A Radio Control Publication for Beginner & Advanced Modeler

GRID LEAKS

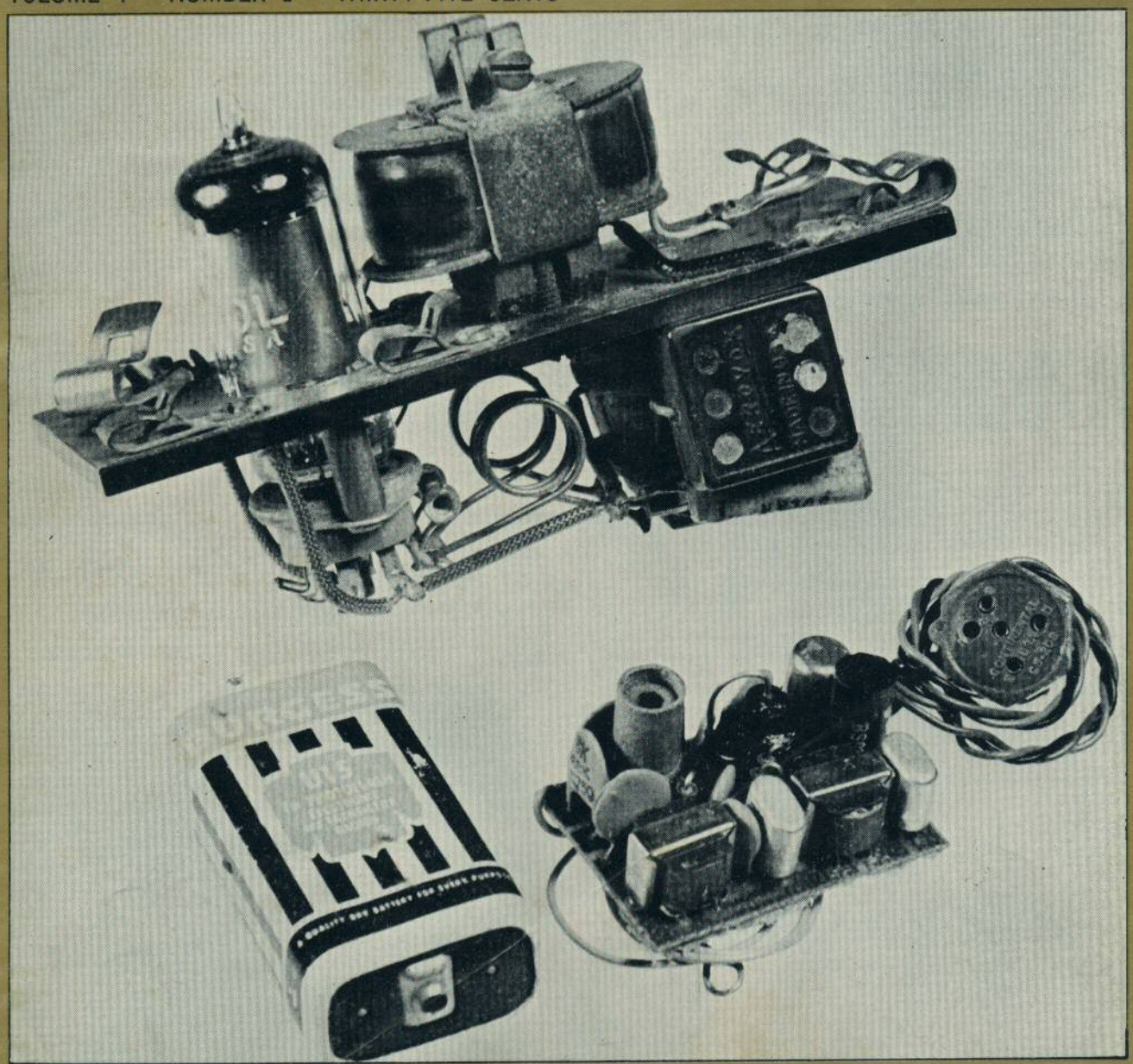
JANUARY
FEBRUARY • 1963

R/C
DATA
SERVICE

VOLUME 4 • NUMBER 1 • THIRTY-FIVE CENTS

SPECIAL!

At last, the Marcy PRM-1 system! Proportional rudder with positionable motor control by means of a feedback servo. It eliminates rudder waggle and gives unparalleled smoothness. Also, a comprehensive how-to-do-it on photographic printed circuits — clear and concise!



Fifteen years of progress! Good Bros. receiver, top, weighed 16 ozs. installed with batteries. At bottom is the modern Kraft single.

GL'S ANNUAL BIBLIOGRAPHY OF RADIO CONTROL ARTICLES, PLANS, ETC.
THOUGHT PROVOKING—READ "A QUESTION OF RELIABILITY" • WHAT'S NEW?

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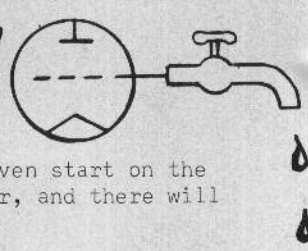
Grid Leaks At Play



Dear Grid Leaks Reader:

With this issue begins Volume 4. Volume 3 ran eleven issues to give us an even start on the year 1963 and Volume 4. Now the numbers of Grid Leaks will coincide with the year, and there will be six numbers per volume per year.

In the last issue of Grid Leaks a brief resume was given of the proposed rules changes. This is the mulling over time and all of you are urged to let your feelings to be known to your district contest board member for radio control so that when the rules are finalized in three or four months from now that you will have had a voice in their finalization. We think there is nothing more unfair than for anyone to gripe about the rules when nothing has been actively done by them about those rules. It seems that in a democracy, and the Academy of Model Aeronautics is also a democratic organization, many people simply do not exercise their franchise of letting their wants being known and their wishes felt, and then are quite vocal about what should or should not have been done--after the time for voting is over!

With all the vehemence at our command we strongly urge and highly recommend that every reader of Grid Leaks who is a member of the A.M.A.--this could be a subject for another editorial since we feel that all readers of Grid Leaks should belong to A.M.A.-- let your contest board representative for radio control know exactly how they feel about the Class 1, Class 2, and Class 3 proposals.

We sincerely hope that this will be the case because we are somewhat tired of listening to gripers and then find out that those gripers have not actually gone through the democratic process. This applies to R/C rules as well as it does to national politics. We feel that unless you have voted in a national election, or you have voiced your feelings to the contest board, you have no right to express your opinion any other way because you are given the manner in which you can voice your opinion, and your opinions are duly noted and acted upon. But if you do not exercise your franchise you have no one to blame but yourself.

We're very proud in this issue to begin the first part of a two series article of the Marcy PRM-I System. This is a system which is engineered from the pulser through the tone generator through the amplifier through the MOPA section into the receiver and then into the two servos. Each part of the system complements the other and is an integral part of the whole system. We believe that this first thoroughly engineered system for simple proportional rudder and motor control and will do a lot to get proportional control in the hands of many more. Admittedly it will be higher in cost than the Mickey Mouse approach, but we believe the overall impact, because it is a designed and engineered total concept, will be much more satisfying than anything in single channel proportional has been up to now.

And speaking of proportional, it looks like at long last there are many other commercial outfits that will be on the market during 1963. There has been Space Control, and now there appears the Don Brown Multiplex System, along with the Sampey Expandable System, and then the eventual release of Airborne Control Lab's unit.

There is one thing we'd like to toss in on the proportional control bit, and that is that the man behind the stick is still the most important and determining factor as to whether or not he can turn in good flights. Just because you have "X" brand of transmitter this doesn't make you a Kazmirski when it comes to piloting your aircraft. Also just because you have proportional, and the potential for proportional flying is the smoothest and the best, this doesn't automatically guarantee that you will fly this way.

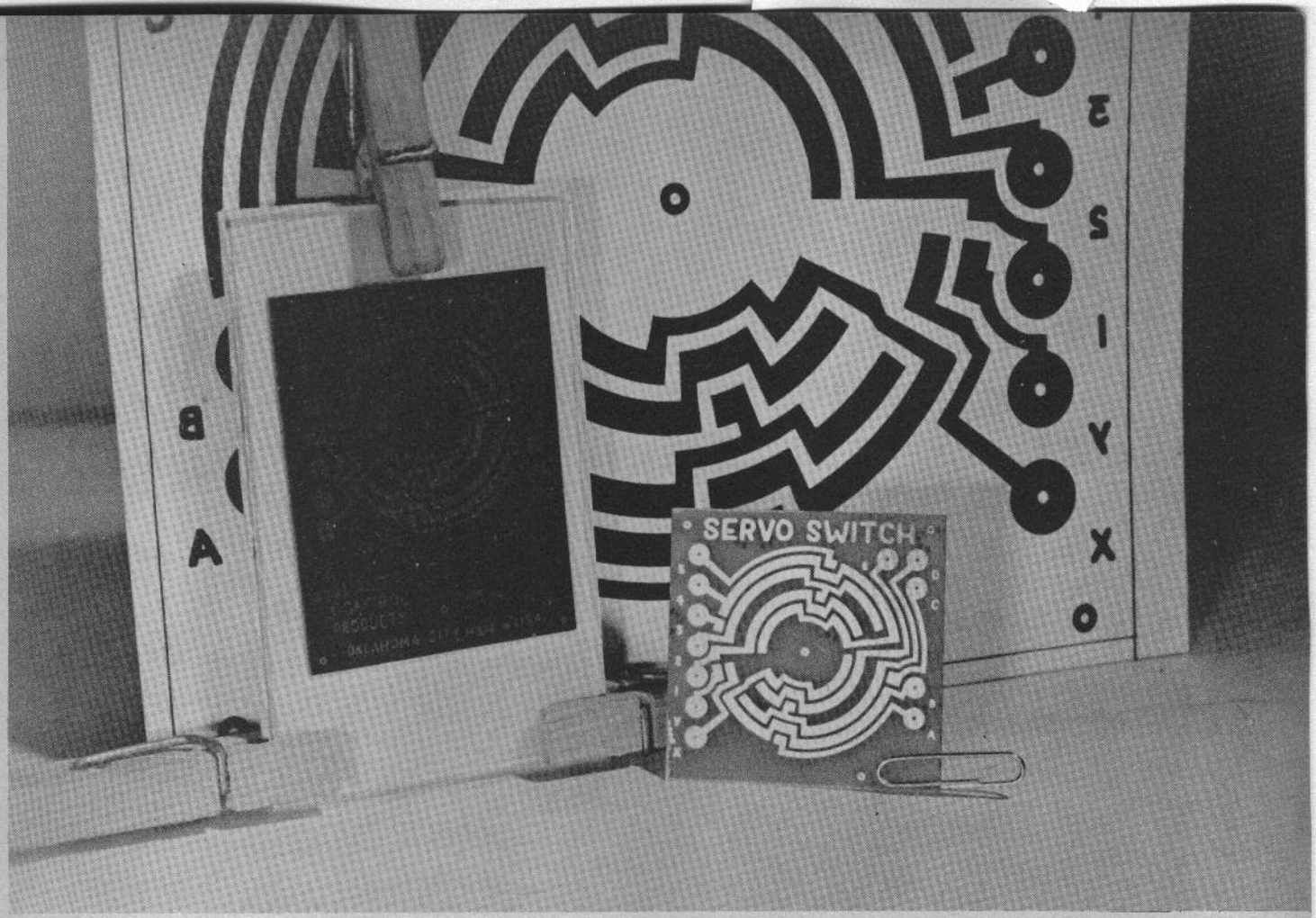
From where we sit 1963 looks rather exciting from the standpoint of the production of new systems, as well as simpler systems. We hope to be presenting some of the latest ideas and the best ideas within these pages in the coming months ahead.

Yours sincerely,

Paul

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.



Any circuit that can be drawn on paper—usually two to four times up—however complicated, easily can be transferred to copperclad board.

PHOTOGRAPHIC PRINTED CIRCUITS

By GORDON FLENNIKEN

Step-by-step procedure for making your own printed circuit boards by the photographic process. Knowledge of darkroom procedures not vital.

Kit offers hard-to-get materials, accurate, professional results.

NOTHING GIVES THE CREATIVE PERSON so much satisfaction as seeing an idea transformed into a completed work. Amateur printed circuits made by the photographic technique approach the ultimate in achieving this end. Here, in a step-by-step process, the original idea actually progresses from rough sketch through the stages of development to the final professional quality product. But for the differences in circuitry and complexity, the finished printed circuit board can approach the quality of those now orbiting the earth in our satellites! Anyone with some mechanical aptitude or the ability to make a fair black-and-white drawing — using even simple instruments — can make finished PC boards that are quite good.

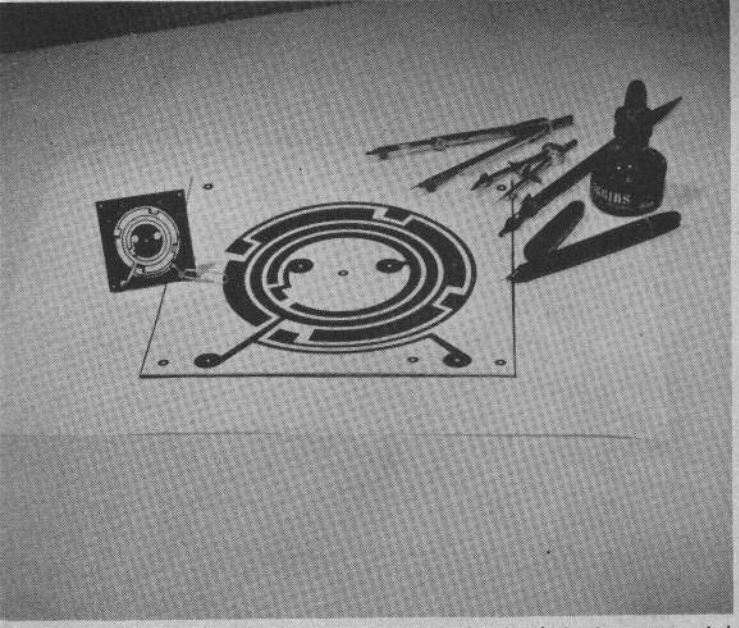
Essentially, a printed circuit made by photographic means is an extension of a black-and-white drawing. The quality and accuracy of the drawing becomes the quality and accuracy of the finished circuit. By this means exact duplicates may be made in any quantity.

Actually a knowledge of photographic dark-room procedure is not required, though it could be useful. Those who have some familiarity with simple drawing instruments such as those used by high school mechanical drawing students will have a definite advantage. That is, they will be able to produce circuits of much greater complexity. However, even this is not required. If you can draw a strright line (with the help of a ruler), make simple lines and curves with a fifteen-cent Speedball lettering pen and handle a razor blade without amputating a finger, then you have all the necessary ability to go through with this project.

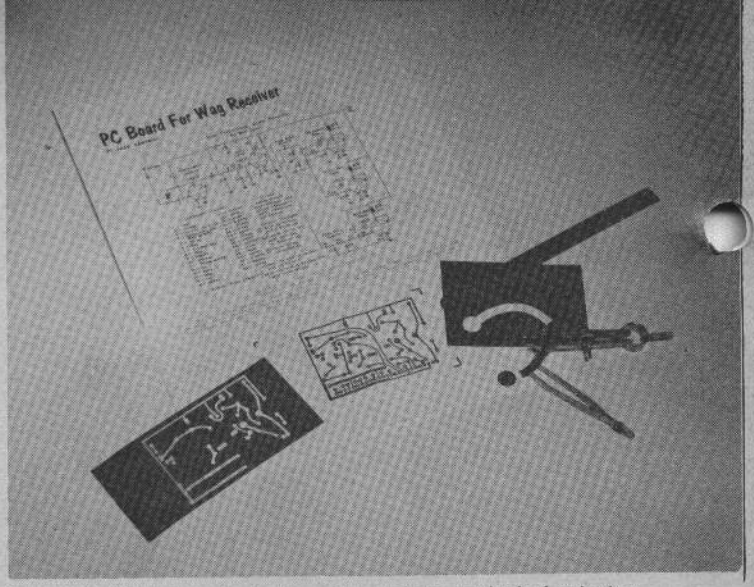
So many articles (see note * have already been done concerning circuit design, parts layout, etc., which lead to the need for a

Continued on Next Page

* Printed Circuit Wiring for R/C Use — Ed Lorenz in BEST FROM GRID LEAKS.
Silkscreening PC Boards — Ed Lorenz in BEST FROM GRID LEAKS.
Photographic PC Boards — DC/RC Newsletter, BEST FROM GRID LEAKS.
Negatives for Photo Etching PC Boards — John G. Burdick, GRID LEAKS for July-August 1961.
PC Boards Are Easy — GRID LEAKS for March-April 1962.
(All available from Ace R/C, Inc., Box 301, Higginsville, Mo.)



1. Black-and-white 4X scale drawing of printed circuit rotary switch plate and completed photographic negative. This method of making a negative gives the most nearly perfect results.



2. Partially finished mechanical negative and one method of stripping. The article pictured furnishes an exact scale layout of the printed circuit to build a modified WAG receiver. Spaced needles or razor blades in a balsa or hardwood stick make efficient cutters. Small dots may be cut with the sharpened end of thin-wall metal tubing.

PHOTOGRAPHIC PRINTED CIRCUITS

printed circuit and the actual design of printed circuits and their current carrying capacities, that we shall skip these and dive right into the business of making the actual PC board itself.

At this stage you need to select the photographic method that you will use. There are several, and your choice will depend on what equipment is available and the degree of perfection and accuracy you want. This article will deal with material furnished in a new photographic PC kit that is now available. This kit includes all the necessary material that heretofore has been quite difficult to obtain in quantities suitable for the R/C fan.

Photographic technique in making printed circuits falls into two divisions. The first is an actual picture taking process; the second is mechanical and does not involve photography in the sense of making a picture with a camera. While the first method is by far the most perfect and accurate, circuits made by the second method are usually quite superior to those made without any photographic technique at all.

In either method the printed circuit board used is the same and comes already coated with Kodak Photo Resist (KPR) ready to use. KPR is a light-sensitive coating on the epoxy glass board that, when exposed to ultra-violet light and developed, is resistant to the etching solution. A very fast developing solution is included with the kit, and total time for exposing and developing is about seven minutes.

All we need, then, to make a printed circuit is a correct sized negative for exposing the KPR treated board. How we go about making this negative is the point of difference between photographic and mechanical techniques. In either case the negative is used in the same manner after it is made.

The first step in making a photographic negative is to prepare a black-and-white India ink drawing two to four times the size of the desired PC board. Care exercised at this stage will result in a highly professional finished product. The drawing may be made with regular mechanical drawing instruments or it may be made with a simple drawing pen, ruler and dime store compass. The compass pencil lines may be gone over with the drawing pen and India ink. The black portion of the drawing represents the copper conductors in the finished PC board. All the white space represents the part of the copper that will be etched away.

Freehand drawing is quite all right — slightly crooked lines and dots will carry current as well as those drawn with straight edge and compass, the difference being mostly in appearance. However, when such printed circuits as a rotary switch plate are to be made, then it is obvious that accuracy becomes extremely important. The nice thing about photographing an enlarged drawing is that all errors will be reduced two to four times when the negative is made. Thus, a line being 1/16th of an inch off in the original drawing will be only 1/64th of an inch off in the finished negative if it is reduced four times. The outline or the corners of the finished board should be included in the drawing with the proper scaled down dimensions noted so that the photographer will be able to reduce it to the exact size required.

The next step is to photograph the drawing — or have it done, and prepare a negative of the proper size. Most commercial photographers, blueprint houses or commercial printers can make your negative from the scale drawing for a nominal charge. A good copying camera with ground glass focusing is required for this work since any distortion introduced at this point will automatically appear in the finished board.

This method gives the most nearly perfect results. Even small letters or numbers or names can be etched in copper along with the lines and dots that carry current. Complicated PC boards can thus be labeled so that accurate assembly of the components may be done easily.

Mechanical negatives, on the other hand, offer a simpler approach and are highly satisfactory for less complicated PC boards. Mechanical negative material in the form of transparent Mylar** sheets that have been coated with a soft plastic film that will not pass ultra-violet light are included in the kit. This is Ulano Amberlith. When peeled from the Mylar sheet, transparent areas may be uncovered that will allow ultra-violet light to pass. These negatives are quite easy to prepare after the technique of stripping has been learned.

The best instrument for this purpose and one most likely to be at hand is a pair of bow dividers from a mechanical drawing set. For the uninitiated, this instrument is built like a compass but has two needle points instead of one and has a screw adjustment to maintain the setting. When held at a low angle — approximately 30 degrees — with the negative material and pulled across the soft film side with firm pressure, the two needle points will cut through the soft film without damaging the Mylar sheet beneath. The width of the strip may be controlled by the width of the needle setting. A bit of practice will allow you to cut perfect 1/32nd or 1/16th or wider strips with ease. Dots are done simply by using the dividers in the conventional manner as a compass. If held at the proper angle the needle will not tear the soft film, but will cut it sharply.

In the absence of bow dividers a simple substitute would be to set two sharp needles in the end of a dowel spaced the required width apart. They should protrude about ¼ inch. The same tool can be used to make the dots. Stick one of the needle points into the film at the center of the dot, and cut a circle through the soft film with the other needle. Dots thus made will have a diameter twice the width of the line strips, which should be about right. Guide holes for later drilling of the PC board can be incorporated into the negative by placing a small India ink dot inside the circle thus cut, or by cutting a tiny circle from the soft film and sticking it back inside the larger circle. Errors made in cutting the mechanical negative also can be corrected in this same way.

Of course, a straight edge may be used to guide the strip cutting, or in the case of curves, the freehand method is suggested unless a French Curve from your drawing set is handy. The cut film is very easily removed with a tweezers and the adhesive that holds it on always stays with the removed strip, leaving a clean, sharp area. This adhesive will also allow the strip to be restuck to the Mylar backing. Single needle cutting tools may also be used for intricate designs and detailed work. Just remember to keep the correct cutting angle, since the film will tear if the needle is allowed to become upright. Other cutting tools can be used such as an Exacto knife or single-edge razor blade. The needle method, however, is quite efficient.

A preliminary sketch to size with the dots shown as crosses and the connecting strips as single lines can be used as a tracing guide for stripping the film. Place the Ulano Amberlith material mechanical negative over the sketch securely with Scotch tape and cut the dots first using the crosses as centers for the dividers, and then cut the strips following the guide lines with the spaced needle cutting tool.

**TM duPont polyester film.

The hard work is now done, and it is easy to go from here to a high quality printed circuit. The negative is placed emulsion side (Mylar backing of film of the mechanical negative) next to the photosensitive PC board. Needless to say, the copperclad board being light-sensitive, should be handled only under proper lighting. This can be done in a semi-dark room using a photographic safe light or a 15-watt bulb wrapped in red cellophane. Do not use fluorescent lighting. The negative is sandwiched between the PC board and a piece of glass and held with clamps, clothes pins or weights at the edge. Be careful not to cover any portion of the negative that must pass light. It is then exposed for a short interval to ultra-violet light. This can be done by propping the board and negative up on a table and exposing with a No. 2 photoflood bulb 10 inches from it for six minutes. Three minutes in front of an RFL 2 photoflood bulb ten inches from the board will work as well.

After exposure the board is immersed face up in the developing solution and rocked gently for one minute. It is then lifted carefully from the dish and allowed to air dry, which will take about 30 seconds. Do not blow on the surface or touch in any way.

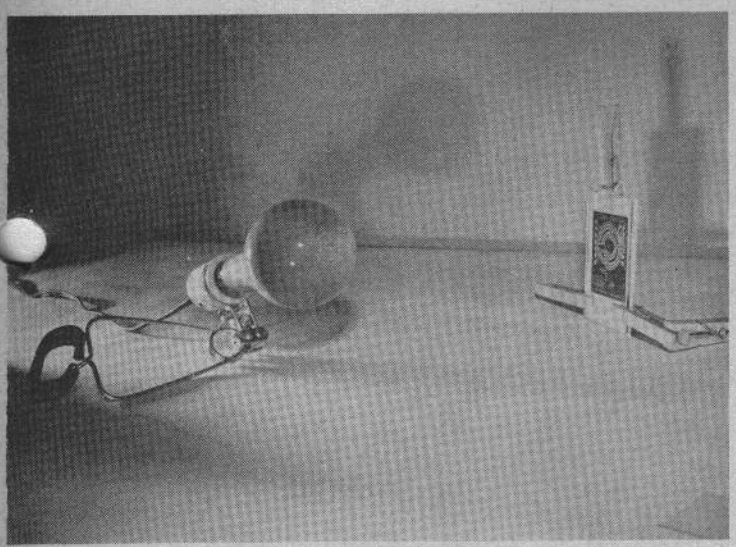
At this stage the board has not changed appearance noticeably. However, if you catch the light just right on its surface — and it is now safe to turn on the lights — you can see the outline of your printed circuit. The lines and dots are effectively coated with an etchant resist just as if you had made them with resist ink or with dots and strips held on by adhesive. The rest of the board is no longer coated with anything and is ready to etch.

Fifteen to 30 minutes immersion in the etching solution with periodic agitation should be sufficient to remove all the unwanted copper, leaving the finished board. The remaining KPR coating on the copper makes an excellent solder flux as well as a protective coating that will prevent oxidation and need not be removed. If desired, an abrasive kitchen cleanser will effectively remove the KPR. After etching, the board should be rinsed thoroughly in running water for 15 minutes. If the etching solution is poured down the drain, be sure to flush with a large amount of water. Drilling the finished PC board is accurate and fast if small guide holes have been etched in the copper dots. These can be provided in the original drawing before photographing or in the mechanical negative. However, center punching the copper dots works equally well.

The new ACRYJEL kit for this type printed circuit work contains several assorted pieces of photo-sensitized epoxy-glass copperclad board, mechanical negative material including an extra piece for practice cutting, a glass for holding the negative in firm contact with the PC board while exposing, and both rapid developing and etching solutions. The only things needed to complete a finished circuit board are drawing instruments (or compass, ruler and pen), white paper, a cutting tool (bow dividers or needles in a dowel rod), an aluminum or glass dish (not plastic) for the developing solution and a plastic or glass dish (not metal) for the etching solution. In addition a safelight (or 15-watt bulb and red cellophane) will be required along with a photoflood bulb as a source for ultra-violet light. Photo clamps or clothes pins will come in handy also.

As in handling any chemical reagents, caution should be exercised and the directions followed closely. The developing solution will react violently with many plastics and is poisonous, while the etching solution will destroy most metals as well as the user's eyes if allowed to splash into them. When handled properly they offer no danger.

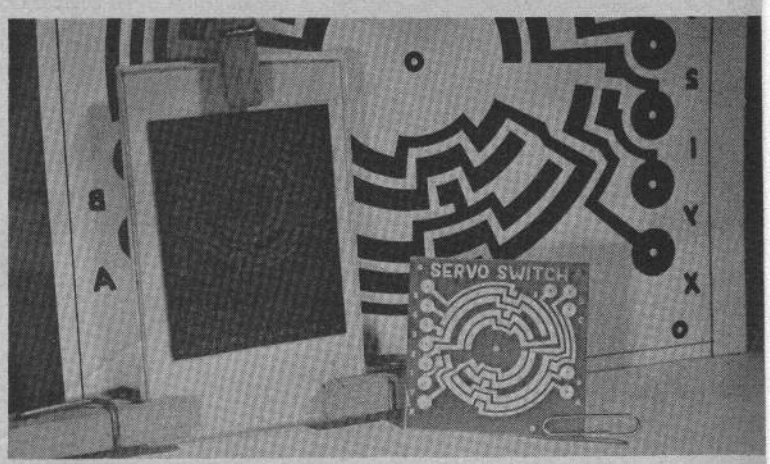
The beauty of this type printed circuit technique, especially when a photographic negative is used, is that any circuit that can be drawn on paper, no matter how intricate, can easily be transferred to a copperclad board. This new kit with its hard-to-get materials at hand will allow a much wider scope of design, accuracy and professional quality workmanship.



3. The negative and unexposed PC board are sandwiched between a glass cover and thin metal or wood backing plate and held with clamps. Six minutes exposure ten inches from a No. 2 Photoflood bulb correctly "fixes" the circuit image. This step must be carried out under a safe light or 15-watt bulb wrapped with red cellophane.

4. After the PC board is exposed it is placed in a metal or glass (*not* plastic) dish and covered with developing solution. Gentle rocking for one minute removes all the unwanted photo resist leaving only the exposed circuit covered. Air drying without blowing or touching for 30 seconds makes the board light-safe.

5. The developed PC board is placed in a plastic or glass (*not* metal) dish and covered with etching solution. Pre-warming the solution in a hot water bath and frequent agitation greatly speeds the process of removing all unwanted copper.



6. After thorough rinsing the finished PC board is ready for mechanical processing—drilling, soldering components, etc. The photo resist remaining on the circuit may be left as a soldering flux and protection against oxidation. Or, in the case of a rotary switch, may be removed by scrubbing with Comet or Bon Ami so that wiping contacts may touch the copper path.

Marcy Inkman and the Tri-Squire used for test flight program. Top— Two servos and receiver (latter foam wrapped) fit neatly in the cabin.

MARCY'S PRM-I SYSTEM

PART ONE

Proportional rudder without unsightly waggling, plus positionable engine control, is offered in a thoroughly field-tested system which stresses simplicity, economy and duplicatability.

By PAUL RUNGE

(Editor's Note—A proposal before the Contest Board, Radio Control Section, of the AMA, would separate Classes I, II, and III according to the axes about which the aircraft is controllable. Since Class I would designate control about the yaw axis, the PRM-I system would fall into Class I. After a six-month required study period, a final Section vote will be taken on this and other proposals. Popular opinion appears to favor the proposed Class definitions.)

"Here, you take it." The speaker was Marcy Inkman. He handed me his transmitter. Both of us had our eyes on the Tri-Squire with its .19 reaching for the breaking clouds in the sky. We had launched it to try out Marcy's PRM-I system in its finalized form. The transmitter fit into the crook of the elbow of my lef arm, and my right thumb and forefinger grasped the stick of the rudder control stick easily and naturally.

It was one of those days. After days of wind and rain, this morning had promised a break, and it had come. The ground was soggy, but the clouds were breaking and the peeks of the sun were stimulating. But not as stimulating as handling the test bird flying about.

Flying was really the only word that could be used. The test had turned from a routine into a very satisfying experience. The Tri-Squire performed as if it held the pilot.

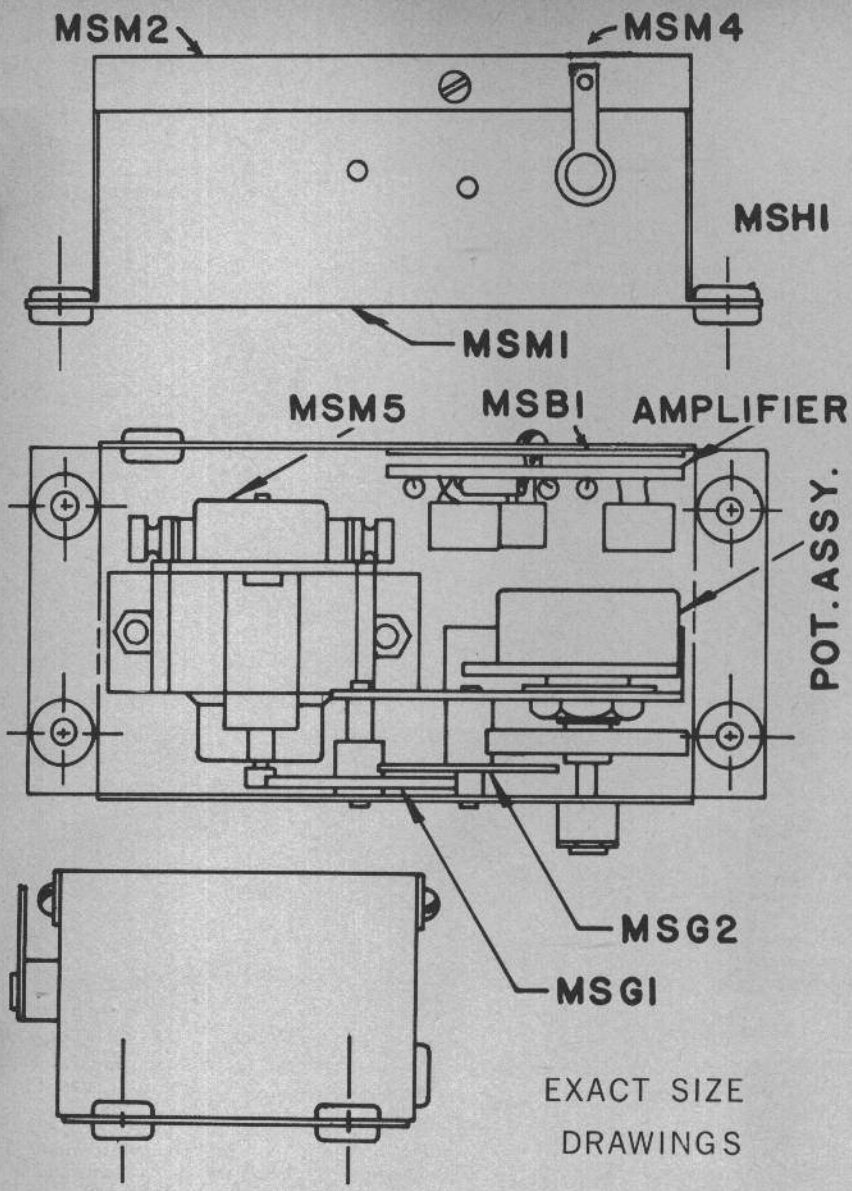
"Gently, gently," cautioned Marcy. The stick moved just slightly to the left and as gently the plane responded by going left in a wide circle.

There was no jarring sky skidding, the rudder did not flap and the plane was responding smoothly. Slightly more left on the stick and the plane tightened its circle and the turn became sharper. The feel of the stick in my hand indicated that I still had over half of the throw travel left—so, bang! Against the left side went the stick. The plane's response was instant and terrific. A tight spiral was the result.

Marcy's voice came over my shoulder: "Now just let go and let's see what happens." My thumb and forefinger loosened their grasp and I felt the stick move back to neutral. Coming about the Tri-Squire responded, and with only a slight seeking of altitude, straightened out—ready for the next command.

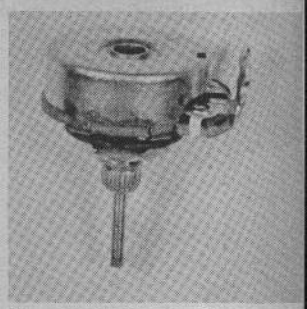
So we tried motor speed—retard, advance, retard to medium, retard to slow, kick it up to high. The system was performing beautifully; things were going just as we had hoped and dreamed they might.

GG Actua

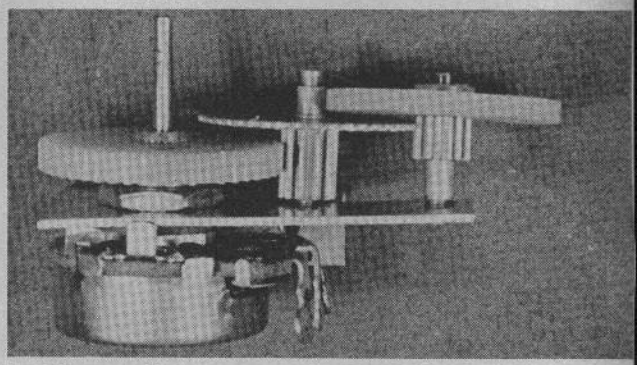


Amplifier now has been mounted to side of feedback servo unit. Note grommets. The servo can be mounted to either bottom or side of cabin—usual practice.

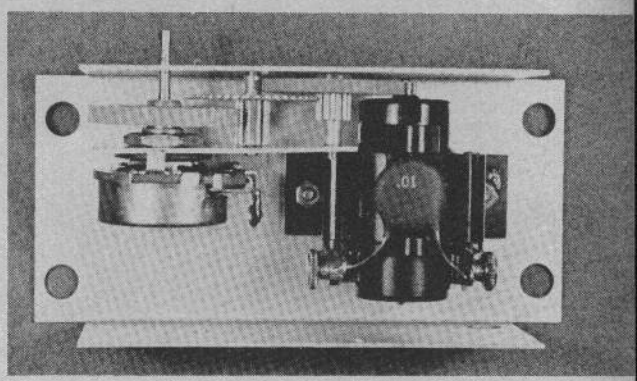
MM nylon output gear with Duramite pinion placed.



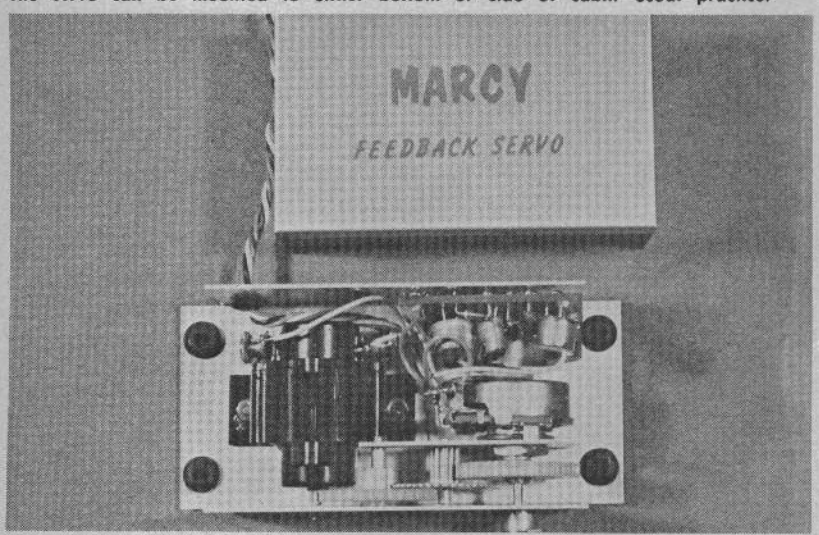
2K pot, shaft extending.

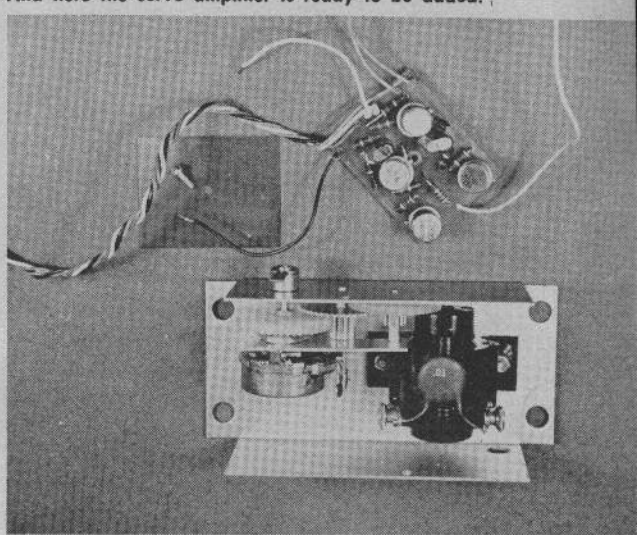


Partially assembled pot, gear-train on metal bracket.



This arrangement of MM eases some familiar problems. And here the servo amplifier is ready to be added.





Response was smooth and positive—and in the degree that was asked for by the ground controller. The PRM-I in the plane was giving gentle turns with no altitude loss, tight spirals under full power, or easy lazy circles with a slow motor just floating—waiting for the next command. This was fun! This was no nerve-shattering, hand-shaking experience; rather this was mastery in an easy and relaxed manner.

The hundreds of hours that had gone into the development of the Marcy PRM-I system, paid off in this and other test flights that afternoon, was final proof of the system that already had hundreds of flights during its development.

The Marcy PRM-I system, as you may have guessed, is a Rudder-Only with Motor Control system. The P means proportional on rudder and positionable on motor. It uses a single tone at about 25 pulses per second, with pulse-width variations ac-

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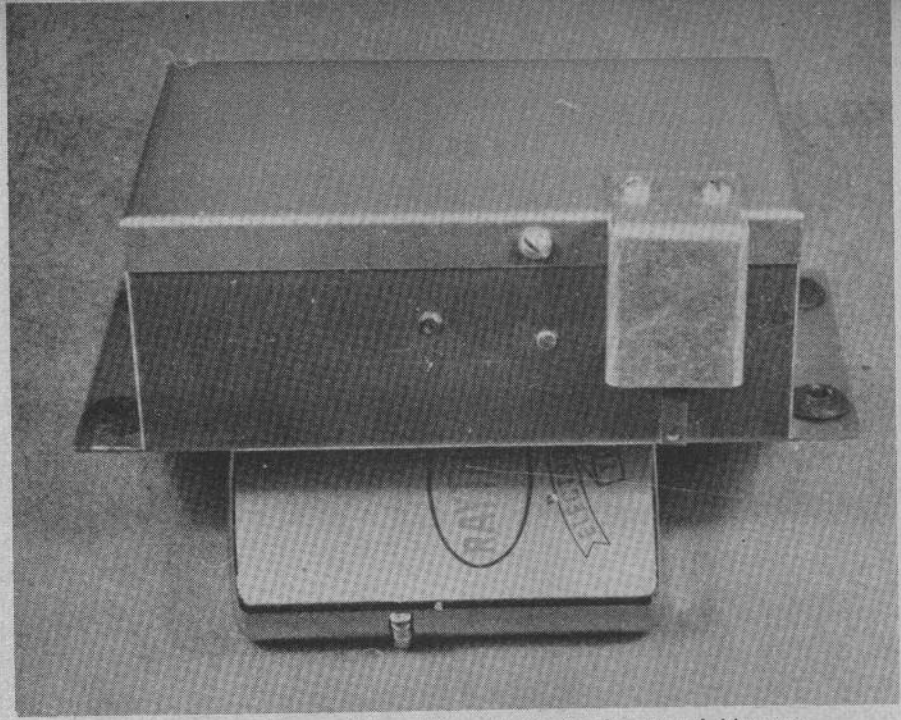
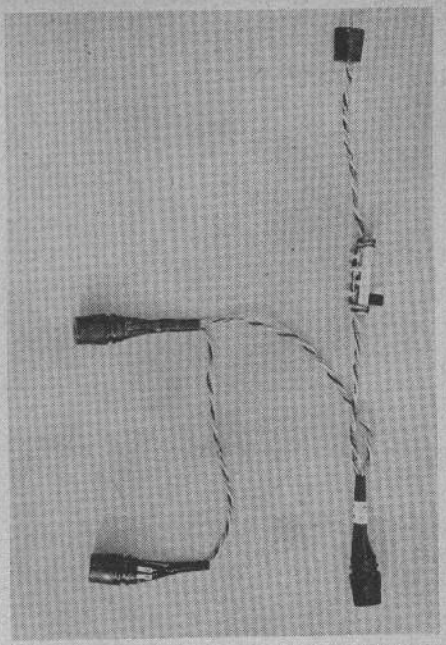


Compare servo side with a cigarette lighter. Note protection for the external drive arm.



Where have all the wires gone? Simple harness.

MARCY PRM–1 SYSTEM

counting for rudder control. The rate of off-to-on, when equal, commands neutral. When the width of the signal, that is ratio of off-to-on, is varied, this results in either a plus or minus voltage depending on whether it is more off or more on. This voltage appears out of the receiver and is picked up by the feedback type servo and gives throw in either left or right, depending on the amount of on-to-off ratio or off-to-on-ratio.

The degree of left or right is in direct relation to the amount of voltage which appears, and the stick on the transmitter controls this degree by the amount of variation it is moved. There is no wagging of the surface for rudder control, and current is drawn by the servo only during time of actual moving. At neutral or any other stopped position current is nulled.

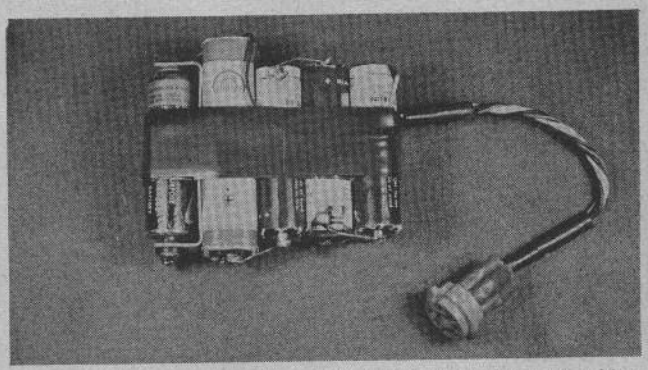
Motor control is achieved with a servo similar to the one used for rudder, but simpler. Two less transistors are used, and a few other components are added. The gear train is left the same, and the feedback pot—which is not used in motor control—is nevertheless left in since it provides a simple and relatively inexpensive bearing for the output arm. The motor control device is housed in a case the same size as used for the rudder.

In the receiver end of the PRM-I system, the motor is controlled by either full-on or full-off of the same tone which is used for the rudder. The pulse omission circuitry is in the rudder portion, and when a full-on or -off command is transmitted, the rudder control cycles through, neutralizes and remains in neutral until motor command is stopped and rudder command is again taken over by the stick. Since motor control commands are usually of short duration, there is no flight effect of the cycling of the rudder. Motor command control is instantaneous with no delay circuitry used, and is fully positionable through the entire range of the throttle from high through medium to slow, or the reverse. Flicking the motor command switch in one direction retards, while in the other direction the switch advances the motor speed.

One of the nicest things about Marcy's PRM-I system is its simplicity—and therefore duplicatability. The circuit is such that once you've gone through it from pulser to tone generator, to transmitter to receiver, to servo you can't help thinking "Why didn't *I* try this approach?"

There are no relays to adjust or to be damaged in hard landings in the receiver. There are no relays in the transmitters. This eliminates one of the fussy items usually associated with proportional. Only a few variables are present, and these generally require touching up on the initial test go-around. While the PRM-I is presently a super-regen, there is no valid reason it canot be used equally well with a superhet front end—and developmental work on this is under way.

In the years that it took Marcy to evolve the final circuitry, he always approached the problem with this basic concept: "How little circuitry does it take to do this function effectively." Complexity was not the goal; performance was. In the latter stages of development, after months of flying by Marcy and others, the concept was broadened one step further. That idea was: "How much of this can be done without any special parts?" This resulted in narrowing down component selection—and took the system from the realm of the exotic to one understandable and useable by the greatest number of home-builders.



Marcy used box for magnesium alkali A bat—don't solder. He solders to side of N46 nickle cadmiums. Smallest B-battery obtainable OK—it gives shelf-life.

Several bits of unique circuitry in certain phases of this system make even standard components do seemingly hard tricks. In the transmitter, for instance, a linear pot is used for rudder, but by simple circuitry the action achieved is NON-linear. There is less throw in the center of the stick than there is in the extreme of either full or hard over left or right. This makes flying smoother than if the movement were translated in direct linear movement, and the center of the stick is not touchy or fussy. It also means that conventional pots can be used for both rudder and built-in trim.

The years of painstaking development of the Marcy PRM-I system make it simple, economic, and—most important for the home builder—easily duplicated. The last probably is the most important. No matter how well a system performs in one case, it really is only good if it lends itself to duplication. For the home- or kit builder this is an extremely important point.

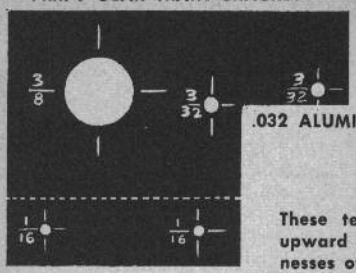
In this article we will tackle the hardest part of the PRM-I system first: The feedback servos. Since the servos are directly related to the aircraft they are to be used in, this article will also deal with their installation. The next article in this series will take up the construction of the transmitter with its pulser, tone generator and RF section, and the receiver.

The PRM-I feedback servos use only one special part; other parts are readily available. The special part is the feedback pot which nulls the voltage input and is the secret of the non-flapping action. Even this, however, can be made in the average shop from a standard 2K pot. It simply requires two different sizes of shafts—one for the 48-tooth nylon gear, and the other for the Babcock output shaft.

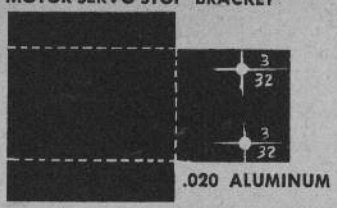
The much used Mighty Midget motor forms the heart of the servo. There may be some discussion and even raised eyebrows as to why a different motor wasn't used, etc. Literally dozens of motors, both domestic and imported were tried in the various models of the servo in the developmental stages of the PRM system. Always Marcy came back to the Mighty Midget; it was husky, started easily and its performance in the finished unit far outstripped its cost. The only objectionable features of the motor were overcome by Marcy in design of the gear train and housing.

GG Actuator

PRM-1 GEAR TRAIN BRACKET

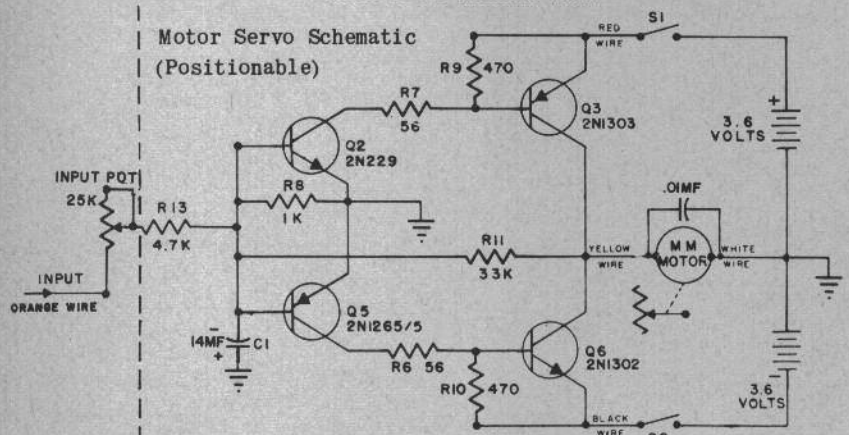


MOTOR SERVO STOP BRACKET

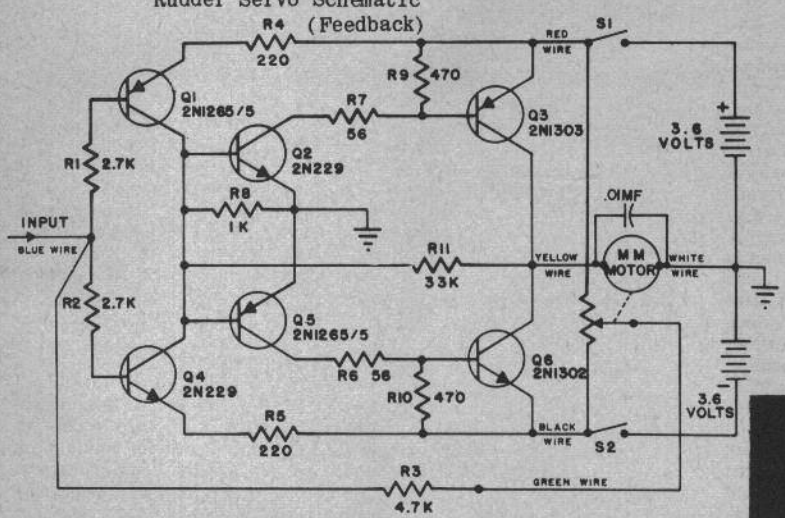


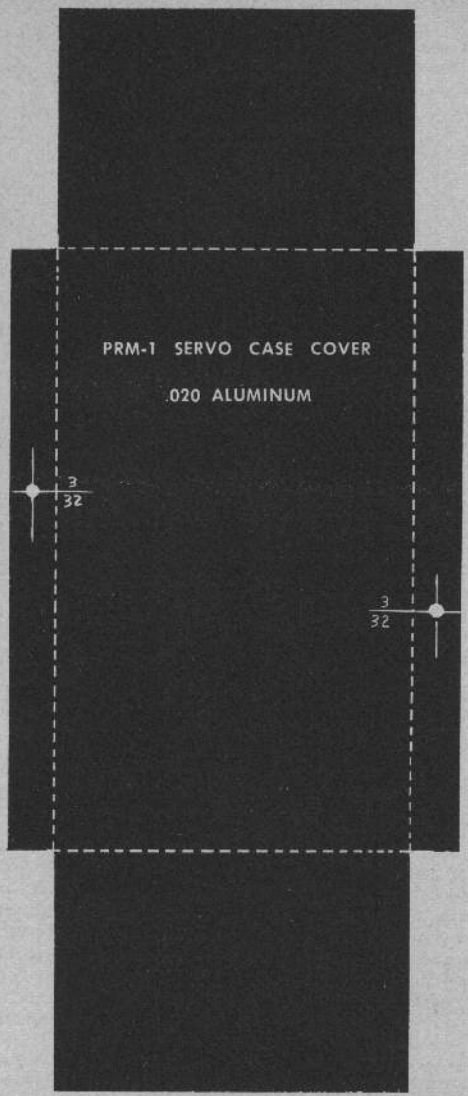
These templates are drawn exact size, bends to be upward along dotted lines. Also note the various thicknesses of the aluminum stock.

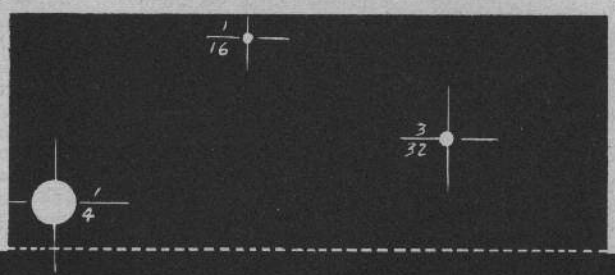
Motor Servo Schematic (Positionable)

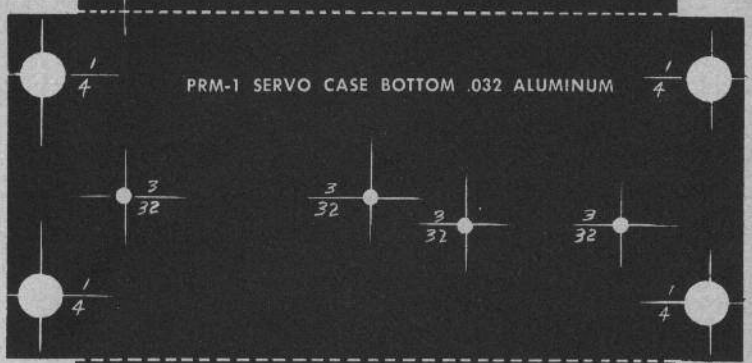


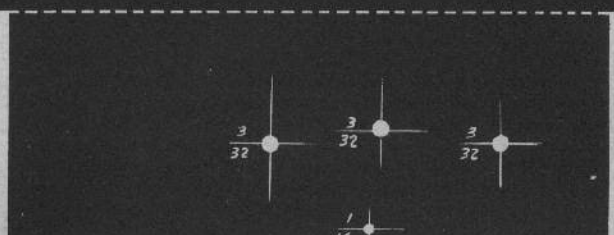
Rudder Servo Schematic (Feedback)











With this design, motor-housing bearing faults were completely eliminated.

The PRM-I feedback servo is housed in aluminum case of conventional construction. Full-size patterns are shown, as well as a pattern for the aluminum bracket for the pot and gear train. The printed circuit board also is shown full size.

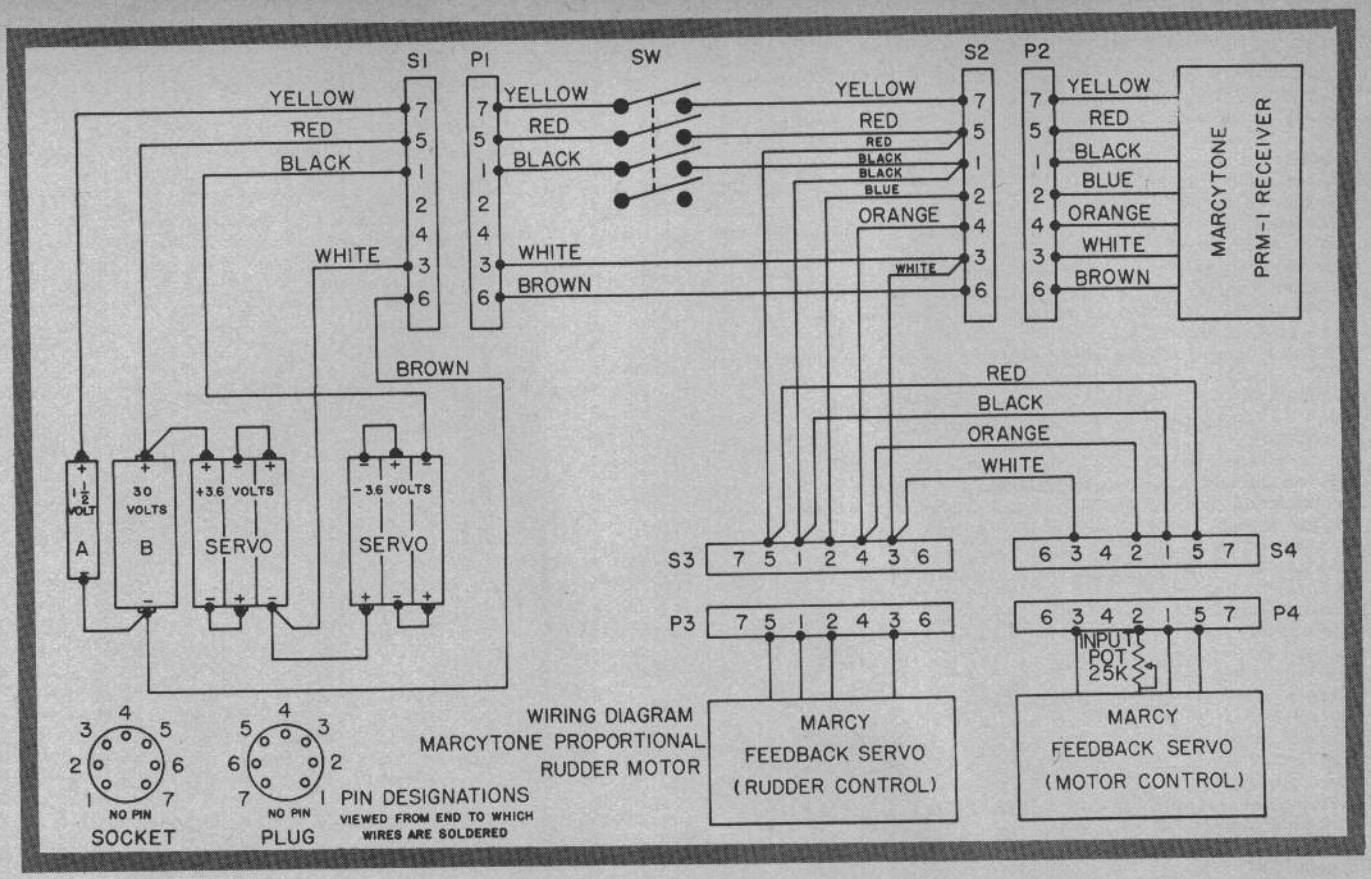
The parts list at the end of this article details all components required for construction. Since construction is a combination of electronic and mechanical assembly techniques, standard construction care of both areas is required to duplicate the servo, but no more than the ordinary R/C home-builder's tools should be required. If desired, individual components already fabricated are available.

The selection of the transistors is important. They should be closely matched so that the circuit is balanced. Match Q1 and Q4, Q2 and Q5, and Q3 and Q6 for approximately the same beta. This may be done on almost any transistor checker, and since only close matching is required, no beta readings are given, since these will vary with different checkers used. Matched pairs also are available if you do not have access to a transistor checker.

After the parts have been fabricated and rounded up, begin construction by wiring the amplifier. For your convenience the printed circuit portion of the board is shown on the opposite side of the sheet from the parts layout. By holding this sheet up to a light, the parts placement on the printed circuit board is easily determined. (Superimposed in this GL layout.)

No detailed steps will be given, since the order of assembly is critical only in two areas. Install all resistors first. Install transistors last using heat sinks. Note that some resistors will be under the transistors. This is the way the unit was designed.

Continued on Next Page



MARCY PRM-1 SYSTEM . . continued

Length and color of the leads from the PC board are important so suggestions will be given. Cut a 2-inch length of black wire, prepare end and solder in hole A. Cut a 7-inch length of black wire, prepare end and solder in hole D. Cut a 7-inch length of blue wire, prepare end and solder in hole F. Cut a 2-inch length of white wire, prepare end and solder in of the two holes labeled W. Cut 7-inch length of white wire, prepare end and solder in other hole W. Cut a 2-inch length of green wire, prepare end and solder in hole G. Cut a 2-inch length of red wire, prepare end and solder in one of the holes labeled R. Cut a 7-inch length of red wire, prepare end and solder in the other hole labeled R.

Twist the 7-inch long wires—black, white, blue, red—into a cable.

The 2K pot to be used should have a knurled shaft extending at least 3/8" from the face of the pot. If you do not use the special pot listed in the parts, you will need to center punch the face of the shaft so that a 1/16" hole can be drilled and a 1/16" rod of brass 5/8" long can be sweat soldered in to form an extension of the shaft. In the servo the knurled shaft is used to press fit on the 48-tooth nylon gear; the 1/16" shaft extension continues out of the case and is the part on which the output lever or arm is fastened. This is a part used on the Babcock 897 boat servo clipped off so only one of the three holes is used. Babcock's number is N126 Torque Arm on N124 Hub. Both the special pot with the two-sized shaft, and the Babcock parts are available completely prefabbed.

Remove the output gear and shaft from the Mighty Midget motor. Take the nylon gear from the shaft. Grind the extrusion at the center of the gear down so that only 3/64" extrusion is left. Cut a piece of 3/32" music wire to a length of 5/8". Cut a piece of 3/32" ID brass tube to 3/8" length. Now assemble MSG1, using the nylon gear, Bonner Duramite pinion gear, and the two lengths of shaft. Study photos for details. Slide the music wire into the MM nylon gear with the extrusion away from you, far enough along the shaft to get purchase on the case gear housing hole. Slip on the 3/32" brass tube and pinch fit. Slide on the Bonner pinion on top of the brass tube. Fit should be snug and tight. Consult drawing and photos for placement details.

With all of the parts ready you are ready to make the mechanical assembly. Assemble the gear train-pot bracket first. Mount the pot so that housing is on the same side as the bottom mounting flange of the bracket. Use the 3/8" lock washer by mounting it nearest to the pot. Secure with the 3/8" mounting bolt, so that the terminal lugs face toward the right of the bracket when viewed from the rear.

After tightening securely, press fit on the N4 48-tooth nylon gear onto the knurled portion of the pot shaft. Now set in MSG2 (the Wilson gear) to fit against the pot gear. Set the nylon-brass combination (MM nylon-Bonner pinion) in the remaining hole. Carefully place the gear train in the servo case bottom and slide the pot shaft and gear shafts into the three holes in the side of the servo case. Secure the bracket assembly and gear train by installing two #2 x 1/4" sheetmetal screws, but do NOT tighten.

Add #4 solder lugs to the motor by fastening under the knurled nuts. Install the motor, using the 3/48 x 1/4" bolts, lockwashers and nuts. (Note: the mounting is done so nuts are on inside of servo case.) Now align gear train and tighten all mounting hardware when you are sure there is no bind or slop in the system.

Install the five grommets. Now install the amplifier assembly in the case by soldering the short black wire to the lower lug on the pot. Solder the short green wire to the center lug of the pot. Solder the short red wire to the top lug of the pot. Solder short white wire to the lug on the motor that is next to the gear train. Solder .01 disc on Mighy Midget at the same time you solder leads.

Dress wires neatly and slide board into the case. Place the 1/32" insulation board between the amplifier PC board and the servo case. Secure the amplifier with a #2 x 1/4" sheetmetal screw.

Dress the twisted cable through grommet in the side of the servo. Install output arm on the pot shaft, and secure temporarily with the setscrew; you will make final installation after testing. Review entire assembly to make sure everything is right. After this you will be ready to test.

A special test circuit which will allow bench checking is shown. This will allow you to test the unit for satisfactory operation without a receiver or transmitter. The pot as used will duplicate the action as performed by the stick pot on the transmitter.

Connect as shown in the schematic. Use the switches (a DPST is recommended) so that both sides of the circuit can be disconnected. The use of nickle cadmium batteries is recommended. Marcy prefers the Eveready N46 pencell type both for bench checking and in the aircraft. He has succesfully used his original set of six for over a period of three years of extensive testing and flying, and they have stood up the best of any of the nickle cadmium types tried.

Connect all wires with switch off, except blue. Make sure output arm is free to rotate 360 degree and is not connected to any load. Turn switch on. The output arm will rotate to a position and stop. This is neutral. Position the output arm either up or down as required for the installation in your model. Secure the output arm setscrew permanently. Use Goo.

Connect the blue wire. Now rotate the pot CW and CCW. Servo arm will follow with a movement proportional to the rotation of the pot shaft. If a linear taper 10K pot is used, movement of the arm will be linear in each direction.

If trouble is experienced, first check the test circuit, then review all assembly steps.

GG Actuator

The motor control servo is similar to the rudder unit, with the exception that it uses less components and is built a bit differently in the amplifier section and has a modified output arm.

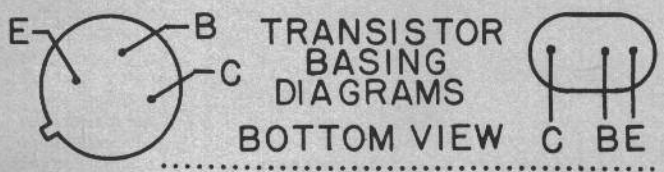
Study of the schematic and parts layout will show the changes in the amplifier. The unit may be made by using a printed circuit board exactly as used for the rudder unit. The parts layout will show the correct placement. Again the transistors in the unit should be matched for about equal gain.

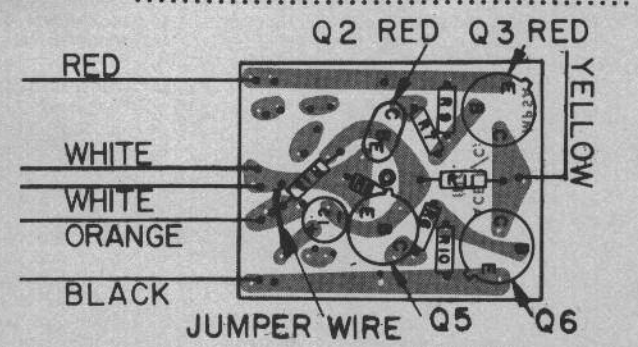
Mechanically the servo units are the same, except the output arm is provided with a clutch for slippage, and stops for either extreme position. Even the special 2K pot is used, since this provides a bearing for the output shaft and is less costly and troublesome than making a different type of bearing. The 2K pot is not connected electrically, but is shown on the schematic as being mechanically connected to the output arm.

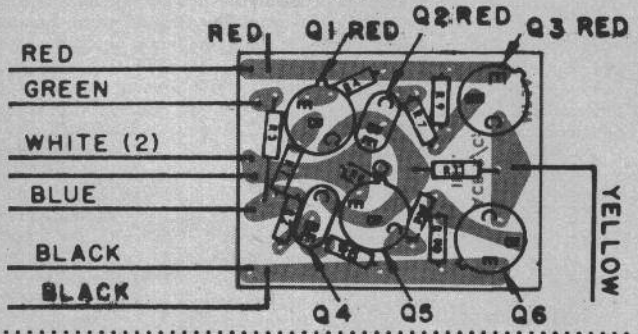
The output arm retainer and stop guide is made of .024 to .032 aluminum and is mounted on the top of the servo case with two #2 x ⅛" sheetmetal screws. A simple clutch of the slip type is made by drilling out the output arm shaft hole to 3/16", inserting some Perfect fuel tubing of standard size. This then slips on the output shaft of the pot, and the setscrew in arm may be tightened to provide slight tension, but not too stiff. The retainer-stop is then attached, and the output arm cannot work off, nor can it exceed the limits set.

As shown in the photos of the installation, the input pot may be either of the regular type, or the subminiature kind. The two wires to connect to this pot need to be brought outside of the case anyway, and so the pot may also be of the regular type, and be mounted on the fuselage with its knurled knob protruding so that adjustments can be made without removing the wing. A bakelite pot guard can be used to prevent accidental shifting of this pot if mounted for exterior adjustment.

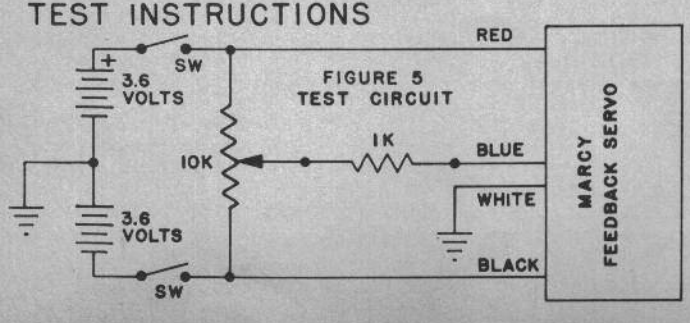
After the motor control servo has been completely assembled, it is hooked up for testing exactly the same way as the rudder servo. Since there is no neutral as such (electrically) all wires including the blue may be connected. Have input pot adjusted to approximately midrange. Now the test pot should move the servo in one direction when turned CW, and in the other when turned CCW.







TEST INSTRUCTIONS



When you have assembled and tested both servos, checked all gearing assemblies, tighten all bolts and nuts and set screws. Use Walther's Goo on the Mighty Midget brushes, on the nuts and bolts mounting the gear train, motor, on all setscrews, and other areas that might be subject to loosening under vibration conditions.

Installation of the servos in an aircraft can be considerably simplified by making a harness as shown in photo and drawing. This system type of wiring makes it an easy matter to remove any component that requires checking at any time, and permits trouble shooting of any part of the system without removing the entire system. It also provides for replacement of the batteries.

A study of the photo and drawing will show that in this particular installation, a taped together battery pack was chosen. Battery boxes could be used for all if desired. In Marcy's Tri-Squire, only one such box was used—this for the magnesium alkali cell for A battery. The makers of these cells recommend that they NOT be soldered, and so an Acme #5 box was used. In soldering to the N46 nickle cadmiums, Marcy prefers to solder on the side of the cell instead of at the bottom. The 30-volt B battery can be the smallest size you can find, since this battery has only the B drain that is required for the XFY34 detector tube, and drain on this is in the neighborhood of half of a milliamp so that almost shelf life will be had from this battery.

For the harness wiring, the cable lengths between the plugs and sockets are recommended to be between 3 to 6 inches, depending on your aircraft. A 19-strand #26 plastic-covered wire is recommended, and the use of fuel tubing ends over the exposed socket pin lugs, and the accepted practice of tying the wiring to the switch for strain relief, as well as using cement or Goo is recommended. The switch shown is a 4-pole single-throw tandem type of the knife action, self-cleaning type, manufactured by Muter. The plugs and sockets recommended are the Methode plug and socket, which will be stocked by Ace R/C under the Methode name.

The installation of the servos in the model should be done by using Bonner servo mounting kits. These provide the vibration resistance required, are designed for the size grommets used, and are much superior to any haphazard methods. Be sure to mount with 1/16" plywood where required.

The templates shown for making the metal can, can be used as a guide for hole drilling. The receiver is mounted by being wrapped in ½" foam rubber.

Linkage is extremely important in the system. There should be absolutely no bind in the movement of the pushrods—repeat, this should be loose, not stiff. If the servo receives a voltage of ¼ volt, it should be able to move! Position the rudder servo so that the output arm can travel a full 360 degrees. This is also extremely important. A "dog-leg" type of connection to the servo output arm is recommended. At the other end of the pushrod a DuBro Kwik Link is recommended, since this will provide for any adjustments required. A Kwik Link may also be used on the engine throttle.

For emphasis let us repeat the two important rules of the PRM-I servos—make sure the pushrods are loose and encounter absolutely no bind; make sure that the installation as well as the pushrod allow for full 360-degree rotation of the rudder servo.

Note—Next issue this series will continue with the detailed instruction of both the transmitter section and the receiver decoder section. The PRM-I is the first unified proportional rudder-only system that has the components of the system selected and matched for use together. This is a TOTAL concept, and eliminates the hit-or-miss hodgepodge of components. It has much in its favor

PARTS LIST FOR MARCY PRM-I SERVO (Rudder)

RESISTORS
R1 2.7K, R2 2.7K, R3 4.7K, R4 220 ohms, R5 220 ohms, R6 56 ohms, R7 56 ohms, R8 1K, R9 470 ohms, R10 470 ohms, R11 33K, R12 2K pot with special shaft (see text). All ¼ watt 10%.
CAPACITOR
.01 disc.
TRANSISTORS
Q1, Q5—2N1265/5, Q2, Q4—2N229, Q3—2N1303, Q6—2N1302.
HARDWARE
MSH1 5 ¼" mounting hole grommets, MSH2 3 #2 x ¼" sheetmetal screws, MSH3 2 #2 x ⅛" sheetmetal screws, MSH4 2 3/48 x ¼" machine screws, MSH5 2 3/48 nuts, MSH6 2 #3 lock washers, MSH7 setscrew for MSM4, MSH8 2 #4 solder lugs.
MISCELLANEOUS
MSG1 nylon-brass gear assembly (see text), MSG2 Wilson 44-W-SS metal gear, MSG3 Nylomatic 48-tooth N4 gear, MSM5 Mighty Midget Motor, MSW1 19-strand #26 hookup wire 8 colors, MPSA Printed Circuit Amplifier Board, MSB1 Insulation board 1/32" synthane.

PARTS LIST FOR MARCY PRM-I SERVO (motor)

The above parts as used for rudder will be used for motor servo, with the exception of the following: Q1, Q2, R1, R2, R3, R5.
The following additional parts will be required:
1 25K input pot
1 14 MF PI type capacitor (C1)
1 4.7K ¼ watt 10% resistor (R13)
1 Stop bracket
2 #2 x ⅛" sheetmetal screws

Note: These parts are available in complete package—See WHAT's NEW page of this issue

R/C BIBLIOGRAPHY

Make sure that you haven't missed important material published during the past 12 months, by checking this annual Grid Leaks compilation. ▶ **FOR 1962**

(Asterisk (*) denotes that schematic only, or drawing only without construction details, is shown.)
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FM, Flying Models
GL, Grid Leaks
MAN, Model Airplane News
RCM & E, Radio Control Models & Electronics

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**Changing CPS of Kratt TX For Otarion & Minx-X*
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**Metering and Monitoring a Transmitter.*
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**Zener Diodes for Voltage Regulation*.*
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Actuator For Rudder-Only Control, by Bob Bates.
Also Provides Motor Control. GL, V3 #9

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For use with cascade escapements. RCM & E, 4-62, p. 199

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**PC Board for Marcy Servo Switcher*.*
G.L. V. III, #11

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Some really practical application details. RCM & E, 3-62, p. 122

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The detailed instructions of a simple electronic pulser. MAN, 3-62, p. 24

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GL, V3 #7

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Description of the system used by the author in the '62 Nationals.
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**An R/C Sea Cat.*
.19 power flying boat. RCM & E, 5-62, p. 230

Chaparral, Pylon Race Plane, by Dale Nutter.
Plane designed for this popular R/C event for a Veco .19 engine. MAN, 5-62, p. 16

D.H. 60M Gypsy Moth, by Elmer Nowack.
R/C Flying Scale Multi Biplane for .45 power. FM, 4-62, p. 15

Double-Bubble, .020 Profile by Howard G. McEntee.
AM, 4-62, p. 16

**Dragon, by B.G.J. Thompson.*
Designed for Galloping Ghost. RCM & E, 3-62, p. 127

Dub-L Dek-R, by Keith Laumer.
This is a ½-A job which can be adapted for small R/C installation. FM, 8-62, p. 21

**Eclipse, Pylon Racer, by John Krauer.*
Uses a Cox Tee Dee 15. RCM & E, 1-62, p. 33

Fairfielder, by Phil D'Ostilio.
For multi control, spans 67 inches, used K & B 45 power, up to 12 channel equipment. FM, 2 & 3-62, p. 11

Flying Deltas, by Weldon Smith and Bob Baldwin.
A complete run down of the basics of design of these three-cornered birds, and how good flights may be accomplished. MAN, 8-62, p. 14

Gliding and Slope Soaring in England.
With hand grip control box and 3-view of soaring glider. GL, V3 #10

Gold Rush III, by Keith Storey.
How to make a fiberglass fuselage for R/C. AM, 4-62, p. 28

"Gwing" R/C, by Keith Laumer.
For .09 Engines, 31½" span, 20" overall. An easy ship to build, flies a brisk pattern. FM, 12-62, p. 29.

How to Add Radio Control to Free Flight Scale Kits, by Ken Willard.
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Hustler XD-7 Delta, by Robert Baldwin and Weldon Smith.
For .19 engine, a very reliable flyer. MAN, 2-62, p. 11

Hydrohoney R/C amphiban ¼ A, by Ken Willard.
AM, 6-62, p. 33

**Jack's Gipsy.*
Compiled from notes supplied by Jack Morton and sketch details. RCM&E 12-62, p. 588.

Kay Dee III, by Howard McEntee.
Intermediate Nat's winner. Detailing the construction of the "Kicking Duck" used by McEntee at the Willowgrove Nats. AM, 1-62, p. 22

Knife Edge Wheels for Grass.
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Maxey's Marvelous P-63, by Maxey Hester.
A scale airplane for .45 engine, scale for the Kingcobra. AM, 3-62, p. 30

McEntee's Kay Dee III.
Second article showing R/C installation. AM, 2-62, p. 32

Nimbus-2 International R/C Entery, by Tom Brett AM, 6-62, p. 18

Nose Wheel with Swinging Arm, by M. Franklin.
RCM & E, 6-62, p. 289

OE-2, Winning, R/C Scale, by Bob Wischer.
Designed for a Fox 15 engine. This is a scale model of the Cessna. AM, 7-62, p. 16

**Olympia, by J. Masaki.*
Simple Rudder—only low-wing model. RCM & E, 6-62, p. 275

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Pipsqueak .020 Radio Plane, by Aubrey Kochman.
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**Pylon Racer, by John Krauer.*
Three view drawings of Krauer's second place winner in the 1961 Nats. AM, 9-62, p. 35

R/S Shiner, ½ A Pylon Racer, by Ted Strader.
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R/C Wind-Jammer, by Don Krupp.
Single-channel radio control canard, 64" span, using a Fox .35. FM, 6-7-62, p. 9

Radio Scale Battlers, by Bill Dean.
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Roaring 20, by Ken Willard.
A perky ⅛A airplane designed for a .010 engine. MAN, 6-62, p. 22

RX for R/C, by Bill Winter.
Discusses some design theories and practical applications today. MAN, 9-62, p. 14

School Boy, by Ken Willard.
For .010 engines. Complete construction details for a midget R/C unit designed for small transistorized receivers. MAN, 1-62, p. 11

Septal III, and the Septalette, a Double Header, by Stan John.
A .15 powered Septal, and the small bird for a compact design. MAN, 7-62, p. 11

SixGun by John Dumble.
Winner of the 1962 Nationals Ripmax Trophy Event. RCM&E 12-62, p. 597.

Sopwith Pup, by Cal Smith.
A giant radio control World War I biplane for a .19 engine. AM, 12-62, p. 14

Spitfire, by George Harris.
A scale aircraft, using a Super Tiger engine. AM, 2-62, p. 15

Square Hare From Delaware, by William C. Northrop, Jr.
A remarkable radio job with complete sheet balsa construction. AM, 9-62, p. 14

Super Finishes for R/C, by Vic Schwegmann.
Describes the use of a sealer for R/C models. RCM & E, 6-62, p. 299

The Disaster, by Don McGovern.
A lightly loaded sport plane, to help make the transition from free flight to R/C easy. FM, 12-62, p. 15

**The Sultan, by Gerald Nelson.*
RCM & E, 11-62, p. 544

The Flattop Stormer, by Doug Spreng.
The multi model that won the Philadelphia 1961 Nats. AM, 5-62, p. 32

The Minnie-Most.
Rudder-only plane with an 18" span using a .010 engine and an Otarion 0-21 receiver. AM, 5-62, p. 22

The Ridge Hopper, by John J. Tudor.
A single channel R/C. Kick Elevator, 58" span, .15 to .19 engines. FM, 10-62, p. 21

The Rookie, by William Winter.
A peaceful multi-aerobatic trainer, using a K & B 45. MAN, 11-62, p. 19

The Scavenger, by Don McGovern.
A 77" span amphibian flying boat, from single to multi-channel radio. Designed for .45 to .56 power. FM, 8-62, p. 14

The Sea Gull Soarer, by Bill Siegel.
Span is 101", wing area is 770 sq. inches, fuselage is 45" overall. Using a Cub .09—.15 for power. This is a Soarer for R/C. FM, 8-62, p. 8

The Switcheroo.
An amphibious tri-engine .049 flying boat, using one engine in the nose, two in the double-ended push pull nacelle. Ample power for ROW and could be converted to R/C. FM, 2-3-62, p. 20

Top Cubmaster, by Harrison Morgan.
Showing the evolution of a scale-like Piper R/C "Cub" for .19 power. AM, 8-62, p. 18

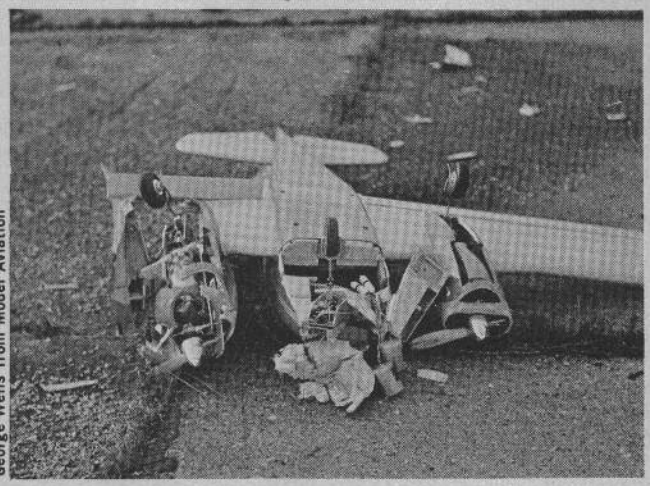
Watch your Yaw, by Eugene W. Engelhardt.
Some design suggestions for R/C aircraft. FM, 4-62, p. 28

Winning R/C Racer, by Keith Storey.
Plans for the Gold Rush III, the pylon Nationals winner in 1961, for a .19 engine. AM, 3-62, p. 16

World Championship Models.
Details of every Model flown in the 1962 World R/C Championships at R.A.F. Kenley. RCM & E, 11-62, p. 540

? A QUESTION OF RELIABILITY

George Wells from Model Aviation.



George Wells from Model Aviation

While we really don't know the cause of the crackup of Bill Murphy's beautiful Piper Apache at the Nats, these before-and-after pix do point up the facts that much time and expense goes into any radio model, and that reliability warrants the highest priority.

"THE FINEST CIRCUIT AND BEST-BUILT EQUIPMENT ARE DEFEATED WHEN SILLY OVERSIGHTS OR FOOLISH PRACTICES CAUSE A FLY-AWAY."

IT HAS BEEN WIDELY OBSERVED that equipment-wise multi is more reliable than single-channel. Considering the greater complexity of multi-channel, especially the relay variety, such a statement would be difficult to prove were it not for observations that can be made on almost any flying field. Of course, most of the multi-fliers are more experienced, know the pitfalls and practice faithful maintenance. Even so, why are there so many fly-aways, crackups and failures?

If you have flown many single-channel ships, then gone into multi, you will have noted the relative improvement in dependability.

Having made 65 R/C airplanes, of which but a few were worn out, smashed or lost, it seems to the writer that we should place greater emphasis on reliability. What a wonderful service would be performed if GRID LEAKS readers passed on their own experiences with equipment failures, the cures thereof, and any other pertinent information gained on the flying field.

To begin with there is the hard-trying beginner who often can't seem to make his equipment work well enough to fly satisfactorily—even the best-made items. Since in single-channel—and this is brutally true of the clever relayless stuff—we have such a cross-matching of receivers, batteries and actuators, manufacturers do not, or cannot, supply sufficiently specific information. Often the actuator is of a different make, might not even be compatible, and each manufacturer has covered—often in quite sketchy fashion—the operation of the item which he has made; the overall system probably is seldom if ever adequately detailed.

This past summer the writer, in the course of developing two kits and getting a young son started on relayless, spent a miserable two months with no-fly, vibration problems, crackups and fly-aways. We started with five different makes of receivers and three of escapements, and ran the gauntlet of ordinary pencells, alkaline batteries and nicads. As designed there was little wrong with any individual item. What we need is specific detail for a specific system involving this receiver, that escapement, and those batteries. We need a "weapons system" concept.

The writer doesn't know all the answers but can outline some of the problem areas.

Escapements: Any escapement has a pull-in and a drop-out value, just as a relay does. If the spring tension is set too high, the escapement may not pull in when the rubber is fully wound —this is especially true when heavier rubber is used and a large number of turns are stored. For instance, we prefer ¼-inch rubber on Vari-comps, particularly when cascaded. Some people use two loops of ⅛ and many use one loop of 3/16 with an extreme number of winds. Now, if the drop-out spring tension is too low and the escapement with heavy rubber does pull in, it may not release. An increase in spring tension, along with 3.6 volts from nicads, solves this problem.

This does not criticize the Vari-comp which works well just as it comes from the box. But if the point seems strained consider these cases.

Installed in a Wen Mac-powered cabin model were two popular escapements with a relayless receiver. The first escapement cycled constantly until the rubber ran down when the ship was held in the hand with the engine peaked. (We think of rough engines, especially big ones, as being prone to vibration but the high-rpm .049 engines can drive an escapement crazy—and Half A is the big deal with beginners.) The second escapement was prone to skipping through in the air every time the airspeed, and rpm, went up. This happened in spirals followed by pull-ups (rapid rudder-walk) and even in level turns.

No doubt to insure maximum success with relayless receivers the escapement manufacturer had dropped the spring tension. This unit pulled in at one-half volt and dropped out almost at zero. While this insured that the escapement would work with reduced voltage—which isn't long in coming on some batteries—or on less current rise at distance (more range), it made the device highly susceptible to vibration of an .049. The return spring was replaced with a heavier one—from an old model of the same escapement—and the trouble disappeared. Higher spring tension does, of course, necessitate higher voltage and, since the drain is increased, a reliable battery supply.

Even with relay receivers we should know where the escapement pulls in and drops out. The necessary adjustments to the spring tension can be made with a rheostat on the bench to vary the voltage to the escapement. Another system with a hand held transmitter with antenna retracted or removed, involves moving the transmitter away (or holding its antenna, etc.) while the voltage rise and drop, along with escapement operation, is

GG Actuator

observed on a volt meter across the escapement. A typical setting might be two volts pull-in on a 3-volt battery (voltage is less at the escapement with relayless) and one-half volt drop-out. Or, with 3.6 volts, it can be set as high as 2½ volts for pull-in.

Incidentally, one wonders why an escapement cannot be made with a high-ohm coil to reduce drain—as was the old Good Brothers (two coils), for example.

Tubes: Last year we piled in a Krackerjac and, on the same day, lost a Beam. We had a Citizen-ship superhet in a Spirit which delighted us for its sensitivity, but it appeared to go bad in less than 40 flights. We had several minor mishaps with Marcy receivers. Recently, one of our group put together a Heath kit tube tester and in the course of checking all our transmitters discovered the cause of all last year's failures to have been transmitter tubes. How many disasters of yesteryear were due to this cause? The old saw that a hard tube is good for 2000 hours is meaningless, if not misleading. Apparently, reliability cannot be had without frequent tube checks.

Keying leads: Gave a Spirit to a local beginner and after a masterful job of handling the first three flights, the ship flew away. Post-mortem revealed a microswitch failure in the keying lead. This particular trouble has hit us so often that we never use a transmitter requiring a keying lead unless a spare lead is handy for instant use. If these leads are interchanged, they should be the same length, because some transmitters are thrown out of tune when a different length lead is substituted.

When a monitor is available, check keying-lead switch operation, for sometimes even a new switch yields bizarre results. One new switch seriously distorted the transmitted tone and, as the monitor indicated, sometimes failed to make with certain finger actions.

As they come from the manufacturer switches, either push or lever type, may be lubricated and the passing of ordinary bond paper between the contact points helps to clear any residue which prevents good electrical contact. Multi transmitter lever switches can become fouled if the X-mitter is permitted to stand where the exhaust from an engine blows against it.

Jacks: Closed-circuit jacks that fail to close cause many a fly-away. Sooner or later rough handling from inserting a meter into the jack causes an intermittent or an open. We've had this happen on preflight check just before launch, on the bench and, we presume, alas, in the air. A friend of ours always puts a 20-ohm resistor across the jack to insure a closed circuit—it throws his meter off not enough to matter. In the "old days" everyone flew with a "shorting plug" which was inserted into the jack when a meter was not in use. Many fliers now are going to the RCA-type phono-jack which may be had with an extra shorting plug, since this definitely prevents fatigue from ruining the contact.

Switches: Although much has been said about pressure-type slide switches, they are seen distressingly often. We all probably know that the knife-action slide switches are better. Multi fliers particularly go in for expensive toggle switches. We know one chap who pays nearly $10 for torsion-balanced switches. Recently, we advised a promising new single-channel flier to use good toggle switches. He bought two of the best. Preflight power check showed unwanted rudder action—the switch was bad. He bought another, cracked up and found this switch, too, was defective. Virtually all active fliers have had switch failures. High cost does not guarantee reliability. This subject plainly needs some research.

One local flier who had flown for several years without a failure of any kind, always disassembles the first copy of any switch (servo, etc.) he buys to familiarize himself with its action, parts, and foibles—as from dampness or just standing inactive. A definitive article on switches is needed.

Plugs and Sockets: Until the recent trend to multi-pin connectors brought about by multi, various types of plugs and sockets were in wide usuage. Some people still use them in multi and plugs and sockets remain commonplace in single channel. Recently, we were flying an .09 scaleup of the Lightning Bug and in a single evening had three violent wind-ins. The receiver cable plug had been vibrating loose in the socket. (Bounce landings will do this too, especially with a heavy plug.)

In a simpler aircraft the socket invariably is mounted rigidly to the structure which makes it vulnerable to vibration. Such things can be the cause of mysterious fly-aways which are blamed on somebody's receiver or Class D characters talking with the missus about groceries.

Batteries: Having stated that the voltage of dry batteries should be read under load, directions leave the beginner on his own. How long under load? A quick reading may seem OK but if the load is held for a number of seconds—perhaps a half minute on a transmitter—voltage often begins to slide.

Minimum voltages are specified. It would be better if we did not come within a country mile of minimum voltages for several reasons, one being that a near-minimum voltage on the ground can be less than minimum five minutes later in the air. Or a transmitter tone finally drifts. And any battery that reads near minimum acceptable, no longer is much of a battery anyway.

Depending on internal construction, some dry batteries are sure trouble if abused—we've had three fly-aways due to an open in a transmitter battery, one traced to a clerk having dropped the battery.

Despite often-printed warnings people keep showing up on the flying field with pencells which have the cap construction (false bottom) on the negative end. These batteries may or may not work properly in boxes that apply considerable end pressure—but even so can cause erratic performance; in soldered packs they are almost certain to fail. The caps can be removed so that leads are soldered to the actual battery.

Tiny beads of solder can short some nicads (button-type) when contact is made between the negative and positive sections of the case—it takes close scouting to find them. Tiny balls of solder also short out servo boards, and even get into multi-type lever switches —presumably from solder splatter.

Tuning: Since most of us legally cannot tune an oscillator, the tendency of manufacturers to peak out transmitter tuning can be a cause of trouble. Recently, we confused this with supposed swamping closeby and was quite fortunate to recover a multi on rudder only—that rudder worked was a coincidence (?). Several times on single, bad transmitter tuning showed up as an inability to hold on control. (You get a momentary response but cannot mainatin a turn—on escapement.)

Receiver slugs and dust cores frequently are loose enough, or become loose with use, to vibrate out of tune with the engine running. A lock-nut arrangement which requires working from both ends of the tank coil can be awkward in some installations. Wax and paper cement are often recommended to end this difficulty but dust core tuners especially then tend to break so that they cannot be turned.

Broken wires: Much has been said about pigtailing, using neoprene or spaghetti sleeves, cementing down, etc., but wires go on breaking anyway. Sleeves are not sure protection; repeated strain on the wire will break it anyway. (One good trick is depicted in the Top Flite booklet on Kazmirski's Tauri; wires connected to the switch are looped back and tied to the switch body.)

Wire breakage is common in single where battery boxes are frequently removed. (On boxes or packs, extra wire length should be allowed for doubling back and fastening to the box or pack with rubber band or tape.) Breakage occurs frequently at the motor terminals on multi servos, or from cable pull at relay terminals. It happens in pulse boxes, despite pigtailing (at the pots); in lever switch boxes and, horrors, in transmitters which use dry batteries. Unless a means is provided in the transmitter case for checking dry batteries externally, frequent moving of the batteries for such purposes, even for changing batteries, causes broken wires—usually at the switch or at the two-pin plug for the A battery. It is incredible how many transmitters leave insufficient slack in the battery wires, or stretch wires tightly point to point, or fail to tie down wires which are subject to frequent pulling. Such connections must be watched as carefully as battery voltage.

Printed circuit receivers: In single, many receivers have the bottom of the chassis covered with exposed soldered joints and circuitry. In itself this is no drawback. But many receivers are mounted to various kinds of rubber or other shock-absorbing material and with all manner of contact cements. Quite often, warnings are printed about such materials and their effects on circuitry, yet it is commonplace in single to violate safety-first practices. A couple of coats of cement over the exposed circuitry would seem to provide a measure of protection. Of course, some receivers are supposed to be installed in parts boxes, which may have to have holes drilled for tuning and leads. That the boxes develop cracks is only a minor inconvenience. That the relay or tank coil, or heavy filter, gets banged around (even with a foam insert), makes the box a doubtful blessing. There is nothing like a can.

Any active flier can add to this list. Upon analysis, failures from such causes are sheer waste. The finest circuit and the best-built equipment are defeated when silly oversights or foolish practices cause a fly-away—which probably defies explanation.

Should we talk up our safety practices?—**BY BILL WINTER**

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

FLASH NEWS — SPECIAL: COMPONENTS FOR THE MARCY PRM-1 SERVOS

If you lack the facilities to make the components for the Marcy feedback servos but would like to make this without buying the full kit, Ace R/C, Inc. is making available the hard to make special parts on a separate basis.

Anodized aluminum case wih all the holes prepunched as manufactured by Marcy, is available on a separate basis at $3.90.
Special pot and gear train bracket is available at 50 cents.
Babcock output lever, 75 cents.
MSG 2 Wilson 44-W-SS metal gear, 25 cents.
MPBSA amplifier printed circuit board, $1.25.
Special pot with the two sized shaft, 2K, $2.50.
One 25K input pot for motor control servo, 85 cents.
One retaining and stop bracket, 50 cents.

All other components are standard and are listed in the Ace R/C current catalog.

COMING SOON!

FLASH NEWS — MARCY PRM-I PROPORTIONAL SYSTEM

The Marcy PRM-I System is the first proportional Rudder Only system with positionable motor control that has been offered as a package to the modeler.

Test flown for years, this system as a package offers advantages that are not found in other single channel proportional jobs. From the transistorized pulser to the transistorized tone generator to the two tube MOPA transmitter RF section, the transmitter is housed in a metal case, and features a stick control for rudder and a lever action switch for motor control.

In the receiver the super-regen vacuum tube detector is followed by transistor amplifiers which are coupled to the two servos. The feedback servo draw a current only when in motion, and translate faithfully the control commands from the stick at the transmitter, without flapping, the degree of rudder motion desired.

No relays are used in the system. In the receiver this means that hard landings do not jar the relay settings, and there is no tedious tinkering at the transmitter for adjustment.

The Marcy PRM-I is recommended for use in aircraft of .15 engine size and up. The system utilizes a single audio tone which is pulsed as to width, and for motor control uses the same audio tone either full on or full off for advancing or retarding the throttle.

The complete story on how these units perform together is being published in the January and March copies of Grid Leaks—one of the most complete construction articles ever offered anywhere.

The Marcy PRM-I Kit package consists of the Transmitter Kit, complete with pulser, Receiver Kit, and a kit for the Motor Control Servo, and another kit for the Rudder Control Servo. Also a complete installation kit. If purchased item by item the price would be almost $130.00. Our kit package price is only $105.95.

Also available on a Custom Built basis, under the direct supervision of Marcy Inkmann. Custom Built PRM-I system, as above but with all units assembled, ready to install. Only $165.95.

KRAFT CONVERTIBLE SINGLE SUPERHET

At last! From Phil Kraft comes the Convertible Single Channel Superhet at a price that is out of this world for the ultra reliable performance that the name Kraft means.

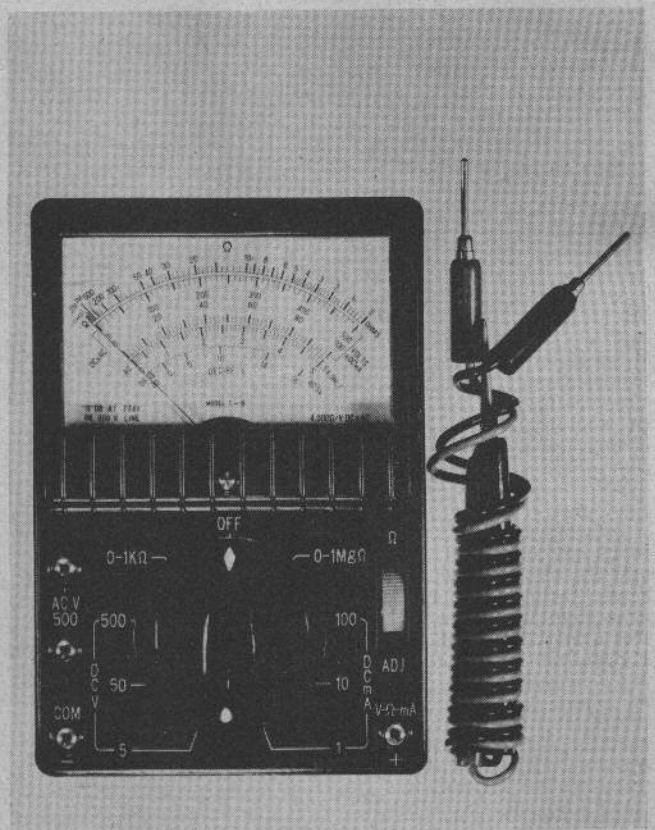
Completely wired and tested, the unit comes complete with a relay, and will follow the fastest pulsing. Available on all R/C frequencies. Housed in a metal case which measures 1¾ by 2⅞ by 15/16 inches. Weight is under 3 ounces. Completely tuned, aligned, and checked out. Ready to go. Be sure to specify the frequency you desire. May be used with the Kraft Single Channel Transmitter provided it is selected on the same operating frequency. One hundred percent completely assembled under the personal supervision of Phil Kraft. This convertible superhet is sure to provide an answer to the increasing amount of interference that R/C'ers are experiencing everywhere.

Now start single channel with the utmost assurance that you have the best in radio equipment available, and convert to multi channel either 10 or 12 when you are ready directly to the factory for a conversion. The price of the CKR1 Superhet (specify frequency) is only $54.95.

Conversion to 10 channel reed operation at the factory is $35.00, and conversion to 12 channel reed operation at the factory is $45.00. Begin R/C the best way with the sure fire Kraft Superhet Single, and go multi when you are ready.

KRAFT SINGLE HYBRID KIT

The Kraft Single Superhet is also available in hybrid kit form. The Hybrid features the complete assembly of the RF and IF strip, and it has been completely aligned. All you need to do with a Hybrid kit is to wire in about a half a dozen components as well as the 100 ohm Deans relay and save! The tedious part of wiring the kit has been completed in the Hybrid, and the savings are substantial. The Ace Hybrid Single Superhet Kit only $47.95.



At long last! Here is a Volt Ohm Milliameter combo that is designed for R/C at a very reasonable cost. Imported from Japan, this unit has precision 1% resistors for accuracy. Sensitivity is 4,000 ohms per volt. Reads DC voltages: 5, 50 and 500 volts; DC milliameters: 1, 10, 100 ma. Has two resistance scales: 0 to 1K and 0 to 1 Meg. Basic meter has two jeweled bearings. Housed in tough black bakelite case 3⅝" x 5¼" x 1⅜". Comes complete with test leads and two pen cells.

MT-2000 Meters. Only $9.95. **Available March 1, 1963, from Ace R/C.**

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

GG Actuator

BITS AND F...S

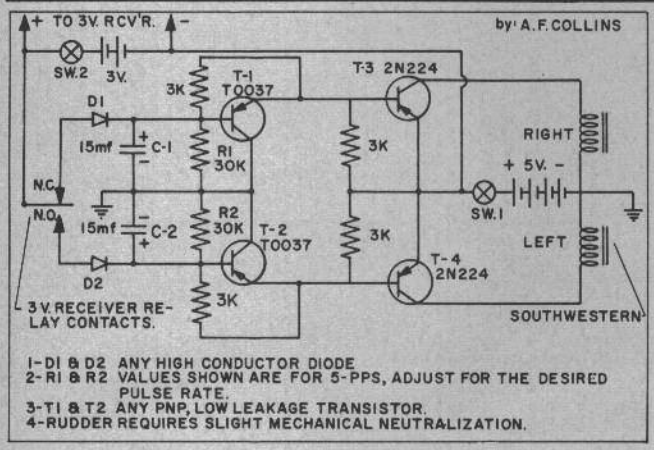
EDITOR'S NOTE—Many readers have indicated that this feature has a practical usefullness that transcen...ip that might help your fellow R/Cer? Sketches or drawings should be drawn as completely and neatly as possit...copy" is, the better the job GL can do in putting across your idea. Material should be sent direct to Grid ...ginsville, Mo.

Ninth Annual Toledo R/C Conference

Sponsored by the Weak Signals Club of Toledo, this mid-winter R/C Conference is the largest of its kind. More than 750 modelers —over 100 planes are expected in the competition—should attend. Program will be similar to those of other years, including exhibits, awards, speeches by experts, a Saturday night auction, door prizes and, if possible, flying demonstrations. Three times the space of previous conferences is available. Affair will be held in the Champion Spark Plug hangar at the Toledo Airport, February 23-24. Your contact: Conference, Box 2864, Station B, Toledo, Ohio.

DCRC Symposium

May 19-20 is the date of the Sixth Annual DCRC Symposium, Johns Hopkins Laboratory of Applied Physics, Silver Spring, Md. the place. There will be an interesting program in the various fields of R/C and flying, and the usual entertaining family banquet on the 19th. The 20th will be given over to flying demonstrations of various types of equipment. Reginald H. Mitchell is Chairman for the Symposium, but advance registrations should be made through John E. Patton, Route 5 Ridge Rd., Frederick, Md.



THIS CIRCUIT ELIMINATES RUDDER WIGGLE
by Frank Schwartz

■ Here is a remarkable circuit which has been designed and flight proven by Al Collins of Nashville. While I am not a pulse fan, this really takes the wiggle out altogether!

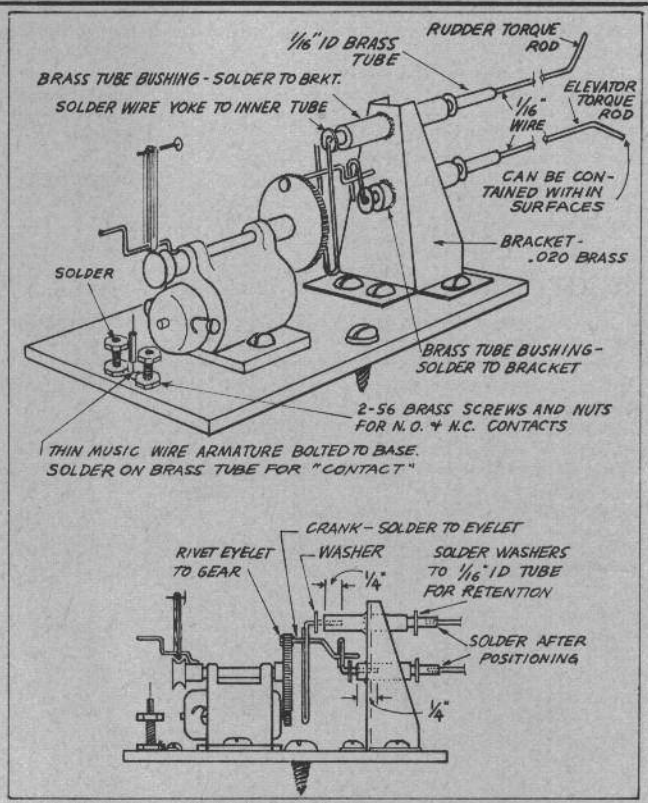
Here's how it works: Sending pulses of about five per second keeps the two P.O.D. units cut off. When the lever (as in a multi plane) is pushed right or left either making a solid or no tone signal, the appropriate contact immediately (1/20 second) closes and the actuator is pulled right or left. A very slight amount of mechanical neutralization is needed. Al uses plastic hinges which try to come back to center and a Southwestern actuator—but a Sage would do as well.

He has this in a Freedom 7 and I was amazed how nicely the system works. The front end of the circuit needs slightly more voltage than the servo (actuator) so he used the three volts working the receiver (a 3-volt superregen w/relay). As long as a pulse rate is going to the unit the actuator is dead and the magnetic plus the mechanical centering of the actuator keeps it at neutral, then a blip of right or left and there you are! Al suggests another transistor than the 0037 but that was what he had at the time he built it. Says a good low leaker, even a CK722, will do fine.

This system has much to offer in that it eliminates the wiggle and gives selectable right or left with instant response. True, it is not proportional but then it is not sluggish either. Al also has a motor control worked out for this so that, with left control, he has a 80/20 pulse which, hooked to another fast acting P.O.D., gives motor control. He says it isn't working to suit him yet so he did not include it in the diagram.

Our club had a Multi and Rudder-only Pylon Race contest and Al won first in Rudder pylon. The little plane really cut the corners, handling as if he was using a two-channel reed unit.

I asked Al if it could work a Transmite and he felt that it could be hooked right to the middle of the circuit, leaving out the 2N224's. Real two-channel control from pulse . . . fine for a bigger rudder-only job!



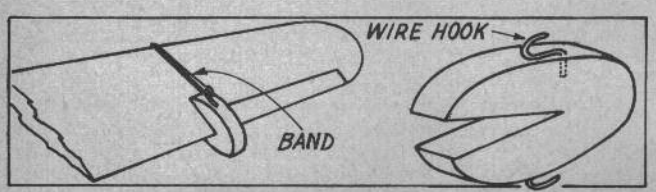
ACTUATOR FOR GALLOPING GHOST
by Bowen F Gover

■ I have used this system successfully in two ships. Our club has been flying "Ghost" almost 100% for the past three years and have had so much fun that the Multi's are gathering dust.

The normal system used around the country seems to use the 270-degree system, but we find that 360-degree is the best overall approach. Obviously, this allows for motor control, but also it permits a full "up" elevator for good loops, etc., without the typical "gallop." One disadvantage though, is loss of rudder as the upward stroke loses rudder beyond the 180- to 270-degree position.

This set up corrects that, keeping almost *full* rudder for within 10 degrees of dead top center. Separate torque rods are a bonus for adjustments and fitting into scale surface positions; in fact, the cranks can be buried within the "flippers" with no hardware being visible.

Don't let anyone sell "Ghost" short. The interaction is not noticeable to the observer, only the pilot, and I believe the gallop can be eliminated without losing max control if we would use more efficient motors (like Micro Mo) which can operate at a higher basic rate with no more current drain than a Mighty Midget.



PROTECT THOSE AILERONS From MARS Pulse

■ ANYONE WHO HAS transported a large wing in a small car knows what this subject is all about. Here is a partial answer. Provide the ailerons with chocks made of ¾-in. plywood or balsa held in place with rubber bands. The chock overlaps the joint between wing and aileron. It is recommended that it be taken off prior to flight!

Attention Contributors to Bits and Pieces: For any item used in this department, GRID LEAKS will award a one-year subscription. If you already have a subscription, it will be extended at its termination for one more year. Subscriptions also given for photos or drawings used in Readers Write dept.

BUILD A METER ON YOUR BOOSTER

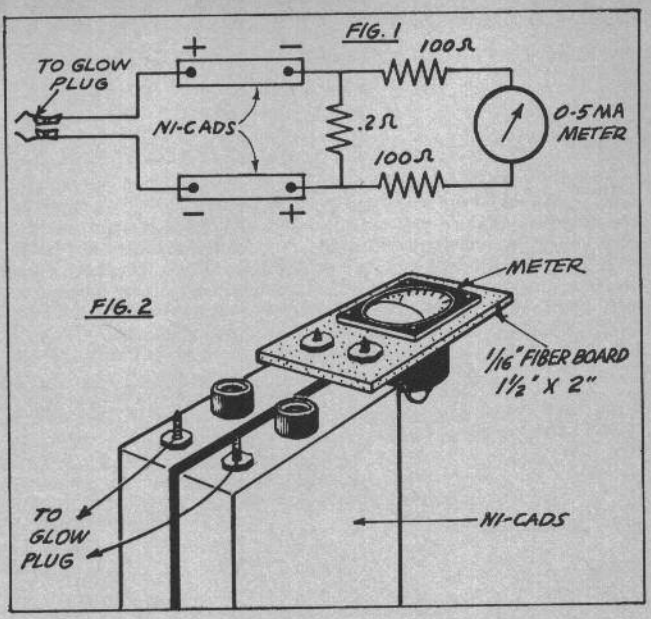
by Walt Good (from DC/RC Newsletter)

■ Ever crank away on that engine when all the while the glow plug was burned out—and you didn't know it? Here's a way to put a cheap meter into the booster circuit so you can read the current going to the plug. If the meter reads zero, the plug is gone. If the meter reads low, then you have a poor connection and the plug is not glowing. Ever notice how the champs like Kazmirski hold the battery clip tight to the plug while starting? They want to be sure of a glow and go.

This scheme requires two nickle cadmiums in series with a dropping resistor of about 0.2 to 0.3 ohm to drop the voltage at the plug to 1.5v. For the resistor I used 4 in. of fine iron wire. Wire from an old wire-wound resistor would be ok. The meter is an Aristocraft 1 in. dia., 0-5ma milliameter and is placed across the dropping resistor with appropriate series resistors to give a reading of 3 to 4 when the glow plug is connected. Fig. 1 shows the connection.

With this arrangement the meter scale reads roughly in amperes. A reading of 3 to 4 amps. is normal. The physical layout is simple and takes only a few minutes to construct. The meter is mounted on a 1/16 in. fiber-glass board and the board is screwed down on the battery terminals as shown in Fig. 2.

Other current meters could be used here if the 200-ohm resistance is adjusted accordingly. Of course, an ammeter of 0-3 or 0-5 amps. would be fine if you could find a nice small one!



MYSTERY RECEIVER IDENTIFIED

■ The Mystery Receiver, Volume 3, #10, GRID LEAKS has been identified. The circuit originally was sent to us by James W. Fosgate, Indianapolis, Ind. The receiver was developed by Roland C. Rhein, Speedway, Ind., along with Jim, and is proving itself in the Indiana area.

Comments from both Roland and Jim indicate that several improvements have been made, and we point out these improvements for the do-it-yourselfers who may have started this receiver as a project.

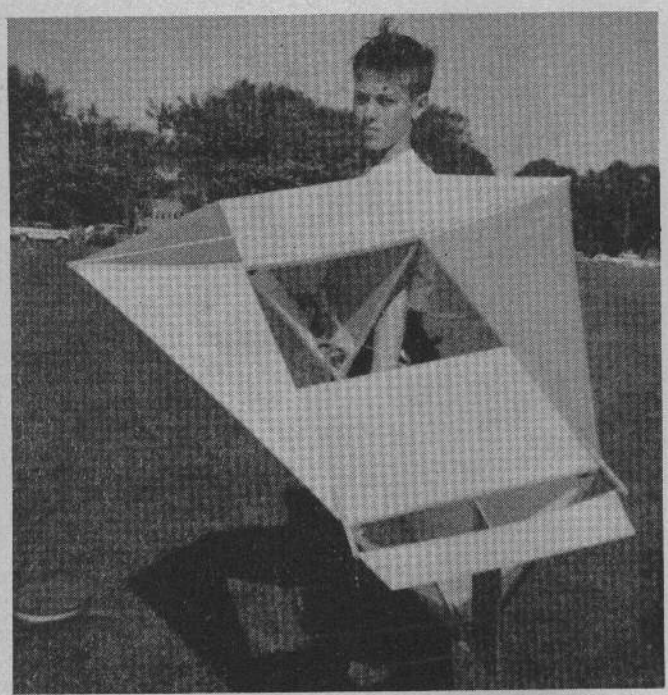
"The 2N217 in the first stage should be a CK722, the 2N1265 in the tuned circuit should be a 2N217 and the 330K in the tuned circuit can be removed. This is the best receiver I have ever had and is extremely fast pulsing for proportional work. I hope some one will take advantage of its good qualities and get a lot of fun flying." From Roland Rhein.

From Jim we have a new pulser, two more receivers which have proven out very well, and some of this will be scheduled in upcoming issues of GRID LEAKS.

We are delighted to give proper credit where credit is due, and hope with the improvements suggested by Roland and Jim that the GRID LEAKS readers who have taken this on as a project will be able to duplicate this apparently successful job.

Go Fly A Kite!

• Radio controlled kites can dive, spin or sideslip with bullet-like speed.



Jim Swearingen, son of the author who operates North Star Kite Co., displays highly maneuverable combat kite equipped with radio to give elevator and rudder control. Ideal way to test experimental receivers.

KITESMEN PURSUE THEIR HOBBY in the face of widespread ridicule. Few understand them. Many people ask "why." This is an interesting question. Kitesmen are somewhat like model airplane builders; they have a hard time explaining just what they get out of their sport. But as a minority group, ever on the defensive against the world's sneers, they seldom miss an opportunity to try to explain themselves.

Most kite flyers are just plain kite flyers. They send up a kite to feel the tug of the string and to watch it dance in the sky. All the cares in the world seem to vanish at this point.

Some kite flyers are highly-competitive. They don't fly kites, they fight with them. These kites are flown with a special glazed string, designed to cut. Two or more kitesmen get together and try to cut each others kites out of the sky. The object is to maneuver until your string is over your opponent's or across his kite itself. Then you saw back and forth until his string snaps. By ancient custom, the downed kite goes to the winner. Such a kite contest could last for hours—even a whole day. Imagine how fast one could down his competition if his kite were radio controlled.

You can make a radio controlled kite dive, spin or sideslip with bullet-like speed. It takes lots of practice, but once you have the hang of it, no conventional kite can get near you.

The Brazilians compete by attaching fishooks to their kites' wingtips and diving at paper targets on the ground. The man who picks up the target wins. A radio control kite would prove excellent for this event.

A kite is also a very good way to range test your R/C equipment. The kite pictured has rudder and elevator control. Why don't you build a radio controlled kite as a Winter project? When Spring comes, you can show your kite flying friends how a kite should be flown.

By Bob Swearingen

Readers Write!

THE RATINGS LOOK GOOD

GRID LEAKS is certainly dressed up! Congratulations to your staff. I am a hobbyist turned semi-pro. A radio amateur since 1939, and a power distribution engineer full-time, I have formed a group of three part-timers devoted to the development of ham accessories in the lower price range. We are presently marketing radioteletype terminal units and audio band-pass amplifiers thru several smaller midwestern distributors.

GL is a constant source of unsophisticated logic, and the fresh ideas of its authors have caused many an additional cup to be poured in our shop, and helped us to advance the enjoyment our customers receive from their hobby, via simple-to-operate, high-reliability, transistorized equipment. Indeed, GL gets as much attention from our group as other technical periodicals.—E. E. Ellsworth, Ellsworth Radionics, Park Forest, Ill.

•

I wish to congratulate you on the fine work you people are doing on GRID LEAKS. Since reading about the suggested articles on "electron flow" by Major Robert E. Parfeis, I would favor articles along this line. Knowing more about your equipment makes it more interesting, easier to keep working, and more confidence is gained in your equipment, therefore more flying and better control.—Clifford A. Altemose, Williamsport, Penn.

•

A large bouquet of congratulations for the staff and contributors of GRID LEAKS. Well done!

Considerable time is spent by this reader trying to assimilate all the new info and various schematics. Its quite an undertaking. Special thanks to Dale Springsted, who is always ready to open the door, whenever I hit that stone wall. Not only will he repair the faulty equipment—he can give the why and wherefore as well.

We like to classify ourselves as one of the so called average builders. The Sunday flier and chap who remains on the **spectator** side of the rope at various R/C meets. There are more on this side by far! We may not be in a position to have the ultimate in ready-to-go equipment, so we compromise and assemble from kits in order to make any attempt to fly R/C. Incidentally, I believe this type of modeler to be Ace's best or largest customer, at least we find it so locally.

With this in mind, we certainly favor Major Parfeis and his suggestion of voltage change and "electron flow." It's an excellent idea and could be incorporated into your kits very much like the present test point for audio level idea.—Kazimir Pulaski, Westfield, Mass.

•

Just a note to congratulate you on the fine issue of GRID LEAKS. It has definite use—(that isn't the word) **place** is better. Am flying my 5th Orion—10-channel relayless Orbit 52.5 mc, Bonner Servos, MERCO 49. My opinion of this engine is **very** high.—Dr. James M. Edwards, D.D.S., New Albany, Miss.

•

I have just completed reading your Sept.-Oct. GRID LEAKS. Your article by Francis R. Plessier was of great interest. Your coverage of the 1962 World Championship for R/C was very informative. I have enjoyed my subscription to your fine magazine, but would like to see a trading section for used R/C equipment.—Luther J. Burriss Jr., Clemson College, S.C.

•

I've been reading over my Sept-Oct. issue of GRID LEAKS, and I would like to put in my "vote" for an article/s as put forward by Major Robert E. Parfeis USAF, (Page 18 of Grid Leaks). An article/s concerning the workings and etc., of each component in a receiver circuit, from single-channel tone thru multi, and transmitters if possible—but single tone receiver anyhow!—Gene Unbright, St. Louis 7, Mo.

•

Attached you will find my check in payment for a renewal of my subscription to GRID LEAKS. This check represents my third continuous subscription to your fine magazine. This collection of GRID LEAKS is bound and is part of my library here at home.

Please Paul, what ever you do, do not change the format of your publication. I hope you will continue to provide information that relates primarily to the latest advances and experiments in the art of R/C, and only through this lofty intent, will your magazine continue to lead the field and provide inspiration to the many contributors of articles in GRID LEAKS. Keep up the wonderful work and I hope, perhaps someday, I can expect this mag every month.—Pat Lufonico.

•

Like your GRID LEAKS very much and like to see the technical trouble shooting, and alignment articles with current and voltages given. Remember some of us older ones have troubles brought to us by the younger generation. Have to keep them flying as you know. At the field sometimes others troubles keep me from getting in a flight—a good feeling to bring home a one piece low wing.—David Converse, Los Alamitos, Calif.

•

I saw latest issue of GRID LEAKS in a hobby shop the other day. This is getting to be quite a magazine, it is a beautiful job from cover to cover. No R/C man should be without this publication.—Richard Swanson, Minneapolis, Minn.

•

Enclosed is a check in the amount of $2.00 to renew my subscription of GRID LEAKS. I am not sure that my renewal is required yet, but I don't want to miss any issues.

You are doing a fine job with this publication, keep it up. Also I do not own one of the new Kraft transistor receivers but have seen a few in action. They are a fabulous unit at twice the price.

A few notes about the receiver are (a) they are somewhat temperature sensitive (b) some of the members are using three nicads to overcome the drop across the switch transistor; this solves that problem and also picks up two to three times the receiver sensitivity.—C. R. Carmen Jr., Mt. View, Calif.

I received my latest issue of GRID LEAKS last week and I must say this is tremendous. Little did I suspect when I got on the band wagon a couple of years ago that it would develop as it has. I feel I must add my words to others which are undoubtedly coming from all over the world indicating satisfaction with your new format, excellent printing and brilliant arrangement. Keep it up, we R/Cers need you.

How about some circuitry for a transitorized switches to replace a normal SPDT relay such as found on any common receiver. It seems to me that R/C is just the elimination on many variables to produce a dependable system. To this end, I would like to eliminate the relay in a pulse system. This switcher should have the ability to work a Mighty Midget or equivalent. How about it, you electronic experts (which I'm not)?—D. E. Henshaw, Windsor, Ontario, Can.

•

I am on vacation but I'll at least tell you that GRID LEAKS is doing an excellent job. Sept.-Oct. issue couldn't be better.

My R/C K3VK works perfectly particularly after Dale Springsted replaced a transistor. Seven flights with a "School Boy" and tonight I try out a "Nomad."

I've now got my sights on proportional. It appears here and there that Marcy Inkman has completed a multi-flex (time division) proportional system. Data on this would be very interesting and also kits if practical.

As I recall from my telephone conversation with Dale Springsted that John Phelps of Syracuse will have an article published on a prop system. Since Dale thinks the system has merit—I'll look forward to reading this forth coming article. (American Modler I believe).

By the way the purpose is to renew my subscription to GRID LEAKS. I have all the copies that were ever published!—T. P. Capron, Wayland, N.Y.

PLEASED WITH GALLOPING GHOST

This season I got my first G.G. (Galloping Ghost) plane going. It has been rather successful and I am more than pleased with the results. I noticed that helpful information in this field is a little hard to come by. The local club has been flying R.O. proportional for some time, but no one else has gone into G.G. flying with any success.

I spent the summer at Benton Harbor, Mich., visited the Kalamazoo Club twice. In this area lots of R.O. escapement and multi, but no proportional of any kind. It seems that progress to other systems is slow once they get started one way. One contestant at the Kalamazoo R.O. contest flew proportional.

I had been thinking along the lines of the "Pulse Blip" system before it appeared in G.L. (Sept-Oct.). I hope I can get one going for next season.

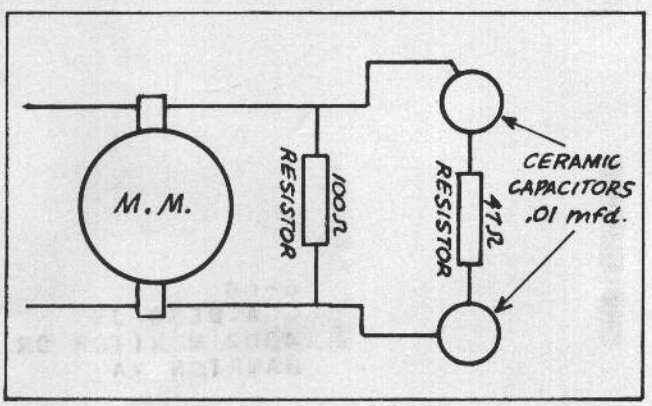
I think I got the most out of John Worth's original article about G.G. or Simple Simul than any other single piece of info I could find. Had a hard time getting it since I didn't have the publication.

My needs in the area of useful info are: 1) A good reliable motor control circuit for Prop. and G.G.—lots of them published (but who knows if they will work?), 2) Recommended control surface size for proportional systems on various commonly used models, 3) Good reliable construction setups for servo to surface movement, 4) Noise elimination methods or circuits for Superhet receivers.

No. 4 is almost never mentioned, but it was the worst problem I faced in getting the G.G. system going. This was with a C.G. Superhet, but it seems to be present in many others and is sometimes impossible to solve.

I used something like this:

—William Gilchrist, Evansville 11, Ind.



TWO RECEIVERS NEEDED?

In the past few years I have done quite a bit of flying rudder-only using Kraft single receiver with relay. If you receive the AMA magazine **Model Aviation** you may have noticed the cover a couple of months ago of a young boy holding a .010-.020 powered R/C plane, which was designed by Frank Ehling. I built the plane before the magazine was published and to date I have over 50 flights using the Kraft 3v relayless, add-on switcher and C & S Mk. III for proportional and, so far, I have had absolutely no trouble. Phil Kraft should be congratulated on doing another fine job.

In the past year I have noticed a sudden increase in small (.010 & .020) R/C planes. This is due no doubt to small transistorized receivers and the new small engines. While using a relayless type of receiver, one is quite limited to the type of controls he installs into his plane, especially if you want proportional control. Here again you have the same old problem, a need for a good servo. However, the need is much greater when using a relayless receiver. Also you are very limited on types of servos available to use with the add on switcher. This problem leads me to think that there might be a demand for one or two types of receivers. They are 1) a fully transistorized 3-volt double-ended relayless receiver for proportional control, and 2) a 3- or 4½-volt all-transistorized receiver using a 50-ohm or 100-ohm relay.—Ken Curtis, Riverdale, Md.

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GRID LEAKS

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