MULTI INSTALLATIONS SIMPLIFIED!

SEE PAGE 6

MARCH
APRIL • 1963

GRID LEAKS

R/C
DATA
SERVICE

VOLUME 4 • NUMBER 2 • THIRTY-FIVE CENTS

SPECIAL!

Transmitter and receiver details complete the coverage of Marcy's sensational PRM-1 System with proportional rudder, plus positionable engine control—no rudder waggling!

Credit: The Evening Bulletin, Philadelphia

GREASING ON A LANDING IS MULTI FLIER DAN McCLAIN, PRESIDENT OF THE VALLEY FORGE (PENN.) SIGNAL SEEKERS.

A Radio Control Publication for Beginner & Advanced Modeler

GRID LEAKS SPECIAL REPORT

TROUBLE AHEAD FOR R/C? — A WARNING — AND A PLAN — HOW YOU CAN HELP

QUITE A BIT OF FUROR was created by F.C.C. Docket No. 14843 of November 16, 1962. Primarily, the furor came from the Class D, or two-way voice communications operators, since it appears that this docket is aimed primarily at the hamming that has been going on on the two-way voice phone communication instead of the necessary and useful communications which this band was designed for. Obviously, the F.C.C. is making an attempt to have the two-way voice communications limited to what it really was designed for in the first place. It will definitely limit the two-way voice to much more restricted use than has been the case up to now.

While this might give us in Class C some cause for rejoicing, it actually points up several disturbing areas, since not in all instances are our own skirts clear.

One of the more alarming things that is being mentioned by S9 Magazine is the fact that now they propose to go on Part 15 and, since these regulations do not state anything about the transmitter or antenna--only the antenna length--they propose to put the transmitter just as high as you can get it, running a voice line from the modulator to the transmitter, and they hope to do hamming on the Part 15 now on the following frequencies: 26.995, 27.045, 27.095, 27.145, and 27.195! While there are other frequencies mentioned, they are of no immediate concern to us. But the others definitely are, since these are our Class C frequencies for superhet operation.

We wrote to Dean Detton of S9 Magazine, in whose column this material appeared and said that we felt Class C was also a part of Part 19, and that, by urging the use of our superhet frequencies, they were definitely rendering a disservice to other users of Part 19. We heard from Thomas S. Kneitel, editor of S9, with the following information:

"Our reason for suggesting that Class C channels was the result of a nationwide survey made by members of our staff. It was found that in the majority of areas the Class C channels (with the exception of 27.255 meg) were in varying states of disuse and very often were not used at all. It was then decided that to prevent Part 15 stations from wandering all over the place we would suggest they operate on the Class C channels, inasmuch as they lie fallow!"

The exclamation point at the conclusion of the foregoing paragraph is ours. We cannot help but wonder who was contacted in what areas to determine the apparent "disuse" of the Class C frequencies.

There are at this stage of the game, two very important points that we believe that you as an R/C'er, and all members of the R/C hobby, as either industry members or publishers of magazines, need to consider, and that is that for some reason Class C--radio control--is being regarded as a very lightly used or a very inconsequential part of Part 19.

We are wondering at this stage of the game whether the F.C.C. may not also be regarding Class C, or our phase of the Citizens Band, with the same eyes. There have been statements made in the past that R/C'ers have not filed their license applications as quickly as they should, and in some instances not at all. Of course, these claims have not been substantiated but they have been there, and how true they are we are not prepared to state.

It would appear to us that there are two very clear-cut courses of action that need to be taken by us as R/C'ers if we propose to keep our hobby as a hobby without being trampled on by hamming--and hamming on Part 15 is legitimate--and that is to make our numbers be known. There are several ways in which we can do this and do this effectively.

First, we must make doubly sure that every R/C'er and every potential R/C'er files Form 505 with the Federal Communications Commission. This form has been completely revised and is so much simplified over the old form that there is no longer any excuse to be found for not filing it. The next step that occurs is by write-in campaigns to help the magazines such as S9 augment their surveys to know that the frequencies mentioned foregoing are definitely being used. If editor Kneitel of S9 was to receive hundreds of letters from R/C'ers to the effect that these Class C frequencies were in use, and informing him of how much they were being used, it might help augment the "nationwide survey" that S9 conducted before they recommended that our Class C superhet frequencies be used for hamming on Part 15. Incidentally, S9's address is 300 W. 43rd. St., New York 36, N.Y.

It is only by sheer weight of numbers that we are going to be able to convince other users of the Citizens Band that Class C is a very vital part of the Citizens Band, and that it is entitled to as much interference-free operation as any other portion. We must maintain and make sure that all Class C stations operate legally, operate for the purposes that they are intended, and that every transmitter that we hope to use in the next five years will be registered with the F.C.C. on the new Form 505. Numbers is the only thing that is apparently going to pack any weight if we are ever going to get relief from the already congested spots that exist in our 27-meg area. We have had enough interference problems created by the Class D stations, to become considerably concerned over the proposed "whooping it up" on Part 15, particularly on our five lonely frequencies that are away from the garbage frequency of 27.255.

It is with this idea in mind that GRID LEAKS is attempting a crusade, following in the footsteps of the model magazines, who for years through their R/C editors have been mentioning the fact to get every R/C'er and every prospective R/C'er registered on Form 505.

If and when the F.C.C. ever reviews another petition and puts our hearings on another docket, we will be able to impress them to give us any consideration only if we have a very sizeable number of registered station licenses.

We think that there could be no finer resolution, that there could be no finer club program or project for all R/C clubs and groups, than to wage a substantial campaign to register as many Class C transmitters, and prospective users of Class C transmitters, with the F.C.C. during 1963.

We are rapidly reaching the point where no area in this country will be immune from interference of some type before long. We also may be reaching the point where our hobby, if we do not use care, will become a snarl and a delusion, and instead of attracting more people as it looks like it might, will before long be something people will begin to shy away from because of the intolerable interference problems.

It will do us no good to point our fingers of indignation at the Class D users of the Citizens Band, or the proposed use of Part 15 for hamming, unless our own R/C house is in order. For our house to be in order simply means that we must have as many of our transmitters completely registered with the F.C.C. and make every concerted effort to make all interested parties register. It does take time for an F.C.C. license to come through and there is a legitimate reason to have all of those who evince a mere interest to register, so that when their transmitters are built or they are purchased they will be able to operate as soon as that is accomplished.

Paul F. Runge, Publisher

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 6-issue volume. For subscriptions outside the United States, add $1.00 for postage.

New FCC Requirement for Station License is Much Simpler

FILLING OUT THE NEW FORM 505

NOTE: The reduced form shown here is the WORK SHEET portion attached to your form 505. To avoid mistakes, fill out this part first—complete. THE FORM YOU SEND IN MUST BE TYPEWRITTEN, WITH CARBONS ATTACHED.

Item 3a. Fill in your name. Individuals only as a rule will be applying for R/C licenses.

Item 3b. Your permanent mailing address.

Item 4. Put an X in the box marked Individual.

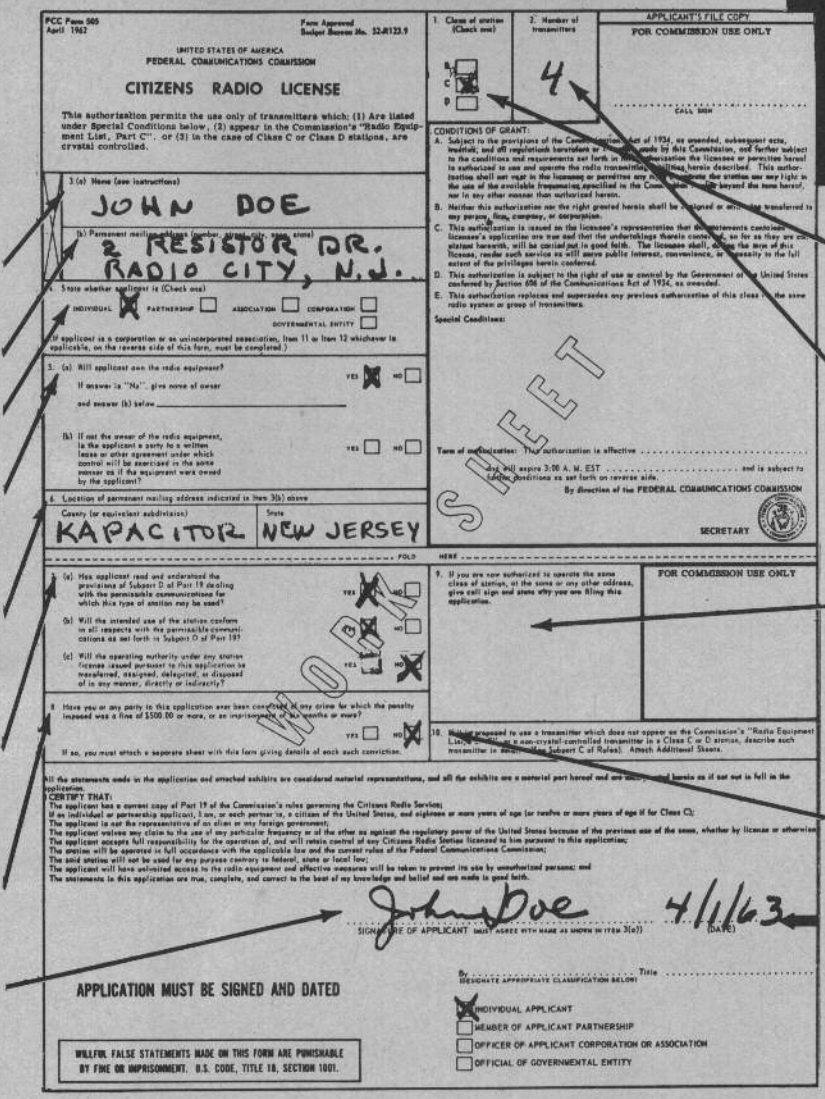
Item 5. Concerns ownership. In almost all cases user will be owner. So check A.

Item 6. Enter the name of the county and state of your permanent mailing address.

Item 7. (a) (b) Read carefully. You should be able to honestly fill in the word "YES". "NO" on (c).

Item 8. Concerns any conviction of crime. You'll have to answer this on your own!

Sign your name in the place called for, and date it, and check in the square below where it says "Individual Applicant."



Item 1. Fill portion marked Class C with an X.

Item 2. Number of Transmitters. Estimate the number of transmitters you will be using over the next five years. License issued will be good for five years from date of issuance.

Item 9. In case you are renewing your license, fill in this part and state "renewal of license expiring on .....(date)." (It would probably be helpful to list the call sign or file number of your previous license).

Item 10, does not require any action, since all R/C transmitters are crystal controlled.

THAT'S IT. NO NOTARY IS REQUIRED. SIMPLY PUT IT INTO A NUMBER 10 ENVELOPE AND ADDRESS TO: FEDERAL COMMUNICATIONS COMMISSION, GETTYSBURG, PENNSYLVANIA.

FORM 505 CAN BE OBTAINED FROM YOUR DISTRICT FEDERAL COMMUNICATIONS OFFICE (CHECK TELEPHONE BOOK UNDER U.S. GOVERNMENT) OR FEDERAL COMMUNICATIONS COMMISSION, GETTYSBURG, PA. OR FEDERAL COMMUNICATIONS COMMISSION OFFICE, WASHINGTON, D.C.

SINCE THE OPENING of the Citizens Band for Radio Control, the FCC has had three different kinds of forms to be filled out, along with a different type for renewal, in order for a person to obtain a station license.

It was in 1958 that the Form 505 appeared. This was a complicated snap-out carbon type of form, and the looks of it probably scared off many a would-be applicant.

The new 505, dated April 1962, while still a multi-paged carbon affair, is a considerably simplified job, and should do much to help beginners in R/C to start out legally by applying for a license in the Citizens Radio Service.

Make no mistake about it—that R/C transmitter, if it exceeds an input of 100 milliwatts; and most types do—DOES require a license. The license is quite easy to get, does not require an examination, and should be applied for by even those who just think they'd like to get into R/C soon.

The reason for the last statement is that even with a newer streamlined form and with electronic equipment installed at Gettysburg, Pa., the FCC licenses are still liable to be slow in coming. And eager as you might be to operate your new transmitter and fly your airplane, the Communications Act of 1934 PROVIDES SEVERE PENALTIES IF OPERATION IS DONE WITHOUT A LICENSE. Don't let the old tale of "low power" mislead you into punching that button on your new transmitter, unless you've gotten your Citizens Band License from the FCC. Your fun could be ruined before it gets off the ground.

Not only is the FCC interested in having you apply on form 505 for a license, but you'd be doing yourself and your fellow R/C hobbyists a favor too. The only way the FCC can be convinced that R/Cers are crowded on the spots we now have is if the FCC has proof in THEIR files that there is a large number of Class C users (R/C). The only way they'll have that proof is if all R/Cers and would be R/Cer's will file for their licenses. Then the petition that the Academy of Model Aeronautics advanced several years ago may stand a chance of bearing fruit.

As with the old 1958 Form 505, you are reqiured to read Part 19 of the FCC Rules and Regulations—and attest to the fact that you have done so. With the new 505, however, you are conveniently provided with an order form on the instruction sheet to the Government Printing Office, which will enter your subscription to Volume VI of the FCC Rules and Regulations, of which Part 19 are a part. For $1.25, this subscription sends you Volume VI and entitles you to the constant revisions that are made as they are released by the FCC so you can keep up to date. So if you don't have access to a copy at your public library, or a friend's copy of Part 19 of Volume VI, send for it. You must certify that you did read it, and under U.S. Code Title 18, Section 1001, you are reminded that false statements on this form are punishable by Fine or Imprisonment.

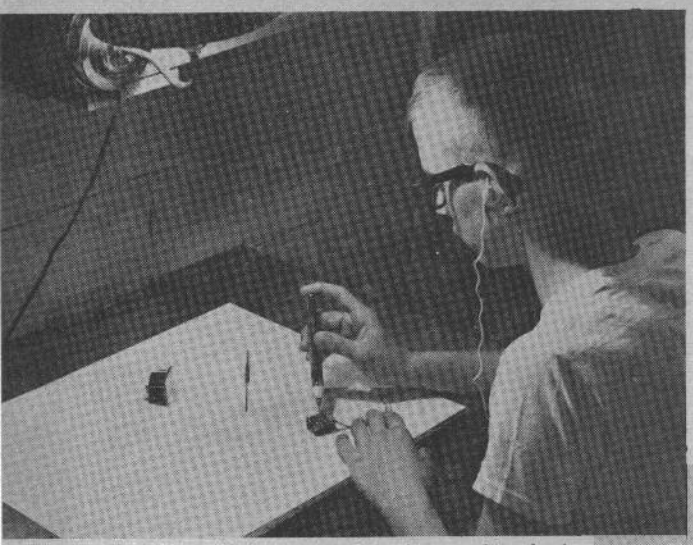
Any U.S. Citizen 12 years of age or older may file for a station license for Part C (R/C).

While the instruction sheet is quite adequate, it is intended to Cover classes B, C, and D. Since all we are concerned with for radio control is Class C, we'll try to sift through the information required on the 10 questions. You are provided a work sheet. Use this as a guide to fill in your first scribbles. When sure this is all correct, you transfer to the form which you send in.

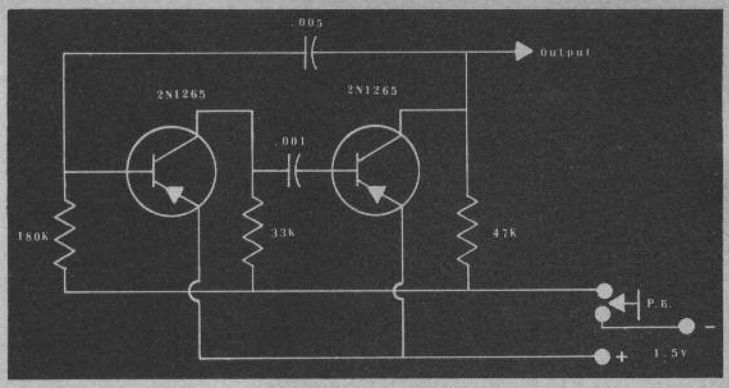
Mail it—and wait until you get it back ok-ed before you punch the button.

You'll get it back and you'll be given a call sign. According to Part 19 and according to some of the FCC boys we've checked with, this call should be posted on your transmitter, and the license should be in your pocket at all times you operate the transmitter.

So make it legal, you'll have fun, and the more licenses we get registered the sooner we may be able to get the FCC convinced we need some additional spots!

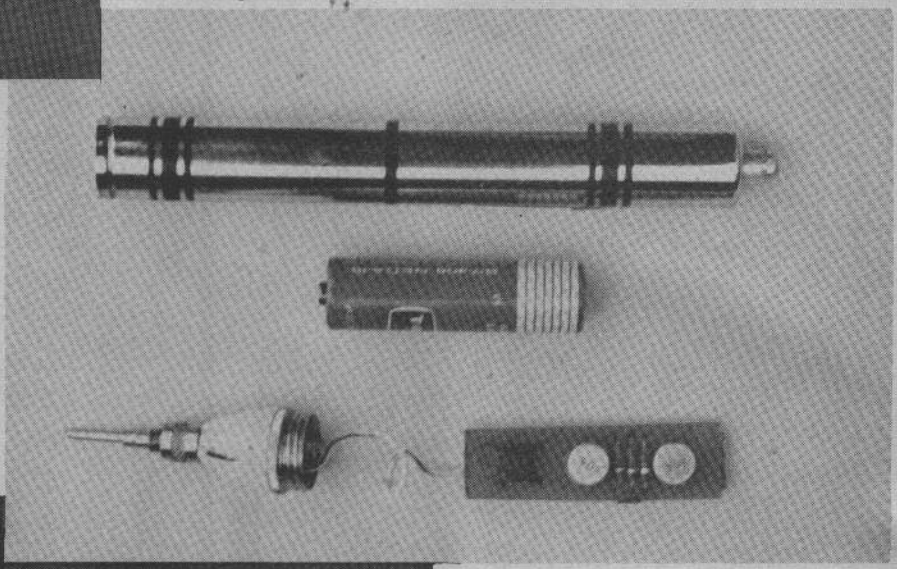


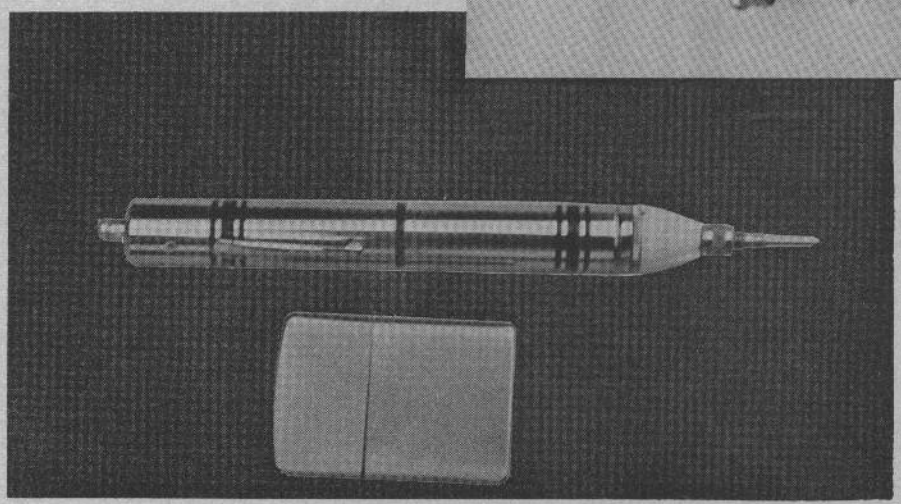
Tackling the last stage first, then working backwards into the receiver, the headset is listened to for the noise put out by the signal injector.



Compare the assembled components in this picture below with schematic. In the model shown, contact is made at the end of the PC board by switching arrangement.

Simple Signal Injector





This handy trouble-shooting tool housed in a small flashlight can be used with superregen detectors as well as with all audio stages.

Convenient to handle, the signal injector is about twice as long as a cigarette lighter. Essentially a multi-vibrator, it splatters a signal widely.

IF YOU HAVE EVER WANTED a signal generator or similar device which would provide you with a signal to help you trace down troubles in a receiver, this is for you. This pocket signal injector can be housed in a pencell flashlight of the two-cell variety very handily—requires a minimum number of parts, and yet provides a very potent signal source so that signals can be injected into a troublesome receiver which is not functioning correctly and provid a very loud audio source to help trace problems.

Essentially this is an audio multi-vibrator but, by its basic characteristics of constructions, the signal is such that it splatters widely over all useable frequencies, including RF on 27 megacycles. It can be successfully used with superregen detectors as well as with all audio stages.

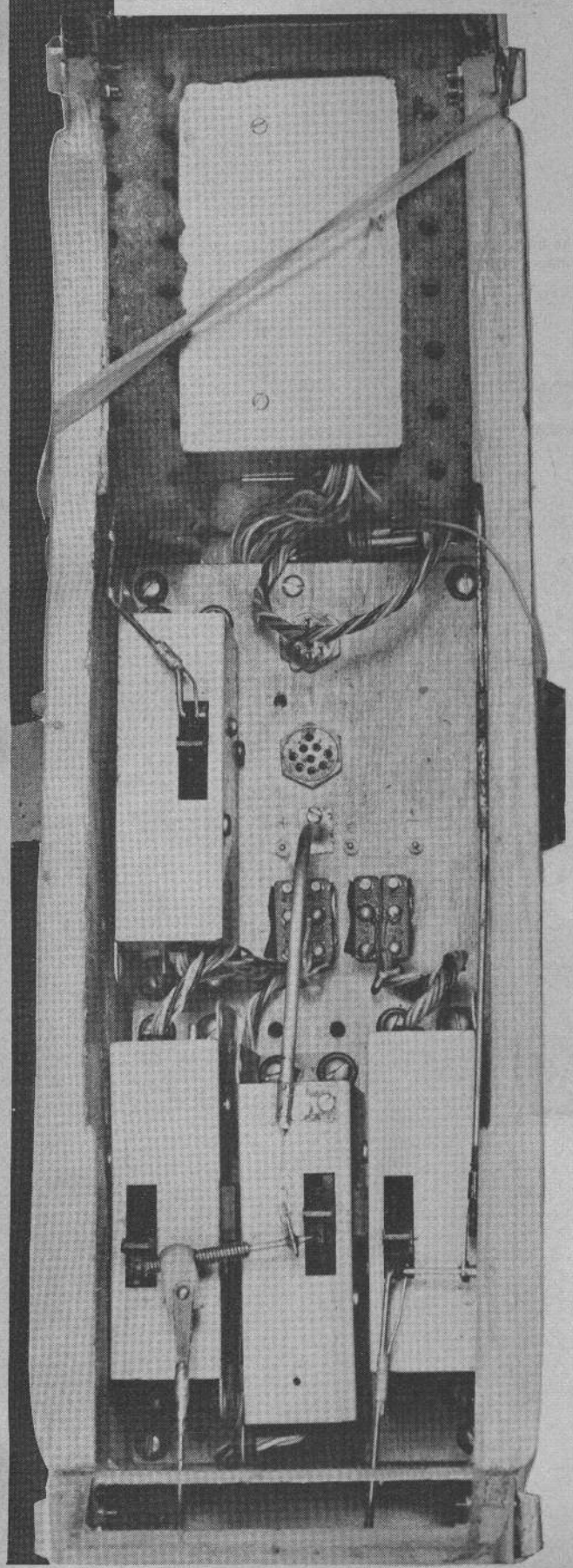
In practice, a headset is put at the output stage of the receiver being checked. This is generally the output, and in most schematics is indicated as the audio test point. Lacking such information, it is reasonable that the headset may be connected directly across the reedbank or other output, such as relay or escpaement, depending on the receiver being checked.

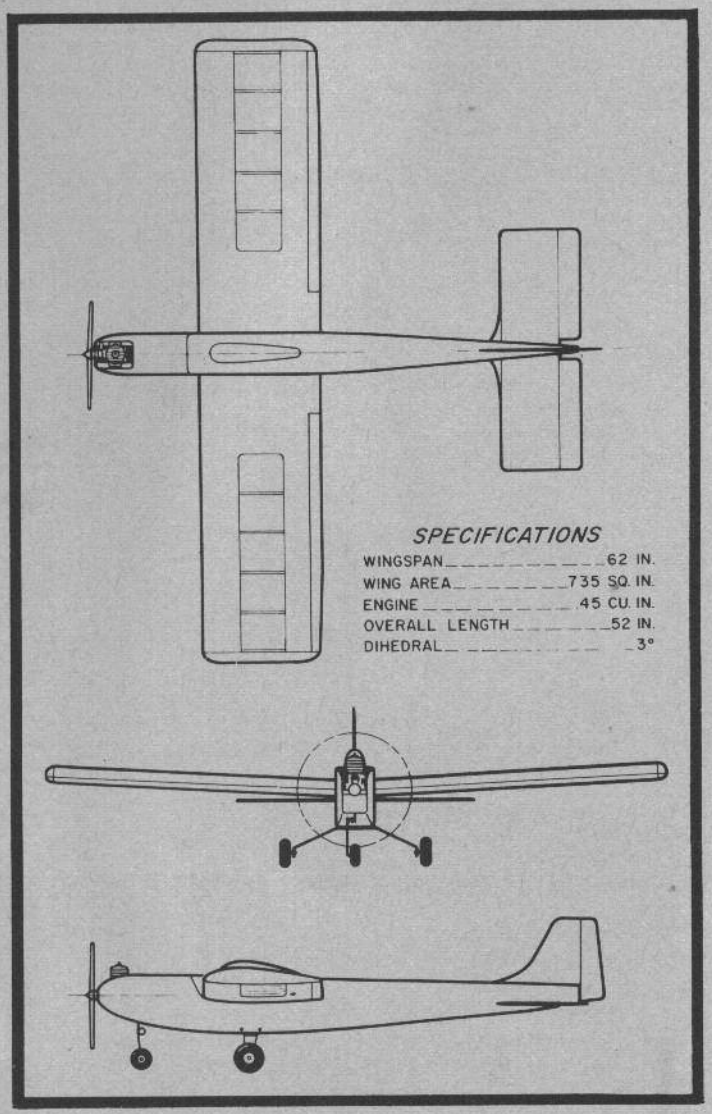
Checking out the audio signals then, the last stage is tackled first and the headset is listened to for the noise that is put out by the signal injector. Working backwards into the receiver, each component and each stage is gone through particularly with references to coupling capacitors, transistors, and tubes to make sure that the audio flows through the receiver. If you reach a point where a stage does not transmit the signal, this is the trouble stage and here further detection is needed to isolate the trouble-making component.

Practice will help point up additional test techniques with this signal injector, and its ultra simplicity and small size belie the very potent help that this unit can be in finding trouble in a receiver.

No printed circuit layout is given. This will vary, depending on the type of pencell light you are able to obtain, and components used. While the 2N1265 is shown, almost General Purpose PNP type should work as well. In the model shown, contact is made at the end of the PC board by the normal flashlight switching arrangement. —D. E. Potter

HEART OF A MULTI MODEL is a functional arrangement of radio and actuator gear. As an aid to better planning GRID LEAKS presents details of three typical systems.





Lou Famighetti's Dyna Soar is an outstanding example of functional, simple design in both construction and radio and actuator installation. Three-view above shows an aircraft which grooves well and maneuvers smoothly. At left is the servo board unit which mounts all switches and plugs—removes by taking out four bolts. Receiver nestles in cut-out foam rubber, removes with servo board—does not plug in, eliminating multi-pin connector. Wiring is minimized.

MULTI INSTALLATIONS SIMPLIFIED

THE KEY TO A SUCCESSFUL trouble-free multi installation is its planning. Numerous wires and soldered joints present a formidable problem to most of us when we do not have an ideal system to copy. In Famighetti's installation a number of useful time-tested features are found. Lou's goal was a unitized set-up which allows transfer of all equipment, intact, from one airplane to another. This is done by taking out just four servo board mounting bolts. The receiver, wired into the unit, comes with it. While this arrangement does require replacing the original receiver cable wires with longer wires, it also offers a number of secondary advantages.

An expensive, hard-to-solder and awkward multi-pin connector is eliminated—a good connector easily costs $10. Because switches

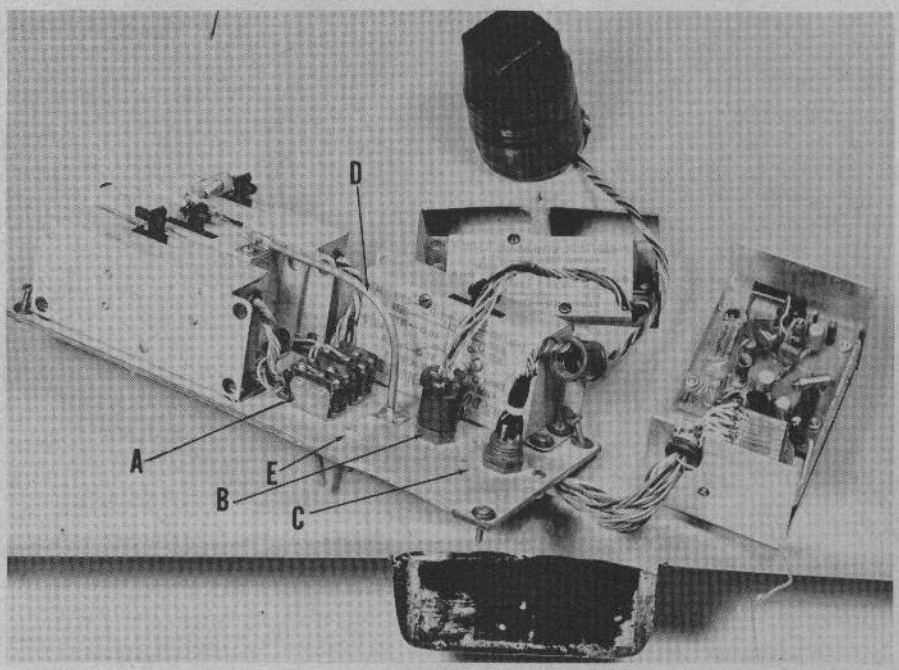
Continued on Next Page

Multi Installations Simplified . . . continued

and sockets are a permanent part of the unit, permitting consolidation of wires into a minimum length harness which can be anchored down, broken leads are minimized. For example, the breakage of wires at a switch which is anchored in a fuselage side is not the worry it is in so many installations. When maintenance is done, or checking required, there is no pushing aside of a forest of wires, or any tugging on loose wires attached to points on the airframe.

The unit shown in the photographs on these three pages has been in five different airplanes over a three-year period. It has been flown winter and summer—the number of flights in the thousands—and with just ordinary periodic checks and replacement of worn servo PC boards. The elimination of a connector has not proved a problem in any way. In fact, some people have found that the space required for a large connector and loose cabling can pose a problem in some of the compact, squeezed-in installations required by many designs.

For this unitized installation the cabin must be free of obstructions between its two end bulkheads. In the **Dyna Soar** all doublers, excepting ¼-inch-sheet nose doublers, are eliminated by the use of fairly soft ¼-sheet fuselage sides. Small ply inserts reenforce the areas where the aluminum wing-rubber brackets bolt on—there are no wing dowels. It is not difficult to get the servo board past the nose-wheel and motor control pushrods (latter is flexible cable, as is the brake actuating line). Only the battery and aileron cables plug in. Winchester plug and sockets make these connections quite dependable. In the picture a battery pack will be noted. This includes five 500 mah nickel cadmium button cells and a Kraft power converter (hence the necessity for two switches). One battery is for filament in the tube front



◄ 10-CHANNEL GEAR COMPLETE

A—Microswitches have long handles which project through slits in bottom of fuselage.

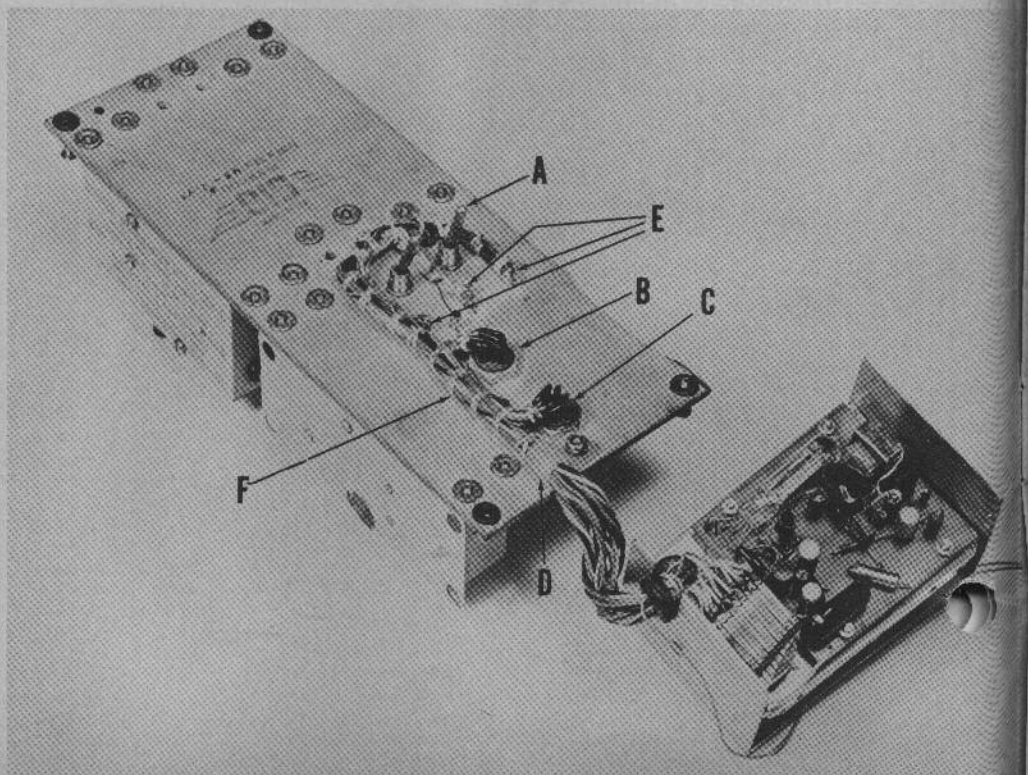
B—Aileron cable plug shown inserted.

C—Power supply cable plugged in, with cap unscrewed to reveal sleeving and binding to protect against broken leads.

D—Brass tubing is conduit for flexible cable for main-wheel brakes. Metal mounting bracket soldered to end of tube, bolts to board; other end clamps onto trim servo.

E—Three tie-points for white, red, black servo power leads eliminates customary extra connections.

Lou Famighettis' Dyna-Soar



SERVO BOARD UNDERSIDE ►

A—Toggle-switch handles. By taking switches off fuselage side broken leads from handling and vibration are virtually eliminated.

B—Bottom of aileron cable socket. Note sleeving and nylon cord tie. Winchester plugs and sockets.

C—Power supply socket.

D—Nylon clamp bolted to board holds harness immobile, minimizes wear and tear.

F—Wiring harness showing nylon cord lacing. Except for cables which require flexibility wiring need never be touched.

E—The three tie-in points for servo power. Brake tube exit may be seen directly behind aileron socket.

Servo board corner bolts are rubber-grommeted. Servo bolts engage standard hobby shop 4/40 blind nuts in board.

end, the others for servo and 6v converter which supplies both A and B current. Bench charging is done by unplugging the battery cable for attachment of charger.

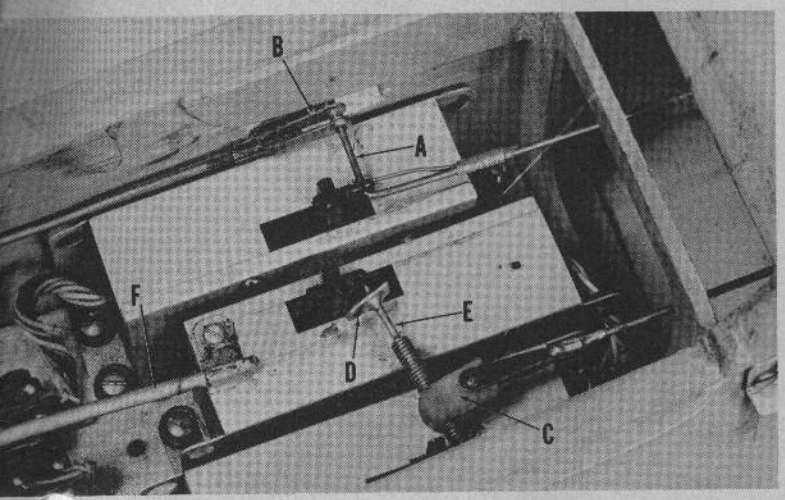
The experienced multi flier may question the advisability of the seemingly rigid nose wheel attachment to the rudder servo. Actually, a high degree of flexing is characteristic of the arrangement shown—more so that the first impression suggests. The system has proved trouble-free. This is due, in part, to the Space Control nose wheel, since the tire can twist on the hub in a hard impact.

The airplane design itself is praiseworthy for its simplicity. Except for a few top and bottom cross pieces, there is no internal construction from the cabin to tail, not even corner shaping blocks. Top is 3/16-inch sheet, bottom 3/16 forward and 1/8 aft. Stabilizer is 1/16 sheet bottom, framework laid on, then 1/16 sheet topped.

The near full-span ailerons (slight planform taper at tips) are flutter-free and afford turns in which control pulsing cannot be detected. They appear to have equal control response at all speeds, making for consistent response. Famighetti likes to fly at 21 ounces wing loading so his choice of 720 square inches of area at from six to 6½ pounds gross, gives him the handling he prefers. His tail arm is three times the nose arm, the stab area one-third the wing area, and the fin one-third of that. Wing is just about on the thrust line.

To construct wing—over and under ¼ x ½-inch spars laid flat—he includes ailerons. Aileron is cut out of the 3-inch wide bottom trailing-edge sheet, but assembled with wing (wax paper separation). Four-inch top sheeting is not cut out, and standard trailing edge stock—holed for lightness—fills between top and bottom sheeting. When done, aileron is deflected slightly upward to crack top sheet, which is then slit free from underneath. There is no ply whatsoever in wing—just between-spars sheet-balsa joiner-fill at center.

Only 30 hours are required for the airframe but, of course, speed in building comes with familiarity with repeat jobs. The original radio installation takes as much time as the airframe, but this time is eliminated altogether with subsequent ships because of installation-unit concept. END



LINKAGE DETAILS

A—Rudder pushrod end extends outboard of servo, engages DuBro link on end of nose-wheel steering pushrod. Arrangement allows flexing to prevent shock damage to servo—no keeper required.

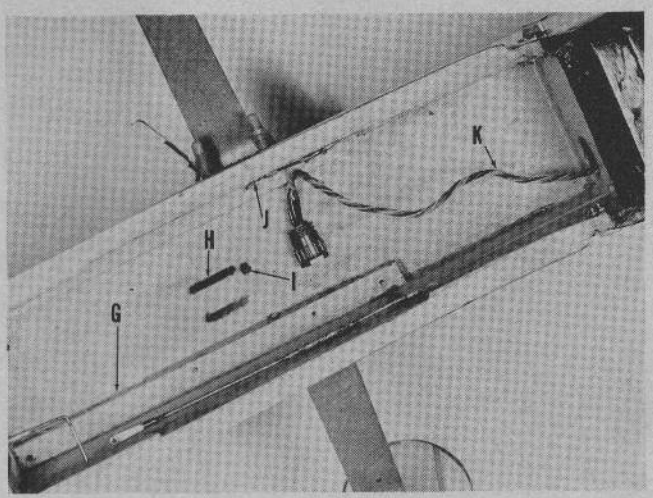
B—DuBro link is screw adjustable, slides off rudder pushrod end for easy removal of servo board.

C—Trim bar. Nylon bracket to which elevator pushrod DuBro link attaches is tapped for adjustment along, and freedom to move on, threaded bar. Bar is drilled out for 1/16" wire end which slides slightly with linkage movements. All parts freely adjust and move with any combination of controls of both servos.

D—Soldered bracket takes looped end of flexible cable for brakes.

E—Wire end can rotate and slide in or out.

F—The brass tubing conduit for brake cable.



SERVO AND RECEIVER BAY

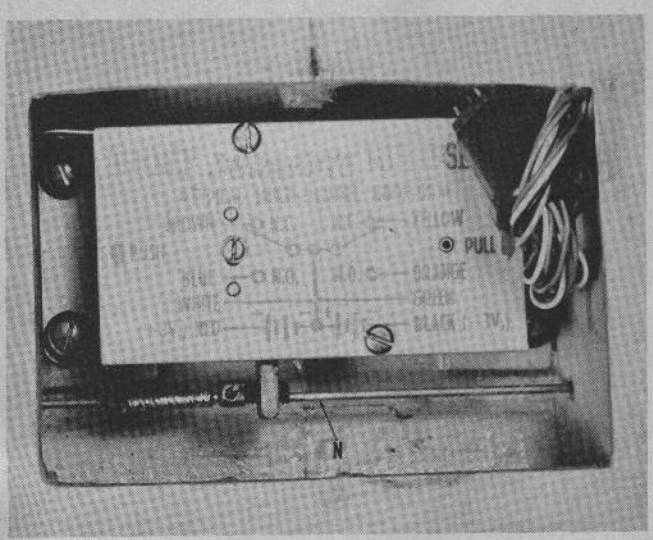
G—Hardwood servo mounting board rails with blind nuts to take the mounting bolts. Board inserts at slant from upper front to pass under pushrods.

H—Slits to pass toggle switch handles for outside accessibility.

I—This small hole passes looped end of brake cable for outside attachment.

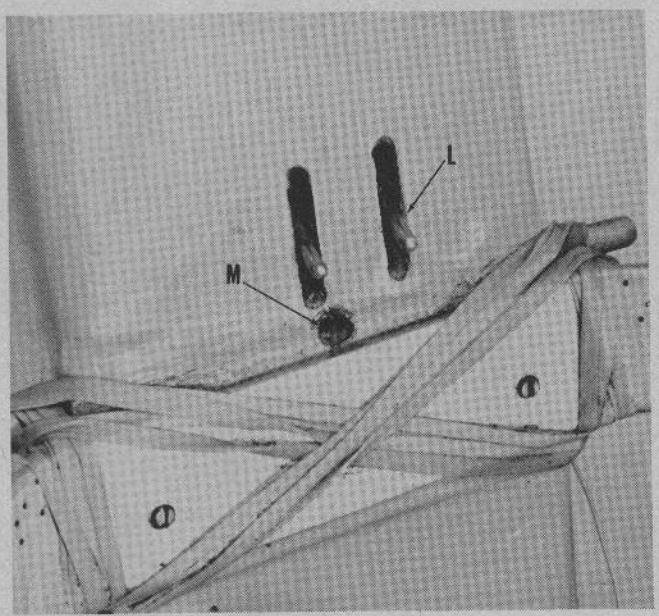
J—Seen as dark line, motor control is stranded lead-out cable.

K—Power cable passes through hole in ply bulkhead. Note that gear dowels terminate at inner face of rails.



AILERON SERVO DETAILS

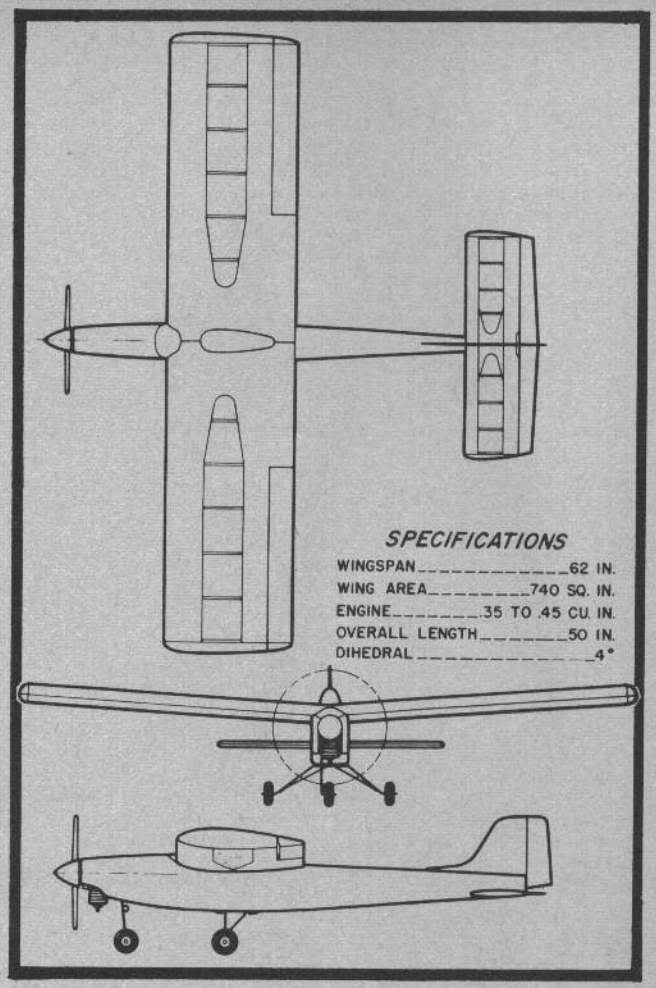
Servo bolts to small ply bearers, no keeper required for pushrod N. L-shaped wire arm is wire wrapped and soldered to pushrod, so that servo lifts out, or inserts, with its adjustable arm automatically engaging the L-wire drive. Aileron servo cable and plug were tucked into corner for picture taking purposes only.



SWITCH DETAILS

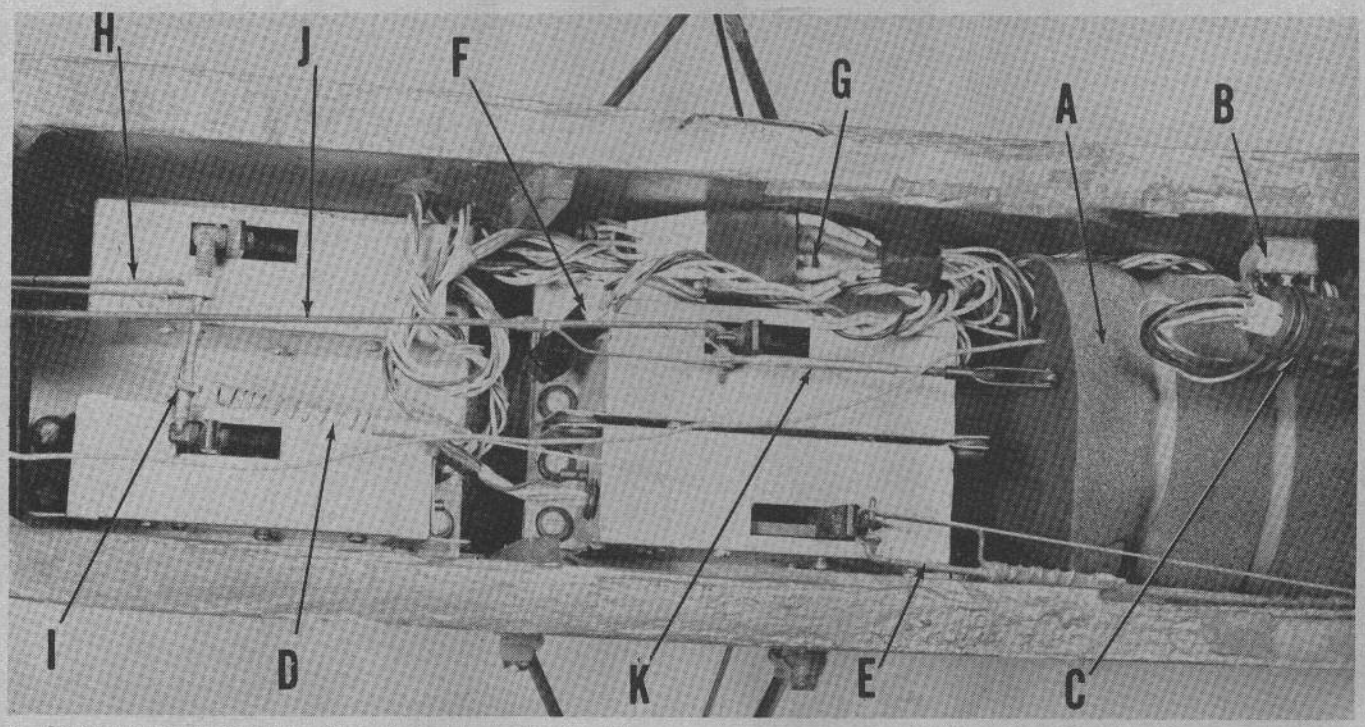
Toggle switch handles as they appear under fuselage when installation drops into place. Slits (L), shown here, are just forward of main landing gear. Hole (M) is for brake cable. Battery pack contains five nickel cadmium batteries plus a Kraft receiver converter. Servo batteries also power 6v converter.

Multi Installations



This stable yet maneuverable airplane offers in a conventional installation several features worth study. Above—Battery pack and unique connector. Pack (L) has five 450-mah German nickel cadmium pencells, one on filament, 4 on servos—also driving 6v converter for receiver. Connector (M) made from Dunham connectors, with 1/16 micarta pieces epoxied between sockets to make one strip. Individual plugs allow removal of any one servo. N shows aileron plug cut from 7-pin Winchester. Servos mount in pairs on removable boards, front pair slightly higher so that pushrods clear the rear pair. Nose steering pushrod (K below) connects to long brass arm, pivoted below for correct movement ratio. Pivot extends to fuselage side where shorter steering drive arm attaches.

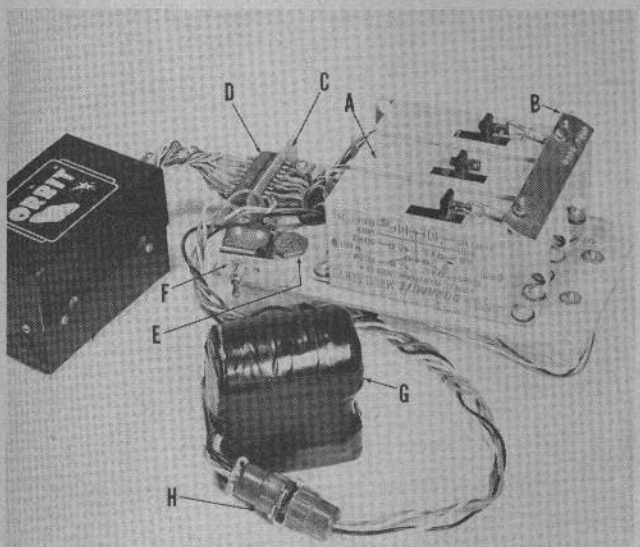
John Roths' "Citation"



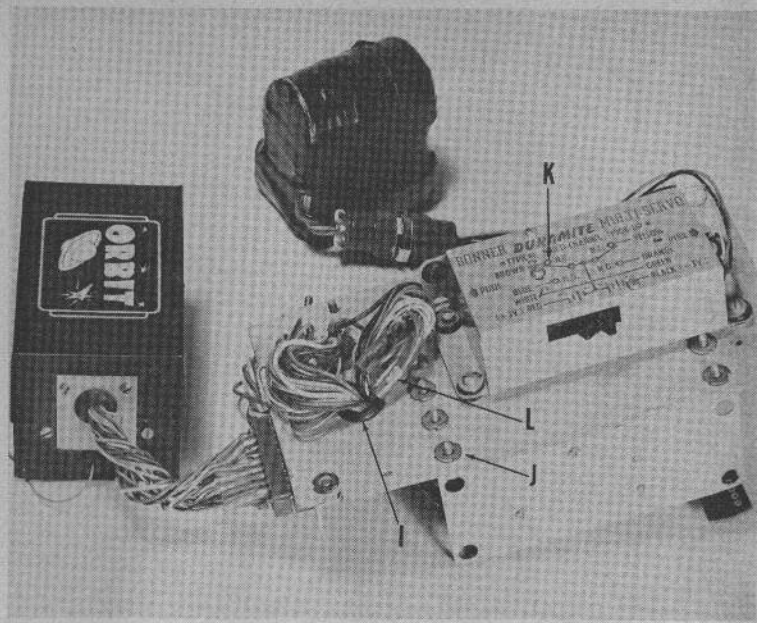
A—Receiver wrapped in foam rubber; B—Toggle switch; C—Winchester plug and socket for all power; D— Spring-loaded monofilament brake cord; E—Motor control pushrod; F—Aileron plug; G—Servo connector; H—Elevator pushrod; I—Tri bar (similar to Dyna Soar); J—Rudder pushrod; K—Nose wheel steering pushrod. Note that battery pack stands vertical against front ply bulkhead—everything in open cabin.

Metal clank tank is removable, despite closed-in nose, through access hole in cabin bulkhead. Ship is lightweight construction—under six pounds. Extra wire visible on landing gear prevents spreading of gear with resulting bounce on concrete runways. Roth uses two battery packs per flying session, changing after half dozen or so flights. Both Roth and Famighetti have placed in first ten in Nationals competition.

Simplified . . . continued



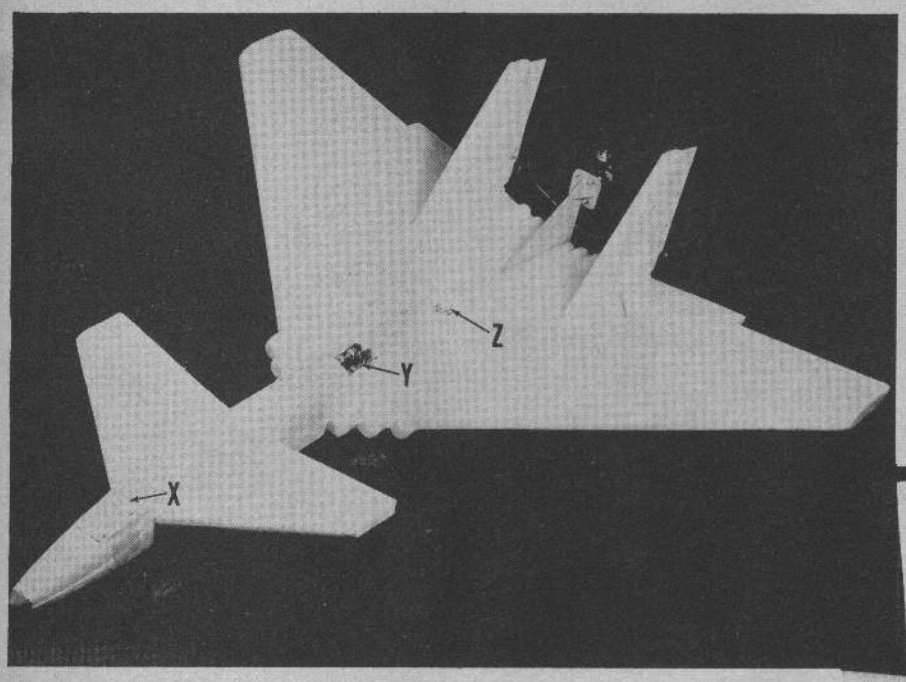
RELAY MULTI INSTALLATION. Sport flier Norm Rosenstock worked out arrangement for three side-by-side servos on one board with motor control servo on bottom. Many kits require relayless equipment, forcing relay servo arrangements that give tail heavy condition—requiring nose ballast. Larger receiver crams cabin enough to affect servo location. In his original designs Norm uses a wider fuselage, with servos in compact arrangement closer to CG. A—Rudder servo; B—Micarta trim bar with holes for trim adjustment (trim servo nearest camera)

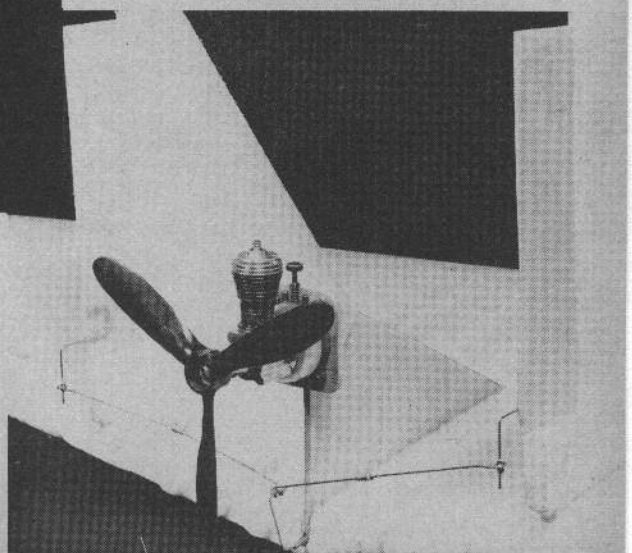


C—Multi-pin connector mounted on removable board by metal bracket; D—Connector plug section on receiver cable; E—Winchester socket for aileron cable plug-in; F—Toggle switch on metal bracket—accessible through fuselage side opening; G—Five 500-mah button nickel cadmium batteries; one for filament, 4 for servos and converter at base of pack (which goes in nose); H—Winchester plug and socket for power cable connection; K— Engine servo; L—Red, white, black servo power leads tie points; I—Grommetted hole through board; J—Blind nuts for servo mounting.

PLASTIC B-70 KITS ON PULSE

Conversion of these styrofoam toys to an R/C model is but an evening's easy work.





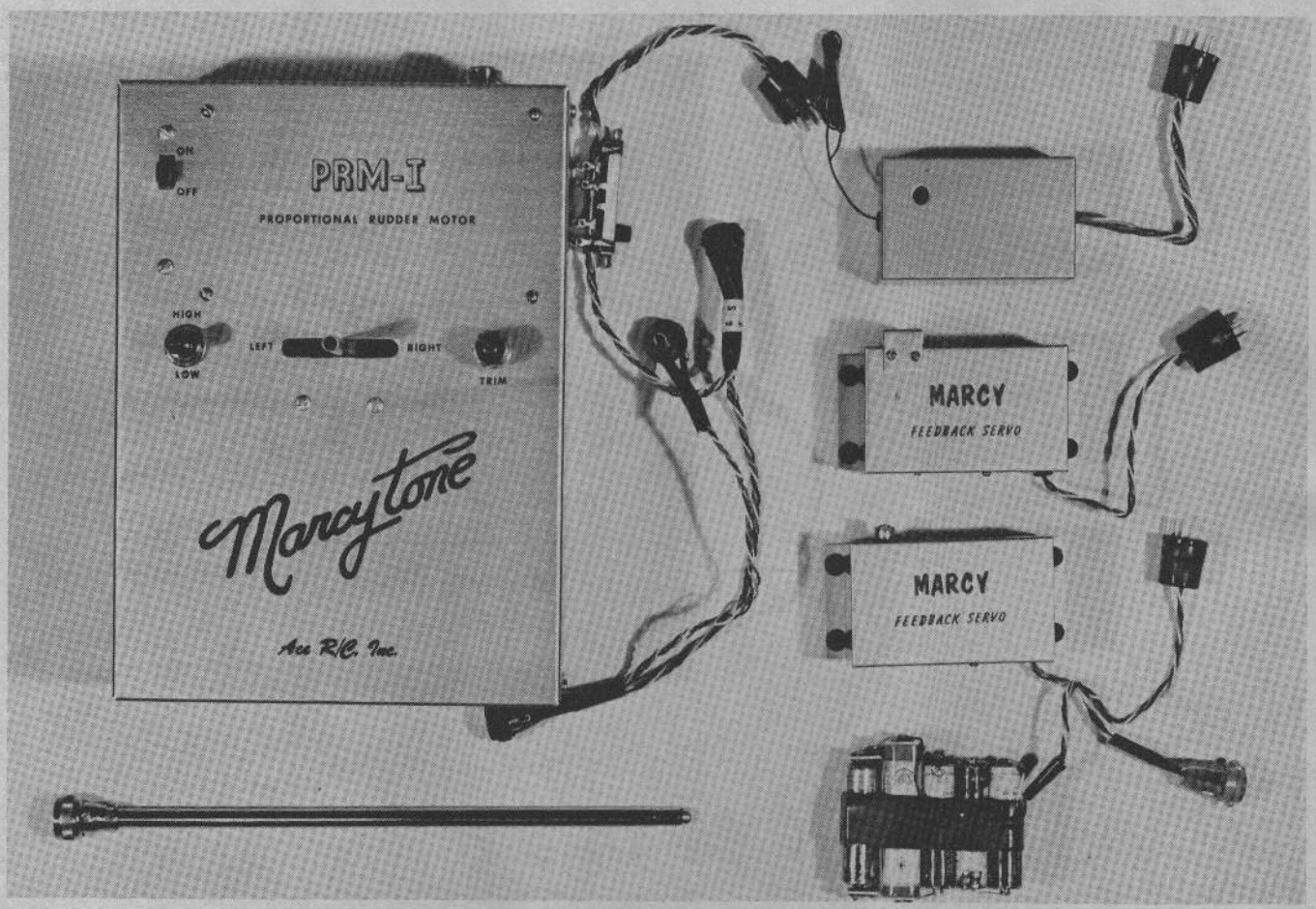
Above—In the particular modification shown here, the batteries are located at X (piece of masking tape holds hatch in place), the relayless, transistorized receiver at Y, and the Septalette actuator at Z. Motor mount on 3/32-inch ply pylon shows at rear and in picture at right, as well as details of linkage to twin movable rudders. Pushrods wrap around and solder to brass-tube sleeves which slide over rudder drive pins.

WHEN FLIERS BEGAN to turn up at so many fields with various conversions of these lightweight plastic toy kites, questions brought out this interesting information. For compartments, cut holes with a sharp knife or blade. If anything needs attaching use white glue—model cement damages the material. For torque rods and wiring, just run a heavy piece of music wire through the foam to make the required passageways. The odd craft fly well on an .02, are lively on an .049—a Cox with standard 3-blader shown. Most builders put the engine on a strut pylon further forward but Eddie Ellis, who made this model, says the pusher arrangement flies better. Rudders for pulse are generous. The ship glides, well, like a kite!

MARCY'S PRM-I SYSTEM

PART TWO

In the January-February issue details of the two servos were presented. In this issue GL concludes this comprehensive coverage with a complete discussion of transmitter and receiver, plus a useful trouble-shooting guide.



Complete system, X-mitter left and, right, top to bottom, receiver, engine and rudder servos and battery pack. Wiring harness includes switches.

IN THE PREVIOUS ARTICLE of this two-part series, we covered the details of the construction of the two items that are the most difficult parts about the Marcy PRM-I System—the two servos. For the benefit of readers who are just coming with us at this stage, and have not had the opportunity to study the foregoing articles, we suggest that the six pages contained in the January-February issue of GRID LEAKS, Volume 4, No. 1, be studied thoroughly.

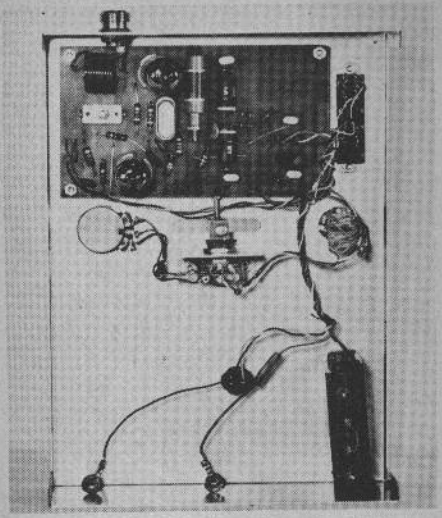
In his search to make the PRM-I System as reliable as possible, one of the first things that Marcy began looking for was ways and means of doing away with the relays which had been used in pulsers for a great many years. Relays in the hands of those who knew exactly what they were doing performed a very satisfactory function, but it was Marcy's belief that if this could be done differently mechanically, or even electronically, the chances for uniform success would be considerably improved.

With that idea in mind a mechanical switching device was designed and was used quite successfully for one of the interim systems which led to the development of the final PRM-I. The mechanical system, although satisfactory, left something still to be desired since, even with its simplicity, it was subject to dirt, corrosion, and other factors.

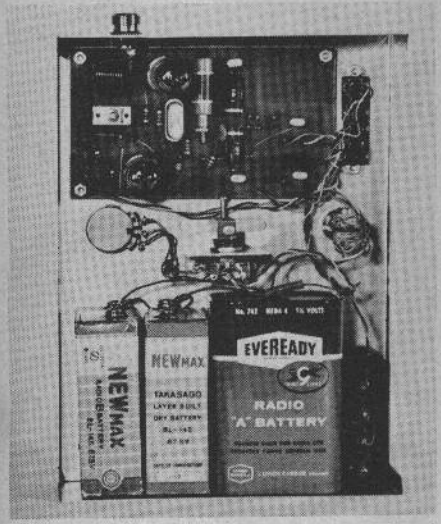
In the final PRM-I System you will note by checking the schematic of the pulser that two 2N406 transistors are used as simple multi-vibrators which are operating at about 20 to 25 pulses per second. No relay is used in the pulser circuit and the transistor switching action is ingeniously used to turn the tone generator section on and off. The proportional part of the pulser is varied between a 70/30 and a 30/70 duty cycle with 50/50 giving an effective neutral.

The trim pot is wired in parallel with the control pot, and the adjustment of the trim pot is quite broad so that the trim may be very satisfactorily had while the aircraft is in the air.

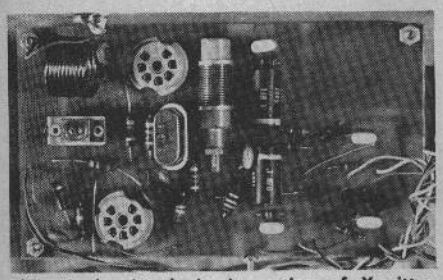
By using component parts of John Rawlings' Pro-trol stick system, Marcy found that no special pot for the stick action was required, and a standard 10K pot could be used. With its neutralizing provided by the strong spring action of the Pro-trol spring, release of the stick immediately neutralizes the pot control and therefore the rudder as well, for a



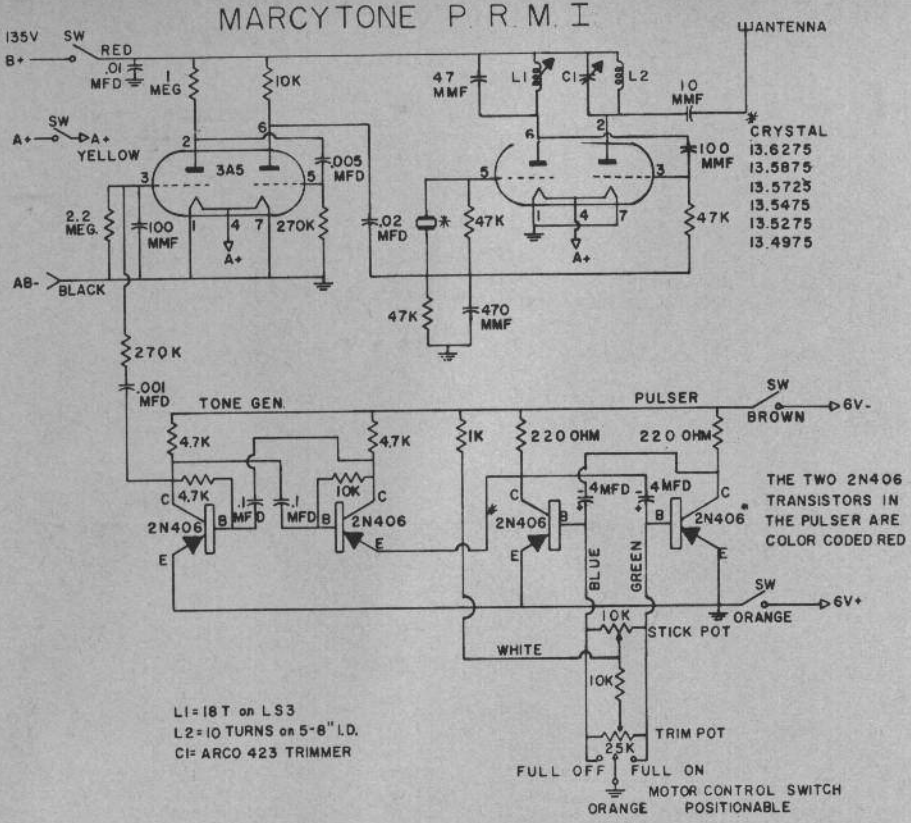
Rear view of transmitter, less the batteries. MOPA 3A5 dual triode section is doubler type.

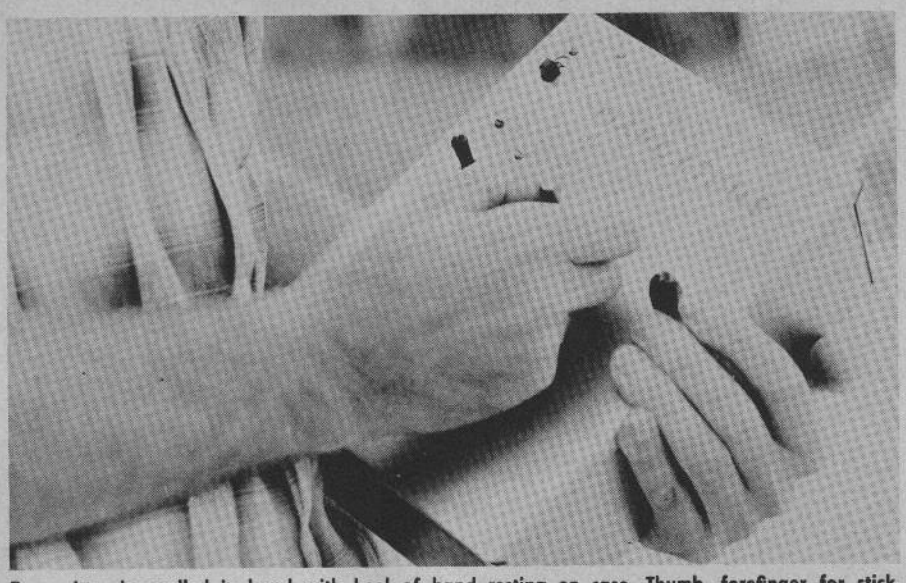


Batteries include: two 67½V B's, the 1½V A and four pencells in DuBro battery box at right.



The wired printed circuit portion of X-mitter.





Transmitter is cradled in hand with heel of hand resting on case. Thumb, forefinger for stick.

correctly trimmed airplane; hands-off safe flying condition.

A study of the tone generator schematic shows that two more 2N406 are used in another multi-vibrator, with the exception that this multi-vibrator is set to oscillate at about 800 or 900 cycles per second instead of the much slower multi vibrator in the pulser section. It is important that the two pairs of 2N406's be as equally matched as possible (the two 2N406 that are used in the pulsers should be very close in gain characteristics ; also the two 2N406's that are used in the tone generators likewise should be very close in their gain characteristics).

To help stabilize still more, the tone generator and the pulser are operated independently of the transmitter batteries so that there is absolutely no inter-action between these two sections and the RF and amplifier sections. The 6-volt batteries used in this tone generator and pulser section are of the pencell carbon zinc or alkali type and the drain on them is in the neighborhood of only 25 to 35 milliamps.

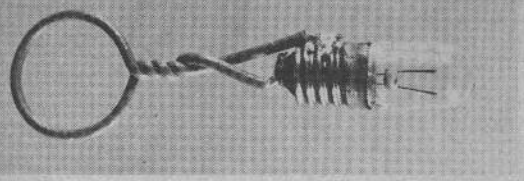
The pulsed tone is fed to the grid of the first stage of the dual triode 3A5 amplifier tube. From the plate of the first stage it is fed to the grid of the second stage of the same tube so that it is finally fed to both of the oscillator and amplifier sections of the next 3A5 which is acting as a dual triode in an MOPA (master oscillator, power amplifier) section.

The amplification by the amplifier 3A5 and the feeding of the amplified tone to both of the grids of the RF MOPA section is to assure an almost 100% modulated tone signal.

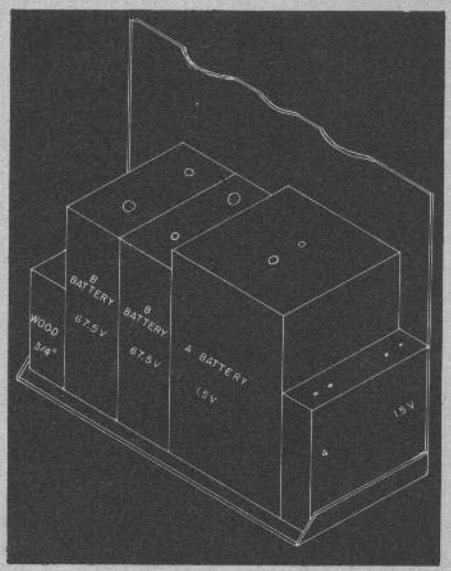
The MOPA 3A5 dual triode section is of the doubler type with the crystal being exactly one-half of the final frequency desired.

Full-size layout of the printed circuit board, along with the component placements on the printed circuit board, should enable the home constructor to duplicate the pulser, tone generator, amplifier, and MOPA section on the printed circuit board quite easily. No step-by-step instructions are given in this article since this is intended for the more advanced builder. Separate instructions for step-by-step building, as well as an etched printed circuit board with the holes completely drilled and punched, and the component parts are available.

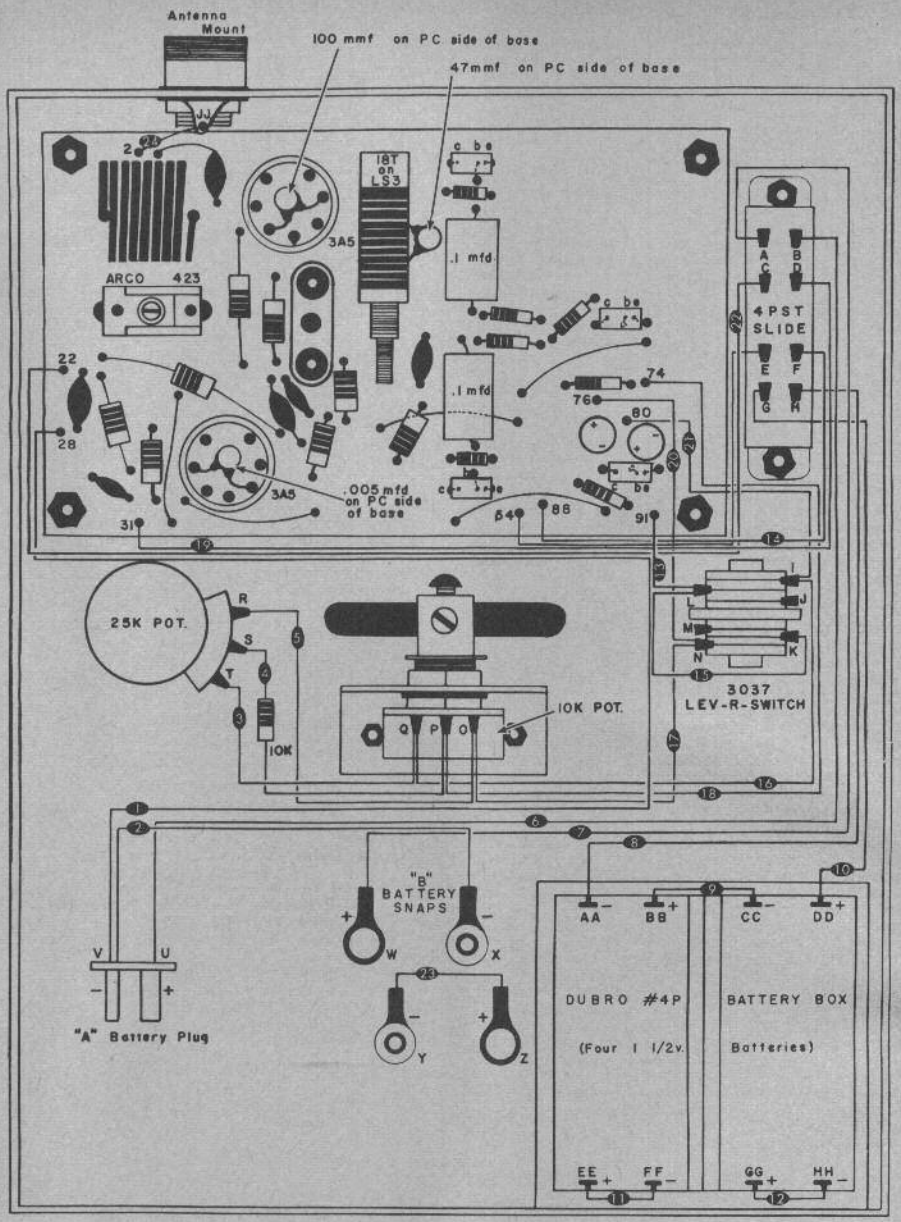
Continued on Next Page



The tune-up loop with pilot lamp. Loop is #20 wire, the ends soldered to #48 pink bead lamp.



Batteries required for the Marcytone transmitter are as follows:
1—1½V Eveready 742, Burgess 4F, or equivalent.
2—67½V Eveready 467, Burgess XX45, New Max BL145, or equivalent.
4—1½V Pencells, Mallory MN1500B or equivalent.



WIRE #	COLOR	LENGTH	FROM	TO
1	Black	12	Lug V	Hole 28
2	Black	4	Lug V	Lux X
3	Blue	3½	Lug T	Lug Q
4	10K Resistor		Lug S	Lug P
5	Green	4½	Lug R	Lug O
6	Yellow	11	Lug U	Lug B
7	Red	12	Lug W	Lug A
8	Brown	9½	Lug AA	Lug H
9	Green	¾	Lug BB	Lug CC
10	Orange	7½	Lug DD	Lug G
11	Green	¾	Lug EE	Lug FF
12	Green	¾	Lug GG	Lug HH
13	Orange	2¼	Hole 91	Lug L
14	Brown	4½	Hole 88	Lug F
15	Orange	¾	Lug L	Lug K
16	Blue	5	Lug Q	Lug I
17	Green	4½	Lug O	Lug N
18	White	8½	Lug P	Hole 74
19	Yellow	7¼	Hole 31	Lug D
20	Green	6	Hole 76	Lug N
21	Blue	6	Hole 80	Lug I
22	Red	9½	Hole 22	Lug C
23	Green	4½	Lug Y	Lug Z
24	Blue	2	Hole 2	Lug JJ

When the PC board has been completely wired you are ready to hook on the wire connections that will make the connections to the batteries, the Lev-R switch, and the pots on front of the cabinet. Consult the drawing which shows the color of these wires that is suggested, as well as their suggested length for guides.

Use four of the ¼-inch metal spacers and, at this point, mount the printed circuit board in the cabinet. The cabinet is 6¾ x 9 x 2⅞" and is available separately if you do not have the facilities to make it. A point should be mentioned here: If aluminum of the anodized type is used, the anodized must be very extensively scratched at the point where the ground connection is to be made through the spacer and its adjacent nut and bolt. Anodizing aluminum makes it almost completely insulated, and unless this is very thoroughly and cleanly scraped the transmitter will ride above the ground of the case. It is desirable to have the ground of the circuit grounded to the case.

Mount the various components such as the Lev-R switch and control stick assembly and the trim pot and the 4PST on-and-off switch.

The assembly of the stick is shown in the exploded drawing. It uses the Pro-trol components as mentioned, is assembled, and then the 2¾-inch brass tube is slid through the top of the case; the pot bracket is then mounted to the case before wiring is completed. At neutral position, it is extremely important that the pot be at about its electrical and mechanical center as much as possible. After installing the trim pot, make sure that it also is set at its electrical and mechanical center as much as possible.

Consulting the various drawings, complete the interwiring between switches, pots, and battery connections. Make harness by lacing leads. Now consult the batter installation suggestion and you will note how the batteries that are required by the Marcy PRM-I transmitter are held in place by a small block of wood along with the DuBro 4P battery box for the 6 volts required for the tone generator and pulser. Before hooking your unit up for the "smoke test," however, it is advisable to double check against the drawings and the schematic to make sure that all of the connections have been made correctly.

We will delay the tuning instructions for the transmitter until after we've discussed the next integral part of the Marcy PRM-I System which is the receiver, and several details concerning its construction.

The receiver as developed by Marcy, is of the conventional superregenerative type. Steps are under way to tie in the amplifier and decoder system into superhet front ends, and the developmental work looks very promising. However, this initial series will be concerned with a superregenerative detector only.

As a review, the XFY34 tube serves as a superregen detector and is therefore quite broad but fairly sensitive in its tuning. This does mean that it is susceptible to interference in areas in which interference is a problem, but it also means that it is one of the most easily duplicated types of circuitry that is available. There are many areas in the country where interference is not the problem that it is in the congested areas, and therefore this version, the superregen, is being given first. The XFY34 output of the pulsed tone signal from the transmitter is fed to the first transistor and is amplified and then is amplified again through a series of R/C networks, and transformer coupling by this is then fed into decoding networks, which for one servo simply gives it the necessary information with reference to a positive or a negative voltage, depending on the ratio of the duty cycle of the signal at transmitter to be used by the feedback servo for rudder or rudder control.

With the pulses at 50/50 the reference voltage as decoded by the output is 0 and therefore the servo is in neutral and will remain so until this balance is upset. If a slightly longer off to on signal is received this results in a minus voltage. This is transformed by the servo into mechanical motion which is transferred to the rudder. It is worthwhile to point out that unlike other simple proportional systems, the Marcy PRM-I moves the rudder in direct relationship to the stick movement on the transmitter with no flapping and that the servo draws current only during the time that it is in motion. As stated in the previous article, the servo contains a pot which is moved along with the output arm and it seeks to null the current or regain zero. When the zero is achieved, motion stops and no further current is drawn. It will remain in this position until the stick is moved in another direction or is neutralized.

The Pulse Omission Detector is in the rudder portion of the circuit, so that when a full on or full off signal is had, the motor control is activated with the rudder servo cycling through one full rotation. This cycling through needs only to be provided for in the aircraft linkage,

ADEQUATE. SEPARATE INSTRUCTIONS, WITH PC BOARD COMPONENTS AVAILABLE.

but is not objectionable from the aircraft standpoint since there is little time for it to respond to this 360-degree cycle. This allows the simpler motor control servo to be set with its pot at a sensitivity sesting so that it will accept only full off or full on audio signal and reject the 70/30 or 30/70 signal.

The receiver is conventional and there is nothing difficult about it. A printed circuit base is provided for those do-it-yourselfers who have the facilities and the ability to make their own PC boards. A study of the printed circuit board as well as the component placement on top, and the following of good and accepted printed circuit practices—with the best type of solder such as Ersin multi core, and a printed circuit type iron—should allow any builder to duplicate this circuit. Follow the color coding suggested on the receiver layout so that you will have the mating color coding to go with the wiring harness which was described in the previous issue.

When the unit has been completed it is housed in its metal case, for protection, with its insulated 1/64 fiber board and #2 self-tap screws.

You are now ready to hook up your units and test each portion of them individually, and then test them together.

First, in the test procedure of your Marcy PRM-I Transmitter and Receiver, we will handle the transmitter portion. Double check all of your wiring to make sure that all connections have been correctly made. A few minutes spent with care here may avoid trouble later on. Double check your building against the instructions as well as against the pictures, the schematics and the pictorial drawings that have been provided.

When you are sure that you are correct, begin your testing procedure by inserting the 4 pencells in the DuBro 4P box, and make doubly sure contact is had. Test with voltmeter. At this time do not insert the 1½-volt A battery or the two 67½-volt batteries. You are interested at this time in checking out the pulser and tone generator sections only. Since 6 volts is all that is required on these, this is all that you will need to hook up initially. Be sure to observe correct polarity.

Make sure that pots, both the trim and control units, have been set appproximately at mid-range or the center portion of their mechanical travel. Hook up a 0-to-10 volt DC voltmeter, or a comparable voltage range on your VOM multitester, with the positive connection going to ground or 6-volt plus. Refer to the pictorial drawing of the printed circuit board and you will note a test point listed as test point A. Here connect the minus connection of your voltmeter. Now turn on the main switch of the transmitter. Your DC volt meter, if everything is functioning correctly, and the controls are at mid-range, should read between 2 and 3 volts DC. Move the lever of the control stick to full right. The voltmeter should now go to approximately 4 volts. Deflecting the stick to full left should find the volt meter reading approximately 1.5 volts.

Now flick the motor control Lev-R switch and you will note in the high position that it reads approximately 5 volts or a little more, and in the low position it reads approximately 0 volts. This indicates that the pulser is working and performing correctly. Variations of the trim pot, with the control stick at neutral, will result in some voltage deflection either more or less from the approximate mid-range scale, but will not be as great as the full off or full on as supplied by the Lev-R switch.

Final adjustments of the electrical neutral can be best finalized when the complete Marcy PRM-I System is hooked up for bench checks. The important point now is that at mid range, with the control stick in neutral, you have a voltmeter reading of approximately 2 to 3 volts. This will be close enough for you to make your final voltage adjustments.

Turn off the main switch of the transmitter. Now insert the 1½-volt A battery and the two 67½-volt B batteries and connect. Remove the 3A5 tube which is the MOPA RF transmitter portion, leaving in only the 3A5 tube which is the amplifier, since this will be the portion of the circuit to be tested next.

Turn on the main switch and check the 3A5 amplifier tube for a filament glow. On the main pictorial of the printed circuit board, you will note test point B. At this point hook up a headset using a .01 capacitor in series with the headset with the other connection of the headset or earphone going to ground. Note: It is possible to use a loud speaker here as well as a headset, but this should be done through an output transformer. With the headset or earphones or speaker connected, with the unit turned on, you should hear a rapid pulsing of an audio tone approximately in the range of 800 to 900 cycles per second. Vary the stick from extreme left to right and you will note a change of ratio of on-to-off signals, as well as off-to-on. In the high position the Lev-R switch will give a solid audio signal while in the low position there will be a complete absence of signal.

This finishes the checking of the pulser sections and the tone generator section of your Marcy PRM-I transmitter. Turn the transmitter switch off.

(This completes the tuning of the transmitter that can be done legally by the home builder. The tuning of the RF section must be done by a licensed first- or second-class technician under the rules of the FCC of Part 19 concerning the use of a Class C Citizens Band transmitting device.)

To assist the first- or second-class technician who will tune this unit for you, here are the general procedures that are to be followed. Insert the 3A5 MOPA RF tube.

The MOPA section may be tuned in one of two ways. The first method to be described uses a one-turn link coil approximately 5/8-inch in diameter made of #20 solid plastic-covered hookup wire, the ends of which are soldered to a #48 pink bead pilot lamp. This coil is inserted about half way into and between the turns of the tank coil L2. Unscrew the Arco 423 padder approximately five or six turns, or until it is on its low capacitance side and turn slug in L1 all the way to bottom. Before tuning the RF section attach the ASP-211 antenna and extend it to its full length.

Turn on the switch of the transmitter and check the glow of the filament of the 3A5 RF MOPA tube. Now with an insulated tuning wand rotate the tuning slug at L1, turning it to approximately mid-point. As this is being turned slowly the # 48 pilot lamp will begin to glow. Adjust the tuning slug for the brightest glow by positioning the slug and then backing off slightly. With your tuning wand, slowly screw in the Arco 423 padder. As this is being done you will note that the #48 pilot lamp begins to glow brighter. Tune for its brightest glow.

To tune with a meter simply insert a 0-to-50 milliamp meter in series with a B-plus lead. With the Arco 423 padder unscrewed, turn the transmitter on. Adjust the slug in L1 until a dip in the milliameter reading is had. Under a non-oscillating condition the unit will draw approximately 30 milliamps. This will drop when resonance is reached.

When the first resonant point is reached, adjust the Arco 423 by screwing in. When the final resonant point of the amplifier section is reached, a still greater dip will be had and the final reading with the unit oscillating correctly will be approximately 17 to 18 milliamps. Tune for the greatest dip on both stages.

Check on a field strength meter for the greatest radiated output, whichever method of tuning is used.

Fix the lock nut on L1 when tuned finally.

TROUBLE SHOOTING INFORMATION FOR TRANSMITTER

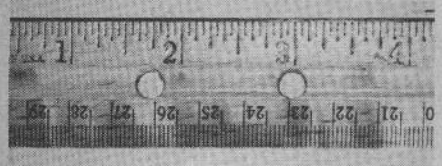
In the event that the conditions mentioned above are not had, and there is trouble in achieving the results mentioned, trouble shooting can be fairly straight-forward, because of the simplicity of the circuit.

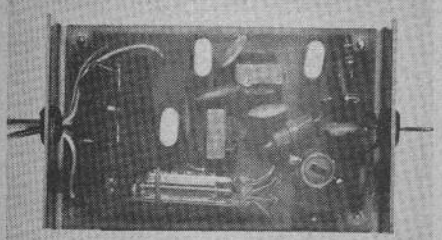
"No go" of any of the functions of the transmitter and its related tone generator and pulser can generally be traced to one of four things, which should be checked for in case of non-function.

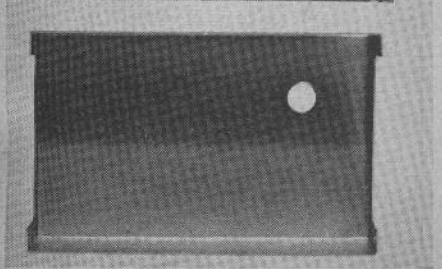
1. Double check the battery hookup and make double sure that the batteries in the 4P box are contacting.
2. Double check the wiring hookup against the schematic, pictorial and step by step. A simple goof up here could easily cause the entire system not to function.
3. Double check the printed circuit soldering. Even a seemingly good joint can sometimes be misleading and the usual PC wiring technique should be double checked. All connections MUST be made electrically.
4. In the event that the foregoing steps do not reveal any trouble, and the unit still does not function, the last—and least likely—spot is a faulty component. An ohm meter may be used to check for the resistance values of

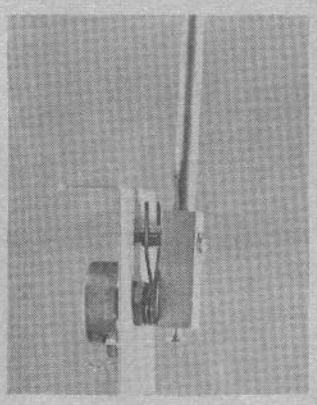
Right—Stick assembly; centering spring shows clearly. Far right—Drawing shows stick parts.

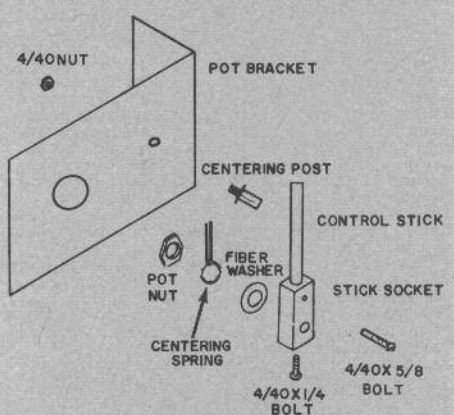
Below—Receiver shown wired inside case, with cover removed. A superregen, uses XFY34 tube.

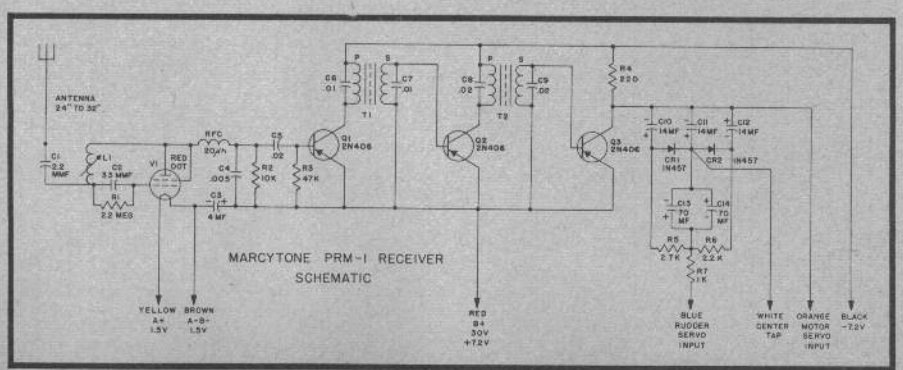




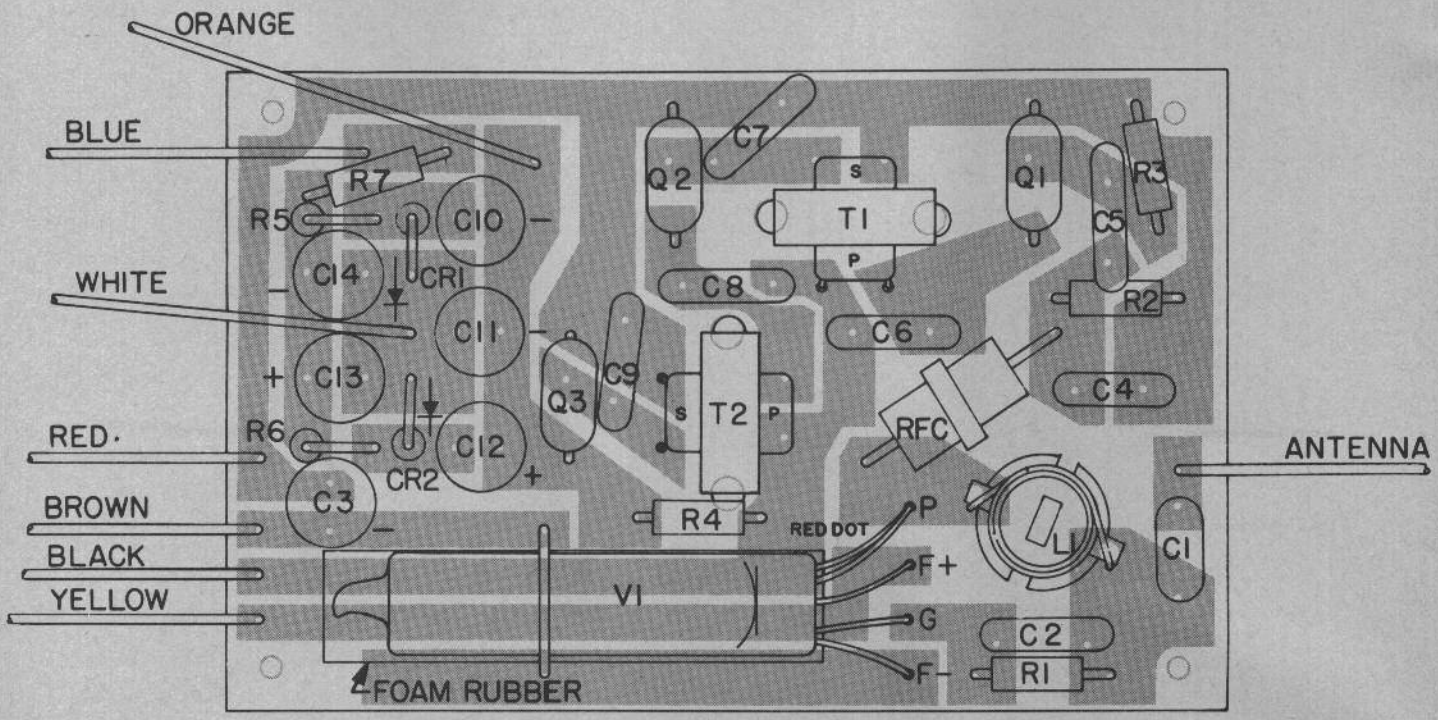








MARCY PRM–1 SYSTEM



ABOVE LAYOUT IS OVERSIZED BUT DIMENSIONED CORRECTLY.
REDUCE BOTTOM MEASUREMENT TO 2 3/4 INCHES.

MARCYTONE PRM-1 RECEIVER

resistors used, and also to check for shorts in capacitors.

The circuit of the Marcy PRM-I transmitter is so straightforward that if hooked up and wired up correctly it should function. There are no elaborate service techniques detailed since none are required or necessary.

Your Marcy PRM-I Transmitter is a battery operated unit but a power converter may be used with it. As a battery operated unit, voltages should be watched, and when tested for voltage should always be tested under load. Under load simply means that the transmitter is turned on and that it is operating and drawing the fullest current that it is capable of drawing in the correct operating condition.

A batteries need to be replaced when the A-battery voltage falls below 1.2 volts, under load. B batteries will need to be replaced when their combined voltage falls below 100 volts, under load. The pulser and tone generator batteries will need to be replaced when these fall below 4.5 volts, under load.

The Marcy PRM-I Transmitter has been, as stated before, successfully used with power converters of the transistor type. When used with converters of this type there are only a few factors which must be considered. Under no circumstances should the B voltage be allowed to go more than 135 volts under load. If the voltage under the 17 or 18 milliamp load is higher than 135 volts it will be necessary to use a dropping resistor in series with B plus. To run it at greater than 135 volts exceeds the rating of the 3A5 tube and will seriously shorten its life expectancy. Ohm's law can be applied to find out what size resistor is required to drop the voltage to the necessary 135 volts. It is also desirable that a separate battery entirely separate from the 3 or 4 required for the transverter be used for the A supply. It is also recommended that the separate 6 volts supply for the pulser and tone generator be retained. The nickel cadmium batteries to be used for the power supply should be of the sealed type. If the vented type is used it is recommended that they be placed outside of the transmitter case in the back. With a 3.6 volt input transverter these 3 batteries may be held with a simple metal strap on the outside of the case, where they will be easily accessible for charging. If they do gas they will release their gases harmlessly and not corrode the interior of the cabinet.

While the receiver is not difficult to wire, if a sequence of mounting of the components is followed, it will be found that the crowding of the work becomes less critical and the soldering may be done with greater ease. No component placing sequence was given for the transmitter since here spacing is quite broad. Although spacing is still fairly open on the receiver, the following sequence is recommended. Install all resistors first; most of these are placed flat against the PC board, although R5 and R6 are stood on end.

Install the plug-in electrolytic capacitors next. Now install the 1N457 diodes, being sure to observe the polarity—the yellow band is the cathode. Install the tuning coil and make sure that the soldereze wire-on form is soldered to the lugs. When the solder lugs have been soldered snip them off. Do not bend. Install the 2.2-mmf and the 33-mmf NPO capacitors as well as C4 and C5. Install the RF choke. Install the two transformers, being sure that primary and secondary are correct. Primary will measure approximately 850 ohms DC resistance, while the secondary will measure approximately 100 ohms DC resistance. The lugs of the transformer are bent toward each other to tighten down and then solder connections on wire leads are made. Install the remaining condensers.

The jumper wire which is used as a hold down for the tube is also an electrical connection. Install one end of this wire in the inside hole. Be sure to clean the tube leads by scraping to remove any agents which might prevent good solder joints. Install the tube by soldering in correct position; note that the two leads next to the red dot go into the same hole on the PC base. Place rubber or felt under tube, then pull jumper over tube to the outside hole and complete soldering. After scraping the leads of the three 2N406 transistors, install using good heat-sink practices. Install all lead-out wires, observing the color code as suggested and end in a 7-pin plug, checking the pin location as shown in the previous issue of GRID LEAKS on the wiring harness. Leads should average 6 inches in length. Install an antenna wire of about 22 to 28 inches for a 27 mc. unit.

Having tuned the transmitter and the rudder feedback servo as detailed in Part I, you are ready to check out the receiver. When it has been completely wired, hook up as shown in the complete installation hook up in Part I. This includes the wiring harness and the on-and-off switch as well as the feedback servo and the motor control servo. Be sure to observe battery polarities and voltages.

Turn the pot in the motor control circuit all the way to the most resistance since this will be adjusted after initial tuning has been made, and you are sure that the feedback servo with the receiver is working correctly.

Now turn on the receiver and the transmitter. With the transmitter control stick held all the way in full right, which gives the greatest degree of on, adjust the receiver slug of L1 until the feedback or rudder servo responds by giving a full throw in one direction which will be right in your aircraft.

This test may now be carried out at range and is the test used with this particular system for a range check. When the condition of right throw is achieved by the rudder servo at range, by fine tuning the slug with an insulated tuning wand, all other conditions in the receiver should be operating.

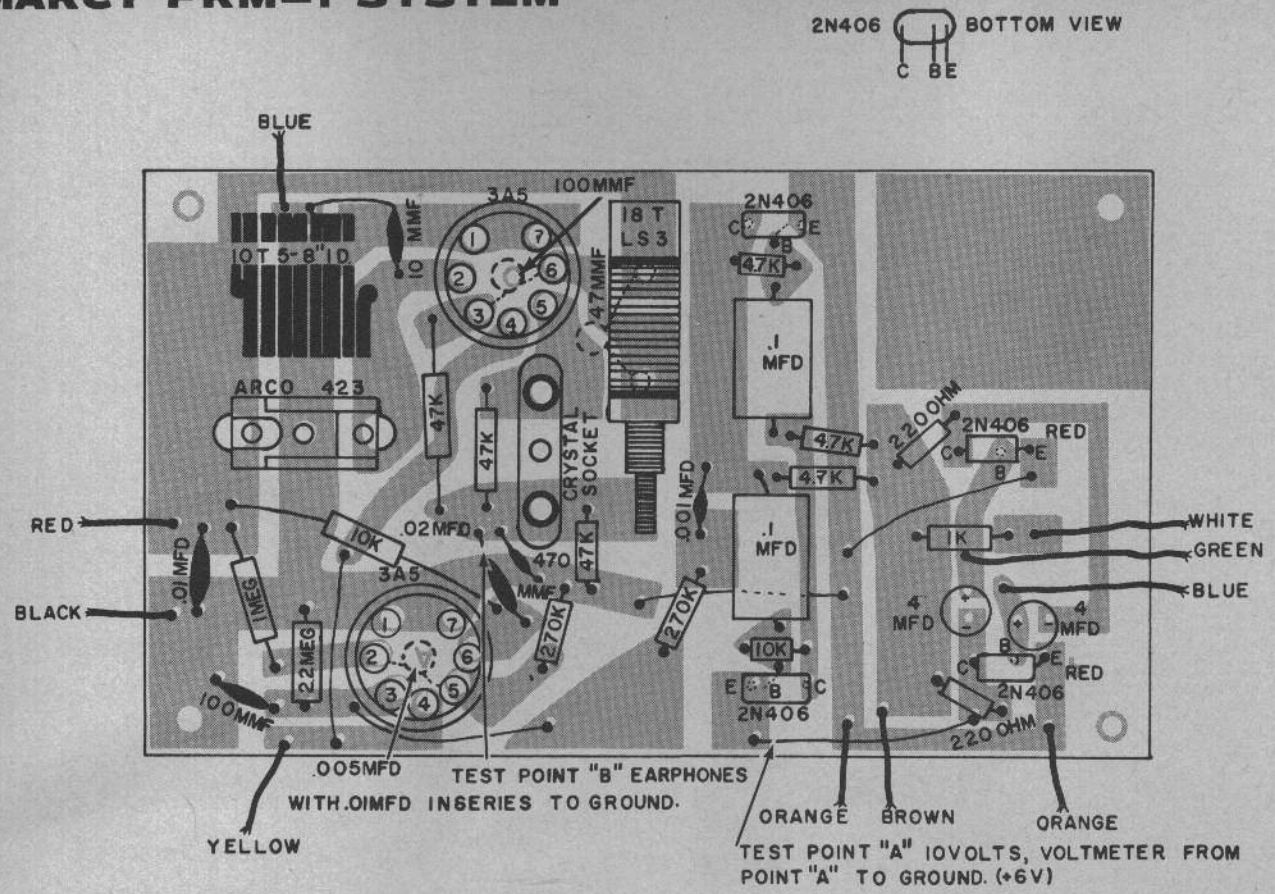
Complete your tests on the rudder servo by neutralizing and observing the return of the rudder servo to neutral. Now give full left and you should get response to the opposite of what you had on the rudder servo with full right.

Adjusting the input or sensitivity pot for the motor control is the next step. This is merely a sensitivity setting and will only require very occasional adjustment, and then only if battery voltages change.

With two less transistors in the motor control servo than in the rudder servo, it is not as sensitive and is not intended to be.

With full rudder to the left, the motor control

MARCY PRM—1 SYSTEM



ACTUAL SIZE

servo also may want to go left. Simply hold the stick in full left condition and adjust the pot to just where the motor control will not attempt to follow. Duplicate this with full right rudder on the stick and achieve adjustment to where neither full left nor full right will activate the motor control. Now, push the full off which is low motor, and the motor control should go in one direction. Push the motor control into high, which is full on, and the motor control servo should go in the other direction.

Motor control input sensitivity pot is set so that it will follow on full-off or full-on signals only, and not on the 70/30 or 30/70 provided by full left and full right.

Trouble shooting the receiver is extremely simple and follows the accepted practices of checking out superregenerative equipment.

This completes the Marcy PRM-I System, the first rudder-only system which has been completely designed as a system.

50-54 mc OPERATION

The Marcy PRM-I system transmitter may be quite easily adapted for use on 50-54 mc for use by licensed ham operators. **(To make the changes listed for 50-54 you must have a regular amateur license; there are stiff penalties enacted by the FCC if operation is attempted on 50-54 by those not licensed.)**

The two tank coils, L1 and L2, need to be cut down exactly in half. For 50-54 mc L1 should be 9 turns #22 enamel. L2 should be only 5 turns #16.

The 47-mf NPO capacitor is replaced with a 33 mf, and the 13-mc doubler crystal is replaced with one in the frequency range that is exactly one-half of the desired output range on 50-54.

The receiver, too, is quite easily changed to 50-54 operation. The tank coil is cut down to 18 turns of #30 wire on the SPC2 form, a 10-uhy RCA type choke is used instead of the 20 uhy; and a 1 AG4 tube is used in place of the XFY34. Antenna length is increased to 30-36 inches.

Tune up procedures for the 50-54 version are exactly the same as detailed in the 26-28 mc version.

MARCYTONE PRM-I TRANSMITTER PART LIST

½ WATT RESISTORS
2 47K (yellow, violet, orange)
2 270K (red, violet, yellow)
2 10K (brown, black, orange)
1 1 meg. (brown, black, green)
1 2.2 meg. (red, red, green)

¼ WATT RESISTORS
3 4.7K (yellow, violet, red)
2 220K (red, red, yellow)
1 1K (brown, black, red)
1 10K (brown, black, orange)

VARIABLE RESISTORS
1 10K pot
1 25K pot

CAPACITORS
2 4 mfd electrolytic capacitors
2 .1 mfd capacitors
2 100 mmf capacitors
1 470 mmf capacitor
1 .005 mfd capacitor
1 10 mmf capacitor NPO
1 Arco 423 Trimmer
1 47 mmf capacitor NPO
1 .01 mfd capacitor
1 .001 mfd capacitor
1 .02 mfd capacitor

TRANSISTORS
4 2N406 transistors

COILS
1 18 turns #22 on LS3 (L1)
1 10 turns #16 on ⅝ I.D. (L2)

MISCELLANEOUS
2 3A5 tubes
1 3037 Lev-R-Switch
1 4PST slide switch
1 ASP211 Antenna
1 DuBro battery box #4P
1 Crystal socket
1 Doubler crystal (must be ½ of desired frequency)
1 Centering spring
1 Control stick, 2¾" long, ¼ O.D. Brass
1 ⅜ fiber pot washer
1 Stick socket
1 Pot bracket
1 A battery plug
1 Antenna base and mount
4 B battery snaps
1 ⅜ Solder lug
5 4/40x¼ bolts
4 4/40x½ bolts
1 4/40x1 bolt
9 4/40 nuts
1 ⅜ Extruded fiber washer
4 ¼" Spacers
2 P.C. tube sockets
1 Control Guard
1 Centering post
1 Transmitter case
2 ⅜ Lock washers
2 ⅜ Pot nuts
10" Solid hookup wire
24" Green, White, Orange, Blue, Red, Black, Yellow, and Brown Hookup wire
18" Solder

PARTS LIST FOR THE MARCY PRM-I RECEIVER

Coils and transformers—L1 36 turns of No. 30 soldereze wire on an SPC 2 coil form, RFC Miller 6152 20 UH, T1 and T2 Zebra 10K to 1K impedance transformers.

Tubes and transistors—V1 XFY34, Q1, Q2 Q3—2N406, CR1, CR2—1N457.

Resistors ¼-watt 10 percent—R1 2.2 meg, R2 10K, R3 47K, R4 220 ohm, R5 2.7K, R6 2.2K, R7 1K.

Capacitors—C1 2.2 mmf NPO, C2 33 mmf NPO, C3 4 mf PI electrolytic, C4 .005 mf, C5 .02 mf, C6 .01 mf, C7 .01, C8 .02, C9 .02, C10 14 mf PI electrolytic, C11 14 mf PI electrolytic, C12 14 mf PI electrolytic, C13 70 mf PI electrolytic, C14 70 mf PI electrolytic.

Hook-up wire — 8-inch lengths of No. 26 stranded (19 strands times 36) of the following colors: Yellow, brown, red, blue, white, orange, black; 24 to 36 inches of any other color for use as an antenna wire, also No. 26 (19 strands times 36).

One PC base or base material. One metal case, 1 piece 1/64 fiber insulating board, same size as PC base, 4 mounting screws, 2 grommets, 1 Methode 7-prong plug and socket with shield.

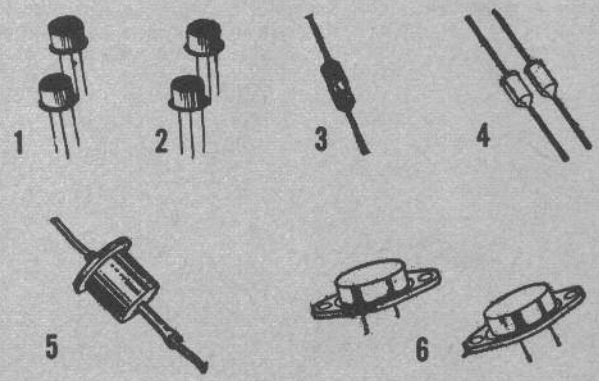
(For 50-54 MC operation the following components will need to be changed from the foregoing list.)

L1—18 turns of No. 30 soldereze wire on an SPC 2 coil form. RFC—10 UHY RCA type choke. V1—1AG4.

NOTE: NEW ITEMS LISTED ON THESE PAGES ARE AVAILABLE OR WILL SOON BE AVAILABLE AT YOUR HOBBY DEALERS. OR YOU CAN ORDER DIRECT FROM ACE R/C —BOX 301 HIGGINSVILLE, MISSOURI. IN CANADA — ACADEMY MODELS, 955 ROSELAWN, TORONTO 19, ONTARIO.

what's NEW

EXPERIMENTER'S SPECIALS



EXPERIMENTER'S SPECIALS

Quantity purchasing plus general price reductions in several fields of items used more and more frequently in R/C, let us set up an Experimenter's Special Bargain Counter. All of these are new items, with the original vendor's guarantee, and represent top buys. Try your dealer first, if he does not stock, send your order direct to Ace R/C, Inc., Higginsville, Missouri.

1 PNP AUDIO TRANSISTORS

General audio type for building code oscillators, useable in many audio amplifier applications. Similar to CK722, N107, and other germanium units. Package of two.
No. 32A10—PNP GP, pkg of 2 ..... .99

2 NPN GENERAL PURPOSE TRANSISTORS

General purpose germanium type transistors, in all audio applications where an NPN type is required. Package of two.
No. 32A11—NPN GP, pkg of 2 ..... .99

3 SUBMINIATURE GLASS DIODES

Latest submini glass type, equivalent to 1N34A, 1N48, 1N60, 1N64 or most any general purpose type germanium unit. Highest quality, all of the same type. Not to be confused with assortments of differing sizes. Packaged in two assortments.
No. 32A12—GP glass diodes, package of 4 ..... .99
No. 32A13—GP glass diodes, package of 25 ..... $5.50

4 EPOXY SILICON RECTIFIERS

Rated 500 milliamps with a 400 PIV. Fine for rectifiers, converters, etc. Highest quality. Package of two.
No. 32A15—Epoxy Silicon Rectifiers, pkg of 2 ..... .99

5 TOP HAT SILICON RECTIFIERS

Lowest price ever. Miniature silicon top hat rectifiers, rate 500 ma with a 400 PIV. Normally would cost two to three times our low price. First quality with 1½" leads. Package of two.
No. 32A16—Top Hat Silicon Rectifiers, pkg of 2 ..... .99

6 POWER TRANSISTORS

PNP power types similar to 2N155, rated 10 watts. Fine for converters and power supplies where the extra oomph is needed. Package of two.
No. 32A14—Power Transistors, pkg of 2 ..... .99

FLASH NEWS

SPECIAL! . . . New Items

Parts for the B & D Pulse-a-Tone Receiver, Pulse-Modulator, and the **Feedback Servos,** as required for the three-part article which is appearing in the **March, April,** and **May issues of Model Airplane News** by **Don Dickerson** and **Norm Behler.**
Gem, 100 ohm double pole double throw relay $5.95
All one quarter watt AB CB ¼ watt resistors. One hundred percent American made. Each ..... 15 cents
PC Board for the B & D Receiver in the March '63 MAN $2.95
B & D Pulser Modulator in April '63 MAN $2.25
B & D Feedback Servo Board $1.95

The special Allen-Bradley Pots and many of the other components as required for the B & D System are either in stock listed in our 1963 A Catalog, or many will be coming in stock soon. **Write us your needs.**
ACE R/C—BOX 301—HIGGINSVILLE, MISSOURI

TACHOMETER

For peak performance you can't beat a tachometer. It will tell you exactly the RPM's being put out by your motor—high speed, low speed and in between.
The ZimTac is electronically calibrated. Of rugged construction and compact size. Direct drive, instant reading and quality meter. Great for comparing RPM of fuels, props, etc. Very accurate plus or minus 200 RPM. Measures from 0 to 25,000 RPM. A must for the serious modeller.
No. 31A16—ZimTac Tachometer $14.95

DMECO RETRACT GEAR

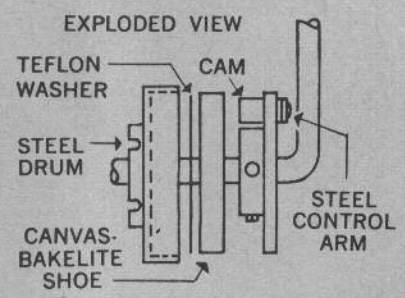
dmeco's sensation! For all model aircraft. A precision built unit for retracting the landing gear on any type of model, rugged construction and yet light in weight.
Operates with 3 to 5 volts and a simple SPST switch. Any number may be operated simultaneously. Unitized construction, easily removable. Built in shock absorbers . . . Steerable or fixed gear as desired. Weight 3½ ounces . . . Size 1 x 2 x 3¼". Ready to use, just plug in. Complete with installation instructions. No. 25A21—dmeco Retract Gear R/C8 ..... $24.95

DMECO NOSE WHEEL

With dmeco's steerable nose gear you will have precise and easy ground control and straight line take-offs in wind and calm!
The gear features flat plate mounting and internal or external steering to suit all models. The length is also adjustable. Precision castings, accurately machined and assembled. Weight only 2 oz. Complete ready to use with installation instructions. No. 25A17—R/C 7 dmeco $3.95

TRANSLATOR IMPROVED

Ecktronics announces that they have made a significant change in their escapement, both the Translator and the Enginac, which allows them to be pulled in on as little as 2 volts. All recent releases have been of this improved variety, and according to reports, work especially well with the relayless type of receivers, and are among the most sensitive and yet vibration proof units available. Ecktronics will modify any of their older escapements that will not pull in on low voltages for a $1.00 mailing and handling fee. The Translators should be sent directly to Ecktronics at 2109 South Wright Street, Santa Ana, California, for this factory conversion.



DUBRO WHEEL BRAKES

Positive action. Stronger . . . Lighter. Brake itself ½ oz. complete. Designed to couple to Du-Bro Dura-Hub Wheels . . . Canvas-Bakelite shoe . . . steel brake drum assures a longer life . . . no scoring . . . more positive stops. Shoe is keyed in place. Steel control arm riveted on and can be adjusted—any position that is desired. Will couple to DuBro Wheels. No. 25A29—WB-M1 DuBro Brakes, pair $7.95

FROM CITIZENSHIP
ZR-10 RECEIVER—TEN CHANNEL SELECTIVE SUPERHET RELAYLESS MULTI SIMULTANEOUS RECEIVER—$79.95

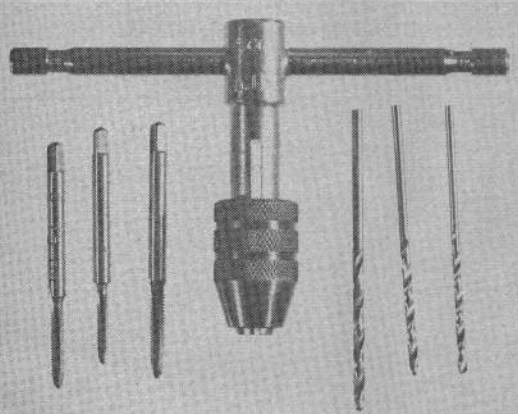
Newly designed STIFFER REED BANK on higher frequencies prevents false commands from vibration . . . Improved sensitivity and signal to noise ratio . . . 6 Transistors—crystal controlled . . . Selectivity permits use on all six approved frequencies simultaneously. Available on order on 26.995, 27.045, 27.095, 27.145, 27.195 and 27.255 mc . . . Change frequency by simply changing crystal . . . Uses inexpensive 9 volt hearing aid battery available even in drug stores . . . Especially designed to operate with TMS Transmitter . . . Use with 5 CITIZEN-SHIP TNA or TCA Servos . . . Measures 2⅛ x 3¼ x 1-1/16 . . . Weighs 4 ounces . . . Voltage Required—9 volts . . . Battery Required—Burgess (P6 or 2U6 or 2N6) or—Eveready (226 or 216 or 246).

TMS TRANSMITTER—COMPACTIZED, HIGH POWER, ALL TRANSISTORIZED, MULTI SIMULTANEOUS FOR REED OPERATION—10 CHANNEL—$119.95

Output equivalent to tube transmitter because of high power silicon transistor used . . . Absolute tone stability to 140° Fahrenheit . . . Uses one 9 volt battery (no expensive power pack needed.) . . . Collapsible externally loaded antenna furnished . . . Especially designed to operate with new ZR-10 Receiver . . . LIGHT WEIGHT aluminum case—Weighs ONLY 3½ pounds including battery. Measures 8¼ x 6⅝ x 2¾ . . . Available in the following frequencies: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255. Voltage Required—9 volts . . . Battery Required —Burgess (one or two C6X) or Eveready (Energizer #2356 or #276).

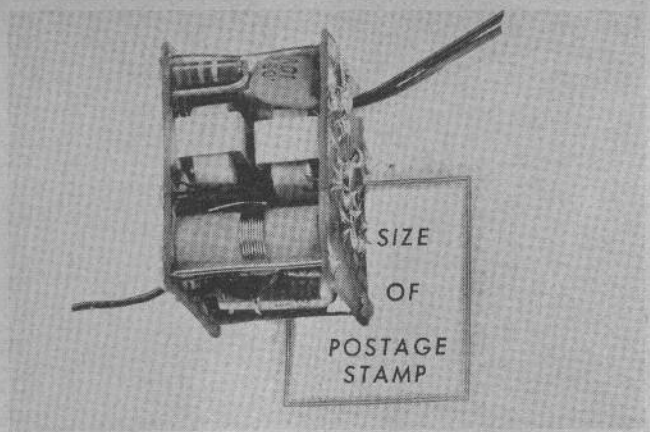
SPX TRANSISTORIZED TRANSMITTER—SINGLE CHANNEL TONE CONTEST TRANSMITTER. COMPACTIZED—HIGH POWER—ALL TRANSISTORIZED—DELUXE—$39.95

High power silicon output transistor used . . . Uses single inexpensive 9 volt battery . . . Collapsible externally loaded antenna furnished . . . Operates any single channel tone receiver . . . Same high output as best tube transmitters . . . Available in 26.995, 27.045, 27.095, 27.145, 27.195, and 27.255 . . . Measures 6¼ x 3⅝ x 2¾ . . . Weighs 1 lb. 14 oz. with batteries . . . Voltage Required—9 volts . . . Battery required—Burgess-D6 or Eveready-276.



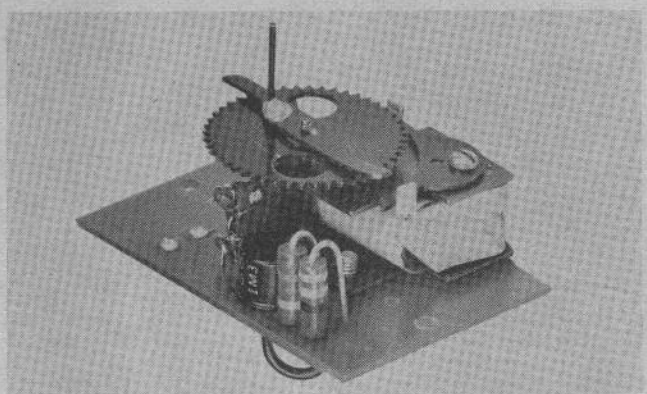
MIDWEST TAP & DRILL SET

High speed matching tap and drill set from Midwest. The tool every model builder needs. Includes those popular but hard to get sizes. Housed in clear plastic case. Easy storage and pickup foam plastic insert. Tap and drill sizes lettered on top of case. Set includes 1 tap each 2/56, 3/48, 4/40. 1 drill each 50, 47, 43. Handy firm grip tap wrench. No. 31A15—Tap & Drill set $4.95



MDL SINGLE CHANNEL RELAYLESS TONE RECEIVER—$24.95

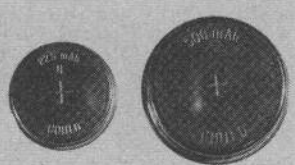
Smaller than a postage stamp . . . Module type construction . . . Super regenerative relayless tone receiver . . . Receiver designed for perfect unit operation with powerful Citizen-Ship escapement . . . ¼A plane accommodates receiver and escapement . . . 2 pencells operate both receiver and escapement . . . Operates from any tone transmitter . . . No sacrifice of sensitivity from ultra miniaturization . . . Virtually crash proof . . . Size with plastic cover—⅞ x 1 x 11/16 . . . Weighs ½ ounce . . . Voltage required—3 volts . . . Batteries Required—2 Pencells.



NEW TRANSISTORIZED ESCAPEMENT—CIRCUITRY FOR MOTOR CONTROL TO OPERATE FROM SINGLE CHANNEL RELAYLESS RECEIVER. MODEL SE-2-M $12.95

Extra parts to achieve extra reliability . . . Operates an auxiliary PSN-2 on momentary pulse (quick blip) from transmitter.

NICAD®



NICAD RECHARGEABLE BATTERIES

Here are the only GENUINE NICAD (Trade Mark Registered)—batteries distributed by Gould National—a top name in batteries in the world. We are offering their two button type cells first, but will add others during the year. These are high rate units—and are ideal for R/C receiver uses. Construction is shown below and offers the best mechanical type of seal we have seen. Offered with solder lugs to make it easy to connect. (Do NOT solder directly to the case of any NICAD).

500 BH is 500 mah. Size is ⅜" thick by 1-23/64" dia., fits nicely into Medco PM5 case. With solder lugs. With full charging instructions. No. 38A38—Nicad 500 BH $2.50

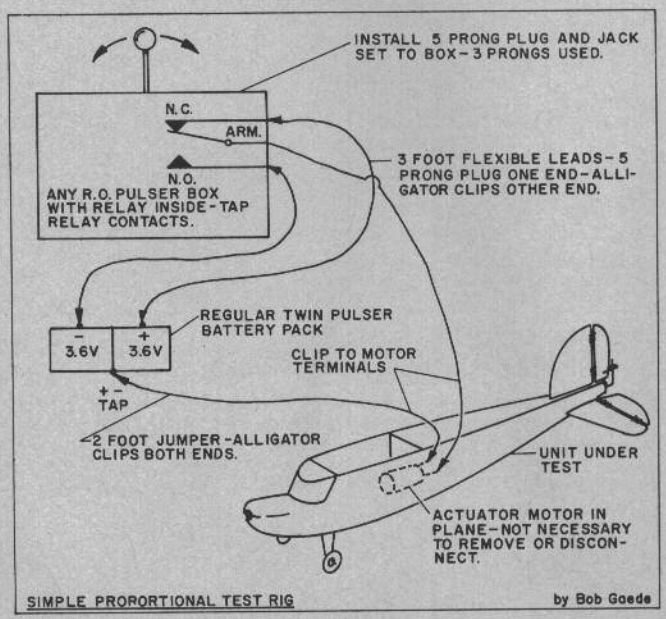
225BH is 225 mah. Size is 23/64" thick by 1" dia. With solder lugs. Charging instructions included. No. 38A39—Nicad 225 BH $1.75

R/C FANS NOTE:

GRID LEAKS HAS COMPILED A 60 PAGE BOOKLET ON THE SUBJECT OF PROPORTIONAL CONTROL. VALUABLE INFORMATION, COMPILED FROM ALL THE PAST ISSUES OF GRID LEAKS! CONSISTING OF RUDDER PRIMARILY —BUT INCLUDING HARD TO GET INFORMATION ON MOTOR CONTROL, GALLOPING GHOST SYSTEMS AND MAKING YOUR OWN ACTUATORS, CONTROL BOXES AND PULSE DETECTORS. ORDER # GL-PPC . . . ONLY 2.00 PER COPY! ACE R/C—BOX 301—HIGGINSVILLE, MISSOURI

BITS AND PIECES

EDITOR'S NOTE—Many readers have indicated that this feature has a practical usefulness that transcends the casual interest value. Do you have a tip that might help your fellow R/Cer? Sketches or drawings should be drawn as completely and neatly as possible. The "cleaner" and more detailed your "copy" is, the better the job GL can do in putting across your idea. Material should be sent direct to Grid Leaks (Bits and Pieces Dept.), Box 301, Higginsville, Mo.



SIMPLE PROPORTIONAL TEST RIG by Bob Gaede

SIMPLE PROPORTIONAL TEST RIG
by Bob Gaede—Townson, Maryland

■ The set up described and shown in the drawing is a simple way to check out proportional systems and locate troubles, or make sure of installation without a lot of bother and needless chasing after bugs that do not exist.

With proportional being tried by more people, the author feels this device may save considerable time in spotting any difficulties, and actually pin pointing them and being able to do something about them fairly quickly, without all of the detail of going completely from the pulse box through the transmitter and the receiver through the relay to the actuator.

Designed primarily for the RO (Rudder Only) type of systems, a little study will show, however, the test rig also will adapt quite easily for Galloping Ghost (GG) systems and even the more complex systems as developed by Walt Good in his TTPW, simply by checking for only one function at a time.

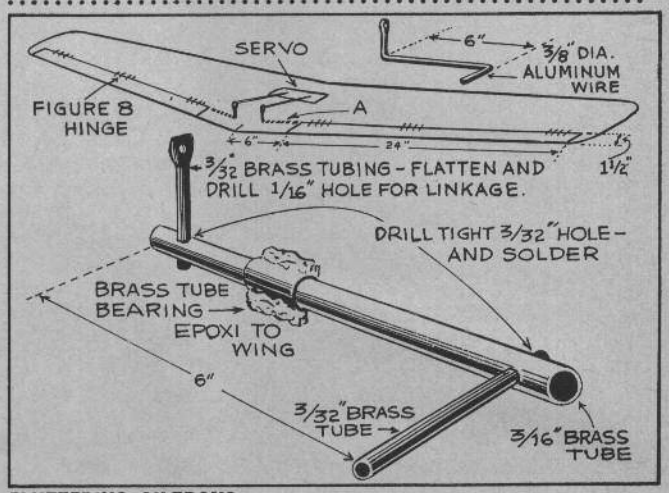
The test rig is for use ONLY with pulsers that use relays. The secret of its simplicity is that it completely by-passes the receiver and transmitter and checks out the proportional actuator in the installation and eliminates a lot of "ifs." If the set up works with the test rig, you can confidently proceed to the next step in installation and run further checks. It is in the initial set-up of proportional systems that beginners (and pros!—editor) can run into trouble. This rig will check out and detect trouble in:

1. Individual WAG Dual actuators one at a time.
2. Any Rudder-only actuator.
3. Motor-control circuits (pulse-omission detectors, pulse-frequency detectors, etc.)
4. Relay malfunction in receiver or in other pulsers, simply by substituting a known good pulser in the circuit.
5. Battery troubles and wiring errors in an installation, again by substitution. (Note: One of the most common mistakes in proportional can be the assumption that the batteries do not cause trouble. They can and do—it is quite easy to believe that the batteries should be OK, they were just bought new!; or that the batteries being used are of sufficient capacity to operate the proportional system forgetting all about the fact that in proportional there is a drain on one set of batteries most of the time—this is quite different from escapements, and presents its own peculiar problems.)
6. The rig also checks out actuators in a new plane without wiring or even without the receiver installed, thus assuring that linkages are free and smooth acting.
7. Spots centering troubles which are mechanically caused, by centering devices, or by noise in a receiver if the actuator does not work correctly when receiver is installed. Spots whether it is actuator or receiver causing the trouble. (If actuator works without receiver in circuit, trouble is in the sensitivity of receiver, and noise and other factors must be filtered out for satisfactory performance.)

The test rig is simple in operation. It merely substitutes the pulser's relay for the receiver's relay and by the process of elimination allows you to spot where your troubles come from. If used first, it will help keep troubles from developing.

8. Use same set up as shown to check out pulse-omission detector and motor control or fail-safe type of circuits. For Galloping Ghost systems, the hookup is the same as shown in the drawing.

This simple set up is one of those ideas that looks deceivingly simple, but may save hours of trouble shooting and bug hunting. Every pulse fan has the basic set up—all that needs to be done is to apply it in this simple fashion for top notch results!



FLUTTERING AILERONS
by Walt Good (DC/RC Newsletter)

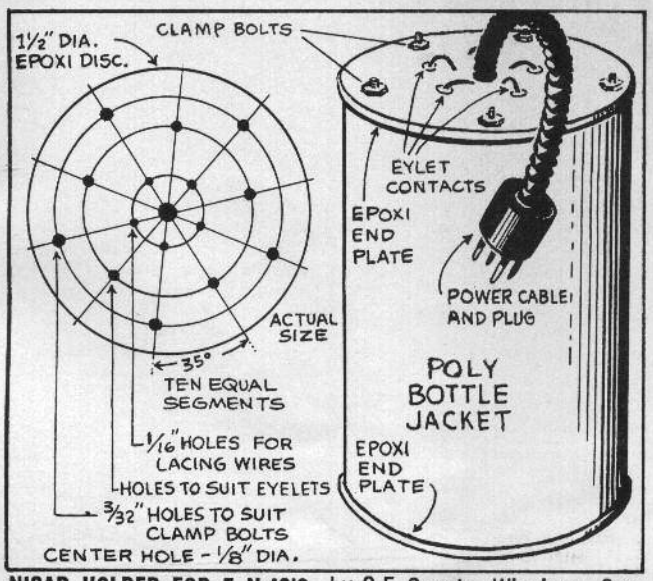
■ THE NEW 64-INCH WING for the *Bug Bomb* uses the new full-span aileron. This narrow aileron was introduced to R/C by Lou Andrews and made popular by Harold deBolt. My version shown in the sketch has 24 x 1½-in. ailerons built up from 1/32-in. sheet balsa.

The first flights showed much faster roll rate than the previous conventional ailerons using the same proportional servo (Spring centered-geared-Mikromax). Also, the roll control at low flight speed was very good. Then in a high-speed dive, the plane emitted a noise like a Bronx cheer and the wings were just a blur. This was aileron flutter. Roll control was no longer with the pilot. Up-elevator and low-speed engine slowed the plane and stopped the aileron flutter.

Flutter usually is due to three causes: 1) Ailerons too heavy; 2) Slop in linkage; 3) Linkage too springy. Items (1) and (2) were ruled out and we settled on (3)—linkage too springy. In Fig. 1. the detail (A) shows the torsion-bar linkage made from 3/32-in. dia. hard aluminum wire—actually aluminum welding rod. As stiff as this seems, about 2.5 times stiffer than 1/16" music wire, it was not stiff enough. The solution was to go to a far stiffer torsion bar made from 3/16-in. dia. brass tubing with 3/32-in. brass tubing crank arms as shown in Fig. 2.

The crank arm at the right is cemented to the end of the aileron with Epoxy. The left hand arm is flattened and drilled to accept the aileron linkage. The new linkage has flown at all speeds through about five gallons of fuel with no indications of any flutter. Moral—Make the aileron torsion bar *stiff!*

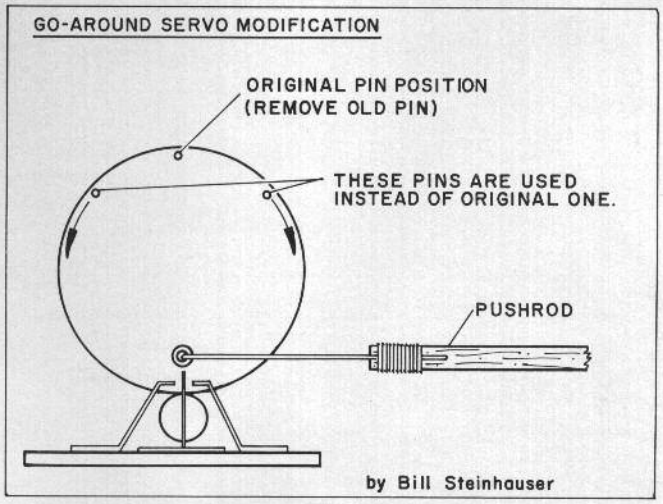
(Editor's Note: A Viscount—full-span ailerons—flown by one of our local boys encountered the same difficulty. Since the torsion bar was "soft" the first fix called for a stiffer bar—perhaps not stiff enough, for the flutter persisted. Progressive long triangular cuts then were taken off the aileron tip, narrowing it to, roughly, half aileron chord at the tip. With each cut the flutter grew less and finally terminated. In low fly-bys the white edge of the cut aileron TE showed clearly and the amount of blur was an indication of progress. Good response remained. It is to be noted that the airplane was fitted with Brown's proportional control and a slight surface movement is present. It was thought this might induce the flutter, so both low and high rates were tried, with no visible affects. On the same day another Viscount on reeds showed no aileron flutter.)



NICAD HOLDER FOR 5 N-46'S by C.E. Swartz--Winnipeg, Can.

■ ASSEMBLE 5 N-46 CELLS to desired polarities around length of dowel and slide into length of poly bottle (will be a tight fit). Wire end caps (epoxi discs) as desired using ⅛" center holes and 1/16" holes nearby for lacing wires—run wires from bottom cap up through center hole in dowel. Bolt entire unit together with long 3/48 bolts running in niches between cells—use spaghetti over bolts to avoid chafing cells. Materials:

2—1½" Diam. Epoxi Glass Discs (Drill & Eyelet as per diagram)
10—Eyelets
1—1¾" Length ⅜" Dowel (Drill Lengthwise ¼")
5—2¼" Lengths 3/32" Brazing Rod (Threaded Ea. End 3-48)
10 Ea. Nuts & Washers to suit above
5 Lengths Spaghetti Tube to suit above
1—⅞" Length Poly Tube (cut from 2 oz. Poly Bottle)



GO-AROUND SERVO MODIFICATION

by Bill Steinhauser—Pittsburgh, Pennsylvania

■ Many of us would rather have a damaged plane than a "lost" one. We all know half an apple is better than none. This modification gives more rapid motor control and it is positive. You get the motor control without the so-called "fail-safe." A "fail-safe" would be great if one were flying on the Great Salt Flats. Pennsylvania just isn't a place for "fail-safes."

CORRECTION

■ I was pleased to see my Galloping Ghost actuator in your recent publication, but it appears that possibly my sketch was not clear enough. The principle is completely violated as shown. With the centering "relaxed" as shown in sketch, the crank of the big gear should be in the down position.

Incidentally, I should have mentioned our club—The Flying Robots. It appears that the active members will all have a Ghost ship by next flying season.—Bowen F. Gover

Readers Write!

GOOD BROTHERS' RECEIVER

I am an RC modeler of long standing and your latest issue of GRID LEAKS brought back many memories. My first successful receivers were Chinese copies of Beacon Electronics, Good Brothers' receivers. They flew on six meters in those days (pre Citizens Band) and used VFO for a transmitter. I lived in DC then and was a pioneer member of DCRC when it met at Walt's house in Silver Spring and Bethesda.

I have my own technician band license now and I fly on six meters with one of your Kraft Relayless 10 receivers with complete success (except for my wild piloting).

I have a question on your November/December 1962 issue, page 18. You describe changes on an LT-3 for six meters. I am interested but confused. What is an LT-3? (a receiver of course but who makes it?)

I like the new format. Your paper has improved steadily since Vol. 1 No. 1. (I have a complete file), and seems to have a bright future.—Raymond G. Yaeger, Wayne, Penn.

(Editor's Note—The LT-3 is made by Citizen-Ship.)

GOOD SUGGESTION?

I wish to extend a belated thanks to you for the subscription to GRID LEAKS magazine which I received for placing in the IMPBA International Regatta held in Seattle last July.

This is certainly an excellent publication—and the only all technical American periodical for and about radio control. My only possible complaint—aside from the long interval between issues—is that I would like to see more technical matter, perhaps somewhat on the order of the English **Radio Control Models and Electronics.** This, of course, is my preference as to the contents and may well be the minority viewpoint, although I do believe that the average modeller would benefit in many ways by being more informed as to how and why radio control works—Ralph C. Mifflin, Seattle, Wash.

NOMADIC NOTES

I was interested in the letter from S. E. Wolverton published in GRID LEAKS, Vol. 3, No. 11 where a Nomad .020, K3VK and add-on switcher combination was suggested, together with a magnetic actuator for proportional gliding. I flew this combination for about a month last summer until the Nomad was caught in a real thermal. On attempting to turn sharply and spiral down out of the thermal, one wing just folded up—that was the end.

The actuator was an old Sage and the whole rig was driven by one Burgess AL-133 heavy-duty alkaline battery. I had about 45 rather short flights, two to four minutes each, on the one battery, although I tried to be quick in switching off the actuator after every flight.

The Nomad ready for flight weighed 13½ ounces(!) and the .02 just managed to get it up to about 150 feet before it ran out of fuel. Even so, I had several flights of 10 minutes or more. The only change in the Nomad was to increase the rudder area by 70 per cent, although I flew with the original rudder when I first built the ship.

Nothing beats a quiet summer evening hunting for the last thermals with the proportional Nomad.

Next project: A 50 per cent larger Nomad, same gear and an old .049. —Alan J. Lemin, Kalamazoo, Mich.

SWITCH TIP

You invite opinions, here is mine. Proportional will become the ultimate in R/C. What realistic person wants to fly an airplane like he would operate a crane?

Reliability article in latest GL is excellent. . . . In the area of switches I can think of no better tip than the one that Walt Good listed in the instruction manual of his old Beacon Electronic equipment. If a switch has a resistance of more than 1/10 ohms, don't use it! This tip was brought to memory after tracing an erratic transmitter to a switch which had developed a 5-ohm resistance!

Congratulations on the good job you are doing at Ace.—Wendell Hostetler, Orrville, O.

BELLAMATIC SERVO FOR PULSE

The new Bellamatic servo is the best servo for pulse up to date that I have used—that is, without going into the feed-back system. It has no bad features. It is the lightest, most powerful and uses less batteries.

It takes about 2.4 volts on each side to run the largest rudder surface to the extreme of its travel. It has as much power full-throw as it does at half-throw.

I've been dabbling with proportional for about two years and this is the first system I have flown. I traveled 350 miles to enter my Charger in the last contest of the season in September and came away with first place.

I am using the Kraft transmitter and receiver with the Shows' pulser and Broadhurst P.O.D. The system is now in a Falcon and it is smooth.—J. I. Kinnaman, J. I. Model Mart, Baker, Oreg.

DPDT TRANSISTORIZED SWITCH

In your last issue of GRID LEAKS in the Readers Write Dept.—D. E. Henshaw, of Windsor, Ontario, was asking about transistorized switches available for R/C work.

There is a DPDT transistorized switch available from Simpletronix, 1904 E. 73rd., Crown Point, Indiana, which will handle loads up to 1000 MA without trouble. I have been using it to cut my battery weight in half for G.G. or S.S.

This little dandy weighs an ounce and is about an 1¼-inch square. The ony way I know of to hurt it is to hit it with a hammer. It runs $15.95 and does not need a separate battery supply. I have used mine two seasons now without any trouble.

Your new magazine layout is tops—and keep the proportional pieces coming.—Max White, Crown Point, Ind.

THROUGH A BEGINNER'S EYES

I've just gotten a good start in R/C. Have an Otarion and Ektronics transmitter. Made one of your K3VK receivers and it worked right off the bench.

The cold here knocks it out, however—the Otarion, too. I'm also convinced that I need a super-het receiver. Liked the New Haven Electronics solid-state job. Can't decide between multi and Inkman's proportional, but believe his system best for beginners. I have enough trouble controlling a rudder-only with escapement.

We need more articles like "A Question of Reliability." Everyone writes glowing reports about good features and ignores the pitfalls which can cause us beginners to become disgusted.—Glen A. Derber, Neenah, Wis.

(Editor's Note: It gets colder than cold in Wisconsin in the winter!)

GRID LEAKS

IN THIS ISSUE

Volume IV, Number 2—March-April 1963

(Many a good idea in these pages—
do you have any you want to share?)

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