. Substitutes include amateur, sportsman, master and expert. Other persons would rather place tenth in the expert

*(Continued on page 47)*

## A.M.A.

*(Continued from page 45)*

event than first in the novice event because they don't want "novice" written on their trophies. Their solution is to increase the number of places for which prizes and recognition are given. Placing sixth in a large attendance multi-event, for instance, should be worth more prestige than it now seems to be, they feel.

Unfortunately, most new sports, as radio control must be classed, eventually develop their corps of experts. These are the guys with enough money and seemingly endless hours of time to devote to the sport. Stock car racing is an example of a sport that started in the junk yards and advanced all the way to sponsorship by automobile manufacturers themselves. There are many other examples of this progresssion to professionalism, some of which almost killed the sport in terms of mass participation. Full scale air racing is a possible example of this.

The novice-expert problem could be a serious one for the R/C sport, AMA believes, and along with many interested members, is seeking the most suitable solution; hopefully in time for the 1965 season, but in any case, as soon as practical.

**R.T.M.A. RESISTOR COLOR CODE**

0—Black
1—Brown
2—Red
3—Orange
4—Yellow
5—Green
6—Blue
7—Violet
8—Gray
9—White

SILVER — 10%
GOLD — 5%
NO COLOR — 20%


A. FIRST SIGNIFICANT FIGURE
B. SECOND SIGNIFICANT FIGURE
C. NUMBER OF ZEROS
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…ugh wing, …t filer for …er. 38" span

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## GROUND UP

*(Continued from page 26)*

constant amount of relay drop-out — in turn, resulting in an off-sided operation of the actuator). But with the Rudder Trim feature of the pulse box, centering for each receiver became a one-second job!

In this little on-the-scene description of a night-at-the-bench, I've attempted to clarify several different phases of system checking, which as this description does, ties together to give you a successfully operating rig. And, though this little arc suppressor worked successfully on three different makes of receivers, I don't want you to assume that it will work on a great many. I checked one receiver which has been working in my escapement system on the Profile P-51 and it would not allow pulse operation. However, I do feel that by increasing the values of the capacitors, even this receiver will snap into line. You may have to substitute larger capacitor values on your receiver relay to get the desired results. For safety's sake, be sure to install a DPST switch in the system as shown to eliminate the possibility of a capacitor leaking and killing your batteries.

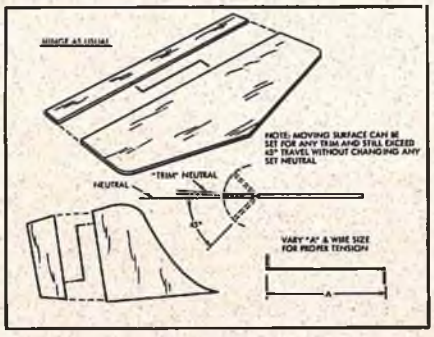
About batteries: On pulse, one of the biggest offenders is system friction. Don't let it fool you, it's there whether in the torque rod to the tail surfaces or the rod to the engine throttle. The linkage to the throttle should be as easy to activate as it would if you were using an escapement for throttle movement. Such friction is something we all have to fight — whether you have several years pulse experience or on your first ship. When I finished the Go-Wind a while back, I spent almost as much time fiddling with the control linkages as I did applying the finish coats of dope! Once the job was done, my reward was in the form of battery savings. I flew last year and a few flights this year on the same four pencells! And this in addition to many hours of "playing" at club meets and friendly late night get-to-gethers! (P.S.—I use alkaline energizers in this application, or mercury cells).

Thought maybe you'd like to see a prettty combo designed to help get you into the swim of things! Don Foster (the CEE BEE Line man) installed a set of his ½A sized, ready-to-use tough plastic pontoons on his Chicken Hawk (should call this a Chicken Hawk P6-E marine conversion!). Don tells me — and everyone he meets — that, though his Baby Bee doesn't have enough steam to get this combo off the water, he has a ball hand launching it in the field and landing on the grass. Sez it hasn't tipped over on landing yet!

I'm not sure, but I have a feeling that I'm running out of magazine! Just enough space to invite you to drop a line and tell us what you're doing RC wise. In the meantime, I'm going to try and work up a tester idea for pulse fans which will make component balance easier.

Keep those frequency flags waving!

### Positive Spring-Loaded Centering for Control Surfaces




**Harland Hansen of Muskegon, Michigan, sugests this method for a simple, accurate, and concealed method of spring centering for escapement operated rudder and elevator surfaces. This method is exceptionally suited for use with Babcock escapements, or with the Digitran system, where a method of light, but positive centering is required. Eliminates the need for unsightly surface mounted springs.**

## SUNDAY FLYER

*(Continued from page 10)*

can help satisfy that curiosity. But only in a general way, though. If you start asking about circuitry, diodes, pulse omission, nulls, etc. — don't! I can't answer. Any more than the electronic boys can explain full scavenging flow patterns, by-pass bleeds, venturi restriction, needle taper, etc.

However, and here again I'm making an assumption that you and I have a lot of common traits —there are several well qualified columnists who can answer your detailed technical questions. Some of them write for RCM, others write for the other model magazines. Unless I miss my guess, most Sunday flyers, once they're "hooked" on R/C, start reading the magazines — and usually read them all. Now, if you're like that, you'll become familiar with the fellows like Ed Lorenz, Howard McEntee, Peter Chinn, and others who get pretty deep into some of the details in their special field. But I don't plan to go that route.

Let's look at it this way. A guy once asked me — "What is the most interesting thing to you about a woman — her hair, eyes, mouth, shoulders, bust, hips, or legs?"

"None of them is singularly most interesting," I replied — "I'm a *systems* man!"

And that's the way we're going to look at R/C modeling. When you come right down to it, the radio is only a part of the system—in fact, it's only a part of the guidance sub system. You've got the power system and flight control system in addition — any one of which can go ape.

We'll talk about designs, trimming and adjusting, gimmicks for engine adjusting, vibration problems, methods of shock mounting radios and servos; we'll discuss problems in finding suitable flight areas; maybe we'll critique some designs. Anything that's of general interest to you Sunday Flyers.

Now — like they do on TV—here's a little preview of some of the things

I've thought of that will interest you.

Right at the moment I'm working on a seaplane version of the VIRUS, with the same basic requirements that if you've got a flat workbench you can build it. Incidentally, the first version flew fine — but no takeoff from water. So, back to the drawing board.

Then, I've got some ideas for you scale fans who would like to build some twin engine scale jobs without offset thrust, but still perfectly controllable under full single engine power.

Next — and maybe by that time you'll have loaded me up with some of your problems for discussion so I'll postpone the design material — there's a real nice looking biplane in the works that I think you'll like.

Here's another point worth mentioning — — and we might enlarge on it later on. And that is for every multi-channel radio and transmitter and receiver that is sold, there are many, many more single channel rigs being bought. I don't know the exact figures, but I'd guess the ratio would be about twenty-five to thirty times as many single channel rigs as there are multi. Maybe more. In any event, the inference is obvious — the majority of Sunday flyers are single channel. Maybe not in the concentrated areas of activity, like Los Angeles, but nationwide it must be true — or else somebody's using the single rigs in their breakfast cereal!

So maybe there'll be a preponderance of single channel chatter here. If so, it will only be because the majority of you want it that way. I'd like to make one thing clear, though. Some modelers think I'm completely devoted to single channel. Not so. What I *am* devoted to — because of time limitations — are R/C models in the smaller size — 2 to 4 foot wingspan — and I look forward eagerly to the day when models in this size range can be commercially equipped with full house proportional guidance. It's really easier to fly than single channel, once you've had a litttle "dual"" time. Look what Bob Dunham — whom I consider the greatest R/C pilot of them all — said recently: "Now that I'm flying proportional, I'm almost afraid to fly anything else."

But, until the day the manufacturers come up with the small proportional rig, the small models are mostly confined to single channel equipment. That could be quite a while, yet, too. Right now, the demand for the proportional systems which weigh around a pound and a half installed, is so great, and the production requirements so comparatively complex, that the manufacturers are hard put to keep up with the demand, let alone concentrate on developing smaller and lighter stuff!

Well, there's a few thoughts. The way I see it, there's a lot of you fellows who fly on weekends — unless you're building something — and you're not beginners. Neither are you experts. You understand most of the basic principles of flight, power, and guidance. It's when you combine the three that you'd like to exchange problems and experiences. This column is for you. I hope you read it and enjoy it as much as I look forward to "conducting" it.

Write me, care of RCM. Let's do some Sunday flying together.

## MULTI INSTALLATIONS

*(Continued from page 31)*

afford stress relief. GE's Clear Seal can be used to "pot" the switch, if you so desire. Slide the receiver out of its compartment far enough to expose the tuning hole. Remove the transmiter antenna completely. If you have an assistant available, have him depress and hold down the motor or trim lever switch in order to drive the associated servo to the end of its travel. Tuning will be easier using the trim or motor tones because the servos will not be running back and forth, self-neutralizing, during tuning. Have your helper walk out a few feet until you cannot hear the reed vibrating. Insert the proper end of a plastic tuning wand into the slug, keeping your body away from the wiring and receiver can as much as possible. Do not hold the receiver while tuning, but allow it to remain in its compartment with only the tuning slug hole exposed. Rotate the slug in or out until the reed starts vibrating again, then have your assistant move slowly away with the transmitter tone held on while you tune to keep the reed vibrating. When your helper has reached the range limit, the slug tuning will be very critical, and in most cases you will be able to faintly hear the tone humming in the reed coil beyond the point of range where the reed stopped vibrating. Simply tune the slug for maximum tone volume. A range of about 15 feet with the transmitter antenna removed is adequate for the Kraft units. Although simple range checks can be made in your shop, many variables exist, and final tuning should be done at the flying site. For a final check, the plane can be propped on a stool, while your helper walks across the field with the transmitter antenna in place. With today's modern transmitter-receiver combinations, he may well expect a long walk!

Once the installation and tuning procedures are completed, you are ready for preliminary flight testing. In case of intermittent operation, or other difficulties, inspect all wiring carefully for properly soldered joints. Most radio troubles can be traced to improper soldering techniques. Be certain that no wiring is accidentally shorted and that all soldered connec-

*(Continued on page 58)*

# SOLO

by Frank Justin

Last month we mentioned that we might get a chance to test one of the new proportional systems — well, one of the proportional manufacturers came through and shipped us a rig for flight evaluation. We have beeen in contact with virtually every proportional manufacturer from the early days of these systems and have had many promises from coast to coast that we would have one of the new "XYZ" rigs to tell our readers about. It was, therefore, with pleasure, that someone finally put it on the line and shipped one out. Of interest, perhaps, is the fact that it was not one of the "Big Three" — the gear we received was manufactured in the East by a gentleman named Don Brown, and was one of his DeeBee Quadruplex Superhet 21's.

If you have been following this column, you may remember that we put together a Taurus/Zeus combination, and this ship subsequently became the test bed for the DeeBee. It flew very well, and the fact that we had some prior time on the ship might make up for our lack of proportional stick time.

The DeeBee makes use of modified Bellamatic servos for rudder, elevator, and aileron, with an Annco servo for motor. As the system is not of the closed looop, or feedback design, the servos use torsion bar centering on the control surface servos. Very simply, the system uses three sub-carriers to feed pulse width information to the receiver filter section, which in turn, separates and amplifies for servo control. This is not a new idea, but like any design, it takes the right hardware and a great amount of time to make a reliable and marketable piece of equipment.

We found the DeeBee gear very easy to install in the Zeus — one evening, all that was necessary to get us ready to fly. The care that reed fliers take to get ailerons rigged correctly was much less of a chore with the trimmable feature of the ailerons. Inasmuch as a local club meeting was upcoming, I pulled the gear and took over for the group to examine. I set the whole works on a display table and asked that they help themselves (Sorry, Mr. Brown!). By the time thirty-six modelers got their hands on the controls, you have a real good idea of what will come loose! I winced a little when Heavy-Handed Harry (our self-proclaimed field marshall — every club has one) started to twist and bend, but the gear came through in good order.

A few days later we got away for an afternoon and the first flight. When you reach our field you must plan your moves with care. The County had just bladed our strip and we have to contend with dust. Now, for you green grass Easterners, I don't mean the dust the old lady removes from the furniture — I mean dust

*(Continued on page 56)*

## FRANK JUSTIN

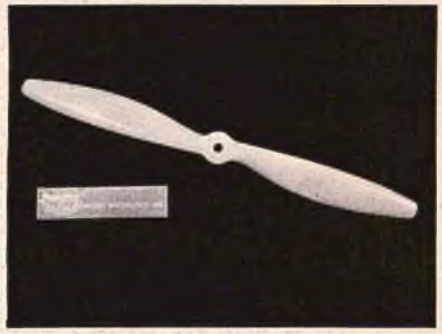
*is RCM's man-about-town. His tongue-in-cheek reportorial style is a favorite among the R/C fraternity. Join the clan, and you'll find that Frank draws a sharp line between fact and fancy in R/C products and progress.*

# SHOWCASE '64

**New Multi Servo from Citizen-Ship** — Available July 15th, the new transistorized multi servos, Citizen-Ship Models TLB and TCB, requires no bias battery, and will be operated directly from any reed receiver regardless of receiver voltage. Model TLB, features linear output, 5/8" travel/1 sec.; rack and pinion gearing. Model TCB, for cam action output, has a slow start for smooth flying coupled with a fast finish for quick recovery. The 5/8" total travel is accomplished in .7 second. Either model may be converted to the other model by simply rearranging parts, and each may be made for trim function by the modeler. The integral amplifier board and switcher plate used in the new servos eliminates interconnecting wires within the servo itself. Internal parts and gears are of precision molded nylon. Positive burn-out protection for transistors is provided in the case both reeds should contact at the same time. Size: 2⅝" x 1-9/16" x 1"; Weight: 2¾ ounces; Price: $25.95. **Circle #1 on the Reader Service Card.**


**Spacetron's new Cougar I** all transistor high power single channel transmitter measures 5" x 4-3/16" x 1-27/32" and operates on a single 9 volt battery at 30 ma. Modulating frequency is 700 CPS nominal with 90% to 100% modilation. Fully temperature compensated, the Cougar I is available on any one of the standard 27 mc frequencies. Each transmitter is covered by a 90 day guarantee. Price is $34.95. **Circle #2 on the Reader Service Card.**


**White Nylon Props** from England are available in 10/6, 10/4, 11/6, 11/4, 12/6, and 12/4 sizes from GM Hobby Specialties, Clifton, N. J. The ten inch props are priced at 85¢, the 11" at $1.00, and the 12" at $1.50 each. Properly designed to give maximum torque under all engine speeds. they are balanced to give minimum vibration and aged for maximum strength. Available at your hobby dealer, or direct. **Circle #3 on the Reader Service Card.**



**The Dremel Moto-Tool** is an almost indispensable item for the RC'ers workshop. This high-speed shaping tool is recommended for drilling motor mounts, servo rails and boards, push rod holes, and wheels; for sanding and shaping of fuselage, wing, elevator, and rudder parts; for cleaning and polishing engines; for sanding hard to reach places, inside and outside the fuselage; for hollowing balsa blocks etc. Several models of Moto-Tool are available in RPM's from 25-27,000 with collet sizes of ⅛", 1/16", or 3/32". Price ranges from $17 to $30 depending on model selected. **Circle #4 on the Reader Service Card.**

**Super Cement** — Since we listed an incorrect price for this item in a recent issue, we'll relist this item, a favorite of ours. Manufactured by Superior Model Products, Super Cement is a fast drying and extremely strong fuel proof cement. A small tube is 15¢, large 25¢, pint $1.69. Thinner (4 oz) is 45¢. Available from Westee. We strongly recommend that you try this cement — you'll like it. **Circle #5 on the Reader Service Card.**

*(Continued on page 61)*

*(Continued from page 53)*

like you saw when the "Grapes Of Wrath" hit the silver screen! The ideal position is to place your ship slightly quartering in the wind, one place removed from Old Harry the Field Marshall. Carefully arrange the tail so that the good old Super Tigre can move about one-half pound of fine powdery dust into Harry's tool box. At times, this is more satisfying than a good flight. It also teaches us to be patient with our fellow modeler — or keep our box closed.

Someone had told me that I would find the DeeBee very reliable, so I approached my first flight with a positive air. To be certain, the controls are somewhat foreign after so much reed flying, but they can be moved in a bang-bang manner with the real feel of proportional developed in time. I allowed the ship to run about fifty feet before starting to feed in a little back pressure on the stick. The Zeus lifted off beautifully, and in fact, subsequently flew a dozen flights that were all a pleasure. The equipment worked as the manufacturer said it would, and we were quite pleased with the feel. Proportional really comes into its own on the Touch-and-Go's!

One unique feature of the DeeBee system is a switch that couples the rudder and ailerons — an excellent concept for approaches. The local experts have been telling me that the response time of the DeeBee is slow, and that large surfaces load the servo's excessively — these two factors might well exist, but to me it's fun to fly and reliable to operate. Not until I try another rig will I be able to compare these factors, and no one else has sent one to be tried.

There are several features that should be mentioned. The servo's are on all the time, so plan on heavier battery drain than you have become accustomed to in reeds. The system is not fail-safe — if you lose the transmitter, you get low motor, full aileron, and full-up. It should be possible to integrate the incoming signal so that on loss of signal, the receiver is shut off and the springs bring the servos to neutral. The only question, then, is it better to lose it in neutral

or in a control position?

We mentioned in a prior column that a type of proportional might be developed for pulsing reed systems. Here is a letter from E. De Pelsmaeker from the recently dissolved Federation De La Petite Aviation Belge, on his experiences with this technique:

*I noted Mr. Justin's comments on reed pulsing in the March issue of RCM. In 1962 I made such a unit for a 10-channel transmitter. The first problem encountered is that normal pulsers give a deviation from 50/50 mark-space when the stick is moved. In this application, the stick should give a theoretical mark/space variation from 0 to 100 in both directions when the stick is moved off-center. The practical approach was found to give a 10 to 90 variation on both sides, the solation being found in a wire-wound, center-tapped control potentiometer. Any way the wiper is deflected, it always results in a 10% tone signal which progressively gets larger as the stick is moved. Difficulty in obtaining less than 10% mark signal is of no importance — reeds do not respond to signals as short as this.*

*The second problem is that the pulser would not give any tone signal while the stick is in neutral. To achieve this, the wiper is resting on an isolation while at neutral. This isolation is in the form of a small piece of cellophane tape placed over the center tapped portion of the pot. The width of the tape determines the time when the pulser starts to work. The cut-and-trial method is used to determine this width and the subsequent first burst of tone. Adjust for 10 to 20% tone. When the pulser is in the neutral position, it should always fall to the same conditions — in other words, the same transistor should always conduct. The pulser is adjusted with pot #2 so that the relay is almost at rest when the wiper is in neutral. The connections for the tone generators are made over the mobile contact and the normally open contact.*

*The third problem is that the tones must be changed when the stick is pushed one way or the other. If separate tone generators were to be used, the problem would be rather simple, but inasmuch as no transmitter with this feature was available, there was no other way out than to fit a double pole switch to each side of the potentiometer shaft. This was not as difficult as it might appear. In reality, Bonner servo replacement parts formed an excellent switch for this purpose — the output arm is fixed to the pot shaft and bears against the*

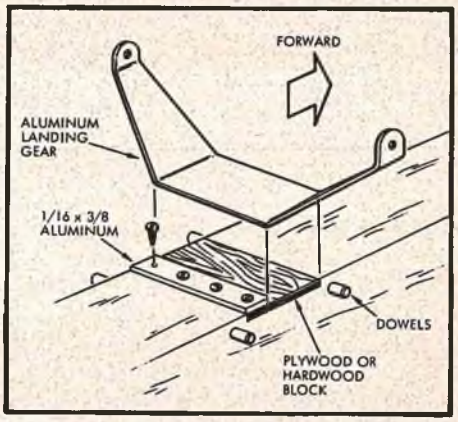
*(Continued on page 59)*

## MULTI INSTALLATIONS

*(Continued from page 52)*

tions are properly sleeved. Check switches and plugs to be sure they are making good contact. Many cases of hard-to-isolate difficulties can be traced to the switches and plugs. Check the battery voltages and inspect the battery pack. Be sure wire color coding matches the manufactures hook-up instructions. Do not forget to fully charge your nicad pack at the recommended rate for the specified length of time. *Do not* reverse charge as you will ruin the pack. If, after trouble-shooting all wiring, connections, and general installation, the trouble seems to lie in the receiver, send it back to the manufacturer or his service center for repair. Don't attempt to make any adjustments or changes in the receiver not specifically mentioned in the instruction manual. This is a hobby whose end goal is *flying*, not tinkering or unneeded expense in costly RC equipment replacements.

## Knock-Away Mount For Dural Gear




**Frank Garcher, Hobart, Indiana, suggests a tried and proven method of mounting dural main gear so that it will knock-off in hard landings, but without tearing along the bottom of the fuselage. The gear is mounted in the normal fashion, with rubber bands and dowels, but is backed up by a 1/16" x 3/8" aluminum strip from an old gear blank. On impact, the main gear is thrown clear, and to the side of the ship, instead of rolling back the length of the fuselage, often causing extensive damage.**

*(Continued from page 57)*

*fixed commutator board. If the lead coming from NO contact is connected to the tracks used for neutralizing, no difficulties will be experienced with stray tones.*

*That's the end of the story—hope it can be useful to someone.*

*E. De Pelsmaeker*
*A. Van de Maelestraat, 69*
*Erembodegem, Belgium*

I'm on my way to Northern Wisconsin for a couple of weeks of vacation, and am currently working on a Jenny with Gee Bee floats for lake flying. "How Not To Fly On Water" will be the subject of next month's column. Short selected subjects will include, "What Happens To 200 Pounds Of Bohemia When Filled With Beer For Two Weeks?" or "How Wide Do Water Skiis Have To Be To Hold That Guy Up?" or "I Can Appreciate Your Problem, Madam, But We Don't Pack Suntan Lotion By The Pail Regardless Of How Big The Customer!"

Tally-Ho.