KEN DWIGHT'S HAWKER HURRICANE

CDC

radio control Modeler

FEBRUARY 1965 50c

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

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RCM SYSTEMS YOU CAN BUILD

R/C modeler

FEBRUARY 1965
VOL. 2, NO. 3

CONTENTS

MONTHLY FEATURES

R/C MODELER is published monthly by the R/C Modeler Corporation, 49 S. Baldwin Ave., Sierra Madre, Calif. Printed in the U.S.A. Second Class Postage paid at Milwaukee, Wis. and at additional P.O. SUBSCRIPTION RATES: Annual (12 issues), U.S. and possessions: $5.50; 2 years, $10.00. Canada: 1 year, $6.00. All other countries: 1 year, $6.50. Payment from all countries must be in U.S. funds. Changes of address must be sent to R/C Modeler as well as to the local Postmaster to insure forwarding. Send old address with the new. Canadian circulation P.O. Box 3005, Vancouver, B.C.

COVER: Ken Dwight's spectacular Hawker Hurricane looks and performs like the full-scale prototype.

EDITORS MEMO

By DON DEWEY

THE SINGULARLY MOST SIGNIFICANT PRODUCT REPORT in the history of model aviation has just been completed by RCM. We have field tested — and proven — that a full-size bed mattress will fly at fifteen miles per hour!

I'm not sure how it all began, but this digital-computer, electronic-type editor of ours, known to his enemies as Don Mathes, was in the process of moving from one house to another. One evening he came rambling over to ask if yours truly would help him move a few small items to his new home. After making all the excuses I could think of for not moving a few small items, we went down and rented a trailer.

The trouble began when Don discovered he had forgotten the trunk key for his car. Thus, the rental attendant couldn't hook up the lights on the trailer, necessitating a somewhat devious route to our destination in order to avoid the local gendarmes. The "few small items" turned out to be two beds, two box springs, two mattresses, a vanity, stool, plate glass mirror, and a few small items.

Having concluded that the most evasive route back to his new house would be right down a major Pasadena boulevard, we were proceeding at fifteen miles per hour when one of the mattresses flew off the trailer. We were, at that time, directly in front of a high school, and with cars parked solid along the curb, there was nowhere to pull over.

You guessed it. Picture, if you will, a fully-grown magazine editor walking down the middle of a busy boulevard at ten o'clock at night with a mattress on his back trying to find out where the digital-computer type had parked the car. Add to this the fact that a group of the younger generation, attending a dance at the nearby high school, was trailing along behind making unsolicited comments appropriate to the situation . . .

Among some very outstanding and unique features scheduled for forthcoming issues of RCM is Dal Moran's scale Ford Tri-Motor. There have been many articles and plans for the famous Tin Goose, including one that is currently being presented in another model publication. We hope that all of these features on this famous ship will serve to whet your appetite for one of the finest construction articles ever published. Dal, a member of the BIRD's club of Long Beach, California, is currently preparing the plans and article for the Tri-Motor — one that has created wide-spread interest across the county. Unlike many of its published predecessors, this model is fully scale and has logged an enviable airtime — a true tri-motor that uses all three motors during flight. The pictures you will see prior to the publication of the article are of the prototype, sans most of the scale detail, built to prove out the RC characteristics of this ship. Details for the article are almost overwhelming—coming from various parts of the world, including on-location shots of a Tri-Motor at the TallMantz Air Museum. This is one worth waiting for — a ship to please even the most demanding scale enthusiast, construction-wise and flight-wise.

Among the many features planned for RCM readers in coming months is a report on RC activities in Russia directly from the U.S.S.R. This report has been arranged by your editor through the cooperation of the Novosti Press Agency and the Soviet Embassy, and will be presented in the interests of international RC activities.

Another upcoming feature is one we're going to keep under wraps for a couple of issues. We can guarantee, however, that it will be the most interesting and unique feature ever presented in this publication — or, perhaps, in any model publication. You'll like this one.

(Continued on Page 56)

Contestants at the Fourth Annual Fly-For-Fun Invitational Rendez-vous sponsored by the Remote Control Association of Central Florida.

SUNDAY FLYER

by Ken Willard

"Take away a man's dreams and from then on he ceases to live; he merely exists."

This is the first issue of Radio Control Modeler in 1965. Sure — because of the peculiar nature of the American publishing business, this is called the "February" issue, even though issued in January. But since it is the first issue in the new year, I thought it would be appropriate to talk about your dreams and plans — and mine — for 1965.

I was going to publish one of mine — the "Schoolgirl" — in this issue, but it seemed to me that to start off 1965 I should talk about the hopes and plans of you Sunday fliers.

Dreams? Certainly. You have them all planned for 1965. This is the year you're going to do all those things you didn't quite get around to doing last year. You're going to build that perfect scale model, or that kit that you bought last June, or maybe — just maybe — you'll screw up your courage, throw caution to the winds, and design and build your own creation — that sleek, streamlined, beautifully proportioned and wonderfully controllable speedster that has been taking shape in your mind's eye. This is the year you're really gonna **move.** At least that is your dream — and nobody can take it away from you.

Recently there was a television program called "The Other World of Winston Churchill." It emphasized the high importance which Churchill placed upon his hobby activities. He never permitted them to interfere with his statesmanship; rather, he interjected a hobby into his life whenever he felt the need to withdraw momentarily and get a fresh perspective on his weighty problems. In doing so, he achieved another world of challenge and acccmplishment.

Well, I contend that that is precisely what you Sunday fliers do. Unfortunately, the artistry of radio controlled models — or any other model aircraft, for that matter — has not received general public acceptance as a cultural expression of artistic ability. Thus, when you design, build, and fly your model, too many people still look at your efforts as "playing with your toy airplane." How ignorant they are! Your artistry may be rudimentary — a simple kit — or advanced, — an orginal design — but it is fully as creative as any other art form. There are painting kits for beginners too, you know.

There's another aspect to the Sunday fliers and our hobby which doesn't apply to Winston Churchill and his painting. Most of us will never achieve a fraction of the recognition which he earned; he is unique in that respect. We do our work — at whatever level we have been able to achieve — and like to think that we are useful members of society, even though recognition of our efforts is not always completely satisfying.

But when you leave your office, store, work bench, laboratory, farm building, tugboat, truck, police beat, stage studio, construction site, sewer canal, jet transport, drill field, stable — just to name a few of the thousands of occupations from which you Sunday fliers come, (I've received letters from fellows in all the above lines of work, plus others) — and go home to your own workbench, you're no longer just a cog (or a wheel) in an industrial, management, or governmental machine. No. You are at once a designer, electronic technician, equipment installer, constructor and assembler of radio controlled aircraft. And when your creation is finished, and you take it out to the flying field, you become a preflight systems checker and finally, test pilot of a radio controlled airplane!

Maybe you never thought of it that way. Consciously, anyway. But give it a thought. Look back for a moment. Remember the pride with which you viewed your creation, or maybe the slight feelings of remorse if you finished it and didn't put forth your best effort in some spots. Remember your nervous and shaky feeling on that first flight? You can't tell me that you didn't get pretty deeply concerned during the construction and test flying of your dream model. I've seen too many of you at the flying field, acting exactly like design engineers, manufacturers, and test pilots of full scale aircraft. Because, except for the difference in size, that's exactly what you are.

This, then, is **your** "other world" of challenge and accomplishment. It is artistic, scientific, and a source of satisfaction complete in itself, because you are wholly responsible for its success. And if you have a failure, you can look back analyze what went wrong, and try again — without having to get anybody else's "review and approval" of your action.

So, as you charge forth in 1965, you're going to be realizing some of those dreams of accomplishment, some of that recognition, some of that satisfaction of a creative job well done.

That brings up a good point. Make a resolution to yourself — and keep it — that you're not going to try any

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Masthead photo: No late comer to the flying game, Frank Justin is, at age 3, dressed for the field. Photo taken at home town of Riverside, Illinois.

SOLO

by Frank Justin

I don't want you to think that it is absolutely imperative that you rush out and buy a proportional rig — by being patient for just a few more hours, you could be in for the treat of your R/C life! I have decided to unveil my own proportional system!

This, of course, is not something one "just does," — it takes long planning and careful analysis. In my travels I have met most of the RC equipment manufacturers and have noted that a high percentage were human. It didn't take long to deduct that with someone to sponsor me I might qualify in the same category.

The first step is to get a really sharp electronics type man to make those block diagrams. I had to settle for a close friend of mine, a Mr. Hank Giunta. This makes it a little tough 'cause Hank really does know electronics, and he gets a little peeved when I don't grab on to flip-flops, half-adders, ring counters, and, or, nor and maybe gates and the like. But even without my understanding he was able to come up with a swinging rig. He has named it the "Digitalis 8." I really liked that name until I looked it up. According to Webster, "a medicine for stimulating the heart." Reeds are stimulating enough — what will this rig be like? To the eighth power, yet! Or in the Latin translation, "having to do with the finger" — this sounds more like what one might expect from good old Hank . . .

Well, I can tell that each of you is just dying for the specs on this new rig, so chew on this for a while:

Everything is in a plastic case so that there is never any fear that you'll wake up of a morning and see a magnetic flashlight sticking to your equipment! And that's only **one** feature!

The Digitalis 8 also has a 20 nome appleflyer that is base-gridded to the hot side for maximum stability in a high wind. This, coupled with the fact that it will run for twelve days on a fully regulated capacitator, makes it a very attractive green package.

The unit is also completely crystallized, and emits a dull brown light when the operator is properly loaded. I would like to say that the equipment is factory tuned, but I can't — we make them in a garage and it don't sound good to say "garage tuned." As a consequence, we merely ship them un-tuned and ask the proud owners to take their unit to the near-

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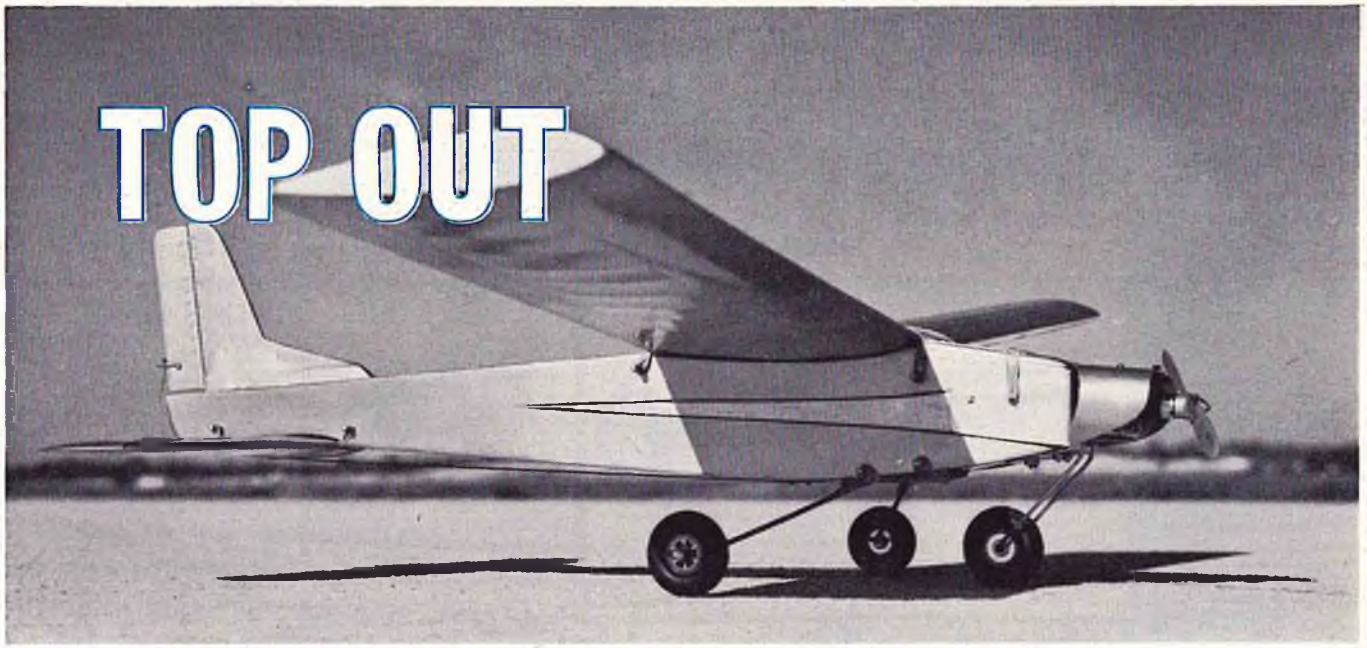

Bill McCormick's "Balsa Box Special"* — our candidate for favorite winter fun project. Strictly a pleasure to see on the graund or in the air. 'BBS' features original simple lines combined with beauty in Class I. 310 sq. in., .09 power, 30 oz., pulse, aluminum cowling and cheeks.

by jerry kleinburg

Houston Meet Sends Winners to Miami

Houston's Space City International Model Championships continue to lead a charmed existence. Held this year right after Thanksgiving, the Texas meet was blessed with two bright mild days. The wind, moderate on Saturday morning, trailed to a whisper in the afternoon and held that way for the rest of the meet — a real contest director's dream!

With coveted prizes and trophies at stake, competition was spirited, but the important action was surprisingly enough brought on by the juniors! While Open contestants produced a quality of flying equal to many previous contests this year, the juniors captured the fancy of the large crowd and demonstrated at this 1964 curtain ringer that the younger RC set is to be reckoned with in 1965!

Familiar to most readers is Dallas' John Jennings, current Junior Pylon record holder (1:10). By virtue of his all-around performance in pylon, scale, and multi, John was awarded, along with class I and III winners (Pete Petri and Pat Joiner respectively) an expense-paid trip to the King Orange meet in Miami. John, a 12 year old flier, who matches his flying skill with unusually good sportsmanship, will prove to be a personable and worthy junior representative.

Joining his father in the winners' circle was Carl Petri, 10 year old class I flier, who showed mature skill in negotiating his way to a 1st place trophy in Junior Rudder. Carl's a little guy, but performed big with his 4 foot multi-rudder Air-Conditioned Mambo. His smooth take-offs and flat pattern work drew special notice during the two day meet.

'Doc' Harr, Ben's 11 year old RC'er, took 2nd place behind Carl Petri and reflected the escapement skill his father helped him develop. 'Doc' is persistent, and determined to match his father's record. Attending contests with his dad literally since infant days, young Harr is no stranger to RC fans.

Also deserving of mention is Jerry Joiner, the junior member of the father-son Joiner team, and Bobby Woods, who gamely flew in a combined age group class II event. Bobby came to do battle with a Mark I equipped with Sampey 404!

Open class I action also included two pulse fliers: Paul Brown of Stillwell Okla. who is real happy with his new Min-X 800S (pretty-pretty) and Pou-voir actuated Septelle, and Bill McCormick, flying an original he calls the "Balsa Box Special." This MM powered gem housed a C & S Finch II and showed that the 8 months Bill has been RCing hasn't been wasted. After seeing the picture included with this column, it's a good bet our editor won't let the mail get out without a note to Bill for plans and details!

... wanted to include details of the Victoria fly-fest and the 1st Port Arthur contest — a fine group there — but I'll hold it to give it more space next month ...

Class I — No Alice in Wonderland

His license plate read Ohio, and he started the conversation with the query, "Oh, you fly those, too?" We were neighbors by chance having adjacent garage stalls during hurry-up repairs to our cars on an early Saturday morning, and the wing to my 4-footer had attracted his notice. (I had it along to razor-blade and sand the new balsa tips during the fuel pump and tune-up vigil I was keeping over my pink Buick!)

"Good idea, bringing along your work while watching the job getting done on your car", he went on.

"Sure thing", I agreed, then added,

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A How-not-to-do-it Article

The cowlings? They're fibreglass, and . . .

By DICK TICHENOR

So it's like I was telling myself that I' about an average model builder (Editor's definition: One blessed with very little talent, an abundance of laziness, plus an inclination to start vast projects with half-vast ideas) and am exposed to lots of good model builders with talent. So why not make the 'most of their know-how to solve a dreaded little chore that was staring me in the face — said chore was the need for two engine cowlings for monster-type scale RC job.

First of all, most of us have a terrific built-in noise discriminator that the new proportional manufacturers would love to install in their systems — this is the gadget that lets us hear only the sounds that we want to hear while rejecting all the other noise. It works great when you tell the guy with the fiberglass goodies of your simple cowling problem and ask for advice. Chances are he'll say something like "make 'em out of balsa!"

But that little ol' discriminator has done blocked out that noise — besides, you've already got it all figured out and only want encouragement. I've got news for you. You aren't about to get the words you hope for, friend, cause he's going to tell you to "carve a block to the finished size, lay up a female mold from this block, and then you can lay up a nice cowling inside that mold."

Okay — those words didn't get through, so you ask if you can't make that block a little undersized, lay up the glass cloth and resin on the outside, then sand it smooth. Old pro will have grasped the situation by this time and will tell you it can be done that way but you will have an awful lot of work to get a nicely finished job. Here again, only the selected words will get through.

Before long, it occurs to you that old buddy Phil Breitling had glass cowlings on his P-38, so why not try for the desired words from him. Sure — he made an undersized form block and layed up the material over it. Beautiful words, but that other noise just wasn't coming through. That other noise described the waffle felt carpet padding, the vacuum bag, the zinc chromate paste for sealing the bag, the intake side of the air compressor for suction, plus a few other odds and ends.

Similar conversations subsequently take place with several others who have gotten their feet wet in the stuff and you end up with the same preconceived ideas, e.g., (a) make the undersized block, (b) wrap it with glass cloth, (c) brush on the resin, (d) sand it, and (e) bask in the glory of having made that slick, lightweight, strong cowling. Sure it can be done, BUT — it's a long way from (a) to (e)! Those other guys were giving good advice.

Nevertheless, with this good old "don't bother me with facts, my mind's made up" attitude, we charge ahead to make a set of templates and carve the form block. No big deal, just lots of work. (In fact, a couple of balsa cowlings could have been carved in the same time!)

A first attempt with cloth (too thin, wrinkles from compound curves and Saranwrap, resin going off suddenly and sticking to cloth) calls for a little reconsideration. Now we try waxing the block and using glass mat instead of cloth. How about that! — you can stretch the mat around compound curves! Let's not mention the glass fibres flying around sticking to clothing, down the neck and over arms — you just ain't itched 'til you go this route!

Brushing the resin on the mat is no problem — only four hands are needed to hold the mat in place, plus another to brush on the gloop. An eyeball for each side of the block, another to watch the brush, and a fourth to keep check on the resin in the mixing cup, is kind of helpful.

. . . about that cup — how come the resin sets up in there but is still sticky on the block? Ah yes, it picked up some grease from the wax we rubbed on as a releasing agent. Setting overnight took care of that, so the next thing is to slip the glass shell off the block. The boys down at the pool room said it would slide off, and they are always right. Or are they?

This is only a hobby for relaxation and plaisure, so if you get a little frustrated, don't fight it. Get a beer and relax for a while and then try again. That's the answer — sure enough, it came loose about five beers later, but I'm not quite sure how!

Now I have my lovely little cowling . . . those rough spots will sand off . . . sure they will . . . and those millions of tiny glass particles that have penetrated my clothing and crawled into almost every pore of my body . . . the itching stops in about four days . . . only two shirts and two pants thrown away up to this point . . . so what if I sand all the way through occasionally, opening up air bubbles all over the place . . . a little resin will patch it all up . . .

In spite of everything I have that slick, tough, lightweight cowling that I had in mind at the beginning. If you want to know how I made the second one, just read this article through a second time, 'cause (ugh!), that's how it happened!

In all seriousness, fibreglass items are great. There are lots of good ways to make them as well as the way I went about it. If you get the urge to try it, listen to those that have learned the hard way. Time spent in making the proper molds will save lots of time and agony on the way to the finished product.

"The cowlings? They're fibreglass and — "

HAWKER HURRICANE

By KEN DWIGHT

Unquestionably one of the most famous fighters in the history of aviation, the Hawker Hurricane was evolved in the mid-30's to replace the biplanes which were readily becoming obsolete. From the time the first Hurricane prototype took the air in 1935 until Hawker's last delivery in September of 1944, more than 14,000 of these fighters saw duty, primarily during World War II, as fighters, dive bombers, night fighters, catapult and carrier based warplanes. By the outbreak of WW II, almost five hundred Hurricanes were in service with the RAF — by the onset of the Battle of Britain, thirty squadrons of the 325-mph ship were in service.

Although somewhat inferior, performance-wise, to the Lutwaffe's dread Me-109, the Hurricane's ability to withstand amazing amounts of punishment in combat, coupled with its excellent maneuverability, enabled its wartime record to be more than impressive.

Insofar as markings and armament go, the author would like to refer you to 'Hawker Hurricane,' published by Aero Publishers, Fallbrook, California, due to the fact that this book illustrates the infinite variety of combinations used on the more han 14,000 Hurricanes produced by Great Britain during WW II.

As to general specifications, the Hurricane had a maximum attained speed of 325 mph at an excess of 17,000 feet altitude. Gross weight was in excess of 7100 lbs. Service altitude ceiling was 36,000 feet with a climb of approximately 2200 feet per minute. Engine on the Hawker Hurricane Mark I was a V-design twelve-cylinder, liquid-cooled, 1025 h.p. powerplant developed and manufactured by Rolls-Royce-Merlin. The variety of armaments used included eight Borwning 303's in the wing; 4-20 mm cannons; 2-40 mm cannons, bombs, etc.

Insofar as the model presented here is concerned, it is almost fully-scale — its wide gear, thick wing, and excellent aerodynamic qualities giving it a flying ability that is truly outstanding. As a matter of fact, the prototype shown on the cover of this issue, and in the photographs accompanying this article, can truly hold its own in the Class III pattern.

Construction Details

Wing. Wing construction is straightforward and conventional, with the exception that it is built in three sections instead of two. First, build-up the straight flat centre section. Attach your gussets and braces to this section, then set it up on a wing jig at the proper dihedral. Jack up the outer trailing edge to give it approximately 3/8" washout at the tips — this will make for an extremely stable aircraft that has no tendency toward tip stalling.

The entire wing is sheeted with 3/32" sheet. The nylon horns on the ailerons are from the Top Flite parts package #10.

Fuselage. The fuselage construction is slightly unusual in the fact that the bottom is built first. Lay out the 3/8" square sringers and the 3/8" square spacers. These spacers will be removed when the fuselage is complete. Lay in the 3/8" x 1/2" motor mounts to fit your motor (spacing is shown for a Veco .45). Fill in around the motor mounts with 3/8" balsa sheet, leaving a space for your tank to fit between the bearers in the rear.

Install formers F3 to F14 and bottom of equipment box in order to form the wing saddle. Add the bottom rear keel piece between Former F6 and F14. This should be cut out of medium 1/8" balsa.

Lay the completed wing on the saddle, then fillet former F15 to flow evenly with the bottom of the wing. Now add the front nose block — this should be made out of soft balsa.

Once this assembly is rigid enough to take up, add formers F1 and F2 which can be of one piece. Now add the top half formers. Plank the front of the fuselage with medium 1/8" balsa sheet — the back half from the sheetline aft uses 1/8" x 1/4" stringers, using the stringer location chart. If Hobbypoxy is going to be used for a finish, the stringers could be of rock-hard 1/8" square. The wing fillet can either be made up of soft block, or built-up — I prefer the built-up version inasmuch as it is considerably lighter.

Stab and rudder. Stabilizer and rudder are built as shown on the plans, then sanded to shape and covered with 1/16" sheet. The rudder fin and elevator are silk covered.

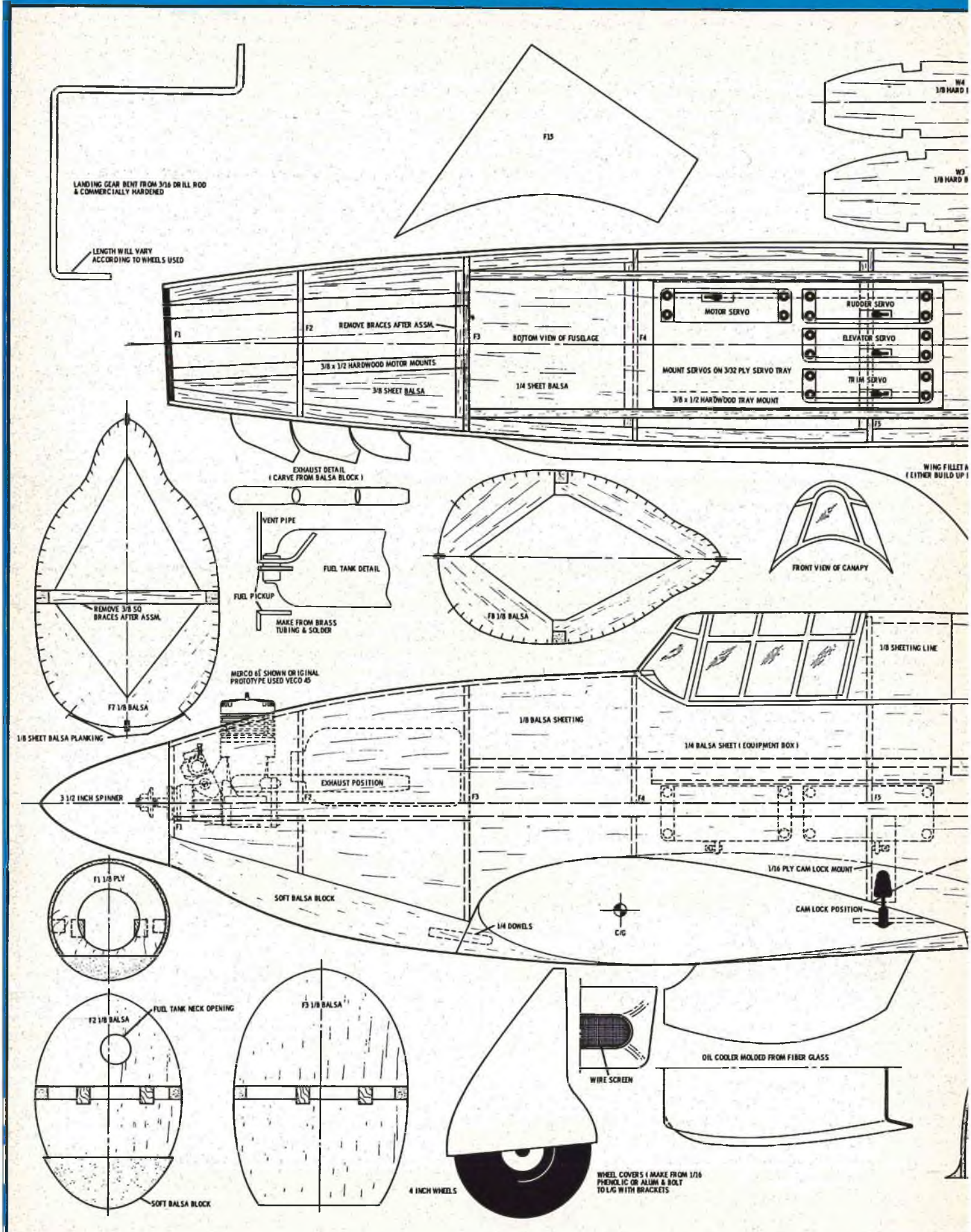
Under-the-wing-radiator. This unit was carved out of soft balsa from which a female mold was made and a fibreglass radiator formed. It was open both in front and back with a metal screen installed in front for added appearance. The model has always been flown with this assembly attached, and with no apparent ill-effects, although it must add a considerable amount of drag to the model.

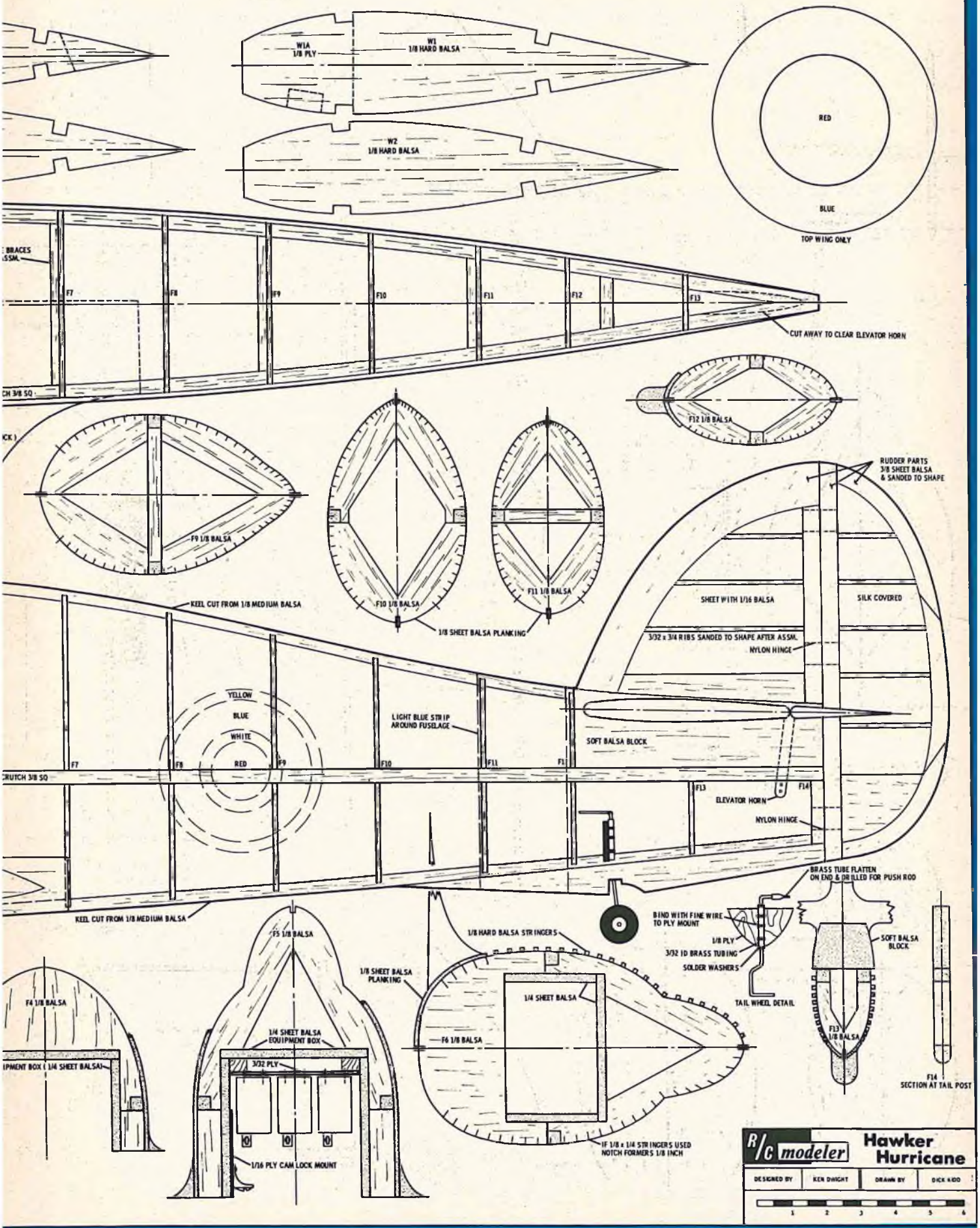
Undercarriage. The undercarriage was formed out of 3/16" drill rod, then commercially hardened.

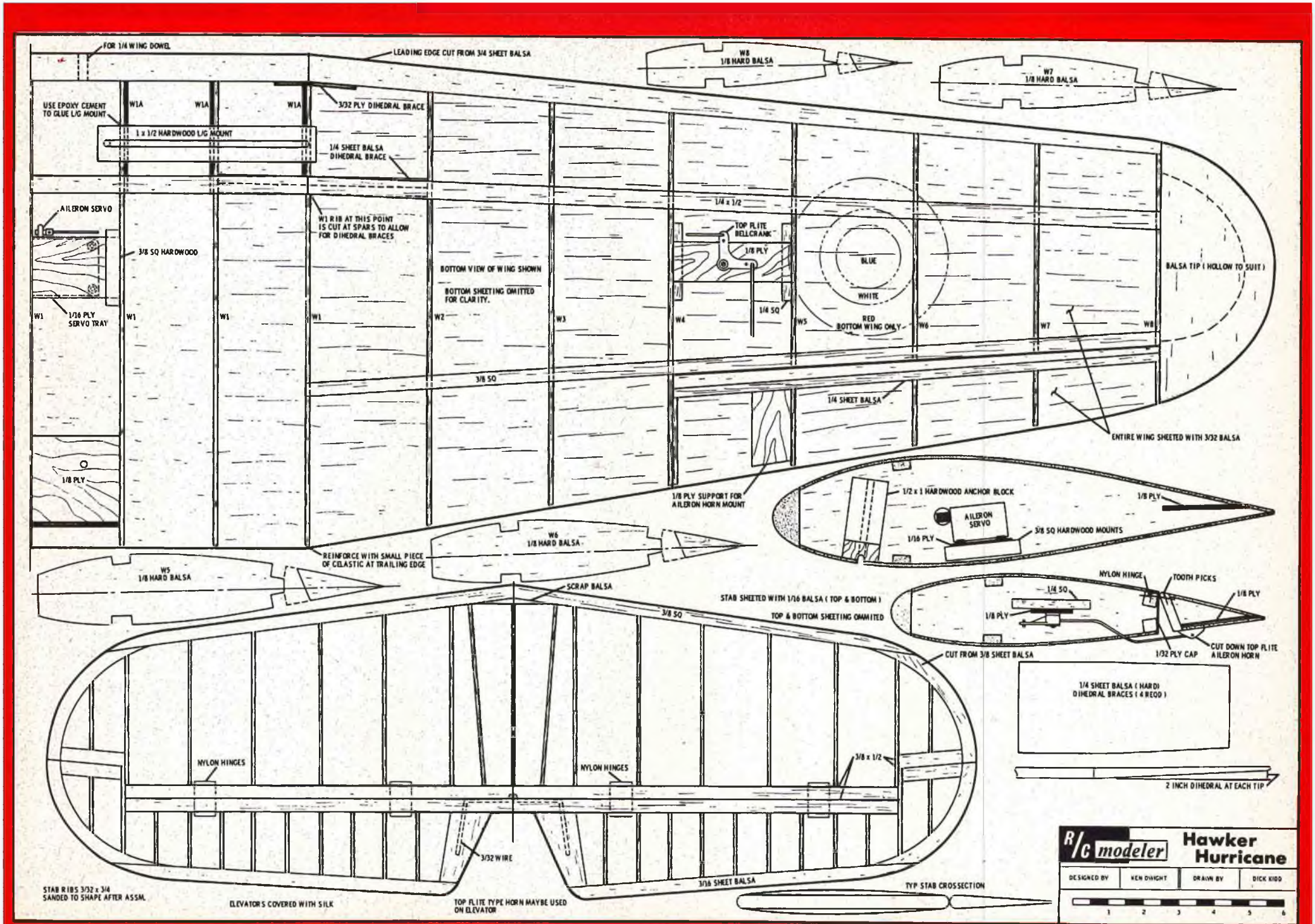
Finishing. The original model was completely finished with Hobbypoxy as per the manufacturer's instructions. This was applied with a Miller airbrush. The underside of the Hurricane was painted light blue — the camouflage was painted olive green and gray.

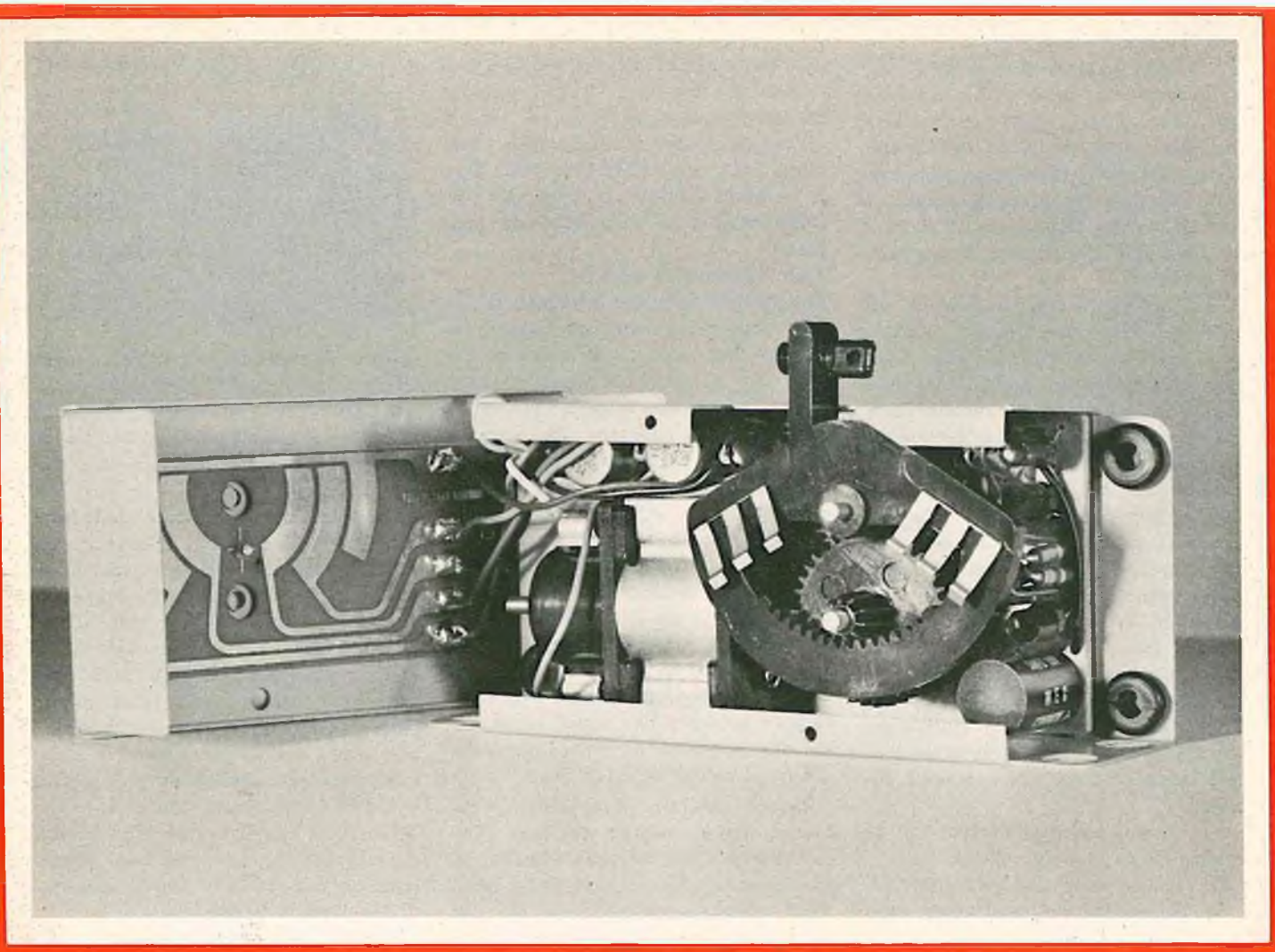
The completed model, ready to fly, weighed 7 pounds, 12 ounces.

Ken Dwight's Hawker Hurricane is an example of outstanding craftsmanship and scale fidelity with a design prerequisite of maximum flight performance.


LANDING GEAR BENT FROM 3/16 DRILL ROD & COMMERCIALLY HARDENED
LENGTH WILL VARY ACCORDING TO WHEELS USED
F13
W4 1/8 HARD
W3 1/8 HARD
F1
F2
REMOVE BRACES AFTER ASSM.
3/8 x 1/2 HARDWOOD MOTOR MOUNTS
3/8 SHEET BALSA
F3
BOTTOM VIEW OF FUSELAGE
1/4 SHEET BALSA
F4
MOTOR SERVO
RUDDER SERVO
ELEVATOR SERVO
TRIM SERVO
MOUNT SERVOS ON 3/32 PLY SERVO TRAY
3/8 x 1/2 HARDWOOD TRAY MOUNT
F5
WING FILLET
(EITHER BUILD UP
EXHAUST DETAIL
(CARVE FROM BALSA BLOCK)
VENT PIPE
FUEL TANK DETAIL
FUEL PICKUP
MAKE FROM BRASS TUBING & SOLDER
F8 1/8 BALSA
FRONT VIEW OF CANOPY
REMOVE 3/8 SQ BRACES AFTER ASSM.
F7 1/8 BALSA
1/8 SHEET BALSA PLANKING
MERCO 61 SHOWN ORIGINAL PROTOTYPE USED VECO 45
1/8 BALSA SHEETING
1/8 SHEETING LINE
1/4 BALSA SHEET (EQUIPMENT BOX)
EXHAUST POSITION
3 1/2 INCH SPINNER
F1 1/8 PLY
SOFT BALSA BLOCK
1/16 PLY CAM LOCK MOUNT
CAM LOCK POSITION
1/4 DOWELS
C/G
F2 1/8 BALSA
FUEL TANK NECK OPENING
SOFT BALSA BLOCK
F3 1/8 BALSA
4 INCH WHEELS
WIRE SCREEN
OIL COOLER MOLDED FROM FIBER GLASS
WHEEL COVERS (MAKE FROM 1/16 PHENOLIC OR ALUM & BOLT TO L/G WITH BRACKETS


W1A
1/8 PLY
W1
1/8 HARD BALSA
W2
1/8 HARD BALSA
RED
BLUE
TOP WING ONLY
F7
F8
F9
F10
F11
F12
F13
CUT AWAY TO CLEAR ELEVATOR HORN
F12 1/8 BALSA
F9 1/8 BALSA
F10 1/8 BALSA
F11 1/8 BALSA
1/8 SHEET BALSA PLANKING
KEEL CUT FROM 1/8 MEDIUM BALSA
RUDDER PARTS
3/8 SHEET BALSA
& SANDED TO SHAPE
SHEET WITH 1/16 BALSA
SILK COVERED
3/32 x 3/4 RIBS SANDED TO SHAPE AFTER ASSM.
NYLON HINGE
YELLOW
BLUE
WHITE
RED
LIGHT BLUE STRIP
AROUND FUSELAGE
SOFT BALSA BLOCK
F14
ELEVATOR HORN
NYLON HINGE
KEEL CUT FROM 1/8 MEDIUM BALSA
BRASS TUBE FLATTEN
ON END & DRILLED FOR PUSH ROD
BIND WITH FINE WIRE
TO PLY MOUNT
1/8 PLY
3/32 ID BRASS TUBING
SOLDER WASHERS
TAIL WHEEL DETAIL
SOFT BALSA
BLOCK
F13
1/8 BALSA
F14
SECTION AT TAIL POST
F5 1/8 BALSA
1/8 HARD BALSA STRINGERS
1/8 SHEET BALSA
PLANKING
1/4 SHEET BALSA
F6 1/8 BALSA
F4 1/8 BALSA
1/4 SHEET BALSA
EQUIPMENT BOX
3/32 PLY
1/16 PLY CAM LOCK MOUNT
IF 1/8 x 1/4 STRINGERS USED
NOTCH FORMERS 1/8 INCH
R/C modeler
Hawker
Hurricane
DESIGNED BY
KEN DWIGHT
DRAWN BY
DICK KIDD
1
2
3
4
5
6


FOR 1/4 WING DOWEL
LEADING EDGE CUT FROM 3/4 SHEET BALSA
W8
1/8 HARD BALSA
W7
1/8 HARD BALSA
USE EPOXY CEMENT
TO GLUE L/G MOUNT
W1A
W1A
W1A
3/32 PLY DIHEDRAL BRACE
1 x 1/2 HARDWOOD L/G MOUNT
1/4 SHEET BALSA
DIHEDRAL BRACE
AILERON SERVO
3/8 SQ HARDWOOD
W1 RIB AT THIS POINT
IS CUT AT SPARS TO ALLOW
FOR DIHEDRAL BRACES
BOTTOM VIEW OF WING SHOWN
BOTTOM SHEETING OMITTED
FOR CLARITY.
1/4 x 1/2
TOP FLITE
BELLCRANK
1/8 PLY
BLUE
WHITE
RED
BOTTOM WING ONLY
1/4 SQ
BALSA TIP (HOLLOW TO SUIT)
W1
W1
W1
W1
W2
W3
W4
W5
W6
W7
W8
1/16 PLY
SERVO TRAY
3/8 SQ
1/4 SHEET BALSA
ENTIRE WING SHEETED WITH 3/32 BALSA
1/8 PLY
1/8 PLY SUPPORT FOR
AILERON HORN MOUNT
1/2 x 1 HARDWOOD ANCHOR BLOCK
1/8 PLY
AILERON
SERVO
1/16 PLY
3/8 SQ HARDWOOD MOUNTS
W6
1/8 HARD BALSA
REINFORCE WITH SMALL PIECE
OF CELASTIC AT TRAILING EDGE
W5
1/8 HARD BALSA
SCRAP BALSA
3/8 SQ
STAB SHEETED WITH 1/16 BALSA (TOP & BOTTOM)
TOP & BOTTOM SHEETING OMMITED
NYLON HINGE
TOOTH PICKS
1/4 SQ
1/8 PLY
1/8 PLY
CUT FROM 3/8 SHEET BALSA
1/32 PLY CAP
CUT DOWN TOP FLITE
AILERON HORN
1/4 SHEET BALSA (HARD)
DIHEDRAL BRACES (4 REQD)
2 INCH DIHEDRAL AT EACH TIP
NYLON HINGES
NYLON HINGES
3/8 x 1/2
3/32 WIRE
3/16 SHEET BALSA
TYP STAB CROSSECTION
STAB RIBS 3/32 x 3/4
SANDED TO SHAPE AFTER ASSM.
ELEVATORS COVERED WITH SILK
TOP FLITE TYPE HORN MAYBE USED
ON ELEVATOR
R/C modeler
Hawker
Hurricane
DESIGNED BY
KEN DWIGHT
DRAWN BY
DICK KIDD
1
2
3
4
5
6



An RCM Special:

THE TRANSMITE SERVO

A Complete Service Reference by

HANK GIUNTA • BILL CAMPBELL • BILL NASH • MAJOR DAVID HATFIELD

During the past few years the Bonner Transmite Servo has unquestionably established itself as the most widely used servomechanism for multi channel reed installations. In the November 1963 (Vol. I. No. 2) issue of R/C Modeler, appeared an article and accompanying repair chart concerning the care and feeding of these radio control workhouses. Since that time, we have published several items pertaining to the operation and servicing of the Transmite. These various items have elicited a steady stream of mail from RCM readers requesting a complete "do-it-yourself" Transmite service article.

In answer to your requests, we are presenting this feature, consisting of a partial reprint of the original Transmite service article by Hank Giunta WA6QEX; a description of the circuitry and principles of operation by Bill Campbell of the McDonnell R/C Club (RCM Vol. I, No. 11); plus a new article on the reconditioning of the Bonner servo motor by Bill Nash; and an excellent feature on the construction of a very practical and useful Transmite Servo Test Console by Major David Hatfield, Base Operations Officer at Walker AFB. This combination of material, edited into one complete article, will enable the reed flyer to maintain his Transmite servos in perfect working condition.

The Transmite Servo: Mechanical Service & Repair

Probably the most widely used single piece of R/C equipment, and yet the least understood, is the Bonner Transmite servo. How many of us take that little box for granted, seldom, if ever, bothering to inspect and clean it, or to proide the normal maintenance it deserves?

In most cases the Transmite will give excellent performance without such care, but it is certain that it was not intended to be used in this manner. With a little effort on our parts, the life of the servo can be greatly extended, and at $30 each, the savings can be very rewarding.

The first consideration is the mechanical condition of the servo. If there is excessive bind, caused by improper gear mesh, bent cases, etc., the amplifier is forced to work much harder than necessary in order to make the servo move. This results in higher battery drain, greater power dissipation in the output transistors, and a general loss of power at the control surface where it is needed the most.

The maintenance procedure can be broken down into five steps:

1. Disassembly and cleaning.
2. Visual inspection of gears, case, and amplifier.
3. Repair of amplifier, if necessary.
4. Reassembly and mechanical adjustment.
5. Operational checkout.

After removing the servo from your individual installation, remove the grommets from the case. This makes the subsequent removal of the amplifier and case cover much easier. Take out the two sheet-metal screws which hold the cover on the servo, and carefully remove the cover by first sliding in an upward direction, the end opposite the motor. This enables the cover to move enough so that it can be removed from the motor side. Be careful not to exert too much force at this point in order to avoid breaking the wires from the amplifier board which are connected to the switch plate in the cover.

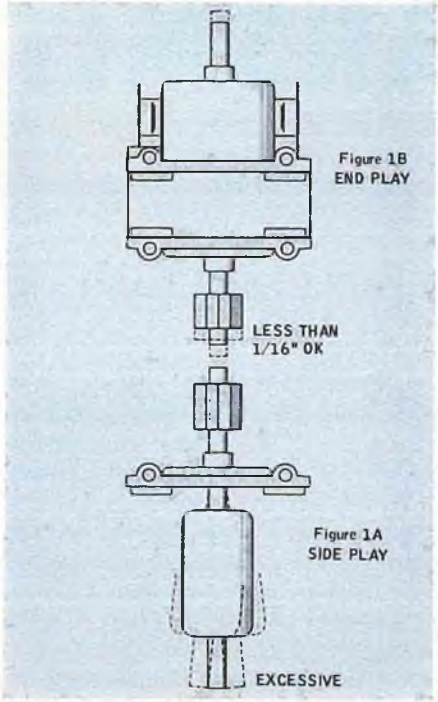
The next step is to remove the sector gear, being sure **not** to lose the two washers which ride against the switcher board in the cover. If you only see one of them, you will find the other stuck to the switcher board. This may be an indication of mechanical bind, so keep this in mind during reassembly. Remove the other two gears and spacer washers. It is a good idea to keep all parts in a suitable container as they are removed.

Remove the three screws holding the motor and amplifier to the bottom of the case, and carefully slide them out of the case. The motor will have to be lifted slightly upwards, and partially rotated, to clear the two gear posts.

The Transmite Servo: Reconditioning the Bonner Motor

If your servos are not running as fast as they used to, it could be the first sign of potential servo trouble. If the motors are drawing too much current, the transistors are working unnecessarily hard and may fail under a heavy starting load. Drag in the oilite bearings is the most common cause of motor failure. Attempts to lubricate with light machine oil is only a temporary measure and can be successful only if the motor is thoroughly cleaned. This may be done more easily by the use of Q-tip (cotton swab on a stick), soaked in radio-TV control cleaner solvent. The latter is recommended inasmuch as it does not leave a film of residue when it dries.

Before carefully disassembling the motor, mark magnet position. The complete magnet assembly can be removed as a unit if caution is used. Swab metal particles out of the end bells with the soaked Q-tip and use a string (or Q-tip shaft) to clean inside of the brush holders. A pencil eraser is then used to clean the face of the armature commutator. Now, use an X-Acto blade to remove the dirt from between these segments. Be careful not to leave a sharp edge on these segments. A thin strip of solvent-soaked cloth is then used to clean and polish the armature end shafts, shoeshine method. A small vise is helpful in order to hold the armature for this operation.



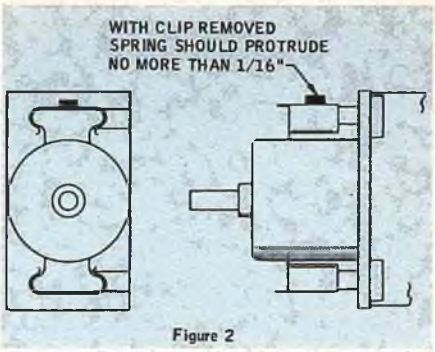


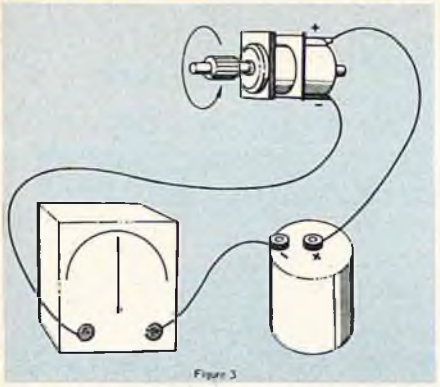
Figure 2

Now insert the armature shaft back into the bell housing. (See Fig. 1). Place flat on the workbench and mark the centerline of the shaft. Mark extreme sideward slop in both directions. If in excess of one shaft diameter, replacement is indicated. Because the bearing and other major parts (except for springs, brushes, and clips) are not available from the manufacturer, substitution of Pittman Oilite Bearings (part number 15-1 for .092 shaft) may be made by driving the old bearing nut and then gently reaming out the hole for a press fit of the slightly larger O.D. of the new bearing. If the bearings are not worn out, it may be possible to restore their lubricating ability by boiling in castor oil.

Reverse the disassembly process and take care that the magnets are replaced in the original position. A pair of tweezers is handy for picking up small parts. If not available, however, pick up the springs by the side, not endways, with your fingertips, as they will invariably spring off into space to be lost forever!

Brushes should slide freely in their holders with no gumminess to bind them. Spring tension increases brush wear. Check brush height as per Fig. 2. It should be no more than shown, and will work well with less. Brush springs are **not** adjusted to proper length by the factory. Compress as needed. If trouble is encountered in replacing the clip over the spring, the spring is still protruding too much.

With the motor completely reassembled, apply 1.32 VDC to the clips as shown in Fig. 3. The motor should start immediately and run at a good clip in a clockwise direction. Run for several minutes in order to seat the brushes. This is necessary even if they have not been replaced with new ones.



Insert a milliameter, set to the 500 Ma scale, in series with the battery and motor and note the current drain. It should be no more than 225 ma, and preferably, around 180 ma. If the bearings need lubrication, place a small amount of light sewing machine oil on each end of the shaft with the motor running. A marked increase in RPM will result, with a corresponding decrease in current drain, if the oil was needed. This decrease in drag and current drain is what we've been looking for. Put the motor back in the servo if the current cannot be reduced to less than 225 ma — the output transistors will not stand the added drain caused by the load of the motor driven control surfaces.

If the drain cannot be reduced any more with the foregoing methods, the only thing left to do is to have the motor remagnetized. This can be done at any slot racing track that has the remagnetizer. The cost will generally be about 50c per motor. Check polarity again, and if the motors run the wrong way, turn the entire magnet assembly over so the top is the bottom, and vice versa.

By following the above directions and exercising reasonable care, any PM motor can be put into top condition. The cost of replacement of the motor makes it worth the effort.

The Transmite Servo: Reassembly

Assuming that the servo was operating satisfactorily before the cleaning and service, you are now ready for the reassembly of the unit. A small brush and a cloth moistened in isopropyl alcohol will enable you to thoroughly clean the inside and outside of the servo case. Be exceptionally meticulous about cleaning the gear posts, as grit on these parts will wear down the pylon gears.

Place a **light** film of oil on both gear posts, then place a small washer on the crown gear post, followed by the crown gear itself. Slide the amplifier and motor into the case (don't forget the insulating board under the amplifier), and replace the two screws which hold the motor. Do not tighten these screws yet. Line the motor up so that its shaft is in line with the crown gear post, then tighten the motor screws. Check for smooth mesh between the pinion and crown gear. Differential tightening of the motor hold-down screws will enable you to make slight adjustments in gear mesh. Mount the amplifier securely with the small screws.

Reassemble the spur gears on their respective posts, then slide the cover in place. If the method used for disassembly is reversed, the cover will go on with no trouble. Be certain that the two large washers do not get knocked off the gear posts while installing the cover. Gently pull back the slack in the wires through the grommet, and secure the cover with the two sheet metal screws. If you have done everything correctly, the servo is ready for service.

The Transmite Servo: Amplifier Circuit Operation and Repair

If the servo was inoperative at the onset of the general maintenance and cleaning, or motor reconditioning, and the trouble did not reveal itself during the preceding service (broken wire, etc.), the amplifier will have to be checked. First, however, it is important that you have at least a basic understanding of the function and operation of the Transmite amplifier.

An important link in the resonant reed bank multi system in use is the servo amplifier. The amplifier receives an average of 3 ma of pulsed DC current from a reed and must amplify this signal to over 1 ampere as required by a starting, or stalled, servo motor. The amplifier is necessary because the resonant reed cannot handle the required 1 ampere motor current for any length of time before it would become pitted or even welded inoperative.

Prior to 1961, the most commonly used amplifier was a SPDT (single pole-double throw) relay. In 1961 Bonner introduced his Transmite servo amplifier which replaced the relay type amplifier with solid state circuitry which has proven to be much more reliable, vibration resistant, and trouble free. A slight cost increase, less space required, and nearly the same overall weight of the control system is also noted.

The schematic, shows the electronic interconnections of the components which make up the Transmite amplifier. Electrical connections are shown by conspicuous dots. Wires are color coded as they appear in the Transmite servo. A (C) by the color code means the wire is found in the cable exiting through the grommet at the motor end of the servo. An (SW) means the wire is attached to the switcher board located inside the cover of the servo. An (AMP) means the wire ties to the "L" shaped amplifier board from the component shown.

The amplifier board illustration shows the approximate component location as viewed from the component side of the amplifier board.

The switching board shows the arrangement of the printed circuit switches and the spring finger wipers (W1 & W2) which comprise the travel limit switches and neutral return switches required by the amplifier The wipers are mechanically tied together, but are electrically isolated. See the quadrant output gear in the Transmite for details.

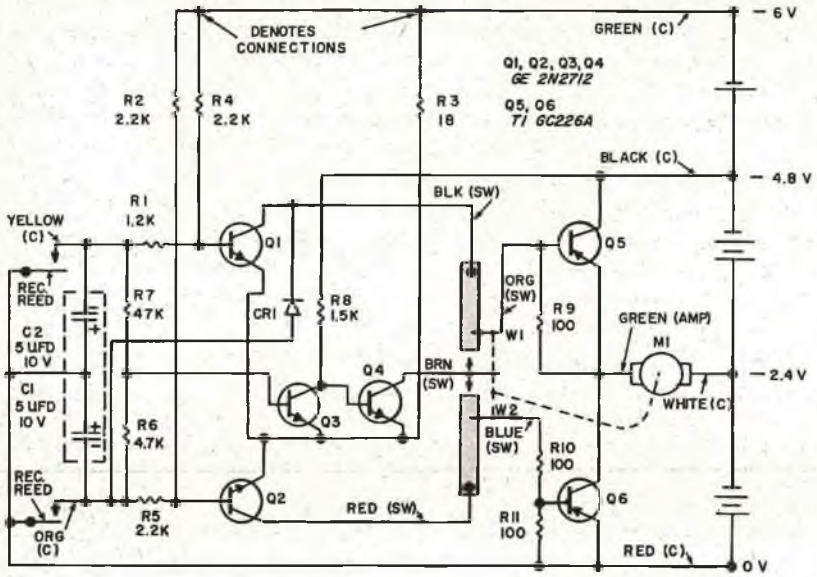
The transistor identity shows the lead location of various transistors which have been used in the Transmite amplifiers since their introduction. All transistors are viewed as though you are looking at the top of the transistor case with the leads extending down and away from you.

All sketches were developed from a 1963 manufactured Transmite and uses the transistors called out in the schematic.

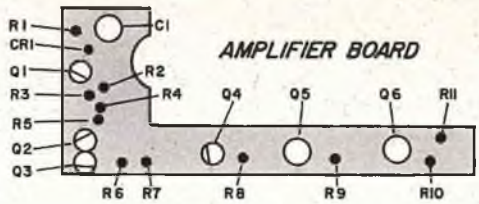
Earlier Transmites used either the Sylvania 2N306 or 2N229 in place of the 2N2712 and used the Philco 2N223 in place of the TIGC26A. They did not contain CR1, this prevents damage in case both input reeds are closed at the same time diode, or R10. R3 was 47 ohms and a 2.2K resistor was tied between 0 volts and the junction of the emitters of Q1, Q2, Q3 & Q4. R1 was 2.2K and C1 and C2 were two separate capacitors housed individually instead of being in a common case.

DC pulses, when received on the yellow signal wire from a resonant reed, are filtered by C2 & R1 for 1; and by C2 and R7 for Q3. DC pulses, when received on the orange signal wire, are filtered by C1 & R5 for Q2 and by C1 & R6 for Q3. Q3 conducts when either the yellow or orange wire is carrying a signal and cuts off neutralizing transistor Q4. Q4 is normally

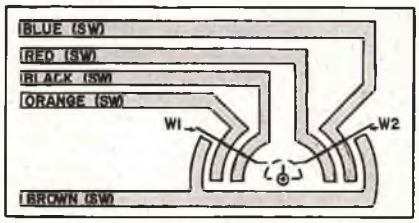
BONNER TRANSMITE SERVO SCHEMATIC



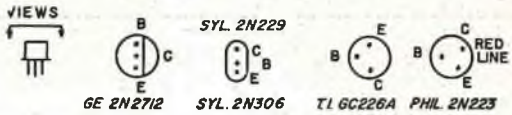
SCHEMATIC



AMPLIFIER BOARD



SWITCHING BOARD



TRANSISTOR IDENTITY

turned on (no signal) and supplies base current (approx. 50 ma) to either Q5 or Q6 to neutralize the servo when no signal is coming in on the yellow or orange signal wires. Q1 amplifies the filtered 3 ma signals which arrive on the yellow signal wire and supplies approximately 50 ma to the base of motor power transistor Q5 which in turn supplies up to 1 ampere to the motor. Q2 amplifies the filtered 3 ma signals which arrive on the orange signal wire and supplies approximately 50 ma to the base of motor power transistor Q6 which in turn supplies up to 1 ampere to the motor. Of course the direction of motor rotation depends upon whether Q5 or Q6 is conducting. R2 and R4 bias Q1 and Q2 off when no signals are incoming on the yellow or orange signal wires. R3 limits the current which Q1, Q2, Q3 & Q4 carry and also helps R1, R2, R4, R5, R6 & R7 to keep Q1, Q2 & Q3 cut off at higher temperatures, since any leakage current passing through R3 increases the reverse bias on Q1, Q2 & Q3. R8 is the load resistor for Q3. R9 & R11 bias Q5 & Q6 off during neutral conditions and are especially helpful at higher temperatures. R10 limits Q6 base current.

SYMPTOM	PROBABLE CAUSES	VERIFICATION
Servo drives in one direction only. Does not neutralize.	(1) Broken orange or yellow wire. (2) Defective TR1 or TR2. (3) Broken orange or blue wire from TR5 or TR6 to switcher board.	A, B, C, E, F
Servo drives in one direction only and neutralizes.	(1) Broken orange or yellow wire. (2) Filter capacitor open or broken loose from board. (3) TR1 or TR2 defective.	A, B, E, G
Servo drives in both directions, but will not neutralize.	(1) You may be attempting to obtain neutralizing action from a trim servo. (2) Outermost contact fingers on sector gear not making contact with switcher board. (3) Brown wire to board broken. (4) Defective Flip-Flop.	
Servo drives in both directions, but is much faster in one direction.	(1) Batteries not charged, or one cell weak. (2) Low gain in driver or output transistors. (3) Leaky output transistor (opposite side).	A, B, B
Servo does not drive, and heavy load is placed on batteries.	(1) Orange and yellow wires shorted together. (2) Two reeds driving at once, attempting to drive servo both ways at once. (3) Shorted output transistors. (4) Shorted driver transistors.	A, B, D, E
Servo drives when orange or yellow wire is touched directly to +6V supply (red wire) but will not drive from vibrating reed.	(1) Filter capacitor open. (2) Reed contacts dirty.	Clean reed contacts A, B, G
Servo drives in one direction without a command, and stays at full throw.	(1) Shorted filter capacitor. (2) Shorted driver transistor.	A, D, E, H
Servo drives hard in one direction and does not stop at full throw. (Usually results in a bent case).	(1) Shorted output transistor.	D

Test procedures for the Transmite amplifier consist of the Transmite Service Chart and accompanying verification procedures, plus the use of the Transmite Servo Test Console. Test procedures are listed A, B, C, D, etc., on the chart. The latter should be used as follows:

1. Locate the trouble you are experiencing in the **Symptom** column.
2. Under the column **Probable Causes,** read the information given, and make whatever visual checks you can.
3. Under the **Verification** column, you will see groups of letters — these letters designate the procedure to be used, and in what order to use them. Be sure to follow the order given.

In order to complete the circuits for these tests, the sector gear switch fingers must be making contact with the switcher board in the cover. A simple way to accomplish this is to place the shank of a #42 drill through the hole in the sector gear and the servo cover, using a clothespin to hold the gear against the switcher board. It is recommended that a separate sector gear be purchased for use in this manner, in order that the original sector gear switch fingers will retain the proper factory tension adjustment. Neutral positioning of the sector gear may be ascertained by visually locating the sector gear at center, and checking the position of the switch fingers on the switcher board.

The Transmite Servo: Service Console

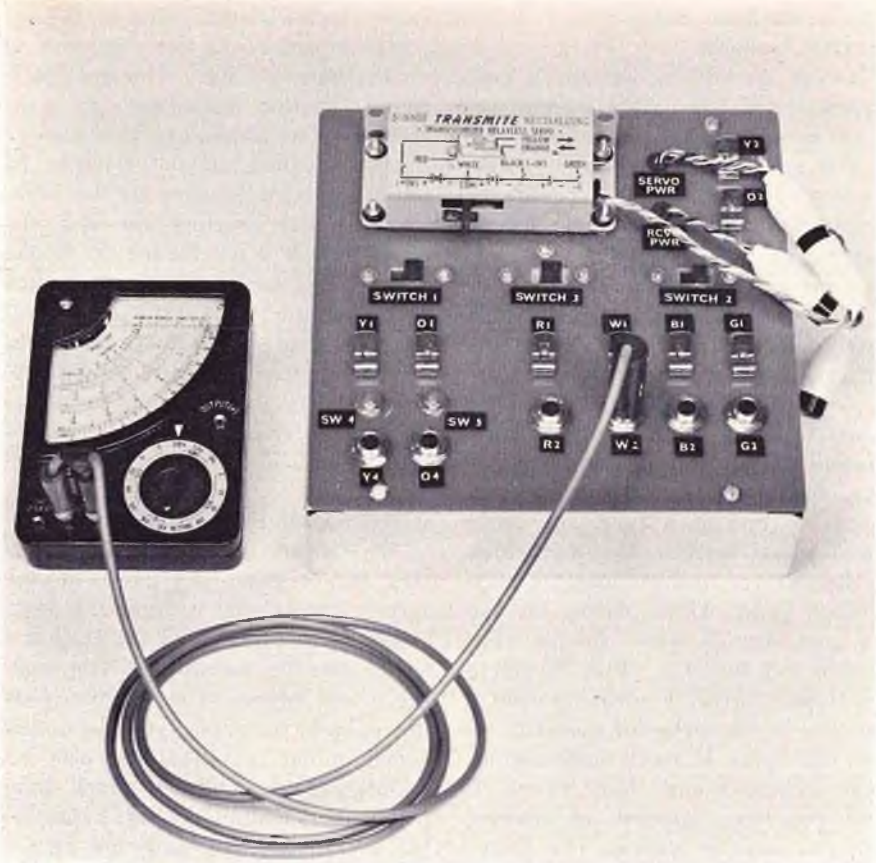
Insofar as the Test Console is concerned, and if you decide to construct it, the list of malfunctions one is able to determine from the tester is dependent upon his technical knowledge and understanding of the Transmite design. The console is designed for use with any good standard multimeter.

As an example in using the Test Console, let's assume that a Transmite runs one way only and centers, as per the second symptom on the Service Chart. By mounting the servo on the Console and plugging it into the Servo plug, then depressing Switch 4 and Switch 5, one at a time, the servo should run either way. If it does, hook up the receiver to the Fahnstock clips by color coded wires, placing the yellow and orange wires in the clips marked 0-2 and Y-2. With Switch 3 closed and Switch 1 open, transmit a signal to check servo for operation in both directions. If it still malfunctions, open Switch 3 and close Switch 1. Now you have injected an external capacitor into the system. The Transmite should operate both ways on signal. Trouble — a bad, or broken, capacitor. With a meter in Y-4 or 0-4, you will read about 3 ma when depressing Switch 3 or Switch 4. Using the transmitter, you will read only about one-half ma.

As another example, assume that the servo drives one way but does not center and will not drive in the opposite direction, as per Symptom #1 on the Service Chart. This trouble is usually spotted immediately as a defective drive transistor. This can be readily verified on the Console by setting your multimeter on the 0-500 ma scale and inserting into W-2. Depress Switch 4 or Switch 5. If the meter reads backward, throw Switch 2 to the other side. The meter will normally read 250-300 ma. (Readings over 300 ma in R-2, B-2, or W2 usually indicate that your motor is in need of cleaning or replacing). No reading will be noted on the dead side of the servo. If you open your servo and attach the top of the case to the Console, then apply the quadrant output gear (the unit with the spring fingers) to its centered position, you will be able to use your meter to measure the voltage. The reading is not important at this time, but the polarity is. Once you determine which motor wire carries plus or minus, you can determine which drive transistor is malfunctioning. Example: Q5 carries positive while Q6 carries negative in the green wire.

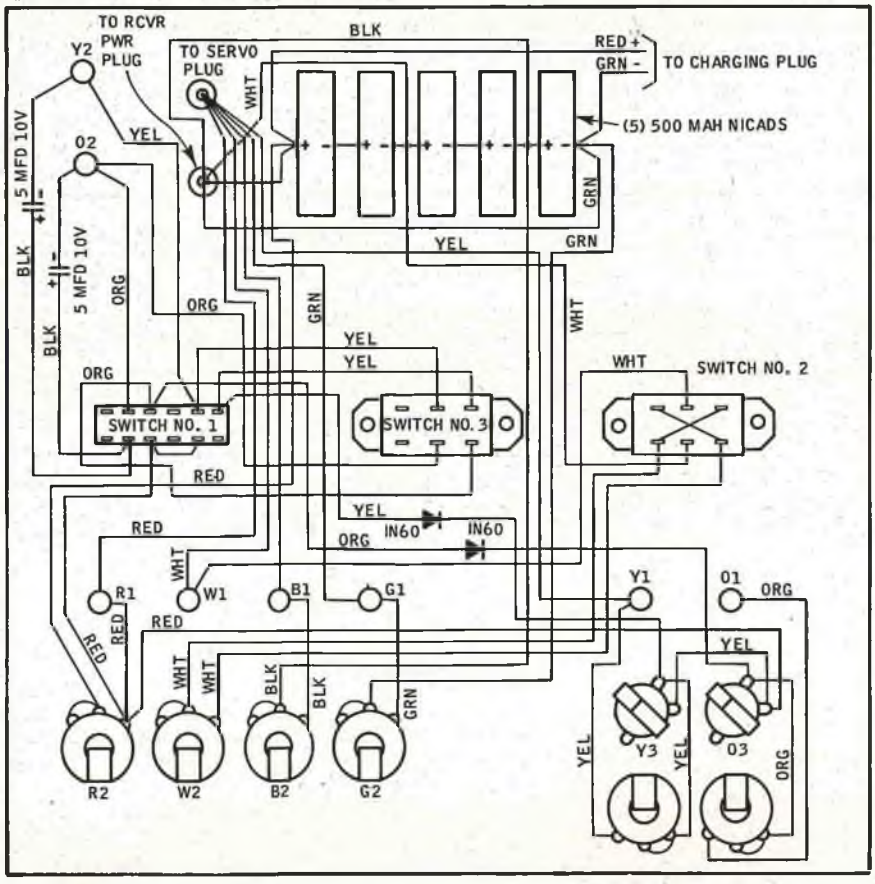
Although the above two examples are the most common malfunctions, others may occur such as the servo failing to drive either way. Most commonly, this is caused by a broken wire at the motor post. Again, a servo may drive one way and return, but not drive the other way. Immediately, you

TRANSMITE SERVICE CHART	VERIFICATION PROCEDURES (FOLLOW CHART ORDER)
A.	Set sector gear to neutral (no rotation of motor).
B.	Apply power.
C.	Temporarily connect a 47 ohm resistor from the base of TR5 to the —6V supply (green wire). If the transistor is okay, the motor will run as long as the resistor is connected. If the motor does not run, replace TR5. Repeat this test on TR6. The motor should run in the opposite direction as long as the resistor is connected. If the motor does not run, replace TR6. After replacement, verify proper operation by making the test once more.
D.	Short the base of the conducting output (TR5 or TR6) to its emitter. If the trouble is in a *previous* stage, the motor will stop. If the motor does not stop, replace the output transistor.
E.	Connect the base of TR1 to its collector with a temporary jumper. The motor should run. If it does not, replace TR1. Repeat the test on TR2. After replacement, if any, repeat the test. The motor should *stop* when the jumper is removed. If not, replace TR1 or TR2.
F.	Check Flip-Flop circuit by manually rotating the sector gear slightly off neutral. If the flip-flop circuitry is okay, the motor will run. Check both sides of neutral, ascertaining that the motor changes its direction of rotation when the sector gear is moved from one side of neutral to the other. If the motor does *not* run when the above test is done, proceed with the following tests: (1) Disconnect batteries. (2) Rotate the sector gear to either side of neutral. (3) Unsolder TR3 and remove from board. (4) Reconnect power: The motor should run. If it does, replace TR3. If it does not, replace TR4. If the motor still doesn't run when TR4 is replaced, the 1.5K resistor which connects the base of TR4 to the —4.8V supply (long black wire) is probably open. (5) As a final check, temporarily connect a 4.7K resistor from the base of TR3 to the +6V supply (red wire). The motor should stop. If it does, the flip-flop is okay.
G.	If the filter capacitor is open, the servo will operate for all these tests, but will *not* operate when it is driven from a vibrating reed. Temporarily connect another capacitor (15 uf) across the unit on the board and check for proper operation. Observe polarity.
H.	Disconnect power and remove one filter capacitor. Reconnect power. If the motor does not run, the capacitor you have just removed is shorted and should be replaced. If the motor still runs, repeat the test with the other capacitor. If the motor still runs, the trouble is most likely a defective driver transistor.



The Transmite Service Console with multi-tester in place. Simple, efficient test unit.

Wiring the Console. Follow the point-to-point drawing and refer to full-size photos.



should know that both drive transistors are good. The problem lies most probably in Q2. Check it on a transistor tester and see if it doesn't leak badly.

Many other possibilities exist with the Transmite Console to determine various malfunctions of the servo, and you will discover them as you get used to using this simple but very useful tool. Along with the Transmite Servo Chart, the information given is more than adequate for most Transmite service problems.

Construction

Construction of the Transmite Servo Console is quite simple, and consists of several switching functions to test various operations of the Transmite Servo. In addition, plugs are provided for external meter readings at each function.

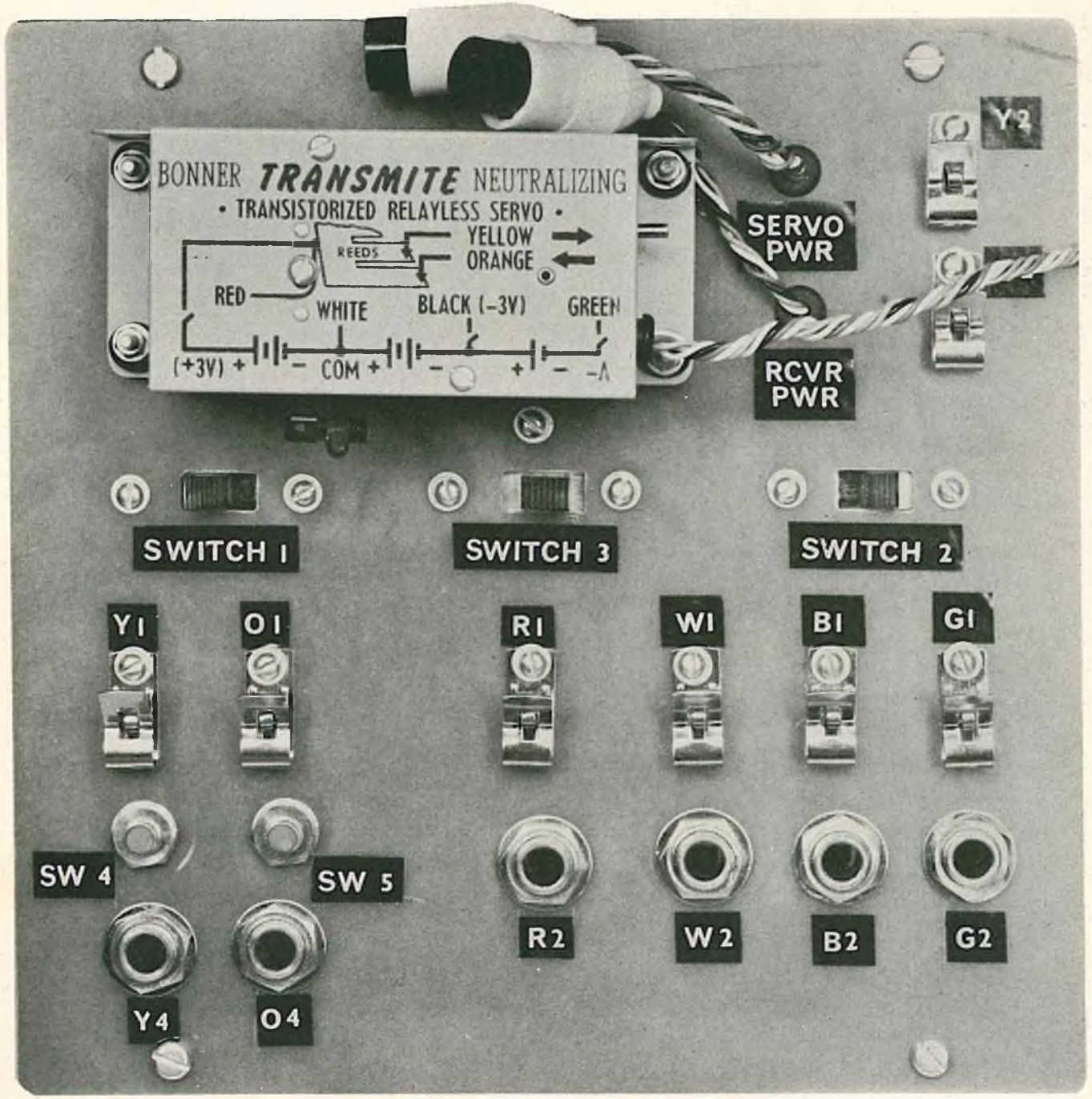
Parts List

1—7″ x 7″ x 2″ aluminum chassis
1—phenolic chassis faceplate, 7″ x 7″ x 1/16″
6—¼″ closed circuit jacks
1—DPDT slide switch (Switch #2)
1—4PST slide switch (Switch #1)
1—DSPT slide switch (Switch #3)
2—NO pushbutton switches (Switch #4 and #5)
8—Fahnstock clips
2—1N60 or 1N91 or other small current diodes
1—500 mah or 600 mah 6V nicad pack
3—Orbit connectors (or connectors you normally use in your multi installations)
1—phone plug for ¼″ jacks with 3′ shielded cable (for meter test)
2—jacks for meter connection
2—5 mfd 10V electrolytic capacitors
hook-up wire, 3-48 x ½″ machine screws, nuts, star washers, washers, sheet metal screws (#6).

Start construction by laying out the phenolic faceplate. Arrangement of the various fahnstock clips, servo and receiver plugs, phone jacks, and pushbuttons is up to the individual. The unit shown in the photographs has proved to be efficient and convenient. Mount the fahnstock clips with 3-48 machine screws and secure to the rear of the panel with star washers and nuts. Clip off the protruding end of the screws and make sure they are tight, as solder connections will be made to these mounting screws.

Determine the location of the Transmite servo that will be tested, then

TRANSMITE SERVICE CONSOLE: Front Panel

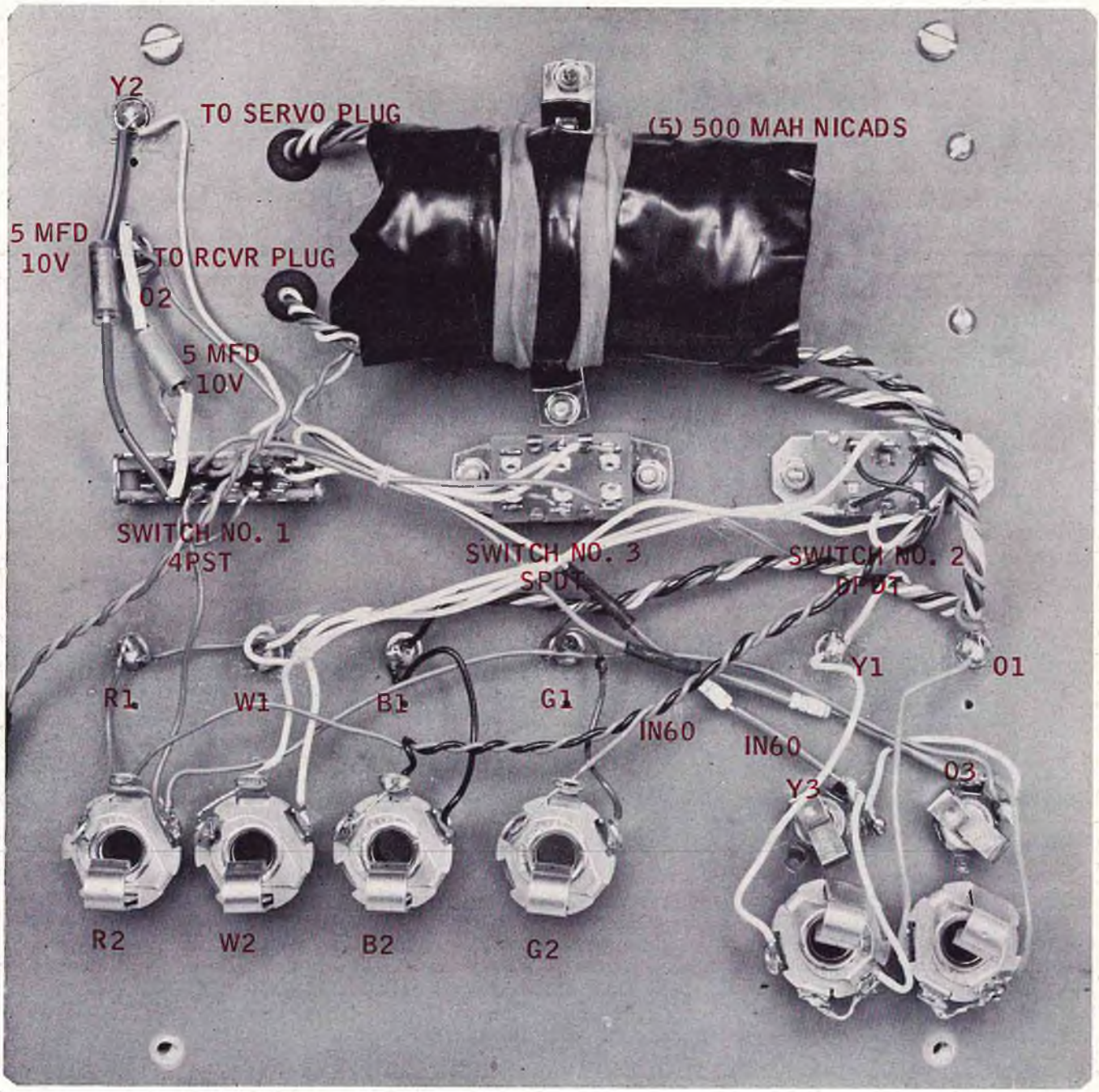


insert permanent mounting bolts for ease of handling the servo. Install the nicad pack directly under this area. Any type of hold-down may be used on the nicad pack — we simply installed two fahnstock clips and held the battery pack down with a double looped rubber band.

Point to point wiring of the Console is much easier if colored hook-up wire, corresponding to the clip or jack being wired, is used. As you will notice, each Fahnstock clip, and each plug, is labeled according to the color code of the wire from the receiver or servo — for example, Y-2 (yellow), 0-1 (orange), etc.

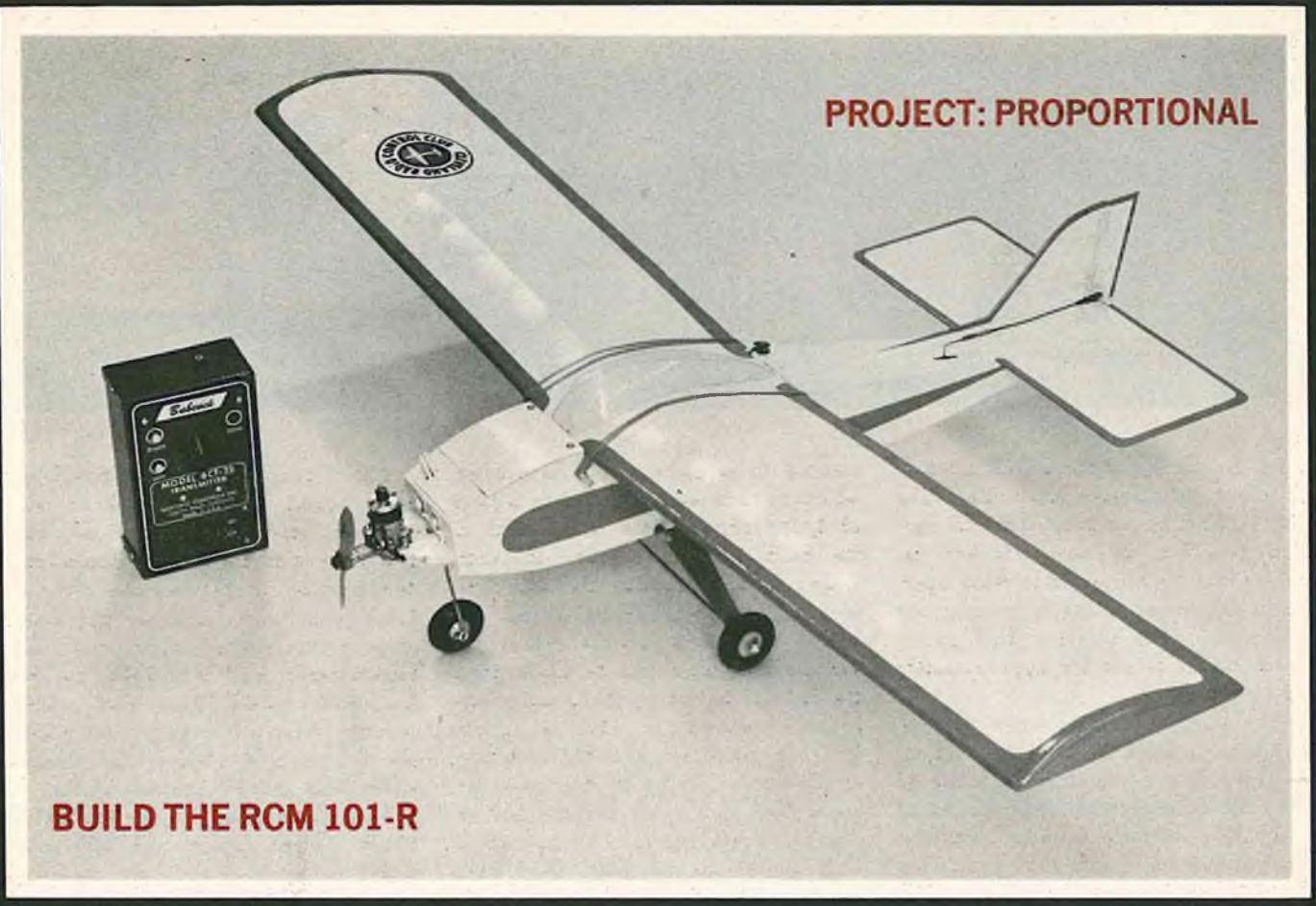
Following the schematic and the

TRANSMITE SERVICE CONSOLE: Rear of Panel



photographs, plus checking off each wire on the hook-up diagram will be of some help to those not familiar with electronic assembly. Another aid is to position all closed circuit jacks and pushbuttons in the same manner, to avoid having to check each lug on each unit to determine which wire goes where!

Mount the phenolic cover plate on to the aluminum chassis with 4-#6 sheet metal screws, and you're in business. The Transmite Servo Console will not only help you to determine wherein the trouble lies in a malfunctioning servo, but its construction will aid in a better understanding of the operation of the Transmite servo.

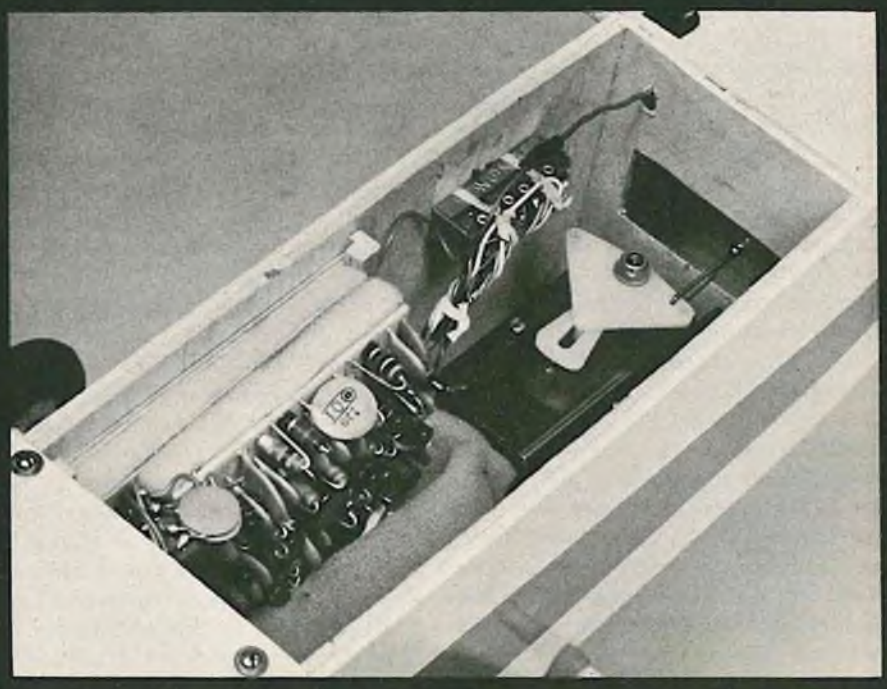


RCM's orange-and-white D.Q.A. 704 (enlarged 20%) complete with the RCM 101-R feedback proportional system. Prototype utilized Babcock BCT-22 transmitter, BCR-22 receiver converted to relay operation. O.S. Max .06 power. 29 ounces. RCM's Editor appears to be striking for membership in the Cleveland R/C Club!

Feedback Proportional For Rudder Only

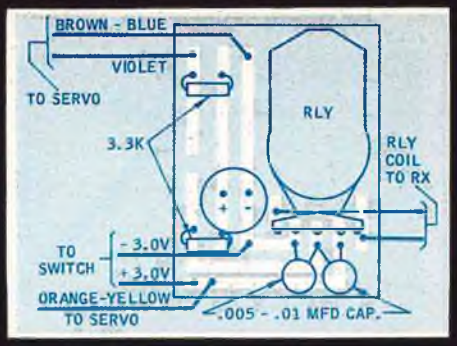
FIRST IN A SERIES OF PROPORTIONAL SYSTEMS FOR THE HOME CONSTRUCTOR

R/C Modeler's 101-R Proportional System is the first of a series of construction articles on feedback, or closed loop, proportional systems that will be presented during 1965. This very basic unit consists of an analog servo manufactured by Accutronics Engineering, an easily constructed filter network, and the conversion of a relayless receiver to relay operation. For our prototype, we used a Babcock BC-22 receiver and transmitter, converting the former to relay operation by incorporating a 500 ohm relay, arc suppression, and filter network on one simple add-on printed circuit board. This combination has worked out extremely well, the 6000



RT: RCM 101-R system installed. Babcock receiver and relay-filter network side-mounted. Accutrol Solo PR 101-3C servo with Camatrol adaptor.

Simple to construct, RCM's Feedback Proportional System for rudder only utilizes a relayless receiver, relay and filter network, plus Accutrol PR 101-3C Servo.



Printed circuit board and component layout — actual size.

c.p.s. frequency of the BC-22 offering excellent interference immunity. The RCM 101-R is not limited to this system however, as any relayless receiver may be converted to relay operation as shown in the accompanying schematics. The receiver and pulser used should be set for approximately 10-15 p.p.s.

The purpose of this series of construction articles is three-fold: first, to give you a better understanding of the basic fundamentals of proportional control by actually working with the design and construction of your own systems; second, to provide RCM readers with electronic construction projects of a practical nature well removed from the 'Mickey Mouse' realm; and third, to present a series of proven proportional systems that can be built by the average RC'er at a minimum of expense while providing a maximum degree of reliability and performance.

Since the mechanical construction of the servomechanism is always the most difficult part of a radio control system, RCM has selected the Accutrol Solo series PR101 as the feedback servo, available from Accutronics Engineering (P.O. Box 144, Linthicum, Maryland) at $40 each. Starting with one PR101-3C servo for the rudder only system, this same servo can later be utilized with the 101-RM construction feature for Class I proportional rudder, plus an additional servo for trimmable motor.

Insofar as the 101-R system is concerned, it begins with a relayless receiver, a pulser, the Accutrol Solo PR101-3C servo, a relay, and the few components necessary for the filter network. As mentioned, we used the Babcock BC-22 system, which was on hand from a previous product review, and which is furnished from the factory with a magnetic proportional actuator. The receiver was contact cemented to a piece of foam rubber, which in turn was cemented to a piece of 1/16" plywood the same width as the BCR-22 receiver, but sufficiently longer to accommodate the added relay and filter network PC board.

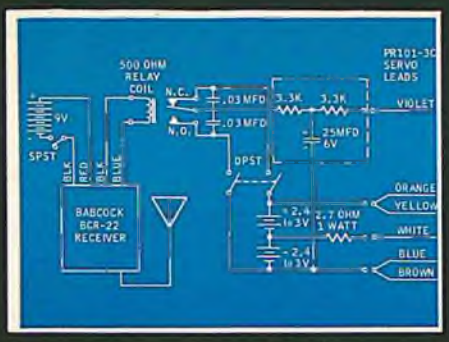
The PC board for the relay conversion and filter can be made from the full-size layout by the usual photographic method, or may be simply stripped out with a #11 X-Acto blade. If you are using the BCR-22 receiver, use a 500 ohm relay for the conversion from relayless to relay operation. Three wires are normally used from the Babcock receiver to the magnetic actuator — in this case, eliminate the one red wire, running the remaining two to the coil leads of the relay. Add the two disc capacitors to the relay for arc suppression. If you are using a three volt relayless receiver, use a 100 ohm relay, such as the O.S. If you intend to use a relay receiver, rather than convert a relayless unit for this purpose, simply omit the relay stage and use the filter network alone. The latter is required in the signal lead to reduce the sharp voltage swing, along with reducing the voltage. The available voltage in the signal lead at the servo should not exceed ± 0.8V. Many types of filters are possible, but the one illustrated is both simple and practical. The values of the two resistors and the single capacitor are average values for a system pulsing at a rate of ten pulses per second with ± 2.4V at the relay. For higher or lower rates, the value of the electrolytic capacitor may change. For higher voltages, the value of the two resistors must increase. If, on the other hand, your pulse rate is less than ten p.p.s. a second filter stage may have to be added, as shown in the schematic. Do not try to filter all of the pulse — the servo should have a slight dither as this will create an absolute neutral with no deadband.

After constructing the filter and relay board, or in the case of relay receivers, the filter unit alone, contact cement to the excess sponge rubber protruding beyond the receiver. Cable your wires and use the plugs of your choice where appropriate. The brown servo lead is -2.4V, the yellow lead $+2.4$V, blue lead -2.4V negative reference, orange lead $+2.4$V positive reference, white lead ground, violet lead ± 0.7V control signal.

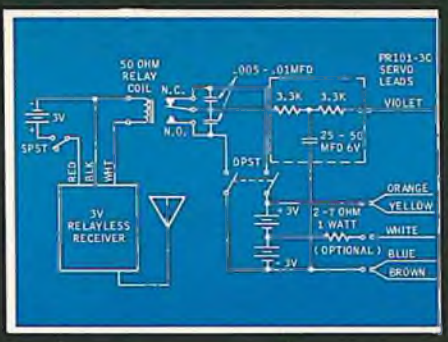
The battery supply for the RCM 101-R system consists of 600 maH nickel cadmium pencells for the servo power (4) and either two additional cells for a 3V receiver, or one 9V transistor battery for the Babcock BCR-22. The entire weight of our system as shown installed was ten ounces. The ship shown is the D.Q.A. 704 (December '64 RCM) enlarged 20% and utilizing an O.S. Max .06 engine.

The Accutrol servo is completely adequate for all sizes of aircraft, including the very largest. The weight of the servo alone is 3 ounces—thrust is over six pounds! — All up weight of the enlarged D.Q.A. was 29 ounces, giving a 14.5 oz/sq ft wing loading.

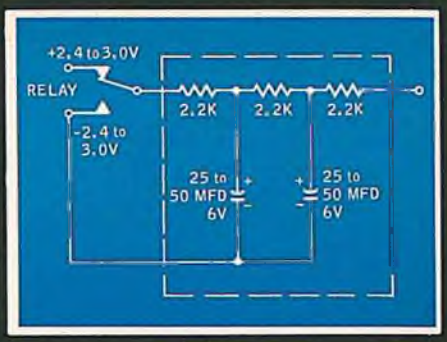
The neutral position of the PR101C servo has been preset at the factory, however, slight differences in systems, or the desire to operate with a different neutral, may necessitate repositioning this neutral. To accomplish this, connect the servo into the system and apply power, bringing the servo to electrical neutral. Remove power. Exercising care not to move the output wheel, remove the two screws holding the servo cover in place. Carefully slide the cover straight up and off, feeding the cable through the grommet. Without allowing the follower to rotate, place the small Allen wrench (supplied with the Solo) in the setscrew in the nylon follower and loosen it. Rotate the output wheel to the desired position and tighten the setscrew,



Babcock BCR-22 receiver with relay and filter add-on.



Relay and filter for standard 3V relayless receiver.



Suggested 2-stage filter for pulse rates slower than 10 p.p.s.

being sure to maintain position contact pressure on the feedback pot. When rotating the output wheel to its new position, the entire gear train must be turned, therefore the wheel will not turn easily. Finally, apply power to the system and check for correct position. Repeat the previous steps if necessary. Carefully replace the servo cover.

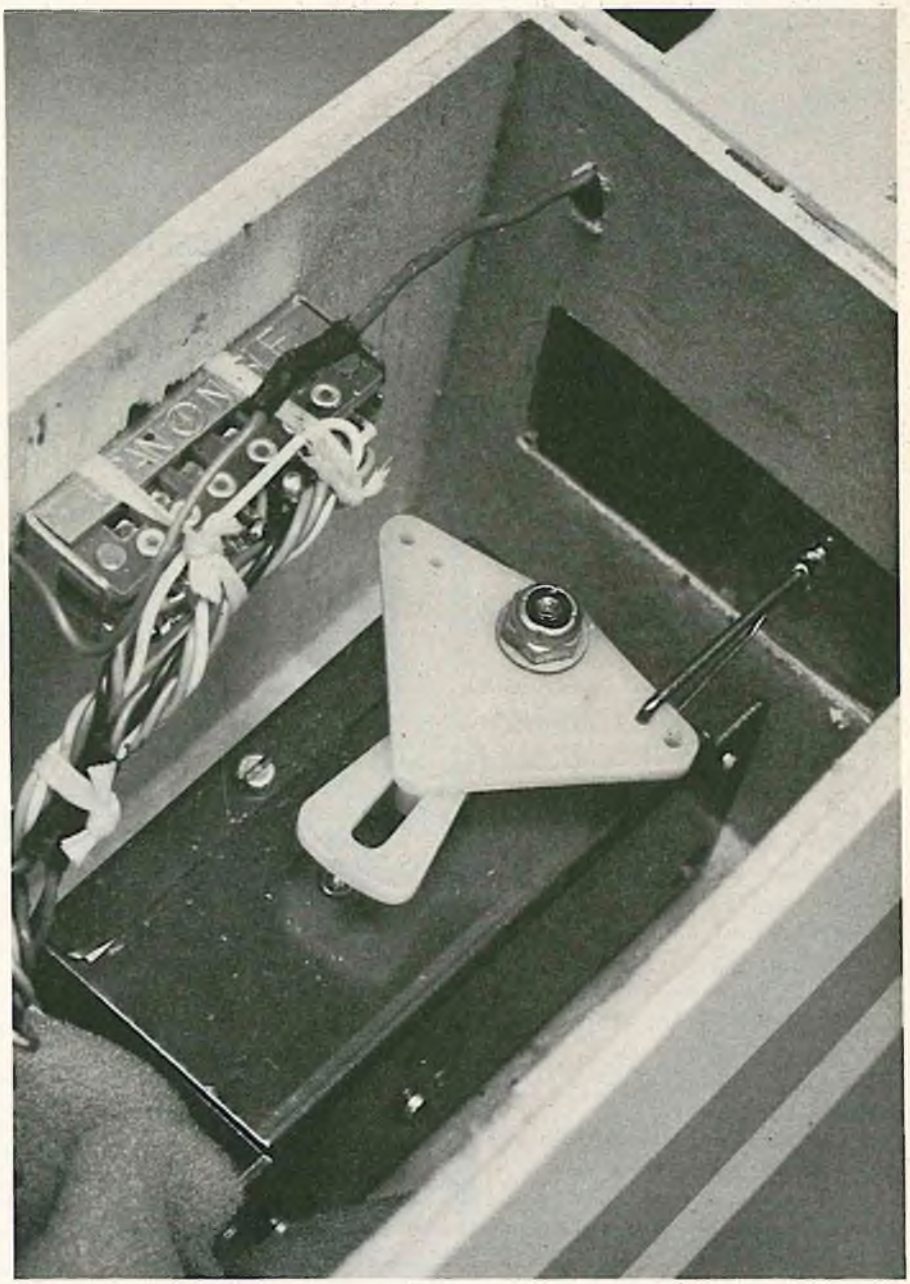
Should you desire a pre-determined control position with loss of transmitter signal (fail-safe), set this position instead of neutral. Then turn the transmitter on and adjust it to bring the servos to neutral. Turn the transmitter off, and the controls will return to the predetermined setting.

We installed the RCM-101R proportional system in the plane by mounting the Accutrol Solo in an upright position using a standard wire and dowel push rod with a wire keeper at the servo end and a DuBro Kwik-Link at the rudder horn. The BCR-22 receiver with attendant relay and filter circuit was mounted against the fuselage side, sliding in two balsa tracks on its plywood base. The battery supply was forward of the leading edge of the wing.

Control response was precise and powerful. The slight amount of dither in the servo was unnoticeable to the eye. Range and performance of the system was excellent. We feel you will enjoy working with the RCM 101R rudder only proportional system. It will be followed shortly by the RCM 101-RM for rudder and motor for total Class I sport or contest performance.

RCM's Editor's will be interested in hearing from readers who are following this series of construction features on proportional control.

Close-up view of the PR-1013C servo installed in the D.Q.A.



WATCH FOR THE RCM 101-RM IN PART II OF PROJECT: PROPORTIONAL

Left: Geoff Franklin checks all controls on his "Allegro" before flying. This is the model with reed equipment and retractable gear.

Right:, Geoff Pike gives his latest model a quizzical look before starting up. Taurus wing, original fibreglass fuselage and neat "Plane Jane" insignia on the fin. Note silencer on the Super Tigre. F and M proportional gear.

BRITISH R/C TEAM SELECTED

by Henry J. Nichols

Sunday the 11th of October saw the second of the Trials for the selection of the British Team for the 1965 World Championships which are to be held near Malmo, Sweden. It turned out to be a cold raw day, with early morning white fog so dense that the start of the contest had to be delayed for over an hour, and rain that seriously handicapped several of the competitors, causing one to crash badly.

The ten competitors were those who had made the ten highest scores on the first Trials, the final result being calculated on the best two out of three flights in the second Trial, plus the score of the best flight from the first Trial. This placed a premium on consistency as well as the ability to put

(Continued on Page 59)

Above: Frank Van Den Bergh checks his idle before take-off. "Stango" has parallel chord wing, narrow strip ailerons, and squarish lines. Large rudder area aids in spins. P. T. Waters assists.

Left: George Bradley with the model that crashed in round #2 due to rain getting into his F & M transmitter. Original "Scorpio" evidences some "Nimbus" influence.

Left: Chris Olsen about to start up for Round #2. New "Uplift" model has parallel chord wing with inset ailerons. Contestant Bradley is acting as Chris's mechanic.

Below: A smiling P. T. Waters prepares for the first round with Ed Johnson as his mechanic. Note the very large rudder area of his "Altair 2". A noticeably short nose moment, too.

Above: S. L. Foster with his Merco .61 powered "Nimbus" and Orbit gear starting his motor for round #1. Foster's father is his assistant and ardent supporter.

Right: The final standings and pertinent data on the British Team Trials for the 1965 R/C Internationals.

Contestant	Model	Motor & Prop	RC Equipment	Servos
Foster	Nimbus	Merco 61 Tornado 12-6	Orbit 10	Duramites Brooks amp.
Olsen	Uplift	ST 56 Tornado 11-6	F&M 10	Duramites Brooks amp.
Waters	Altair 2	Merco 61 Tornado 12-6	Min-X 10	Duramites Orig. amp.
Van den Bergh	Stango	Merco 61 Rev-Up 11-6	Orbit 10	Transmites
Bradley	Scorpio	ST 56 Tornado 12-6	F&M 10	Duramites Brooks amp.
Pike	Plane Jane	ST 56 Tornado 12-6	F&M Prop.	Bonner
Franklin	Allegro Original	Merco 61 Tornado 12-6	Franklin 10 Orbit Prop.	Duramites Franklin amp.
Knowles	Styrus	Merco 61 Tornado 12-6	F&M 10	Duramites Brooks amp.
Read	Interceptor	Merco 61 Tornado 12-6	Orbit 10	Duramites ED amp.

INTERNATIONAL Circuit

By Cliff Rausin

SWEDEN

Although we don't, as yet, have complete details on the Scandinavian Championships held in Sweden, we do know that the Swedish team entry was victorious, with individual honors going to Stephanson of Norway, Nordahl of Denmark, and Toennesen of Norway. A sidenote of this event was the fact that the good reed flyers were equaling the good proportional pilots in almost every respect!

Also from Sweden is a photo of Tommy Bennwik's R/ sailboat which captured third in a recent Regatta. Four channel reeds used for rudder and sail.

AUSTRIA

In a recent letter, Oskar Czepa mentioned that "he did some flying lately... on September 5th I flew to a new Austrian record, and I believe, European best time for RC Glider duration, with my 'Standard Austria.' It is already official with seven hours, one minute, and eighteen seconds. Was a little tired when I stopped flying due to darkness."

And that sounds like the understatement of the year... "a little tired." Whew!

SPAIN

In case you may wonder what a corner hobby shop looks like across the ocean, here's a photograph of the Resopal, S.A. hobby shop in Madrid, and R/C dealer specializing in continental and U.S. radio equipment and supplies. Note that wide expanse of showroom window!

FRANCE

American R/C Clubs and CD's take note: From Windy Kreulen comes the photo of a group of modelers who gave R/C demonstrations for the benefit of tourists and campers in Gerardmer. As you will notice, their "trophies" for this event came in the form of an excellent supply of French cognac! From left to right, Fritz Heeze (Germany), Chris Teuwen (Belgium), Walter Schmit (Germany), Jan Van Vliet (Holland), Jan van del Ley (South Africa), and Arend Van Der Burg (Holland). This may be the answer to U.S. contest participation!

HOLLAND

From Windy Kreulen in Holland comes the photograph of the usual group of Dutch modelers that fly at the Terlet Dutch Glider Centre. The favorite models of this group are the Tauri, Taurus, and Falcon. F & M and Orbit reed equipment used by the majority. Windy, by the way, also maintains a "service department" in his home workshop where he makes repairs and adjustments when required on U.S. radio rigs, Bonner servos, etc.

We have just received a copy of Windy's new book, 'Radio-Besturing,' a complete radio control handbook. Written in Dutch, this is an outstanding reference and text. We strongly recommend it to Dutch-speaking modelers around the world. Contact: E. Kreulen modelbouw, Goudsewagenstraat 4, Rotterdam, Holland.

IRELAND

The biggest boost for Irish RC activities may well be the 10-minute color film recently produced by Gael-linn and destined for screening on the Irish commercial circuit. It includes a goodly amount of radio control activity, both in-flight and bench shots, and stars Reggie Orr and Henry Dagg with their magic boxes. In the supporting roles is one Smog Hog, a Cruiser, and a Taurus. The latter, incidentally, was a smash hit—fortunately on grass! Background music was supplied by an O.S. 35 with superimposed "pee-po-bee-dee-dee" from the field monitor, adding to the authenticity. Now there is an idea for the next bull session — use a prerecorded tape fed to the transmitter for the perfect pattern flight with, of course, a fully compensating thermo-whatsit activating the ancilliary grawble-swivel for variations in wind strength.

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THE FRENCH NATIONALS

France's team for the Internat's: Casson, extreme left, Marrot, fourth from left; Plessier, fifth from left.

Team member Plessier with Orbit single stick proportional and Taurus.

Marrot, starting the Super Tigre .56 on his "Lucifer"

Coulommiers, France. The French 1964 National RC Championships, held thirty miles from Paris on October 2 and 3rd also marked the selection of this country's 1965 Internats team.

On Saturday, the first day of the two day eliminations, multi and single gliders along with single channel motor-powered aircraft were flown around the triangular circuit. On Sunday, both Multi Novice and Expert were contended. All contestants were pre-selected on the basis of their three best contests during the year.

All of the multi-channel flying was accomplished with reed systems, although the well-known French RC pilot, Plessier, performed a demonstration flight with an Orbit single-stick proportional system in a Taurus. Of the reed gear competing, there were units representative of several U.S. manufacturers, including Orbit, Kraft and F&M. Other relayless systems included O.S. and Radio-pilote, the french system produced by Marrot. Two homemade systems also competed.

In the Expert Multi division, Marrot, for the third consecutive year, was first with his Lucifer II, the latter a modified version of Fritz Bosch's 2nd place 1963 Internat's ship. Power was supplied by a ST .56.

Second place in the Expert category was captured by Plessier with his Super-Filochar, with Veco .45 and home-made radio. Casson was third with a Taurus, Veco 45 and Kraft 10 combination. Fourth place was taken by Nicol with a Taurus-Veco combination and F&M 12-channel reed rig. Point spread from first to fourth place was 3214 to 1478.

In the Novice classification, Casson was first with a Taurus and Max .49, and Orbit 10. Second was Bossard with a Taurus-Veco combo and another Orbit 10. Fontaine was third with a Taurus, Veco .45, and O.S. 10. Gros was fourth with his Floride design, O.S. 29, and home made radio. Point spread was from 2204 to 1234.

In the single channel category, this year's Nationals marked the last year for this class of competition. After takeoff, it is required that the model make the triangular circuit in one direction, then in the opposite direction. The lowest time is first with additional points given for good landings in a 50 meter circle. In 1965, French competition will be divided into Class I, Class II, and Class III Novice and Expert along the division lines of U.S. competition.

By CLAUDE BERNARD

RCM SPECIAL REPORT

THE IRISH NATIONALS

By John J. Carroll

Baldonel, Ireland. The 1964 Irish Radio Control National Championships were held at Baldonnel Military Aerodrome, September 19-20. Single and Intermediate classes were run off on Saturday with a high wind playing havoc with the majority of entrants. Ken Boyde (UMAC) repeated his Ulster Nat's success in Single with his Taifun 2.5 powered 'Robot,' the only single channel model that made any attempt at wind penetration. Henry Menary (UMAC) placed second flying a modified "Sliver." Engine was a venerable radial Elfin 2.49, circa 1949! Jim McDowell, also of the Ulster MAC, made A.P.S. happy by placing third with an AM .15 powered 'Lumpers' and McGregor radio gear.

The Intermediate Class (single channel, any application) was conspicuous by the seeming disinterest in motor control, with few models entered appearing to be designed for this class. Johnny Evans, (SMFC), flew his well-worn Strader-designed 'Shiner' into top honors, using a C&S Pulsitran and Septalette actuator, while Jack Parker (UMAC) used a Kraft receiver to operate a GG setup in his OS 'Pet' .09 "quickie." By virtue of his takeoff points, RCM's Editor in Ireland placed third! Overall conditions were against the small models from the very start, and any attempt at pattern maneuvers ended down-wind! A well-earned word of praise to those why **did** fly!

Saturday evening found the RC fraternity, complete with wives and etcetera(?), completely ensconsed in the Powers Royal Hotel, wining and dining — which helps explain the sudden rash of sunglasses on Sunday morning which dawned bright and clear — almost ideal for the single channel events held the day before!

The multi channel competition saw two unhurried flights for each contestant. Highlight of the days flying was the demonstration given by Roger Hargreaves of the Rolls-Royce Club whom the MACI had invited over for the weekend. Hargreaves, with an Orbit 10 controlled and Super Tigre .56 powered Taurus really carved up the air, leaving us with the thought that if this was reeds, what must proportional be like! All through the weekend the RC boys plied Roger with questions. Illustrating that "it" can happen to anybody, a stuck elevator servo caused the Taurus to splash most comprehensively on the grass at the end of the second flight!

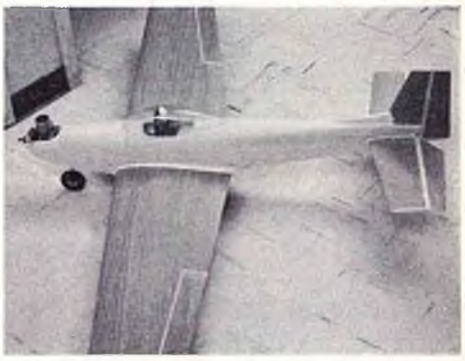
With only a slight wind, the standard of multi flying was high, although it was noticeable from the scoring cards that the consistently lowest marks were awarded by one judge — Roger Hargreaves! There's a clue there, somewhere!

The win of Loudon Blair (UMAC) was the most popular at the Irish Nats. Flying his well-proven 'Sultan,' he was right on form. In addition, his home built radio equipment never missed a beat. Benn Hunter (UMAC) flew a Grundig 8 'Navigator' into a good second place, and the very fast 'Soraco' with Grundig gear, piloted

(Continued on Page 55)

RCM PRODUCT REPORT

Woodcraft Introduces Mahogany Veneer-Foam Kit



One of the most promising developments in radio controlled aircraft model construction has been made available by Woodcraft of Albuquerque, New Mexico, with the release of their pre-fabricated El Tigre model.

This new ship is constructed of a combination of foam cores with mahogany veneer covering. We first heard of this material at the LARKS Open in Bakersfield, California, where it was a topic of major interest among the attending modelers. Shortly after, Jack Blything of Woodcraft sent us a prototype El Tigre kit.

The wing of this model is shipped in two sections with ailerons pre-cut. The core is of foam, channeled for aileron servo linkages, and covered with .015 mahogany veneer, laminated on the underside with silkspan. This covering is in one piece on each wing panel. Wing tips, stripping, etc. is accomplished with pre-cut balsa furnished with the kit. All assembly is done with white glue.

Once assembled, we were amazed at the strength-to-weight ratio. The wing will support over 250 pounds without any indication of weakening, yet is quite light. The fuselage is constructed of a plywood-foam-balsa sandwich with pre-formed balsa and foam top shells. Stab and rudder are of foam and mahogany, as was the wing. Canopy, nose gear, main gear hardwood mounts, etc. are included with the kit.

The finished El Tigre, complete with dope and quad proportional equipment, and Kustom 51 engine weighed 6¼ pounds, with a strength factor that cannot be matched by conventional

(Continued on Page 61)

REGATTA

West Coast Boatmen Seek Records

•

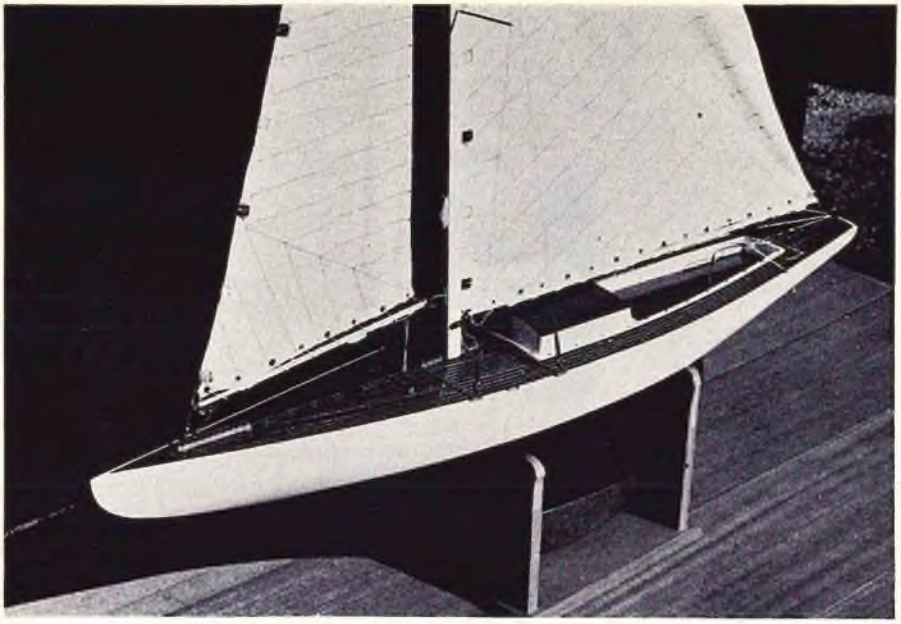
The Screw Propeller

•

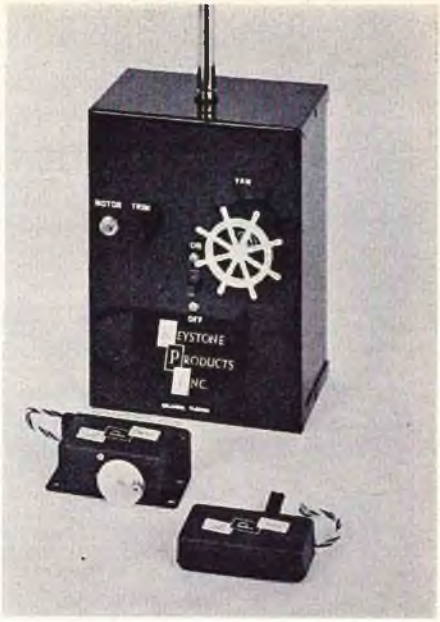
The Roostertail

Western model boatmen have exhibited substantial interest and prowess in the specialized and competitive area of straightaway speed record runs. This year has seen most WAM (Western Associated Modelers) records broken and even higher speeds are anticipated in 1965. The continual rapid improvement in the straightaway performance of radio controlled model boats on the West Coast can be traced to the availability of modern high performance two-cycle glow-ignition engines; light, compact, reliable radio gear; and, perhaps most important, a high level of technical competence coupled with the typically western flair for "hot-rodding".

Straightaway speed records for the one-sixteenth mile (330 feet) distance are recognized by the Western Council of Model Boating, affiliated with WAM. Formal recognition for record holders consists of a certificate from WAM and membership in the WAM Record Club. Only records set at WAM-sanctioned events are recognized. Additional requirements include WAM membership, a measured 330



D. R. Hartman's "Olympia" Sailing Sloop kit. One piece fibreglass hull and deck, mahogany deck planks, 6' spruce mast, 10 lb. lead keel weights. Length 55", weight less R/C gear 16½ pounds.



Proportional rudder with motor control for boat fans from Keystone. Available now.

foot course, and an approved timing system. An outstanding example of a WAM-approved timing system is West Hunt's electronic timer (RCM, May 1964) with photo-electric "eye" sensors, which has checked out to within plus or minus five one-thousandths (.005) of a second for periods as long as five minutes, and is proportionately more accurate for shorter periods of time. A record run consists of two consecutive passes in opposite directions over the one-sixteenth mile course. The speed is computed from the average time for the two passes.

Engine classes and current WAM speed records are listed below.

Class ½A—.000-.050 cu. in. 12.82 mph
Class A—.051-.200 cu. in. 18.00 mph
Class C—.301-.500 cu. in. 32.14 mph
Class B—.201-.300 cu. in. 25.72 mph
Class D—.501-.650 cu. in 39.47 mph
Class E—.651-1.00 cu. in. 17.98 mph
Class F—1.0001-2.000 cu. in. 36.00 mph
(data furnished by Mr. Wm. C. Young, Purser of WCMB)

The above records are for hulls of any design. In 1965 the records will be re-classified to distinguish between hydroplane and mono-plane hull designs. All but two of the above records are held by hydros. Thus, most of the "flat-bottom" records will be vacant, a situation not expected to last long.

Interest in the small engine classes has been low until this year. With the advent of light-weight radio gear, however, high speeds became attainable with even the smallest engines. The ½A record was set this year by a three-point outboard hydroplane powered by a modified K&B Allyn .049 Sea Fury. Weight of the hull is 3.5 oz. Total weight ready to run is 21 oz. Three or more challengers are reported after this record, and the first modeler through the traps with a Tee Dee .049 should raise the mark above 15 mph. Record holder R. J. Foley of San Diego, Calif. is experimenting with props and nitro, and has exceeded 13.6 mph on test runs.

The Class A record (18.00 mph) was also set this year, by Griff Parker of San Diego. The record holding craft is a Sterling Century Sea Maid powered by an O.S. Max. 19 R/C engine. This outfit is a beautiful scale job, featuring upholstered seats, windscreen, instrument panel, and a water-cooled muffled exhaust system. Again, several modelers are taking aim at this mark, and hot engines in the .15 cu. in. size should push a flat-bottom boat to 20 mph; a hydro may attain 25 mph.

In the larger boats the McCoy rear intake racing engine is king. The outstanding performance of the year was turned in by Dick Pretel of San Francisco, whose radical three-point hydro set a new Class D record (34.89 mph) using a McCoy .60. That was in April. In May he raised the mark to 39.47 mph. In September he had a McCoy .49 in the same hull and pushed the rig past 30 mph for a new Class C record.

Class F is dominated by 1.2 cu. in. twin cylinder engines based on the McCoy .60 piston and sleeve. Variations in intake rotor timing offer a choice from relatively docile ("cool spool") ski boat engines on up to the radical rod-bending ("hot spool") racing engines such as that used by Del Silva of San Francisco in a three-pointer which reached 36 mph.

Indicative of the upswing in interest in straightaway speed trials is the increased frequency of sanctioned meets where records are at stake. Five such meets were scheduled this year, with running sites at San Diego, Delano, Sacramento, and San Francisco (twice). Already scheduled are time trials in San Diego in February and in Delano in April. While Mid-Western Model boatmen are still shooting at 40 mph, Californians are now taking aim at the 50 mph mark. It is rumored that several West Coast clubs are considering IMPBA affiliation so that future time trials may be sanctioned by both WAM and IMPBA, thus providing more recognition for speed records set on the West Coast.

The Roostertail

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

Here's a hot item for all boat modelers: The 16th Annual IMPBA Regatta, to be held in 1965, will be at Cape Coral, Florida. The date has not been settled, but plans are in the making now. More details later as they become available.

New record applications are being included with sanction requests. The new form is for both R/C and Tether. We feel this new form is simpler, easier to use, and gives us the information we require. Fill out the part that applies to **you** only. Remember that this form is for both divisions of the IMPBA. R/C men should remember that any record set with a G.E.M. Models hull is worth $25 in G.E.M. merchandising.

Multi Boat Racing Rules. The Minute Breakers, Inc., of Lombard, Illinois, have taken the time to write up the most complete set of multiple boat racing rules I have yet to see. These rules are the third attempt at such a task, and are the result of additions, and deletions to the first two sets which were put to the test of actual competition during this past season. I must remind you that these rules are not official, but are only a guide to Multi racing. Since no official rules for multi racing exist, and since these rules do not conflict with the existing Rules of Competition, they may be used as a supplemental guide to Multi boat racing at IMPBA sanctioned regattas.

These Multi Racing regulations will be presented serially for the next several months. It might not be a bad idea to cut them out, and make your own handbook — scrapbook style. These rules will not appear in the new rules book (due out soon), as they must be voted upon by the membership before they can become official. Since these rules are so complete, keep them as printed for your official notification, and at the end of the series, we may send out a ballot asking your acceptance or rejection of these Multi Boat Racing rules for the official Rules of Competition.

Hats off to Don Jordan, Bob Foelker, Gary Preusse, and the rest of the Minute Breakers who helped compile the following:

Section I — General

A. A multiple boat speed contest shall consist of the simultaneous running of the standard international oval bp two or more boats for a total of six consecutive laps (¾ mile).

B. The contest shall consist of three distinct phases which provide for: (1) **Port time** for starting of engines; (2) **clock time** or start timing so that all are afforded opportunity to start the course together; and (3) **the race** itself.

C. A general description of the match starts with the first phase which consists of a three minute port time for contestants to start engines and get boats underway. At the end of this interval or less, or when all engines are started, the second phase begins with the starting of a one minute clock which is in full view of all entrants. Contestants will not be permitted to pass the starting line until the end of the one minute clock time at which instant a gun will be fired. This starts the third phase or the race itself, which due to the clock time of phase two, allows contestants -to "pace" themselves by the clock so as to be in position for a running start at full throttle across the start line together.

The first boat to finish six laps, satisfying all the applicable conditions as herein described, shall be declared the winner.

This action on the part of a contestant is ordinarily expected to finish this phase and the race. Thus the contest is declared as won. However, the contest may be aborted or terminated during or prior to the final phase due to adverse, exceptional or other circumstances in which case a **"no contest"** shall be proclaimed.

In case a radio frequency conflict should occur, the entrants in question will run individually against a pace boat. The winner will be that entrant with the best time.

The Screw Propeller

The screw propeller is not an invention of the last century but was conceived in France in 1752. Nothing was particularly done about it until 1812 when an Austrian inventor named Ressel took out a patent and then used it successfully on the steamer "Civetta" in 1829. Later, the most important advance was by Smith in a reduction of the original number of blades. This event actually happened quite by accident when one blade was lost off a six-bladed prop and it showed a marked increase in acceleration.

In America, Ericsson in 1839 developed and installed a screw-type propeller on the war vessel U.S.S. Princeton, leading to similar application on merchant and warships by the close of 1870.

The next practical advance in screw design was by Griffiths. The boss or spherical portion was enlarged to one-third the diameter of the propeller. The previous screws were designed with boss diameters about twice the shaft size, subsequently losing quite a bit of efficiency at the central portion. The increase in the boss diameter allowed the propeller to revolve smoothly in the water. Now these bosses are from one-fifth to one-third the size of the entire screw.

What is the propeller, or more appropriately, the screw propeller? As the latter name implies, the blade of the propeller is a small portion of a screw-thread of great pitch. The pitch of the propeller is the distance through which a point on one of the tips would move in one revolution if it were working in a solid substance such as a screw in wood.

The face of the propeller is the afterside (looking from the stern of the boat). The back of the blade is the forward side. The rake of the propeller is the angle its surface makes with a line at right angles to the axis of rotation.

The term "slip" represents the speed of water passing through the propeller, relative to the still water that the boat is passing through. Without the slip, there would be no thrust. It is the motion of the water being pushed sternward that develops the forward reaction called thrust.

The propeller is like an airfoil in that it develops low pressure on one side. When the pressure drops below the vapor pressure of water, the water boils and forms steam pockets. When these pockets break instantaneously there is enough force to take pieces of the blade from the face. This is called "cavitation."

Ventilation is another term that is used and sometimes confused with cavitation. This usually occurs on extreme turns when the air is actually sucked into the propeller past the rudder.

"Fairweather" is a tapered conical attachment fitted to the after end of the propeller hub to allow the water to pass without drag.

For model boat usage, a cast propeller is best purchased with the shaft hole pre-drilled, as it is very important that this be done accurately. Use a smooth file to remove the rougher file as the next step, followed by yet a finer grade of emery cloth. (Flat section of file against the back of blade and rounded section against the working face). Next, the prop may be polished on a buffing wheel with "Tripoli" used as a cutting compound when an aluminum or brass prop is involved. This will give a fine, mirror-like finish.

It is important that the propeller be accurately balanced to reduce vibration and improve efficiency. A simple balancing rig is made by screwing two equal pieces of wood (about 4″ x 4″ x ½″) in a vertical position to a flat piece (about 4″ x 2″ x ½″), forming a "U". A double edge razor blade (new) is screwed to each of the vertical pieces of wood, sharp edge up. Be sure the edges of the blades are parallel and the same distance from the base line. A short piece of shaft is run through the propeller hub with about 1½″ projecting on each side of the hub. If a set screw is used with the prop, tighten it to hold the shaft securely. Lay the shaft on the knife edges so as not to flatten the sharp edges which would give a false indication. Also, be sure to use a good, straight piece of shafting.

Spin the blade slowly and allow it to come to rest. The heavy blade will be at the bottom. Remove metal from the back of the table (side seen when facing stern), and test until prop will stop at any position. Polish propeller and test once more. Be sure that the propeller is a snug push fit on the propeller shaft or the tightening of the set screw (if used) will throw it off balance. Socket head set screws are preferred to the slotted type.

Cast aluminum and brass are satisfactory for ordinary running, but for real speed and power, cast manganese bronze, or props fabricated from stainless steel are required. Blades are fitted into slots cut into the hub and then silver soldered in place.

There are many varieties of propellers available at this time, but every so often a special size or design is wanted which must be custom built. A simpler method of propeller fabrication is as follows: The hub is turned to required outside diameter and shape. Drill and ream shaft hole to size at the same time, striving for a gentle push-fit on the shaft. Lay out on the hub the number of blades to be used, equidistant from each other. Saw cuts are made a bit wider than the blades. All slots must be the same depth, and at the same angle. This is best done with an improvised mitre box. The mitre box is made from two equal pieces of rectangular wood secured on each side of the bottom block. A hole is drilled the size of the propeller shaft and about ½″ from the top of box. A sub section of shaft passing through the holes in the box with the hub between will serve to keep the hub located in respect to the slots in the box. As each slot is completed in the hub, the hub is rotated until the next mark for blade location is at the top. This arrangement can be held securely in a vice while the cuts are being made.

The blades, themselves, are made of the same thickness of material cut to equal shape. To dish or curve the blades, a simple dish is carved into a hardwood block and the blades shaped to fit into this curved dish by the use of a lead or soft copper headed hammer. Due to the curve of the blades at their base, they will be more

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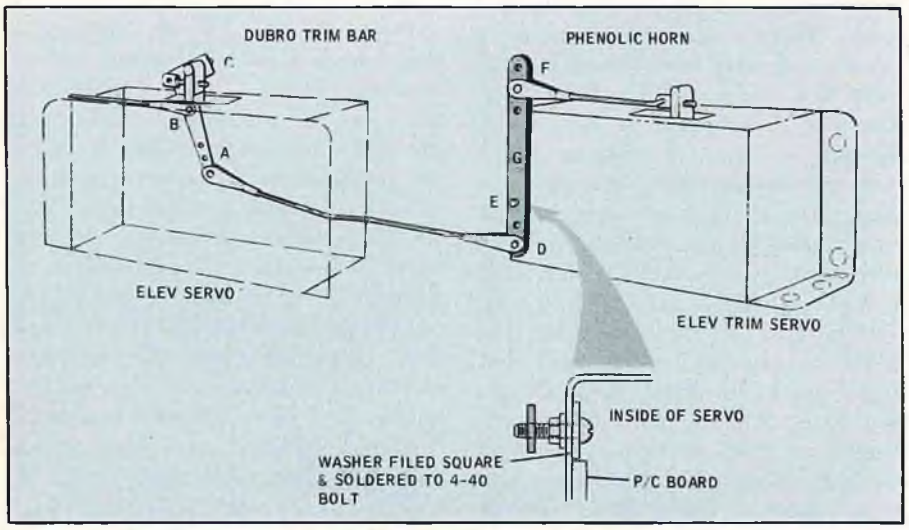
SHOP and FIELD



With the regular type trim bars it is hard to obtain correct elevator movement and trim movement. If the push rod is moved away from the trim servo, on the trim bar, true, the trim movement is cut down, but the perfectly shaped loops you had previously, become akin to knot holes. Of course, the opposite is true if the elevator push rod is moved toward the trim servo. This makes it difficult to trim a plane out in the modern trend of full elevator control loops, full up trim take-offs, and full down trim inverted flight. With this trim set up, once the elevator throw is established, by adjusting the elevator push rod at the elevator horn and at Point B on the elevator bar, the trim can then be altered all you want without changing the elevator throw. This is how it works: The Du Bro trim bar on the elevator servo pivots at A. The amount of elevator throw is governed by the hole in which the elevator push rod is put on the trim bar at B and also by the position of the push rod on the elevator horn. To make a trim change the trim servo pushes at F, pivots the trim bar at E and the link hooked on at D transmits the motion to A on the elevator trim bar. If you want more or less trim travel, all you do is change the position of F or D. You will notice that we have not changed the position of A at all, therefore, the elevator movement still remains the same.

I use a Du Bro trim on my elevator servo. My trim servo pivot bar is made out of 1/16" phenolic with an extra small piece added at E to make a total thickness of 1/8" where the ball goes through, I drill and top the hole to 4-40. Then, I take a 4-40 ball and solder it to a washer, and cut flats on it. I drill a hole in my servo about half the way down the end in such a way that the flats on the washer lock in place between the end of the servo can and the P.C. board. A nut put on the outside with contact cement locks it in place. Then, just screw the trim servo in place. No lock nuts are needed, it will never come off. — *Harry Tom.*

FOREIGN TRANSISTOR SUBSTITUTION CHART

Many R/C Modeler readers have asked for an American equivalent chart of the transistors commonly called out in construction articles presented in the British magazine, Radio Control Models & Electronics. For this reason, we have gone back through several issues of RCM&E and listed some of these transistors and diodes along with their equivalent U.S. substitutions. Unless otherwise specified, all are PNP germanium types.

Low Power Transistors

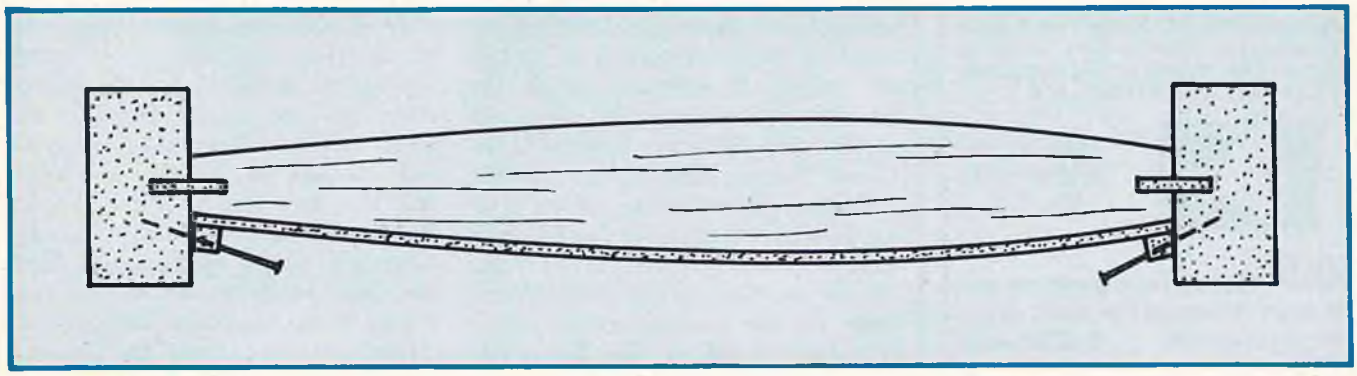
Foreign	U.S. Substitution
AC 107	2N248A, 2N1516
AC 125	same
AC 127	same
AC 128	same
AF 114	2N1516, 2N1177, 2N1179, 2N1180
AF 115	2N1516, 2N1177, 2N1179, 2N1180
AF 116	2N1516, 2N1177, 2N1179, 2N1180
AF 117	2N1516, 2N1177, 2N1179, 2N1180
AF 118	2N1516, 2N1177, 2N1179, 2N1180
AF 124	2N370/33, 2N371/33
AF 125	2N370/33, 2N371/33
AF 127	2N370/33, 2N371/33
GET 114	same
GET 115	same
GET 116	same
OC 44	2N2189, 2N2190, 2N2191, 2N1516
OC 45	2N2496, 2N2495
OC 70	2N279, 2N283
OC 71	2N283
OC 72	2N518, 2N404A
OC 75	2N369, 2N633
OC 76	2N518, 2N044A
OC 80	same
OC 81	same
OC 82	same
OC 83	same
OC 84	same
OC 139	2N438, 2N630
OC 169	2N1177, 2N1179, 2N1180, 2N1516
OC 170	2N1177, 2N1179, 2N1180
RA 701 (npn)	2N1995, 2N377

Power Transistors

Foreign	U.S. Substitution
OC 22, OC 23, OC 24	interchangeable, no substitution
OC 25	2N1182, 2N297
OC 26	2N1314
OC 28	2N1666
OC 29	2N1667, 2N1668, 2N1669
OC 35	2N1668, 2N1669
OC 36	2N1667, 2N1668, 2N1669

Diodes

OA 70	1N60
OA 79	1N295
OA 81	1N60
OA 90	ON34A
OA 91	ON34A
OA 95	1N618



A highly successful jig-assembly for symmetrical wing and stabilizer sections was devised by modifying the construction techniques used in Lloyd Sager's Nationals-winning Mac-17. As illustrated above, two oversize strips of balsa are used for the leading and trailing edges. Down the center of each a slot is cut on a table saw. The horizontal leading and trailing edges are then glued into these slots. Put all ribs in place, then add spars. Sheet one side, holding sheeting in place with 1/8" square "wedges" secured to the leading and trailing edges with straight pins. This prevents pinholes in the sheeted surfaces. Now, turn entire assembly over A-D. Repeat the sheeting steps for the remaining side. When dry, remove pins and wedges. Then carve and sand leading and trailing edges to finished shape. You will find that you have completed the assembly in far less time, plus having a truer wing or stab than by conventional methods. — *Chuck Waas*

Sunday Flyer

(Continued from Page 8)

"quick and dirty" designs or installations, just to test out an idea. It won't work. There's no such thing as a "quick and dirty" solution to a radio controlled model problem. Only dirty. The idea may appear to be a quick solution — until it vibrates loose, peels off, causes static, or does something else to spoil or even destroy your model, so you have to start all over again! Do it right the first time. Be bold in your artistry, if you will. But don't be sloppy. Otherwise you might find yourself taking your new model out to the flying field for the first time, and another modeler will come over, take a critical look and ask with mock solicitude "Gee, how many crackups has it had?" So be neat. Make 1965 the year of your dreams, not your nightmares.

Finally, as we head into 1965, and think of the things that are important to consider as we hope to achieve some of those modeling dreams, I'd like to say a few words to you about the Academy of Model Aeronautics.

The AMA is covered regularly in columns by other writers, and I'm not going to talk about the activities of the AMA. Rather, I want to try and get across to you the way I feel about the AMA, what it has done for me in this hobby, and what I think it can do for you.

Many of you are well acquainted with the AMA, and are members. But for those of you who are unfamiliar with the AMA, let me just say this. Join. You don't have to pitch in and offer to do a lot of work for the AMA (although there's always the need for more help) but merely by joining and paying your dues you are helping maintain the organization which, in my opinion, is solely responsible for the advanced state of radio controlled model flying which now prevails in the United States. Were it not for the AMA and its continuing efforts with the Federal Communications Commission, we probably would still be fighting for air time on 465 megacycles! Some of you newcomers may never even have heard of that frequency, but it was the only one available to us not too many years ago. That is, unless you were a radio ham. In my own case, I was the farthest thing from it! For that matter, when it comes to the technical part of the radio equipment, I can solder color coded wires, twist a tuning slug until a light gets bright, or a tone starts to get loud, and that's about the limit. So I've always had to use commercial equipment which is available to the average citizen. To me, the radio euipment is a guidance system for my airplane designs — just like the engines are the propulsion source. And the AMA has worked with the FCC for many years in order to provide us with several frequencies with which we can control our models, yet not have to be qualified radio operators. Further, if it weren't for the AMA, we probably would still be sharing these frequencies with the thousands of citizens' band two way rigs, walkie-talkies, and other "model crashers."

So the AMA has done much in the past for me — and for you — in working to provide us with the radio frequencies necessary for our growing hobby. The effort is still going on, but that is a subject in itself that I want to talk about later on the year, to show you what you can do to improve your own circumstances.

Another thing the AMA has done is work with the Navy in providing facilities for the National championships. Now, as Sunday fliers, this doesn't have a direct impact on you, but in the same way that engineering improvements to autos have resulted from the Indianapolis 500, making your auto safer, design and equipment improvements in radio controlled models have resulted from the National championships, and some of the kits which you buy and fly successfully are derived from the designs which prove so consistent in national competition.

Still another indirect benefit which you receive from the efforts of the AMA is the international recognition of American modeling — of which you are an integral part. We like to think that the United States is the leader of the world in all of our social and scientific pursuits. We also know that this isn't true in every respect. But in your and my hobby of radio controlled model aircraft, the AMA has done much to assure that the United States maintains a highly respected position among the International leaders.

So join the AMA in 1965 — preferably right now. Support the efforts of the organization which does more for you than any other single agency

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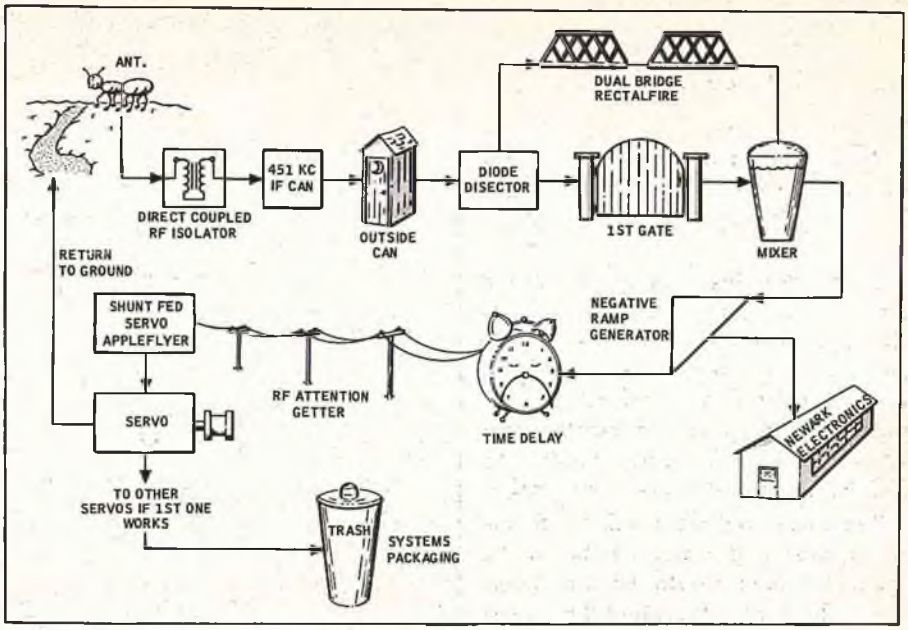

Solo

(Continued from Page 10)

est factory for tuning...

Every chain has a weak link, and that brings us to the servo. The motor is similar to most servo motors — designed in the good old U.S.A., fabricated in Germany, and assembled in Japan. This has had a salubrious effect on our balance of payments, and Dean Rusk wanted our engineer, Hank Giunta, to speak at the U.N., but couldn't pronounce his name.

The servo output arm is completely linear with the axle mounting bracket, which makes for spurious mounting in all but the half-A jobs, and I, for one, frankly don't care! All components have been rigidly fastened in an endless loop, guaranteeing that once established, a signal is never lost!

We have been making shipments on a first come, first served basis, and as soon as the "first" shows up, the rest of you guys will get yours. Please don't call us — it is most difficult to be running from the garage to the house every five minutes, and the constant opening and closing of the door disturbs the dust in our Clean Room.

The editor of this sick rag has refused to review my gear, and it will do my heart good to have some of my loyal readers hit him with a few nasty notes. Please don't worry about the price — we have been very fortunate in getting the General Motors Acceptance Corporation to carry all the paper — simply look for the sign of the Chevy dealer in all our ads. You Ford owners need not despair — the world bank is authorized to loan up to 70% of parity if you plant every other ship. (Dean Rusk has his uses even if he can't pronounce names!)

Many of you are going to try to steal this design. You'll be writing in for schematics, trying to make me believe you need them for repairs or some such obviously fraudulent practice. Well, just to show you I'm not one of those "damn the competition" people, we have presented the complete proportional block diagrams for the Digitalis 8. Now for any further questions, write direct to Min-X. They won't have the slightest idea why you're writing, but it won't hurt you to get acquainted and maybe buy some decent gear.

In closing, I would like to ask you to send all your old SuperTigre parts to me, Frank Justin, P.O. Box 135, San Gabriel, California...

Sunday Flyer

(Continued from Page 44)

in the world.

Well, maybe I've been carried away a little this time as I've talked with you about your dreams and plans for 1965. Next month for sure I'll get back to some of the more material aspects of modeling, with that new design I've been promising. But that design was just a daydream early in 1954 — like a couple I'm thinking about now for 1965, — and every now and then, just like you, I procrastinate and need a little urging on. So for this month I've tried to give you a little inspiration for 1965, to go along with your perspiration in starting, or finishing up, some of your dream planes.

Top Out

(Continued from Page 12)

"—just about run out of time this week and wanted to make sure the car and the wing are ready for tomorrow's fly-fest over in Victoria — Texas".

In the next few minutes we agreed that almost anything interfering with RC'ing on weekends was to be avoided or minimized. More talk, and it developed that this was how things 'once were' — until about 18 months back when he started his present sales job and 'sorta drifted away' from RC.

"You can't tell what will be dreamed up next and I figured this multi-channel rudder would be too expensive", he said, capsuling his views (and reduced flying!).

From here on the conversation settled down, and for about two hours the subject of Class I, its rules, and its future, received serious attention. He was both interested and concerned, and what follows is a question-answer condensation of our garage scene encounter that sums up the ground covered.

Q. Have the current Class I rules achieved the results looked for when they were adopted?

A. This business of the objectives of RC rules, Class I, or otherwise, is a bit complicated and the tendency is to sometimes oversimplify when considering them. Roughly stated, when rules result in a certain amount of progress they're considered good. Designing rules, in some ways, is a tight-rope operation. The aim is to encourage participation but at the same time rules have to be tough enough to offer an adequate degree of challenge. This is certainly a contradictory condition and one satisfied mostly by bringing about change, considering such items as equipment development, economic factors, contest needs, and what the fliers themselves want. These are some of the major factors involved, and when they weave together smoothly, then most fliers are satisfied, and it can be said that there's progress. Based upon this, it's a fair assessment to conclude present Class I rules, having brought improvement in flying skill, flight performance, aircraft versatility, while retaining the basic single flight control concept, have achieved their intent.

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Top Out

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Q. Now, this timely meshing of rules and factors like equipment development and economics — how do these factors work out in the case of current rules?

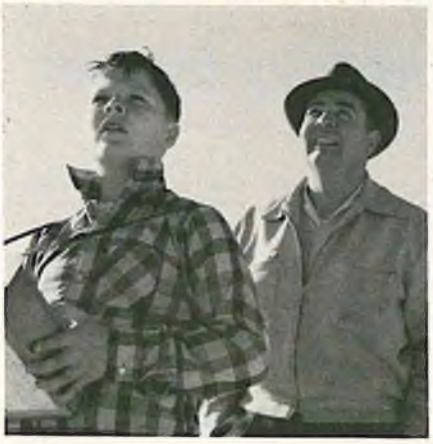
A. For about two years prior to adoption of multi-channel radio for Class I, Class III fliers had been enjoying the advantages of reed equipment while rudder flying for contests was locked on to systems offering less, at that time, in the way of dependability. Class III was stirring to move on while Class I prepared to linger where it was. However, the change came along at this time and made it possible to use the more sophisticated gear. It also meant taking advantage of not only the dependability of multi-channel reed equipment, but also the rather broad manufacturing base in existence, too. This last element is important, since it's not feasible for most RCers to make or service their own equipment. What this all adds up to is the change certainly made it possible to capitalize on a good equipment setup.

Q. OK, agreed we have better equipment to use and enough outfits with plenty of experience at making, marketing and servicing multi gear, what about the economics? Multi-rudder flying and contesting still costs more than escapement or pulse, doesn't it?

A. For a quick answer, no, it doesn't! To understand this, let's take a full look at all that's involved in order to see what's behind this answer — The decision to change the rules hinged on the question of whether enough fliers would make the switch and prove by practical experiment that multi-rudder could work out. There was no doubt about the technical feasibility but there were some dissenting views about the popularity of higher costs. Would enough fliers spend as much as $300 on new gear and virtually scrap previous investments to prove the value of the change? Then there was the item of learning to fly with the new gear — no small matter for many whose skill, instincts, and confidence were highly coupled to the timing and feel of the old equipment. Activity during the 1963 season was inconclusive since the rule change went into effect midway through it. But the 1964 season proved the quiet following the change was a period of almost 100% acceptance by contest fans. The technical feasibility factor had evidently made sense to the majority, and they readily put servos where their escapements had been, dollars not withstanding. Then they went out and put and kept their planes in the air as never before! To their satisfaction there dawned the realization that flying hours were actually costing less in real dollars, too. The reason was simple: fliers were able to get 7 to 10 times the actual air hours they got in the same time with their escapement airplanes. (Flying times of 150 hours or more per season has become common during 1964.) Increased air time and practice led to fewer crack-ups, also. For example, only one Class I crash occurred during the Dallas Nats while over 180 official flights were logged. Less rebuilding not only saves money but means more hours may be spent flying and achieving the fun and satisfaction sought after in the first place. One other big plus — better skill and equipment means radiocraft design may proceed so as to produce additional flight performance.

In summing up; when taking into account equipment and operating costs, divided by flying hours and subtracting repair savings, multi-rudder comes out a lot less expensive. And there's the bonus of that added

A pair of 1st place winners — Carl and Pete Petri ready Carl's Jr. entry for an official flight. Carl is small but throws a long shadow.



John and Walt Jennings concentrate during the Space City Championships. John's the leading U.S. Junior and current pylon record holder, is slated to fly at the King Orange's Internat's.

fun and satisfaction — this counts, too.

Q. How long will the rules stay put — where do we go from here?

A. Well, for one thing, it's safe to assume there will be some change. Class I is not static and its rules move on to keep this hobby/sport growing. Changes affecting basic equipment don't seem likely for some time, but procedure refinements and additions are possible. What is important, though, is to keep all aspects of rudder flying in view. After all, it's the broadest of the three pattern classes in that it offers the widest number of approaches to satisfactory participation. With the advantages of simplicity and ruggedness, escapement and pulse systems shouldn't be ignored. They still flourish and serve useful purposes for the flier with limited time or the beginner yet to develop a lasting RC interest. Such enthusiasts, including most youngsters inclined to RC, find this equipment a practical initial investment.

Q. Did anything of real significance to Class I result from the changes?

A. Two major items of importance emerged. One involved releasing to Class I a workable means of finite power control and this opened the door to real achievement. Since flight conditions are continually variable, a highly responsive control is essential to mastery of those variables. But remember, the means of motor control were with us a long time before becoming available to Class I. In spite of the advantages, for various reasons the more primitive means were employed which also ignored, during that time, the plus safety factors offered by servos. The lesson here is to recognize that full development can be prevented if we become too set on past techniques or operating modes. Knowing this can happen should help in future considerations if the lesson is remembered. The other major item of significance is perhaps more important than all else because it deals with the continued existence of rudder-only on the contest scene. Class I use of multi-channel radio represents a necessary advance for contest flying and the change came at a time when a clear performance demonstration was needed to sustain the claim for contest time and radio space in major organized events. Class I belongs side by side with the other classes, but it must do so as a full-fledged equal, not as a poor substitute merely to bolster participation. The rules change allowed Class I to remain vital by drawing upon the fullest technology available

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"Doc" and Ben Harr make points in the chill Houston air. "Doc" is a Jr. with lots of escapement savvy. Placed second.

the blade edges are semi-sharp. Polish and balance as previously described.

Silver solder is preferred to soft solder due to its greater strength. There is considerable strain on the blades when the boat is running at top speed.

Your first attempt at prop building may not result in an exhibition piece, but the experience gained will be of great help when building others.

A simple method for testing which propeller is most suitable for your particular boat and power plant is to set the rudder for a circle and lock it in place. Time the boat for a lap or two. Replace the propeller with another and retime for the same distance with the power plant developing as near the same output as previously. The propeller consistently giving the best speed under the same conditions is the one most suitable for your job.

Since this article was written, there have been great manufacturer advances in making available quite a number of excellent propellers. Cameron of California has a supply of propellers with all drive accessories available. Another place where special large props can be purchased is from A. J. Fisher of Royal Oak, Michigan.

Also, as noted in various hobby magazines, Octura Models of Chicago has a fine variety of model boat props available. Their plastic variety are highly adaptable for quick change in the field. Also available from Octura are props in aluminum, bronze, and stainless steel. From experience it has been found that the plastic props are ideal in a case where you hit a submerged rock or underwater cable. The propellers were stripped apart but there was no damage to the underside of the boat. It is easier to change to a new prop than try to repair a damaged or bent drive shaft or tube.

The authors hope that this article has helped the boat modeler to a better understanding of one of the components that govern the running of his model.

The Screw Propeller

(Continued from Page 42)

securely held into the hub slots for subsequent silver soldering.

A slight "V" slot is filed at the tip of each blade. With the blades in position on the hub a wire is curved around the tip of the blades, fitted into the slots, and the ends twisted tight. This will hold the blades in place for soldering. Be sure to check to see that the blades are all the same distance from the end of the hub and equidistant from one another before soldering. Do not be afraid of putting on too much solder, as any excess will be removed in order to form a smooth fillet at the blade root and hub. The "V" cut in the tip of each blade can be filled-in with silver solder or the blade tips filed down to eliminate the slots. File the back of the blades to form a smooth curve so that

Coming Next Month!

KEN WILLARD'S

SCHOOLGIRL

½ a biplane for single channel

WASHINGTON REPORT

World Committee Approves Fibreglass Fuselages, Foam Wings

The Individual Radio Control World Championship Trophy was presented to G. H. Derantz and G. Hoffman, representing the Aero Club of Sweden, by John Worth, A.M.A. Director, at the 1964 Annual F.A.I. meeting held in Paris in November. Sweden, under the personal direction of Mr. Hoffman, will host the 1965 R/C World Championships at Lyunghbyhed, near Malmo, August 9-15. The trophy presented was won by the United States at three successive championships, first by Ed Kazmirski in 1960, by Tom Brett in 1961, and by Ralph Brooke in 1963. Cliff Weirick, Zel Ritchie, and Ralph Brooke comprises the U.S. team to compete in the 1965 world championships. Former champion Ed Kazmirski will serve as Team Manager.

Radio control model aircraft demonstrations will constitute an official part of the International AerOlympics and Aviation Trade Fair to be held in Palm Springs, California, November 5-14. This is the first time since the National Air Races of 1923, held in St. Louis, that model flying has been an integral part of such an aviation program. An anticipated spectator attendance of 300,000 to 509,000 persons will view the nine day affair which will receive international coverage by press and broadcast media. Included in the R/C portion will be a free-style aerobatics event along with the usual RC AMA pattern plus multiple RC pylon races. The former event will be similar to freestyle figure skating in the Olympics, where flying will be judged on perfection and grace as well as the flier's selection of difficult and artistic maneuvers. All model flying will be strictly on an invitational basis to insure the highest caliber and safest flying possible at the event. Included in the full-scale events will be pylon racing for two classes of midgets, cross country racing for jet aircraft, plus world champion aerobatics, parachute competition, baloon racing, soaring and glider aerobatics, historical aircraft in air progress shows, fly-bys of new and experimental aircraft, and military precision team flying. The Trade Fair will feature displays of aircraft and equipment.

Dr. Walter A. Good, well known modeler, and a physicist at John Hopkins Applied Physics Laboratory, Silver Spring, Md., was elected President of the Committee for International Aeromodeling at its yearly meeting in Paris. Dr. Good is past President of the A.M.A. During the meeting in Paris, several F.A.I. rules changes for radio control were established. These included approal of a rotating judging system for world championships; a reduction in the maximum flying time from 15 to 12 minutes; and in record attempts, forbidding the use of assistant pilots to fly the model. The most significant change concerned prefabricated models. Although defeated in the R/C Sub-committee, the full committee approved the use of prefabricated "fibreglass fuselages, poly-foam wings, etc." Not permitted is "a complete, ready-to-fly R/C model which has been built by a person other than the pilot." With regard to existing world model aviation records, it was noted that the U.S. holds seven records, Russia 14, and the remainder of the total of 34 by various other member nations.

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RCM PRODUCT REPORT

Royal Multi Servos Are Excellent Buy

Following closely behind their very popular, and highly successful single channel servo, was Royal Products' announcement of a servo for multi-channel usage. During the past few years, attempts by various manufacturers to compete in the multi-channel servo market has been met with only limited success, due to the almost unanimous acceptance of one multi-channel servo which has established itself as the "standard" of the industry. It was for this reason that we weren't overly excited by the announcement of the new RMK servo-mechanism imported by Royal. That is, until we bench and flight tested this new model!

Available is an SN (Model RMK-SN) and Trim Model RMK-T) version for relayless operation, and another unit for older, relay-type receivers. Our tests were confined to the relayless SN and Trim versions. The physical dimensions of the individual servo unit are 2½" x 1¼" x 1¾" with a weight of 2.5 ounces each. The flat mounting surface is of white nylon with a nylon wheel-type output. The motor and amplifier are contained underneath in a colored "see through" high-impact polystyrene type of material. Since we have become accustomed, for the most part, to mounting our servos in an upright position, parallel to the fuselage sides, it seemed that these units would be somewhat awkward to mount. Quite to the contrary, when installed per the manufacturer's specifications in a side-by-side position, four RMK units take up only 2½" x 5" — making a very compact and neat installation. Total weight of four servos is 10 ounces, or 12.5 ounces including the aileron unit.

The servo motor used in the RMK is a five-pole Matsumi motor that gives more usable servo power than any comparable unit on the market today — five pounds of usable thrust by actual test. Servo current drain was 250 Ma average, and 500 Ma at full stall. Oilite bearings are used in the motor. Transit time is .5 second each

direction, or 1 second total travel. Nylon gears are used throughout.

Six transistors are used in the servo amplifier — the latter a vey well designed unit. Switching is the printed circuit plate which is also externally adjustable for neutral. Color coding of the wiring is conventional, requiring a standard positive ground to the reed bank.

Price of the Royal Model RMK-SN is $24.95, while the Trim version is $22.95. Our findings? After thoroughly bench and flight testing these units under a variety of adverse conditions, we can only agree with other local RC'ers who have recently been flying with the RMK servos — once you try them you won't be satisfied with any other reed servo. They were, without any doubt, designed by active RC'ers for maximum performance under any and all conditions from the optimum to completely adverse. We recommend them highly to your consideration — they will be used by RCM as our standard servomechanism for flight testing other associated radio control components.

RMK Servos are manufactured in Japan by M. Kato and distributed in the United States by Royal Products Company, Denver, Colorado.

Irish Nationals

(Continued from Page 38)

by Bertie Troy (UMAC) finished third.

The DMFC monitor was in operation both days with no outside interference being detected — in fact, there were no malfunctions reported at all.

Final Standings

Single

1st: K. Boyd 260
2nd: H. Menary 205
3rd: J. McDowell 130

Intermediate

1st: J. P. Evans 440
2nd: J. Parker 263
3rd: J. Carroll 85

Multi

1st: L. Blair 3816
2nd: B. Hunter 2744
3rd: B. Troy 1687

Application for membership to the I.M.P.B.A. for 1965

I.M.P.B.A.
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Annual dues 50 cent 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 subsription (one address only).

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Editor's Memo

(Continued from Page 6)

Since the last issue, Walt Findlay has completed almost seventy-five completely successful flights on the Orbit proportional system that was reviewed in the January edition. At that time, we could not report on the reliability of the system — at this point, and without a hint of any malfunction, this factor looks promising. Despite the fact that a typesetting error described it as a "proportional multi-reed system" ...

●

While on the subject of proportional systems, the Kraft prototype reviewed in the December issue has been further changed for the forthcoming production models. Since this review covered a prototype, it should not be construed as a report on the production units.

●

Another proportional manufacturer has gone into full production — Bonner Specialties shipped their first run of 150 units in December. One of these systems was selected by RCM's Chuck Waas for review in a coming issue. Personally, I thought ol' chuck was brainwashed by Cliff Weirick and Howard Bonner — he's building a Candy, using a Meinke wing, Glas-Kraft fuselage, Bonner proportional — the whole bit. But then he showed his true colors, and expressed his individuality by selecting a Merco .61 for power instead of Weirick's favored Super Tigre. This, however, might be attributed to the fact that Geoff Franklin sent it to him gratis from Dennis Allen at Merco.

If none of this interests you, then try Frank Justin's column this month. Our "left-wing, middle-of-the-roader with a slight right-turn" political correspondent has decided to manufacture his own proportional rig. You can be sure of one thing — when Frank decides to do something, it's bound to be big!

●

So that's about it. Hope you like Ken Dwight's Hawker Hurricane. Flies as good as it looks. Test pilot was Ron Chapman. Send us a photo of yours.

●

If I wasn't such a devout coward I'd get a job like James Bond's... like, how about Valentine's Day with the girls *he* runs arount with? That guy Goldfinger just didn't get the picture ...

British Team

(Continued from Page 32)

in a good score on any one flight.

From the beginning, it was evident that the scoring among the top four or five men was going to be very close. Van den Bergh, veteran British Team member had a new model of rather squarish appearance that was evidently not fully trimmed out, having had very little flying time before the contest. The fact that he was flying so new a model may have contributed to his not making the team this year.

Foster, one of the youngest competitors appearing regularly in British RC competitions, had his much-flown and well-trimmed Nimbus with which he put up a most impressive performance from the very start. This young man has all the makings of a future World Champion.

P. T. Waters, from Wales, was flying his Altair #2, another well-tried model which the pilot flew with supreme confidence even when conditions were at their worst.

Chris Olsen, another pioneer of British multi-modeling and a previous Team member, was flying in competition for the first time this year with F&M gear and had evidently benefited from having reliable equipment that left him more time to concentrate on the business of flying. His model, the Uplift, is really a low wing version of his original Uproar.

Geoff Franklin, RCM's editor in England, was one of two pilots to fly with a proportional control system. Franklin's second model, the Allegro, was fitted out with Franklin 10-channel reed equipment, the British-built version of the Orbit 10.

The other proportional flier was Geoff Pike with F&M proportional equipment in a model with original fuselage and tail section and a Taurus wing.

George Bradley, another very young contestant, flew his Scorpio well, but not with the confidence he had previously displayed. Bradley also had the unfortunate luck that during his second flight the heavy rain penetrated his transmitter, putting all left hand controls out of action with a resultant crash and total destruction of the model.

The other competitor badly affected by the rain was Waters, who was wearing glasses. Every time he looked up, the rain on his glasses obscured

(Continued on Page 61)

British Team

(Continued from Page 59)

his vision to the point that he was quite unable to fly the model, handing the transmitter instead, to his helper, Ed Johnson.

Fortunately the weather improved during the third round enabling those who had flown in the worst conditions in Round Two to retrieve their positions, with the exception, of course, of Bradley. Final placings were: 1st: Foster; 2nd: Olsen; 3rd: Waters; 4th: Van den Bergh. The first three comprise the team with the fourth position holder serving as reserve man should any of the team members have to drop out before nomination day.

The British team is a good one, and with luck, they should acquit themselves well in Sweden. At the time of this writing there is some possibility that at least one team member will convert to proportional equipment before the Championships, with the reservation that if it is not as reliable as his present reed equipment, he will revert back to reeds for the Internat's. At the moment, the proportional equipment that we have in this country does not seem to behave too well in the hands of those pilots who have no "factory backing," apart from which, the conversion from reed flying to proportional cannot be made overnight.

We all look forward to a very fine Championship Contest in the latter part of 1965. Besides — who can resist a trip to Sweden? I certainly can't.

Top Out

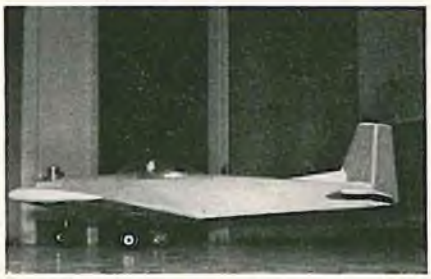
(Continued from Page 49)

while still retaining the classic rudder concept. Credit for the opportune change, of course, belongs to the farsighted leadership that worked hard to bring it about. Such credit, however, carries with it a leadership responsibility to retain its visual clarity and to continue by study, plan, and action to keep Class I moving forward — it cannot be accomplished by chance alone . . .

. . . At about this point the car repairs were finished. In the process of checking results and paying our bills we separated and I never found out if the salesman from Ohio intended to find more time for building and flying. Fact is, my bill of $50.60 shook me, since it set back the RC goodies fund I was accumulating and so I missed getting his name, too. So, ladies, RCing can be exciting. In typical soapbox opera style we find ourselves wondering — Did the stranger get back to Ohio? If so, did he dust off his gear and get with it again? Will Emily allow me to cut her shopping allowance to make up the $50.60? Tune in next month . . .

Product Report

(Continued from Page 38)



construction or fibreglass shells. The El Tigre, incidentally, is an excellent flying machine for reeds or proportional, with a power requirement from .45 cu. in. up to .56.

In adition to this kit, Woocraft also is making available wings and stabs for many of the more popular multi designs flying today. Wings and stabs will also be available in this torm of construction for a majority of the construction features to be run in RCM.

The only flaw we could find was not in the construction process or fabrication methods, but was simply in the design of the fuselage tail in the original El Tigre. This has since been redesigned, and current El Tigre kits are very attractive. Price is $54.95. RCM does not hesitate to recommend this kit to your consideration. It is our opinion hat this form of construction will open an entire new era in RC aircraft building techniques.

International Circuit

(Continued from Page 36)

AUSTRALIA The photograph of Tony Farnan with his new Taurus was taken at the Australian Country Multi Meet in September. Tony's ship uses a Max 50 with silencer and O.S. 12 channel superhet gear. The second photo from the same meet illustrates the popularity of the Sultan, Taurus, and Stormer designs Down Under.

An example of how keen some of the Aussie RC'ers are, can be gauged from the annual feud between the N.S.W. and Victorian flies at Wagga, N.S.W. This town is situated 330 miles from Sydney and 280 miles from Melbourne. Most of the contestants set out after work on Friday afternoon, reach Wagga around midnight or 1:00 A.M., fly all day Saturday, attend a party Saturday night, fly all day Sunday, then drive 300 miles home Sunday night. It takes a strong constitution to stand up to that pace! The only thing worse is the Nationals — it lasts a week with a party every night!

SOUTH AFRICA The two shots from S.A. show Jack Immelman with a Tauri modified for ten channels. Kraft 10, Veco 35, Bonner servos. All are jammed in for a weight of 5½ pounds. With 530 square inches of area, the pilot only smiles when the plane is on the ground!

Hal Snow, in the second photo, is shown neatly positioning his Radiant for a shot at Rand Model Aeronautic Club Field, in Johannesburg. This ship uses a Kraft 12 and Veco 45. In the background is the suburb of Johannesburg. Hal has a lovely new home just to the left of the first houses, and only one half mile from the field. Hal was also one of the original RC'ers in South Africa, winning the first two African Nationals with a single channel Champion.