A Radio Control Publication for Beginner & Advanced Modeler

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& MODEL AIRCRAFT WORLD

FEATURING

Proportional hook-ups for single-channel—Dick Adams.

•

Don Knaust's lovely Curtiss Robin—another fine multi.

•

For the boat fan—An easy-to-make single-channel project.

VOLUME 6 NUMBER 5 SEPTEMBER-OCTOBER—35¢

CURTISS-ROBIN SEMI-SCALE, PAGE 4. LOOKS LIKE A MILLION! SNAP ROLLS AND SPINS LIKE CRAZY!

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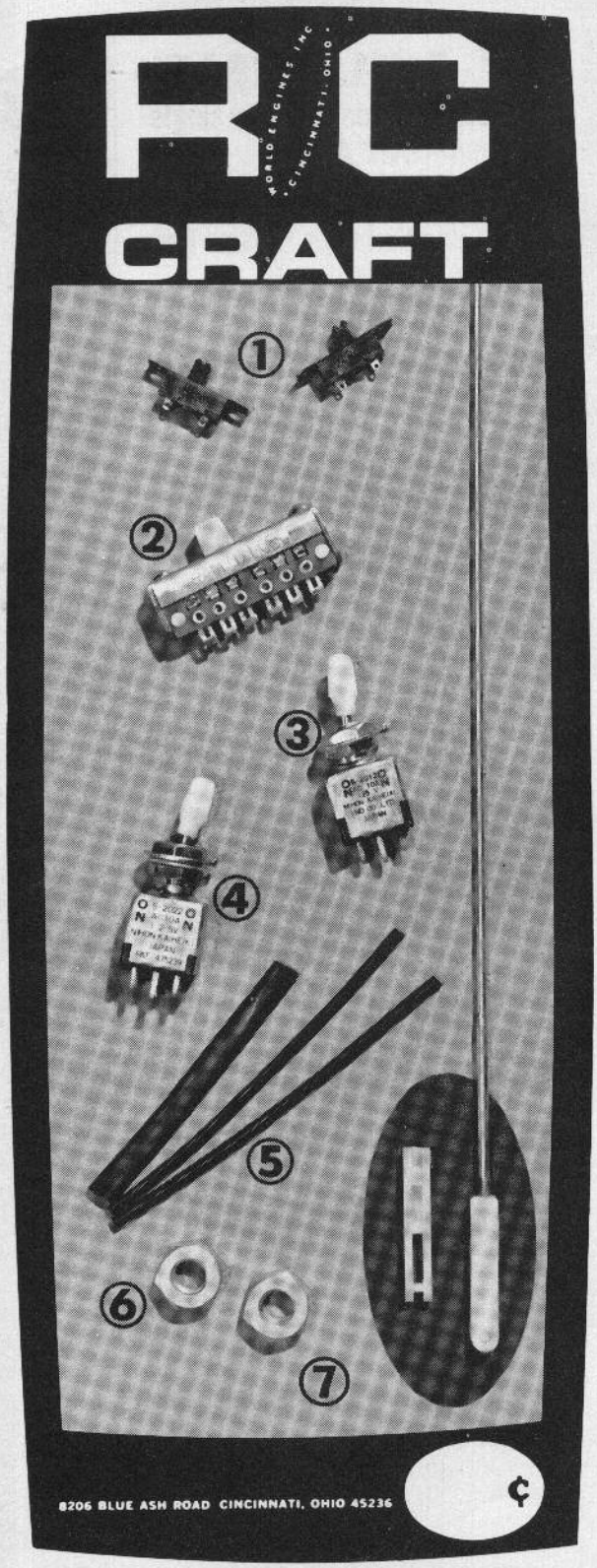

Switches

1 This IC-T, SPST 1 Ch. mini switch will delight the ¼A R/C fan. Actually it is good for any R/C circuit where one line must be opened. Dimensions: 3/16" wide, ¾" long. Mounting holes are 2-56 and the weight is .028 oz. Self-cleaning knife action with a ball detent assures trouble free performance. Price 37¢ each.

2 The 9F, 4PDT switch is ideal for multi where it is necessary to open and close three circuits. Usually two DPDT are used. Here it is all done with one switch. It features self-cleaning knife action with a ball detent for vibration free performance. You can feel this switch go into position. Dimensions: 1⅜" x 5/16". Weight is .232 oz. Note: just one of these switches is required in a relayless multi hookup. A diagram of such a hookup is shown in the CONTROLAIRE section of this catalog. Price 79¢ each.

3 S-2012, SPDT toggle switch is useful for single channel R/C. It could also be used to switch in or out a charging jack or socket. Price $1.19 each.

4 S-2022, DPDT toggle switch is ideal for general R/C use by those who prefer a small switch. As with the S-2012, it mounts in a ¼" dia. hole. Body of the switch is only ½" square. Price $1.59 ea.

Heat Shrink Tubing

5 Each package of R/C CRAFT Heat Shrink Tubing contains a total of one foot of .062" I.D. and 2" of .125" I.D. tubing. It will shrink with the application of heat to 50% of its original dia. It makes a perfect insulator around connections of wire to wire or wire to terminals. The small R/C plugs demand this type of insulation. Price per package is 25¢.

Prop Nuts

6 R/C CRAFT Prop Nuts are ¼-28 in size. You'll find that these high quality, plated nuts will fit almost all medium and large size engines. Price is 10¢ each.

Ny-Link

7 The Ny-Link was designed by R/C CRAFT to meet the need for a quality, Nylon connecting link for R/C use. These are available with or without the wire rod. The large diameter end of the rod has a 2-56 thread and is a snug fit in the Ny-Link. The smaller dia. end fits inside a 3/32" O.D. brass tube. For use with cable: insert cable into link, apply a drop of solder to the cable and the link will not come off. Prices are — Ny-Link without wire rod — 15¢ and Ny-Link with wire rod — 20¢.

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GRID LEAKS AT PLAY

• Ordinarily this column does not go in for movie reviews—and this won't be a standard type of review. Saw a picture in the last few weeks that we highly recommend for any modeler—enjoyed it so much we simply must comment. Any model fan interested in vintage and ancient airplanes, will get a once-in-a-lifetime pleasure from it.

The picture: "Those Magnificent Men In Their Flying Machines, OR, How I Flew From London To Paris in 12 Hours and 11 Minutes." While the men without question were magnificent, it's their machines that you will find a joy to behold.

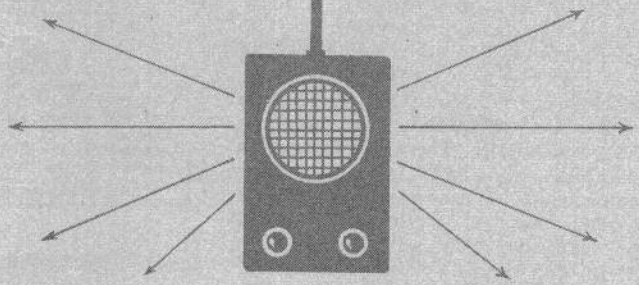
Keyed to the 1910 era the picture is a fictionalized version of the $50,000 offer by Ramond Orteig for the first air crossing of the English Channel. Displayed are full-size reproductions of many historic planes: Antoinette, Bleriot, Phillips Multi Plane (Flying Venetian Blind), Lee Richards Bipe, Avro Triplane, Blackburn, Farman, Burgess and Sopwith, to name just a few.

Not only were they reconstructed but, powered with modern - to 50-horsepower engines, they flew! Not just one short hop, but many times and thrillingly for some really spectacular photography across the English countryside.

According to the information available, some of the planes that originally used wing warping, were changed to use movable surfaces for better maneuverability. (*Continued on page* 28)

THE MONITOR

Regular round-up of new and overlooked aspects of the growing R/C field • Shop talk and just talk • A discussion corner.



REFLECTIONS WHILE BUILDING AN AIRPLANE

■ WHAT DO PEOPLE THINK about while building a radio model? The good builder probably thinks of nothing but the job on hand, but there must be times in the quiet hours when a guy goes on automatic while pushing the sanding board.

What old hand, for example, can construct a modern multi without dreaming? Only a short time ago an expert was the "nut" who harnessed his wiring! Most of us ran all black wires point to point inside a deep cabin in which switches, jacks, etc. were anchored in corners only a catfish could love. Noise drove everything crazy, including the airplane, and few of us knew that such a thing existed. We were economy minded—or at least not yet conditioned to the concept that if we wished anything better (and there wasn't anything better anyway) we'd have to pay for it. The chap with the black market gas tubes who asked $3.50 instead of $3.00 was a public enemy and, buying two for $7, you went around for a week with a guilty conscience. Nowdays, one considers delaying painting the house or buying a dish washer, to get the latest slick-stick stuff.

The multi we just put together for the Kraft propo certainly pointed up the ever-changing nature of RC flying. Once, the only special item on a crate was the (*Continued on next page*)

It's a Gasser! Randy McGee displays his new half-gallon capacity quick tank filler. Also empties tank, will prime easily.

THE MONITOR ...continued

home-made tin tank. But then Bonner put a plastic bottle tank in a Smog Hog, and afterwards manufactured such conveniences as control horns and tail wheel mounts, soon multiplied when Top Flite kitted the Orion—we had spring nose gears, and both nylon and metal hardware. Now every trip to the hobby shop sees something new—dozens of items peg boarded on display.

A baffling reflection: With so many things to take the work out of installations, how can it take so long to finish a crate? The frame is nothing, as you must have noted. But the wrapup takes longer than the basic construction. Complete systems are fully prewired—you need not touch a soldering iron, or even cut a piece of wire. There are things like Kwik-Links, trim bars, noiseless tubing through which a nosegear pushrod can run, and noiseless motor control and brake actuation deals permitting flexible wire to do everything but go around corners (sharp ones that is) without binding. Nylon wing attachment screws eliminating dowels and rubber bands (they break off conveniently in a crack-up), electric wheel brakes, battery packs and chargers within the systems. Molded fuselages and foam wing cores. At 3 a.m. one giddily imagines dehydrated radio model pills over which water is poured to produce magically the next day's multi. A $3 tube indeed! Add all these work saving conveniences—nylon strip hinges, fuel can siphons, etc.—and you come up with a surprisingly fancy figure!

The model press certainly is understandably carried away by all the accoutrements of what we once called the "country club" event. Experts who answer questions in print—and they are qualified beyond question—frown upon single channel, escapements, the St. Vitus-Dance proportional stuff; in fact, single channel gets described as "free flight with occasional radio interference." Escapements—except to those who use them—are dark-age torture gimmicks. Dare we ask if model aviation can survive on a broad basis if airplanes must cost $700—if you pay list?

In the writer's area there is a club with more than 100 members. Now there is nothing wrong with a group fortunate enough to be almost exclusively multi, and who, starting to encourage juniors, etc. has youngsters who can start with six channels! But wandering off into the 30-minute away hinterlands one chances upon groups here and there, sometimes flying nothing but single channel. Is radio everywhere divided into two worlds?

RC has reached such proportions that, though they may not know it, those who report and promote it, have a responsibility to get straight the facts of life. Radio now numbers almost half of all the people who compete in contests of any kind—indoor, speed, free flight, stunt—anything—as well as radio. Radio is altering the face of model aviation. If general contests are thinly attended there is good reason. It is fine to offer the one-grand airplane but the loss in overall numbers demands consideration, if not explanation. Since most of the stream of converts to radio are not interested in contests—at least as we run them—we can be justly concerned for the future of all competition modeling. Within radio itself we surely should not aggressively discourage all those who would fly simple equipment in simple aircraft.

There is much wrong with single channel today—indeed, single channel, generally speaking, was at a higher level of utility ten years ago, than it is now. But oddly, while multi had (*Continued on page* 18)

NEW RADIO CONTROL FREQUENCIES PROPOSED BY FCC FOR MODELS

On July 22 FCC took the first step toward granting the petition of the Academy of Model Aeronautics for five VHF band channels for radio control.

A Notice of Proposed Rule Making was issued which would allocate the following five frequencies for RC: 72.08; 72.24; 72.40; 72.96 and 75.64 mc. These frequencies cannot be made available until FCC has received comments by all interested parties, due by October 1. Final action is expected about January 1, according to AMA communications counsel, Jeremiah Courtney, Washington, D.C.

The new frequencies would be incorporated into the Class C Citizens Band—the same service under which we now operate. Therefore, it is expected that no new radio license would be required. It is expected that present 27 mc frequencies will remain available, traditionally a five-year transitional period.

Use of these new frequencies will be subject to two basic conditions. First, that no interference be caused to TV channels 4 and 5 which they lie between. In view of the low power employed for RC, TV interference is not expected to be a problem, according to Edward Lorenz, AMA Frequency Committee Chairman. Also, the FCC does not guarantee modelers interference-free reception on the new frequencies, which are shared with a few "flea" power industrial users and some fixed and mobile radio systems. The 72-76 mc band is considered the least crowded of those possible for radio control.

Additional conditions applicable to the new frequencies are: 1) The maximum transmitter final amplifier plate input power will be one watt; and the maximum output power .75 watts. 2) Nothing with greater gain than a vertically polarized half-wave dipole antennas will be permitted. 3) The transmitting antenna shall be immediately attached to and form an integral part of associated transmitter. 4) Voice transmissions will not be permitted—only tone or carrier interruption signalling RC models will be authorized. 5) Frequency control of the transmissions must be within a .005% tolerance of assigned channels. 6) All transmitters shall be type-accepted by the Commission and no authorization will be granted otherwise.

The AMA will file a strong endorsing comment on behalf of the allocation before October 1, according to Dr. Walter A. Good, Bethesda, Md. He appeared before FCC on several occasions during AMA's successful petition to obtain the 27 mc frequencies.

Readers Write

THOSE DOUBLE-DELTAS

Enclosed, $2.00 for a subscription. I'm tired of waiting to peruse a second-hand copy. GRID LEAKS and I have been well acquainted for many years, so it's about time I help the circulation! But the main reason for this letter is to comment on John Worth's article in the May-June issue.

First, the fellows who have not tried something different, as John suggests, are missing a lot of fun. Second, the flying wing of mine pictured on page 14 was one of my best flying models.

Being a tyro at RC, the design was not by any means the ideal ship. With a wing area of over 700 sq. in., flying weight of 20 oz. (FF contest weight at the time), this ship, under power, was hot. I didn't have much RC flying experience, so all controlling was done after the engine cut. The climb was straight out at about 45 degrees and just as the engine stopped I would push the old button. This would result in a really nice, sharp turn which lost no altitude. (I also found out in which direction the first turn would be.) Many very nice flights were made with some real thermal hopping. I finally made the mistake that all beginners make. I tried a tight turn too close to the ground.

My final comment concerns the double-delta 3-view. The flat section at the extreme leading edge is a result of adding a fuselage width to the basic wing layout. This would result (using the same terminology shown on the drawing) in an increase in the span ("C" dimension) by $\frac{C}{8}$. "C" should therefore be $C+\frac{C}{8}$.

The fuselage should only be just big enough to grasp for launching, therefore change the "'D' or more" to read "'D' or less."

There is no necessity for any fuselage side area forward of the wing apex. Careful examination of the drawing shown will reveal that by adding the nose, in fact, a drastic reduction in effective rudder results.

The note regarding engine location should read "Locate the engine as close to the CG as you can when you are building the ship." This is one mass which will be just about impossible to change once the glue has dried. The radio gear and batteries may be shifted to change the CG location. By the way, twin engines, mounted in a push-pull set-up on the pylon is very effective. You double (almost) the thrust and practically eliminate torque effects.

If any readers are interested, Frank Zaic's new *Year Book* to be released soon, has a more descriptive write-up on some of my double-delta experiments and conclusions with construction and control data. I would be more than willing to answer any questions about this interesting type of airplane and its effect on an otherwise "normal" model builder.

BILL POYTHRESS, Saugerties, N.Y.

(*Continued on page* 32)

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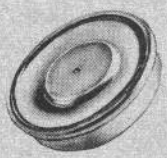

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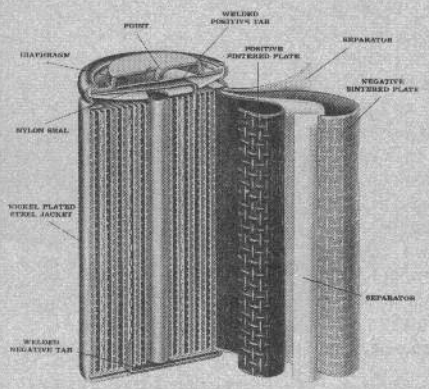

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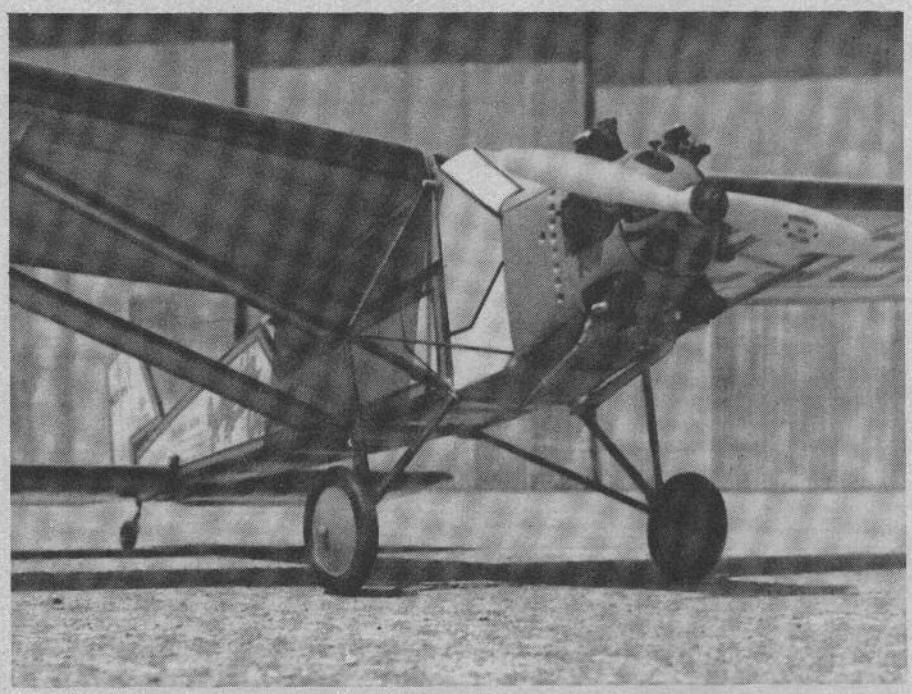
Aircooled cylinders are from a Monogram plastic engine kit. Side-mounted engine obscures the out-of-scale working head.

This semi-scale oldie—a modified Veco White Cloud kit—should start a new craze. Put the stab on top of the fuselage and you'd fool the experts. It's a .19 to .25 powered craft for the many six-channel rigs—or those "minus one" proportional systems.



Williams wheels, decorations and exhaust pipes heighten realism. Ailerons are not used but presence would permit reduction in dihedral for still greater scale look.

CURTISS ROBIN

By DON KNAUST

► PROBABLY FEW OTHER AIRCRAFT in aviation's earlier days accomplished more for setting the pace for the modern-day airplane than did the historical Curtiss Robin. It had served as a test-bed for new aircraft construction techniques, new engines and human endurance. The first Robin was built in 1928 at a time when biplanes ruled the roost. Its main object was to get an inexpensive airplane with power and weight somewhere near that of the biplanes and to put the pilot in a cabin. The Robin made good use of the surplus Curtiss OX-5 engine of World War I fame.

The endurance flights started in 1929 and that same year Dale "Red" Jackson with Forest "Obie" Obrine established a record from July 13 through July 30 of

420 hours, 21 minutes and 30 seconds with a Challenger powered Robin called the "St. Louis Robin." This record was broken in 1930 by the Hunter brothers with the famous Stinson Detroiter which remained aloft from June 11 to July 4 (553 hours, 41 minutes, 30 seconds). Jackson and Obrine regained the record by taking off with another Robin, this one called the "Greater St. Louis Robin" on July 21, 1930 and circling Lambert Field for 647 hours and 28 minutes. Nearly 27 days of listening to the steady drone of the engine, the pilots flew and slept in tours of a few hours each.

The Robins were almost forgotten until July 17, 1937 when Douglas "Wrong-way" Corrigan took off from New York using a Wright J-5-powered Robin with intentions of "returning to California" but somehow landed in Dublin, Ireland 28 hours and 13 minutes later, "much to his dismay" but nevertheless establishing a record from New York to Dublin.

Our semi-scale Curtiss Challenger Robin is modified from a Veco White Cloud kit. Finished with a unique color scheme, it is easy to fly and looks like a real "bird" in the air. This is my first attempt with multi-channel radio control and as a beginner's airplane the Robin has served its purpose well. After having some rough landings while getting "key-time" it proved easy to repair and now has some 37 flights and is into its third season. It was flown very little during 1964 while the pilot was busy with aileron jobs.

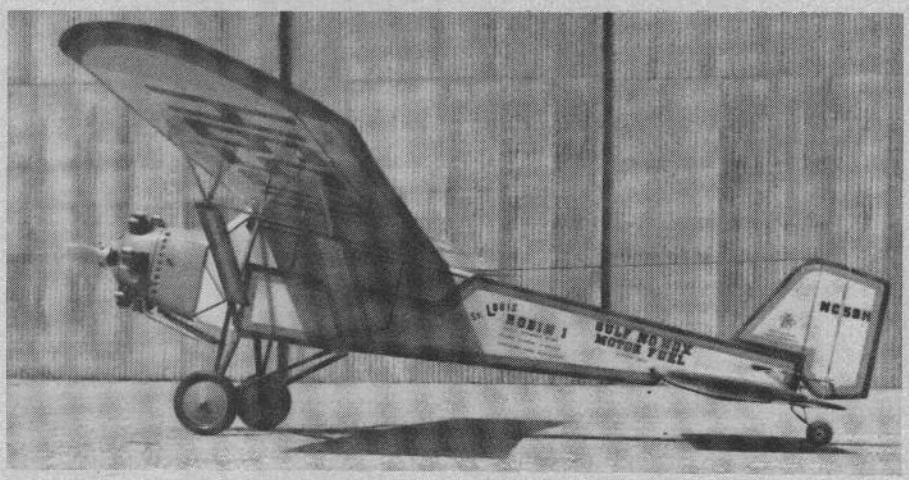
Having flown some radio control in 1955, using a Lorenz two-tuber by Ace Radio in a Livewire and 6-foot Taylorcraft, my enthusiasm dropped as the interference increased. Local interest then had hit an all time low and convenient flying sites were at a premium. The "Bug" bit again in 1962 with the appearance of newer tone receivers with their smaller size and smaller battery complement. Renewed interest by other ex-control-line flyers added greatly to the desire and I've been burning the midnight oil ever since. After fighting the panic-button the first year with 3-volt relayless jobs with half-A engines, I happened to notice that the multi boys were not shaking as much as I was. I decided it must have been a combination of multi-equipment along with the fact that the larger planes seemed to fly smoother and groove better. I guess some single-channel boys will buy anything because I purchased a used 8-channel relay receiver, a fistfull of servos, traded for what was supposed to have been an eight channel transmitter, and dived in.

It just so happened that I had a White Cloud kit gathering balsa dust. After thumbing through some old model magazines I came upon a Curtiss Robin three-view and, with this kit, it looked like a cinch to duplicate and more like a scale job.

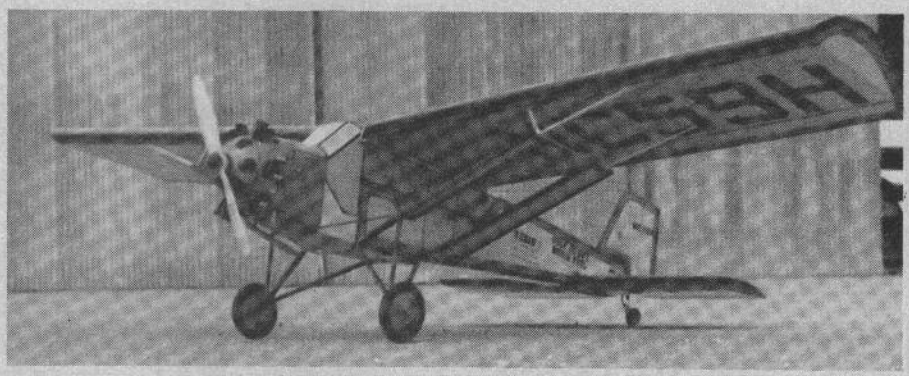
By drawing a Curtiss Robin rudder, changing the nose section and adding Monogram's plastic cylinders, scale-type "burners" and wing struts, it looked pretty much like Robin. (*Continued on next page*)

CURTISS ROBIN PLANS ON FOLLOWING TWO PAGES

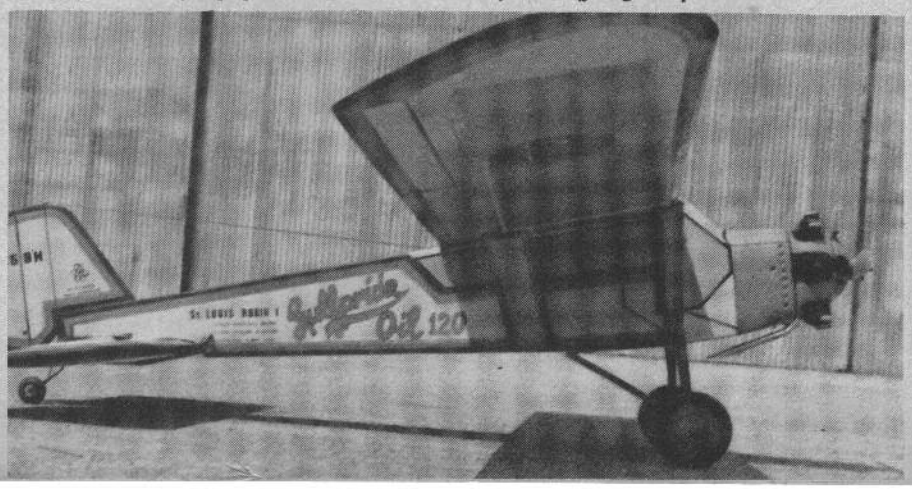
Not only does it look like million bucks but "snap rolls, spins like crazy."



Markings and details were taken from Nieto plans published in MAN back issue.



Silver-soldered stacks function—no loss, some muffling. Prime via plug hole! Weight with relay equipment was 4½ lbs. Many kits offer good possibilities.



CURTISS-ROBIN . . . Continued

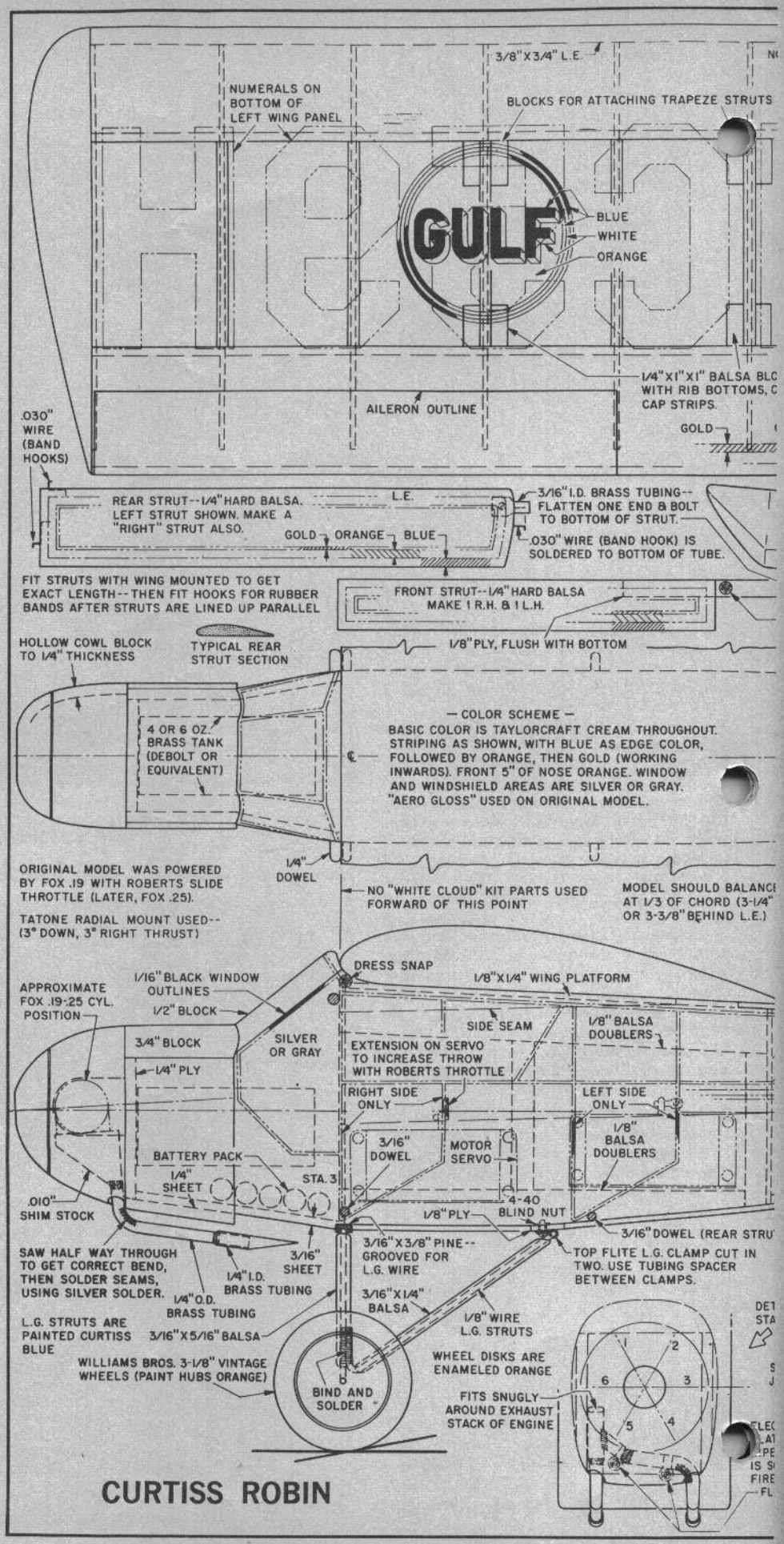
The scale-type landing gear and paint job seemed to give it that final touch.

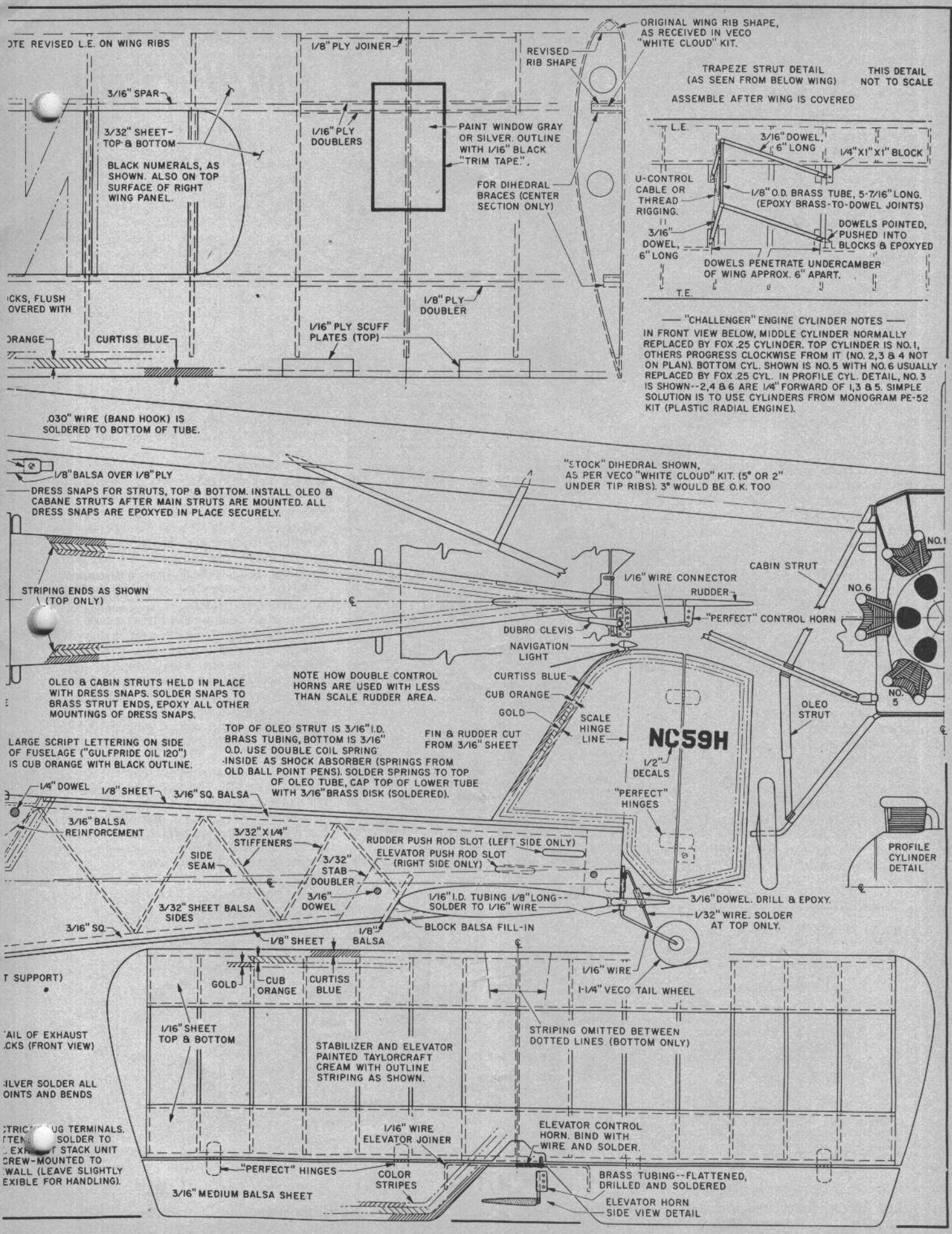
Now came the big day for the test hop. But there were no multi flyers around that day to give some advice and moral support. So one of our single-channel artists heaved it into the air and away she went. Flew off the board as the experts say. Thinking that my launcher had flown a little multi before, I turned the controls over to him as I needed to unwind a little bit. Found out after he landed the Robin in fine fashion that it was his solo flight, too! The multi equipment did not stop the shaking but the planes handled better with this set-up.

A Fox .19 with Roberts slide-throttle was first installed, which handled it pretty well and idled down good. Later a Fox .25 with the same type throttle was mounted for added power. With the .19 and using rudder, elevator and throttle, the still evenings gave opportunity for our co-pilot to get some good low-level movies with the Robin flying at altitudes of about five to six feet. It snap-rolls well and spins like crazy. I have heard it said that the prototype had on occasions gotten into flat spins doing turns too tightly. We accomplished one of these when I buzzed the field during a fly-in and let the Robin get out too far. Suddenly there were light poles from an adjoining ball-diamond passing between the Robin and the pilot. Instant panic set in and, with the throttle jammed open and up elevator we clipped a light poles from an adjoining ball-diamond for a true flat spin with only loss of a wing tip. After that incident a little more looking ahead at low altitudes prevented grandstand stunts.

The ready-to-fly weight was 4½ pounds when using six channels with the relay equipment. This gave us an 18-ounce-per-square-foot wing loading. Later, the relayless equipment was installed and, with the addition of a heavier battery pack, and nose ballast to offset the heavier amplifier servos, the loading increased to 19.94. With the addition of the lifting trusses we then figured the loading to be 17.80 ounces.

With the scale-type exhaust stacks it is not too easy to prime the engine in the exhaust. We have removed the glow-plug and primed, which seemed sufficient. The stacks should be (*Continued on page* 28)




OTE REVISED L.E. ON WING RIBS
1/8" PLY JOINER
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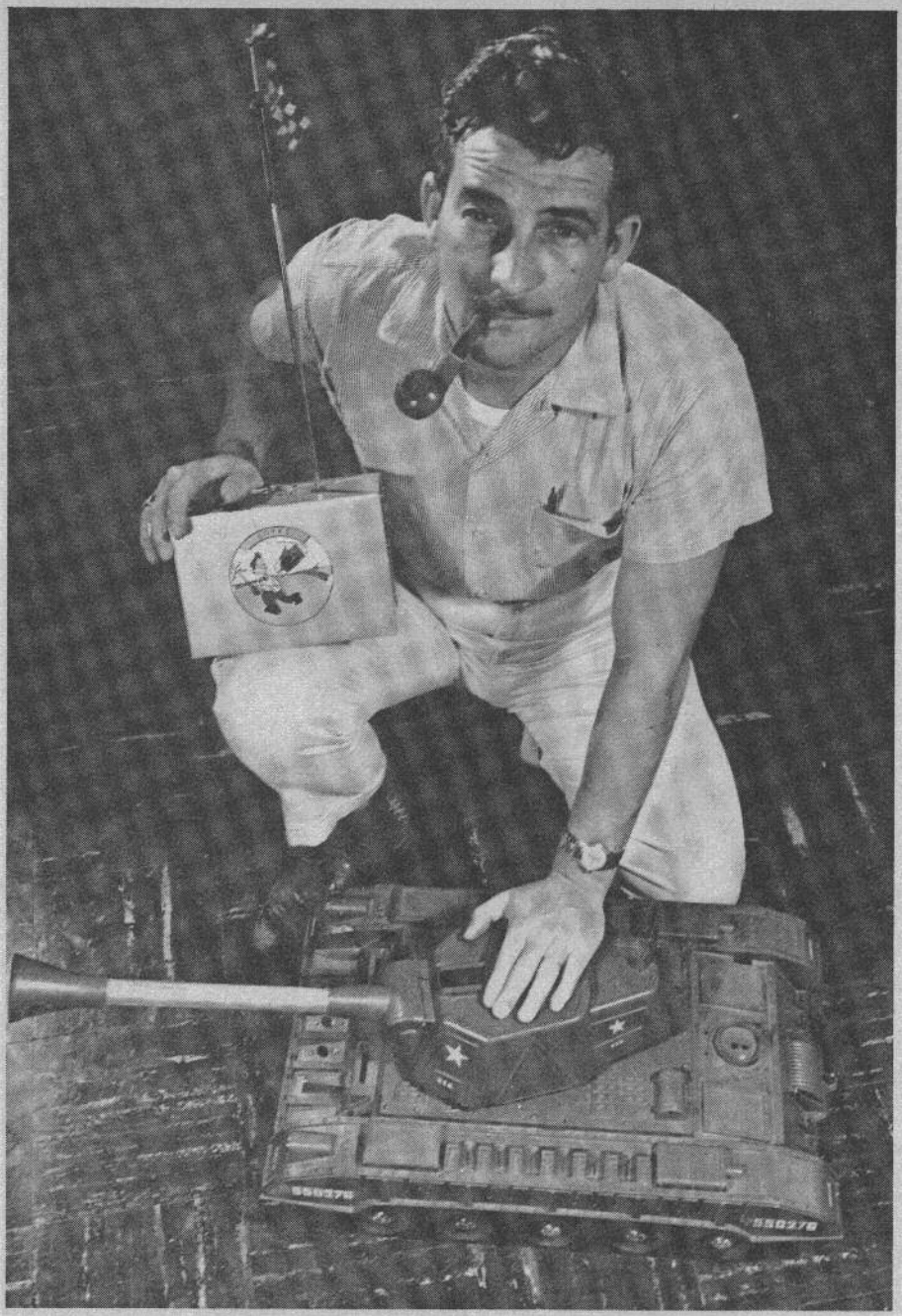
T.E.
"CHALLENGER" ENGINE CYLINDER NOTES
IN FRONT VIEW BELOW, MIDDLE CYLINDER NORMALLY REPLACED BY FOX .25 CYLINDER. TOP CYLINDER IS NO. 1, OTHERS PROGRESS CLOCKWISE FROM IT (NO. 2,3 & 4 NOT ON PLAN). BOTTOM CYL. SHOWN IS NO. 5 WITH NO. 6 USUALLY REPLACED BY FOX .25 CYL. IN PROFILE CYL. DETAIL, NO. 3 IS SHOWN--2,4 & 6 ARE 1/4" FORWARD OF 1,3 & 5. SIMPLE SOLUTION IS TO USE CYLINDERS FROM MONOGRAM PE-52 KIT (PLASTIC RADIAL ENGINE).
1/8" PLY DOUBLER
1/16" PLY SCUFF PLATES (TOP)
CURTISS BLUE
.030" WIRE (BAND HOOK) IS SOLDERED TO BOTTOM OF TUBE.
1/8" BALSA OVER 1/8" PLY
DRESS SNAPS FOR STRUTS, TOP & BOTTOM. INSTALL OLEO & CABANE STRUTS AFTER MAIN STRUTS ARE MOUNTED. ALL DRESS SNAPS ARE EPOXYED IN PLACE SECURELY.
"STOCK" DIHEDRAL SHOWN, AS PER VECO "WHITE CLOUD" KIT. (5° OR 2" UNDER TIP RIBS). 3° WOULD BE O.K. TOO
STRIPING ENDS AS SHOWN (TOP ONLY)
1/16" WIRE CONNECTOR
RUDDER
CABIN STRUT
NO. 6
"PERFECT" CONTROL HORN
DUBRO CLEVIS
NAVIGATION LIGHT
NO. 5
OLEO & CABIN STRUTS HELD IN PLACE WITH DRESS SNAPS. SOLDER SNAPS TO BRASS STRUT ENDS, EPOXY ALL OTHER MOUNTINGS OF DRESS SNAPS.
NOTE HOW DOUBLE CONTROL HORNS ARE USED WITH LESS THAN SCALE RUDDER AREA.
CURTISS BLUE
CUB ORANGE
GOLD
SCALE HINGE LINE
OLEO STRUT
LARGE SCRIPT LETTERING ON SIDE OF FUSELAGE ("GULFPRIDE OIL 120") IS CUB ORANGE WITH BLACK OUTLINE.
TOP OF OLEO STRUT IS 3/16" I.D. BRASS TUBING, BOTTOM IS 3/16" O.D. USE DOUBLE COIL SPRING INSIDE AS SHOCK ABSORBER (SPRINGS FROM OLD BALL POINT PENS). SOLDER SPRINGS TO TOP OF OLEO TUBE, CAP TOP OF LOWER TUBE WITH 3/16" BRASS DISK (SOLDERED).
FIN & RUDDER CUT FROM 3/16" SHEET
NC59H
1/2" DECALS
"PERFECT" HINGES
1/4" DOWEL
1/8" SHEET
3/16" SQ. BALSA
3/16" BALSA REINFORCEMENT
3/32" X 1/4" STIFFENERS
RUDDER PUSH ROD SLOT (LEFT SIDE ONLY)
ELEVATOR PUSH ROD SLOT (RIGHT SIDE ONLY)
SIDE SEAM
3/32" STAB DOUBLER
3/16" DOWEL
3/32" SHEET BALSA SIDES
1/16" I.D. TUBING 1/8" LONG--SOLDER TO 1/16" WIRE
3/16" DOWEL. DRILL & EPOXY.
1/32" WIRE. SOLDER AT TOP ONLY.
3/16" SQ.
BLOCK BALSA FILL-IN
1/8" BALSA
1/8" SHEET
PROFILE CYLINDER DETAIL
T SUPPORT)
GOLD
CUB ORANGE
CURTISS BLUE
1/16" WIRE
1-1/4" VECO TAIL WHEEL
AIL OF EXHAUST CKS (FRONT VIEW)
1/16" SHEET TOP & BOTTOM
STABILIZER AND ELEVATOR PAINTED TAYLORCRAFT CREAM WITH OUTLINE STRIPING AS SHOWN.
STRIPING OMITTED BETWEEN DOTTED LINES (BOTTOM ONLY)
ILVER SOLDER ALL OINTS AND BENDS
1/16" WIRE ELEVATOR JOINER
ELEVATOR CONTROL HORN. BIND WITH WIRE AND SOLDER.
"PERFECT" HINGES
COLOR STRIPES
BRASS TUBING--FLATTENED, DRILLED AND SOLDERED
3/16" MEDIUM BALSA SHEET
ELEVATOR HORN SIDE VIEW DETAIL

NINE-VOLT UNIJUNCTION PULSER



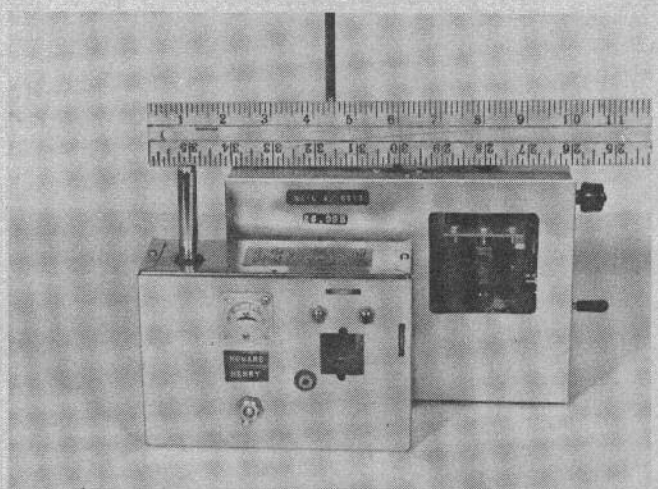
Author and modified Mule X-mitter with a Deye pulser. Tank is controlled by pulse using Controlaire SH-100 rcvr. Stop-Go, Left-Right, Auxiliary and has Fail-safe.

● *(Quite a bit of interest has been shown in rate-and-width pulsers, which are compatible with nine-volt transmitters, using one battery source. There are several commercial packages available, but these are for completed outfits. A kit will be available later. This circuitry has been used by Mr. Deye with a repackaged Mule transmitter, and his friend, H. Henry, has used it with a repackaged Kraft KTX1. It is a proven circuit, used by more than 15 CORKS flyers in the Columbus, Ohio area. Deye used it all of one flying season, on galloping ghost. Mr. Henry flew a 1/8 A model on pulse at the Toledo Weak Signals Conference in February.)*

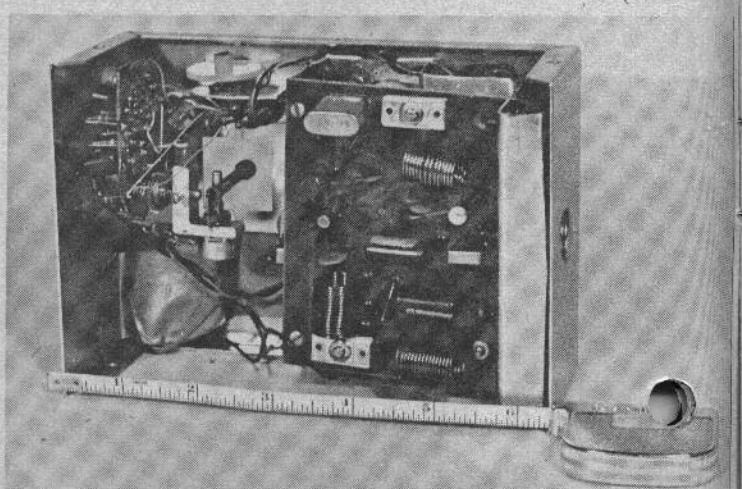
■ This nine-volt pulser was designed to be used as a relayless companion to the nine-volt transmitters on the market. It can be used with a relay to operate the tube-type transmitters. A relay of the 50- or 100-ohm configuration would work well. The design reflects some compromises made to accommodate some of the low-cost components used.

Basically, this unit consists of a unijunction oscillator which uses a variable current regulator to determine its rate and linearize its output. This output, a linear voltage change with time, is the input to a voltage level detector. This level detector provides a pulse output which is proportional to the ramp voltage detected which, in turn, is proportional to the duty cycle symmetry.

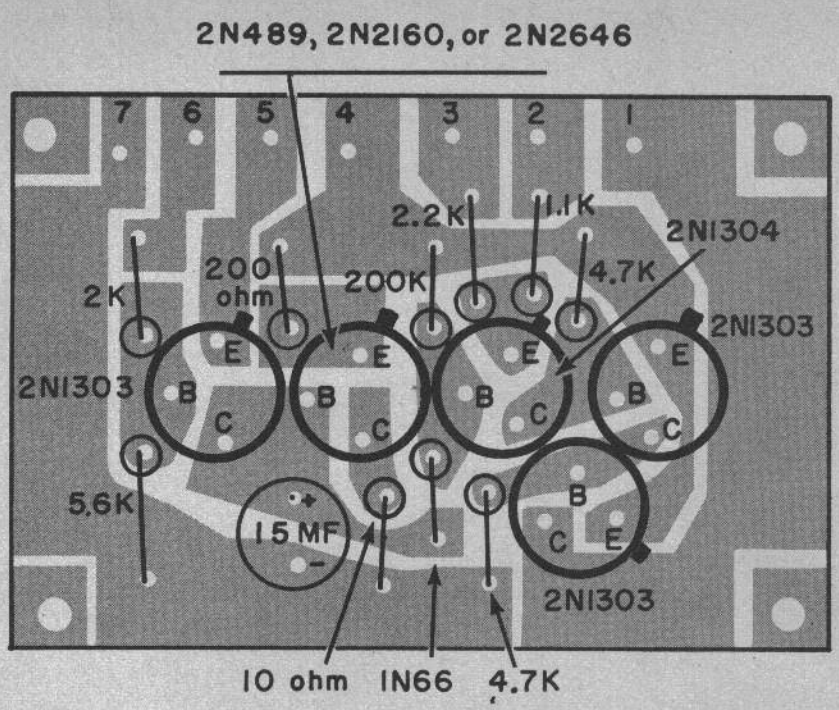
Q1 provides a constant current source for charging C1. The value of this charging current is determined by the voltage divider R1, R2, and R3, the emitter resistor R4 and the beta of Q1. R4 was used in the emitter circuit to provide some degeneration and, thus, reduce the effects



Kraft KTX1, front, and Controlaire Mule, using a Deye pulser, self-contained units including 9-volt battery.

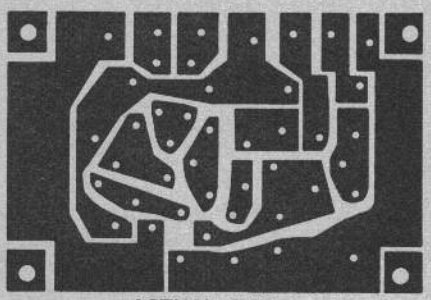


Interior of the KTX1, displaying the Deye pulser installed. (See Home Brew Transmitter, elsewhere in this issue of GL.)



A well-proven circuit using a nine-volt battery, compatible with many transmitters on the market, will interest those who need to up-date a pulser.

By NEIL S. DEYE

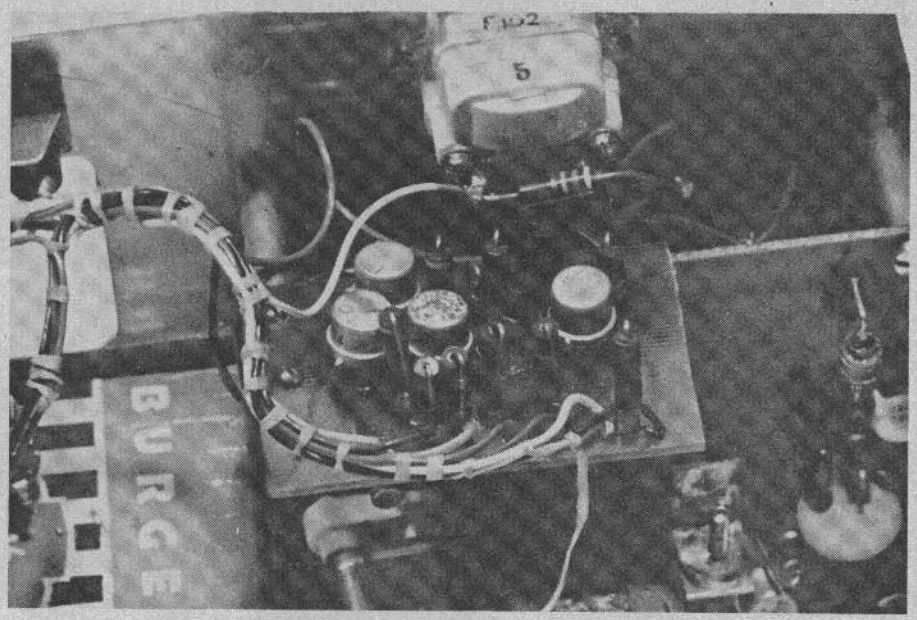


ACTUAL SIZE

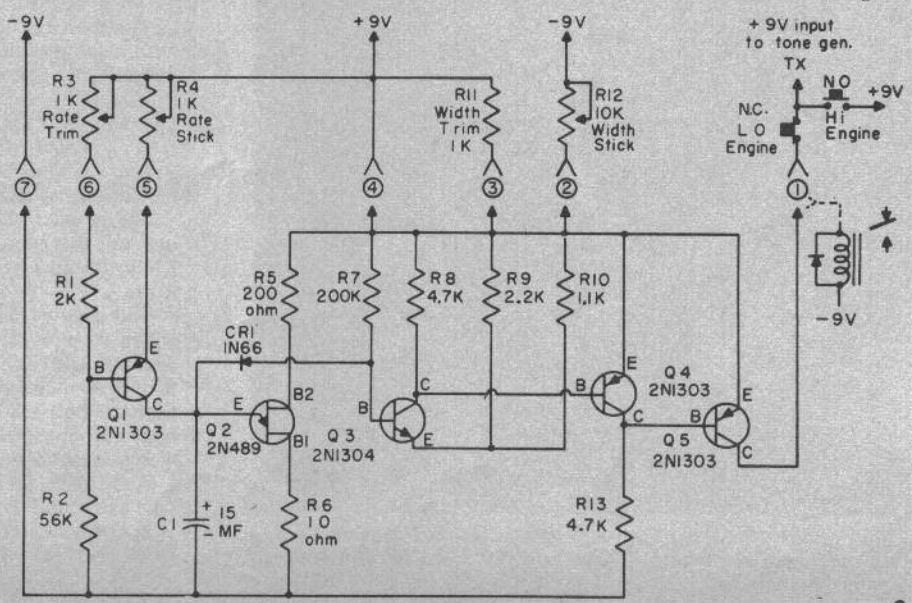
of leakage and change of leakage with temperature of Q1. The choice of usable transistors for Q1 is broad with prime consideration given to leakage current and beta change at low currents. The actual Q1 collector current requirement will be 0.2 to 2.0 ma (*refer now to end of text*).

The charge of a capacitor is normally exponential when a resistance is used in series. However, if charged at a constant rate of current, the voltage across the capacitor will be in a linear relation to time. Thus, C1 is charge to V_p of Q2 ($V_p = n\ V_{BB} + 0.7$ volt $= 6.55$ volts); at this point, Q2 turns on and C1 is discharged to V_E (min) $= 0.5\ V_E$ (sat) $=$ 0.4 volt, at an exponential rate determined by C1, R6 and emitter to base one resistance. In all cases this should be only a small percentage of the total duty cycle and can be neglected. R6 limits the peak discharge current of C1 and increases the recovery time. It would be desirable to reduce C1 which, in turn would permit the reduction or removal of R6 and improve the recovery of Q2.

The minimum charging current of C1 must be at least 10 times the leakage of Q1. The loading effects of CR1 and R7 will represent an exponential change of current from 45 micro-amp. maximum to 15 micro-amp. and will account for less than 10 percent change in linearity at 2 cps to less than 1 percent at 20 cps and this error will decrease as the rate or C1 increases. R5 is used to provide some temperature compensation and, to a small degree, reduce power dissipation of Q2. The linear ramp output of this circuit is coupled to Q3 by CR1. Q3 is a voltage level detector and its level is selected by a voltage divider at its emitter consisting of R9, R10, R11, and R12. When the ramp input to the base of Q3 exceeds the emitter voltage, Q3 conducts, its base current conducts through R7 and results in holding the base of Q3 at slightly higher (0.5 volt) voltage than the emitter. As the ramp input to C1 increases in voltage, CR1 is back (*Continued on page 27*)

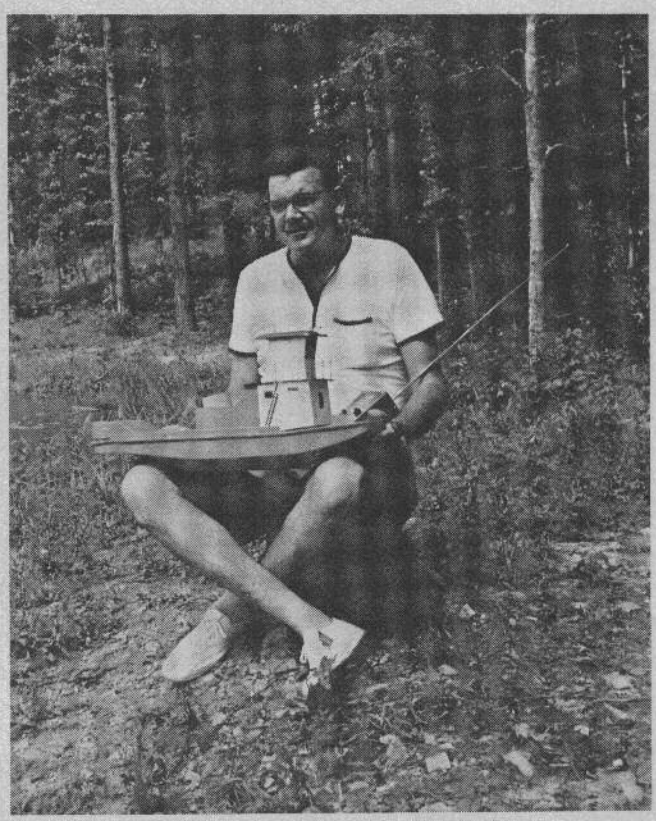


Completed pulser installed. Size may be compared with battery at lower left. Or with the crystal just below it. Schematic below, includes a high-low engine.



CHATTAHOOCHEE CHUG-CHUG

"I became so smitten with this little boat while it ran up and down the river, that I felt compelled to make a model of it . . ."



The author. "I love to fly RC airplanes—and tear them up, but there is something to be said for this boat business."

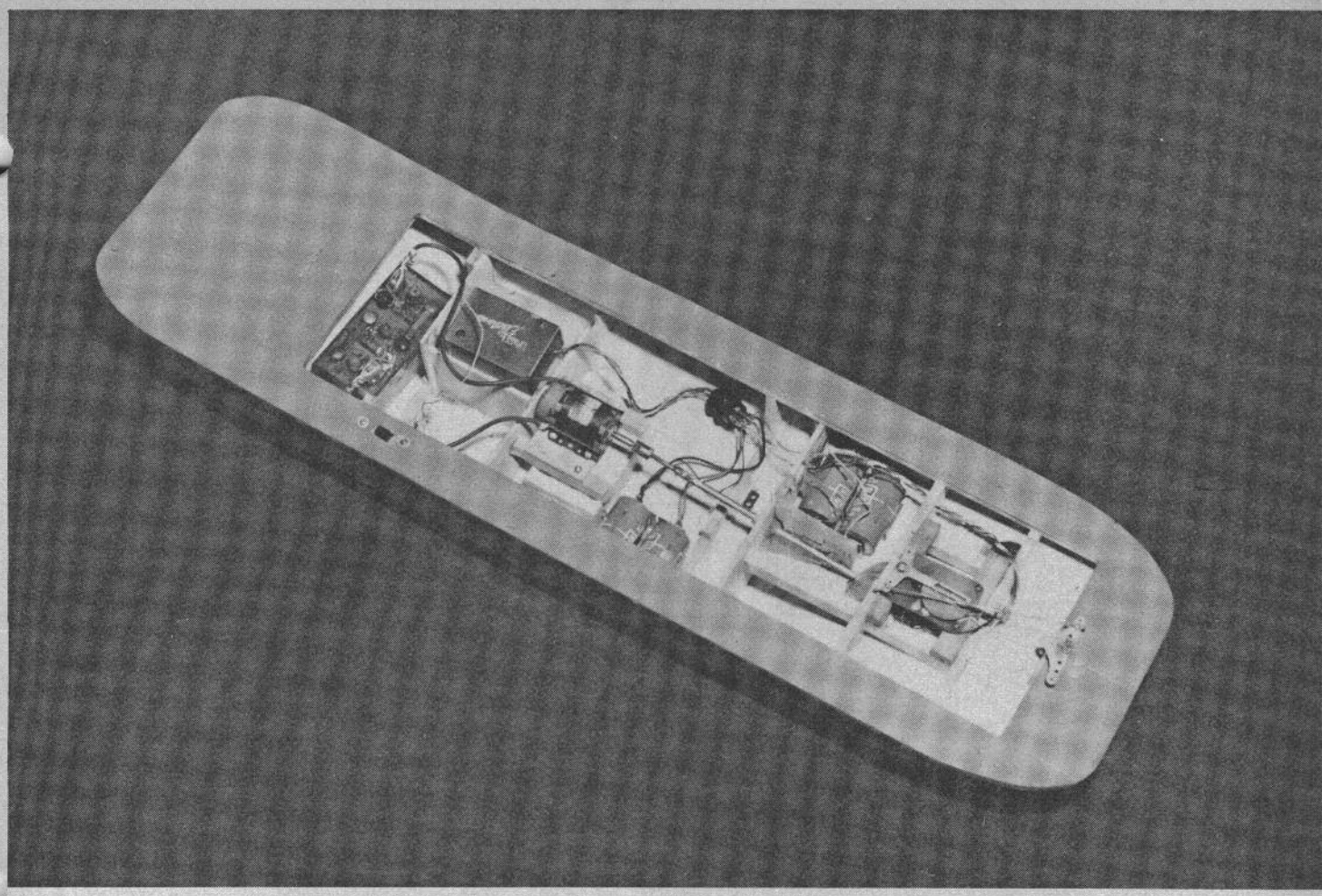
By *FELIX BURRUS*

Most interesting thing about this dredge tender is that it was an original design by an airplane man who knew nothing about boats—no fuss, no feathers, no gadgets!

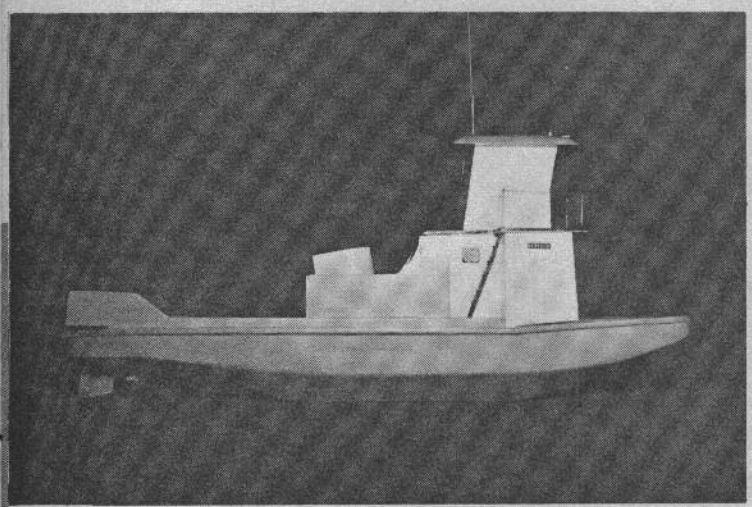
► LAST SUMMER WE HAD A DREDGE operating here on the Chattahoochee River, cutting a nine-foot channel to the Gulf. Along with the dredge was the prototype of this model, a small tug-like vessel called a dredge tender. I became so smitten with the lines of this little boat while watching it run up and down the river on its chores, that I felt compelled to build a model of it. The result which is shown here was constructed very easily and is a pretty sight to see skimming along on the local pond.

I knew next to nothing about building boats, as my specialty up until this time had been tearing up RC airplanes! However, I built it and I believe that you will enjoy building and running it too.

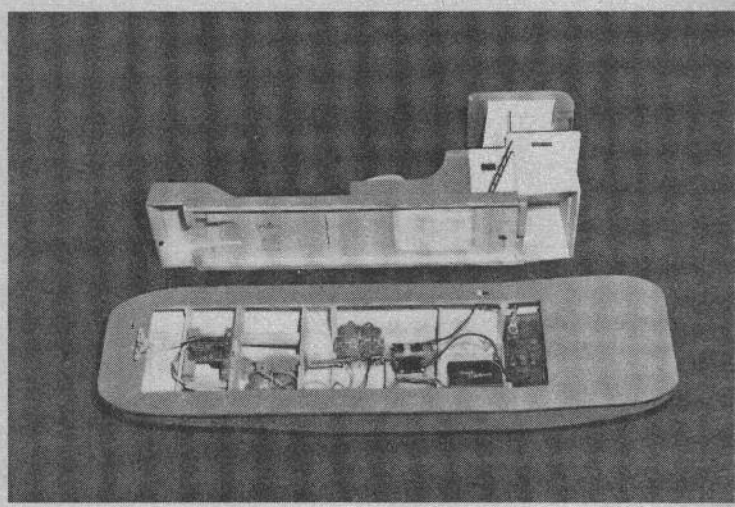
The only plans I could obtain were those for the prototype which were so courteously sent to me by the naval architects who designed the boat, and since these were not large enough to use as a full-size guide, I did it the easy way. I discovered that the hull taken from the plans of Musciano's Dravo Tow boat (Hobby Helpers #571, still available at 50 cents—Ed.) was almost identical with that of the tender, and this is what I used. Since these plans include templates for the hull parts, you can build it exactly as shown with the exception of the twin-screw set-up and nozzles which are not used on this boat. (The real one, that is). The Dravo plans are self-explanatory



GM Monoperm motor, Aristo wetcell, F&M Vanguard receiver and Minicombo rudder servo were used—noise did not bother rcvr!



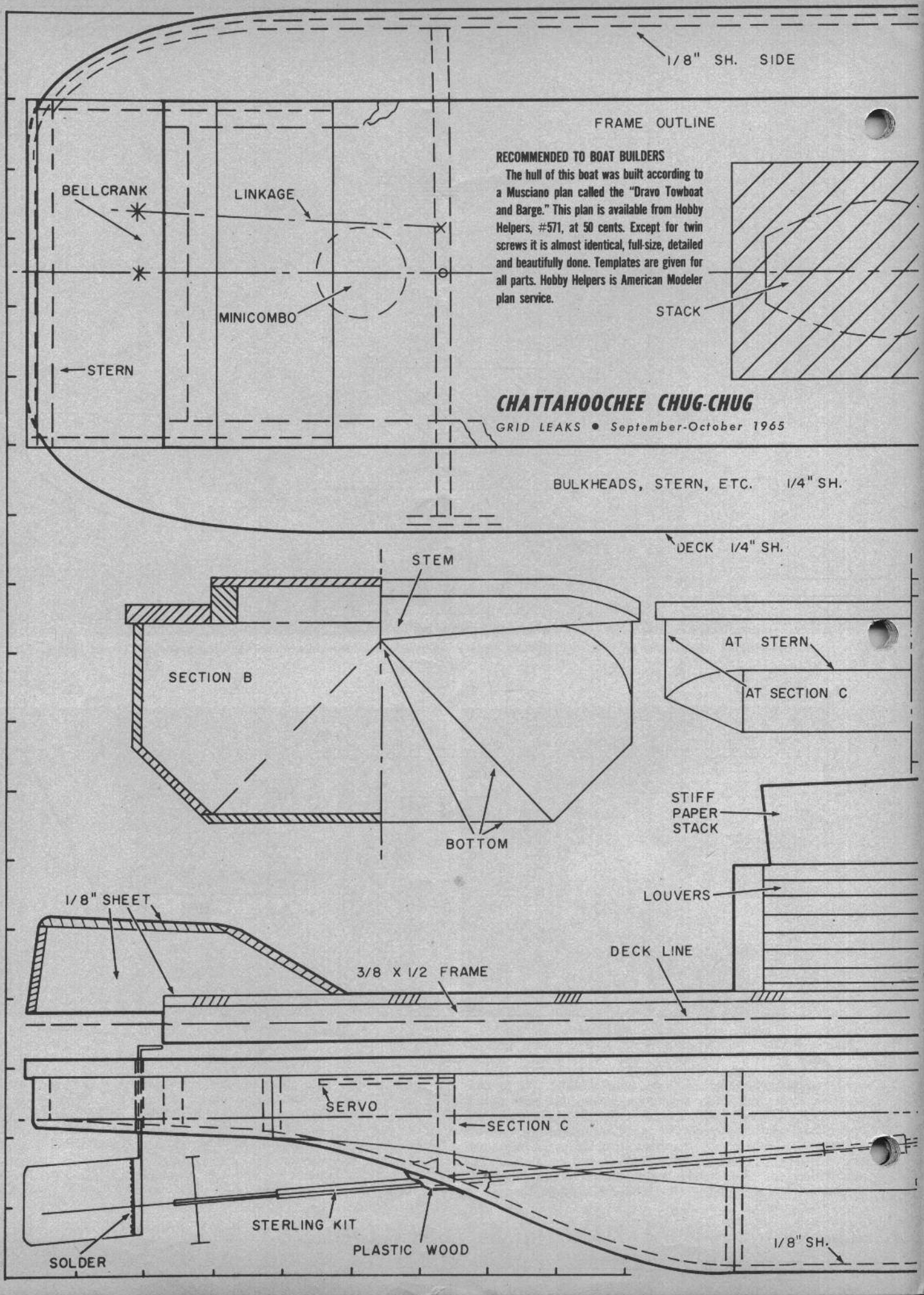
Entire boat is made from balsa, with exception of hardwood motor and servo mounts. No more difficult than fuselage!



Superstructure lifts off as a unit, providing easy accessibility to installed equipment. Photographs taken by Bob Faircloth.

(and extremely nice according to sample—Ed.). As to construction of the hull—only suggestion I can make here is that you can use soft balsa which sands easier, but be sure to seal both outside and inside well after sanding and before applying color. If using talc sealer, use about 10 or 12 coats, inside and out; if HobbyPoxy two or three coats should do the job. The superstructure is somewhat similar in construction to the Dravo, except that it does not have the long cabin or deck house. It will amount to a cover for the innards of the ship when completed, and is made by first making a frame from ⅜ by ½ in. balsa which fits just inside the hull and rests right down on top of the bulkheads. After frame is completed it is covered with ⅛ in. sheet cross-grain and then the pilot house at the front and the equipment locker at stern can be built right on top of this. When building the pilot-house, you can use either 3/32 or ⅛ in. sheet balsa, but make sure you (*Continued on page* 25)

PLANS FOR CHATTAHOOCHEE CHUG-CHUG ON NEXT TWO PAGES

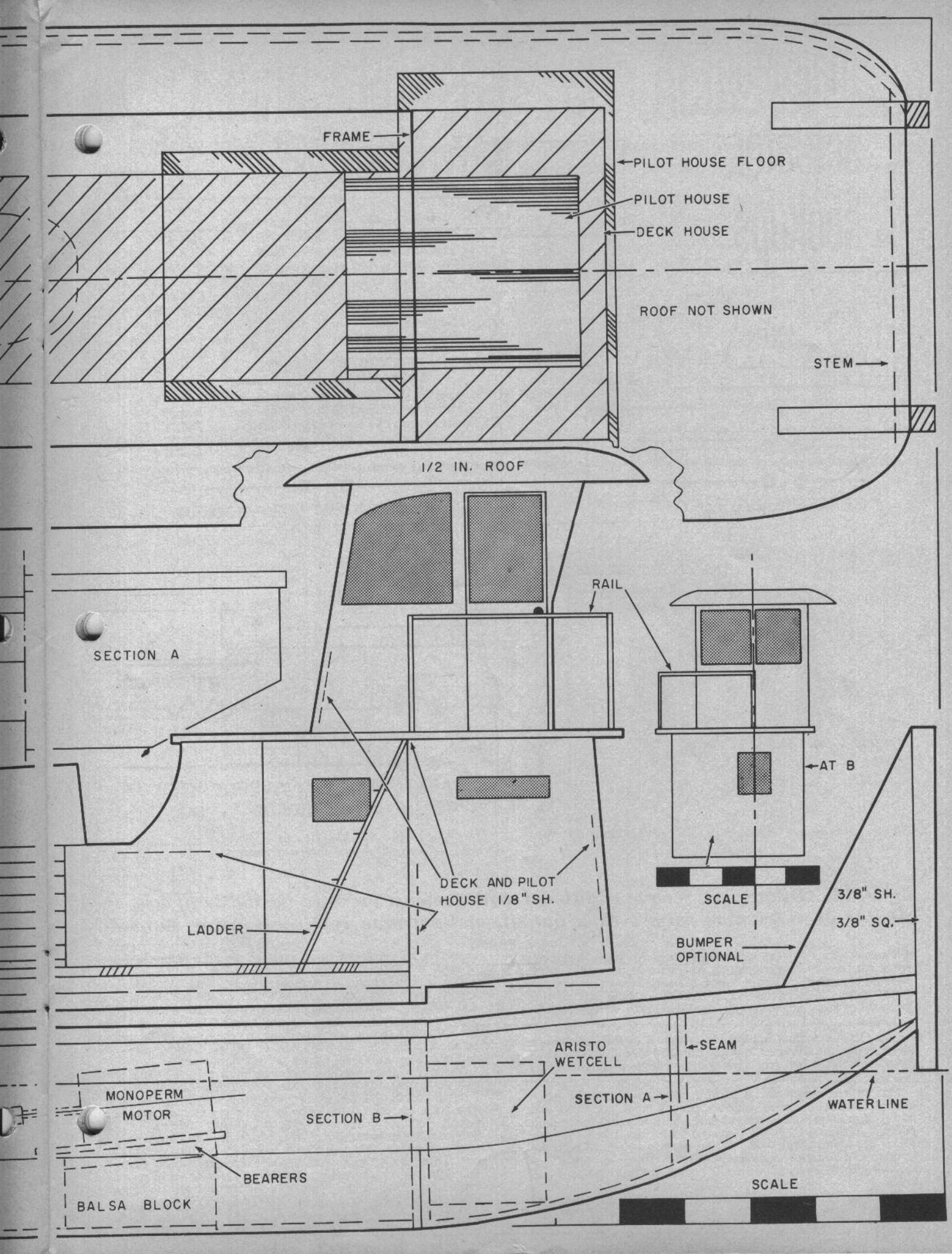


RECOMMENDED TO BOAT BUILDERS

The hull of this boat was built according to a Musciano plan called the "Dravo Towboat and Barge." This plan is available from Hobby Helpers, #571, at 50 cents. Except for twin screws it is almost identical, full-size, detailed and beautifully done. Templates are given for all parts. Hobby Helpers is American Modeler plan service.

CHATTAHOOCHEE CHUG-CHUG

GRID LEAKS • September-October 1965


FRAME
PILOT HOUSE FLOOR
PILOT HOUSE
DECK HOUSE
ROOF NOT SHOWN
STEM
1/2 IN. ROOF
RAIL
SECTION A
AT B
DECK AND PILOT HOUSE 1/8" SH.
LADDER
SCALE
3/8" SH.
3/8" SQ.
BUMPER OPTIONAL
ARISTO WETCELL
SEAM
MONOPERM MOTOR
SECTION B
SECTION A
WATERLINE
BEARERS
BALSA BLOCK
SCALE

magnetic actuator hookups

NORMAL HOOKUP

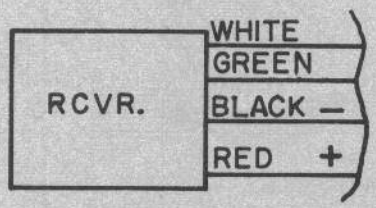


FIG. 1

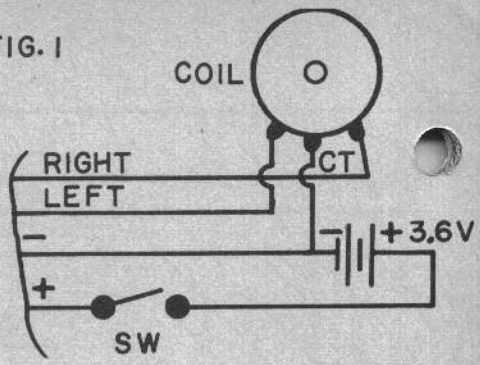


FIG. 2

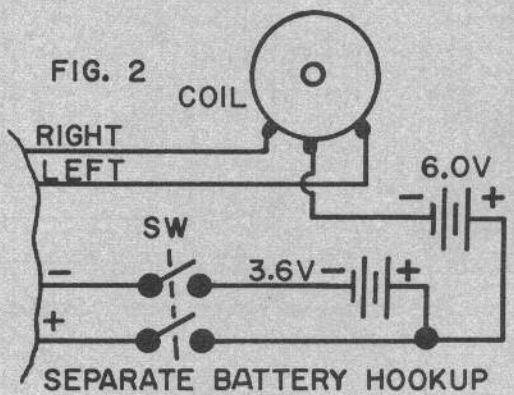
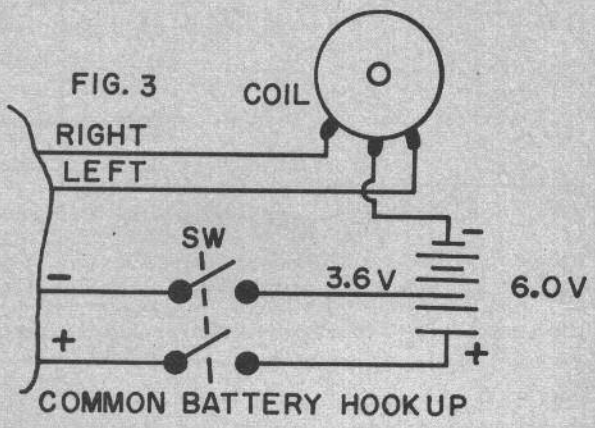
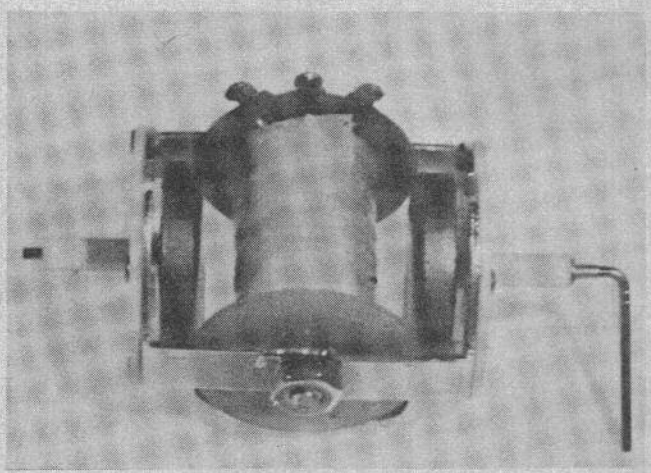


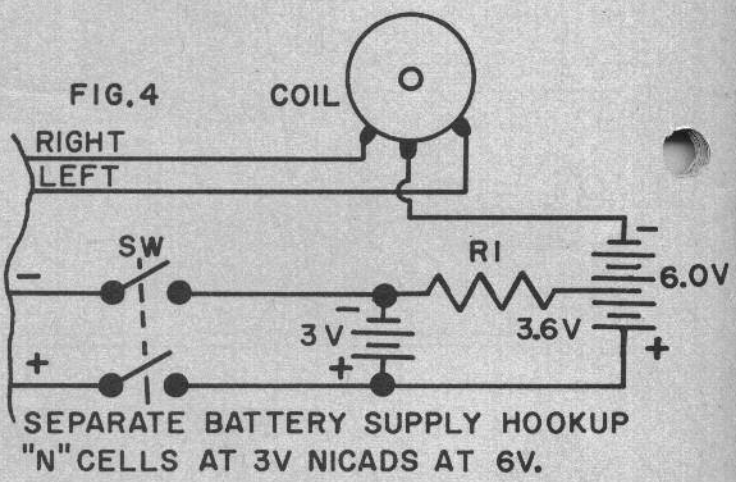
FIG. 3





The double-magneted actuator capable of handling .19 ships.

FIG. 4



In this drawing, R1 should be of such value that, switches on, voltages across 3-volt supply will range from 3.1 to 3.2 volts.

By DICK ADAMS . . . Several additional arrangements increase flexibility of use, including overexcitation for a greater output, and separate receiver-actuator supplies.

■ PROPORTIONAL FLYERS using the Adams Actuator have been doing considerable experimenting which we have verified in all manner of aircraft. This circuitry is being passed on through GRID LEAKS, since we believe it is of more than just passing interest for users of the proportional actuators of the double-coil type.

Fig. 1 is the normal hookup, as is shown in the instructions for the Adams Actuator, using three 450-milliampere-hour nickel-cadmiums for receiver-actuator common supply. This is a double-ended circuit.

Fig. 2 is a circuit for a receiver at 3 or 3.6 volts using either alkaline batteries of the pencell type, or 100-mah nickel-cadmiums. The actuator supply here is either four alkali pencells (shorter life—200-ma drain) or five 450-mah nickel-cadmiums. Note that it is necessary to switch off both the positive and negative leads to the receiver whenever the actuator is to be overexcited with more than the normal 3 or 3.6 volts.

Fig. 3 is the circuit for overexcitation of the actuator, and supplying the receiver from a negative tap off a common 5-pack of 450- to 500-mah nickel-cadmiums.

Fig. 4 is the circuit for separate receiver and actuator power supply, using half-size pen or "N" alkali cells for the receiver, and 450- or 500-mah nickel-cadmiums for the actuator.

With the proper resistor from negative 3.6 to negative 3 volts, the "N" cells should last all season, as they will be floated up by the nicads. This is adaptation of Dr. A. L. Scidmore's circuit published in GRID LEAKS several issues ago.

Testing of these circuits was done with a C & S 505 (over two years old) and a Controlaire 5, with Ace Add-on switcher. Kraft 9-volt KTX1 transmitter was used with a Shows pulser. The drain by receiver on 3.6 volts was 3 ma idle and 10 ma on signal. Actuator drain at 6 volts was 190 to 200 ma.

Nickel cadmium cells of the 100-mah size could be substituted for the "N" batteries in Fig. 4, and the resistor left out. Then the 450-500-mah nickel cadmiums would keep the 100 charged up. I myself, however, hate to parallel nickel cadmiums, since there is quite a bit of chance of damage. (Editor—Nickel cads must be charged in series.)

Adams Powered GG Actuator

By JOHN F. FELTER . . . New, more powerful models of this magnetic actuator increase engine range to at least a .15—here is a Galloping Ghost system with internal linkage.

■ USING THIS ACTUATOR. one trades a mess of wires and yokes at the aft end of the aircraft for a simple pushrod and control horn configuration. In addition, adjustment of control surface movement is facilitated. I have also experimented with a curved versus straight yoke on the actuator, to obtain more elevator pushrod travel. This complicates construction a bit, but can be done without too much trouble. An end view is given.

NUMBERS ARE ASSOCIATED WITH SKETCH:

1. Frame is constructed from 1/16" aluminum sheet; fold on the dotted lines to achieve figure 2. Dimensions are approximate and are not critical.

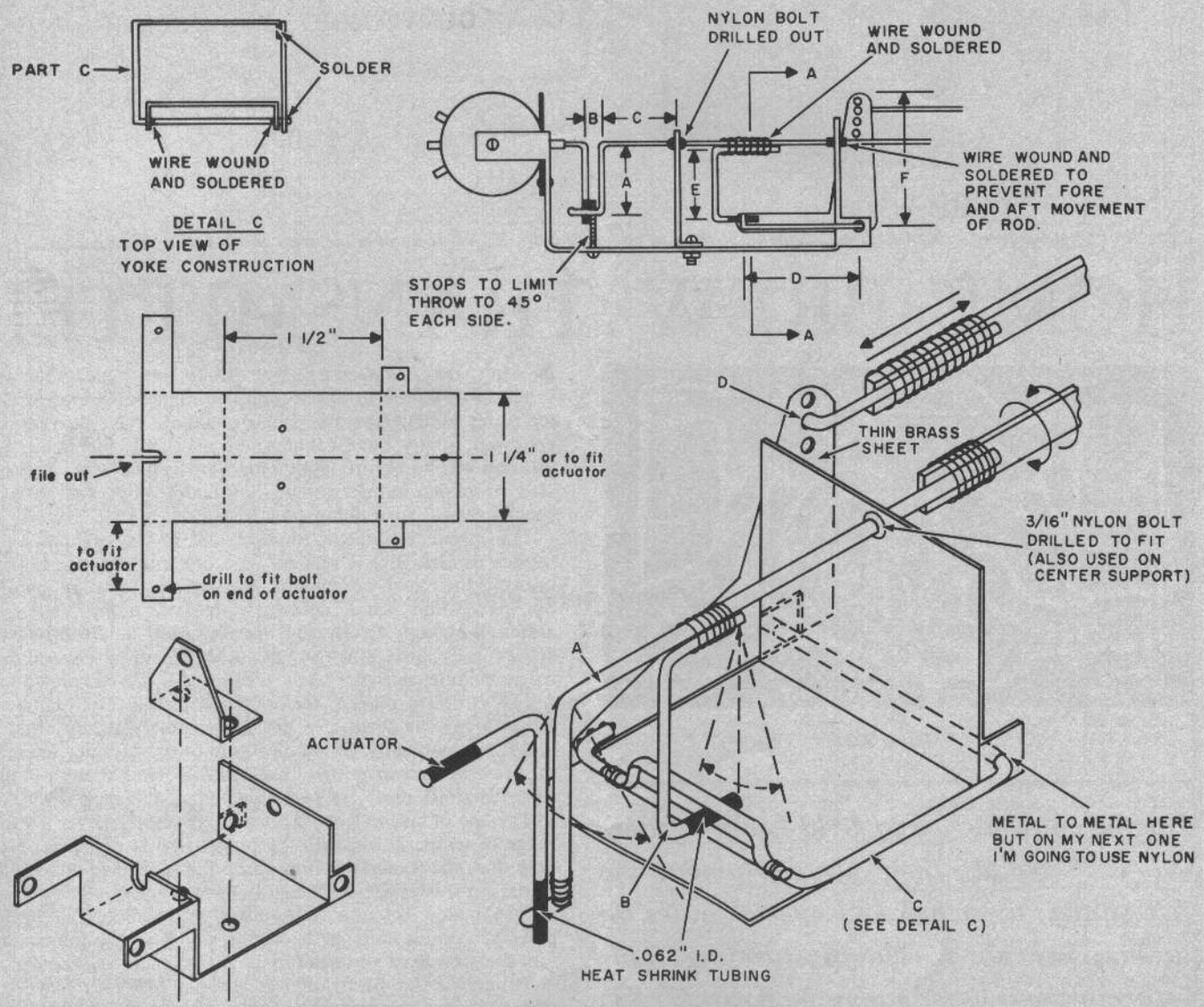
2. Frame is ready for installation of yoke and rudder rod mechanism.

3. A few things to watch for here: Dimension "A" must be ½" *; Dimension "B" should be kept to a minimum *; Dimension "C" should be as small as possible—a good place to reduce the overall length of the device; Dimensions "D", "E", and "F" will determine the total elevator throw. I used "D"= ⅞", "E"=½", and "F"=1".

4. This is an isometric view of section "A-A" from figure 3. Operation is as follows: Rod "A" (rudder torque rod) is moved through a 90-degree arc—45 degrees each side of neutral; the Adams actuator imposes this limit. "B" travels through the same arc and, in doing so, cams the yoke up and down; part "C" transmits this up and down action to part "D" which moves fore and aft.

Part "C" should be one piece for rigidity and well soldered to the brass horn. Limit stops should be placed on the rudder or rear crank. (User's instructions for Adams Actuator.) Limit stops work all right as shown, and are made from two long, thin brass bolts screwed up through the bottom of frame as shown in figure 3. (Cover the stops with heat shrink tubing.)

* MANUFACTURER'S SPECIFICATION SHEET.



Typical of single-channel transmitters which the hobbyist can make himself, KTX1 is compatible with most single receivers.

HOME BREW TRANSMITTER

ACTUAL SIZE

For the convenience of Grid Leaks readers who wish to make their own equipment, the schematics, drawings and special notes on tuning, provide a valuable briefing. This information is based upon the Kraft KTX1.

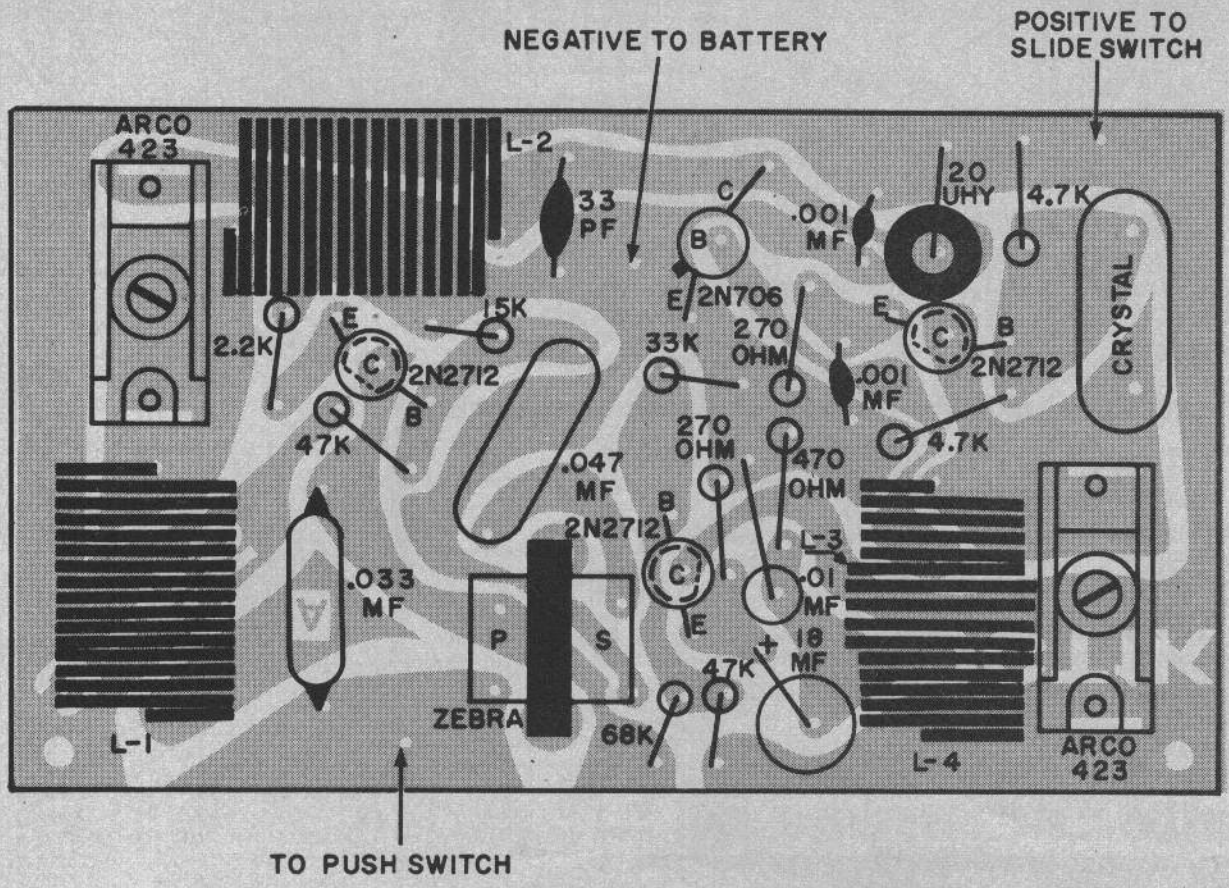
► HIGH PERFORMANCE, LOW COST, and repeatable results are desirable in any equipment. The KTX1 transmitter, the Kraft Custom single-channel, has proved so endowed; many have found their way into the hands of satisfied RC fans throughout the world. The same can be said of many industry items, of course, but we have a special reason for talking now about the KTX1.

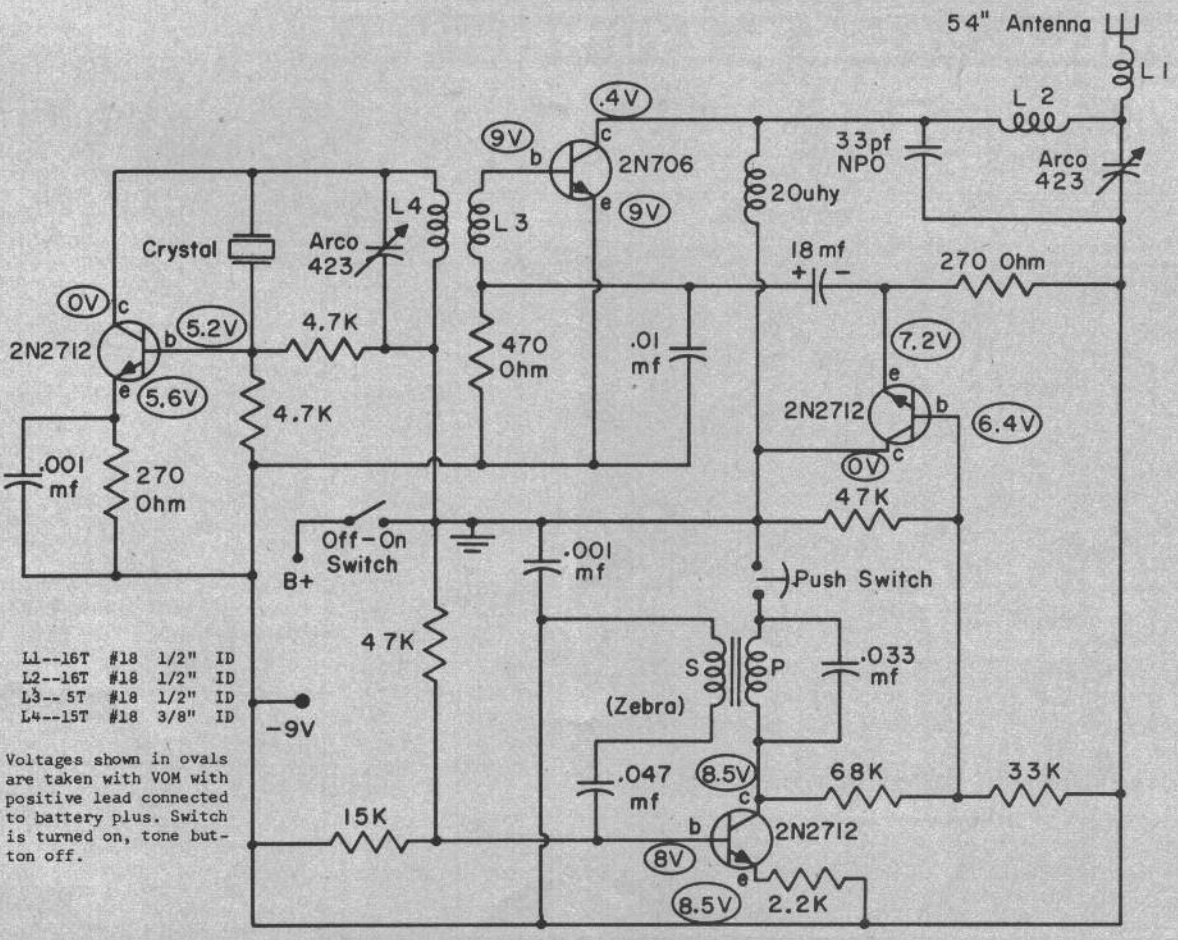
The circuit is straight-forward and is shown here as a service to Grid Leaks readers who are interested in home-brewing their own equipment. Step-by-step instructions are not given—this is not necessarily a construction article—although enough details and drawings will be furnished to enable the home constructor to duplicate a dependable single-channel design.

The circuitry utilizes silicon transistors in all functions. It has a MOPA section in the RF radio-frequency circuit, and is modulated by a tone of 400 to 500 cycles per second, to provide a transmitter that will be usable with most single channel receivers available today, relay or relayless.

The use of silicon transistors assures stability over a wide range of temperature, with the power that is desirable. Not only does the transmitter have an input of 300 to 400 milliwatts, but this power is efficiently used, since it is coupled to a base-loaded antenna. This effectively radiates all of its powers, without nulls or deadspots, and puts the punch out into the air where you need it.

Tuning of this transmitter is straight forward; however, since it does use more than the flea power under 100 milliwatt jobs, regulations require (*Continued on page* 31)


NEGATIVE TO BATTERY
POSITIVE TO SLIDE SWITCH
ARCO 423
L-2
33 PF
.001 MF
20 UHY
4.7K
2.2K
15K
2N2712
33K
270 OHM
CRYSTAL
47K
.047 MF
270 OHM
470 OHM
.033 MF
L-3
.01 MF
18 MF
P
S
ZEBRA
68K
L-1
L-4
ARCO 423
TO PUSH SWITCH


54" Antenna
L1
L2
.4V
9V
2N706
33pf NPO
Arco 423
20uhy
L4
L3
Crystal
Arco 423
18 mf
270 Ohm
0V
5.2V
4.7K
2N2712
470 Ohm
.01 mf
7.2V
5.6V
4.7K
2N2712
6.4V
0V
.001 mf
270 Ohm
47K
Off-On Switch
B+
.001 mf
Push Switch
47K
S
P
.033 mf
(Zebra)
-9V
.047 mf
8.5V
68K
33K
15K
2N2712
8V
8.5V
2.2K
L1--16T #18 1/2" ID
L2--16T #18 1/2" ID
L3--5T #18 1/2" ID
L4--15T #18 3/8" ID
Voltages shown in ovals are taken with VOM with positive lead connected to battery plus. Switch is turned on, tone button off.

The Monitor

(*Continued from page* 2)

fantastic growing pains, it was permissible to correct its faults—many took a beating and came back for more. But if anything is faulty in single-channel, it is ridden out of town on a rail, tarred and feathered —by the multi pundits. What is wrong with correcting those faults, especially when untold thousands of people are fussing with it? There are good escapements, and good servos, and good radios. But there is a fantastic amount of incompatible equipment, normally outside any overall systems concept, and that marvelous (it should be) technical revolution, the tiny, transistorized, relayless receiver perhaps unexpectedly turned "rudder only" into a baffling science. No one has the fortitude to call a spade a spade. All advertised products are perfect, it seems.

So putting the finishing touches to our multi propo job on the far side of midnight, thought back to the "they don't work" escapement jobs of yesteryear. There was one with two Vari-Comps plus SN which flew a season without loss of control—it did all the multi maneuvers except spins. (It did compel a choice of outside-loop or inverted pre-flight trim, and rudder rolls were more of the barrel-roll variety.) You saw fly-aways and crack-ups, too, but nothing like today. People no longer know what a proper keying switch looks like. Whatever science there was, is now all but forgotten. All the hard-won experience, the know-how is gone because those who had it, went into multi, and none of them, including the scribes who should know better, will enthusiastically help the segregated single-channel man.

Perhaps some of us need to be convinced that single channel—and the escapement—has a place. On this assumption the remainder of this month's column is given over to a GRID LEAK's correspondent whose report speaks for itself. Mr. George Sawn. . . .

Last year the N.C.R.C. launched its flying season with a schedule of weekly flying events. These events were scheduled in the early spring to be flown throughout the flying season by single-channel escapement aircraft. Cash awards were given at each monthly meeting for the winners of the weekly contest.

Single-channel escapement events were chosen to provide everyone an opportunity to compete on an equal basis. This type of model was decided upon because of its low initial cost, its durability and its convenient size.

The flying program had three objectives: 1) Get the modelers out of their shops and on to the flying field; 2) Give the inexperienced modeler an opportunity to compete with other modelers on equal terms; 3) Attract more members to keep the club on an active basis.

Some of the AMA maneuvers were chosen as special events in order to get the modelers accustomed to flying on demand. We chose the loop and barrel-roll for starters. Other special events were Kite Kombat, Cross Country, Limbo and Spot Landing.

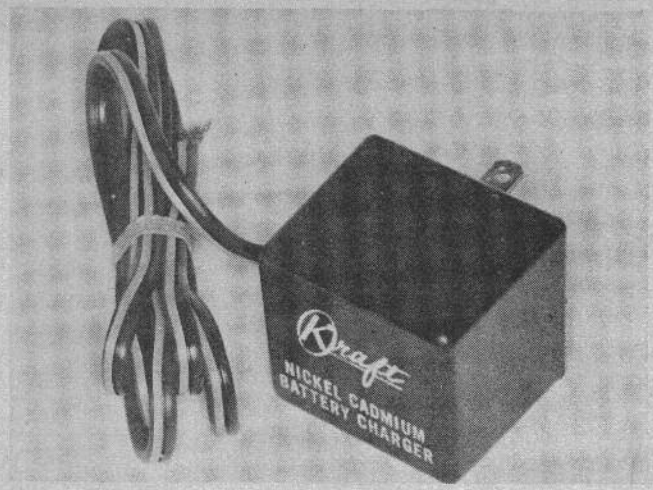
The flyers acted as their own judges, the only rule being that three modelers must be present and must agree on the final result. The original rules called for the standard AMA pattern, takeoff, 50 feet straight, left 90 degrees, right 270 degrees with return and figure-eight over head before the special maneuver could be attempted.

This proved too much for many of the

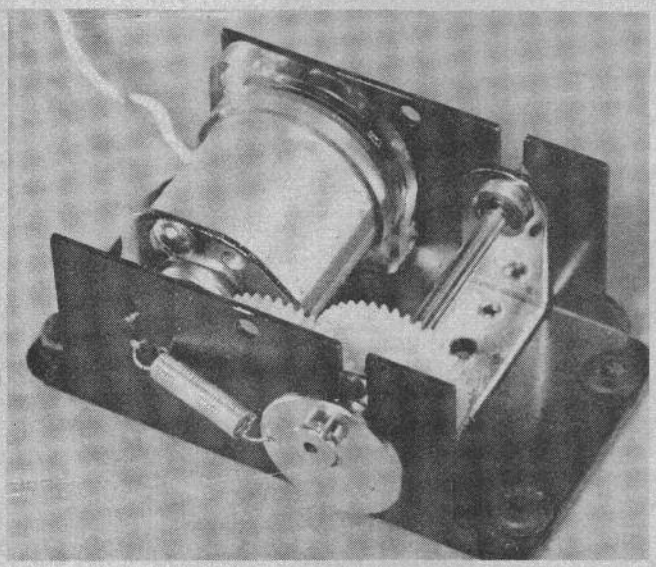
(*Continued on page* 27)

BITS AND PIECES...

Selection of new products and ideas which will be useful to plane and boat builders.



Kraft charger plugs into outlet.



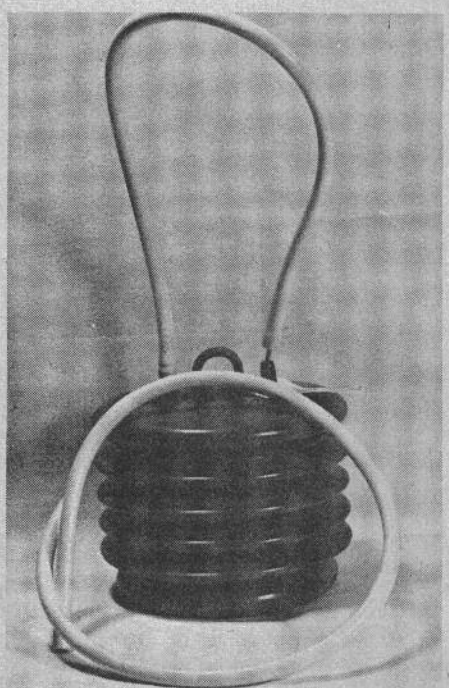
World Engines servo modification for GG.

► *Gasser:* The strange looking object below is neither a power-line insulator nor some exotic space battery, or ever an accordion —one of the editor's nearer guesses on receiving the unidentified pic. According to publisher Paul it's Randy McGee's Gasser, under the firm name of M & W Products, sells for $6.00 and fills a tank in seconds, take fuel out of the tank, primes, and it holds half a gallon! If half a gallon sounds impressive, just think of those new 12-ounce tanks!

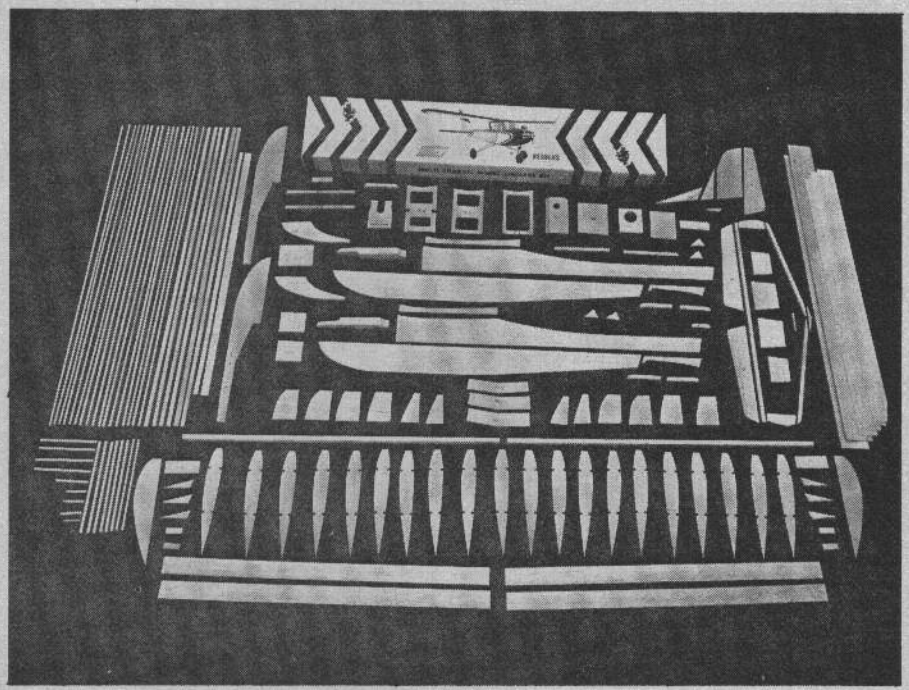
Kraft Charger: Kraft Systems, Inc. (S. El Monte, Calif.) has a completely new molded charger, at $3.95. This KC5-50 unit is designed to charge packs of five nickel cadmium batteries at a rate of 50 milliamps. As the pack assumes full charge, the charger lessens its charging rate.

The small black plastic case plugs into the AC outlet, and is furnished with a black and white lead for connection to battery. (Plug and socket connector are not furnished, since this varies with pack. Shock and hazard isolated from the AC line via transformer, the unit is ultra dependable and safe in charging rate and capacity. (From Ace R/C, Box 301, Higginsville, Mo.)

Controlaire GG X-Mitter, OS Servo: Galloping Ghost control, which gives proportional rudder and elevator for single channel, plus engine, is an exceed- (*Continued on next page*)



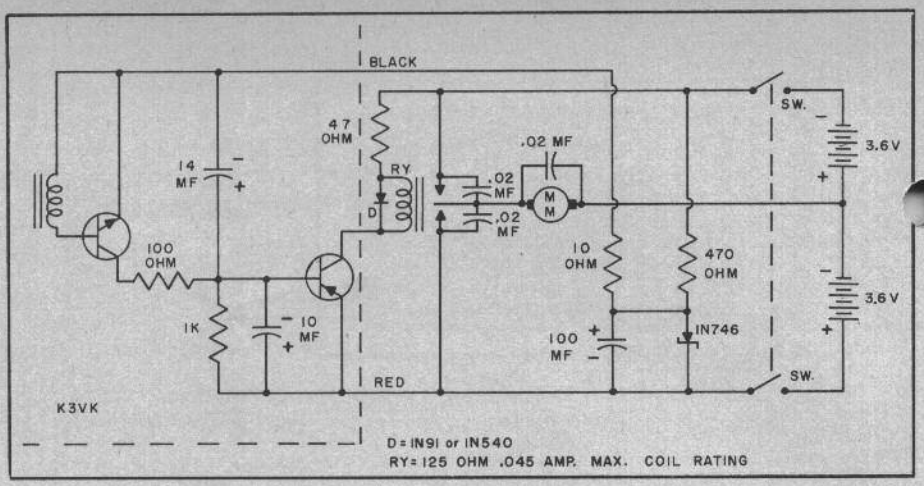
Half-gal. Gasser fills tanks fast.



Regulus kit, 6-channel.

single channel proportional

By SAM MOHR



► THIS IS NOT INTENDED to be a construction type article. The purpose is to stimulate thinking in an area which we believe has been neglected. This is in the area of truly low cost proportional control systems which can be assembled from readily available material. The complete aircraft installation shown in the schematics was made for less than $20.00.

The single-channel proportional system shown here probably has a few of the known weaknesses of some of the basic components. Among these is the temperature range for the Kraft receiver. It is believed that this problem has been reduced by supplying a regulated voltage for its operation.

Workbench tests with the Kraft K3VK driving a relay instead of an escapement resulted in some circuit changes to improve the operating characteristics for pulse-rate, pulse-width applications. These changes consisted of substituting a 14-mf capacitor for the original 70-mf unit. The 10-mf capacitor in the base of the output transistor was added while trying to clean up some elusive noise and, at the time, seemed to improve the operation. Since then there is a question as to its actual value; however, no attempt has been made to remove it since it does not appear to adversely affect operation.

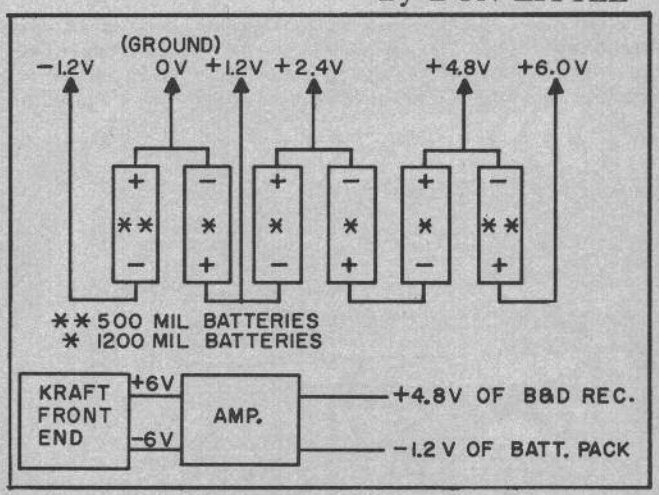
The relay in this unit was a surplus miniature with a 125-ohm coil rated at 45 MA maximum DC current. A 47-ohm resistor was added in series to limit the current to a safe level since 7.2 volts is being used on the output stage. Although this particular relay is probably no longer available from any source, there is no reason why a Gem 50- or 100-ohm relay or an equivalent could not be used, by changing the 47-ohm resistor to an appropriate value.

An attempt to operate the front end of the K3VK from a tap on the nickel cadmiums created all sorts of noise problems that filtering could not cope with. This technique also has a disadvantage in that part of the cells will be discharged more rapidly than others. Not wanting to add the weight and associated problems of another battery for receiver operation, it was decided that a voltage regulator could be made for the cost of a couple sets of dry batteries. This resulted in the addition of the 1N746 Zener diode and the 470-ohm resistor across the servo batteries to provide a 3-volt source for the receiver. The 100-mf capacitor and 10-ohm resistor eliminated a noise feedback problem attributed to internal impedances of the nickelcads.

The motor is a Mighty Midget geared 49 to 1 (2 sets of MM gears) with spring centering. There is no reason why other small motors will not work as well or better. The entire unit except for the MM motor, the switch and the batteries is mounted in a 1 x 1¾ x 2 in. plastic case. (A smaller one would have done the job but couldn't (*Continued on page* 32)

front end for B&D

By DON LITTLE



► RON LITTLE, VIDALIA, GA., is an ardent booster of the B & D System which was detailed in a series of articles in *Model Airplane News*. *R/C Modeler* in September 1964 showed how a Kraft Superhet front-end could be tied in to the B & D receiver (superregen version).

"Here are some of the changes that I had to make to the amplifier published in the September issue of *R/C Modeler*, to convert the B & D Triple proportional system. These changes were required to secure satisfactory operation. There was oscillation (and or) feedback in the amplifier itself. I have two B & D receivers, and this change makes the conversion work on both of them, but that's no guarantee that it will work for all of them, so this is purely presented as information.

1) Using the schematic in the September *R/C Modeler*, remove the 5 UF electrolytic between the 1K resistor and the +6 volts. Substitute a 10 UF electrolytic with the minus lead at the same point as the 5 UF was, but with the plus lead going to the base of the #2 transistor.

2) Remove the 80 UF electrolytic across the 470 ohm resistor on the emitter of the #1 transistor. Do not substitute anything for this, but leave it out. It causes oscillation in my amplifiers.

3) Tap the input for the B & D servo discriminator off the plus side of the diode bridge of the original B & D receiver.

4) For the servo discriminator, we remove the 100K resistor (#1) in the servo discriminator, and replace it with a .01 capacitor. The reason for this change is that on the original superregen front-end, the collector of transistor #3, where the tap for the aileron servo discriminator originally was, carried a minus voltage. On the amplifier tap is a positive voltage; so, we remove the 100K resistor used to cut down the signal formerly, and replace it with an .01 capacitor which will pass audio, but blocks out DC voltage. I haven't checked the voltages, or put it on a scope. It worked fine, and has continued to work through some 100 flights.

My wiring diagram is pretty involved, and I really don't know if it is necessary, but it worked first time around. As you folks with the new B & D system know, it requires six nickel-cadmium batteries: preferably four of the 1200-mah, and two of the 500 mah, for a total of 7.2 volts.

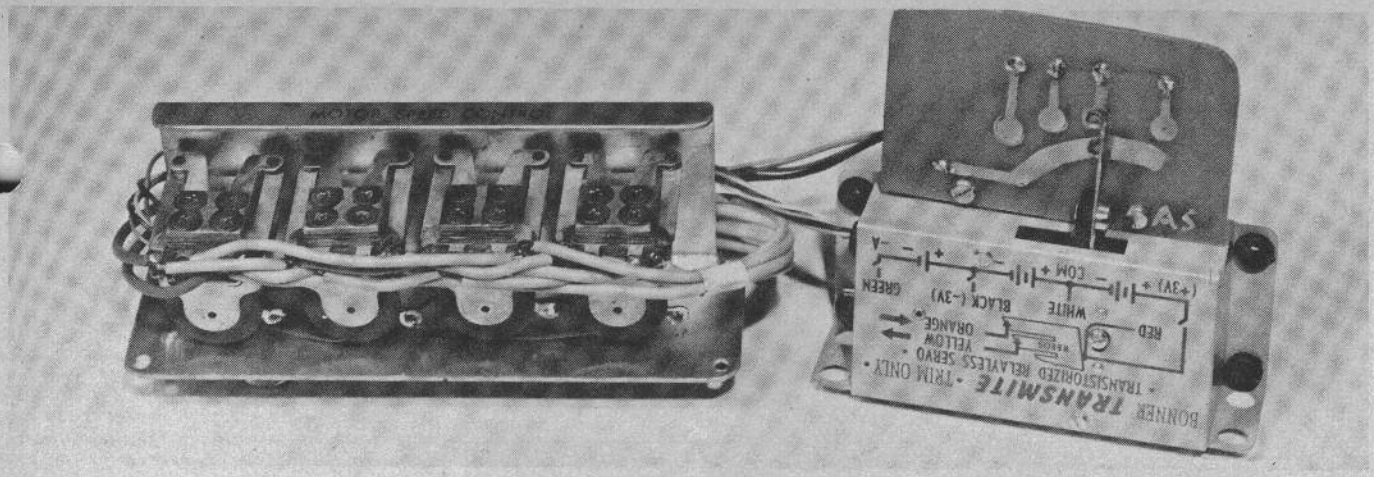
1) Amplifier and Kraft superhet front-end share a common + and — 6 volts.

2) With an X-Acto #11 blade, carefully remove the foil from around the mounting holes of the Kraft front end.

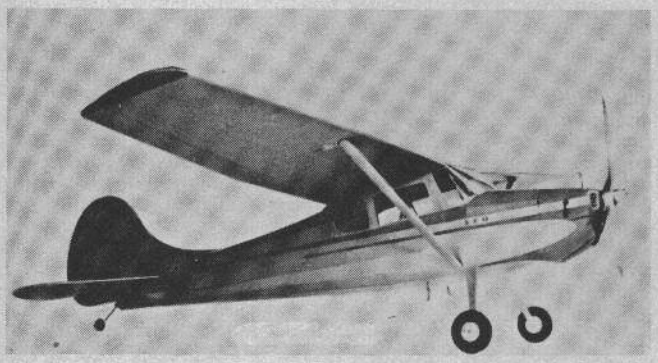
3) The + 8 volts of the original B & D receiver is the common point for the superhet front end, amplifier, and rear end of the B & D receiver.

4) Wire the servo discriminator and rear end of the B & D receiver as per Mr. Dickerson's instructions.

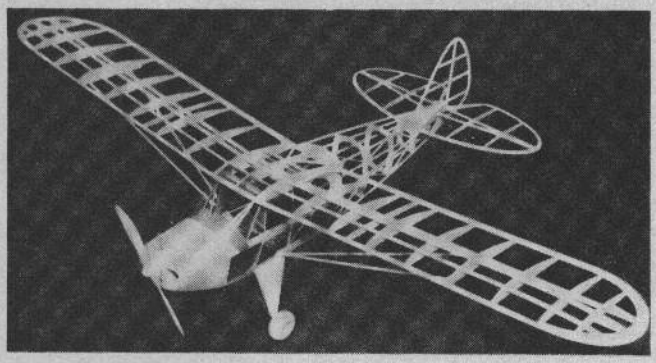
This superhet conversion really gives a boost to your morale if you have as much interference as we do in our area!



Seidenberg's motor control unit for high-drain boat situations incorporates servo driven switching, heavy-duty circuit relays.



Jetco's .049-powered Cessna 170 a well performing scale job.



Piper Super Cruiser is another built-up Jetco Half-A scaler.

BITS & PIECES CONTINUED

ingly popular way to fly, despite what you read in print! Many releases of new equipment leave the consumer to his own devices—no pun intended—for the actuator. Queried about this, World Engine's John Maloney explained a simple modification to their reliable OS single-channel "rudder-only" servo (see picture).

This servo normally gives right, left and motor in the signaling method of the compound escapement. "Either of these servos (he refers to the MC servo as well) can be converted to single-channel pulse work by the addition of an OS escapement spring," John states. "When the servos are pulsed the current is directed to the motor and does not go through the drum, cam wheels used on this shaft for the sequencing operations."

The GG transmitter is a pulse-rate, pulse-width unit with signal on and off. All transistorized, all-electronic solid state device operating from one 9-volt battery. Range is approximately 75%-25% on ratio and from 3 to 12 cps rate. Price $59.98. Kit possible later.

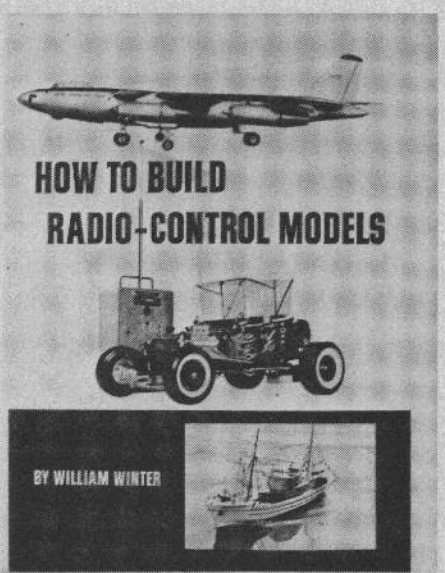
Regulus Kit: Several compelling reasons merit consideration of this .29 to .45 powered cabin model kit by Royal Products (2365 S. Holly Pl., Denver 22, Colo.). Important in GL's opinion, is the utility of this ship (Royal also has a 55-in. Ranger kit with the .35 the upper limit) for sport flying with the fast selling six-channel reed outfits which most people like to use with a stable high-wing for rudder, elevator, and engine.

The parts include, as shown, a high degree of die-cutting with trouble making bulkheads ready to pop in. The standard kit (shown) is $17.95; deluxe kit with all hardware (including sprung nose gear, dural gear, the usual control horns, bottle tank), is $19.95.

Boat Motor Speed Control: This much needed device is marketed by Al Seidenberg (729 Evelyn Ave., Bellmore, N.Y.). Anyone who has faced the problem of controlling speed and direction of high-drain electric boat motors, knows the limitations of existing switching devices. This one consists of a printed circuit switching board which attaches to a Transmite servo, and an assembly of four heavy duty circuit relays which will handle two drive motors having up to 18 volts drive or three motors with up to 12 volts. Price is $29.85.

Cessna 170, Piper Super Cruiser: These Jetco kits (C. A. Zaic Co., 883 Lexington Ave., Brooklyn 21, N.Y.) are not new, but are reviewed again because of the rapidly growing interest in scale. The Piper spans 40 in., the 170, 36 in. Power is given as .049's (*Continued on page 24*)

Howard McEntee's popular R/C Primer is now in its second edition — for novice.



Companion book by GL's editor also is a release from Kalmbach Publishing Co.

No takeoff problems with this free flight. Rudder-only fans could take note.

FLY IN STYLE

By KEITH LAUMER

The stereotyped multi-channel stunt models may justify a never changing style, but the restless souls among us grow increasingly impatient. A guest free flighter speaks frankly.

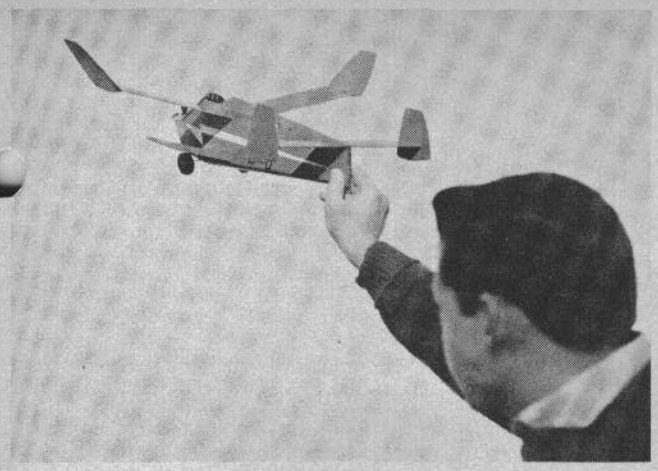
(Editor's Note—While Keith is not a radio flyer, he is noted for the attractive styling of many free-flight sport designs published in the popular magazines. When GL asked for his impressions of RC design these interesting comments were forthcoming.

Laumer is author of How to Design and Build Flying Models, *Harper's, 1960—still in print at $4.95. Pix on this page are of models published in Flying Models, those on the opposite page (clockwise): Model Airplane News, American Modeler, MAN. FM, MAN. FM.)*

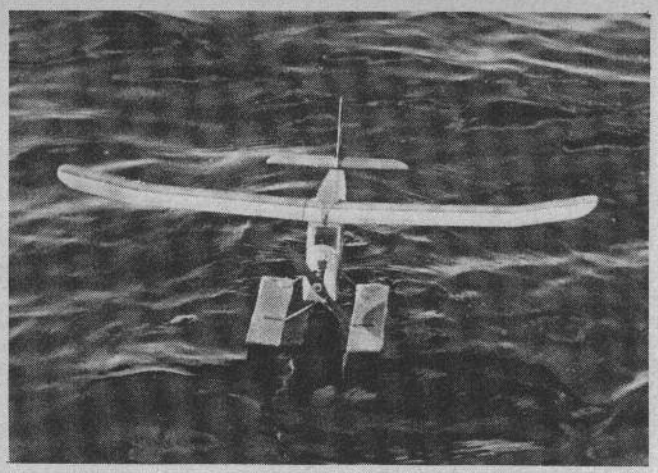
■ REMEMBER BACK in the early days of gas models—the Maxwell Basset era, when everybody knew what an ignition-powered job ought to look like? It was common knowledge that, first, you had to have a square fuselage with no nonsense about it, and plenty of diagonal braces, rigging wires and plywood gussets, because after all, this was serious now—no rubber-powered toys, these. Wings were mounted high, *a la* Curtiss Robin—because low-wing designs had no stability—and were thick-sectioned, with ribs crowded together on ¾-inch centers just like the big fellows. Size was important, too—anything with a piston going up and down up front had to span six feet, obviously. And most important of all, those three-to-five inch air wheels had to be way out front, to protect that delicate mechanism, the Gas Engine.

Today, those ideas sound pretty silly; engine-powered models have proliferated in every conceivable size, shape and configuration, from ducted fans and channel-wings to helicopters, low-wing scale jobs, sea-going pylon designs of an apparent fragility that would have amazed the modeler of 1935. Plywood gussets, basswood stringers, nailed and horse-glued joints, wire bracing are as forgotten as buggy whips. The .049's are bolted on to 16-inch span bipes and free-flown; sheet balsa wings with the edges rounded take to the air without further fuss and bother; silk covering is becoming a forgotten art, and landing gears have shrunk back to reasonable dimensions. We've learned that

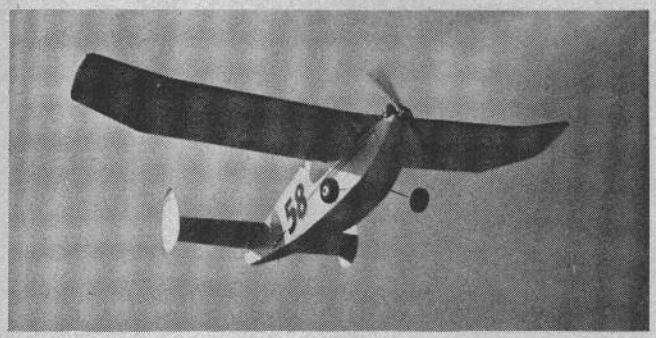
The ship held by the photog's smiling assistant is equal-wing bipe—a trike gear.



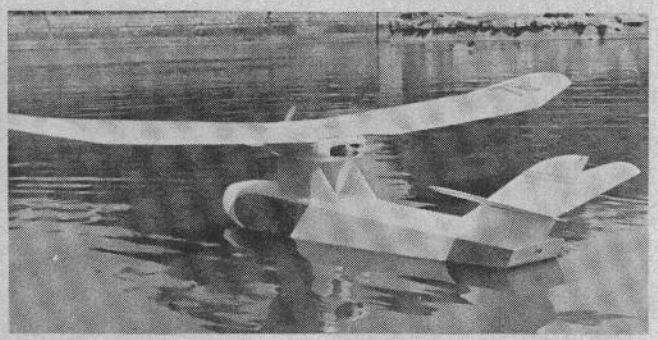
A sesquiplane, perhaps? Stub wing could be used for mounting a landing gear—and strap on. Free-flight dihedral is too much.



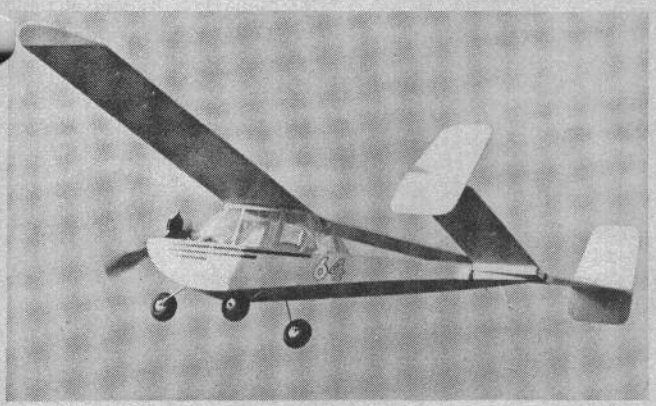
If you want good looking functional floats, try the Gee Bee Line. For sport, waterproofed sheet-wood jobs will substitute.



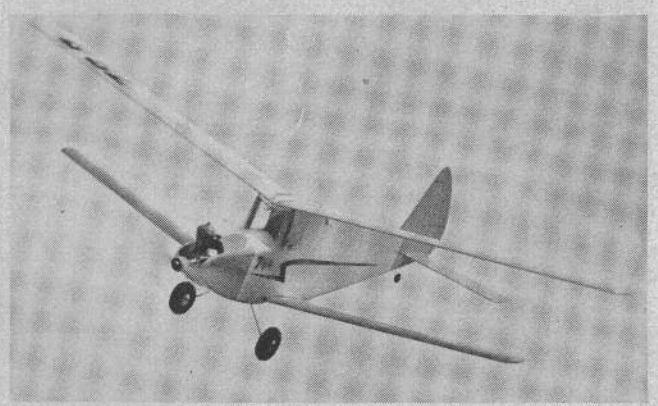
Fat and sassy. If you want to split hairs, at least it is the correct scale for the human figure—how about your bubble job?



Vacation-time special, simple sheet hull and push-pull engines. Twin pylons support nacelle and the wing. How many throttles?



This one might have been designed for RC, so good are proportions. Dihedral in stab is different. Use ply cabin framework.



Promising is the word for this bipe configuration. Less span, and area, for RC. Small engines—all sheet-balsa construction?

after a full-power clobber-in, that "delicate engine" is frequently the only undamaged component; we've broken the grip of superstition—

Or have we?

Let's take a look at the RC jobs parked about the field. What do we see? Yep, high wings—thick section, square-tipped ones—strapped down by half a pound of T-56 to a cabin built from big blocks of solid balsa. (Keith is talking about Class 1, mostly—Ed.) The fuselage is a solid box big enough for a lumberjack's lunch, with a Cessna-type gear strapped to the bottom, and the engine nestled up front in a massive blunt prow slabbed up from inch-thick balsa. And aft, we have the big square rudder with the little bitty waggable tab, and below, strapped to the bottom of the fuse, a large, square-tipped elevator.

Boring, isn't it?

But then of course, this is the configuration you have to have, because everybody knows, etc., etc., etc.

True, Kazmirski came up with the low wing Orion—and now we have a whole school of Orion-copiers and developers among us. You can take your choice: Smog-Hog or Orion types, or their descendants.

Or—you can get out of the rut and have some fun with your own original design. It's an unfortunate fact that there is a certain percentage of RC flyers who look upon the airframe as an unavoidable nuisance; they want to push the button and see the response, and anything that will wallow into the air, penetrate the wind, flop over on its back on command, and then come hurtling in to slam the strip and ground-loop without actually being rendered unflyable is AOK. These remarks are not addressed to that minority—though it's hard to understand why they don't just set up some sort of static display—a semaphore, maybe, that would give signal responses on cue. They'd save a lot of fuel, and not run the risk of a flyaway.

But for those who like flying as flying—who appreciate the classy look of a clean, new design—who get a kick out of a fool-the-eye scale job cruising overhead, or can admire the curves of neat home-built at the EAA fly-in—here's news: Your RC job doesn't have to look like all those other ones.

You like curvaceous lines, pylon-mounted stabilizers, twin rudders, stagger-wing bipes? You can have 'em—and properly designed they'll fly just as well as the conventional layout.

Contrary to (*Continued on page* 30)

RESULTS 1965
RC WORLD CHAMPIONSHIPS

TEAM RESULTS

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

INDIVIDUAL RESULTS

1. Brooke, Ralph, USA	6,151	7,008	7,188	20,347
2. Teuwen, Chris, Belgium	6,168	7,216	6,609	19,993
3. Weirick, Clifford, USA	6,217	6,403	7,269	19,889
4. Stephansen, Poju, Norway	5,997	6,103	6,779	18,879
5. Olsen, Christopher, Great Britain	6,005	6,066	6,257	18,328
6. Ritchie, Zelbert, USA	5,404	6,095	6,211	17,710
7. Chapman, Ronald, Canada	5,848	5,013	6,732	17,593
8. Foster, Stuart, Great Britain	5,092	5,476	5,862	16,430
9. Blauhorn, Karl, West Germany	4,691	5,313	6,168	16,172
10. Tom, Harold, Canada	5,616	5,504	4,930	16,050
11. von Segebaden, Jesper, Sweden	5,186	4,939	5,600	15,725
12. Bosch, Fritz, West Germany	5,654	2,827	6,974	15,455
13. Sweatman, Christopher, S. Africa	4,675	4,958	5,570	15,211
14. Hichcox, Warren, Canada	4,329	4,804	5,305	14,438
15. Haegeman, Georg, Belgium	4,649	5,176	4,454	14,279
16. Nordahl, Rasmussen, H., Denmark	4,189	4,934	5,140	14,263
17. Waters, Peter, Great Britain	3,923	4,560	4,986	13,469
18. Corghi, Erminio, Italy	3,966	5,000	4,438	13,404
19. Kato, Sousuke, Japan	4,065	4,826	4,502	13,393
20. Wessels, Johannes, S. Africa	4,659	3,862	4,574	13,095
21. Mantelli, Oreste, Italy	3,826	4,316	4,413	12,555
22. Guglielminetti, Francesco, Italy	3,366	3,390	4,522	11,278
23. Hackhe, Jan, Denmark	3,469	3,844	3,927	11,240
24. Bauerheim, Kurt, West Germany	5,152	5,315	535	11,002
25. Culverwell, Clifford, S. Africa	5,276	1,065	4,638	10,979
26. Levenstam, Jan, Sweden	3,590	3,303	3,749	10,642
27. van der Burg, Arend, Holland	3,708	2,621	4,127	10,456
28. van Vliet, Jan, Holland	845	4,569	4,964	10,378
29. Kato, Masahiro, Japan	4,388	4,950	988	10,326
30. Tonnessen, Ulf, Norway	3,256	3,066	3,280	9,602
31. Dilot, Rolf, Sweden	3,643	3,032	2,914	9,589
32. de Dobbeleer, Joseph, Belgium	1,395	3,243	4,679	9,317
33. Andersen, Erik, Denmark	2,850	938	3,904	7,692
34. Martens, Frans, Holland	2,961	2,707	485	6,153
35. Michalovic, Jiri, Czechoslovakia	1,274	2,072	1,339	4,685

Bits and Pieces

(*Continued from page* 21)

but scale-like performance should result with an .02 as well. Built-up construction, plastic cowls. Primary purpose free flight, conversion to radio simple. $4.95.

Kalmbach Books: Howard McEntee's second edition of the "R/C Primer", advertised in the last GL, proves to be a 6¼ x 11¼, beautifully manufactured, 64-page book at $2.00. Printing and paper are the best. Intended for the beginner, with emphasis on single-channel, the R/C Primer is a fine edition to any RC man's library. Many fine pix and detailed drawings. And finding on its rear cover a plug for the companion book by GL's editor "How to Build Radio Control Models" have shown it, too. (96 pgs., $3.00.) Kalmbach Publishing Co. (1027 N. Seventh St., Milwaukee, Wis. 53233) has hobby shop distribution of book and hobby magazines.

Accu-Tie Servo Harness: Those who have struggled with soldering of multi-pin connectors (the hobby types designed for individual servo cables are not so bad) appreciates what the printed circuit-type servo harness board does to simplify a wiring job. The Accu-Tie by Accutronics Engineering, (P.O. Box 144, Linthicum, Md.) is a representative example. As the illustration shows, it takes the power and reed leads, with servo cables either wiring direct to the board, or joining by individual connectors to corresponding cables coming from the board. If the receiver is connected directly to the tie and then the tie taped onto the receiver can, the wiring becomes a dependable model of neatness and compactness. Price: TK

Commander Pulser: Designed by GL author Dick Jansson, this solid-state (no relay used), pulser, 2 x 3 x 13/16 in., is designed to attach to the front of any 9-volt transmitter. Spring loaded knob for neutralization, operates off x-mitter battery.

THINGS TO TRY

Low Voltage Converter: A circuit used successfully is a transistorized converter utilizing the same circuit configuration and components as the 3.6 converter, shown in GRID LEAKS some time ago. However, its output was designed to produce a much lower voltage DC. It was brought about because of a need for a lower voltage source, with a newly acquired Phelps pulser to be added to a Kraft single-channel transmitter already using a 135-volt converter.

The low voltage converter is assembled in the same manner as described in May-June 1963 GRID LEAKS, except it is much easier because the secondary of the cupcore toroid only uses 128 turns of #38 wire instead of the original 750.

With 128 turns of #38 on the secondary, this converter puts out +23 to +24 volts DC, and is perfect for most equipment which normally uses a 22 ½-volt battery. Transistors can be any good ones capable of ½ amp or more. Some of the larger ones used in servo amplifiers work fine.

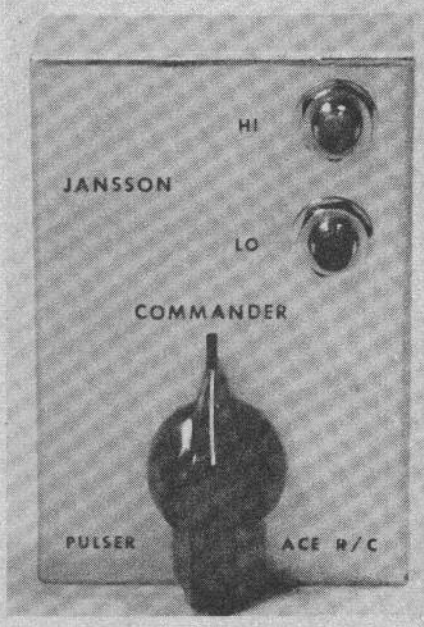
The primary of the converter draws only about 300 MA. This, added to the 800 MA necessary to power a single channel transmitter, is well within the capabilities of most surplus nickel-cadmium batteries. (By Jim Lynch WB2K0I; Red Hook, N.Y.)

Good's Long Run Mix: Here's a new fuel that will make you think the tank has grown 20 percent larger. Just add 10 percent gasoline to K&B 100 and you'll find the engine runs 20 percent longer. Gas has considerably more energy per ounce than alcohol. Over 10 gallons of this mix that been run through two Merco 49's with good success and no loss in top speed. Idling seems to be improved. The formula: 1 quart K&B 100, 3.2 ounces (fluid) of AMOCO unleaded gas, 1 capful of GLOLIFE.

Cleaning and Waxing Compound: Carl Lindsey, Mo., uses Pledge as a combination cleaning and waxing compound. Furnishes a good detergent action for cleaning on the field, also gives a good lustrous coat.

Wandering Tuning Cores: What we might call "involuntary variable tuning" can be disastrous. Loose fitting slugs and forms which vibrate and move are to be guarded against. Olan L. Atherton, Dallas, Tex. has this suggestion. "File a notch lengthwise of the coil slug used in ceramic coil forms, and place a small piece of teflon or PVC tubing in this notch. This stops all vibration and still allows the tuning adjustments to be made."

Phelps Pulser Hint: Gordon Lauder of Springfield, Ill., advises that the Phelps Pulser, when used in conjunction with the Controlaire Mule 2 transmitter, requires that the jack and the case be isolated electrically from the transmitter. The modulator is above ground, and therefore,

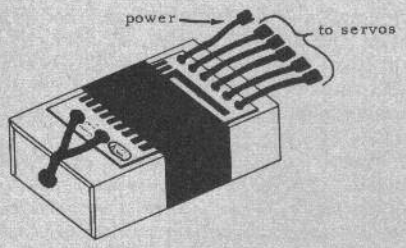


Commander Pulser designed by Dick Jansson attaches to any 9-volt transmitter.

unless it is insulated, the system will not function correctly.

Trim Pot Gears: In several pulsers featured in GRID LEAKS, trim pots have been exposed to the outside of the case, using nylomatic gears for the trim function. Generally, shim brass stock is used to force fit the nylon gears on to the pot shaft and then epoxy is suggested.

One of our readers, Lt. Col. T. F. Felter, U.S.N., cuts one-inch squares from plastic parts bags, and places a square over the knurled shaft, then forces the nylon gear on the shaft. This procedure saves time, secures the gear firmly to the shaft, and still permits the gear to be removed at a later date—something which would be impossible if epoxy were used.



Accu-Tie servo harness from Accutronics Engineering, simplifies your wiring job.

Strickland No Noise Housing: This is a tubing with a flexible wire insert, which can be used for brakes or throttles, or any application where a minimum of one-half-inch radius is desired. The plastic housing will fit snugly inside of 1/16 in. brass tubing, which can then be soldered or glued at both ends of the installation. The brass tubing may be pinched lightly for extra tight fit, without restricting movement of the cable. Generous four feet of both plastic housing and flexible cable available at $1.25.

Phelps Rcvr With Babcock: John Matthews, Tempe, Ariz. advises that the Phelps receiver works excellently with the new Babcock 3500 CPS transmitting equipment, such as the Digitran 27 and the BC-21.

Chattahoochee Chug-Chug

(*Continued from page* 11)

allow for slant upward toward bow of boat when cutting sides for pilot-house. The exhaust stack for Diesel engine is made from cardboard, roof for pilot-house is ½ in. soft balsa sanded to contour.

Windows are made by simple expedient of cutting holes at proper places, glueing sheet balsa in from behind to give recessed effect, and then painting inset black. Antenna is piece of piano wire which is pushed down through pilot-house until it comes out at bottom, and at this point glue in a piece of brass tubing for it to rest in. Also, solder a small Fahnestock clip to the brass tube after crimping it to make a connection for your antenna lead from receiver.

If you have sanded and sealed the hull properly, now is the time to paint it—it will be difficult to do this with the equipment mounted. Color scheme for boat is any marine or industrial gray for hull and deck part of pilot-house, white for rest of pilot-house except roof which is bright red, and exhaust stack which can be orange or "Caterpillar" yellow. Of course, the after part of deck is also painted gray.

Mount the propeller shaft and tube. For

(*Continued on page* 26)

1965 NATIONALS WINNERS

CLASS III—JUNIOR-SENIOR-OPEN

1. Clifford Weirick (38) ..... 217 points
2. Harold deBolt (48) 209.5
3. Harold Coleson (38) 206.5

CLASS III NOVICE—JUNIOR-SENIOR-OPEN

1. Dave Eby (35) ..... 178 points
2. Alvin Sager (19) 169
3. Ernest Huber (36) 165

CLASS II—JUNIOR-SENIOR-OPEN

1. Nick Neville (33) ..... 174 points
2. Lloyd Sager (36) 160.5
3. Bud Atkinson (40) 153

CLASS I—OPEN

1. Jackie Gardner (37) ..... 125 points
2. George Gordon (29) 120
3. Miles Reed (30) 105.5

CLASS I—JUNIOR-SENIOR

1. Gary Davis (18) ..... 89 points
2. Richard Schmidt (19) 78
3. Stephen Morgan (16) 64

SCALE—JUNIOR-SENIOR-OPEN

1. Claude McCullough (43) ..... 10,489.5 points
2. Ralph Jackson (42) 10,355
3. Willis Northrop (42) 9,646.5

PYLON—JUNIOR-SENIOR-OPEN

1. Austin Leftwich (42) ..... 75 mph
2. John F. Rohrbach (43) 67.71
3. Theodore D. White (28) 58.97

PYLON NOVICE

1. Theodore D. White (28) ..... 58.97 mph
2. Edwin Hull (33) 58.63
3. Edward Sweeney (22) ..... 37.

(*Continued from page 25*)

this you can use Sterling's marine drive kit for small boats, which will give you everything you need: tube, shaft, propeller, rudder, and universal joint. After determining the proper place for the shaft to come through the hull, simply drill a hole right up through the bottom at the correct angle and secure the tube in place both inside and out, with Plastic Wood, model body putty or any other good filler which is water proof. As long as the top end of the tube is above the water line, you do not have to worry about water coming in at this point, especially since this little vessel doesn't draw much water.

After you have mounted the tube, you can now see the proper angle to mount the Monoperm motor, also the height. The motor is mounted with bolts to a base cut from 1/16 in. plywood. Cut a balsa block of the proper size, sanding the top at the correct angle, and to the top of this block glue two pieces of small motor-mount stock on which the motor mount plate will be attached with small wood screws.

The servo can be mounted in somewhat the same manner, using hardwood blocks to fasten it to, and scotching up underneath if necessary with balsa. The choice of servo is rather limited, as the hull begins to get thin at the stern, but the Minicombo fits very nicely and I believe that a Royal S/C, etc. could also be used. In mounting the rudder, a balsa block should first be fitted into the space at the very end of boat to hold the tube for the tiller post. Insert piece of tubing down through end of boat where tiller post will work, making sure that you use size tubing which will just give smooth fit for wire which will be used for rudder post. Push wire up through tubing and solder on tiller arm. (Easiest thing for this is 1/2A ukie control horn.)

Placement of batteries is not too critical if the craft seems to balance out fairly well. You will notice that my wet cell is in the front of boat, as this seemed to give best balance. Receiver and servo can be powered by D cells which will give much longer life than pen-cells, and the extra weight won't be noticed as this little job is practically flat-bottomed and will fairly skim over the water. Your receiver can lie on foam in the bottom of the boat, and if you care to you can make a box for it by simply glueing pieces of ⅛ in. balsa around it.

A word of caution to those of you who haven't run into the "noise" problem. Some receivers can't co-exist with the electrical "noise" kicked up by a motor-driven servo and an electric motor in the same boat! If you run into this, you will have to work out arc suppressing, or your whole system will "go ape."

Details are not difficult on a boat of this kind, as anything seems to stand out and give a good effect. Your hobby shop should be able to supply you with the little horn, mast, searchlight, etc. The ladders leading up to top of pilot-house can be made by soldering pieces of wire across HO railroad track, then cutting out the tie-strip at the back and painting the whole thing black. Hand railings are made by soldering soft wire to pieces of brass tubing which are used for stanchions.

To save disconnecting while not running the boat, DPST slide switches can be installed in top of hull, one for drive motor, and one for receiver-servo batteries.

When a boat of this type is first placed in the water, the stern may not sit down properly causing the screw not to grab the water as it should. However, this is not necessarily due to improper balance, but is caused mostly by the unusual shape of the hull and the relation of the screw and thrust line to the bottom of the boat. After she has run a few yards, the stern will gradually settle and she will go skimming off as pretty as anything you ever saw on the water.

Monitor

(*Continued from page* 18)

more inexperienced flyers so a rules change was made. The revised rules eliminated the AMA starter. Now once airborne, the contestant had only to call out the maneuver just prior to execution. The loops and rolls were a little rough at first, but soon improved. The flyers were pleased with their weekly progress. More times than not the awarding of the prize money was followed by a heated debate on how to perform a loop or some other maneuver. The rules for the events were as follows:

Kite Kombat—A standard dime-store kite is flown at about 100 feet altitude with a 25-foot crepe-paper tail, trailing in the breeze. The object is to cut the tail off the kite in any way possible. This proved most exciting. Aircraft attacked from all angles. The occasional cut or kill was always followed by cheers from the observers.

Cross Country—This event is flown where observers can be stationed to signal the flyers when the model has gone past. The model is timed for one lap on a one-mile rectangular course. This becomes difficult on a breezy day. Cross wind flying with an escapement job can get pretty tricky.

Limbo—Strictly an event that requires motor control for any success at all. A pair of 15-foot bamboo poles is set into the ground and a 25-foot crepe-paper streamer is hung between them. The object is to fly between the poles and under the streamer. This is no easy matter; however, quite a few fellows tried it and some actually did fly through it. I think this year the poles will be replaced with sky hooks; last years poles look as though they had been chopped with a double-bit ax.

Spot Landing—Is simply landing within a prescribed five-foot circle. The model must come to rest within the circle. With a deadstick rudder-only job this is one prize that was not collected until late in the season.

At the end of the 1964 flying season our club sponsored an inter-club invitational contest. Cost, including prizes, was born by our club treasury. There were 43 contestants from four different clubs. The AMA pattern was flown for all three classes; spot landing and limbo were flown as special events.

The air was full of models from sun up until after five o'clock with a total of more than 90 flights logged. It was gratifying to see the flyers, who a few months ago were only hangar flyers, now flying like old timers. We feel the program was a great success and are planning for a bigger year in 1965.

In conclusion I should like to make some observations and suggestions. The beginner is anxious to get his model in the air but unwilling to ask for advice. He is afraid others will laugh at his ignorance of flight trim and radio tuning. He may go off to an isolated spot and demolish his prize and lose interest without giving the hobby a fair try. In order to save this modeler, he must be encouraged to ask questions and be shown how to trim his ship. If he goes beyond this point chances are he will fly single channel for one or more seasons before going on to multi.

For this reason I would like to see an AMA pattern event tailored to the escapement flyer. The model requirements would be any size model with rudder and motor control by escapement only. The pattern would eliminate all fantastic maneuvers that can only be done with a high powered multi or proportional model.

This event would not only provide a challenge to the established flyers it would provide interest for the teens group now unable to compete because of cost.

Unijunction Pulser

(*Continued from page* 9)

bias and cutoff. This results in all the current through R7 the base current for Q3, which drives Q3 to saturation. Q3 should have a high beta to permit rapid saturation at low collector currents. Q3 must have low leakage because as it exceeds

$$E_{bo}\ (Q4) = \frac{.25}{R8} = \frac{}{4.7 \times 10^3} = 53 \times 10^{-6} \text{ amps}$$

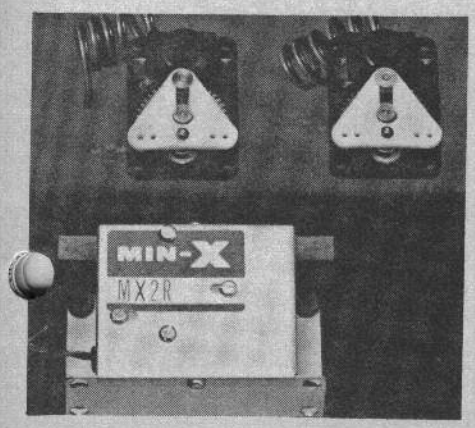
Q4 will start conducting. R8 then is used to compensate for the leakage of Q3 and provide a base to emitter return for Q4. Q4, in turn, is a pulse shaping and isolation stage. Q5 is the driver and functions as a switch.

R13 provides up to 2 ma for saturating Q5 which, in turn, can switch currents in excess of 100 ma if its beta exceeds 50. Both Q4 and Q5 should be switching type transistors with very low Vce (sat).

For relay operation, an Omega HR-1 relay could be substituted for R13 and Q5 eliminated.

To connect directly to a nine-volt transmitter, simply break the +9 volt connection to the tone generator circuit, and connect the pulser to this point in the tone generator. In the old Controlaire Mule, this point is the emitter of the only PNP transistor in the transmitter. In the Mule II, this point would be the primary of the transformer. In the Kraft KTX1 or the Commander kit designed by Phil Kraft,

(*Continued on page* 28)



SERVOS FOR MIN-X "A" SYSTEMS

● The "A" systems utilize the Pulsemite 800A or 1200A transmitters, former with Capri receiver, latter the Superhet 1200. Both receivers work with the Minicoder PL for dual proportional control plus engine control. Shown are Min-X modified Bellamatic II servos for rudder or aileron, and elevator. Also Min-X modified is Annco servo for positionable engine. Bellamatics at $17.95, Annco at $14.95, usable with other pulse applications. ("S" systems for Galloping Ghost primarily—principle difference is in pulse rates and use of Minicoder with the "A" system.)

(*Continued from page* 27)

this would also be the primary of the transformer.

To change the range of the Rate Trim vary R1. To change the range of the Rate Control vary R2. To change the range of the Width Trim vary R9. To change the range of the Width Control vary R10.

$$I = \frac{Q}{t} \qquad Q = E_p C1 \qquad E_p = n\,E_{bb} + .7 \text{ volt}$$

$$= 6.55 \times 15 \times 10^{-6} \qquad n\ (2N2446) = .56 \text{ to } .75$$
$$= 100 \times 10^{-6} \qquad = .65$$

$$I = \frac{100 \times 10^{-6}}{.5 \text{ to } .05} \qquad E_p = .65 \times 9 + .7$$
$$= 6.55 \text{ volts}$$

$$= .2 \text{ to } 2 \text{ ma} \qquad t = \begin{matrix} .5 \text{ sec for 2 cps} \\ .05 \text{ for 20 cps} \end{matrix}$$

Formulae referred to on page 9, Unijunction Pulser.

GL At Play

(*Continued from page* 1)

Other than that, this is the greatest job of 100 percent scale-size building of vintage aircraft that probably has been tackled anywhere.

The film was made by Twentieth Century Limited in England. Only a few of the faces of the actors will be recognizable by American audiences, but this does not deter from the enjoyment of the flick. It is, to use a British phrase, a good show! Besides enjoying the planes, you'll probably get many chuckles and laughs. It's played strictly for laughs and if we were doing a *Life* or *Time* type of review of this aspect we'd go into greater detail.

The machines you will enjoy the most. Put this movie on your must-see list. Who knows, you might get an idea for your next R/C scale!

* * *

• It's contest time again, and they have been popping up all over. We visited one recently, the Mile-Hi held in Denver, on a personal invite from Norma and Larry Kelly.

Well run! The weather cooperated and there was good flying. Some troubles were experienced by flyers from lower altitudes in getting their engines set for the mile-high altitudes. Takes a bit of doing.

Quite pleased to see Kriesser's Pietenpol Air Camper, which was a recent GL smash-hit feature, show up in the scale event. Looked good. Flew good. Built by Bill Robinson of Denver.

Ten-year-old Mark Parsons did some remarkable flying, placing second in novice multi—right behind his dad!

Thanks, Norma and Larry. Glad we could make it.

Curtiss Robin

(*Continued from page* 6)

silver-soldered as these get pretty hot and regular solder just won't stay put. There seems to be no loss of power and they do muffle the noise somewhat. If this type of exhaust is mounted, care should be taken by the launcher as he can be burned by the heat. Takeoffs can be accomplished on a smooth field. An ordinary stack could be used inside the cowling if plenty of resin is used to fuel-proof it, and substituting wood dowels for the pipes.

A four-ounce square stunt tank was installed, but a brass Dmeco of 4- or 6-ounce size will fit. The tank vents were installed on the bottom of the cowling for appearance but this may cause the tank to siphon if the fill tubing is not blown clear. With a Fox .19 and a 6-ounce tank your buddies on the same frequency may resort to rock throwing when you try some semi-scale endurance flights. The plastic cylinders are from Monogram's PE-52 kit which, in some places, may be difficult to locate. These are a little off-size but it is hardly noticed. The two lower cylinders should be made removable while flying as they will take a beating in event of a nose-over during the landing. The OLEO type vertical landing gears trut should be removed then, too, unless you are a super-duper three-pointer. The dummy shock on the tail-wheel adds to the appearance.

Perfect's brass hinges are used because they appear more to scale. The tail surface sizes work well as shown, although

(*Continued on page* 30)

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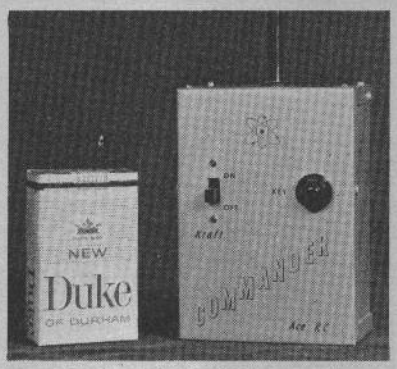
ACE R/C



IT'S HERE—THE ACE COMMANDER TRANSMITTER KIT

It's hard to visualize a package this small and easy to hold that packs the punch that this one does. **The Ace Commander, designed by Phil Kraft,** is the result of many requests for a powerful hand-held single channel transmitter kit that would use a standard 9 volt battery of the Eveready 276 or Burgess 2D6 or Mallory 1603 types. Features a click type push button, which can be not only felt, but heard as well, for a real solid keying action. Has a 54 inch antenna that is base loaded, so that for the input, you probably have the most efficient output of any transistor transmitter available. Has no nulls or dead spots. Features a modulator that produces an audio signal that is clean at 100% modulation. May be used with the K3VK, K[illegible] or the Kraft Superhet Receiver and most o[illegible]eceivers. Is easily and efficiently converted [illegible]ulser operation, since the transmitter will follow the fastest pulsing. When used in conjunction with the Kraft Custom Superhet Receiver, you have one of the finest proportional set ups for simple proportional available today. **Instructions feature easy step by step assembly details, complete with photos and drawings.**

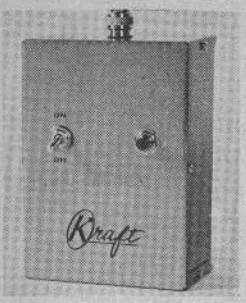
Kit has all components you need, including a metal case, which measures 5" by 3½" by 2", completely punched. Case is of pre-anodized aluminite, which wears well. Four transistors, crystal and all required components. Nothing extra to buy, except battery. **This makes a sweet little, but powerful, handful. No. 11A41—Commander Transmitter Kit $17.95.**

BONNER POLYPROPOLENE HINGES

Bonner has Control Surface Hinges made of Polypropolene. This new miracle material is enjoying increasing popularity in applications where ruggedness and long wear are prime considerations. These hinges are packaged 8 to a package, and list at $1.00 per package. While it is available only in this one size, according to the instructions on each package, the hinge may be cut by the consumer to any desired shorter length. Hinges measure ¾" wide by 1½" long by 1/16" thick. **No. 36L150—Bonner Polypropolene Hinges, 8 per pkg., $1.00**

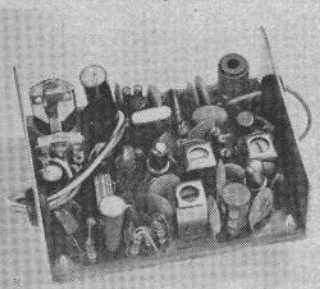
Wing cores from Greater Enterprises are really moving. Now, Greater Enterprises has come up with a contact cement that they recommend. Has much to recommend it over some of the others that are being used. Has a latex base, is not inflammable. Will set firmly, and will not allow balsa skin to shift. Simply coat both sides to be contact cemented, allow to set to hardness about 20 minutes, and then apply. Is recommended for the Greater Enterprise wing cores as well as all others. Comes only in one size—1 pint. **No. 24L43—GE Contact Cement, $2.98**

ACE LINES ARE E-X-P-A-N-D-I-N-G



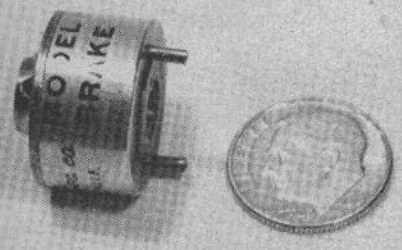
KRAFT CUSTOM SINGLE CHANNEL ALL TRANSISTOR TONE TRANSMITTER

From Kraft Custom comes the Kraft Single Channel All Transistor Tone Transmitter. In a smart gold anodized cabinet, measuring 4⅜ by 6 by 2½, this little jewel packs the punch that is required to override many interfering signals. Uses a 56 inch antenna with base loading so center loading is not required, thus increasing the efficiency of the output. Completely transistorized, uses only one nine volt battery, yet packs the punch of many a vacuum tube type of transmitter. Completely assembled ready to go. Features sine wave—no splatter—modulation. **Signal is 100% clean. 400 cps. . . . . Only $29.95**



KRAFT CUSTOM SINGLE S/H RCVR.

Here it is. The Kraft Custom single superhet receiver. With a relay, this is a versatile unit. Pulses excellently and resistant to brush noise when hooked up as shown in the instructions. Measures 1⅛ x 1⅞ x 2⅜". Weighs 2½ ounces. This unit, along with the KTx1, will do much to provide trouble free superhet flying for the beginner. Available in all CB frequencies, except 27.225. Please specify. . . . . This is a breakthrough in price that you have been waiting for. Completely assembled, tested, ready to go. For use with KTx1 shown elsewhere. Uses 1 9 volt battery. **No. 12A40—KR1 Kraft Custom Single Receiver SH $39.95**



Reliable brakes—won't lock!

An electric brake for your R/C models, developed by **Dr. Walter A. Good.** In the testing stage for over a year, this lightweight unit provides up to 8 inch ounces torque drag on 2.4 volts, with a drain of only 160 mils. May be used with 2 to 6 volts. Coil resistance is 15 ohms. Now get electric braking for your R/C model in this Ace exclusive, by special arrangement with Walt Good.

Braking action is by magnetism—employs no shoes. Use of special formula alloy, cuts residual magnetism to almost nothing.

Will fit most R/C wheels. Designed for a 5/32" axle.

Packaged with one brake and complete instructions per package.

No. 25A55—Ace-WAG Electric Brake $6.95

(*Continued from page* 28)

full sizes could be used with reduced travel. There is no change to the regular White Cloud wing except for the trapeze-struts. Silk was applied to the wing and stab with tissue used on the fuselage and rudder. The license numbers were painted on with Aerogloss black. The 4-inch GULF wing decal were obtained from a generous local distributor of Gulf Products. These were cut from a larger emblem with only the roundel being used. Decals on the fuselage are not exactly to scale as most hobby shops find it difficult to keep or obtain a wide choice.

The regular R/C decal sheet supplied by Ace Radio was a great help. The GULF-PRIDE OIL 120 on the right side is a stickler and is freehand. Carbon paper under a sketch will transfer a pattern to work with. The blue-orange-gold stripes that I used are a little larger than shown on plan. I had an idea that being wider they would add to appearance. Narrower stripes are shown which appear to be more to scale size. Aerogloss butyrate dope was used throughout and, if the cream dope appears to be flat after it is applied, a coat or two of clear sprayed on will bring in the shine and will fuel-proof the decals as well. I used ⅛- and ¼-inch masking tape.

Dubro 3-inch wheels were first installed but later were replaced with Williams vintage type. These look more like the real thing and the wire main gear seems to absorb the shock very well. Perfect's small pins were used to simulate the cowling rivets. The engine vents on the sides of the cowling can be done with short pieces of metal tubing glued on, or in 3/16 holes cut in about 1/8 of an inch. The serial number panel on the side of the engine is in the plastic kit and it is not known to be authentic. It should be left off until the model is completed.

The Robin balances as described on the kit plans which is usually about one-third chord back from the leading edge. On slightly gusty days when we could not wait for the wind to die down, we used shims under the wing trailing edge. However, adding a trim servo should eliminate this problem. Two inches of dihedral was used under each wing tip but could use less. Have seen a Tri-Squire fly well on single channel with only one-inch under each tip. With ailerons on the Robin all, or almost all, the dihedral could be eliminated.

Fly in Style

(*Continued from page* 23)

popular myth, you don't need a degree in aeronautical engineering to turn out a flyable model. A few simple rules-of-thumb will get you off the ground—and with some experimentation and flight testing, you can coax some real weirdies into the blue.

To start with, just check a few kit and magazine free-flight plans for basic data: Span and chord vs. engine displacement; dihedral angle; wing placement and angle of incidence; engine off-set. Keep the elevator about 1/3 to 1/6 of wing area (they'll try to tell you you have to have a huge elevator—even enlarge scale tail on a Piper Cub or a Spad—but t'ain't so).

The rudder should be about equal in area to the fuse area forward of the CG. Keep the LG just forward of CG (unless it's trike—then put main gear just behind). Keep wing at about 1/3 to 2/7 back from nose, and be sure to establish a positive angle between wing and elevator. Sound easy? It is.

To keep it simple, you can stick with that old reliable, the box fuselage, and the constant-chord wing, and throw in the sheet-balsa tail assembly, too. You'll find your scope for originality in design is still unlimited. For example, take pic #1—here's a 30 in. span, .049 powered job. It's a box with a cabin with daylight fore and aft; a tricycle gear—3/32 piano wire laced to 1/8 ply—that will take any landing—a sheet tail. It's all balsa except the tissue-covered wing, and will carry a modern transistorized receiver with ease. A simple pushrod hung under the right elevator will work the rudder very nicely. Simple, sturdy—and a bit different from the run-of-the mill. Pic #2 is a bipe—all balsa. The wings are shaped from 1/4" by 3" medium stock, reinforced at the center dihedral break by a strip of linen top and bottom. Indestructible, neat—and impossible to mistake for those kit jobs parked on the line.

And #3 is a built-up box—but the stark rectangularity is concealed by the deep curve of the belly, the free-form rudders, the neat cowl and cabin enclosure. And as for all that window-area—1/64" sheet plastic, well cemented, is an incredibly strong, rigid—and light—structural material. Those conventional jobs wouldn't smack the pavement quite so hard if they weren't staggering under the weight of all that massive solid balsa cabin construction.

Picture #4 shows a neat model; there's an airplane in the picture somewhere, too, but don't bother me with trifles right now.

Number 5 is photographic proof that tip dihedral, a stubby fuselage, and a butterfly tail work just as well on a model as they do on the big ones. And plenty of room inside for RC installation, par-

ticularly if you use simple slide-in components with contact power connections.

And who said a bipe had to look like a crop-duster? Number 6 features a cockpit up topside, flat, lifting tip-plates—and a new look.

For variety, slip a set of floats under ır model as in #7. Build 'em up from et balsa, slide 'em on the regular LG struts—and believe it or not, you don't need water. A float landing on grass is as safe as a wheel touch-down—safer, if the grass is deep, and the model light, as it ought to be. (Sure, everybody knows you need all that weight for wind-penetration—and man will never break the sound barrier. A thin section, low-air-resistance lines, adequate power up front—and your light-weight job will outrace the tug-boat up wind every time).

But if you really want to go wild, try something like #8; it's the same old slab-sided sheet-balsa fuse, built up on typical boat hull lines. The wing (constant-chord except for a little sexy taper at the tips) is set up high—on twin pylons, for rigidity. Stabilizer is likeways hoisted up out of harm's way. Two engines are mounted back to back for no-torque twin-engine power; a single larger engine would serve as well. And as a bonus, this job features plug in wheels and a third engine mountable in the nose (a removable, weighted noseblock is used for water flying) for real screeching overland flight—not that she can't skid in to a smooth landing on her hull.

These are a few variations. There are a million others you can use to give your job a stamp of individuality. And surprise, surprise!—designing 'em is part of the fun. When it's snowing outside, you can keep yourself amused bending over a drawing board, playing with zorchy curves, dreaming up something to express the ıl you.

...Home Brew Transmitter

(*Continued from page* 16)

that it must be tuned by someone holding a first- or second-class license issued by the F.C.C. To assist the technician in the tuning, we include necessary tuning hints.

Insert a milliameter of 0-to-100 or 150-milliampere range in your B-plus lead, with a positive lead of the meter going to the positive connection of the battery, and the minus lead of the meter going to the positive snap on the battery connector.

With both Arco 423 padders turned down fairly snug, turn on the on-off switch. With an insulated screwdriver rotate the Arco 423 trimmer in holes 1 and 2 (located below the crystal as you view the printed circuit board from the back) in a counter clockwise direction. Rotate until a maximum reading of about 40 milliamperes is had.

Now tune the other Arco 423 for a dip. It will be slight, so watch for it carefully. Final reading will be about 38 milliamperes. Key the push button. Your milliameter with tone on will read about 42 or 44 milliamperes. A field strength meter may be used for final tuning. The entire tuning procedure may also be carried out using a FSM. Tune the Arco 423 below the crystal first. Then tune the other one for aximum output.

A word about field strength readings is in order. Taking field strength meter readings with field strength meters of the average kind on the modeler's bench, gives only

(*Continued on page* 32)

relative readings. Never judge final output by field strength meter readings alone.

True Field Strength Meter readings can be had by being more than one full wavelength away. Most of the simple FSM circuits in use will not reach nearly that far and therefore they cannot be used to judge transmitters relatively. There are many factors that enter into true readings of output.

Single Proportional

(*Continued from page* 20)

find it in the junk box.)

This single-channel proportional unit is currently being used with a Kraft single-channel tone transmitter having a modified version of Phelps Pulser included. An identical transmitter with a Shows Pulser added works equally well. Although not tried, the B & D pulser should also work providing the pulse rate is reduced.

The above unit does not have a so-called fail-safe feature not is there intention to incorporate one. For those desiring this feature a Broadhurst or similar POD could be added. Our next efforts with this unit will be toward utilizing pulse rate for elevator control at a minimum expense. Ideas and suggestions from any source would be more than welcome. (DC RC Newsletter.)

Readers Write

(*Continued from page* 2)

LIKES R/C JAY

I thought you may like to know that I have built the R/C Jay from May-June '64 GRID LEAKS, with slight mods. I have had my first test flight using Don Brown's Dee Bee 21 gear. This is the first proportional outfit in NZ, and has caused quite a sensation. I was thrilled with the smooth flight.

Previously I had flown Orion and Taurus on reeds and noticing that R/C Jay had the best points from Orion and Taurus, I decided to build it. I call it "TAURION."

Like yourself, I am a pilot (private license) and find the proportional very easy to fly with.

REG TRUMAN, New Zealand

SPORT, SI

I wish to take this opportunity to congratulate you upon the high quality of GRID LEAKS. I think you strike a nice balance between technical articles and model plans. I have not the slightest interest in contests or contest type models. Let's have more models such as the Air Camper for us sport fliers. I fly 6-channel reed equipment and am always interested in a model with some character such as the Air Camper.

Please don't waste any precious GRID LEAKS space on any full-house proportional super stunt fuel hogs as the field is fully covered elsewhere, much to my disgust.

BOB BINKLEY, Lovettsville, Va.

HE FLIPPED

I really flipped over this issue of GRID LEAKS for two reasons, first the Pietenpol article and plans, plus the article and dictionary on radio control, because so many ask me, "How does radio control work?" Now they can get all the answers they want without a long winded explanation that leaves both of us "pooped."

Good luck and many many more happy years of modeling to you.

MANUEL SANTA ANNA, Woonsocket, R.I.

Kraft Custom Radio Control

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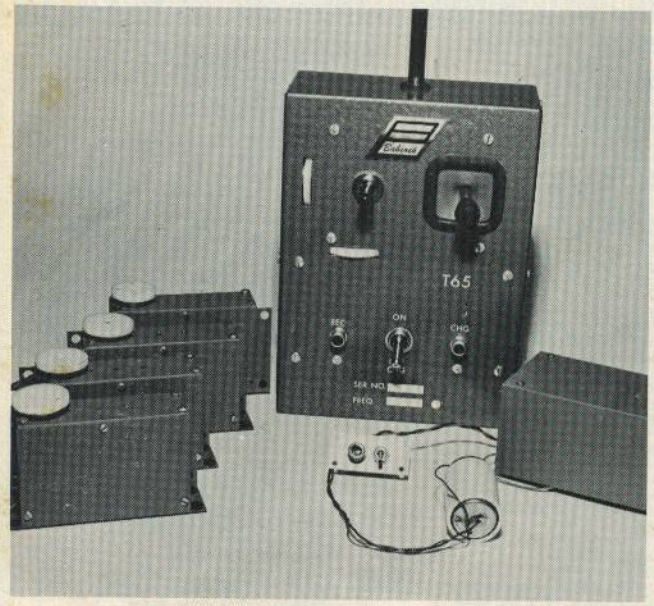
SOUTH EL MONTE, CALIFORNIA

THE BABCOCK PROPORTIONAL SYSTEM

Manufactured by the country's most experienced R/C manufacturer. There is more Babcock full-scale proportional equipment flying with the military services than any other make. This new equipment is the outgrowth of R/C experience from 1939 to 1965 and has been in development for over 1½ years. The one transmitter and one receiver are used in all four systems listed below. We make three types of servos. Any of these systems can be changed to any other by the addition or deletion of servos by plug-in methods. No factory modification is required. These systems cover every requirement for both sport and contest flyer, beginner and expert alike. They will give complete control of a plane, boat or car. These are all **complete** systems including Nic and charger.



T-65 Transmitter

Size: 7" high, 5" wide, 2⅛" deep. Antenna chrome plated, 43" long, collapses to 3", base loaded. 100% modulated. 500 m.w. input, 300 m.w. output. Dual sub carrier F.M. method, 11 transistors. Hand held with right thumb on stick. The left thumb falls naturally to motor control, pitch trim or roll/yaw trim. 12-volt Nicad supply furnished. Four hours flying between charges. Charger furnished for either full or trickle from 115-volt A.C. safe transformer type. Jumper cables to charger and receiver. Finished in bronze hammertone. **$95.00**

R-65 Receiver-Decoder

Size: 3" x 1 15/16" x 1⅞", weight 3½ ounces. Sensitivity better than 1 microvolt for full limiting. Amplified A.V.C. 6 volt 450 m.a.h. Nicads furnished. Four hours flying time. Switch and charger jack provided. No taps on battery for equal current drain on all cells. Five connectors provided for four servos and battery harness. Decoder uses special sealed sub carrier filters, complementary symmetry is used throughout for temperature change immunity. Seventeen transistors in receiver and decoder. Glass epoxy P.C. boards. Rugged, stable, reliable. **$95.00**

PS-1 Proportional Feedback Servo

2" high, 1" wide, 3" long plus mounting flanges. 100° output wheel, rotation ¾" or ⅜" throw. Wheel can be positioned for differential ailerons or elevator. Over 5 pounds thrust at ¾" and 3½ pounds at ⅜". Eight transistors in complementary symmetry circuit for temperature immunity. Uses famous Copal 5-pole motor and our own rugged Delrin gear train. ¼ second from center to full throw. **$40.00**

TS-1 Trimmable Motor Servo

Same size and weight as PS-1, ¾" or ⅞" travel in 180°. In high speed motor override, rudder and nose wheel are centered for slow rolls and normal flying. Slightest backing off couples rudder and ailercns for landing, takeoff, spins and snap rolls. May be "beeped" to any position with great speed. Dynamic braking on motor. **$40.00**

TSB-1 Winch Servo

Same size and weight as PS-1. Over 10 pounds pull on ⅜" winch drum for large and small sailboats. **$40.00**

Designed to meet **YOUR** *Requirements!*

BC-65 System

Consists of T-65, R-65, 3 PS-1 servos, 1 TS-1 servo, all Nicads and charger. Nothing else to buy for a full house "3+1" proportional system. Will handle any size model aircraft. Class III competition. **$339.00**

BC-24 System

T-65, R-65, 2 PS-1 servos. Nicads and charger. Rudder and elevator or rudder and motor on boats, cars or aircraft. Ideal for Class I competition. Special add-on switcher for electric cars and boats available. Can be upgraded to BC-30 or 65 by addition of one or two servos. **$259.00**

BC-30 System

Consists of T-65, R-65, 2 PS-1 servos, 1 TS-1 servo, all Nicads and charger. May be upgraded to BC-65 by purchase of one PS-1 plug-in servo. (Ideal Goodyear pylon.) Class II competition. **$299.00**

BC-31 System

T-65, R-65, 1 PS-1 servo, 1 TSB-1 winch servo, Nicads and charger. **$259.00**

Available from the factory September 1, 1965
or contact your nearest dealer

DEALERS INTERESTED IN HANDLING THIS EQUIPMENT
PLEASE WRITE FOR NEW REPRESENTATIVE ARRANGEMENT:

BABCOCK CONTROLS, INC.

P. O. Box 666 **Laguna Beach** **California 92652**