

R/C DATA SERVICE

MARCH-APRIL, 1962
VOLUME III, NUMBER 7

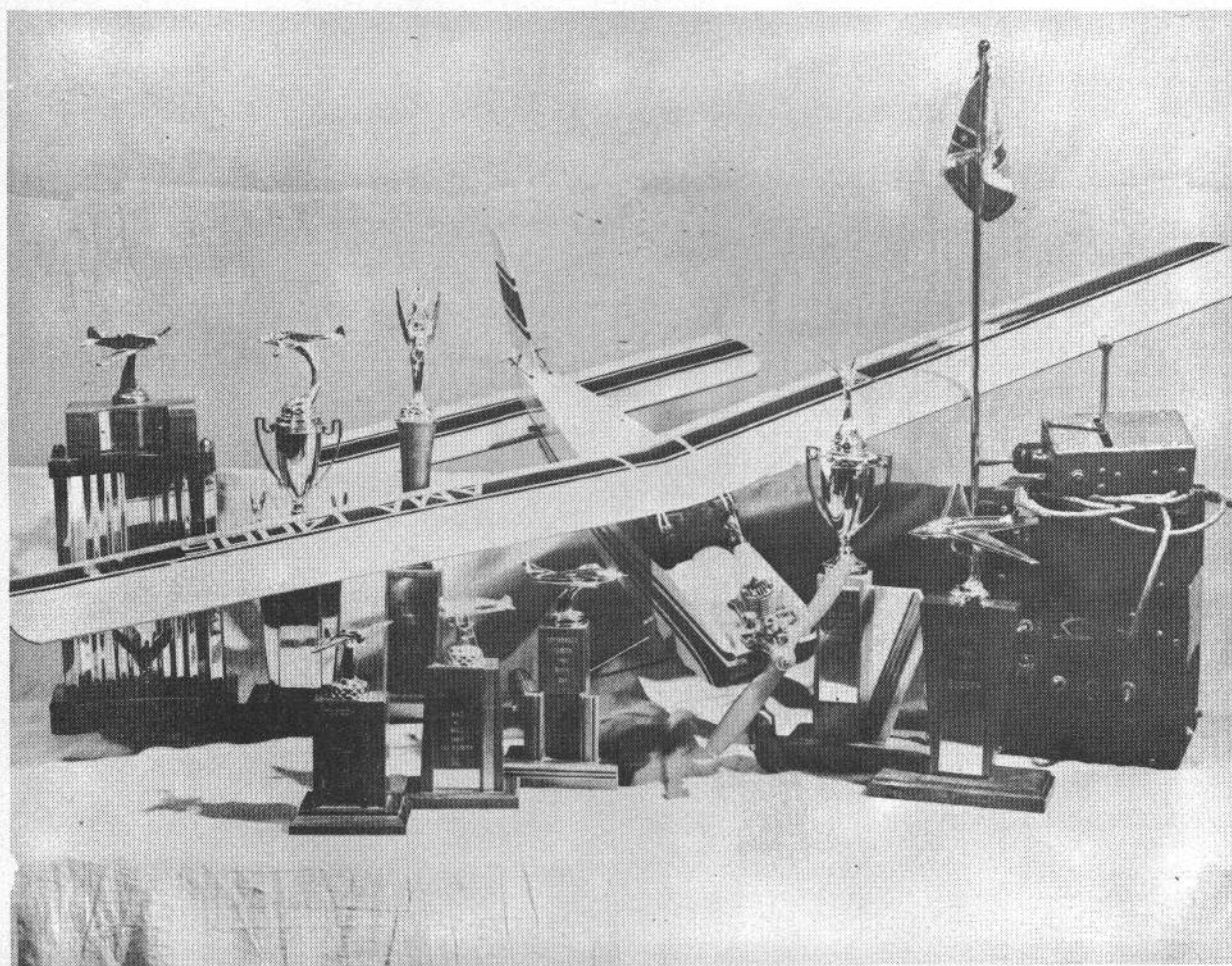
GRID LEAKS

25C

PUBLISHED BI-MONTHLY AT HIGGINSVILLE, MO.
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Proportional Control for Rudder Only

PART III BY JAMES SHOW



Proof of any R/C system comes only from performance in the air! Look at some of the hardware that the system Jim Shows is writing about, has racked up.

To us, this is quite convincing. Grid Leaks proudly presents part III of the series. The next issue will contain the concluding article.

This third article of the series is devoted to the ground based components of the system which consists of the stick pulse control box and transmitter. The control box, designed and used by the writer for the past 2 years, is published in an article in the March 1962 issue of Model Airplane News. The writer's transmitter is a WAG TTPW published in the March 1957 issue of American Modeler and kitted by ACE R/C. As the published articles cover the description, construction and operation of the respective units, this article is devoted to a discussion of the application of each to the proportional rudder only control system.

STICK CONTROL BOX - In Part I of the series, it was shown that the function of the stick control box is to convert the position of the control stick into equivalent electrical pulses which in turn controls the transmitter signal. An example pulse frequency of one cps (cycles per second) was used. In actual practice a pulse frequency of approximately 10 cps has proven optimum for the receiver-POD-servo system used. Part II described the relationship of the airborne system and transmitted signal and the dependence of the overall system on the signal symmetry and frequency for proper operation.

In converting the stick position into equivalent electrical impulses, the control box should provide at least a 80/20 symmetry ratio with maximum stick deflection with minimum change in pulse frequency.

After having flown with several different stick control boxes, both electronic and mechanical, the writer found that for a fixed pulse frequency system, a low voltage, 6 volt, transistorized pulser proved optimum with respect to performance, reliability and operating costs. The electronic unit uses a relay to provide the switching action for the transmitter, much in the same manner as the keying switch on a single channel transmitter. In addition to the relay which controls the pulsed signal dwell time or symmetry, the control box

can transmit a steady on or off signal. The switching arrangement is shown schematically in Figure I.

As the control stick is moved, the dwell time of the pulser relay armature on the NC (normally closed) contact increases or decreases depending on the direction of stick motion. At maximum stick deflection, the armature dwell time becomes 80% closed 20% open or vice versa, however the armature does not stop pulsing. To obtain engine speed control, the control box is equipped with two push button switches, normally closed and normally open as shown in Figure I, which override the pulser relay signals. When the low engine speed switch is pushed it opens the relay circuit cutting off the power to the modulator regardless of the relay position, as the two are wired in series. The high engine speed switch is wired in parallel with the relay and is normally open. Upon actuation, the switch completes the circuit, by passing the relay, and supplies continuously uninterrupted by actuation of the engine speed control switches.

Another important consideration of the stick control box design, which is often neglected, is its overall size, weight and physical arrangement. The major advantage proportional control offers over other control systems is smoothness and precision, which unfortunately is often compromised by poorly designed ground control stick boxes. A good control box is one that is light in weight and rests comfortably and naturally in one hand so the stick can be precisely controlled with the other. Experience has proven the best size for a stick control box is one that is approximately 3 inches wide, 2 inches deep and 5 inches long.

With the box resting in the palm of the left hand, the left thumb and left middle finger naturally grasp the sides of the box near the front end. With the high engine speed push button switch located under the thumb and the low engine speed push button switch under the middle finger, high and low speed engine operation

Figure I

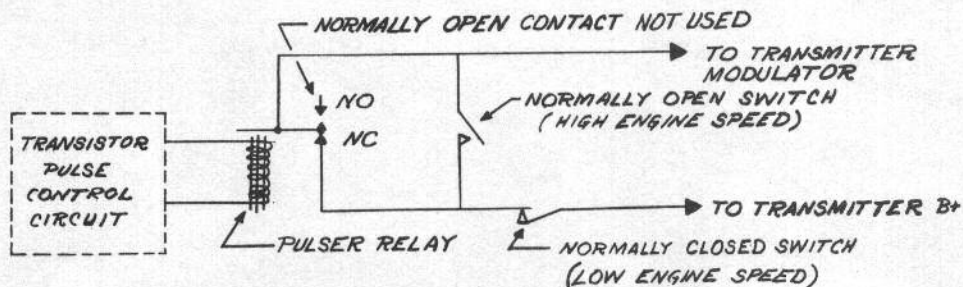
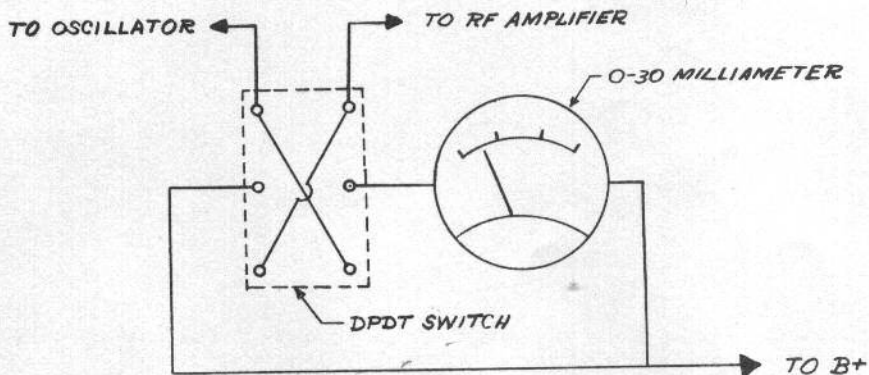


Figure II



can be actuated without shifting the grip, by simply depressing the desired engine control switch. The stick is placed forward on the box to allow the heel of the right hand to rest on the upper rear surface with the fingers grasping the stick lightly. This arrangement combined with a moderate stick centering force, provides the flyer with a sense of feel with respect to control application. The ON-OFF battery switch for the stick box is located on the front end along side the transmitter control cable jack to prevent accidental actuation during flight.

TRANSMITTER - The WAG TTPW transmitter is an audio tone amplitude modulated (AM) type. The stick control box controls the transmitted signal by turning on and off the electrical power (B+) to the modulation section of the transmitter causing the emitted radio signal to be either straight cw (carrier wave) or amplitude modulated cw. The writer's transmitter is a standard WAG TTPW used for both multi proportional and rudder only proportional operation. The rudder only stick control box is equipped with an 8 pin octal socket, the same as the multi proportional control box, but use only the two modulator leads. During rudder only operation the two integral pulsers in the transmitter are left in the off position. Both the WAG TTPW and Kraft Single transmitter modulators separate satisfactorily with a

rapidly keyed B+.

The only modification the writer has incorporated in his transmitter is the addition of a 30 milliampmeter to the front panel. The change is shown schematically in Figure II. The double pole double throw switch allow the meter to indicate either the oscillator or amplifier current. This is most useful in tuning the final state of the transmitter and for quick periodical checks of the transmitter operating condition.

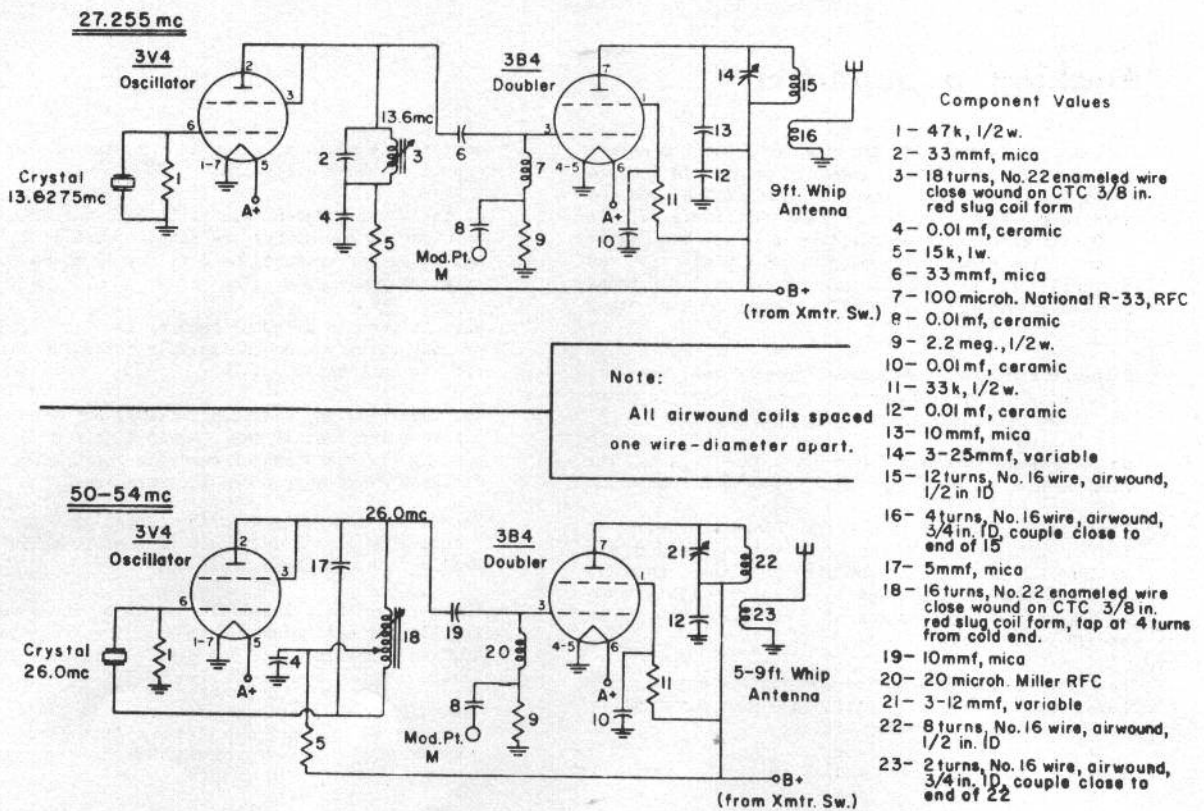
In lieu of dry batteries, the writer uses an MC two volt wet cell vibrator power supply. This reduces the operating cost over dry batteries plus provides an engine starting battery. This second feature is very convenient for sport flying, but is questionable for contest flying where the transmitters are impounded leaving the flyer without a starting battery should he desire a engine run-up and adjustment between flights.

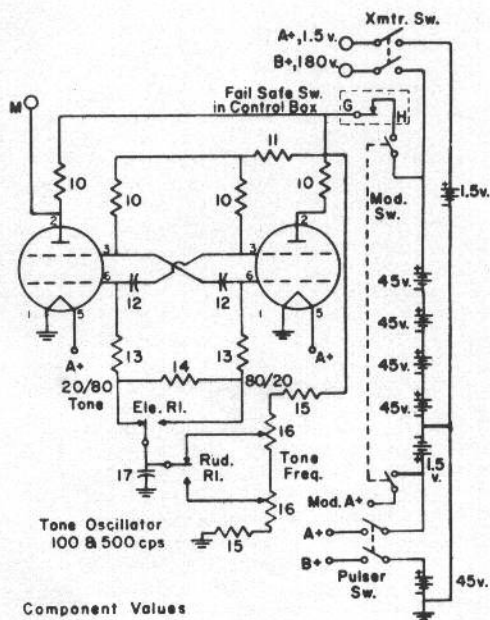
The control cable between the transmitter and stick control box is approximately 10 feet in length which permits the flyer sufficient freedom of motion during flight operations. The next final article of the series will cover installation, adjustment, operation, malfunctions and limitations of the system.

EDITOR'S NOTE: Since it was printed 5 years ago, and may not be readily available now, Grid Leaks is reprinting the circuit. Copyright is held by Dr. Walter Good.

Immediately below are the two MOFA sections used, one for the Citizen's spots, and the other for 50-54 mc operation.

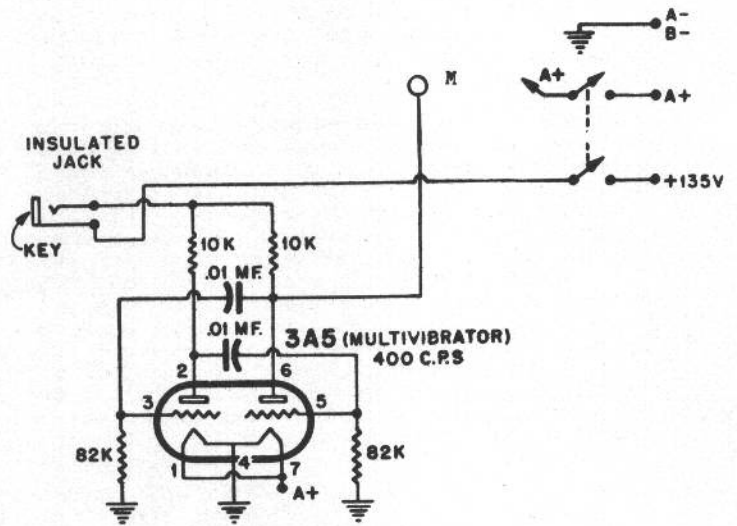
On the next page are shown two modulators. The first is the one used in the WAG TTPW, the second is the multivibrator 3A5 version as used by Dr. Good on his single audio transmitter.





Component Values

- 10 - 47k, 5%
- 11 - 82k, 5%
- 12 - 0.005mf, 5% or closely matched, mica
- 13 - 470k, 5%
- 14 - 1meg, 5%
- 15 - 4.7k, 10%
- 16 - 100k, pot.
- 17 - 0.001mf, ceramic
- Tubes - 3V4



Peaking a Superhet

Phil Kraft, designer of the superhet, soon to be released in several forms, urgently recommends that a potential kit builder, give the circuit a second and hard look. While the design is straightforward, it is **ONLY** recommended for builders who have had quite a bit of technical background. Ace R/C adopts the attitude that it will push the Hybrid unit for those of less experience, since all alignment **has** been done.

Here are some simple alignment procedures, however, using some of the simpler equipment. There is nothing about the Laboratory approach on this!

While this is intended for primary tune up, it can also be used to touch up the Kraft or other supers.

First we will tune with a VTVM. Place the meter on the 10 volt scale. On the Kraft this is land B and to land C. Connect the red wire from the receiver to +6 volts, and the black to -6 volts. (This coding may vary on other makes of receivers.) The meter should read 0 volts.

Now turn on the transmitter and depress any of the keys. The meter should still read 0 or give indication of a very low voltage.

With key down, s, tune the tank coil, L1. Try to

achieve the maximum, which in the case of the Kraft, should be about 4.5 volts.

If the meter reaches this point with the transmitter at close range, remove the antenna, and if the voltage falls off, retune the coil trying to reach the original reading.

When it reaches original reading move the transmitter away until you can definitely determine the peak for the tank coil.

Now come back in, with transmitter, but antenna off and tune the last IF can. Again tune for peak repeating the operation of removing the transmitter a distance away, so you can determine peak.

Repeat the foregoing with the second IF, then the first. **THEN** repeat the whole procedure again for a really fine and close touch up.

The reason the transmitter has to be moved away is the AGC Automatic Gain Control on the Kraft is way up, and close in it is not possible to peak IF units.

When tuning with a scope, connect the reed bank directly to the vertical plates. Tune for the most expansion of the wave shape which the tone gives.

Modulators For Reeds

BY MARION DODSON, K9KQJ

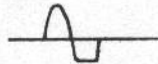
Am enclosing my first attempt to write something in the hope that it might be of some help to others. I do not expect that necessarily everyone will agree with all of my deductions. However, after almost three years of experimentation with home made reed receivers and transmitters, these are some of the conclusions I have reach. I do not claim to have originated these ideas - or the circuits. The basic idea for using a toroid was passed on to me by Colby Evett when I was enroute to Guam. The idea for using the pot to adjust frequency is from the Orbit equipment.

Of course in reed work, the first requirement is frequency stability. However, another factor which is often overlooked is the percentage of modulation. Most multi channel reed receivers of the super-regen type seem to require 100% for best results. The next factor which must be considered is the wave shape of the modulating signal. Theoretically this should be a pure sine wave. Practical considerations usually dictate a concession or two with respect to the purity of wave shape.

The multivibrator audio generator has been used in R/C for some time. By using a toroid choke this can be stabilized as far as frequency drift is concerned. A high Q provided by the toroid chokes seems desirable.

Toroids in the range from .5 to 2 Henry can be had. Generally speaking, the higher the inductance, the higher the Q and thus the less capacity required to tune to the desired audio cps required.

What about the wave form of a multivibrator? When tuned in this circuit it is neither a square wave or a sine wave. The wave form shown is typical and it will

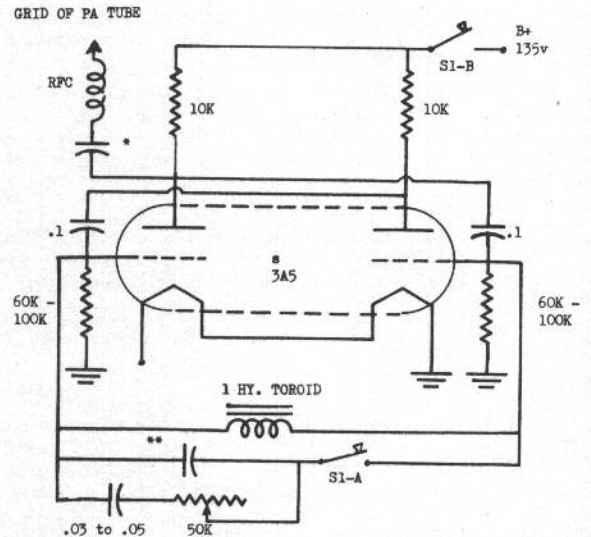


drive a reed. Note that the feed back capacitors are .1 mfd. A decrease in the value of these will prevent the proper oscillation at low frequencies.

Either of the circuits shown will modulate practically any hand held transmitter if properly adjusted. A method I have settled on was evolved after several different approaches were tried. Simply go over all transmitter adjustments (including neutralization if used)--until a field strength shows at least a 40% drop when a modulated signal is applied as against the straight RF signal alone. 50% drop is desirable if it can be had.

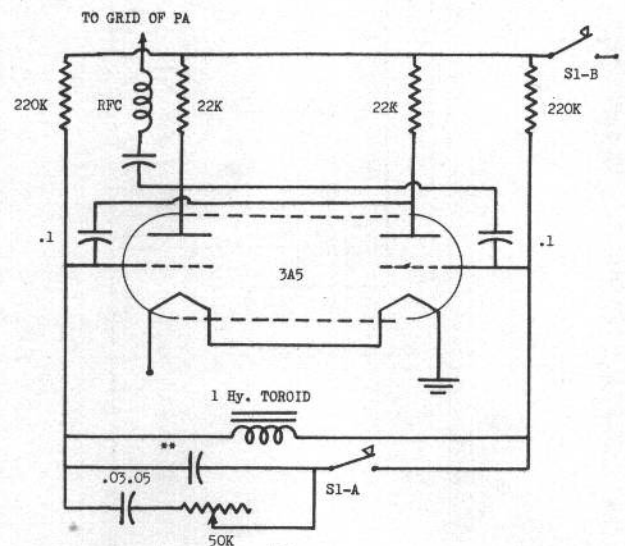
Then monitor receiver output with phones. With high enough percentage of modulation there will be no side-band tuning. The foregoing applies only when using grid modulation. This procedure has been used to adjust transmitters on the 26 to 27 mc spots and also in the 50-54 mc range. They have had power inputs from half a watt to three watts.

While both circuits seem to work fine in every way the one labelled B is the one I am using at present. It modulates half of a 3A5 at 51 mc.



* exact value as necessary, will range from .01 to .15
 ** exact value as necessary to tune to desired reed with pot as near center of range as possible. .15 to .35

A



B

Simple POD-Failsafe Circuit

PLAY IS FROM BROADHURST TO DAVIS TO GRID LEAKS

In the September-October issue of Grid Leaks there is mention of a Kraft receiver with a pulse omission detector circuit by Ernie Reuther.

Here is a circuit diagram used and developed by DCRG members and who are having very good luck with it. This uses the servo batteries for its power so no extra battery need be used in the plane. This seems to me to be just the ticket for combining on one board with the Kraft, or even a small add-on unit.

Perhaps you are planning just such a thing, but it is so simple as developed by Bob Broadhurst, I'm passing it on. It will be published in the DCRG newsletter too.

Fremont Davis
University Park, Md.

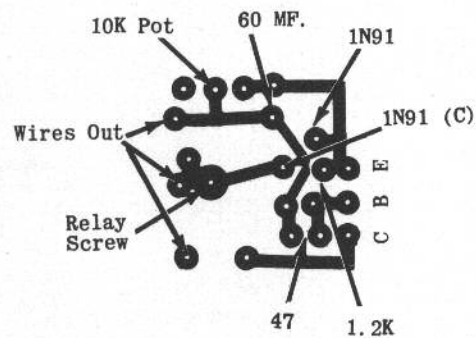
Here is a failsafe circuit similar to others but it uses only actuator batteries for power. This circuit also works in reverse of most, in that the failsafe relay stays pulled in as long as receiver pulses and drops out on lack of pulse; which means should actuator batteries go dead or stop functioning for other reasons, the failsafe will automatically drop out. Most other units require the battery power to pull the failsafe relay in. The unit has been flown for a number of months with no problems.

The variable 10K resistor can be replaced with a fixed unit once the value is set. With the fixed resistor a plastic box only slightly larger than the one used for a Little Gem relay. This lends itself very well for use in

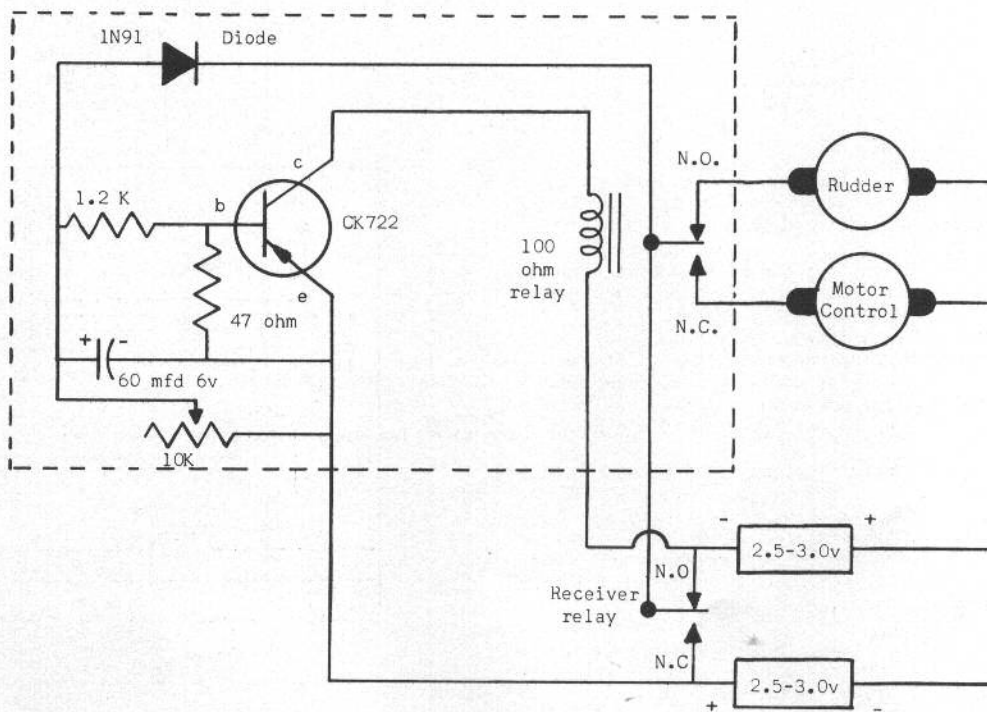
small .049 airplanes because it does not require any additional batteries. The circuit as drawn operates with the lack of signal, but can be operated with solid signal by reversing POD relay contacts. -- DC/RC Newsletter

EDITOR'S NOTE: This circuit so enthused the GL staff we decided to do some PC doodling. Below is the full size result for those who would like to etch your own base.

Unit may be housed in Plastic case 1 1/8 x 1 1/8 x 3/4". Relay of the Deans or Gem tinimite series is required.



This view is from the TOP
PC portion is below.



AMA 1962 R/C RULES

Here are the 1962 AMA R/C rules. While all AMA members received them in *Model Aviation*, we bring them to you in a continuous form which we believe will prove especially helpful to Contest Directors and judges for the early Spring contests.

AMA headquarters will have the official rules book, but this will contain ALL events. Here are all the R/C events on a handy 4 pages.

As a special service Grid Leaks will run some extra pages of these rules and these are available to CDs and Judges, as long as they last. These will be no charge for the service, but we ask you to reasonable in your requests.

22. RADIO CONTROL PATTERN EVENT REGULATIONS

- 22.1 **OBJECTIVE:** To control by radio a model airplane so that various planned maneuvers may be accomplished. The criterion is the quality of performance, not the mechanism of control. R/C competition is based on the excellence of performance of the model's maneuvers, compared to similar maneuvers performed by a full-sized plane. Maneuvers shall be judged according to a recognized full-sized plane manual, such as C.A.A. Bulletin No. 5, "Flight Instructor's Manual."
- 22.2 **GENERAL REQUIREMENTS:** Models may be of the reciprocating internal combustion engine-powered type with no limit on engine size or length of run, or of the towline glider type, with no limit on length of towline. No model may weigh more than 15 pounds gross weight ready for take-off.
- 22.3 All radio equipment and operation must conform to the regulations of the F.C.C. AMA membership card and F.C.C. license of each entrant shall be checked at every sanctioned meet.
- 22.4 The Radio Control Pattern Event shall be divided into the following three categories:
Class I—Models which are controlled by the rudder only; the rudder is defined as the movable surface affixed directly behind the conventional fin. Engine control and/or cut-off by radio is allowed in this class, but actuated brakes and steerable wheels are prohibited. Class I equipment is limited to the single channel type.
Class II—Models which do not fall in the first or the third classes.
Class III—Models employing systems that allow full and independent operation of any one control surface without operation of any other control surface.
Engine speed control and/or cut-off optional in the second and third classes; there is no limit to the number of controls allowed in these two classes.
- 22.5 A Class I plane may be entered in either of the other classes, at the option of the flier, and a Class II plane may be entered in Class III. Scores for all three classes shall be listed separately. Contestant shall be permitted to enter only one plane in the RC Pattern Event, and that in only one of the three categories listed in Para. 4. A plane is considered "entered" when it has completed an Official Flight.
- 22.6 **NUMBER OF FLIGHTS.** There shall be no limit on the number of flights (other than that imposed by time available). Contest officials shall make every reasonable effort to insure that all contestants receive equal opportunity to fly.
- 22.7 **OFFICIAL FLIGHT.** A flight is considered official if two maneuvers, other than take-off and landing, have been judged. An attempted maneuver yielding zero points is still considered "judged."
- 22.8 **TIME LIMIT:**
A Class I contestant is allotted a total of nine minutes.
A Class II contestant is allotted a total of eleven minutes.
A Class III contestant is allotted a total of eleven minutes.
In all classes the contestant must commence his flight within the first three minutes. When he fails to commence within the three minute time limit, and is so informed by the judge, he must immediately clear the area for the next contestant.
- 22.9 The highest score for the best single flight shall be the winner. Maneuver points from repeat flights may not be added to earlier flights. Each flight is complete in itself. In case of ties, the second best flight scores of the contestants concerned shall be used to determine winner.
- 22.10 **POINT SYSTEM:** A point system shall be used to score maneuvers. Each maneuver shall be judged on a scale of zero to five.
- 22.11 **FLIGHT PATTERN:** The contestant must fly his entire flight according to the established Flight Pattern and in the order listed. The contestant may waive any maneuver ex-

cept those numbered 2 through 6. Maneuvers performed out of order will not be judged. The contestant must call out each maneuver before he attempts to perform it. ALL THREE CLASSES WILL USE THE SAME FLIGHT PLAN. (Except for maneuver 9a-9b).

MANEUVER:

(Each one is to be considered as a separate proposal. This list will replace in the new rules those under the heading MANEUVERS in the 1959-1960 rule book.)

1. *Proto Taxi.* Taxi downwind at least 50', stop, turn at least 120 degrees into the wind...
 - 2a. *Unassisted ROG.* No help of any kind release of plane.
 - 2b. *Hand Launch.* Mandatory zero points.
 3. *Straight Flight.* Approximately upwind from directly over transmitter to marker 500' away. Judge will announce arrival over marker. (Judges may reduce distance in windy weather.)
- Note: On maneuvers 3-6, maintain constant altitude for top points.
4. *Procedure Turn.* 90 degrees left, starting just beyond marker, followed by immediate 270 degree right turn.
 5. *Straight Return Flight* from marker to directly over transmitter.
 6. *Figure Eight.* Axis perpendicular to wind. Smooth equal circles, crossing over above the transmitter.
 7. *Touch and Go.* While traveling in a straight line, plane must land and take off again. In the judges opinion the plane must be completely unairborne, but must not come to a stop on the ground.
 8. *Wing Over.* 180 degree change in direction, with level recovery at same altitude as entry.
 - 9a. *Three Continuous Horizontal Axial Rolls.* Straight level recovery on same heading as entry.
 - 9b. Class I and Class II planes may substitute three continuous barrel rolls for the above.
 10. *Immelman Turn.* Half loop followed by half roll at top. Level recovery at higher altitude than entry.
 11. *Three Continuous Inside Loops.* Smooth, round, equal sized, all at the same altitude. Straight and level recovery.
 12. *Four Point Roll.* One complete axial roll with a pause in the roll and a short but obvious straight flight at each 90 degree point of the roll.
 13. *Three Continuous Outside Loops.* Smooth, round, equal sized, all at the same altitude. Straight and level recovery.
 14. *Cuban Eight.* Horizontal eight performed by means of two delayed Immelman turns. See diagram.
 15. *Three Turn True Spin* (not spiral dive). Model must enter spin from a stalled attitude. Three complete turns, recovery on same heading as entry.
 16. *Inverted Figure Eight.* Smooth equal circles, cross over transmitter. No restriction as to how inverted flight starts, however entry and recovery must be inverted.
 17. *Rolling Eight.* One inside loop followed by a half roll immediately followed by another inside loop followed by a half roll. Entry and recovery on the same level. Maneuver creates a vertical eight with one loop above and the other below the entry-recovery axis.
 18. *Tail Slide.* Under moderate power the model is allowed to stall in a vertical attitude. After a controlled slide downward on the tail, the model recovers normal flight at the same level from which the initial stall was entered.
 19. *Vertical Eight.* Level entry, one half in-

side loop, one complete outside loop, one half inside loop, and level recovery at the same altitude as the entry. The complete maneuver is an eight in the vertical plane with all parts of the figure above the entry-recovery altitude.

20. *Traffic Pattern Approach to Landing.* Fly upwind over transmitter, turn 90 degrees (right of left at the option of the Contest Director—safety considerations will determine which) fly straight 100', turn 90 degrees downwind and fly as far as the contestant feels is necessary to make a safe approach. All turns must be made at a safe altitude. Judges are required to give zero points for this maneuver if in their opinion turns are made at unsafe altitudes. Turn 90 degrees cross wind, finally turn up wind onto the final leg and start to descend. Maneuver is over when plane is within 6' of ground.
 21. *Landing Perfection.* Smooth approach, smooth landing with no bounce—full points—graduated to minimum points for extremely rough approach, rough landing with bounce but without nose-over due to poor control. (Might be due to poor surface conditions.) Mandatory zero points for nose-over, intentional dive in, or landing not within clear view of Judges.
 22. *Spot Landing.* The spot shall consist of a circle 100' in diameter. For landing within this circle with the main gear of the plane, the Judges will award points equal to those earned in the landing perfection.
 23. *Proto Taxi to Hangar.* After touching down, model is taxied over and brought to a stop with the main landing gear within a 3' circle designated as the "hangar". Said "hangar" to be outlined close to the start line for the proto taxi.
- 22.12 **FIELD PROCEDURE.** The procedures listed below are suggested, and may be altered by the Event Director to fit local conditions.
- 22.13 All R/C contestants shall be set up in "pits" at spot assigned by Event Director, so they will be under his immediate control.
- 22.14 There will be no testing of transmitters or receivers during the flying period. Transmitters may be impounded at discretion of Event Director. Any person causing interference will suffer immediate disqualification. The Event Director will provide a monitor receiver to check for interference.
- 22.15 The flight order shall be determined by position of contestants' signatures on a *single Flight List* held by Event Director or his representative. This list shall include all classes and frequencies. Contestant shall have his name on List only once at any one time; names may be moved to bottom of List on request, but trading of positions with other contestants is not allowed. When a contest is to be continued on a following day, the Flight List shall carry over from day to day.
- 22.16 Event Director shall carry out following procedure:
- a. Numbers 1, 2, and 3 on Flight List shall be on flight line with their models, equipment, and one helper if desired. No 1 is contestant flying or ready to fly, No 2 is next man to fly, etc.
 - b. The No. 1 man shall have 3 minutes from completion of preceding flight in which to release model for the start of his flight. False starts are permitted within the 3 minute limit. Failing to start flight within this limit, contestant must immediately remove his plane and equipment to the pits. It shall be responsibility of Event Director or his representative to notify contestant of start and end of 3-minute period.
 - c. Numbers 4, 5, and 6 on the Flight List shall have their planes and equipment in a ready box located near the flight line. As soon as a flight is completed, the No. 4 man becomes No. 3 and shall be requested to move his model and equipment onto the flight line. If he is not on hand to do so, he shall be dropped from the Flight List, and the List advanced to fill his place. The Event Director or his representatives shall be responsible for notifying contestants when they are to move to ready box or flight line.

- 22.17 When technically possible and when judges and space are available, it is strongly recommended that two or more flights be flown simultaneously, under the following conditions:
- Separate take-off and landing areas sufficiently spaced cross wind from each other to minimize engine noise and flight path interference.
 - Contestants flying simultaneously shall carefully check receiver and transmitter operation before take-off, to be sure no interference between them is possible.
 - Contestants flying simultaneously must be

no more than three positions apart on the Flight List. Event Director or representative shall, where possible, select contestants at top of Flight List so that contestants flying on compatible frequencies are on flight line together.

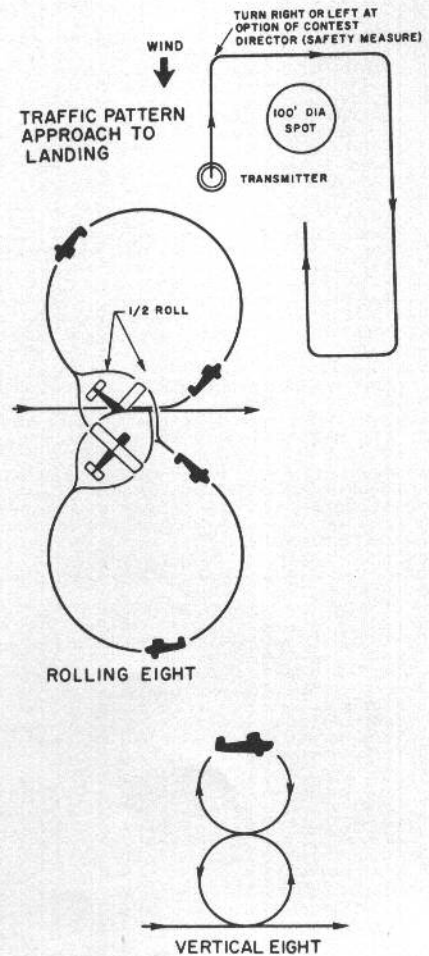
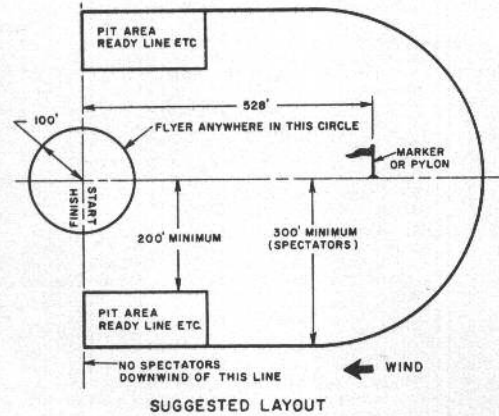
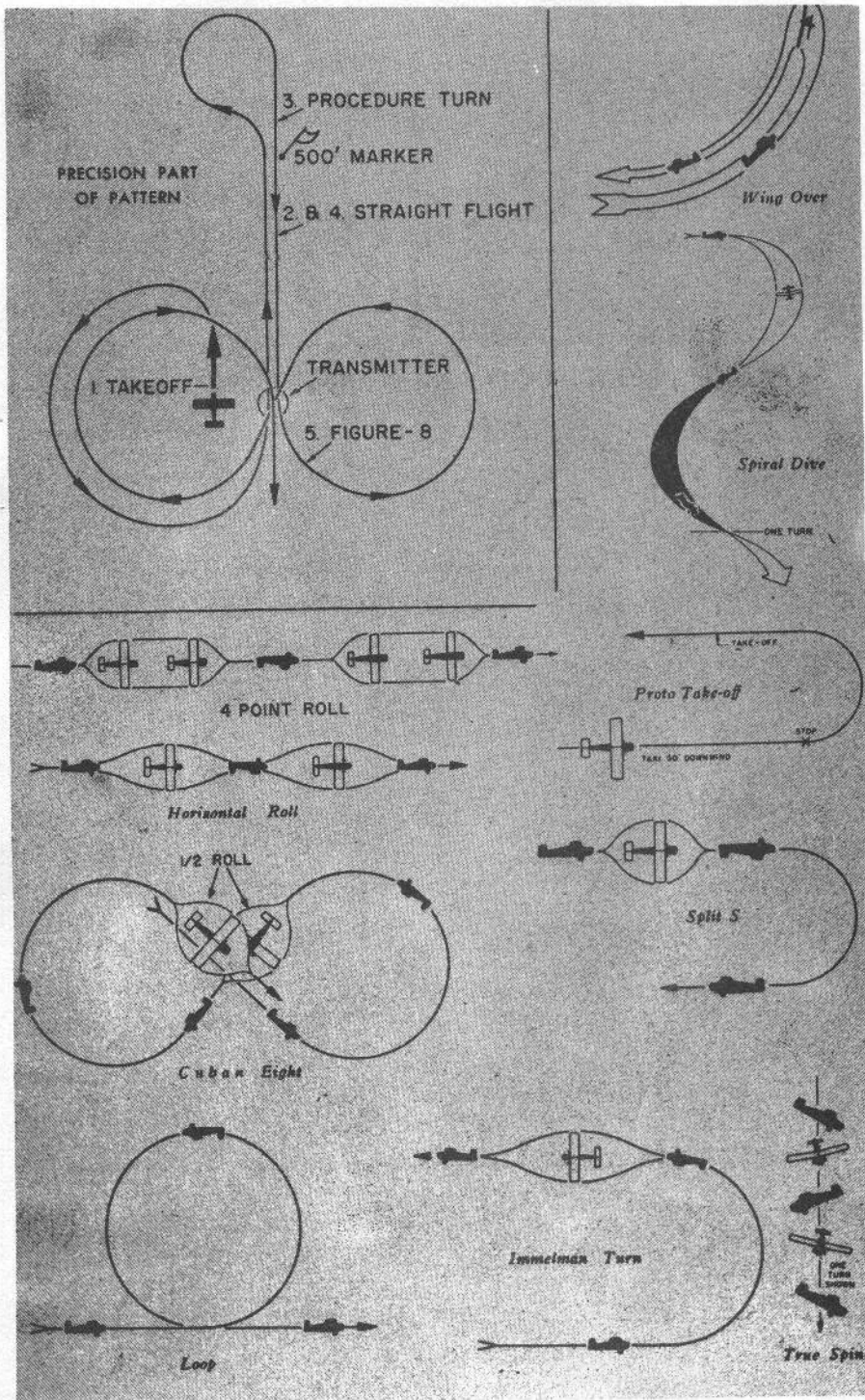
d. Should a contestant oppose flying simultaneously with someone else, he may cancel his turn and re-sign at the bottom of the Flight List.

22.18 OFFICIALS. An Event Director, a Dispatcher-Recorder and Judges are the essential

officials for an R/C Event. If possible, the Dispatcher-Recorder should have at least two helpers.

22.19 Each flight should be judged by at least two Judges, with their scores averaged to give final score for the flight. It is suggested that each maneuver be scored immediately after it is performed. Judges shall score maneuvers individually and without consultation between them. There should be enough judges available to establish a rotational procedure which will average out variations in judging.

R/C PATTERNS



23. RADIO CONTROL PYLON RACE REGULATIONS

23.1 **OBJECTIVE.** The purpose of this event is to cover the prescribed course at the highest possible rate of speed. Race results will be posted in miles per hour.

GENERAL:

- 23.2 All AMA and FCC regulations covering the R/C flyer, his plane and equipment, shall be applicable to this event, except as noted herein.
- 23.3 There shall be no limitations on the type of equipment fitted to the plane, or the number of controls.
- 23.4 The contestant shall be allowed only one entry in the R/C Pylon Event, but this may be in addition to any entries he might have in the R/C Pattern Event or R/C Scale Event. The same plane may be entered in more than one event if it meets all of the model requirements of each of the events entered.

MODEL REQUIREMENTS:

- 23.5 This event shall be flown on the basis of a single category only, and only one set of records will be kept by the AMA. However, to allow for individual preferences and available equipment, models with the following specifications may be flown in the event:
- Maximum engine displacement of .20 cu. in. and minimum wing area of 766 sq. in.
 - Maximum engine displacement of .1525 cu. in. and minimum wing area of 576 sq. in.
 - Maximum engine displacement of .10 cu. in. and minimum wing area of 386 sq. in.
- 23.6 AMA license numbers shall be displayed prominently on the upper right wing panel and the lower left wing panel.
- 23.7 Radio control frequency shall be displayed on each side of the rudder.
- 23.8 Racers may not use drop-off or dolly landing gear, but must carry such gear with them. Retractable gear is acceptable provided that it is lowered for landing.

SAFETY REQUIREMENTS:

- 23.9 Considerations of safety for spectators, contest personnel, and other contestants are of the utmost importance in this event, and the

following safety provisions must be observed."

- 23.10 All models must pass a general Safety Inspection by the Event Director or his representatives before they are allowed to compete.
- 23.11 Any flying over a controlled spectator area will be cause for immediate disqualification of that flight.
- 23.12 Dangerous flying of any sort, or poor sportsmanship of any kind, shall be grounds for disqualification of the contestant involved.
- 23.13 All planes entered must have rounded prop spinners, or some sort of safety cover on end of propeller shaft (such as a rounded "acorn nut").
- 23.14 Knife-edge wings are not allowed.

COURSE:

- 23.15 The course shall be .1 mile (528') long, and shall be indicated at each end with crosses (hereafter called Markers) drawn on the ground, or by vertical pylons. Where possible, the course shall be in line with the prevailing wind. Models must circle outside of the Markers.
- 23.16 A Start-Finish line at right angles to the course, and running through the Marker, shall be provided at the downwind end of the course.
- 23.17 The pit area and Ready Line of those waiting their turn to fly shall be at least 100' to one side of the centerline of the course. Pit and/or spectator areas should not be on the side of the course that is used by the planes on their upwind leg. If the layout does not permit this arrangement, an additional 100' set-back must be used.
- 23.18 The modeler who is flying may place his equipment at any point within a 100' radius of the Marker at the Start-Finish line.
- 23.19 Spectators must be kept at least 200' each side the centerline of the course, and the same or greater distance beyond the upwind Marker. No spectators shall be allowed downwind of the course. Pit and/or spectator areas should not be on the side of the course that is used by the planes on their upwind leg. If the layout does not permit this arrangement, an additional 100' set-back must be used.

RACE PROCEDURE:

- 23.20 If the Pylon Race is being run during a meet where other R/C events are also in progress, it is suggested that the Pylon entrants operate from the same flight line as those in the other events, to preclude possibility of interference.
- 23.21 All flights shall be ROG, with release at the Start-Finish Line, unless Event Director certifies that ground conditions do not allow this, in which case hand-launch may be used. Hand-launched flights are not eligible for AMA record recognition.
- 23.22 Each flight will be timed from the instant model is released for ROG take-off (or is hand-launched), will continue for 5 complete laps (a lap being considered as one trip each way between the two Markers), and will end as the plane passes the Starting Line.
- 23.23 All laps shall be flown counterclockwise, with turns to the left.
- 23.24 Flyer will have 3 minutes from time he is called, to get his engine started, equipment turned on and checked, and the plane released for ROG (or hand-launched).
- 23.25 Flight time shall be 4 minutes, and plane must be landed within this time, or the flight cannot be counted.
- 23.26 If the model fails to fly outside the Markers, it must recircle the missed Marker, or the flight will not be scored.
- 23.27 Two or more planes may be flown at a time, if the equipment allows this and there are sufficient Judges and Timers. If this is done, there should be a Timer for each plane in the race, and preferably a Marker Judge to keep track of each plane.
- 23.28 The Marker Judge shall give no signal unless the plane has failed to round the Marker, in which case he will wave a flag.

OFFICIALS:

- 23.29 In addition to the Event Director, there shall be a Timer who also functions as a lap counter, and a Judge at the far Marker to check that all turns are legal. The Timer shall act as Marker Judge at the starting point. A Recorder should be available to keep records.

24. RADIO CONTROL SCALE REGULATIONS

24.1 **GENERAL.** All AMA and FCC regulations covering the R/C flyer, his plane and equipment shall be applicable in this event, except as noted below.

24.2 There shall be only one category for R/C Scale. There are no limitations on the radio or mechanical equipment used by the contestant.

24.3 Contestant will be allowed only one entry in R/C Scale. This is in addition to any entries he may make in the R/C Pattern or R/C Pylon Race Events. The same plane may be entered in more than one event if it meets all of the model requirements of each of the events entered.

24.4 **QUALIFICATION FLIGHT.** Before being Scale judged, an R/C Scale model shall make a qualification flight consisting of the following maneuvers:

- Unassisted ROG. (No full scale plane is ever hand launched; therefore hand launching of scale models is prohibited. Event Director may make a general exception in case of poor field conditions.)
- Figure Eight over transmitter starting down wind.
- Landing perfection.

In order to qualify, the flyer must exceed the score of "Unrecognizable." That is, score one or more for each maneuver.

Judging will be to the same standards as are used in the R/C pattern event. Total field time will be 4 minutes, 3 of which may be used to start flight. Additional time will be allowed for extra engines as indicated in section 24.11.

24.5 **SCALE JUDGING** shall be done according to the provisions of the unified *Flying Scale Regulations*, Regulation 25.

24.6 **SCALE OPERATIONS.** The following operations must be accomplished in flight. No points shall be awarded unless operation is complete.

- Retract and extend landing gear Max. 25 points
- Lower and raise flaps Max. 10 points
- Drop bomb/s Max. 10 points
- Lighting system Max. 10 points
- Other operations not listed Max. 10 points ea.

Points for non-listed items should be based upon the degree of relative skill, ingenuity, and/or effect as compared to the listed items. A maximum of 50 points may be awarded for non-listed operations.

24.7 **MULTI MOTORS.** A bonus of 50 points shall be awarded for each engine in excess of one, providing each contributes thrust needed to fly or improve the flight of the model and that each runs until maneuver 24.9.6 has been completed, or in event of engine failure, other engine/s continue to run, and the model remains controllable.

24.8 **FLIGHT MANEUVERS.** All flights shall be ROG unless the Event Director certifies that ground conditions do not allow this, in which case hand launch may be used.

24.9 **FLIGHT PLAN.** The flight plan shall consist of the following maneuvers. Optional maneuvers are so noted. Maneuvers not so noted are mandatory and must be accomplished in the order listed.

- Proto Taxi (optional)
- Unassisted ROG
- Straight Flight
- Procedure Turn
- Return Flight

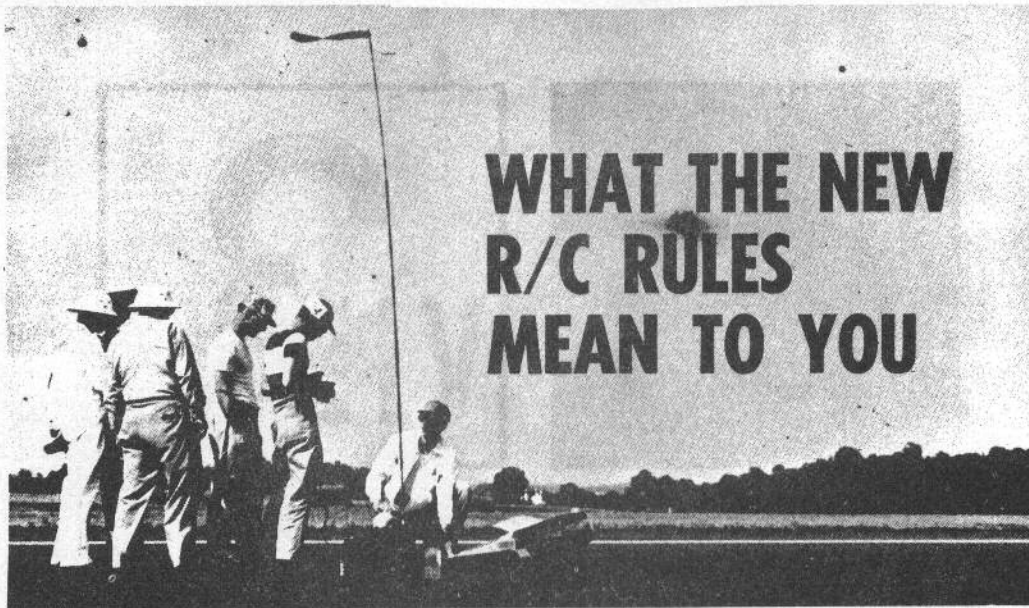
- Figure Eight
At this point the contestant may demonstrate any equipment that is installed under Scale Operations. Bonus points must not be awarded if this equipment fails to work.
- Touch and Go (optional)
- Traffic Pattern Approach to Landing (optional)
- Landing Perfection
- Spot Landing (earns points equal to those awarded to Landing Perfection)
- Proto Taxi to Hangar (optional)
Points for all these maneuvers are listed under the R/C Pattern Event, and can total a maximum of 55 points.

FIELD PROCEDURE:

- 24.10 Contestants shall be allowed a total of seven minutes, the first three of which may be used to commence the flight.
- 24.11 In the case of multi-engine models, an additional two minutes shall be allowed for each engine, up to a maximum of four engines. This time will precede the seven minutes allowed in section 24.10. In no case will the time allowed for flying exceed seven minutes.
- 24.12 If the meet has an R/C Pattern Event, the R/C Scale contestants will fly from the same flight line as their turns come up.

OFFICIAL SCORE:

- 24.13 The official score shall consist of the product of the *Flight Points* times the sum of the points from *Scale Judging*, *Scale Operations*, and *Multi-Motors*.



WHAT THE NEW R/C RULES MEAN TO YOU

By **ROBERT LEININGER**
CB Chairman R/C 1961

PATTERN EVENT: There have been a few changes that will affect the R/C pattern event fliers. First of all, there has been no change in the definition of the classes; however, class names have been changed to make terminology consistent between the new and the old sections. Some sections have been renumbered because of the deletion of former section 22.9.

The changes occur in the following sections by the new numbers:

22.8 TIME LIMIT. This section includes the time to start the flight in the flight time, thus placing a premium on good preparation on the part of the contestant.

22.10 POINT SYSTEM. All maneuvers have been given the same relative value. That is, an excellent wing over is now as valuable to a contestant as three excellent outside loops, or a vertical eight. Scoring on all maneuvers is on a scale of 0 to 5 with all maneuvers having equal value.

22.11 FLIGHT PATTERN. A flight pattern has been established and it is mandatory that the contestant fly according to the exact order in which the maneuvers are listed in the rules. Maneuvers may be waived; however, maneuvers 2 thru 6 must be attempted.

MANEUVERS—

- 1) PROTO TAXI (The proto taxi has been separated from the ROG)
- 2A) UNASSISTED ROG
- 2B) HAND LAUNCH (mandatory zero points)

- 3) STRAIGHT FLIGHT
- 4) PROCEDURE TURN
- 5) STRAIGHT RETURN FLIGHT
- 6) FIGURE EIGHT
- 7) TOUCH AND GO
- 8) WING OVER
- 9A) THREE CONTINUOUS HORIZONTAL AXIAL ROLLS
- 9B) Class I and II may substitute THREE CONTINUOUS BARREL ROLLS
- 10) IMMELMAN TURN
- 11) THREE CONTINUOUS INSIDE LOOPS
- 12) FOUR POINT ROLL
- 13) THREE CONTINUOUS OUTSIDE LOOPS
- 14) CUBAN EIGHT
- 15) THREE TURN TRUE SPIN
- 16) INVERTED FIGURE EIGHT
- 17) ROLLING EIGHT
- 18) TAIL SLIDE
- 19) VERTICAL EIGHT
- 20) TRAFFIC PATTERN APPROACH TO LANDING
- 21) LANDING PERFECTION
- 22) SPOT LANDING
- 23) PROTO TAXI TO HANGAR

PYLON RACE EVENT: No change except for a safety regulation to help prevent low-level pylon turns over the pit and spectator areas.

FLYING SCALE: These regulations have been changed almost completely. The prominent features are listed below.

A) A qualification flight is now required before scale judging.

B) Scale judging is according to the new UNIFIED FLYING SCALE REGULATION (Section 25).

C) Bonus points are awarded for SCALE OPERATIONS. (Must be demonstrated in flight.)

D) Bonus points are awarded for MULTI-ENGINES.

E) A simplified flight plan has been taken from the new pattern event.

- 1) Proto taxi (optional)
- 2) Unassisted ROG
- 3) Straight flight
- 4) Procedure turn
- 5) Return flight
- 6) Figure eight

At this point the scale operations are demonstrated.

- 7) Touch and go (optional)
- 8) Traffic pattern approach to landing (optional)
- 9) Landing perfection
- 10) Spot landing
- 11) Proto taxi to hangar (optional)

With 11 maneuvers a maximum of 55 flight points can be earned.

OFFICIAL SCORE = Flight Points times the sum of Scale Judging plus Scale Operations plus Multi-motors; or

OFFICIAL SCORE = Flight Points × (Scale Judging + Scale Operations + Multi-motors).

Since a product is used between the FLYING QUALITIES and the SCALE QUALITIES of a plane; a plane—to win—must be a good balance between a good flying plane and a good scale plane.

The qualification flight BEFORE scale judging should minimize test flying at the contest.



MODEL AVIATION

If you are not a member of the AMA now, we believe you would find that membership does offer many advantages. Beside contest—there are other privileges: Insurance is an important one. You are covered on all R/C flying, if it is conducted to AMA standards—and all flying ought to be on these anyway! Next, you receive a copy of Model Aviation the official monthly magazine. We believe you will enjoy your membership. We invite you to write for more information.

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Printed Circuit Boards Are Easy

MAKE YOUR PC BOARDS USING MATERIALS USED BY THE PROS

Subminiaturization continues in R/C. Led by Otation, manufacturers are striving for smaller units. F&M, and other manufacturers are coming through with much smaller receivers and other gear to help modellers—especially with the pronounced trend of backyard planes that have been introduced—to shave off size and weight.

Transistors and printed circuit construction as well as ultra small parts are making this possible. But what about the home builder? If letters are any indication of trends the home constructor wants some really simple PC techniques, which are clean, fast and dependable.

Much has been written on the subject in various magazines, including Grid Leaks, but continuing heavy mail indicates the writers want something so they can join the submini trend.

We at GL ordered some of the low cost Printed Circuit Kits from some of the large Radio Houses, and found all of them to be generally excellent for the run of the mill PC work—but NOT for submini R/C.

In manufacturer's circles there are many aids that are available. They help manufacturers to do work of a submini type. As far as the average R/C fan is concerned, they are available to him PROVIDED he is ready to buy in large quantities—which he is not.

Among these aids are PC dots and crepe strips which can be placed on the copper and used as a resist. In such manner, many "one shot" units can be prototyped fast and very inexpensively. The dots we use are a product of W. H. Brady Company, but there are many other products of a similar nature available.

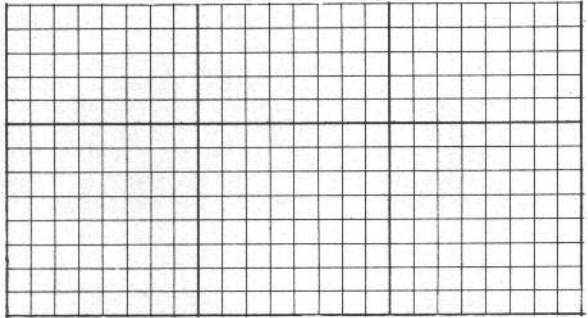
The use of the dots and flexible strips allow fast "one shot" layouts, and are much superior to ink or dope type resists since they are much cleaner.

To use them effectively, it is necessary to necessarily follow a few fundamental and elementary steps.

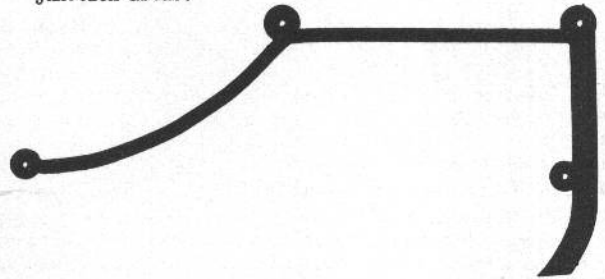
DESIGN—This is probably the most important phase of PC work. It is not difficult, but changes should be made here, since when etched, it is too late.

Using graph paper with 1/8" lines, consult the schematic, and with the actual parts on hand begin layout. Bear in mind factors such as RF lines, heat dissipation, and other important considerations. If preliminary arrangement seems satisfactory, draw on the graph paper the exact location of the components and mark each hole to be drilled. Then draw in the lines, trying to avoid crossovers. Sometimes a bit of rearranging of the components will do wonders but if crossings cannot be avoided, a jumper wire will have to be used. Mark the location of all input and output wires. When complete, double check it again, using the schematic and tracing it through thoroughly. Extra time spent here, may save time and some boards later on.

With the aid of 1/8" grid graph paper, begin your PC board by carefully designing the layout.



Extreme radius curves are not recommended, but fair curves are easy to make. Make sure tapes and dots are really down on the PC board, especially at the junction areas.



PREPARATION OF THE BOARD—With the tape dots and the strips, this work is simple. To get board ready, it is necessary first to transfer the drawing on graph paper to the copper side by using carbon paper. Use of scotch type tape will help the paper from shifting. Mark all the holes to be drilled with a center punch. Trace the conductor lines with hard pencil—it is not necessary to trace the components. Check the PC board to make sure all lines have been transferred.

The tape and dots are supplied in two sizes for this article's illustration. They should be used as need dictates, that is, if eyelet is to be used, it is best to use the larger of the dots; if there is lots of room in your design use the wider tape—this will save on the etchant, since it will have less copper to etch away.

The tapes are on cards, and to facilitate removal it may be necessary to insert an old phono needle in a 1/4" dowel. Use the needle point to help achieve a separation from the paper backing. Cut to length required and apply on the PC base firmly. This is necessary to achieve evenness, so the etchant does not have room to seep underneath the tape. The line is on a crepe type material which allow bending, but short radius bends should be avoided.

Now the dots may be applied at the terminal points--use extra pressure here, since joints are susceptible to seepage. When all tape and dots have been placed, burnish again to make sure contact is good.

ETCHING--The etchant is usually ferric chloride. It is brown and apt to leave stains and should be used with caution. Once on clothes or other items, it is difficult to remove. It should be used in trays of plastic, rubber, glass--NEVER metal. It is a good idea to select a tray only a slight bit larger than the piece to be etched. Ferric chloride is subject to oxidation, and the less it is exposed to air, the longer the solution will last. Always store out of reach of children. While most people can handle it with bare hands, those who are subject to rash, or skin irritation from photo chemicals, should use ordinary rubber gloves. It is also a good idea to use ordinary photo print tongs when removing board from etchant, since it is neater that way and less messy.

To etch your board, place the board at the bottom of your tray. Pour in etchant enough to cover (board) to a depth of about 1/4". Agitate tray gently so as to make sure of distribution over the surface. Agitation also helps speed the etching process. Fresh solution at about room temperature should etch the board in 15 minutes.

Check the progress occasionally, by removing board from tray using tongs.

When board is completely etched, remove it from the tray and wash under running cold water. Pour the etchant back into storage bottle, using a small funnel of the plastic type. Stopper bottle well. Now rinse out the tray in running water.

Remove the tape and dots by peeling off. Use fine steel wool and scour finished board lightly.

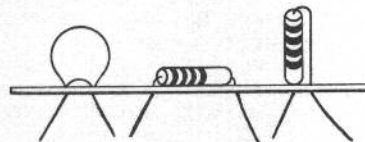
WIRING--this is the simple part comparatively speaking. The board has been designed for the components and here is where the extra time spent in designing, really pays off.

Drill the board from the copper side only. Use the smaller of the two drills supplied. Use the larger one where eyelets will be needed. To use an eyelet, simply insert in hole and flare the straight end by using a small center punch. Flatten by using peen end of a ball peen hammer. Use care and gentleness, not a great deal of pressure is required to set the eyelets. If desired, you can practice set a few of the eyelets in a scrap base of similar base material--this will demonstrate to you the technique required.

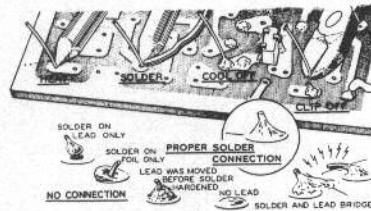
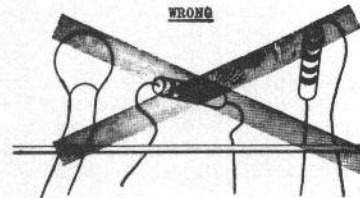
The soldering doesn't require any special technique, but a few words will be mentioned here. Use a small iron of the 25 to 37 1/2 watt type. Use only rosin core solder. A 60-40 type of the Ersin Sawbit type will do the job quickly, neatly, and also save on the tip from wear and corrosion.

When completely soldered, test the circuit. If it performs satisfactorily, it may be given a protective coating. Remove the surplus flux by using alcohol. Apply a coat of coil dope, or acrylic spray, and you're in business. PC the easy way!

PROPER MOUNTING



WRONG



In the preparation of this article, we checked to see about the availability of the dots, strips and other items. Some of the larger stationery stores in the larger centers do have them and will sell small lots to individuals. Some of the blue print houses will too. Chasing etchant down can be quite a problem.

So, feeling a need for a PC kit with the R/Cer, we chased down the parts needed, and are happy to tell you that Ace R/C will handle it. The parts are almost all in, and kits should be ready soon.

Here is what the kit contains:

28 1/8" dots, 16 3/16" dots, 26 pieces 1/16" tape x 4" long, 13 pieces 1/8" tape x 4" long, 2 drills, 1 PCS-2 printed circuit 7 pin tube socket, 2 layout in 1/8" segments sheets, 1 copper laminate on epoxi 2 x 2 7/8", 2 copper laminate on epoxi 1 5/8 x 2 1/8", 1 bottle of etchant, enough for about 75 square inches of surface, 1 package of assorted eyelets, flea contacts. PC #1 Kit, only \$3.95.

If there is enough interest indicated, we would also be willing to explore the possibility of a photo kit; this could contain tape and dots, and clear acetate, to make a layout positive; Ortho film, developer as well as fixer for making negatives, copper laminate, Kodak Photo Resist and Developer for making any number of PC boards by the photographic method. This method is quite the best way if several boards of an item are required. The difficulty, up to now, has been the availability of the film, chemicals, resist and developer. These have generally come only gallon sizes. So you tell us--are you interested?

Transmitter Tricks

VISUAL TUNING FOR YOUR KRAFT

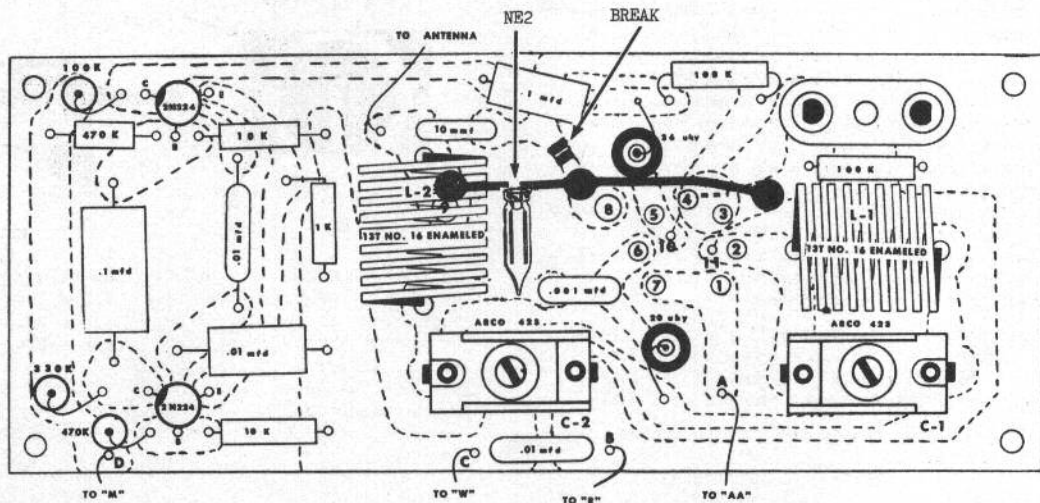
Felt that it would be desirable to add a tuning bulb to my Kraft transmitter, so I could get visual tuning. I utilized a jumper wire from land of pin three of tube to point indicated. Copper is broken, merely to have a tie point. Three large dots indicate places where new holes need to be drilled. NE2 connected from tie point to antenna output on etched side.

Transmitter amplifier section can then be tuned for the

maximum brilliance. (Ed. Note--This is permissible under latest interpretation of FCC Rules.)

Very little loss of output noted on scope. Of course, it does not glow on low power, since when battery voltage is below 120, NE does not fire. Tune up on Hi, then switch to Lo.

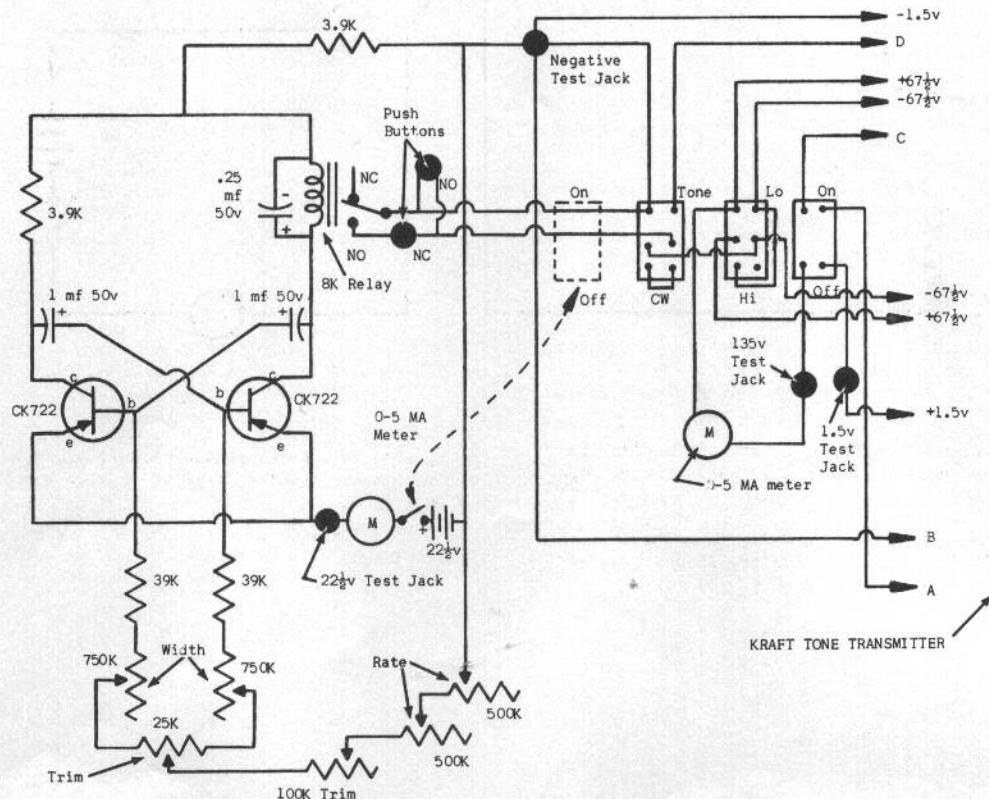
Bob Hinkle
Jackson, Mississippi



CW, TONE, RO PULSE, GG PULSE FOR YOUR KRAFT

HAND-HELD TRANSMITTER by Bob Broadhurst--Here is a circuit using Kraft's single-channel transmitter with a pulser added and a few switches which makes quite a universal package. It may be used with rudder only pulsed, rudder and elevator pulsed (galloping ghost), escapement, tone, or carrier wave. The pulser circuit has borrowed some ideas from John Worth on using double

pots for rate and width which enables trim pots to be installed easily. It also gives high rate and width changes within a 90° stick movement without gearing. Also, all pots are stationary which means no wires flexing to eventually break. This unit was housed in a 10" x 6" x 3½" metal case instead of original Kraft case. Kraft circuit remained unchanged except for wiring of switches.--DC R/C Newsletter



Bits and pieces

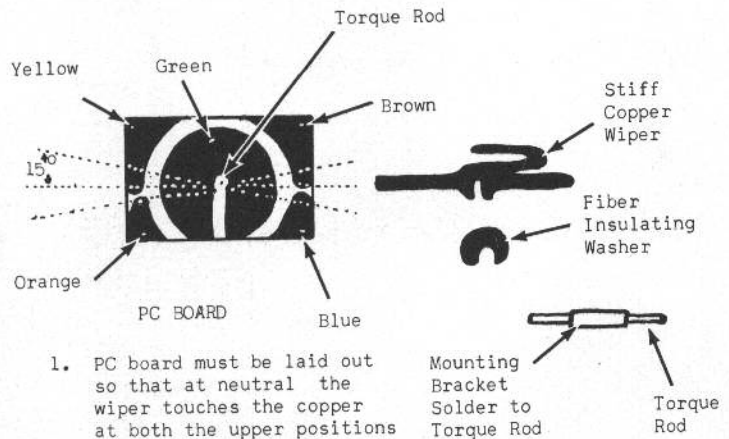
COUPLED AILERON SWITCHER FOR A VARICOMP

Am not much for writing to mags, but I found the enclosed which I had misplaced so thought I would put in my two cents worth. I think Grid Leaks is fine the way it is, but would suggest you try to find someone who could give us a feature on the subject of how to measure things which are not readable directly. For example, how do we tell when modulation is 100%? How do we hook it up to a scope to read modulation? Is there a way to approximate or determine percentage by another method for those not having scopes? You might include some theory on superregent detectors. Answers to such questions as to the effect of the LC ratio on stability--why some designers use a low cap, while others use a high cap, and change L, but both use the same type of detector tube?

I have been using a Lorenz transmitter for the past two years, but had trouble with blocking on tone closeup. I switched it over to a doubler as suggested in a recent GL, and it works fine, but I changed the 68K to a 22K.

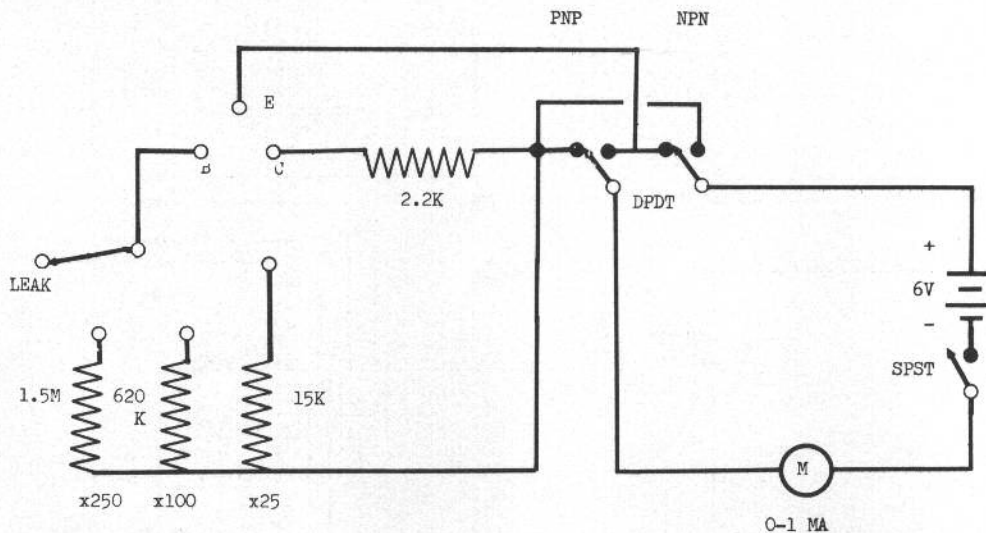
Enclosed sketches shows how to get coupled rudder and aileron with a Varicomp.

Pete Reed
Plainfield, Conn.



1. PC board must be laid out so that at neutral the wiper touches the copper at both the upper positions and at 15° of arc it must not hit the upper contact.
2. Be certain that the wiper does not touch the torque rod.
3. Mount PC board on the back of the Varicomp with contact cement.
4. Will give linked rudder and aileron with tremendous reliability.

DIRECT READING BETA TESTER FOR TRANSISTORS



This one is from QST magazine by way of the "Printed Circuit". Tests DC current gain and leakage of most all transistors.

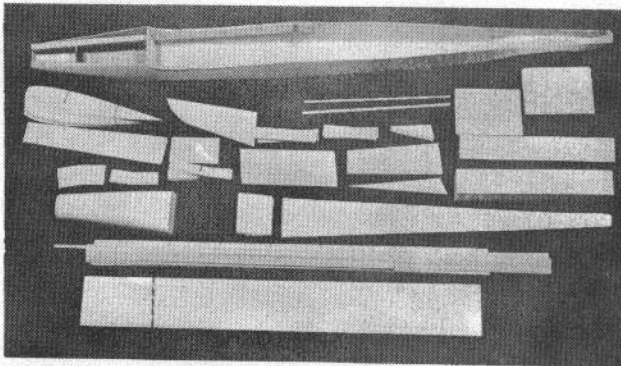
Looks very simple to make, and low in cost, especially it it was used with a multi tester, which usually have 0-1 MA ranges on them.

The Beta meter reading X multiplier is just that -- assume a meter reading of .2 ma on X100 position. This is a Beta of 20.

For leakage, simply put rotary switch on leak position and read in micro-amps.

WHAT'S NEW ?

BARNETT EPOXI PLANE KIT



The parade of semi-built airplanes is just beginning. Several have been announced in a recent issues of the model mags.

One Ace R/C hopes to have on shelf soon is the 'Spa-dad'. While a bit of epoxying still needs to be done, this is minor. There is no tedious pulling of sides, only adding the top to the fuse after installing servos and linkage.

Patterned after the Stormer, this is a multi ship, using up to .49 power. Motor mounts are NOT drilled to allow engine choice.

Wing ribs are band sawed; uses NACA 2415 modified foil. Span is 64 inches; chord is 12 inches; area: 768 square inches.

Fuselage is finished pure white. No hardware furnished; deBolt RC-6 landing gear recommended, nosewheel: your choice.

Extensively test flown, its shoulder wing lends itself to both reed and proportional radio.

Manufactured by B & L Manufacturing of Chanute, Kansas, this one looks good to us especially with a price tag of \$29.95. Fuse separate is \$19.95.

NEW FROM SPACE CONTROL

Not only has Space Control improved their Wheel Brake with a larger shoe and a sturdier cam and arm assembly, but they have expanded the line with different tires, and added matching wheels. See listing below.

Wheel brakes, complete and ready for installation, are priced at \$4.95 each. Plain hub wheels to match are priced at \$1.98 each. Extra tires are only \$1.00 each, and replacement brake shoes are 9¢ each.

Sponge rubber tire sizes available are 2½ inch and 3 inch.

Semi Pneumatic tire sizes are 2½", 2¾", 3", and 3½".

Part No.	Size	Type	Price
A201	2½"	Semi Pneumatic with brake	\$4.95 each
A202	2¾"		
A203	3"		
A204	3½"		
A211	2½"	Sponge Rubber with brake	\$1.98 each
A212	3"		
A251	2½"	Semi Pneumatic plain hub	\$1.98 each
A252	2¾"		
A253	3"		
A254	3½"		
A261	2½"	Sponge Rubber plain hub	\$1.98 each
A262	3"		

Complete in attractive box, with Allen wrench enclosed.

MICRO MOULDED PLANE KITS

Micro-Products of California add the Magna-Fly and the Magna Flea to the parade of moulded fuselage aircraft.

Both feature a hand moulded polyester fuse with only the firewall and wing hatch formers needing to be added to complete.

Color is not moulded in, so with a bit of sanding, the choice of finish is up to the builder.

Both units will be available on a fuselage and wing combo, or fuselage only basis.

The combo kits will feature Sig balsa, silk along with all necessary materials, except dope and cement. Repair kits are included in both fuse and combo kits.

Fuses will be available by the end of March; combo kits will be a bit later.

Single Channel 'Magna Flea' (58 inch span)
Fuselage joined, plus plans and repair kit of resin, catalyst and accessories--\$29.95

Complete kit with wing parts-\$49.95

Multi Channel 'Magna-Fly' (68 inch span)
Fuselage with plans and repair kit \$29.95

Complete kit, as above, \$59.95

SHOWS' RO PULSER

When the March issue of *Model Airplane News* came our way, we looked high and low for the values of resistors and capacitors in the article by Jim Shows on his Pulser. Upshot was a phone call to Jim in Houston. Here are the missing values:

R1, R3--100 ohms

R4, R6--1,000 ohms

R2--510 ohms

C1, C2--25 mfd electrolytic for 10 pps

R5 is a 10K pot painted to 3K resistance

D1--1N34, 1N48, 1N66, 1N295 any general purpose diode OK.

The Ace Kit for the foregoing unit will be highly prefabbed with punched screen case, etched and drilled PC board, formed hardware, matched transistors, Gem relay, special Chitel pot. All the hard work done for you and yet priced at only \$17.95. Jim's figures were parts only and did not count his labor.

NEW FROM TOPFLITE

The compacts by TopFlite--Rascal and Schoolboy had just barely arrived, when we received word of several new items by TopFlite.

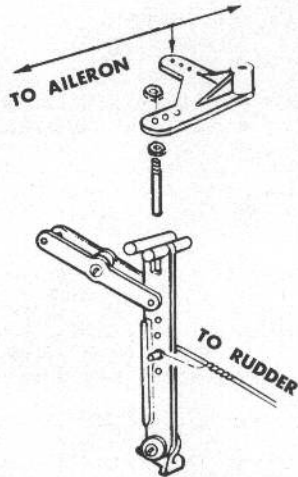
Two more compacts are on the way--Roaring 20 by Ken Willard, and a scale Cessna 182--Spans 21 and 30 inches respectively. Both in the \$3.00 price class.

The Tauri--a multi trainer by Ed Kazmirski, designed for 6 channel operation. Shoulder wing design trike gear, 57 inch span, .15 engine. Price around \$20.00.

Also from TopFlite will be a new nosewheel. Price to be announced.

NEW FROM WILLIAMS BROS.

Williams Bros., announce their new Nylon Servo Travel Reducing Linkage. They also state this can be used with Coupled Ailerons and Rudder. Drawings show how linkage is to be applied to servo; and also suggested C.A.R. system. Linkage sells for 75¢.



SUGGESTED C.A.R. SYSTEM

WAG TTPW PC BOARD

The Wag Printed Circuit Board by Jack Campbell in Volume III, Number 4 of GL, stirred up quite a bit of interest. So Ace has had them made up. On epoxy, drilled and with reprint, while they last--\$3.95.

5-0-5 METER



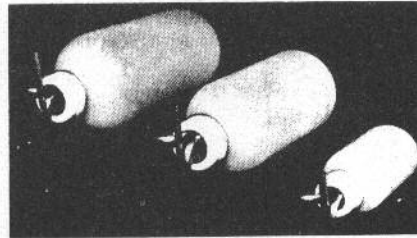
You asked for this! We have located a limited supply of zero centering meters, like new. The use is mainly in symmetry adjustment, for proportional relays, but other applications can be found in R/C. D'Arsonval movement 5-0-5 ma with zero set. Unmarked face may be calibrated. Black metal case. Mounts in 1 inch hole. Requires 1 inch depth. \$4.95.

RBM 5K RELAY



Here is a real buy! These unused surplus RBM relays at \$2.25, represent a bargain.. RBM relays have been favored by many proportional fans in both receivers and pulsers. Heavy silver contacts. Measure 7/8 x 7/8 x 7/8 inches. 5,000 ohms resistance. Pull in 3.6 ma, dropout 2.8 ma, but may be adjusted by bending. Supply is limited. Only \$2.25.

NEW FROM deBOLT



'Visual Flow' R/C fuel tanks in 1 oz., 4 oz., and 6 oz. capacity, feature two air vents and positionable tubes. Dual vent tubes enable easy filling without detaching a tube. Both fuel outlet and vents adjust simply to suit particular models; they also may be reversed for an 'opposite' needle valve location on the engine. VF-1 is for .049-.09, \$1.99; VF-4 is for .15-.29, \$1.20; VF-6 is for .35-.49, \$1.30.

These, as well as Nosewheels, R/C landing gears, and rubber bands from the deBolt line are being added to the Ace R/C line.

SUPER SOLDER

Super Solder is available from Willoughby Enterprises. This is a flux cored alloy and does a fine job on landing gear wire, piano push rods, servo linkages and stainless steel. It has a very high tensile strength of 15,000 psi, and a low melting point of 450 degrees, so can be used with 10 watt irons. Not a general purpose solder because of cost, it is outstanding where strength is needed. 50¢ pkg.

C & S TUFLINE

In addition to the complete C & S line of Receivers and Transmitters listed in our re-1962 catalog, Ace will soon be adding the new Tufline Fuel Line manufactured by C & S. This will withstand temperatures over 600 degrees, is not affected in any way by any fuel. Does not swell, shrink, lose its elasticity, or harden. We wrapped some around a soldering iron--no change!

Available in small or regular, ft 30¢

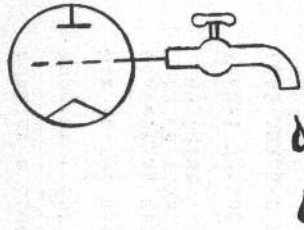
NEW FROM ECKTRONICS

From Ecktronics comes word of three new goodies: *Freedom 15*--A larger version of the popular *Freedom 7*. Stable enough for single channel, yet maneuverable enough for ten. Perfect intermediate or Class II. 520 sq. in. for .15 to .19 engines. Soon. \$15.95.

Pacesetter--Single channel tone transmitter. A top-quality rig at a low price. Proven RF circuit with new neon transistor modulator. Soon. \$24.95.

Translator--All new escapement. Compound action, yet weighs less than 1 ounce. Measures 1 7/8 x 1 1/4 x 3/4 inches. Sure-Blip engine control works with relay or relayless receivers. Right and left rudder, kick up elevator. Soon. \$9.95.

Grid Leaks At Play



Dear Reader:

We hope the variety of type faces in this issue do not cause you too much eyestrain! The fact of the matter is that we have been so snowed under composition of GL had to be done in several locations by several different people. Couple this with the arrival of a new Varityper and you have a total of 7 different type faces glancing at you.

The arrival of the Varityper, however, we hope means that the next issue should be more uniform and more readable—provided we can learn to operate the cotton picking thing by that time!

The arrival of the Varityper also signals a step forward in GL history. Not that we have come of age, but as those who have been with us from Volume 1, Number 1, know, this has been largely a so-called labor of love. Grid Leaks, however, now has reached a point of no return. More and more R/C fans are subscribing, and we are actively encouraging them to do so. There have been numerous exchanges of letters with various people; conferences with others, to see which branch of the road to take.

At the risk of being repetitious, GL had the basic idea that readers would respond to a publication which was a Data Service—with no "continued on page so and so", as well as no advertising. The no advertising has undergone a subtle change, in that it has become a sort of house organ for Ace Radio Control. A subsidy, or underwriting, of the expense of publishing it, since the number of subs did not make it self-sustaining, had to be done. So, it was put in the advertising and public relations budget of Ace R/C, at the advice of our financial advisors. To justify this, taxwise, it was necessary to make this an adjunct of Ace. So the what's new pages became largely advertising for Ace.

That only one reader objected to this, we find most gratifying. We hope, also, that this brief explanation will suffice to explain the situation to new readers. And new readers are coming. The future of GL is the brightest it has ever been, and we look for 1962 or 1963 to see some fairly major changes—most of which we hope you will like. For the time being, however, GL is still to be considered a non-profit type deal, and will continue to welcome your circuits, ideas and comments—on a no-fee basis. When that picture changes, we'll let you know.

R/C generally seems to have gotten the shot in the arm we've hoped for for a long time. There are more and more newcomers entering the picture. We welcome them, and urge them to look for the nearest R/C club for some straight advice. Getting with old hands is one of the best ways of getting info from the guys who build and fly. The R/C clubs, generally are to be commended for their help to the beginners. Usually, in each club there is an individual or two who should be given a special recognition for going the second mile to help beginners.

In our own club, the KC/RC, one individual stands out—Max Boal, and close to him must rank retiring prexy Bud Atkinson. These two have been on the forefront of R/C development, are ardent R/C from way back, and are generally more than able to take care of the beginner's questions. While we don't always agree with their answers—excuse this Bud and Max—we nevertheless commend them most highly for their willingness. They go the contest route, and therefore share a lot of R/C experiences with the best fliers in the US. There are Max and Buds in most any of the other clubs you will find—and the beginner can do no better than to seek them out. Their help will be invaluable.

Other clubs also sponsor affairs known as confabs, symposiums, shindigs, flyins, and so on. These are beginning to attract larger and larger crowds. Ones that come to mind readily are the ones put on by the Buffalo Bisons in January, the Toledo Weak Signals just completed, and the upcoming DCRC symposium on May 19 and 20. Be on the lookout for affairs of this kind in your section, be you expert or beginner—they prove most helpful.

The DCRC symposium will be the fifth one held. Plans are again to have a technical session on Saturday, a banquet for wives and attendees Saturday evening, and a flying session for the purposes of demonstrating new developments on Sunday. Samuel A. Mohr at 13519 Grenoble Drive, Rockville, Maryland, is the Chairman, and additional info can be had by contacting him.

As usual we have run out of space and time. Seems to us, what we need at GL and Ace R/C is a 40 hour day—there just isn't time to do all the things you must and want to do in less than that. See you next issue.

Yours sincerely,

Acc R/C Inc.
BOX 301
HIGGINSVILLE, MISSOURI

GRID LEAKS

IN THIS ISSUE

VOLUME III, NUMBER 7
March-April 1962

Printed Circuit Boards
The Easy Way

Proportional Control For Rudder
Part III of the series
by James Shows

Peaking a Superhet

Modulator For Reeds

Simple POD and Fallsafe

Converting Kraft Single Tx
to CW-Tone, RO Pulse,
GG Pulse

Visual Tuning for Kraft Tx

1962 AMA R/C Rules

What the New Rules Mean to You

What's New?

Grid Leaks at Play

Simple Beta Tester

Coupled Alleron Switcher
for a Varicomp

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