A Radio Control Publication for Beginner & Advanced Amateur

GRID LEAKS

R/C DATA SERVICE

July • August

TWENTY FIVE CENTS

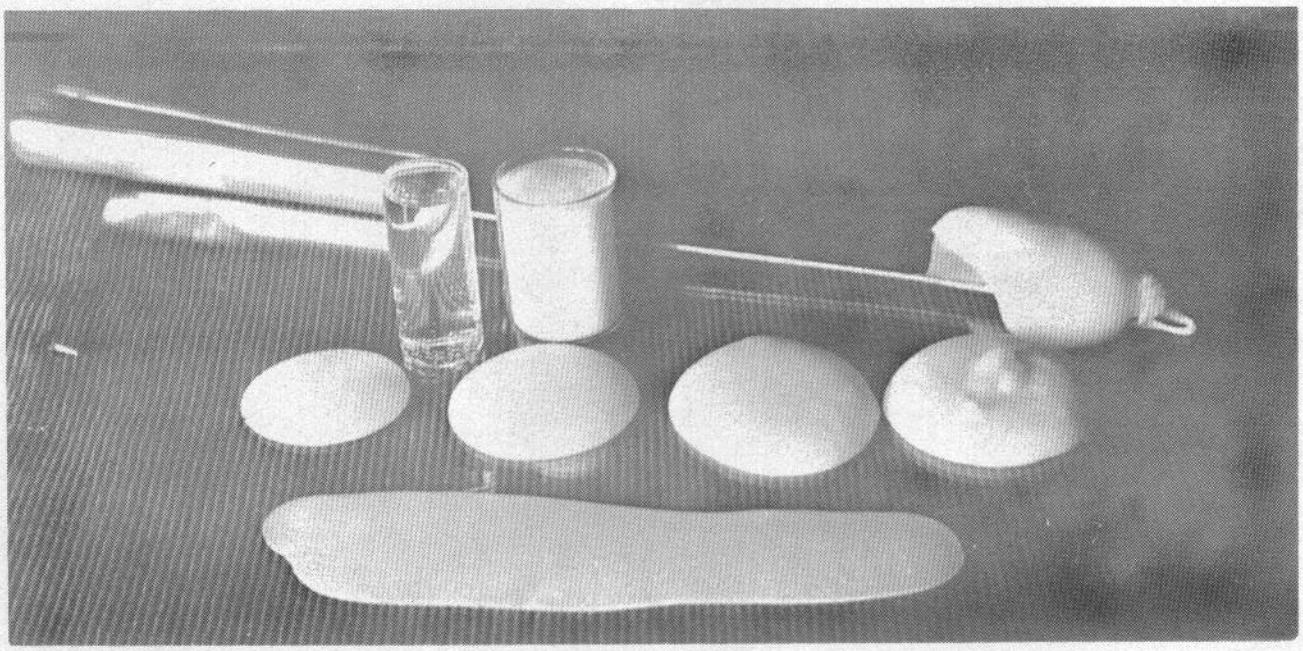
VOLUME 3, NUMBER 9

- IMPROVING MIGHTY MIDGET MOTORS FOR SERVOS
- PROPORTIONAL RUDDER-ONLY ACTUATORS
- DUAL PROPORTIONAL CONTROL STICK
- MATERIAL UNLIMITED — ACRYLIC PLASTIC
- SOLID-STATE I.F. RECEIVER
- ELECTRONIC PULSER FOR RUDDER-ONLY
- ACTUATOR FOR RUDDER-ONLY — MOTOR CONTROL

SPECIAL PROPORTIONAL CONTROL ISSUE FEATURING HOW-TO-DO-IT ARTICLES BY JIM SHOWS, BOB BATES, JOHN W. RAWLINGS • PLUS MANY OTHER TIMELY FEATURES

MATERIAL UNLIMITED

By GORDON FLENNIKEN



THIS PAST YEAR the introduction of self-curing acrylic plastic to the hobby world opened many new vistas. This can be somewhat compared to the advent of glue—or even to the nut and bolt.

For several decades the wonder of plastics has grown until today industry could hardly do without them. The general public, however, has not been able until recently to play with these fascinating materials. We are using the polyesters and more recently the epoxies for such purposes as building radio-controlled models. Techniques have been borrowed from industry and applied to these ends. Such is the story of laminated glass cloth as a modeling material.

The most recent addition to this ever growing list is self-curing acrylic, truly the jewel of the plastics industry, and one having many of the most sought after qualities. It is quite tough, machinable, easily colored, molded and shaped. Here, in effect then, is a bolt and nut for the man who wants to put something together.

Acrylic plastic is familiar to all of us in the form of Plexiglas and Lucite, trademarks of Rohm & Haas and the du Pont Co. All present day automobile tail light lenses are molded of these substances and the Air Force has used Plexiglas for canopies and turrets since the days of World War II. They are available from suppliers in the form of sheets, tubes, rods, and castings. Acrylic plastic's common form is optically clear and transparent and has the peculiar ability to transmit light around a corner. It is thermoplastic so that it can be heated until soft and given any shape.

Self-curing acrylic gives the experimenter the raw materials to mix his own acrylic plastic. It comes as a finely ground white powder and water-clear liquid. These two are the polymer and monomer phase of methyl methacrylate—and when added together in the proper ratio react to form acrylic plastic. The liquid portion contains one of the most expensive catalysts known. This is is the element that triggers self-curing.

When first mixed, the plastic is very fluid and may be readily poured into prepared molds. However, if left in the mixing cup for a few minutes, it begins to jell and thicken. It goes through this stage for several minutes with gradually changing handling qualities. It becomes like putty, losing most of its stickiness and may be handled with tools wet in water or through wet cellophane with the fingers. It may be poured onto a sheet of glass and, after becoming very stiff, may be lifted intact and shaped as a flexible sheet. The side which had been in contact with the glass will look like glass. All of this requires from two to 15 minutes. Colder working temperatures can stretch this out to an hour or more.

During this phase of the cure many uses can be devised for the putty-like substance. Molds for boat hulls or plane fuselages or race car bodies can be used by laying the lifted sheet of putty-like plastic inside and pressing it into all the contours with your fingers. It is stiff enough to stay there. Reinforcing ribs can be placed where needed simply by pinching up a ridge of plastic. Timing this operation is important so that you don't get half through and have the plastic suddenly harden. Experience with the material in small quantities will give anyone the ability to work with it.

Once the plastic becomes warm, hardening is imminent. This phase progresses rapidly once it is started, and quite a bit of heat is generated for about two minutes, depending on the amount of plastic. This process—called auto-polymerization—is the action of the molecules aligning themselves into the pattern of the finished acrylic. If no dyes or opaquing material have been added, the plastic becomes clear during this process.

When cured under pressure, this self-curing acrylic can be molded to look exactly like the commercially produced plastics. Unless it is subjected to about 40 psi pressure while curing, tiny bubbles develop from the expansion of the liquid into a gas. These bubbles do not materially weaken the finished plastic, but do prevent an optically clear casting from being made in an open mold. Careful mixing and measuring of the powder and liquid and careful pouring at just the right consistency can keep these bubbles very tiny and to a minimum. Thin sections, such as sheets poured on glass come out quite good. The side that cures next to the air is not shiny like the side that was next to the glass, but can be polished with very fine pumice and water until it is clear. The addition of an opaquer and colors including black and white completely obscure these imperfections. Actually no gas bubbles occur close to the mold walls, or in the case of a shaft molded into a plastic bushing, next to the shaft. For this reason, final machining operations and polishing do not break into the bubbles and a perfect surface results.

By far, the most uses for this new material fall in the field of casting or molding. Here there are unlimited possibilities. Molds may be made of plaster (Hydrocal, trade mark U.S. Gypsum Co.), metal, wood, ceramic, glass—or practically any material except acrylic plastic. Polyethylene plastic can be used as it will not react with the acrylic. A beautiful transparent barrel-shaped pulley for a Van de Graaf electrostatic generator was molded simply by cutting a hole in the bottom of a polyethylene cup for the shaft which in turn was struck into a hole in a board. The cup was half filled with acrylic and allowed to cure. Upon removal the shaft was knocked out and a second pulley half molded in the same manner. The two halves, tapered like the cup which formed them were filed flat on the large end, smeared with fresh acrylic and pressed tightly together on the shaft. Irregularity in the mating surfaces was corrected by turning one half until they came into perfect alignment. This pulley was completed by running it in its own acrylic bushing with the motor that drove the generator and finally shaped to a perfectly balanced and true part with a file—just as in a lathe. A 400-grit wet-or-dry paper was then applied to the rapidly turning pulley for the final polish. Knobs may be made by suspending the shaft in a suitable mold—such as a dixie cup—and finished by running in a drill and filing.

Self-Curing Acrylic Plastic

By GORDON FLENNIKEN

Bushings are a snap. Whether these are needed for a rotating shaft or as a pushrod guide, they can be molded in place for an exact fit and perfect alignment. All that is required is a hole larger than the shaft in the supporting member and a washer larger than the hole. The shaft is centered in the hole in a vertical position and a piece of aluminum foil covered card is placed over the shaft below the hole. The washer is centered on top to serve as a mold for the bushing shoulder. This is filled with acrylic and allowed to cure. The washer is then tapped free, the whole assembly inverted and the washer used on the opposite side for the second shoulder. Usually a bit of oil and slow rotation in the bushing will give a running clearance. If not, a touch of fine pumice will accomplish a perfect fit. For high speed, light oil will prevent heating and consequent softening of the bushing. Slow speeds do not affect it at all.

In radio control there are many applications for acrylic—and many more that alert modelers will discover. One of the finest that we have seen is to use tough acrylic to strengthen the Mighty Midget motor. The mounting base of the motor can be covered with acrylic by constructing a temporary mold or dam around it and filling. A sheet of acrylic can be used to encapsulate the entire motor, or to hold the brushes more firmly in place. Some R/C fans have molded tiny connectors for electrical hook ups, using different colored plastic as a code.

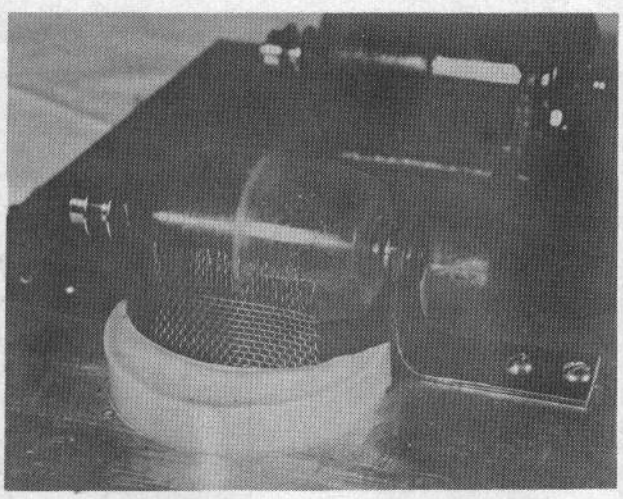
Bits of Scotch Tape, aluminum foil, tin from a coffee can, balsa wood, paper—you name it—can be used to support the liquid plastic while it cures. And, of course, plaster molds can be made to copy practically anything when coated with the proper release. General Electric's self-vulcanizing silicone rubber even allows the modeler to make exact copies of such difficult items to copy as a nylon gear. When used as a mold this material has the property of no shrinkage and perfect memory—plus the fact that it is rubber-like, and the finished plastic part can be easily removed.

The only difficulty here is the cost of silicone rubber—but very small amounts as would be required should not be out of reach.

The encapsulation of electrical components renders them virtually indestructible. Guides, supports, reinforcements, mountings, cams, gears, wheels, pulleys, field repairs—stripped threads, broken parts—with this material at hand only the imagination limits its many uses. Its practical qualities, including rapid cure, good machinability, toughness and resistance to most solvents including hot fuel and dope lend themselves easily to the alert modeler.

Self-curing acrylic plaster is now available in kit form containing all the necessary material to mix any color or degree of transparency—a supply of plaster mold release, measuring vials and wax mixing cups as well as highly detailed instructions. This exciting new plastic is taking its place in hobby shops across the nation alongside the dopes, cements and resins that have come before, and is destined to become more and more popular with the modeling crowd.

Top left—When first mixed, plastic is fluid, can be poured easily into molds. Begins to thicken in few minutes with gradually changing handling characteristics. Becomes like putty, can be handled. Or poured on glass, making flexible workable sheet after stiffening. Below—Beautiful, transparent barrel-shaped pulley made by molding two halves in a polyethylene cup. _____ Nylon gears and other parts can be copied exactly, as suggested by space capsule and mold.



GRID LEAKS is a bi-monthly publication, and is intended for the modeler who is interested in Radio Control. It is published by Ace R/C, Inc., at 203 W. 19th Street, Higginsville, Mo. Subscription rate is $2.00 per 10-issue volume. For subscriptions outside the United States, add $1.00 for postage.

Improving the MIGHTY MIDGET

By JAMES SHOWS
(From the MAC Carrier Wave)

Editor's Note: Even before Part 4 of Jim Shows' series on Rudder Only Proportional appeared in the last issue of GRID LEAKS, we had received a number of requests for an article on how to make an actuator such as Jim used.
The McDonnell R/C club paper, Carrier Wave, had carried this some time back, both on how to strengthen the Mighty Midget, and how to make two versions of the Shows' actuator. So we're taking a couple of leaves from this excellent club paper and reproducing this material with Jim's permission, too. On the subject of the MAC Carrier Wave and Club, this is quite an active group, one of their members contributing to this issue of GL with a stick-type control set up that is simple, but extremely workable. Another of the group, Don Dickerson, developed the Pulse Omission Detector as used by Jim in his system. This article appeared in MAC Carrier Wave.

THE MIGHTY MIDGET MOTOR is probably the single most-written-about piece of radio control hardware for servos ranging from complex concoctions providing six or more functions to (rarely) a stock motor to provide a single function.

This article is a two-part, single-issue discussion intended to present on these two pages the whats and hows to improve the basic performance of the M-M, and on following pages, two types of proportional servos that are functionally similar.

First obtain the following materials and tools:

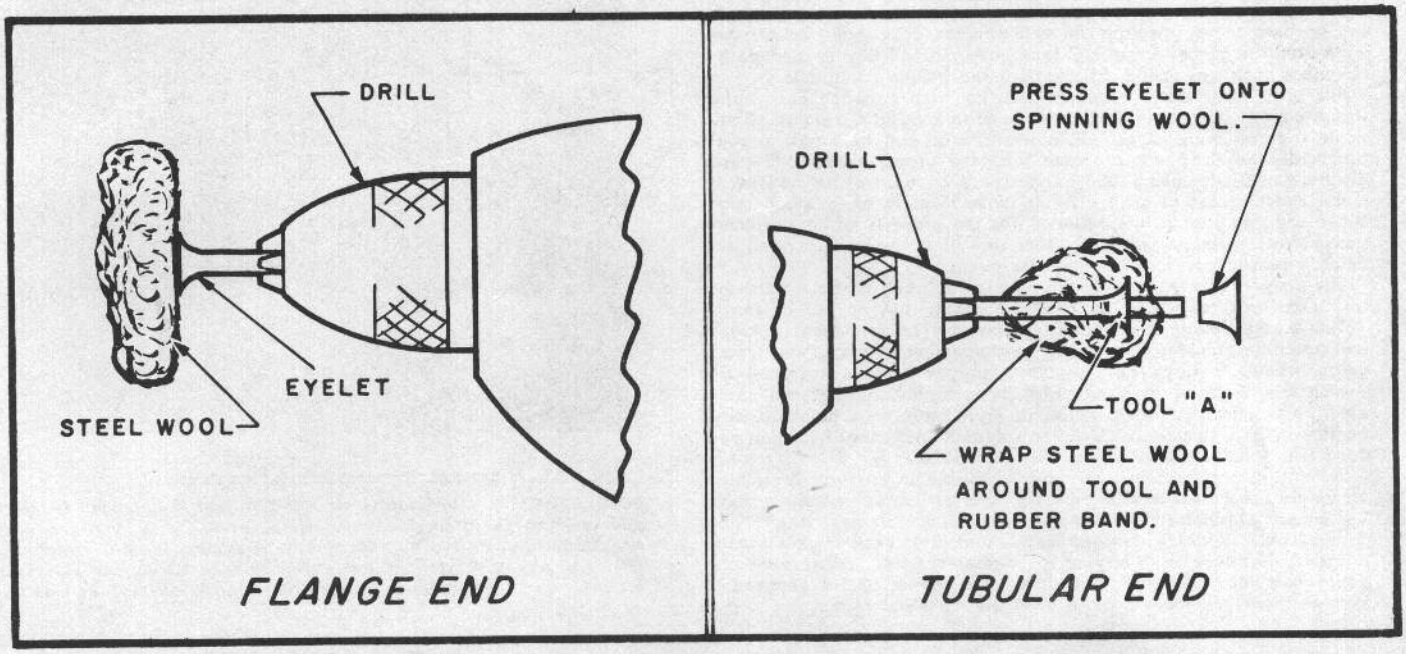
1. One package of Perfect Half-A leadout eyelets
2. One Mighty Midget Motor
3. One #45 drill bit
4. 1/16 OD music wire
5. One narrow blade X-Acto razor saw
5a. .040 wire or sharp punch
6. One small file
6a. Vise
7. One power or hand drill
7a. Small hammer
8. One pin-vise (to accept a #45 drill bit)
9. Pad of steel wool
10. One 3/16 inch drill bit
11. Approximately 2-inch square of .010-.015 steel on .020 aluminum

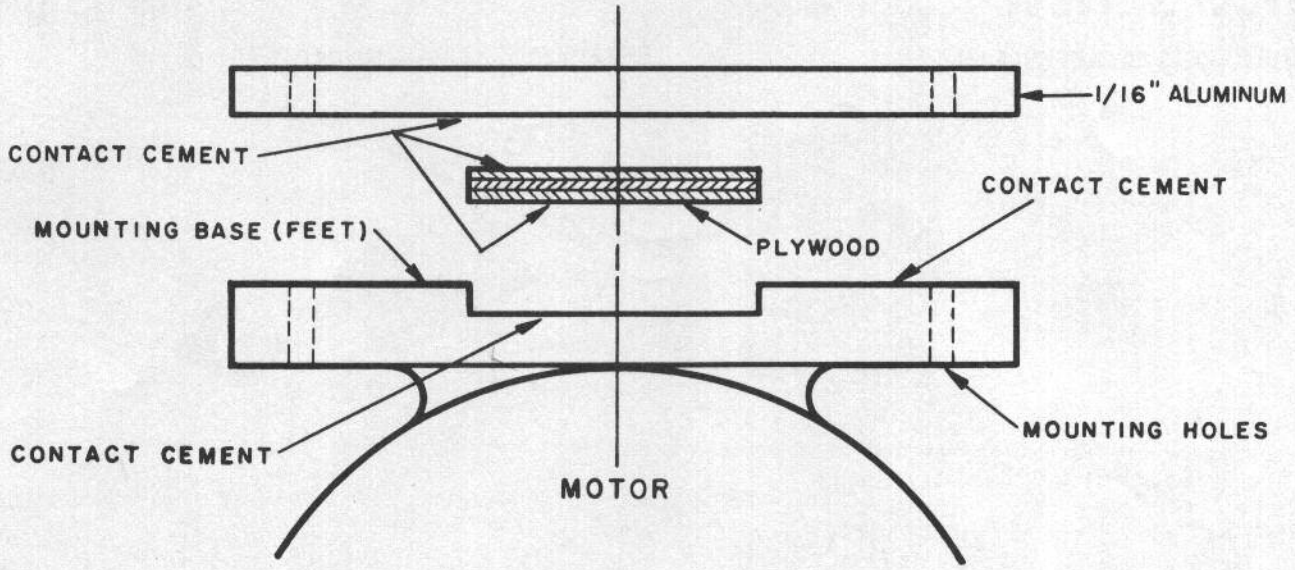
With the above supplies or facsimile the next step is to build the two tools, "A" and "B". With the tools completed proceed as follows:

(1) Remove brushes (carefully noting orientation)
(2) Remove nylon gear and counter-shaft
(3) Remove case screws and brush end of case
(4) Place open end of case on opened jaws of vise or edge of bench, being careful the armature doesn't touch.
(5) Tap end of armature shaft lightly with small hammer driving small spur gear against case. This will cause the gear (press fit) to move slightly toward end of shaft.
(6) Slip tool "B" under gear and push the shaft into the slot
(7) Drive gear to end of shaft by tapping shaft end with hammer. Slip gear off shaft by use of punch, being careful not to damage gear or drop armature

NOTE: Tool "B" protects both bakelite case and spur gear. With the armature removed, proceed to rebush armature bearings as follows, starting with the brush end of the case.

(1) With #45 drill in pin-vise carefully drill out the case armature bearing. The #45 drill is under size for the eyelet so very carefully ream hole by pushing drill in and out with light side pressure. Periodically try to push eyelet through the hole from inside the case by slipping the eyelet over the short end of tool "A". Although this step is not difficult, take your time and be careful to obtain a press fit. *Do not tap with hammer as this will crack the case.*
(2) Countersink the hole from the inside with the 3/16" diameter bit to accept eyelet flange.
(3) With eyelet seated, mark length on outside of shaft by scoring with razor saw. Allow approximately .02 inches beyond case.
(4) Remove eyelet. Saw to length marked with razor saw and polish as shown in sketch.
(5) Repeat the same procedure for the gear end of the case. Allow about .01 beyond case for this end.
(6) Insert polished eyelets with tool "A". Place ends of case together and align bearing, inserting 1/16" wire (long end of tool "A") through bearings. Bearing can be tilted slightly to assure alignment.
(7) Remove magnet and coat with PLIOBOND or similar glue, also inside of case. Replace magnet and align with index on brush-end of case.
(8) On re-installing the armature you will note it is too long. Shorten by placing brass armature collar (on gear end) into a hole of tool "B" and into an open jawed vise. With a hammer force the collar approximately .01 inches toward armature winding. On re-assembly, this should allow a slight armature end play.
(9) Remove armature and, repeating this procedure, drive the commutator approximately .01 toward armature windings. Upon re-





assembly, the armature will have an end play of approximately 1/32 inch.

NOTE: The writer lubricates servos as follows—this is optional as there are pros and cons on lubricating.

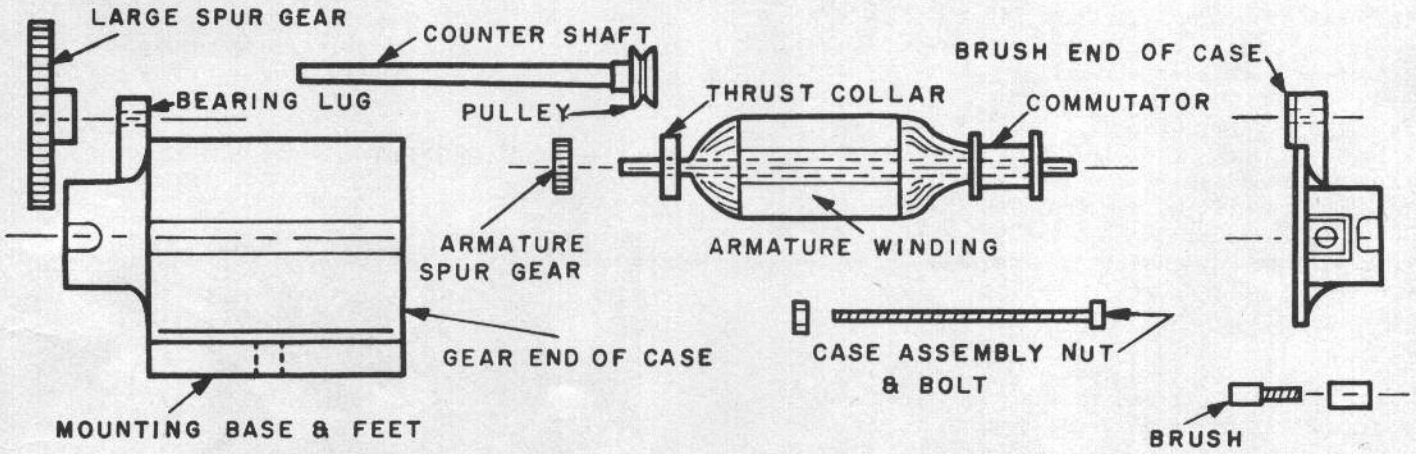
a. Place drop of household sewing machine oil on flange side of bearing.
b. Install armature and brushes, holding case together with hand or single bolt. Run motor about 30 seconds to one minute in both directions on 4.5 volts.
c. Remove and wipe free all excess oil especially commutator and brushes.

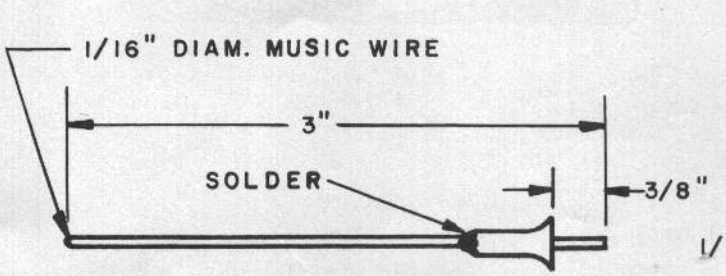
(10) With armature in place and the brush end removed replace gear on shaft by tapping on brush end of shaft using tool "B".
(11) Drive gear on shaft until approximately .002-.005 end play is left. This will provide metal-to-metal end bearing on the gear eyelet. This prevents the commutator (plastic) touching the brush end bearing causing excessive drag.
(12) Close case and bolt. Place a drop of white glue on nuts and heads of case bolts to prevent loosening from vibration.
(13) Carefully sand and solder spur gear to shaft. Use care to not get solder in gear.

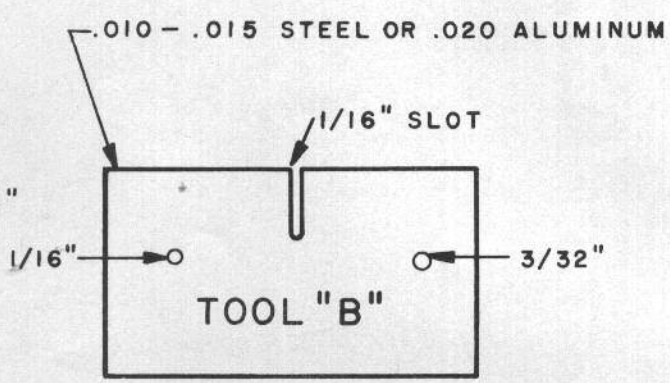
The mounting lugs which tend to crack are beefed up in the following manner.

1. Remove embossed lettering on motor base by filing.
2. Cut 1/32 plywood to fill recess in base.
3. Fill gap by bonding plywood to motor base with contact cement.
4. Sand plywood insert flush with mounting feet and roughen feet.
5. Cut 1/16 aluminum to match motor base and bond to case with contact cement. Roughen aluminum plate with sandpaper before bonding.
6. Drill hole in aluminum plate to match motor mounting hole.
7. The writer prefers to thread the aluminum plate for 4-40 mounting bolts to simplify installation.

(Part Two Follows)

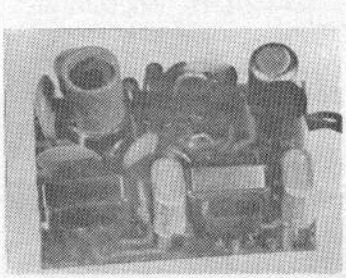


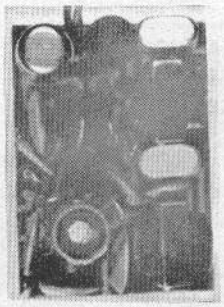




WHAT'S NEW

CK3V RECEIVER ASSEMBLED





Now-the fabulous K3VK receiver is available in a completely assembled version at a price that will rock the R/C industry!

Assembled under the personal supervision of Phil Kraft, and tested to Phil's exacting standards, this unit will make its mark in R/C. Never has the R/C modeler been offered a receiver which performs as excellently as this one on the 26 to 28 mc range, and is relayless, using only 3 volts of batteries for both the receiver and the escapement. The custom built unit by Phil Kraft is even smaller than the kit, which has been a runa way item at Ace R/C, and has received many very favorable comments from R/C'ers through out the country, and much complimentary publicity in model magazines.

The unit measures 1 1/32 of an inch by 1 7/16 and is shown in the photograph above as actual size. The kit will not be changed, because to produce this unit in this small a size, we feel is exacting and beyond the average kit builder's ability.

But the custom built unit by Phil Kraft will literally rock the R/C world because it carries the fabulous price of only $16.95. These units will be available by the end of July, 1962, order CK3V at $16.95. We predict this will be a sensational seller, and urge you to get your orders in early.

CK3V $16.95

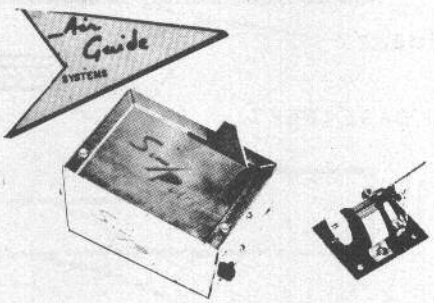
NOTE: The price as advertised above is $2.00 less than as carried in the August national magazines, and is a saving that is immediate and is being passed on to Ace R/C customers.

TOPFLITE R/C PROPS

Due to demand from the field, because of the fact that the popular R/C props by Topflite apparently are hard to obtain, Ace R/C has added the following to its expanding line of Topflite accessories:

11-6	Wooden Prop	$.35
10-3½	Wooden Prop	$.25
7-6	Nylon . Prop	$.40

STRADER' S AIRGUIDE SYSTEMS



Especially for pulse fans, here is the new air-guide system developed by Ted Strader. SIM/PULS a rugged reliable rudder only pulser at a reasonable price, operates all year on 2C cells without trouble. Expandable later to operate POD's and the new SIM/DU-AC.

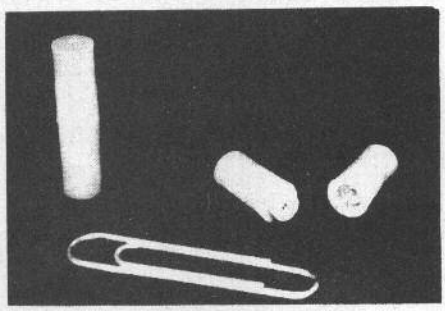
Ready built and tested, designed for years of trouble free service, only $12.95.

The SIM/AC, the perfect rudder-only companion for flawless flights. A special "autolectric" switch eliminates dead stops and allows three times normal battery life and more! Every unit tested and shock mounted. $7.95

Coming soon, is the GO/AC, which provides rudder and elevator and an optional motor-control, only $14.95.

The SIM/PULS is also available in a deluxe model, which features sensory index, only $14.95.

CRESCENT SINGLE CONNECTOR



From Crescent Industries comes a single connector which is designed for antenna plugs made of a hard and almost imperishable plastic. Subminiature in design, the antenna plug is only 50¢.

It measures ½ inch long per section, and is 3/16 inch in diameter. Order CI antenna Plug 50 cents.

FREQUENCY FLAGS

For a long time there have been a number of attempts to standardize on frequency flags for use at contests. Willoughby Enterprises of Tustin, California, in correspondence with a number of clubs throughout the country, has come up with the following standards: 26.995 brown, 27.045 red, 27.095 orange, 27.145 yellow, 27.195 green, and 27.255 blue. It is suggested that all superregen receivers fly a blue flag. Six meter band receivers fly a white flag with frequency in black numbers. This frequency flag is to be tied to the tip of the antenna, using the wrap around wire supplied. At the very low price, and the attempt to standardize in the industry, Ace R/C makes these available through the courtesy of Willoughby Enterprises to contest directors and to modelers in general.
Order the frequency flag of your frequency. Catalog No. WFF (Specify color). Only 25¢

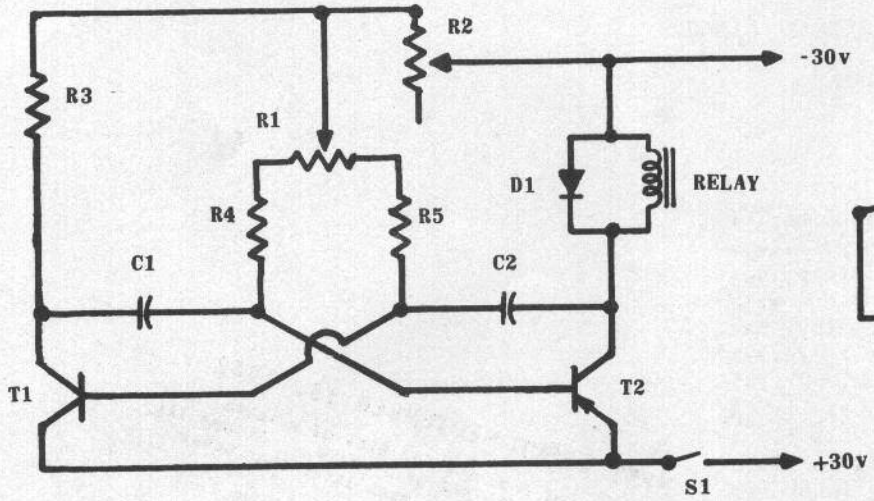
NEXT ISSUE SEPTEMBER 15, 1962

Because of some special bits of news we have planned for the NEW Grid Leaks, Volume III, Number 10, will be a week later than usual.

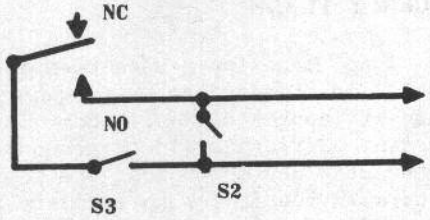
MODEL R /C NYLON CLEVIS

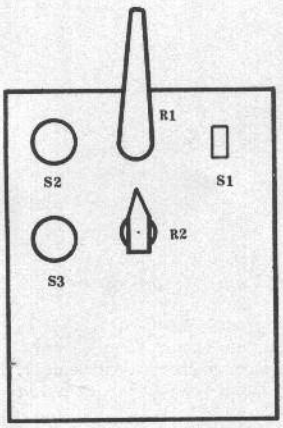
From Model R/C products comes the latest addition to the nylon clevis line. They offer 2 clevis for 50¢. They are modled from pure nylon, and the kit contains 2 clevis, 2 self-retaining plugs, and 2 special springs for use as threads on 1/16 inch diameter music wire.

A standard bicycle spoke can be used as a push rod end, in which case the clevis can be threaded directly to the spoke for quickly adjustable length to the control service horn. If 1/16 inch music wire is preferred as a push rod, then the springs with the kit can be used to obtain a threaded end on the wire. The clevis pins are specially made screws, having an unthreaded section for smooth operation on standard nylon control horns. Order MRC Clevis, pair 50 cents.



T1, T2--CK722 or equivalent
Relay--5K (Gem)
S1--SPST Slide
S2--NO pushbutton (Switchcraft 103)
S3--NC pushbutton (Switchcraft 203)
Misc.--2x3x4 aluminum box, knobs, Printed Circuit Board, hardware





ALUMINUM BOX TO HOUSE PULSER
Top View (Not to scale)

BATES RUDDER-ONLY PROPORTIONAL PULSER

By BOB BATES

(From Clanking Armor, Lincoln, Neb., Sky Knights)

R1--100K pot
R2--1 meg pot
R3--4.7K
R4, R5--33K
C1, C2--.33 (Matched)
D1--1N34 or equivalent

SOME OF THE NEW proportional servos, principally the Propomatic, have renewed interest in single-channel proportional control. The above circuit, the author feels, fills the need for a simple, inexpensive pulser which may be built initially for rudder-only and later expanded to include elevator.

The pulser employs two general purpose transistors in a multi-vibrator circuit. R1 controls pulse width for rudder control. R2 controls pulse rate, from 2-15 cps, for elevator control. If desired, the pulse rate span may be increased or decreased by changing C1 and C2. A higher value for C1 and C2 will lower the pulse rate. Engine control may be achieved through the use of switches S2 and S3 which cause either a solid signal or pulse omission.

The circuit board is well worth the time spent in preparation. The board makes wiring fast, fool-proof, neat. It is prepared from a two inch square of 1/16" copper-clad phenolic. The copper islands should be traced on the board, the holes drilled with a 1/16" bit, and the excess copper removed either by acid-etching or stripping with a knife. All components except R1, R2, S1, S2 and S3 are mounted on the board.

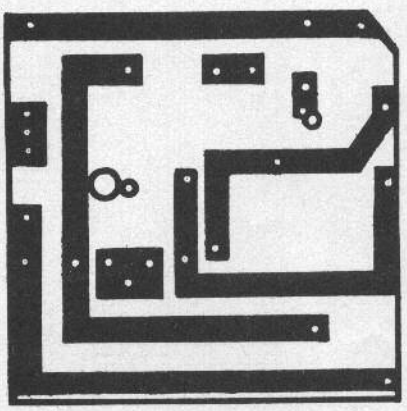
The pots and switches along with a battery box for the 30-volt battery may be mounted in a 2 x 3 x 4 aluminum box. A length of zip-cord connects the pulser and the transmitter through a standard plug and phone jack.

The average battery drain is 2 ma. which will give good battery life with the smaller 30-volt batteries. The battery should be replaced at 25 volts or when R2 can no longer be adjusted for proper operation.

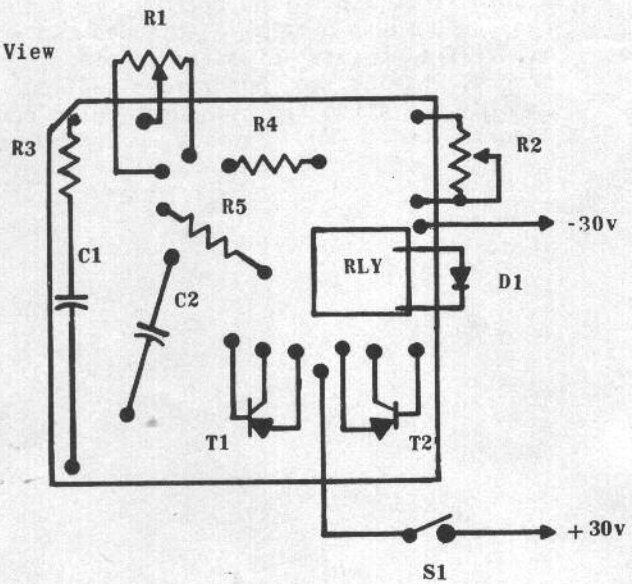
The total cost of the unit, including relay, battery, and 2 x 3 x 4 box is about $12.

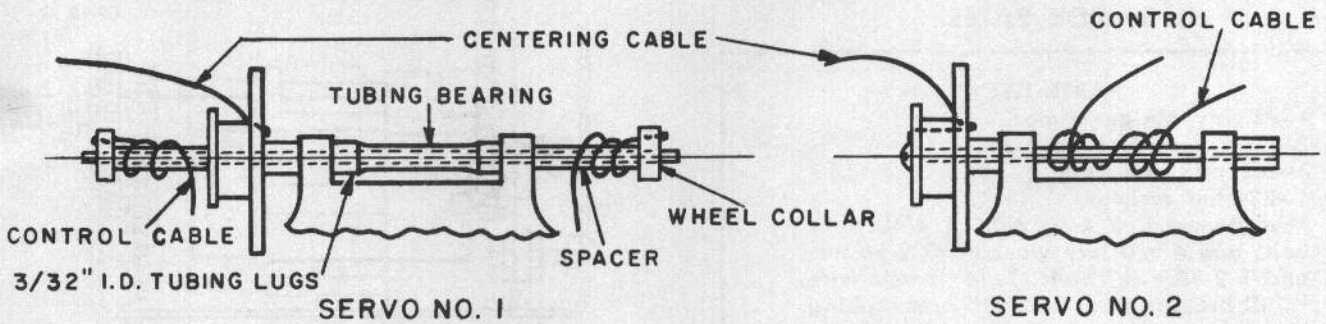
PRINTED CIRCUIT BOARD

Bottom View



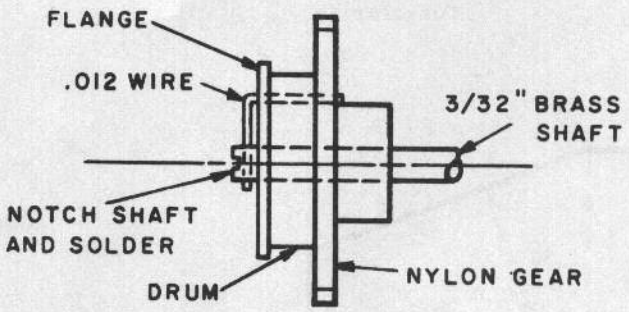
Top View





SERVO NO. 1

SERVO NO. 2



TWO PROPORTIONAL RUDDER-ONLY ACTUATORS

By JAMES SHOWS
(From the MAC Carrier Wave)

THE CONSTRUCTION of two proportional servos is outlined below. Both function quite satisfactorily and generally depend on the preference of the individual.

These are numbered 1 and 2 as shown in the drawings.

NO. 1 SERVO:

1. Replace 3/32-in. diameter brass shaft with 1/16 ID brass tubing with the length approximately 1/64 inches beyond case lugs. Before inserting cut two 3/32 ID brass sleeves approximately 3/16 inches long.
2. Slide 1/16 ID tubing through end lug, through 3/32 ID sleeves and through the second lug.
3. Locate sleeves against lugs and solder to 1/16 ID tubing. This provides the bearing for a 1/16 in. music-wire shaft.
4. The centering drum is cut from an ½-in. diameter dowl stock approximately 3/16 inches in length. The retainer flange is cut from 1/32 plywood, ⅝ in. in diameter.
5. Drill center hole with a #45 drill bit, reaming slightly to obtain a tight fit on 1/16 dia. wire shaft.
6. Bond centering drum, flange and brass gear together with contact cement or PLIOBOND.
7. Drill a #60 hole in the brass gear at the junction of the drum shown in sketch.
8. Slip ⅜-in. length 1/16 ID brass spacers on both ends of wire shaft and hold in place with 1/16 ID wheel collars.
9. Drill #60 hole in wheel collars to hold Half-A Dacron control-line cables as shown above.
10. Wrap cables two or three turns on each spacer (in opposite directions), then route to control-surface horns.
11. Slip the Dacron line through #60 hole in the large gear and knot. Allow three to four drum diameters length of line before attaching to centering spring or rubber band.
12. The writer uses three loops of office type rubber band (approximately 1/16 in. square), hooked together end to end and well treated with castor oil. The tension is adjusted to allow approximately 1¼ to 1½ turns of centering drum before motor stall.

The degree of control surface deflection is determined by the length of the control horn.

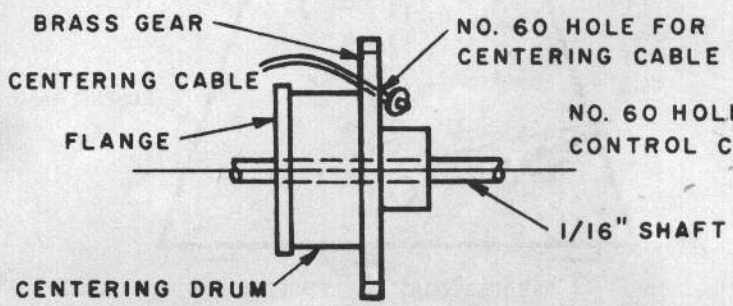
NO. 2 SERVO:

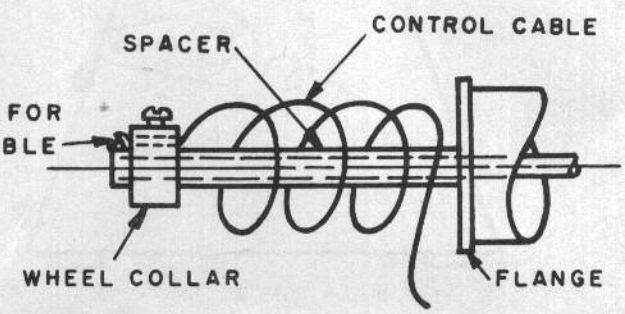
1. With 3/32 brass shaft removed, place in vise and, with punch and hammer, drive the shaft through the pulley.
2. With the pulley removed, file a V-notch in the end of the shaft to accept a .012 wire.
3. Build centering drum and flange as described for servo #1, except drill shaft hole for a press fit on the 3/32 diameter shaft.
4. Sharpen the end of a .012 dia. music wire and push through flange, drum and nylon gear.
5. Bend wire 90 degrees on flange side of the shaft and insert in V-notch. Solder wire to end of shaft and cut off excess length.
6. Carefully push wire and shaft into flange, drum gear assembly, until wire touches flange, then cut off wire flush with inside of nylon gear (see sketch).
7. With shaft assembly inserted in bearing lugs, mark shaft half way between bearing, remove and drill a #60 hole through shaft. Polish shoulders of hole.
8. The diameter of the Dacron cables that are countered-wrapped on the shaft passing through the hole will cause a minor interference with case. File away a small amount until the cables do not touch the case.
9. The shaft can be retained on the brush end of the motor by either a short sleeve of 3/32 ID brass tubing soldered to the shaft or 3/32 ID wheel collars. If wheel collars are used be sure the set-screw does not interfere with the case.

A final step performed by the writer is to adjust the brushes to a very light load. This is done by bending the brush with the fingers away from the shaft until the motor ceases to run or is erratic. Then bend very slightly in the opposite direction until contact is maintained. Also, check to be sure the brushes are flat with respect to the armature. This is done by looking for uneven signs of wear on the brush, and by careful alignment inspection. The writer currently has approximately 21 hours on one set of brushes.

NOTE: After final assembly wrap two to three loops of Dacron line between the two brushes over end of case. Glue with white glue. This is best accomplished after wires are installed to prevent interference. This is a must as the brushes tend to vibrate out in flight. It happened to me.

At first glance this article makes the job look like a major project. However, with equipment gathered, it takes approximately one hour to complete the first servo and usually no more than 45 minutes for more units. Ironically enough, I could have built four to six servos in the length of time required to prepare this article!

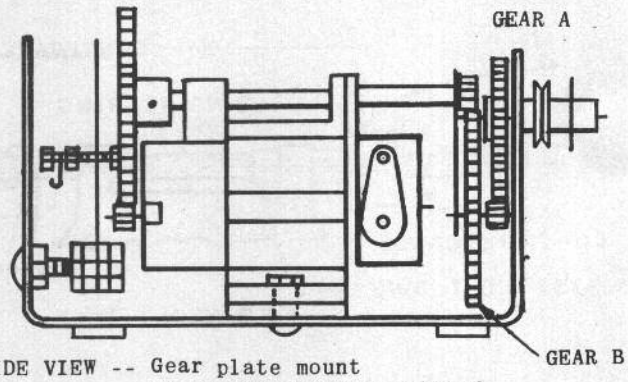




By BOB BATES

PARTS LIST

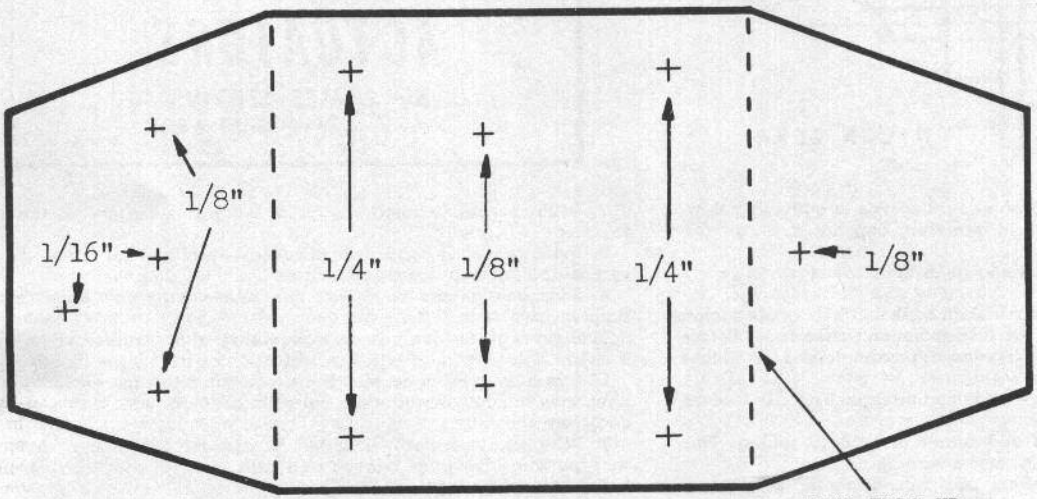
1—Mighty Midget Motor
2—Mighty Midget gear set
1—0.1 mfd capacitor
1—33-ohm resistor
Miscellaneous: 8 4-40 nuts, 5 4-40 x ½" bolts and 4 #4 lock washers; 3 2-56 nuts and 1 2-56 x ⅝" bolts; 1/16" music wire; ⅛" ID brass tubing; 1/16" ID brass tubing; solder lugs; rubber grommets; dial spring; aluminum and/or stainless-steel stock.



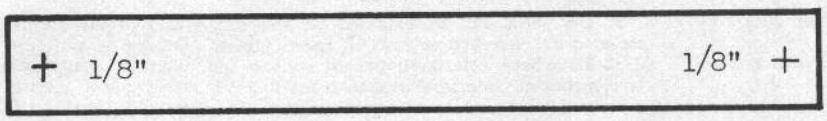
SIDE VIEW -- Gear plate mount bolts and spacers omitted for clarity

All Drawings Full Size

BASE PLATE

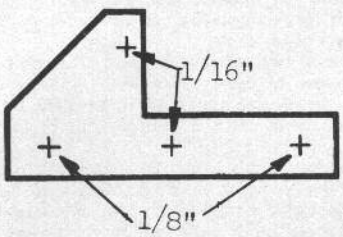


MOTOR STRAP

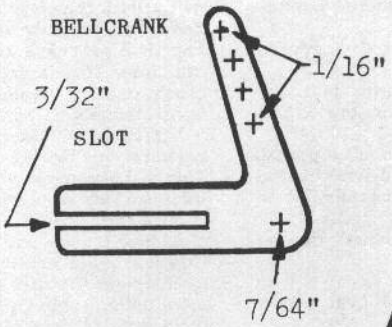


MOTOR CONTROL ARM

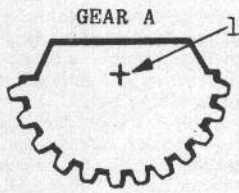
GEAR PLATE



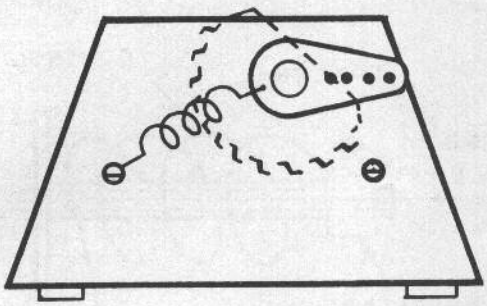
BELLCRANK



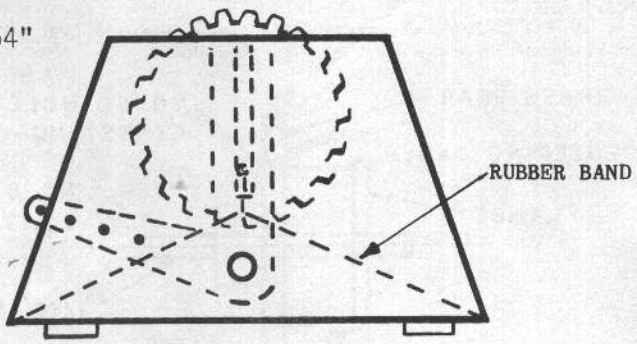
GEAR A



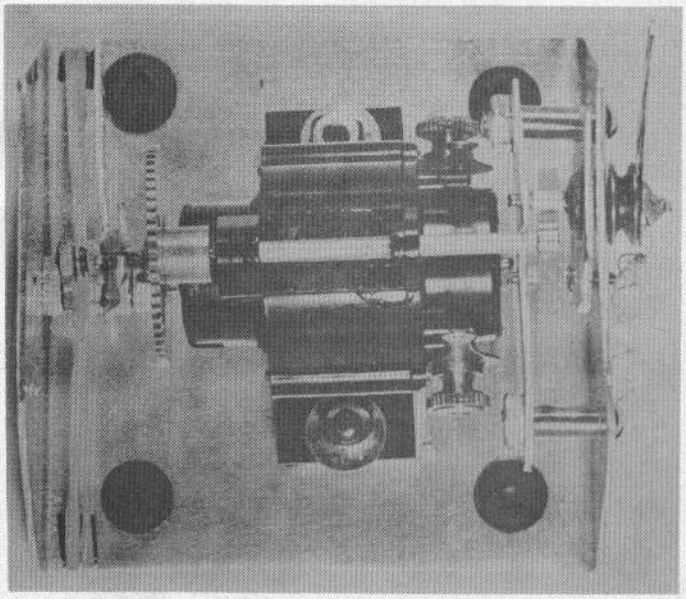
GEAR A



MOTOR CONTROL END VIEW



RUDDER CONTROL END VIEW



Left—The finished actuator as constructed by the author.

Prepare gear A from a large brass gear by filing off some of the gear as shown. Remove all but 1/16" of the brass collar and solder the gear to a 7/8" long 1/16" wire axle as shown in the side view.

Prepare gear B from the nylon gear removed from the motor. Remove all but 1/8" of the nylon collar. Force a small brass gear on a 1/2" long 1/16" wire shaft. Insert the shaft through gear B as shown in the side view.

Place thin washers on both ends of gear B. Place a thin washer on the long end of gear A shaft and a 1/8" long piece of 1/16" ID brass tubing on the short end. Insert both shafts through the appropriate holes in the base plate and attach gear plate, using 4-40 bolts, lock washers, nuts, and 5/16" long 1/8" ID spacers. The gears should mesh well and revolve freely. If they don't, cure the trouble now.

Remove the brass pulley from the original motor shaft and drill a 1/16" hole through one side of the pulley into the vee. Place the pulley and the motor control arm on gear A shaft. The pulley and control arm will be soldered to the shaft later. Hook a dial spring to the gear plate mounting bolt. Tie a length of nylon line (Half-A control line) to the spring and through the hole in the pulley. The dial spring will probably need to be chosen by trial and error to obtain the proper tension.

Mount the motor on the base plate, using 4-40 bolts, lock washers, and nuts. Use spacers under the motor as needed to obtain the proper meshing of gears. Use care in this fitting as proper operation can only be realized with good gear meshing.

Position and solder the pulley and motor control arm so that when small gear B is in the middle of A gear's span, the control arm will be at mid-position and the tension spring will be as contracted as possible.

The final problem is centering. Two methods are readily adaptable. First, solder two 2-56 nuts on the 2-56 bolt used on the main large brass gear and put a hook between the two nuts as shown in the side view. If you can obtain the proper spring, place the spring between the hook and the 4-40 bellcrank axle. If a workable spring is not obtainable, rubber bands may be used by putting bands entirely around the base plate and over the hook as shown in the rudder control end view. In this case, notches may be cut in the base plate to hold the rubber band. The centering device should be strong enough to do a good centering job but flexible enough to allow the motor to run in one direction as as to advance or retard the motor control.

Use some form of arc suppression. One form which is satisfactory is a 0.1 mfd capacitor in series with a 33 ohm resistor, which is placed across the motor terminals.

You now have a single channel proportional servo which will work with four nicads, and is built well enough to last. The motor control arm (or elevator trim) has a transit time of 3-4 seconds.

Actuator For Rudder Only - ALSO PROVIDES MOTOR CONTROL

THE WEAKEST LINK in the chain of proportional control is, in my opinion, the servo. This attempt to remedy the situation was approached with definite objectives in mind. These were: low cost, easily obtainable parts, durability, easy maintenance, moderate current drain, ability to operate reliably on 2.8 volts, push-pull rudder action, and a motor trim section with plenty of power. The Mighty Midget motor and extra gear sets were natural choices.

Start construction with modifications on the motor. Remove the nylon gear and shaft. Drill out shaft bearings to accept a 1-7/16" section of 1/16" ID brass tubing. Cut a new shaft 1-13/16" long from 1/16" music wire. Force-fit a small gear (from the extra gear sets) on one end of the new shaft. Prepare a large brass gear by drilling a hole 1/4" from center to accept a 2-56 nut and bolt. Solder the nut and bolt. Insert the new shaft, attach and solder the prepared brass gear, and cement the tubing to the motor case with PLIOBOND. Fit the motor terminals with solder lugs and cement the terminals to the motor case with PLIOBOND. Shape the motor strap to fit over the top of the motor and coincide with the motor mount bolts.

Drill and bend the base plate as shown and install the rubber grommets. Install the rudder bellcrank using a 4-40 bolt, lock washer, and nuts. The bellcrank is double-nutted on each side, allowing as little play as possible to obtain both snug fit and complete freedom of movement.

SUBMINIATURE EDITORIAL —Bill Winter

As the new "editor" of GRID LEAKS the writer finds himself on the spot. For "GL" decidedly is a prestige publication, regardless of its modest appearance and low-key approach. It is unique in its field, being noted for a policy of presenting timely and practical items which truly advance the state of the art. Here is felt the stir of progress. Obviously, one should not blithely tamper with so good a product.

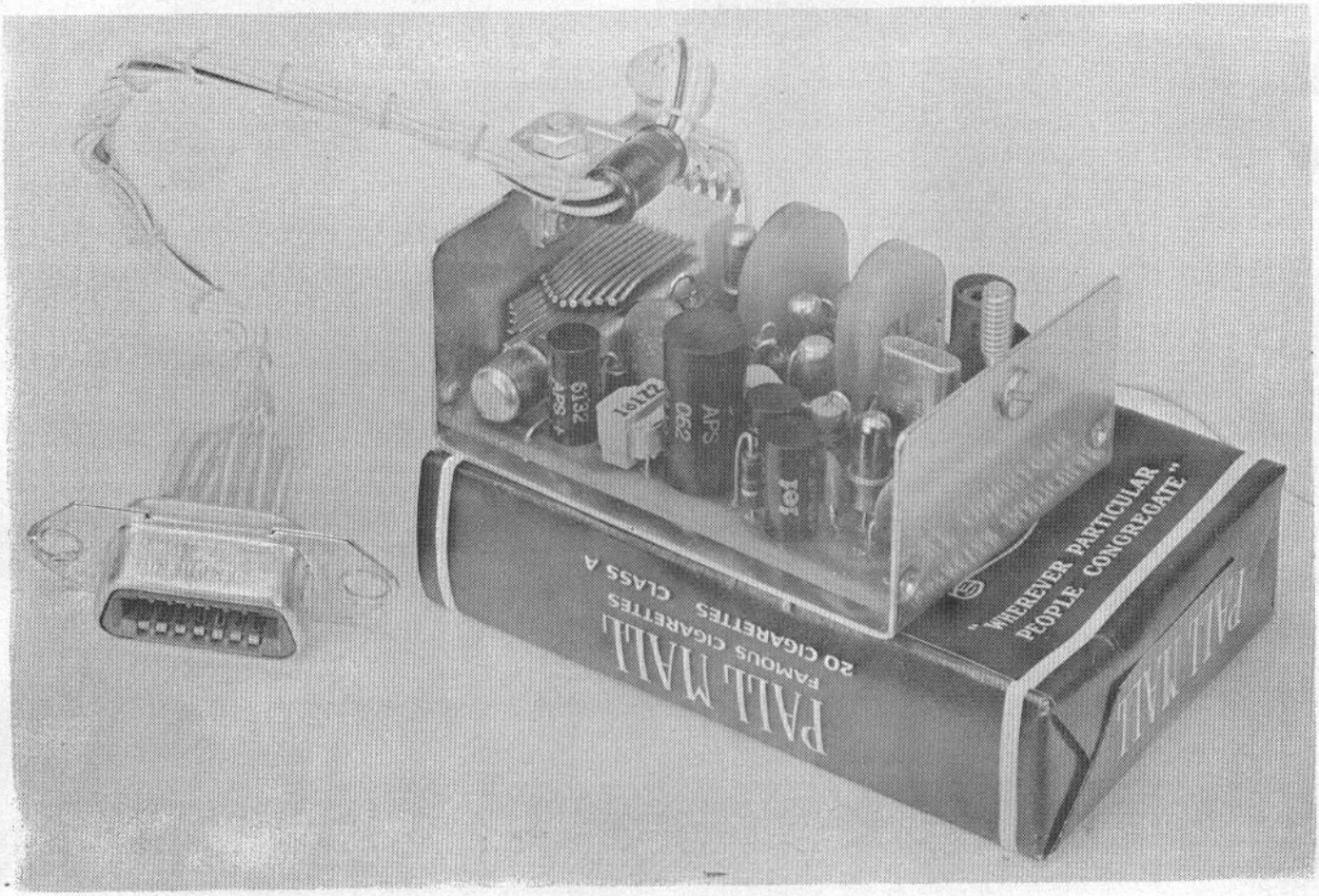
It is all the more important, therefore, that the editor state what he is doing here, and what will happen to GL. Perhaps we should begin with the observation that Paul Runge who has nursed GL along in his spare time (joke) is in reality the editor. (Take that out, Paul, and we resign!) The "assistant editor," which we consider ourselves, is here only to help, at first in production to lighten Paul's load and later, as we "get checked out," to augment the contents.

To our way of thinking, a new editor should confine himself to the problems at hand, and not to sail off on flights of fancy. The concept that has made GL so useful must not be changed. The truly professional contributions must not be diluted.

It is conceivable that other kinds of material should be added. Will you help? What additional ideas would you recommend? More on vehicles themselves, and systems, for planes, cars, boats, tanks and what-have-you? What about the operational aspects of R/C? Field problems, reliability, getting the most out of devices and systems now on the market?

What about the beginner? Building tips? More on installations? Wiring? Personally, we sweat bullets handling those multi-pin connectors for multi-channel. Doesn't anyone fly escapements—and you know the answer to that! What about the mistakes you've made? You might save somebody grief.

The last thing we need is a smart alec editor. It is the writer's intention to play this by ear. In effect every reader is a member in good standing of an editorial board. Your opinions are earnestly solicited. Just address us in care of GRID LEAKS.



SOLID STATE I.F. RECEIVER FOR R/C

By JACK D. FISHER*

Through the use of Clevite's new solid-state IF "Transfilters," it is now possible for the non-technical minded home constructor to build better than commercial quality Superhets. The NHE receiver has a total bandpass of 5 KC at the 6 db points, is stable for years under shock and vibration, and absolutely no test equipment or alignment is needed.

Clevite's transfilters perform the same functions as regular IF transformers. They transform impedance for matching between stages and are very frequency selective. They are physically thick and well mounted between spring clips and contained by a nylon protective shell. They have low mass with three-point mounting and perform perfectly under high G shock or vibration such as that encountered in model aircraft use.

This receiver has been designed for simultaneous multi-reed operation in the Citizens radio band and requires a 27 MC receiver crystal operating 455 KC down from transmitter frequency. Crystal is of the series mode type. We used Midlands' ML-18 with wire leads.

The antenna coil has a slug which should be peaked for maximum battery current or voltage drop while transmitting a tone with the transmitter antenna removed. This should be done with the unit mounted in the aircraft as the antenna coil is very selective and depends to some extent upon antenna length and counterpoise. We tune our receiver by listening to one reed vibrate when using our Klinetronics transmitter at a distance without the transmitter antenna. When operating the receiver on the bench it was found necessary always to have the bottom chassis in place when the antenna coil was peaked; this is to prevent the receiver from picking up its own mixer products. This is normal action in all sensitive superhets, and is a good sign.

* *Engineer, New Haven Electronics*
Currently employed by the Advanced Development, Lab Magnavox Company, Fort Wayne, Indiana.

The transistors used for RF and IF are Philco low-cost 250 MC units with high gain to give uniform results.

A.G.C. current is obtained from the DC voltage drop across the drives transformer primary through a 3.3 K resistor. After filtering, it is fed into the emitter of the first IF transistor through a 680 ohm isolation resistor to give reverse type A.G.C. action.

Front-end blocking is prevented by using a large collector load of 4.7 K and temperature stability is obtained by a low base resistor of 500 ohms with a large emitter swamping resistor of 4.7 K. No noticeable sensitivity decrease was observed in the range of −32°F to 130°F.

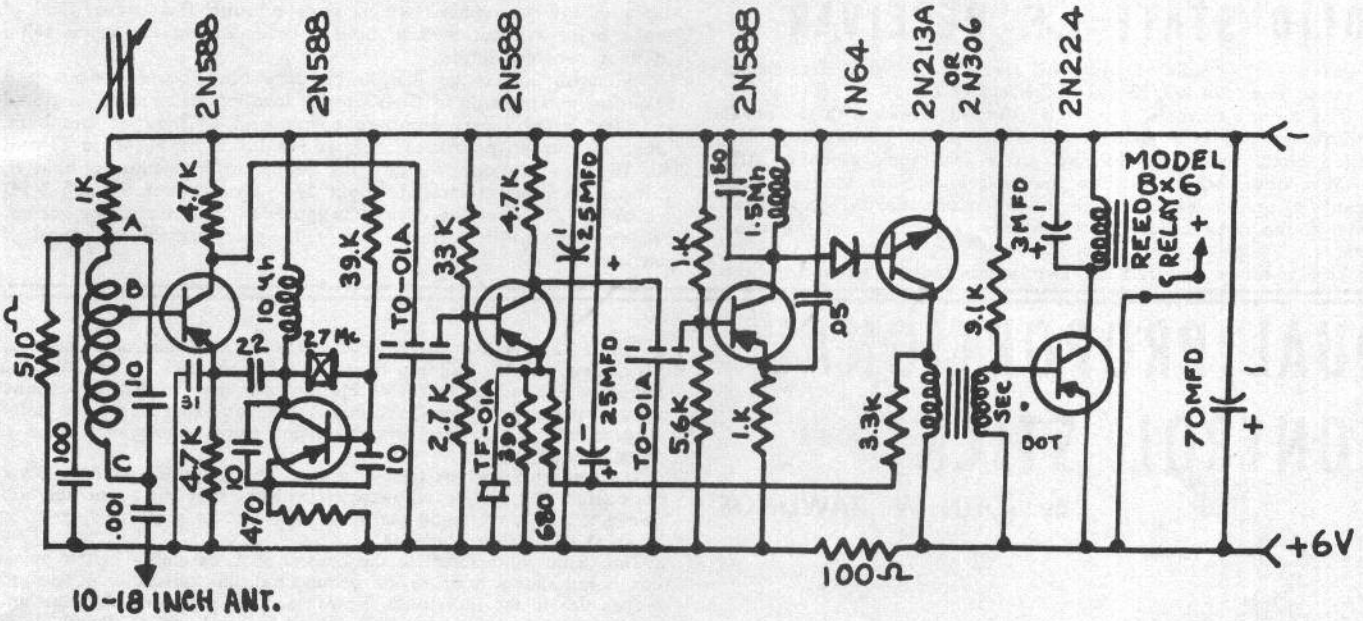
The New Haven reed bank is factory phased so that the lightly clipped positive portion of the receiver output wave form corresponds to the large dwell time desired for resilient contact fingers. This allows a longer contact closure time, creating a desirable self-wiping contact action (exclusive with NHE).

On the return swing of the reeds, electro-mechanical resonance is still in phase with the lower negative portion of the wave form. Harmonic content is negligible. This adds up to a larger total reed excursion so contacts can be set anywhere from 1/64 to 1/32 inch gap and be able to take more drive before overloading.

This receiver follows fast simultaneous reed pulsing perfectly by using a combination of narrow reed widths for low mass and .010" thickness. This makes vibration problems non-existent in the tone range of 235 to 475 cps where most transmitter tone drift can be controlled easily, eliminating need to go higher in tone. The transmitter need not have 100% modulation.

Bad sine waves or even square waves can be tolerated since we have designed the receiver and reed relay coil to clean up the waveforms when used with a 3 mfd capacitor.

Receivers constructed to check design have operated between 12-15 MA without tone and 30-45 MA with tone at 5.8 volts. Design center was 6 volts, but receiver could be used on 4.8 V.



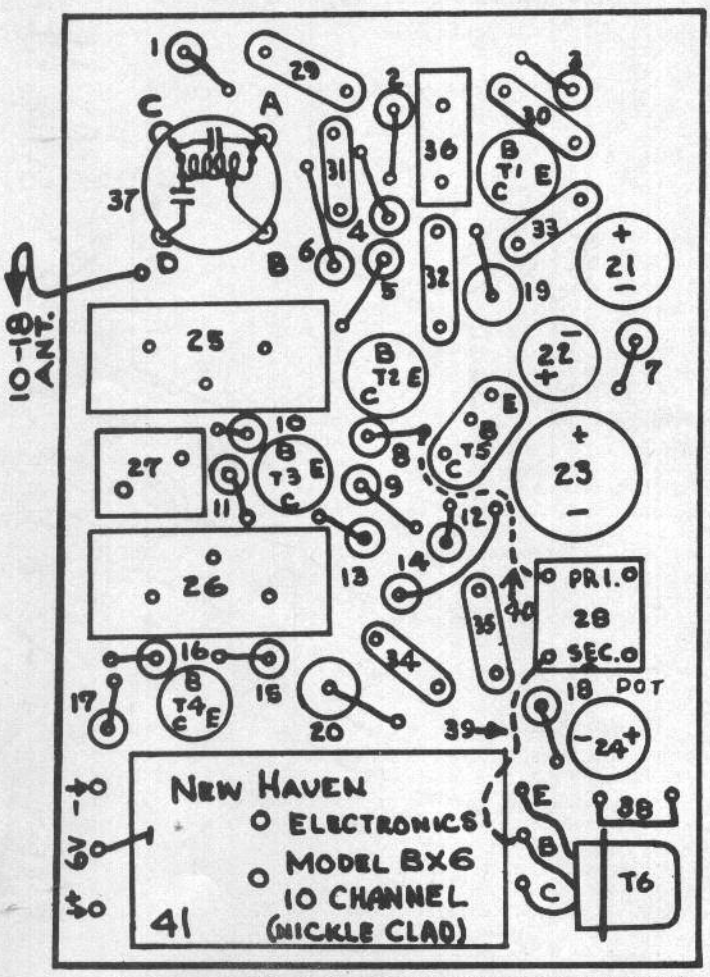
PARTS LIST

(resistors in Ohms and 1/4 W)

1)	510
2)	39K
3)	470
4-15-17)	1K
5-6-13)	4.7K
7)	100
8)	33K
9)	680
10)	2.7K
11)	390
12)	3.3K
14)	1N64, mounted with bar end up on board
16)	5.6K
18)	9.1K
19)	10 uh RFC
20)	1.5 Mhy RFC, Miller
21-22)	25 mf, PI, 6 volt
23)	70 mf, PI, 6 volt
24)	3 mf, 50 volt
25-26)	Clevite, "Transfilter" TO-O1A
27)	TF-O1A (T1 to T4) 2N588 (T5) 2N213A (T6) 2N224
28)	20K to 1K transformer
29)	100 pf
30-33)	10 pf
31)	.002 mf
32)	22 pf
34)	50 pf
35)	.05 mfd, 1/2 dia.
36)	Transistor socket to hold crystal
37)	CTC-SPC2-D-4L, 1/4". AtoB 4-1/4 turns, BtoC 10-1/2T, 27 en. wire. Add 10 pf AtoC, .001 mf DtoC.
38)	Jumper wire
39-40)	Transformer leads (insulate)
41)	New Haven Reed relay, 235-475 CPS (Nickle clad) .010 thick reeds, fasten to PC board with Pliobond

Selectivity is a total of 5 KC wide at 6 db down on selectivity skirt, with a total of about 2.5 KC width at the peak which is slightly round, giving an excellent shape for true selectivity. This fact is brought out by being able to run the receiver at less than one microvolt and not be troubled by electrical noise, such as poor bonding or servo noise. This is due to a much narrower bandwidth giving a better noise figure.

With values as shown, sensitivity has been adjusted to run between 1 to 1.5 micro volts on all units, which is adequate when used with at least an 18 inch antenna.



PARTS LOCATION, SCALE X2, TOP VIEW

SOLID-STATE I.F. RECEIVER

Weight of completed unit will be 1.78 oz. with case about 2.9 oz. or less. Sie 2-9/16 x 1-11/16 x 1-1/16".

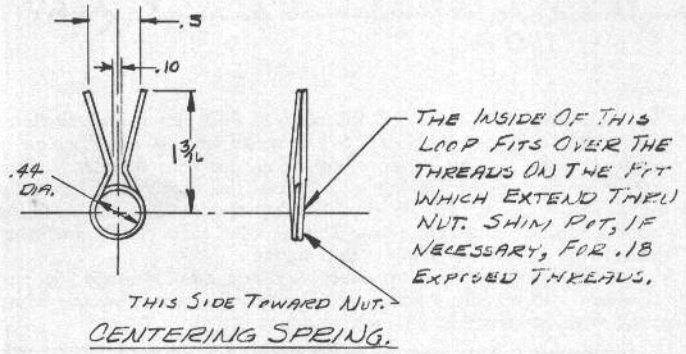
The chassis consists of two "U" shaped pieces with the cover overlapping on the outside of all edges of the bottom half. The printed circuit board is floating on a 3/16 inch piece of ART FOAM rubber, which pushes the board against four dimples formed in bottom chassis. This allows much flexing and many dents in the case before any damage is incurred to the components.

The cover is secured by two spade bolts fastened to the sides of bottom chassis which pass through the cover. One of these bolts will be used to hold a cable clamp for strain relief of your receiver leads.

Construction is as simple as consulting parts lay-out and inserting components in their proper location as marked or noted in parts listing. Part numbers correspond to location numbers. Observe marked polarities and use insulation on numbers 39 and 40. T6 does lay on its side and needs no fastening to hold it. Capacitors used measured about 1/4" dia, except the .05 MFD which is 1/2" dia. The crystal is mounted in a transistor socket. Fasten foam rubber inside cover to hold crystal in place, if desired.

DUAL PROPORTIONAL CONTROL STICK

By JOHN W. RAWLINGS



CENTERING SPRING.

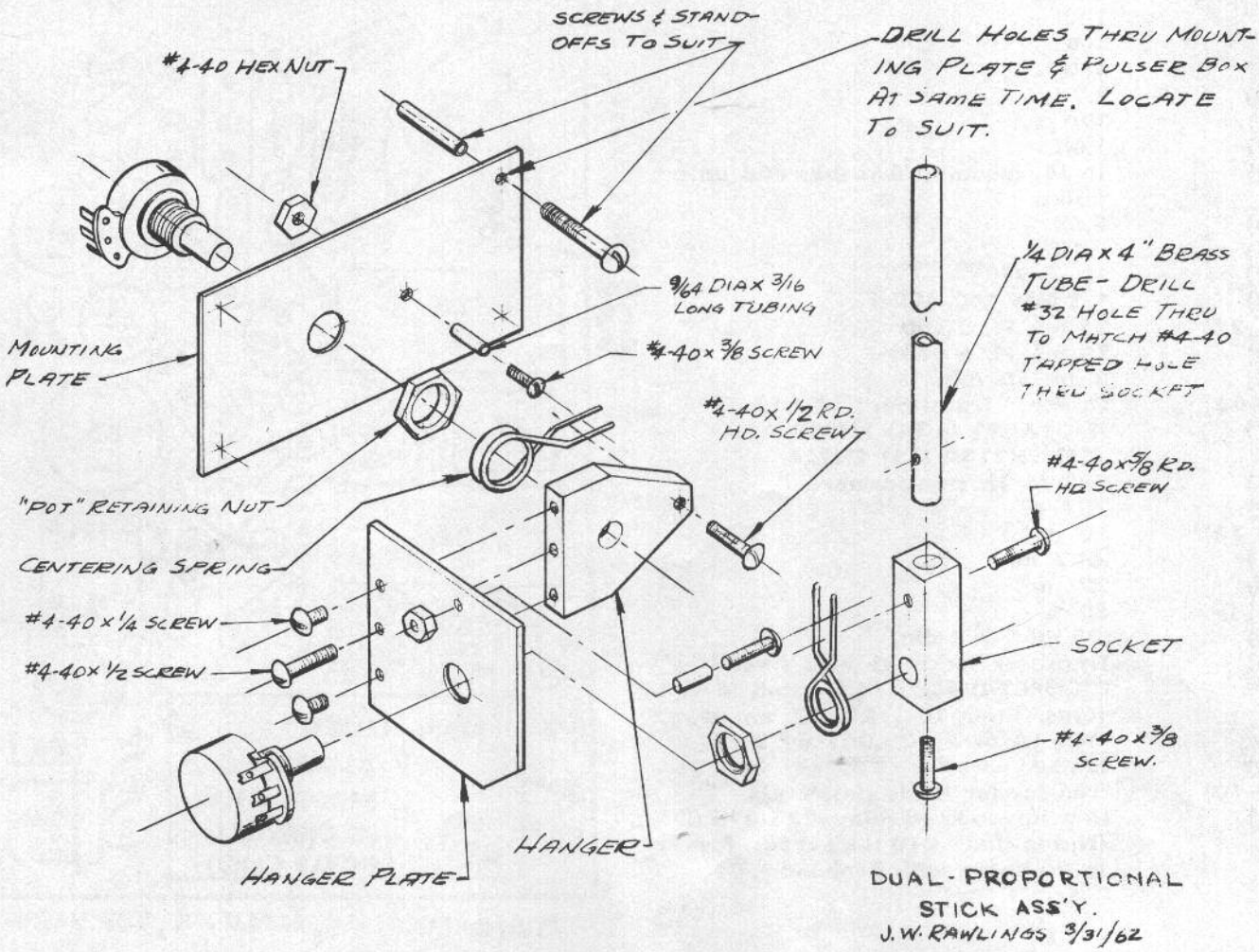
THE FOLLOWING DETAIL DRAWINGS and assembly give all necessary data for building a versatile control stick. A unit like this has been applied to the TTPW, Marcy Twin, and Kraft single-channel used as rudder-only and Galloping Ghost, and experiments are underway to adapt it to reed systems using rotary switches instead of potentiameters.

The centering springs furnish a good safety feature in that, if you get confused in the air (what expert will say that this never has happened to him!), releasing the stick will turn the airplane over to its inherent flight characteristics.

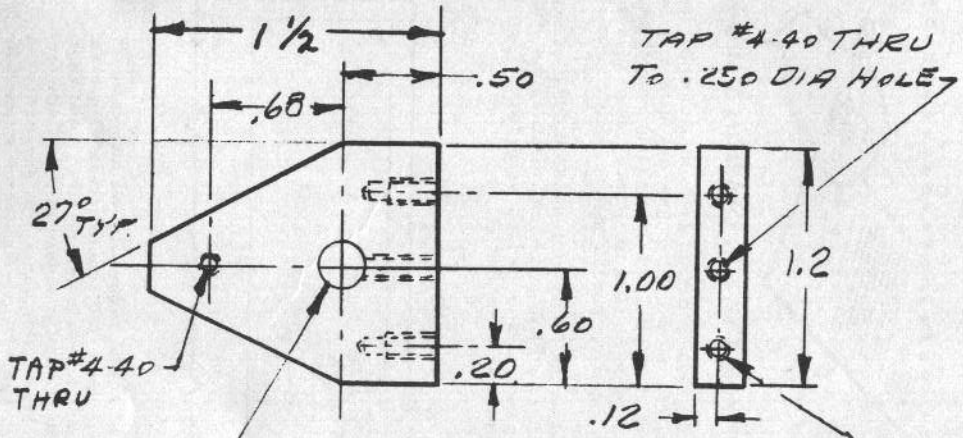
The actual attachment of the control stick assembly to the pulser box is not shown because, as pointed out, the versatility of the unit leaves this to the individual. However, it is suggested that the unit be suspended from the box using stand-offs and screws. Small pieces of aluminum angle may be used but I found that a more rigid mounting is necessary than this during the rigors of aerobatic flying.

Mounting the unit so that the rudder-control motion parallels the mounting plate is the way in which I have assembled mine but mounting it so that the mounting plate parallels the elevator control motion will produce equally favorable results. The determining factor is the space allocation inside the box.

The stick will give you the feel of the airplane. If you are looking for a little encouragement to get into proportional control or have misgivings as to whether you can handle it, your troubles are over.



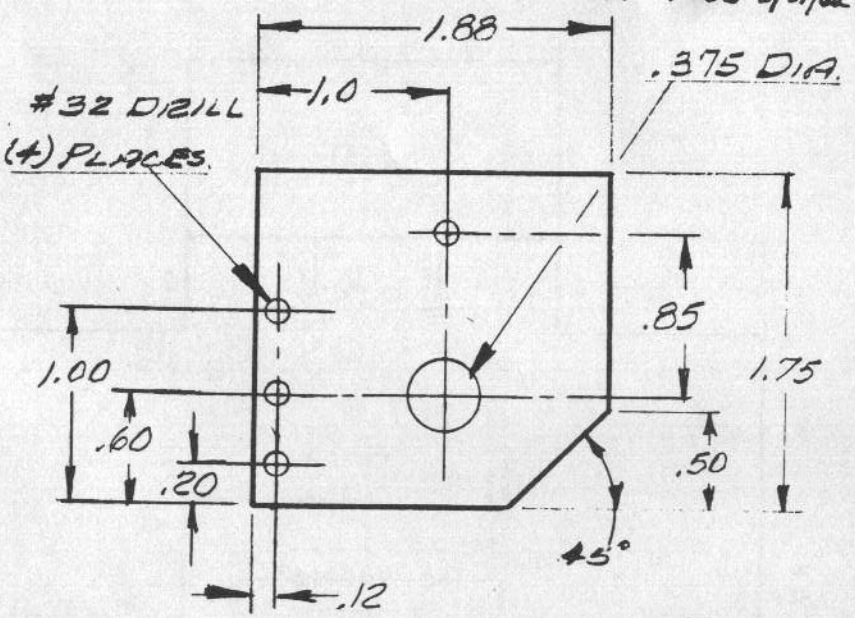
DUAL-PROPORTIONAL STICK ASS'Y.
J.W. RAWLINGS 3/31/62



HANGER.

MAT'L. 1/4 ALUM PLATE

J. W. RAWLINGS 3/31/62

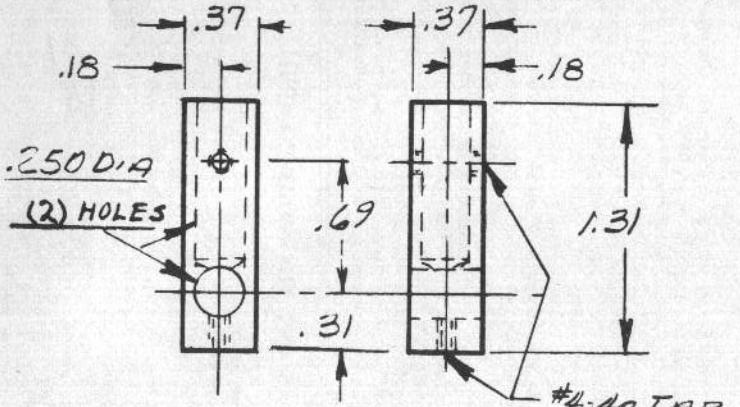


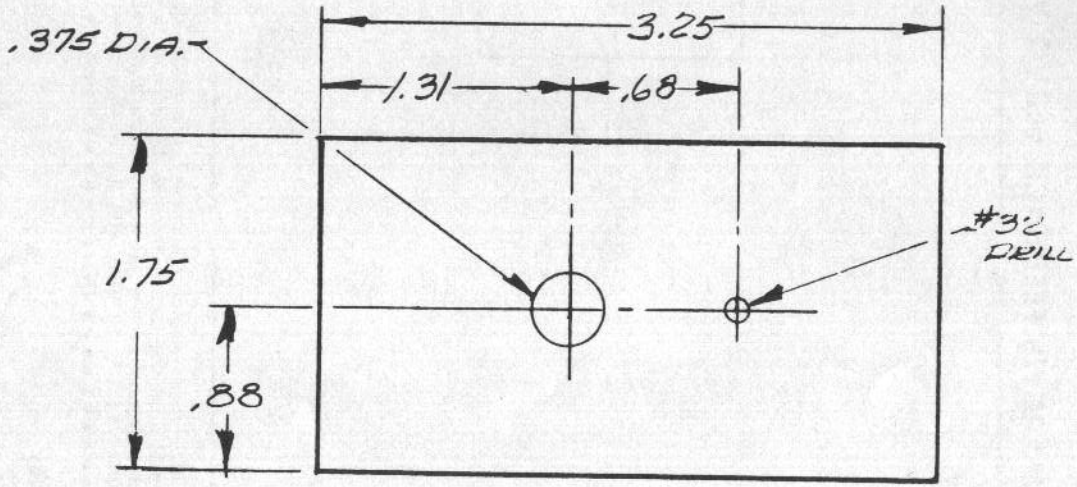
HANGER PLATE.

MAT'L. .063 ALUM SHEET.

SOCKET

MAT'L. 3/8" SQ. ALUM.

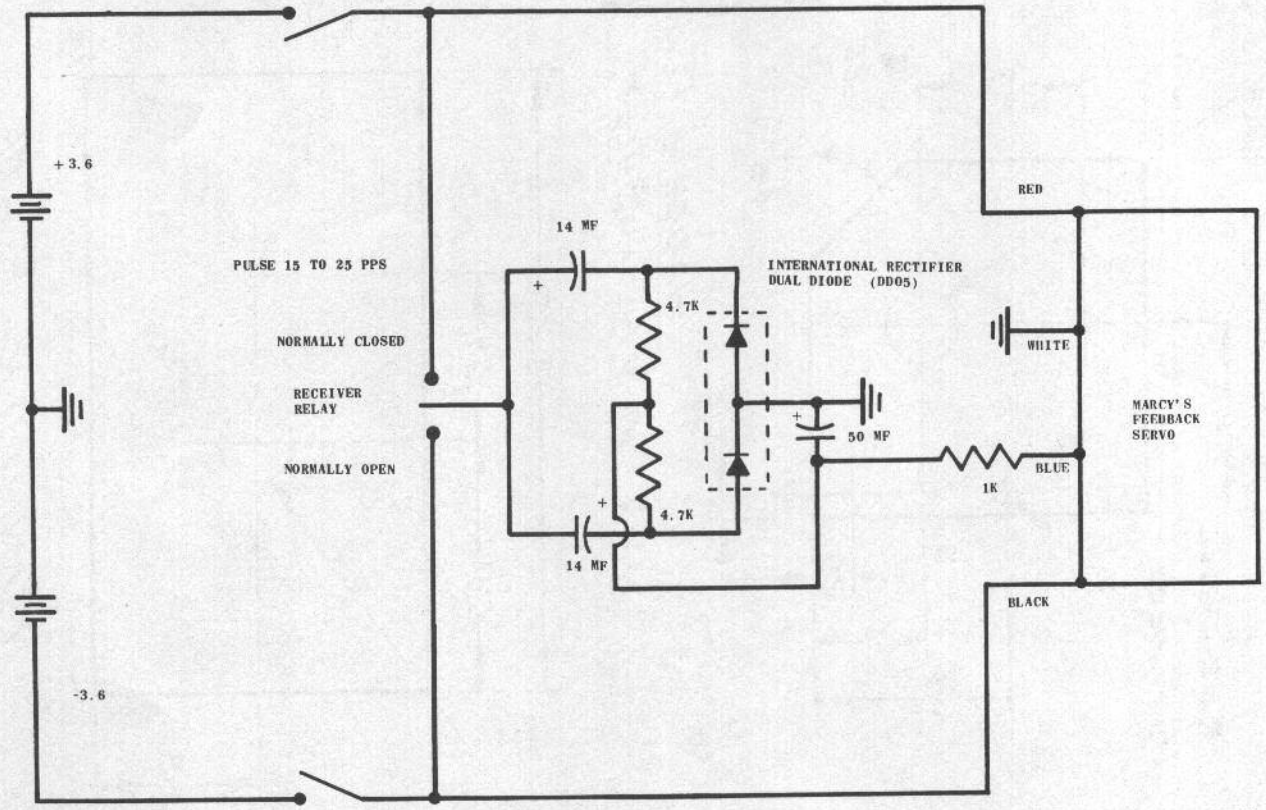




MOUNTING PLATE

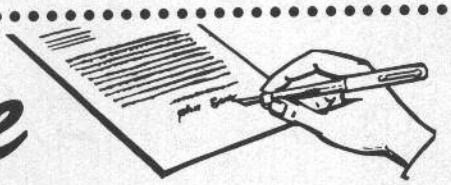
MAT'L. .063 ALUM SHEET.

USING MARCY'S FEEDBACK SERVO WITH RELAY



With the appearance of Marcy Inkmann's proportional feedback servo, (it should hit the market by the time this appears in print) a great deal of interest has been shown and questions have been raised as to how this unit may be used with Rudder-Only systems with relay type of receivers. Grid Leaks got in touch with Marcy, and show below his circuit. This will give true proportional rudder with no flutter and will draw current only when the surface is moved in one direction or the other.

Readers Write



SIMPLE PC BOARDS FAST—NO PHOTOGRAPHY

With the many PC designs coming almost every month, here is a method for the experimenters that gives you a single board or two, in about 1½ hours assuming you have a full-size layout of the base.

1. Tape board to *back* of layout with masking tape. Observe against strong light that the board is in proper position to layout.
2. Punch the copper through the paper by placing the board on a flat smooth block of wood and using a needle point punch. Tap lightly. Mark every hole and corners, if necessary.
3. Remove board from back of layout and, using layout as guide and punch marks on board, lay out circuit with 1/16 or 3/32 in. resist tape. (Tape can be moved if necessary.)
4. "Island" and holes can be outlined with a ball-point tube of liquid resist or dots of the resist type. Make sure tape is pressed firmly.
5. Etch in a tank made out of a quart or ½-gallon milk carton (wax type) which has been cut off.
6. When etched, wash and drill out punch marks after cleaning off tape and resist with lacquer thinner.—Bob Gaede, Md.

IDEAS ON THE WAG/CAMPBELL PC BOARD

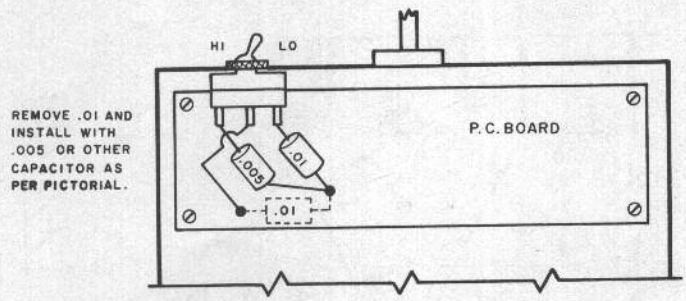
The only real pesky soldering job is the 25 tube connections at the bottom of the board. Now, if you look close, 12 of these are double. Drill all 25 out 1/16 inch and put in 25 flea clips and jumper doubles on top. The flea clips are carefully soldered to the rest of the PC connections. This eliminates bending tube leads 90 degrees, a potential source of failures; also makes tubes removable for trouble shooting—tube pins can be clipped on to at *top* of board on other end of flea clips. Also, the tubes can "give" slightly in crashes.

For newcomers to the WAG: One tip—don't pad tubes with sponge rubber. Use plastic foam *only*. The rubber (some kinds) is conductive in the high meg range and will throw circuits off, also rubber and sulphur can tarnish relay contacts.—Bob Gaede, Md.

CHANGING CPS OF KRAFT TX FOR OTARION & MIN-X

Here is a little change I made in a Kraft single transmitter for the local R/C club. This, of course, is nothing new, but there may be some R/Cers who can use the idea. To get better range on high-tone receivers (600 to 800 cps such as Minx or Otarion), and still have good range on a Kraft Receiver, I made the following change to incorporate both high and low tones:

Remove the .01 that is on the PC board in the Kraft audio section, and install it on one side of a DPST switch, and a .005 on the other side. The center of the switch goes to the land which formerly terminated the .01.—J. I. Kinnaman, Baker, Ore.



OUR COVER

Rogers L. Barton of Austin, Texas, with his own designed Zim II. Has 28-inch span, 140 square inches wing area, weighs 8½ ounces. F & M Relayless receiver, 2 E91 Energizer batteries. Mr. Barton is Industrial Arts Consultant for the State of Texas. This photo was snapped by a Grid Leaks photographer, when Mr. Barton stopped by the home of GL.

What's New?

THIS IS HOT!

G & P ALL PURPOSE ADHESIVE

The nation's finest quality - dries fast, spreads easily and clean. Dries transparent and waterproof, when dry. The film of the adhesive is so soft that it can be sewn through. America's finest Gimp Adhesive.

1¼ oz. Plastic Refillable Bottles	.33 each	Packed 48 to Display Carton
4 oz. Plastic Refillable Bottles	.59	" 24 to Display Carton

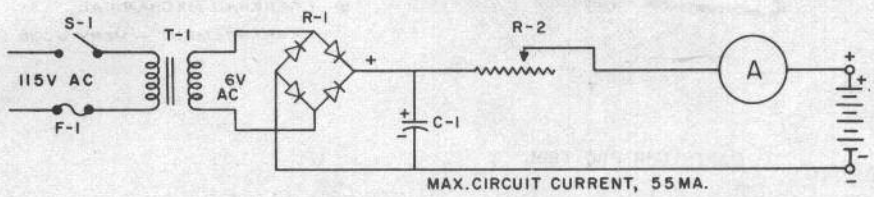
A Poly-Vinyl-Latex White Glue. The only one with Latex to make it resilient and practically waterproof. Withstands over 140 hours of soaking with no noticeable deterioration. It is not soluble in any known solvent -- acids, bases, or fuels. Withstands temperatures up to 650 degrees. Original glue used by major phone directories to hold cover on. NOW avaiable for the modeller! An Acryjel package.

NICAD CHARGER PARTS or PACKAGE

It is a well known fact that nicads of all types must be charged with a pure DC, filtered, and at low rates --especially on the ones used in aircraft. To help R/Cer's do this economically, Ace R/C has located a source of supply of transformers, silicon rectifiers, UL approved line cords, binding posts, electrolytics--just about everything you need to make the charger as it was recommended by ABC Battery Company.

	VO-180	VO-250	VO-500
CAPACITY	180mah	250mah	500mah
CELL VOLTAGE (nominal)	1.2V	1.2V	1.2V
CHARGING CURRENT(I_c)	3-15ma	5-25ma	10-40ma
CHARGE TIME	$275/I_c$	$375/I_c$	$750/I_c$
RECOMMENDED CHARGE RATE AND TIME	15ma for 18hours	20ma for 19hours	35ma for 21hours
TRICKLE CHARGE RATE	1-3ma	2-5ma	5-10ma

CHARGER SCHEMATIC



MAX.CIRCUIT CURRENT, 55MA.

S1--SPST Switch
F1--1/8 amp fuse
R1--Four silicon diodes
R2--1,000 ohm 5 Watt Wire Wound
T1--Filament transformer
A --0-50 ma may be used here.

NICAD PACKAGE--contains transformer, line cord, electrolytic, 4 silicon top rated rectifiers, line cord UL approved, binding post mounted on nylon -- all parts except for case, switch, fuse, and pot. A charger can be assembled just as simply or as fancy as you desire. Package, only $3.75

Or buy the parts separately:

UL approved Line Cord		.30
Binding posts (pair-one red one black)		.30
120 MF, 35 volt electrolytic		.45
Silicone rectifiers (four needed)	each	.50
Filament transformer		1.19

CLOSE OUT SPECIALS

ABC announces the closeout of the VO180 also the VO1. At the special price, these will not last long. Brand New, with original instructions. NOTE: Dealer discount does not apply for this close out. First come, first served.

VO180 ma $1.25 VO1 amp $3.25

SELECTED RF TRANSISTOR

The Philco T6058 is used in both the K3VK and Superhet, but grading is done differently. In ordering, order LOW voltage version for 3 volt jobs, and the HIGH for 6 volt.

T6058 (specify) $1.90

SPECIAL POTS AGAIN!

The 60 to 90 degree pots just had to put into our line again. You just wouldn't let us keep them out. So based on your requests here are the two most requested.

Ace 60 degree 1 meg $2.50
Ace 60 degree 3K 2.50

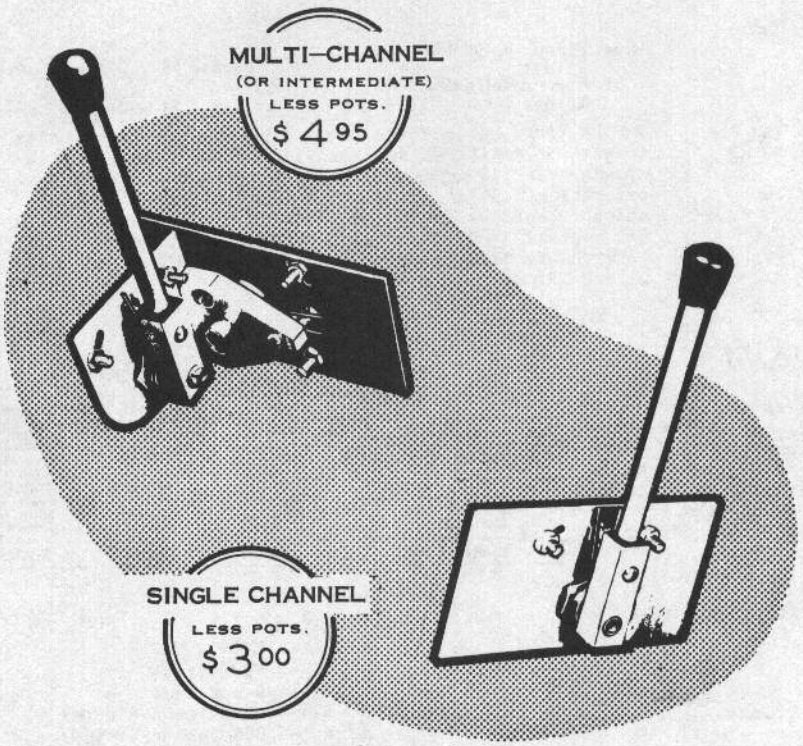
Policy Statement

Ace R/C reserves the right to change specifications, design or prices at any time without notice and without incurring obligation.

PRO-TROL

PROPORTIONAL RADIO–CONTROL HARDWARE

(ALL PARTS COMPLETE FOR ASSEMBLY)



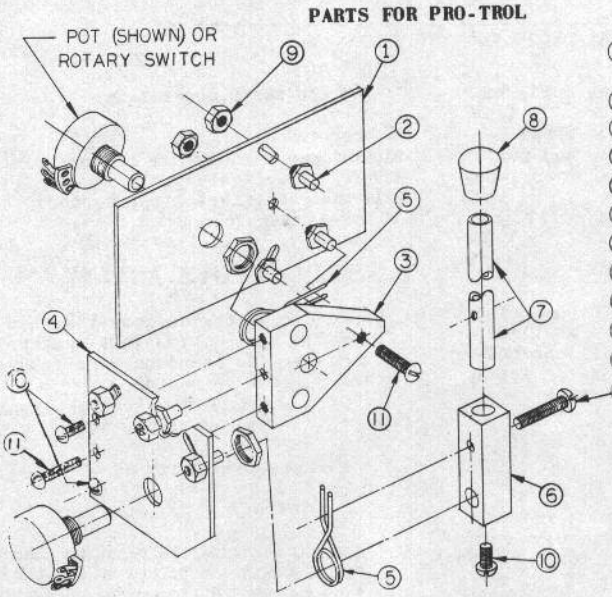
FEATURES

- CONTROL PRINCIPLE SAME AS PROTOTYPE AIRCRAFT
- ADJUSTABLE LIMIT STOPS
- SELF–NEUTRALIZING
- ALL PARTS MACHINED
- ALSO ADAPTABLE TO REED SYSTEMS.
- PRO–TROL WHEN ADDED TO ANY PROPORTIONAL PULSER WILL GIVE THE ULTIMATE IN CONTROLIBILITY

DR. W. A. GOOD SAYS

- SPRING TENSION AND FEEL – JUST RIGHT
- ADJUSTABLE STOPS – GOOD
- GENERAL MECHANICAL ARRANGEMENT – VERY GOOD

PARTS FOR PRO-TROL



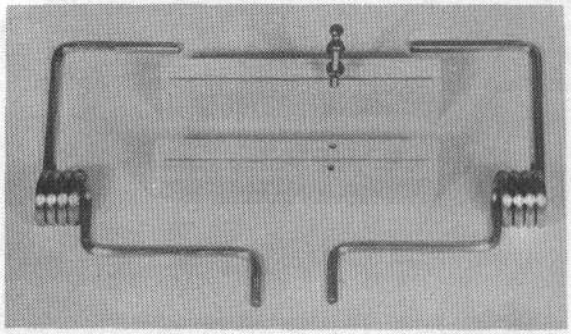
① MOUNTING PLATE (DOUBLE SHOWN)		
② STOP PIN	.25*	.25*
③ HANGER		
④ SECONDARY PLATE		
⑤ CENTERING SPRING	.40*	
⑥ STICK SOCKET	.75*	
⑦ STICK	.50*	
⑧ KNOB	.10*	
⑨ HEX NUTS		
⑩ 1/4" LONG SCREW		
⑪ 1/2" LONG SCREW		
⑫ 5/8" LONG SCREW		

*In stock at Ace R/C, Inc.

MANUFACTURED BY

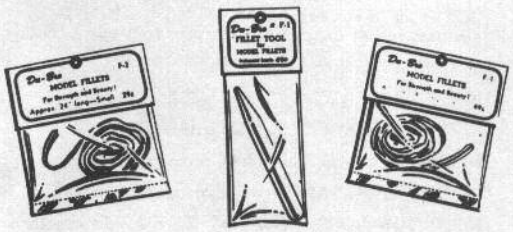
HOBBY HAVEN

BLACKWELL COIL GEAR



From Blackwell Manufacturing comes word of a coil landing gear kit. This will be ready to release in July. Kit contains all of the material shown in the photo, steel mounting plate, mahogany mount blocks and wheel eyelets and nuts and bolts as well as 2 coiled gears. Wheels not included. Order BLG#1 only $2.95.

DuBro FILLET MATERIAL

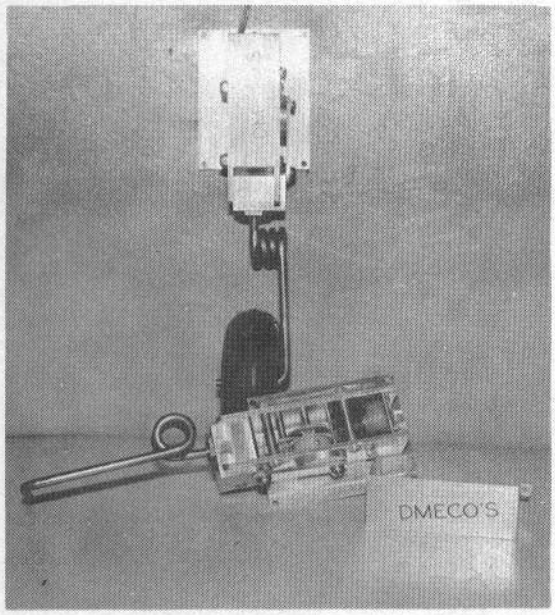


From DuBro Products comes word that their fillet material is finding increasing use by the R/C gang. May be used at stress points as well as smoothing the joints between wing and fuselage, tail to rudder, and firewall to the body. May also be used on all parts of boat hulls for strength and waterproofing. It is applied with either airplane or white glue. A more professional application can be had with the use of the DuBro Fillet Tool.

F2 Model Fillets, small, 24" long, only 29¢
F4 Model Fillets, large, 24" long, oonly 49¢

F1 Fillet tool, made of aluminum, only 49¢

dMECO RETRACT GEAR



dmeco proudly announces that they have completed development of a quality retractrable landing gear to be known as the "Retract-Gear" and is scheduled for production for the winter of 1962.

Pappy says this is not a toy or a gadget, but would easily pass A-N specs.

The "Retract-Gear" is a compact universal unit which is simply bolted to the model much as an engine would be. It is completely self-contained and requires nothing but the wiring, to the power to operate it. It is a unit that may be used as a steerable nose gear on trike or as the main gear on trike, or on two wheel, it is feasible to duplicate any sort of retraction action with it.

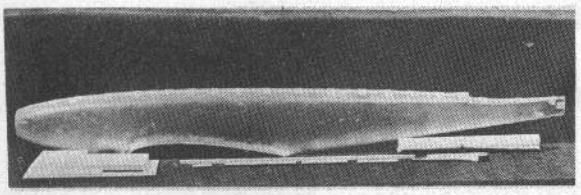
Tests have provent it to be extremely reliable in action. A 20% increasein in flying speed, and close to a 50% increase in overall performance can be expected!

The "Retract-Gear" is electric motor operated and requires from 3 to 5 volts. A single or SPST switch operated by a servo already in use will actuate any number of gears. The size of the unit is 1" x 2" x 3 5/8", Weight is 3½ ounces.

The "Retract-Gear" is planned for production, for the Winter of 1962. But realizing some will want evaluation this season, a limited number of units will be made. These units on a first come first served basis will be from the factory ONLY around July 15.

The price will be $24.95. Rembmer the protos will be available ONLY from The dr Bolt Model Engineering Co., 3833 Harlem Road. Buffalo 15, New York.

ORION TYPE MULTI CHANNEL AIRCRAFT FIBREGLASS FUSELAGE KIT



It had to come! a molded fibreglass polyester resin fuselage. Simply tape the two halves together--precision moulded, about a 30 minute job.

Kit includes fibreglass tape motor mount, dowels, bulk heads, servo mount and instructions for easy assembly.

Produced by that well known R/Cer, Dwight Hartman, of Argenta, Illinois. May be used with a Top Flite Orion Wing Kit, with almost no changes.

Weight of fuselage is 12 ounces. Price is $18.95.

PC ETCHANT IN LARGER SIZES

Many of you have requested larger sizes of the PC Etchant as used in our printed circuit kit, and also sold in 4 ounce size. We contacted Acryjel, and are happy to announce we will be able to meet the requests for larger sizes at very reasonable prices This is liquid Ferric Chloride and comes to you in an unbreakable container.

FC8 8 ounces Ferric Chloride	.85
FC16, 16 ounces Ferric Chloride	$1.45

MEDCO POWER PACK KIT

From Medco comes word of a Power Pack Kit for use with your existing Nicad batteries. It houses 5 nickel cadmium cells, and is constructed of black high impact plastic which will withstand tremendous punishment without damage. There is also room to house your power converter. Makes a terrific installation unit for your plane. Complete with plug and socket. KM5 Kit measures 1 5/8 inch in diameter and 2 3/4 inches long; when using power converter housing it measures an additional 1 inch long.

MEDCO Power Pack Kit KM5 $4.95

CLEVITE TRANSFILTERS

By Request! We are again stocking the Clevite solid state Transfilters. Check below for specs. For TF series price is $1.15. The TO series $1.25.

The Clevite Transfilter TF-01 is a time and temperature stable piezoelectric unit that can replace an emitter by-pass capacitor. It improves selectivity and long range reliability, and simplifies circuit alignment procedure. It is easily attached to other circuit components and can be mounted by automatic assembly techniques.

FREQUENCY: Resonant, 455 KC ± 2 KC
BANDWIDTH: 4 to 7% at 6 db

Clevite Type TO Transfilter is a ceramic filter with impedance matching characteristics. This piezoelectric disk vibrates at the first overtone of its fundamental radial mode. It forms a four-terminal network with a high impedance and a low impedance pair of electrodes. With appropriate circuit design, the "Overtone" Transfilter can replace transformer, inductive and capacitive elements used in conventional frequency selective circuits.

SPECIFICATIONS TO-01A

FREQUENCY: at resonance 455 KC ±2 KC (measured at output with input open-circuited)

BANDWIDTH: 4 to 7% at 6 db

INPUT CAPACITY: ≥ 180 uufd.

OUTPUT CAPACITY: ≥ 800 uufd.

INPUT IMPEDANCE: 2000 ohms nominal

OUTPUT IMPEDANCE: 300 ohms nominal

INSERTION LOSS (Power): @ 455 KC 2 db maximum

FREQUENCY STABILITY:
Time within 0.2% for 10 years
Temperature ±0.1% −20° C to + 60° C

Model TO-02 is especially useful in circuits using higher impedance Drift Transistors.

SPECIFICATIONS TO-02A

FREQUENCY: at antiresonance 457 KC ± 1 KC (measured at output with input open-circuited)

BANDWIDTH: 1 to 4% at 6 db (Function of loading)

INPUT CAPACITY: 480 uufd +20 −10%

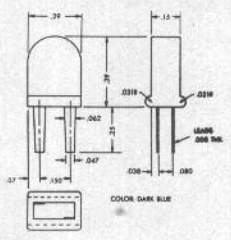
OUTPUT CAPACITY: 2650 uufd +20 −10%

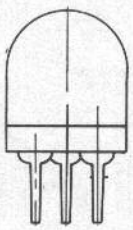
INPUT IMPEDANCE: Min. 3.9 K, Max. 15 K

OUTPUT IMPEDANCE: Min. 680 Ω, Max. 3 K

INSERTION LOSS (Power): at antiresonance 3 db maximum

FREQUENCY STABILITY:
Time within 0.2% for 10 years
Temperature ±0.1% −20° C to +60° C





ACTUAL SIZE TF-01 TO-01 TO-02

GRID LEAKS AT PLAY

Dear GL Reader:

For the second time in recent months, these notes are being written on a jet. The date: May 20, 1962. The place: United Air Lines DC8 enroute from Washington, D.C. to Higginsville, Missouri. The occasion: Trip to New York and the DC/RC Symposium in Washington.

Bobbie and I have a solid sense of accomplishment. The trip was stimulating, rewarding, and worth-while from many standpoints. Tiring, too!

First we'll cover some of the highlights of the Symposium. Attendance and interest were high. Papers presented covered a variety of subjects. Flying demonstrations on Saturday proved the worth of some of the papers presented. We had to leave before the flying demonstrations held Sunday.

If we were to summarize the highlights of the papers, the following two would rank uppermost in our mind:

1. Proportional is on the upsurge. This was borne out by new systems, new techniques, new equipment, all of which was ably demonstrated by flying.

2. The wide spread confusion that exists about R/C rules must be clarified. The technical double talk which allows so many different interpretations because the meaning of the words is not clear; MUST be clarified.

Class I, for instance, allows itself to a variety of interpretations. Is it rudder only with optional motor, regardless how it is achieved? Is it single channel radio with only one tone applied or what? In England Class I means one movable surface with motor control required! There is little here to confuse CD'S and Judges!

Class II almost defies description. It can be interpreted in so many ways by so different people - and it is!

Highlights of the evening was the banquet with an outstanding program of a History of Aviation by Dr. Paul Garber of the Smithsonian. Illustrated by slides, Dr. Garber traced flight from earliest recorded history to Capt. John Glenn's orbital flight. Amazing was Dr. Garber's reeling off of dates and places in the talk with no notes.

All in all a very rewarding day. The DC/RC is to be commended for the fifth symposium. While we'd like to mention the name of all who had a part in the affair, this would be impossible. So Grid Leaks doffs its editorial hat to Sam Mohr, Chairman and Bill Nesbitt, President of the DC/RC and to the unnamed members.

Earlier in New York, our main objective was to confer with Bill Winter, Grid Leaks' editorial consultant, and Wittich Holloway, art consultant.

In general, areas of agreement were reached as to policies of the new Grid Leaks. To mention a few: The concept of an R/C Data Service will be kept initially; for the time being it will remain bi-monthly and the price will be maintained for the next few issues; editorial policy will be largely the same, but, broadened to cover a wider area of interest; new subscribers will be actively sought; present style is to be cleaned up and more.

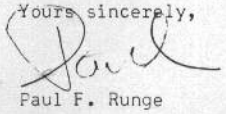
With Bill assuming more of an active editor's role, Bobbie and I, while we will be active in policy decisions, will retire to the background. From where we sit, we feel this will be of vital importance to you since it will result in a much more worth-while publication.

Grid Leaks will retain a family type homey style of the house organ variety and will not, for the time being, accept advertising. We know you'll like the new Grid Leaks. Your comments and suggestions will be welcomed.

While in New York we had the chance for a nice personal chat with Walt Schroeder of MODEL AIRPLANE NEWS, but time limited us to a phone call to Al Lewis of AMERICAN MODELER.

The "Fasten your Seat Belts" sign has just come on. So it is time, literally, to come down out of the clouds and get back to the routine of a regular work day. See you next issue.

Yours sincerely,



Paul F. Runge

Ace R/C, Inc.
BOX 301
HIGGINSVILLE, MISSOURI

GRID LEAKS

IN THIS ISSUE

VOLUME III, NUMBER 9 -- JULY-AUGUST, 1962

TO

C. A. DEES, JR.
4002 MONITOR DRIVE
HAMPTON, VIRGINIA