

GRID LEAKS

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25C

R/C DATA SERVICE

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THIRD ANNUAL DCRC-AMA RC SYMPOSIUM

The third annual AMA DC/RC Symposium will be held in Washington area on May 7 and 8. This is on a Saturday and Sunday. A much larger crowd than ever before is expected.

The entire program will be conducted at the Washingtonian Motel on Route 240 near Gaithersburg, Maryland. The technical papers will be presented in two sessions on Saturday and flying demonstrations will be held on Sunday. By moving the date of the meeting up to May, it is hoped that the possibility of escaping snow at the flying session will be had since, last year, the Symposium, held in April, was almost snowed out.

Also, by holding the meeting in one location, it is expected that a greater attendance than the 140 attending last year will also be had. Again, it is hoped that representatives from R/C clubs in the many states

will be present so that ideas and techniques can be added to the "bull sessions" that are different from the local concepts which are discussed all year at regular club meetings.

This is a nice family affair and it will be a very enjoyable opportunity to meet folks from other areas who come to conferences of this type.

As the years go by, the AMA DC/RC Symposiums increase in importance and the technical papers which are later made available at the conclusion of the event for a very modest fee are certainly worth adding to any serious R/C'er's library. For further information, it is suggested that Don Clark, chairman of the Third Annual R/C Symposium, be contacted at 4202 Brookfield Drive, Kensington, Maryland.

PARADE OF NEW PRODUCTS



Word comes from Blackwell Models Manufacturing Co., makers of the T-100 airplane kit which has been impossible to stock in depth on our shelves by virtue of the fact that builders have taken it to their hearts, that a new shoulder wing type, also 54" wing span and roughly the same configuration but designed more for full house and violent stunt maneuvers will be in production. This is the Ranger S-10-W. This will feature the same high-quality grade wood, the same high-quality pre-

fabrication and ease of assembly as the T-100 except that it will be designed for the more advanced builder who can handle a hotter airplane. This is designed for .15 to .19 power. We feel the Ranger S-10-W will find a ready market among the R/C fans throughout the country. In spite of the high pre-fabrication as evinced in this second of the Blackwell series kits, the price will only be \$11.95. Advance orders will be accepted by Ace Radio Control until such a time as deliveries can be effected.

VO BATTERIES ARE BACK

Good news to VO battery fans from ABC Battery Company. ABC, as you know, has been marketing a series of nickel cadmium cells which have appeared on the surplus markets and have been sold exclusively by Ace Radio Control. However, they have also secured, within the past several weeks, the exclusive franchise for the VO series formally handled by CG and manufactured by Gulton.

Presently, they will be available in the VO.500 series which is 500 milliampere hour and is a button cell type and the VO.800 which is a flat pack 800 milliampere hour

They will also be available in a potted form containing four VO.500's which will be completely encased in epoxy for crash-resistance.

Prices tentatively set with deliveries almost immediate are VO.500 at \$3.25, VO.800 at \$5.95. and the price of the four potted VO.500's will be \$19.95

HILLCREST SPINNERS

Web Hill, the genial prexy of Model Plastic Products, makers of the Hillcrest battery boxes and the Hillcrest motor control servos, announces now a 2 1/4" high-impact plastic spinner which will dress up the appearance of most R/C ships. Available immediately for the low, low price of 45¢.

NEW COBB MICROS

Cobb Hobby, manufacturers of the new Micro series of servos which will, eventually, during 1960, replace the old Electro series, has in current production the Micro multi at \$9.95, the Micro SN at \$9.95, and the Micro 3 position at \$9.95. Shortly in production will be the following: Micro 4 position which is a versatile unit with power for large planes and boats but light enough for the smallest of planes. Can be keyed by hand but the Micro Controller is a perfect companion which accounts for the perfect stick-type action. Available shortly at \$12.95.

Also, coming soon will be the Micro Compound servo at \$10.95 and the Micro 4 Controller similar to the Pilot Control box but designed specifically for the Micro 4 and the Electro 4 servos at \$14.95.

The last three items are currently in production and will be released shortly

NEW 52 MC ROCK

For some time, Ace Radio Control has been carrying Z2 type crystals in 8750 fundamental frequencies which triple to 26.25 in the master oscillator and doubling to 52.5 in the final. A much more active fundamental type 26 megacycle crystal has been found which will emit a signal of 26 mc in the master oscillator which will double to 52 in the power amplifier. This crystal uses large type pins the same as the old Z2 but is a much more active crystal and will do much for the R/C fan who is going onto the technician's band. Price remains the same at \$3.95.

VARICOMP WHEELS

Based on a number of requests received by Ace Radio Control, we now stock the Bonner VariComp nylon wheel for the builders who like to make their own servos of various types.

This nylon wheel is available for immediate shipment at a list price of \$1.35. R. E. VariComp wheel \$1.50

KRAFT KITS AND COMPONENTS

Hardly had the Volume II, Number 4 issue of Grid Leaks (which featured the Kraft transmitter) had time to get into the mails when Grid Leaks and Ace Radio Control were besieged with requests such as "Why don't you kit the Kraft transmitter?" We feel such a request will also be coming for the Kraft improved single channel receiver which is featured in this issue of Grid Leaks and therefore, we are happy to announce that both will be shortly available from Ace Radio Control

The Kraft receiver, as shown in this issue, has many improvements over the old type which has won many very ardent fans.

The improved version, however, so far outdoes the old standard version that it defies comparison. Do not be misled. This is not a "Craftone", or a "Kraft-type" receiver. This is THE only designer-approved receiver kit available bearing the name of Kraft. This is named after Phillip Kraft, the designer. Features Nashville type plug-in capacitors, a lighter weight relay, and is bound to win R/C fans everywhere. Best of all--the improved version is the same price--\$19.95!

The Kraft transmitter featured in Volume II, Number 4 has been designed with a printed circuit board using a 3A5 MOPA type transmitter with the modulator being two 2N224 Philcos for ultimate stability in a single-tone transmitter unit. The complete combo kit including tube, crystal, transistors, printed circuit board, cabinet, all components with an imported type telescoping antenna for only \$22.95.

With a 56" domestic type heavy-duty antenna for \$24.95.

This issue also features the Kraft 8 channel receiver While this will be eventually released by Ace Radio Control in kit form, the individual components are being listed separately for those do-it-yourself builders who do not, for one reason or another, choose to wait until the kits are available.

Electrolytics

1 mf 50 volt plug-in type	.95
2.5 mf 50 volt plug-in type	.95
4 mf 50 volt plug-in type	.95
14 mf 15 volt plug-in type	.95
20 mf 50 volt plug-in type	1.00
1 mf 50 volt ceramic	.85
14 mf 6 volt ceramic	.85

Printed circuit boards KRI for the Kraft single channel audio receiver, undrilled 1.75

KTI, for the Kraft single channel transmitter, drilled 3.25

KTM, Kraft multi channel transmitter, completely drilled 3.95

KR8, 8 channel Kraft receiver, drilled 4.25

KRI0, 10 channel Kraft receiver, drilled 4.50

Wound Coils on CTC form for 27 or 52 mc (please specify) 1.25

Toroid, 1 henry tapped for transistor oscillator as used in the Kraft tone multi-channel transmitter 6.95

Lev-R switch by Switchcraft, #3037 2.25

DPDT toggle for HI-LO or ON-OFF .65

50K pots for the Kraft transmitter multi-channel linear taper .85

Pot guards to prevent accidental shifting when once set .25

Dean's 8 channel reed bank 22.95

Dean's 5K relay 4.25

2N224 transistors (new price) \$1.90

6007 for 27 mc operation 1.95

1A4G for 52 mc operation 3.95

1 mmf Silver Mica for 52 mc operation .25

2.2 mmf Silver Mica for 27 mc operation .25

47 mmf Silver Mica .25

7 pin miniature tube socket for PC base .25

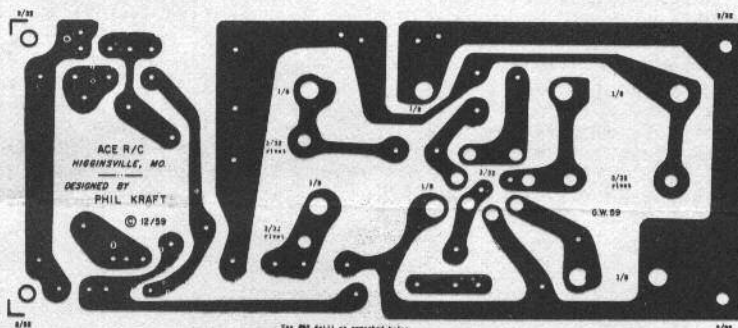
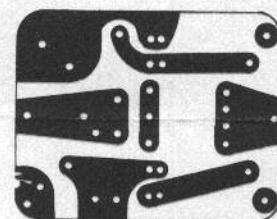
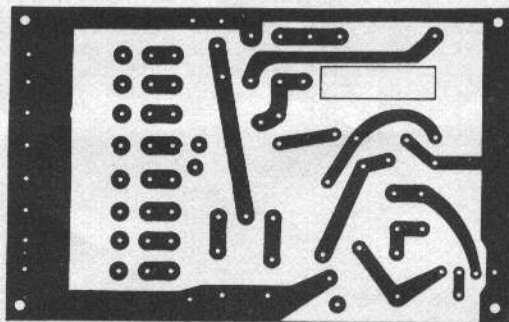
36 uh RFC Miller #6176 .45

54" telescoping imported type antenna as used in the standard version of the transmitter. \$2.95

56" telescoping domestic type antenna as used in the deluxe version on the transmitter 4.25

Photographic PC Boards

GOOD STUFF FOR BEGINNER OR EXPERT



EDITOR'S NOTE: This article is reprinted from the DC/RC Newsletter. We feel it to be of general interest for all types of R/C fan—from the beginner to the most advanced. If any of you should like to secure your own copy of the DC/RC Newsletter, send \$2.00 for a year's subscription to George Wells, 10004 Thornwood Road, Kensington, Maryland.

With more and more printed circuit diagrams appearing in construction articles in the model magazines, GRID LEAKS and other publications, a photographic method of reproducing these on copper laminated fiberglass board can be most useful. Although it is possible to make some printed circuits by drawing the circuit on the copper or by using a stencil to apply the resist, the increasing number of subminiature units such as Bill Grogan's receiver almost require a photographic process to capture the minute detail and fine lines.

John Merrill, 131 Melbourne Avenue, Syracuse, New York, a former DCRC member, became interested in the technique of printing circuits for the Grogan receiver while in Washington last summer. Although several acceptable boards were produced using a printed circuit kit purchased locally, the process left much to be desired. John continued his experimentation in Syracuse, and has come up with a method which produces cleanly etched circuit boards with a minimum of time and effort.

First you must obtain a photographic negative of the circuit. Unless you have access to a camera with a ground glass direct focusing arrangement such as a Speed Graphic, your best bet is to have the job done by an industrial photographer. Ordinary film does not make the best circuit negative. Kodalith is one type of film used for this purpose. If done commercially this should not cost more than a couple of dollars. We had a cir-

cuit negative made recently for fifty cents.

Chemicals can be obtained from Eastman Kodak Stores, 6210 North Capitol Street, Washington, D. C. (Check the yellow pages of your phone directory for your nearest Eastman store.) You will need Kodak Resist which is the sensitizer, and Kodak Photo Resist Developer. Unfortunately, the smallest amount of resist that can be purchased is one quart at \$13.00. The resist developer is \$6.00 per quart. A little sensitizer will go a long way and someone could become the Club source for this chemical by purchasing the initial quart. Ferric chloride is used as the etchant, and may be obtained at any chemical supply house.

Prepare working area in room that can be darkened. A bathroom or basement washtub area is best because running water and an electric outlet should be handy. Two containers such as photographic trays are needed to hold the chemical baths. A contact printing frame is useful in exposing the sensitized copper laminate through the circuit negative, but a piece of window glass may be substituted as method of holding the negative against the laminate while exposing to light. Here is the way John outlines the printing and etching process:

1. Clean the board thoroughly, using a Comet type cleaner and a small stiff brush. Copper-Brite will help remove oxidation and speed the cleaning. The board is clean when water will stand on it with no breaks or bubbles.
2. Flow the Photo Resist onto the board until a uniform coating covers the entire surface. Two or three drops will go a long way here, so don't be over-generous. Before developing, the board should be handled in dim incandescent light or, if more light is desired, a bulb

can be covered with red cellophane and brought closer to the work. Do not expose the board to fluorescent light during this phase or severe fogging will result.

3. Prop the board in a vertical position against a bottle or other object until completely dry. A paper towel or piece of absorbent material should be used under the board to catch any excess. This should be placed so as to prevent the formation of a liquid bead along the lower edge of the board. At this point, dust is your worst enemy so any method you can think of to prevent its getting to the board is worth considering.

4. Expose the board to a single RFL-2 or equivalent photo-flood bulb through a Kodalith negative of the circuit. The board should be about twelve inches from the light and, while exposure length will vary somewhat, 3 to 4 minutes should do it.

5. Place the board face up in the developer for 3 to 4 minutes using slight agitation. Do not touch the face of the board at this point as the emulsion is very soft.

The image will be visible now if the board is held at an angle to a light source.

6. Hold the board under a gentle stream of cold tap water. This hardens the emulsion and washes away the unwanted portions. Make sure all the unwanted emulsion washes away. Gentle rubbing with wet cotton or Kleenex may help if the emulsion proves stubborn.

7. Dry the board using heated air (100-150°F.). The wife's hair dryer will work well here or the oven door can be propped open and the board held in the stream of warm air issuing therefrom.

8. Etch the board in Ferric Chloride solution until all excess copper is removed. Wash and dry.

9. Kodak claims that the KPR doubles as an excellent solder flux and protects those lines that are not soldered. They, therefore, recommend that the resist be left on after etching. If you wish to remove the resist, steel wool will do it nicely.

UPDATING LORENZ MOPA AND WAG SINGLE AUDIO XMITTERS

In the March issue of Model Airplane News, mention is made in Ed Lorenz's column "Radio Control News" that a cure has been found for the oscillation of MOPA type transmitters that want to take off on other than the crystal frequency, particularly when they employ a 27½ crystal in the master oscillator section such as the old 1954 Lorenz MOPA and the WAG single audio.

This trouble has been spotted and cured by Dale Springsted by using a 13 megacycle crystal in the oscillator and then doubling in the final.

In the interest of finding out what this modification was for our readers who may have these units, we

queried Dale and here was the reply:

"A Lorenz change is a cinch. Remove the oscillator coil and replace it with a new coil of 3/8" I.D. about 26 turns #22 enamel for 13 mc crystal. Also, the same trick may be done with the WAG single audio by padding the tank coil with 33 to 47 mmf, put in the 13 megacycle crystal, and you are in business."

This will be good news to the many owners of the Lorenz MOPA and WAG single audio who want to make double sure in view of the new FCC regulations. This will insure that they are on frequency, after being tuned by a commercial operator.

A BIT ABOUT GRID LEAKS

We thank the many renewal subscribers that have come in to make sure that they receive all issues of Grid Leaks and we also thank many of those who have made the comment that, somewhere in each issue of Grid Leaks, there ought to be a note to the effect on how often it is published, how much subscription price is, what its policies are and just general information.

Because of space limitations, this has not always been feasible or possible. However, this particular issue finds us with some space available at the bottom of this page and we, therefore, take this opportunity of informing those of you who are not yet familiar with Grid Leaks of somewhat of its operation.

Grid Leaks is an outgrowth of many letters received by Ace Radio Control and the many circuits received by Ace Radio Control which almost demanded that a publication be begun for the interchange of radio control ideas so advanced circuits, as developed by various designers in various sections of the country, could be shared as quickly as possible with other designers.

In the interest of advancing the art, the contributions have been received over the past 30 months during which some 15 issues of Grid Leaks have been published.

Grid Leaks is published bi-monthly at Higginsville, Missouri. Subscription price is \$2.00 for a 10 issue subscription which constitutes one volume. This particular issue is Volume II, Number 5 which means that 15

issues, to date, have been published.

For the benefit of newcomers who might be in the Grid Leaks readers group for the first time, due to the rather insistent demands of many of our fairly recent subscribers, a limited press re-run was made of Volume I, Numbers 1 through 10 and these are available and will be available only so long as the printed supply shall last at 35¢ per copy. The price is higher than the cover price for the simple reason that the printing run had to be limited and it, obviously, is much more expensive to print a limited run than it is to print the full press-run of Grid Leaks.

The subscription list of Grid Leaks grew from issue to issue and we are very happy to see this. If you know of some buddies of yours who are not yet on the subscription list for Grid Leaks, it will make an ideal gift from you to them or they probably won't mind buying it as a present for themselves if they only know about it.

Grid Leaks is not in the position, at the present time, to offer any money for any of the photographs or articles or schematics used. We are most humbly grateful that most of the submissions made to Grid Leaks are in the interest of the advancement of the R/C art. Grid Leaks, at the present time, still constitutes a non-profit labor of love although it is achieving the stature where it will, very shortly, begin to pay its own way.

PRO AND CON ON PRO

READ CAREFULLY -- THEN ADD YOUR TWO CENTS WORTH

EDITOR'S NOTE: In Grid Leaks, Volume II, Number 4, we presented an editorial opinion on the merits of "bang bang" systems versus the proportional as detailed in the KC/RC Contacts and invited comments. Editorially, we refrained from making any but invited readers to do so. The following by one of the old timers in radio control merits careful reading and consideration. Do you agree? Let's get into the fracas. Editorially, we will venture no opinions of our own but will hold space in these pages for yours. How about it?

Just finished looking through your Volume II, Number 4 of Grid Leaks. Enjoyed it very much. One part of your editorial struck home to me and concerns some thoughts which I have had for some time and have yet to voice; interested?

This business of bang-bang controls versus full proportional has had me bothered for some time resulting in lots of thought being given to it and much time wasted trying to get a pro rig to work that I would be satisfied with. So far I haven't had a rig of my own to fly but have some time on Walt Good's and others which does give a guy an idea of what it is all about. I like what I have seen, yet I never have been able to get smoothness from it as you have mentioned. However, perhaps practice would help and maybe not--

What I wanted to do here is to bring out some fundamental basics which I wonder if proportional will ever be able to overcome. We often have long "bull sessions" on proportional and invariably they wind up with the same thoughts.

For the most part, our models fly a distance from us; that we all can realize. We can only fly according to what we see and our eyes do the seeing for us. I believe that it is true that anything which is beyond 5 feet from our eyes is affected by depth perception and that anything which is 100 feet or more from us can move without our seeing it do so. Now, add to this the excitement of our nervous system while flying which can only reduce our concentration and it is not hard to see that we have problems which no full scale pilot will ever have. So, it would seem that we never will be able to fly in the same manner as full scale; we are going to have to compensate for these handicaps no matter how good our system may be.

To get smoothness of flight, we depend upon being able to apply just the proper control (and in correct amount) to our model at precisely the right time. I don't believe the "amount" of control is half as important as is the timing, I feel that we can learn the amount but can we "learn" the timing? We might even learn the timing under ideal calm conditions but it seems doubtful that we could do it under any rough air conditions.

I cannot help but think that many proportional problems are wrapped up in the above thoughts and that some solution must be found before we can expect perfect results (T-V??).

Let's take a simple example: Our model is flying some distance out (not beyond normal maneuvering range) and we have moderate gusty weather. The model is level and then strikes a gust which raises the nose and per-

haps tips a wing. We can see the nose raise due to the sharp silhouette of the fuselage against the sky (if we are flying in bright light) so we can do something about that even though it may be too late. But, can we see the wing raise?? And soon enough to smooth out the bank before it becomes noticeable? I doubt that we can very much. Now, what is involved to get the nose back level? First, we don't know that any control is required until the model is actually out of position, then our eyes must tell our brain, our brain tells our hands to do something, our hands get into motion and move a stick that tells the transmitter to send a signal (after a few relays have actuated) and this signal arrives at the receiver. The receiver deciphers the signal, closes a relay which tells an actuator to move, and after it does, the control moves which causes the model to move after its inherent time delay. Thus, if we have guessed the correct control and come close to the right amount, we may get the model back to level flight but, in the mean time, the model was not standing still so we wind up finding it in a somewhat different position by the time the action occurs from what it was when we started all this! If we are lucky, we can make an additional number of minute changes in the amount of control which we gave it and eventually get back on an even keel. Now, if we have to correct a sidewise motion too, you can just double all this rig-ma-role. Gosh, when you start to think this way, it is a wonder proportional works at all, isn't it? So, I cannot help but think Walt is doing real fine with his flying and, if he ever finds the answer to the delays, he will be on top to stay!

The second part of this would be to tell why a bang-bang model does fly smoother than proportional--notice that I said the model flies smoother and not the pilot for in that lies the answer. The simple answer is that the bang-bang model flies itself and the pilot only guides it. When the model has all controls in neutral, it is much like a free flight. If something disturbs it, the model's natural recovery ability goes to work the very instant that the disturbance starts--not after the pilot has noticed it and a long chain of action has taken place. So, normal air disturbances are very seldom noticeable to the onlooker due to the very facts which make proportional tough to fly--perception and our poorer eyesight at distance; the onlooker has to put up with these drawbacks too! Some time watch a distant flying model with field glasses and notice the amount of movement in the glasses as compared to what your bare eyes see. Not all models fly smoothly, of course, probably the average fly no better than a good proportional type. However, the difference comes in the models flown by champs, so to speak. These people spend hours trimming their models by changing wing and tail settings, thrust adjustments, C. G. locations and even servo action. The result of all this "adjusting" is a model which flies itself automatically and gives the smooth flying which we want. The smooth recoveries from maneuvers are usually not because of good piloting but, rather because the model is adjusted to recover smoothly by itself! On top of this, a great deal can be done with the model design alone, the proper choice of air-

foils, moment arms, amount of power and wing loading can directly affect the "automatic" flying of the model. I have long been an advocate of designing "automatic stability" into our models and I, personally, feel that this is the right school of thought. If we find this stability rough to put up with for stunting, we simply must design a control system which will upset the stability. It is an accepted fact that, by using enough control surface movement, you can upset any amount of stability, so we need only find a control system which will provide the amount needed at the time we want it. Sound like proportional??? It would be awfully close to it and the answer to proportional which I want to propose would be just it!

The answer to proportional would be a system which would positively neutralize in a split second when commanded. This neutralizing must be as positive or even more so than our present bang-bang actuators. The controls should not depend upon a resultant as does anything which "wags" and should move to any chosen position instantly and stop there. With such a system, we would essentially have a bang-bang type with an infinite number of control positions. In my opinion, this would be the answer as we could then fly the model exactly in the "automatic" way and even add to the inherent stability depending upon the added control action for maneuvering. I believe that it would add a lot to our flying and come just about as close to full scale as we ever will get.

Harold DeBolt
Buffalo, New York

I have been a subscriber to GRID LEAKS from the first issue and have just finished reading your interesting comments on proportional control versus bang-bang systems. I have been trying to analyze and find the answers to the same questions you mentioned.

I am 50 years of age and have been in engineering and operations of the Canadian Broadcasting Corporation for 22 years. This is the government-owned Trans-Canada Radio and TV system. I am the assistant to the B. C. Regional Engineer here in Vancouver. I have an amateur call VE7NY. I became interested in R/C about 2 years ago and built a Sterling Tri-Pacer with TTPW control, Distler servos, gear ratio 95 to 1, and VO.250 cells. I must have been one of the first to use these cells as I wanted VO.500's and the answer was that they had not been made yet since they had just started production. I now realize that a Tri-Pacer was not the type of plane for a beginner to learn to fly on, let alone rudder, elevator, and motor control for a start.

The reason for this letter was to tell you of my experience trying to learn to fly my plane. I just could not handle the plane with the control unit as the lack of a definite neutral always got me into trouble since it was so easy to get a little unwanted control without realizing it immediately. Al Doig sent me a blue print of the control stick designed by Bonner and as soon as I saw this, I knew, as far as I was concerned, this was the answer to my flying. Consequently, I built a unit. I was able to handle the Tri-Pacer from then on, in spite of the fact that this ship was too fast for me and I had to run it in second speed after I got it in the air. The plane weighed over 6½ pounds and had to move pretty fast to stay in the air.

I believe that the spring return system for the control base by Bonner is the answer for proportional flying as it is possible for the beginner to fly the system by the pulse method at first if he so desires. He can fly rudder only just by pulsing the stick to right or left and releasing it to go back to neutral. There is not much danger of getting elevator unless he wants it. After he gets the feel of the system, he can start following the stick through and gradually work up to true proportional flying. I might add here that I have a long way to go before I can really call myself a good R/C pilot. My trouble is that I do not get enough practice since I have to go so far to find a place to fly a plane. I have been driving 65 miles to Bellingham,

Washington and flying off the local airport with Kale Harden and Ralph Graham. At the present time, I have a Multi-Bug with TTPW and 16 flights on it.

I guess I will always be a proportional fan since it is the true control and there is no good reason why it should not be possible to compare with or surpass the performance of bang-bang systems. Personally, I have never seen a current reed job really fly as smoothly as is possible with my equipment. The tendency nowadays is to ignore the fine points of flying and concentrate on stunts. Maybe I am too fussy or expect too much in my old age, but, before the way, I used to do a little flying and one of the things that a pilot was judged on was precision flying.

Clayton M. Wilson
Vancouver, British Columbia
Canada

In reply to your comments on multi channel reeds vs. "ulti" proportional control as to the smoothest system, I would like to toss out the following comments for consideration.

First, availability. Reeds have been available to the R/C flier longer than "multi" proportional systems. There were several simul eight channel reed systems commercially available four years ago--possibly longer. As yet, the only true "multi" proportional systems available are the WAG and Marcy. Since you are the sole outlet for both, you know how recently they have become available. This lack has certainly hampered the general climb in proficiency through flying practice.

Second, servos or actuator. There are several excellent reed servos available (top quality ready made). For proportional, I only know of four and these are far from being satisfactory or comparable to the reed servos. As a result, the major portion of the serious proportional fliers have to build their own. This is readily evident by a review of model publications including GL (good ole MM's). As most servos are home built, generally with hand tools, they lack the precision and excellence of performance of commercially machined equipment. Yet, the proportional actuator demands more precision than reed servos. This home-building process has seriously hampered proportional systems and scared away many would be proportional fliers.

Third, model aerodynamics. This is considered to be, by far, the major factor for proportional roughness. With all due respects to Walt Good, whom I consider tops in R/C electronics, the Multi Bug (a revamped 1953 Rudder Bug) compares to the Astro Hog somewhat as you would compare a DC-3 and a Boeing 707. It compared favorably with the Smog Hog (even without ailerons) but doesn't even fall into the same class as the Astro. The Multi Bug's inherent stability, both spiral and pitch, makes for abrupt pitch and yaw change when upset.

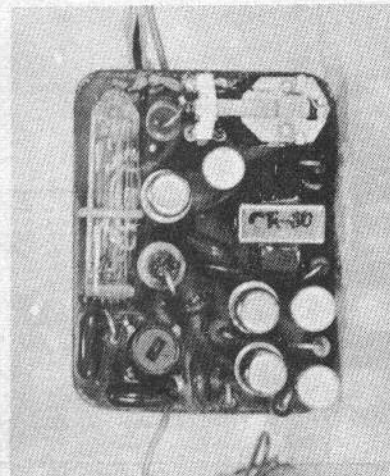
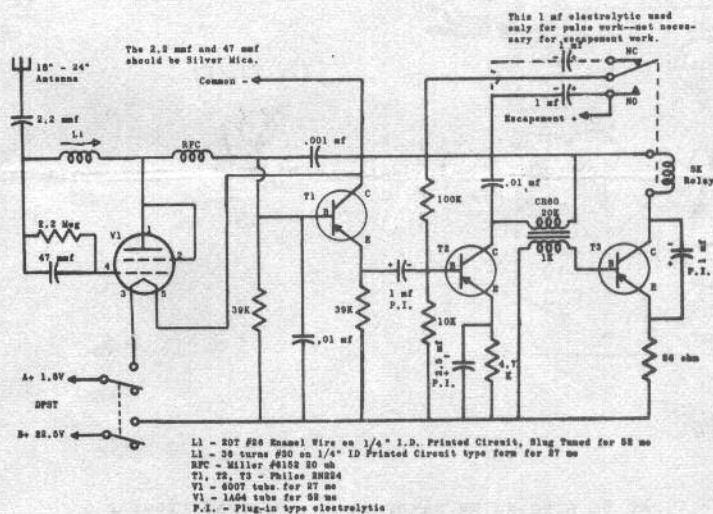
I have discussed these model aerodynamics with several of our club members who are experienced aircraft (MAC) aerodynamic engineers with years of experience in the design and research of stability and control parameter. Since last summer, three of the aerodynamicists have made extensive study of all the major R/C models. They have established graphs and curves in terms of stability, roll and yaw coupling, wing loading, tail volume, and control power by which the parameter of a model can be inserted and a predicted performance obtained. Of five models in our club that have been run through, the predicted performance has been 90% correct. One member, whose model didn't do very well with back into the curves, picked out the least extensive changes necessary to improve performance. Once changed, the model bore out the predicted performance improvement; approximately 200% over the unchanged version.

Well, there are my comments. Give proportional systems another year, better servos, and a good up-to-date ship and let's rediscuss this question again next January.

Jim Shows
St. Louis, Missouri

Improved Kraft Single Audio Receiver

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When the Kraft receiver was originally published in the March, 1959 issue of Model Airplane News in the E. J. Lorenz radio control column, it was published primarily as a printed circuit base with a circuit for those who had gumption enough to go ahead and try to wire up something new.

Soon this happened with the more ardent scratch-builders and reports on the fantastic performance of the receiver began pouring in from all sections of the country.

Immediately, in view of the fact that some of the components as used in the article in March, 1959 Model Airplane News, were not available to everyone concerned, a design was chosen which used readily available components such as the CR80, IBI capacitors etc. and it developed into one of the fastest growing audio kits that has been marketed in the U.S. to date.

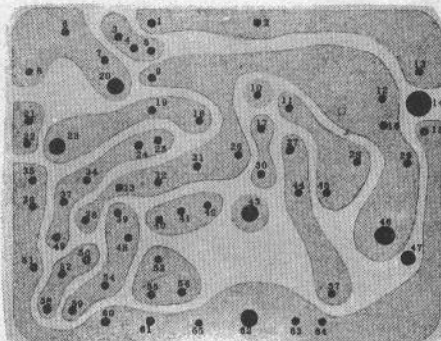
About this time, correspondence began to be exchanged with the designer, Phil Kraft, of California. Phil had some very different ideas as to methods of im-

proving the already fabulous performance of his receiver.

This included a re-designed and completely revised printed circuit board so that printed circuit IEI capacitors could be used, the much lighter Dean's relay could be substituted, and several additional features could be filled in.

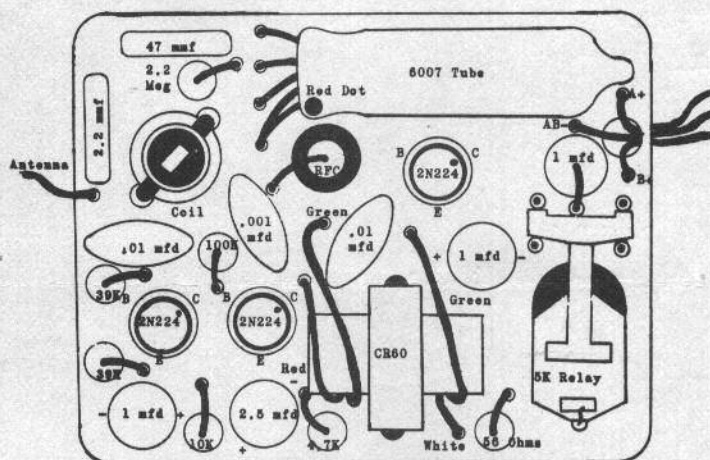
This has now been done and the improved version is shown here with a full-size layout on the base as well as an over-size component placement on the top side of the board. It now features: 1. Far greater sensitivity. 2. Will follow the very highest pulse rates. 3. Uses new highest quality transistors for excellent uniformity of results. 4. New circuit layout features a much greater ease of assembly. 5. Uses new Dean's relay for even lighter weight. 6. Uses Nashville IEI plug-in type electrolytics for greater ease of assembly.

A study of the base diagram as well as the component placement diagram will assist you greatly in building this new 1960 version of one of the most popular receivers in radio control history.



Use #80 drill throughout except the holes listed below by numbers.

Holes #20, #23, #43, #47, #62 - Bit size 5/64
 Hole #46 - Bit size 3/32
 Hole #14 - Bit size 1/8



T1, T2, T3



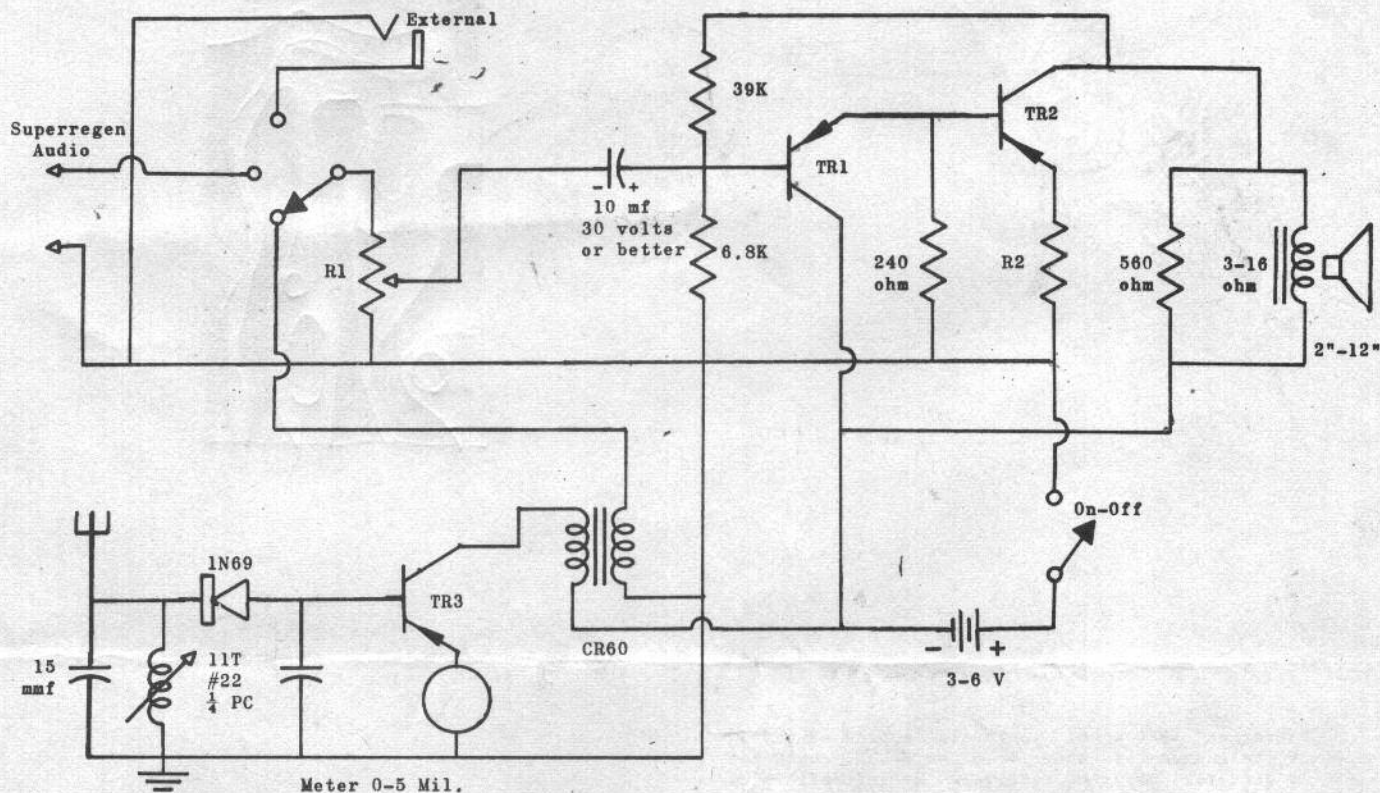
To tune the receiver, it is necessary first to plug an ma meter at the B+ lead. Tuning the receiver to the carrier will quiet or still the meter needle vibration. Meter current, without signal, is generally in the neighborhood of .9 to 1 milliamp.

Upon receipt of signal of the carrier, this will be quieted considerably and will also show a steady characteristic.

With receipt of a modulated carrier of at least 100% in a range of 400 to 1000 cps, the relay stage will rise to approximately 4 milliamps. This will depend on varying characteristics of the tubes and transistors used, but, in any case, the action will be sufficient for good solid relay action.

Build A Field Monitor

BY GERALD GILL



TR1, TR3 - Sylvania 2N1265 (CK722, T0037)

TR2 - Sylvania 2N255

R1 - 25K to 100K (See Text)

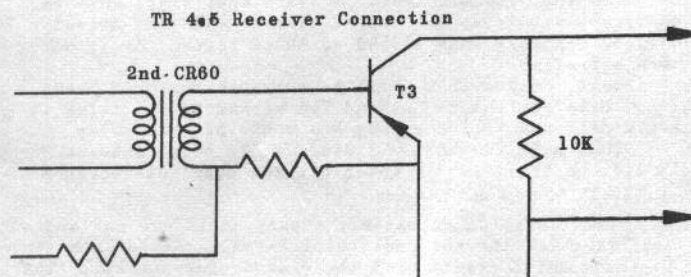
R2 - .9 ohm (See Text)

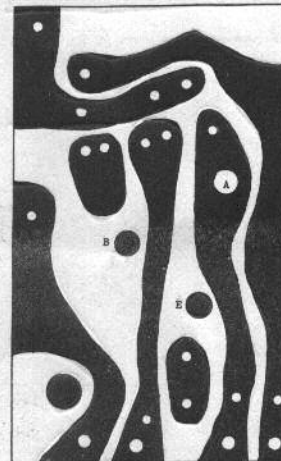
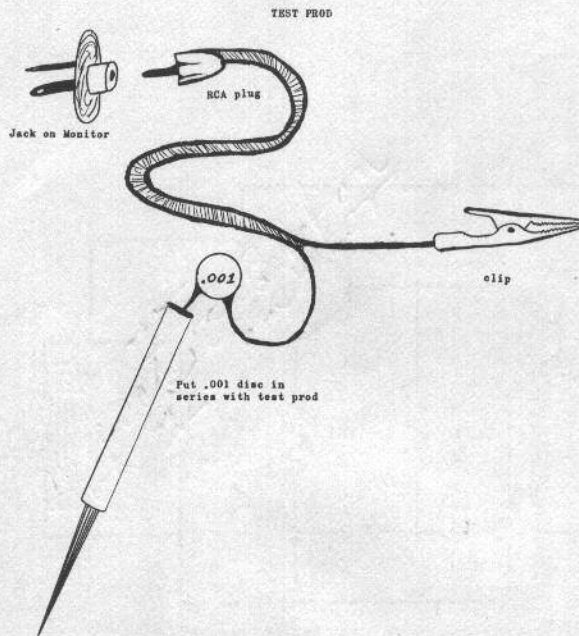
Here is a field monitor that is the perfect unit for club use. It has more than enough volume for a monitor on only 3 volts and can be used on up to 6 volts for terrific volume. It can be used as a diode detection unit giving up to 30 feet range or it can be coupled to a superregen receiver for complete field monitoring. It can also be used as an audio check prod for trouble shooting receivers. The external jack can be tied to many things.

My own personal unit has a TR 4.5 receiver detector with two transformer-transistor stages of amplification. The third CR60, normally used in the TR 4.5, was replaced with a 10K resistor as shown. I used an 8" PM speaker with a 4 ohm coil. It has much too much volume for indoor use with the volume turned up. I used a 100K pot for R1 but, with other receiver types, this might be changed. This value worked well behind a MarcyTone receiver minus the selective components.

This unit can be used with many different front ends. For those who fear that the superregen operating while flying would interfere, merely switch to diode detection and turn off the superregen detector. With the small amount of power involved with the TR 4.5 front

end, we haven't experienced any interference until we get about 4 or 5 feet from the monitor. The FSM will work regardless of selector switch position. Also, any FSM detector circuit that you might have would work. Just insert CR60 in series with meter.





ACTUAL SIZE

To use as test prod, you build a prod as shown, clipping the ground of prod to B+ or B- and check the audio in different parts of receiver. My unit will pick up the hiss by tying to ground and bringing prod near receiver.

We have a phone setup for club use for range checking receivers. This is with 1000 feet of 2 conductor cable. The monitor can be tied across the telephone ear piece and the man on the transmitting end can hear and operate the transmitters at the same time. It makes a handy setup for club flying when there are 10 to 15 transmitters to range check with.

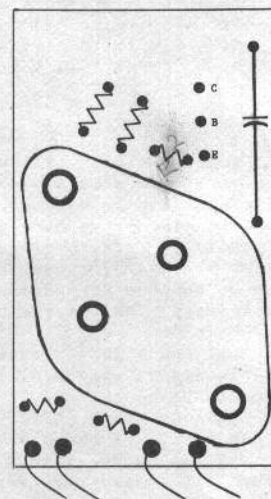
Here is the PC Base I used on my monitor, double size. 4/40 bolts hold down 2N255 with the head of one soldered to copper at "A". The projecting base and emitter leads were bent over and soldered full length at "B" and "E". Resistor R1 was built by winding a couple feet of #32 copper wire over a 10 ohm resistor to make a little less than 1 ohm. This is not critical. It's just to give a load to TR2 in case of a short at speaker.

I built a complete unit for one fellow (speaker, \$4.00, meter, diode detector, audio amplifier, antenna, battery box, less the super front end and selector switch) for less than \$15.00 worth of parts. He is more than satisfied.

Well, maybe this will be suitable for Grid Leaks. It's been real handy around my workshop. I think it could fill the bill for many who want the same setup.

SOME LATE THOUGHTS - I used a 7 foot antenna on TR 4.5 to bring in 10 meter citizen band interference. It brings them right in.

Don't use common battery supply on TR 4.5 and audio amplifier as the set audio oscillates. Maybe this can be cured but I didn't have the time to investigate. The monitor reproduces the super hiss when no transmitters are on. When carrier is on--all is quiet. When two transmitters are on, you get the beat audio frequency and, of course, tone transmitters give good loud tone.



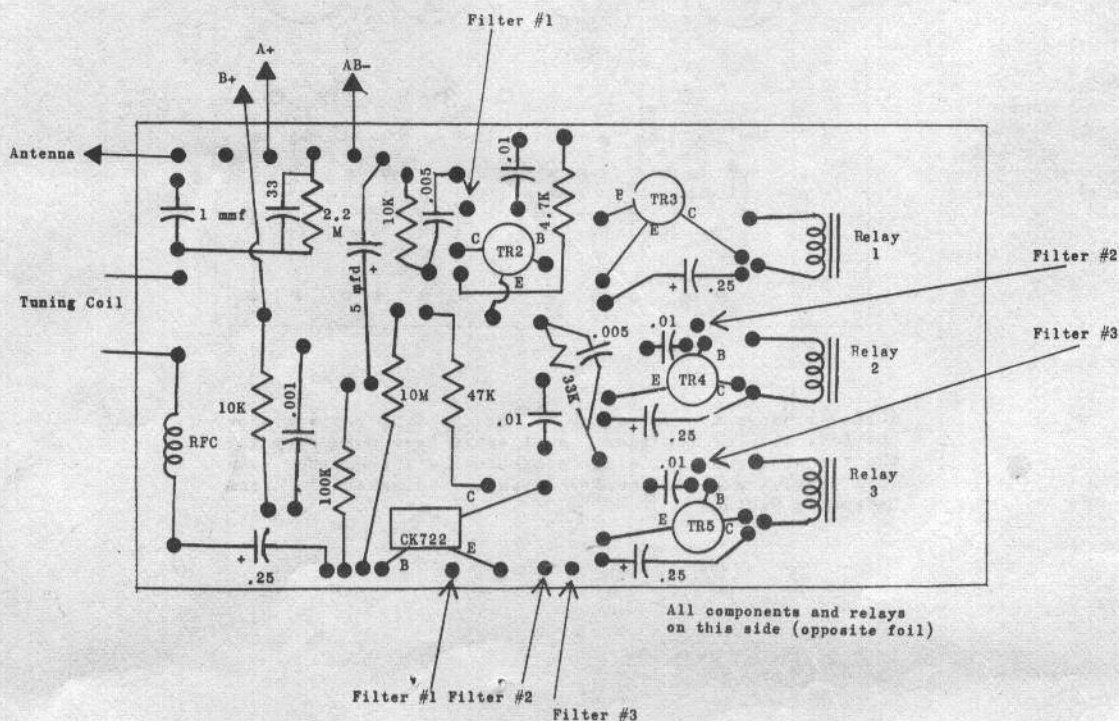
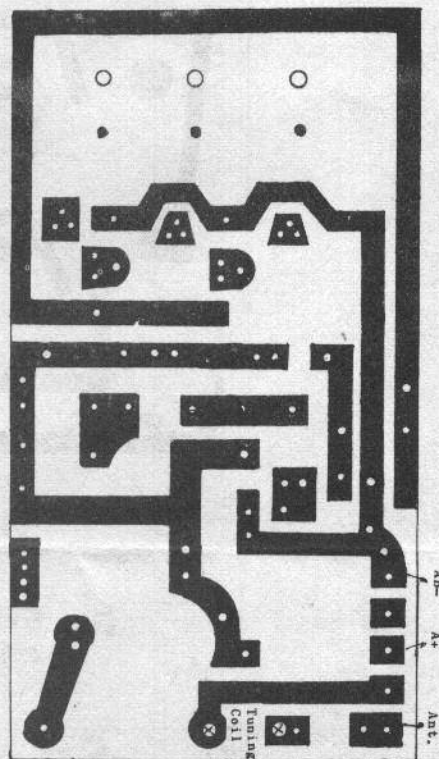
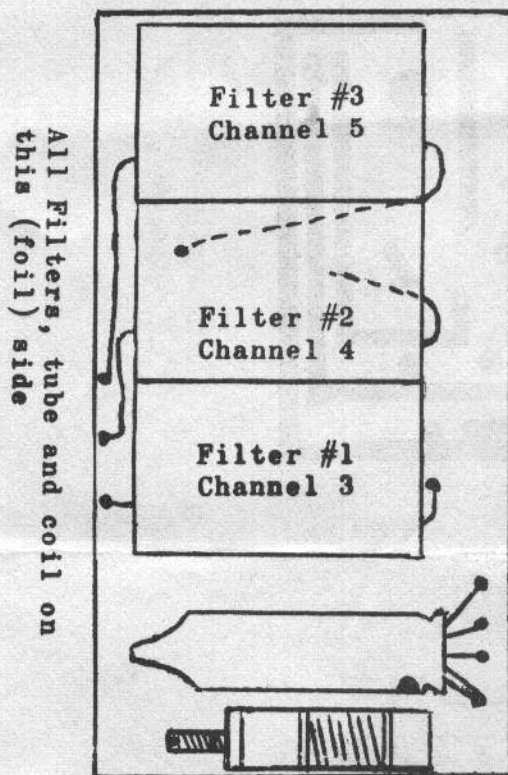
PC FOR MARCY TRIPLE RECEIVER

BY E. S. KNIGHT

I am enclosing sketches for a PC board for the Marcy dual. As you can see, I have added filter circuit #3 which I use for motor control. The circuit is not changed in any way except a third filter network is added. Modification to the transmitter consists of simply adding a third tone oscillator identical to the existing two. Positive voltage to operate the oscillators is fed through the normally closed contacts of a

push button switch to the two existing oscillators and through the normally open contacts to the new oscillator. Thus, a momentary pulse sends out the third tone, activating the third relay. I have not tried sending this tone simultaneously, as I just haven't wanted to, but perhaps someone else would like to try.

This modification gives proportional control with motor control and seems to be superior to WAG in ease of operation and simplicity.



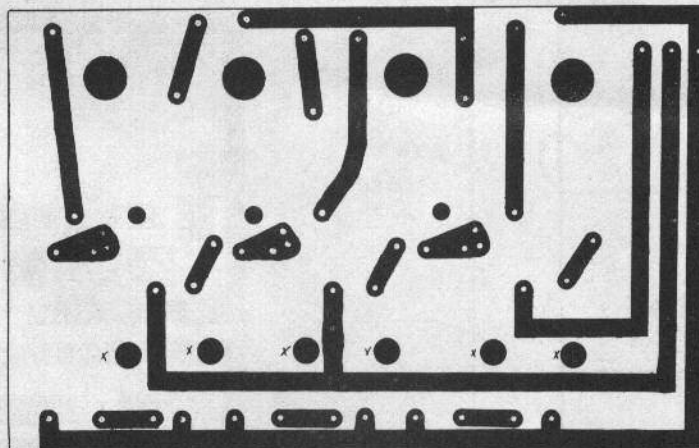
PC FOR MARCY TRIPLE MODULATOR

BY E. S. KNIGHT

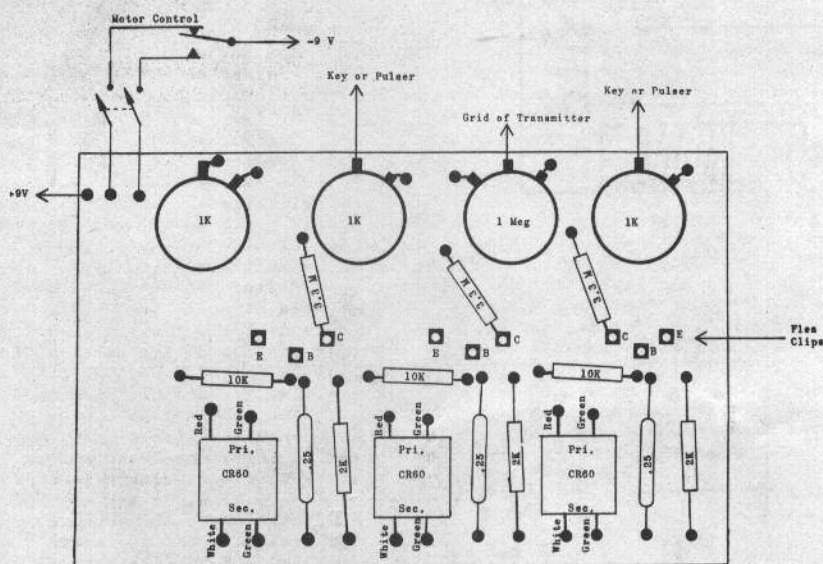
Further in connection with the PC board sketch I sent you of the Marcy Dual Receiver with Motor Control added -- It occurred to me that you might also be interested in the Tone Modulators. I have also PC'd this, and the switching is built in. I have not looked into PC for the pulsers or transmitter as they needed no alteration.

Editor's Note: If you wish to refer to the originals in schematic form, see Grid Leaks, Volume 1, Number 10 -- both receiver and dual Tone Generators are contained in that issue.

PC PATTERN FOR 3 TONE MARCY MODULATOR

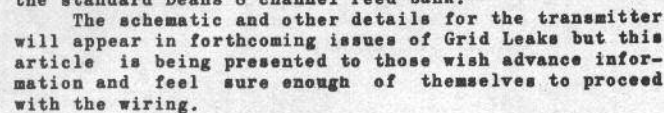


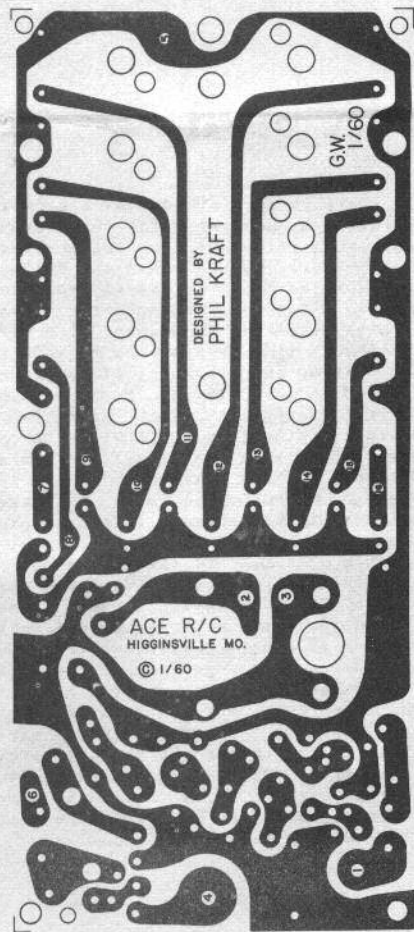
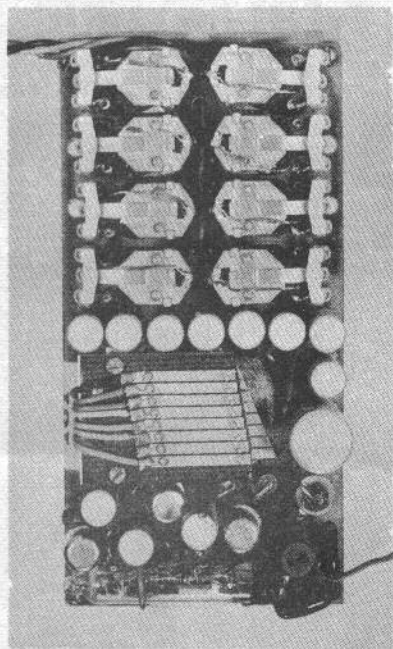
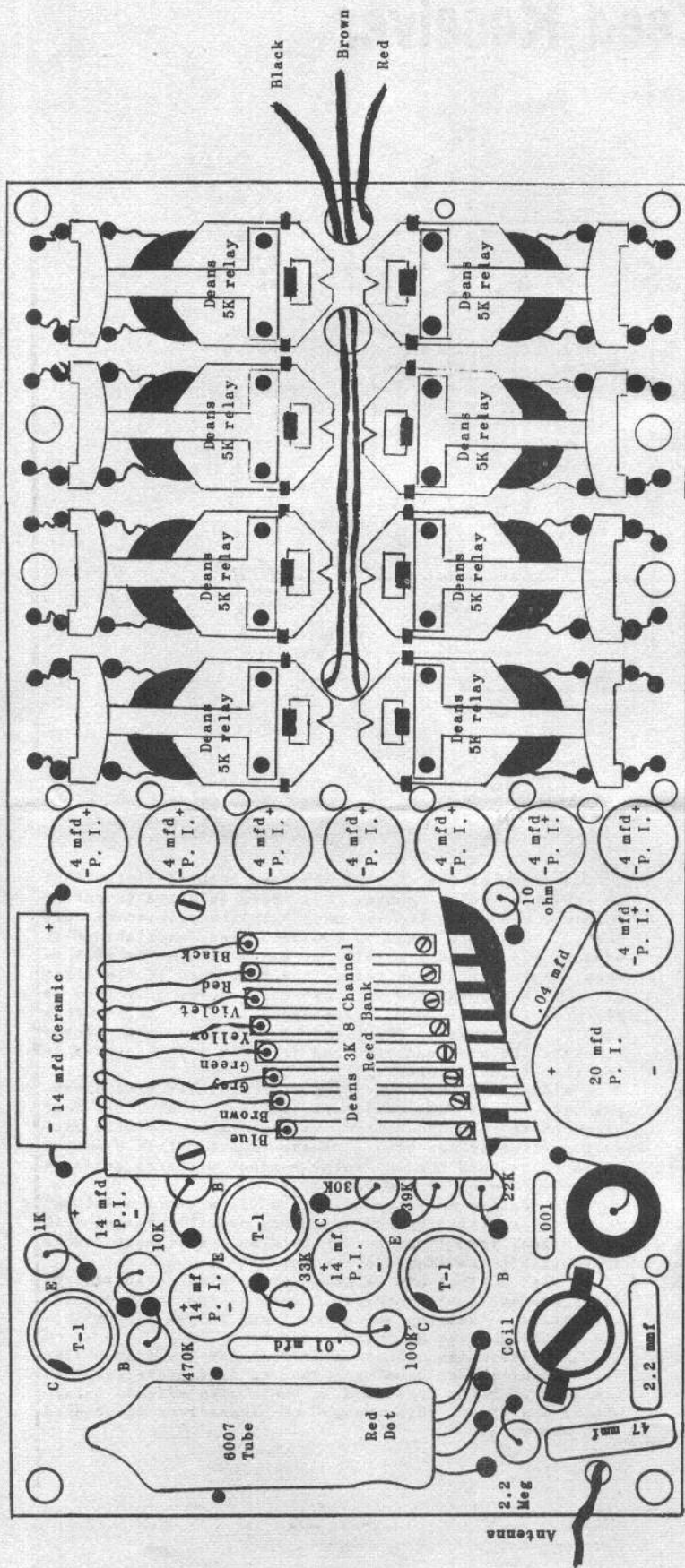
X 1/8" Dia. Mounting Holes for CR60



NOTE: Although not necessary, I put the 3.3M resistors on the foil side of the board, so I would have more room for the transistors. All other components are opposite the foil side. Pots are the 5/8" diameter "dime size" from Lafayette Radio.

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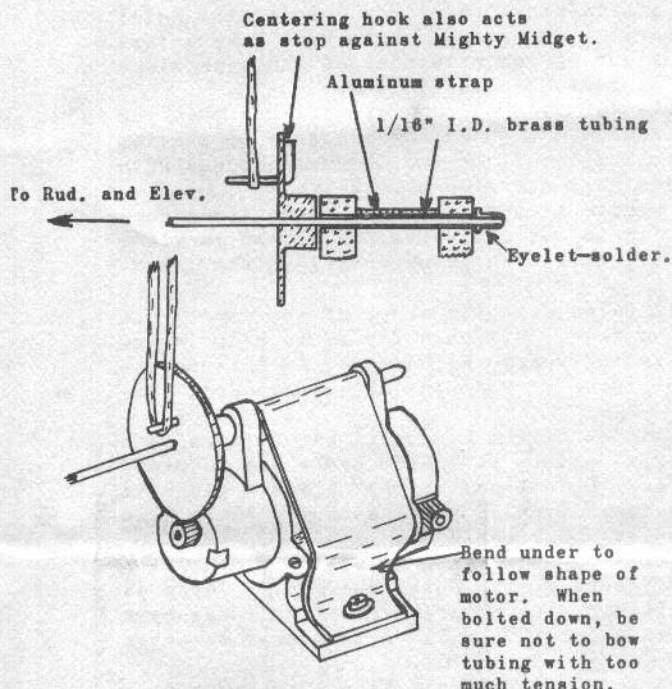




BITS AND PIECES

mighty midget bearings

On the Mighty Midget motor, I have had bearing wear problems and, even on some of the new ones, the gear mesh was very sloppy. I have had a couple of hang-ups on account of this. The sketch and notes enclosed tell how to cure this problem. I have never had a hang-up or even had to throw a motor away because of bearing wear which I understand is common practice.



Drill through bearing bosses with 3/32 drill and insert 1/16" I.D. tubing and hold it down with aluminum strap. I have had some hang-ups due to bearing wear and this cures the problem.

W. F. Heger
Peoria, Illinois

KRAFT TUBE DATA

I need a little information—I have two tubes, a CK526AX and a CK533AX. One of these tubes is doing a fantastically good job in my Kraft receiver.

A local hearing aid firm throws away old aids by the boxes full complete with tubes and batteries. That is how I have obtained about 50 of these submini tubes—most of them, about 80%, check out good on a tube tester. However, the lettering rubbed off the two tubes aforementioned and I don't know which one I'm using in the Kraft.

I do know that the tube works well down to 15 volts B+ and 1 volt filament. It has a 15 ma filament drain, superregens twice as loud as a LAG4. Using a MarcyTone coil, this tube gives me four times the range (800 yards) as a 6007 or LAG4 will.

Sincerely,

George Zimmer
West Monroe, Louisiana

Since the filament drain is known, this is a fairly easy one. CK533 has 15 ma filament — CK526 has 20 ma.

TR 4.5 ALTITUDE ATTEMPT

I recently built your TR receiver and have had wonderful results with it after a little initial trouble was ironed out. Apparently the upper voltage limit on my A01 was critical as the receiver would begin to oscillate on anything more than 4.3 volts. I now use 3.4 volts and am presently running tests on the possibility of using this supply and receiver in an altitude record attempt.

So far I've built a miniature barograph, which still has to be calibrated and approved, and I'm constructing a test vehicle along the lines of the Ramrod FF. My version will be powered by a supercharged Fox 35 and I hope to use some type of pressure feed for fuel. After ironing out the biggest of many problems, ie. engine run and accurate R/C at 20,000 + feet, I'll build a Mac 60 version to make a real attempt, possibly next summer at the Nats. For a transmitter, I'm using a 24 watt taken from a surplus weather balloon that is presently on 7 meg.

I would greatly appreciate hearing from anyone who has similar interests and who may have a problem obtaining a suitable barometer or barograph.

Sincerely yours,

Cadet John J. Wolcott
1st Squadron AFCW
USAF Academy, Colorado

You no doubt have read in Grid Leaks by now how some of the audio oscillation can be cured on the A01

We're very interested in your proposed altitude record attempt and wish you would keep us informed.

We know of no one who has a similar interest at the present time but we're publishing your letter in full including your address so that they may contact you directly. Best of luck on your venture.

TR 4.5 ON 50 MC.

I have my TR 4.5 on 53 megacycles. Used a Philco T-1324 purchased from Arrow Sales in Chicago for \$1.65. I removed two turns from the coil and substituted 10 mmf for the 22. The T-1324 appears to work even better than the A01 at 27.

L. V. Miller
Park Forest, Illinois

CONVERTER INFO

I've become very interested in making a transistor power converter. I would like to make the converter described in Vol. I, No. 4 of Grid Leaks by Joe Curtis.

My big problem is trying to get the Ferroxcube cup core #7F-160-3C to make up the transformer.

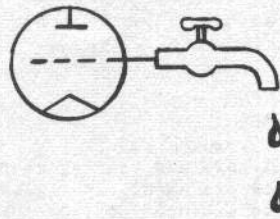
I would like to know if Ace sells this cup core. If not, where can I obtain it? I've tried every supply house in New York but cannot seem to pick it up anywhere.

Sincerely,

Frank Barbera
Yonkers 2, New York

MC Manufacturing & Sales, 6720 Monroe, Kansas City, Missouri can furnish you the Ferroxcube cup core #7F-160-3C. They also have this all wound up which is sold through Ace Radio at \$3.00 per unit.

Grid Leaks At Play



The 23rd Annual Hobby Industry Association of America Trade Show held at the Hotel Sherman in Chicago in February, 1960 is now history. The items shown will have a far-reaching effect on the radio control fan's actions during the remainder of the year since they portend the release of many new items of general radio control interest.

As always at affairs of this kind, one is impressed by the many old friends that you run into and the many new friends that you make. Bobbie and I had the pleasure of staying at the Hotel Sherman and visiting both on the exhibition floor and the hotel rooms with many of the friends that it has been our privilege to meet over the past years.

One of the major impressions we received from people at this show was their tremendous faith in the future of radio control for the R/C fan in America reflected in the many new products and many new ideas which were shown and were talked about as coming in the immediate and near future.

Lunches, dinners, coffees and swapping of tall tales were the order of the day. All in all, our all-too-short stay at the Trade Show, we feel, did much for us to help formulate the policy that Grid Leaks will follow in the coming year. We hope to, in this particular run-down of Grid Leaks at Play, give you some ideas of what you may expect from some of the major manufacturers during the coming 1960.

It was also very heart-warming to have, in addition to the hundreds of letters that we have received, verbal confirmation of the editorial policy that Grid Leaks has adopted. By and large, the confirmation is this opinion: "Keep Grid Leaks as is!" "Let beginner's articles be kept for the other mags and the handbook type of publication." "Keep Grid Leaks on the advanced plane so the art of R/C may be ever furthered."

Now, for the benefit of the consumers, here is a capsule run-down of the many booths sprinkled generously on the mezzanine and display floors of the Hotel Sherman. These do not, by any means, represent the total of items exhibited, but we are presenting these here mainly as an idea of items of interest to the R/C fan only. We will not attempt to cover any of the craft or other related items.

At the booth presided over by Vernon C. MacNabb and Mrs. Virginia King, we saw a preview of the CitizenShip transistorized dual channel receiver for 27 megacycles. It was termed as a receiver for the "middle modeler" who has graduated from single channel and is not yet ready, for financial reasons or lack of experience, for 8 channel equipment.

The list price on the unit is \$54.95. It weighs four ounces and measures 3 3/8" x 2 1/4" x 2 1/8". It will provide for rudder, elevator, and motor control for small planes. Total battery requirement is only 4 pencils. Has a simple single RF tuning adjustment and operates from CitizenShip's existing dual channel REX transmitter. Delivery approximately April 1, 1960. This is in addition to the many other items offered by CitizenShip who, at this particular Trade Show, were celebrating their 10th anniversary in radio control.

At the booth displaying the products offered by Aristo-Craft Distinctive Miniatures and presided over in the R/C department by Gil Rose, the following new items were apparent.

The Aristo-Craft CR-1 carrier wave receiver at \$12.95. This is a single hard-tube job completely encased requiring 67 1/2 volts of B and 1 1/2 volts of A completely assembled.

The Aristo Rangemaster 1AP transmitter housed in a 3" x 5" x 8" plastic case with a collapsible chrome antenna. Factory tested and guaranteed using a 3S4 tube in a highly efficient design. \$19.95.

The Aristo-Craft TRR tone receiver also completely housed in a small plastic case 1 1/4" x 1 5/8" x 2 3/4" using one hard-tube, three transistors, featuring a current rise and requiring one 22 1/2 volt B and one 1 1/2 volt A. \$27.50.

The Aristo-Craft Rangemaster 2AP tone transmitter featuring a 3A5 MOPA circuit using a 3S4 as a highly efficient modulator for 100% modulation. Factory tested and guaranteed. \$29.95.

The Aristo-Craft Rangemaster multi-receiver 8 channel and multi-receiver 10 channel weighing 8 and 9.5 ounces respectively. Using transistorized equipment with a single hard-tube front end, either unit requires one pencil for filament and one 45 hearing aid B. Single touch tuning. Price of the 8 channel is \$99.50 and the 10 channel will sell for \$127.50.

Matching Rangemaster transmitters in 8 channel simultaneous and 10 channel simul-

taneous are also available in metal cabinets measuring 6 3/4" x 3 1/2" x 9 1/2". 8 channel simultaneous is \$99.50 and the 10 channel simultaneous is \$112.50.

All the foregoing units are scheduled for release in the fall.

Among the newest items to be brought forth by Aristo are some brand new and good-looking escapements.

First is the Code-A-Matic control box, a device that actually thinks for you, is conveniently small, measures 3 1/4" x 2 1/4" x 7/8". It may be hand-held or permanently attached to transmitter. Is energized automatically requiring no winding or batteries to operate. It is self-neutralizing, transmits your commands with accurate precision, and is designed in conjunction with the Quad-Trol escapement listed below. Only \$10.95.

The Quad-Trol selective escapement is actually two compound escapements mounted on one board called the "Uni-Panel". It is factory wired with printed circuit contacts so that multi-channel control from single channel equipment is easily available. Positive precision control of rudder and elevator plus electrical contacts of motor control mechanism with simple single-channel receiver. Is self-neutralizing. Three volt operation. \$12.95.

The selective compound escapement has a built-in control linkage to provide easy control movement. Has internal electrical contacts for operating an additional control device. Uses up to 1/4" rubber, 3 volt operation, ball bearing thrust bearings, instant response. \$6.95.

A rudder or motor control escapement that is light weight (only 1/2 ounce) will operate effectively on three volts DC. Heavily plated, is corrosion-resistant. Only \$3.95.

All of the foregoing control devices are to be ready for delivery some time in March according to authorities at the Show.

Now, for the related items such as planes, accessories etc. One of the cutest items that we saw was at the booth maintained by Paul K. Guillow, Inc. This was a new 1/2A radio control ship known as the "Vanguard". This 36" span job features a wing area of 230 square inches and is designed for engines of .049 to .074. While it is primarily designed for the new 3 to 9 volt transistorized receivers, it may be used with a number of the other smaller, light weight units now available on the market such as the Kraft audio.

Can be flown rudder only or Intermediate and is extremely stable when flying precision or "hands off". Take-offs and landings are smooth and realistic, yet, the "Vanguard" is maneuverable enough to perform the aero-acrobatics loved by most R/C fans. We found the basic construction to be simple--yet rugged--and very highly pre-fabricated so it appears that a minimum of building time would be required to get this job in the air for some just plain fun in confined areas. Price less motors, R/C equipment, tank, and propellers is \$5.95.

At the booth of Continental Dynamics, Inc., a new company as far as model aviation is concerned, was the 48" wing span Piper Super Cub completely pre-fabbed and made of revolutionary Dylite construction. The unit appeared to be very easy to assemble with all the larger sections completely molded--including the wings. Dylite is supposed not to splinter and pieces are quickly rejoined and repairs are said to be 100% strong. All parts including sides of fuselage and wings, stabilizer, ailerons, rudder, etc. are all available on a replacement basis. While the unit is designed for a combination of free-flight and U-control, it can and should be readily adaptable for radio control. We are looking forward to receiving a sample of this particular unit to report to you at a later date as to its flyability. The unit, less engine and controls, was \$16.95.

At the booth occupied by Midwest Products Co., Inc., a number of other 1/2A radio control plane designs were being displayed. All were beautiful and all looked very sturdy and specifically designed for the light weight radio equipment now available for plain fun flying. Among the new units to be released during the year are the Bébe Jodel D-9 at \$6.95 and the L-19 at \$5.95, the Aeronca Sedan at \$5.95, the 1/2A Esquire--patterned after the very popular larger version--at \$5.95. All of the foregoing are designed for use with engines of .049 to .074 and the kits are complete but less radio, wheels and motor.

At the Jetco booth, two new planes for single channel R/C--also in the 1/2A style--were being displayed. These were the Piper Super Cruiser with the 40" span for \$5.95 and the Cessna 170 also at \$4.95. Both of them are designed for .020 to .074 engines. Both feature detachable flying surfaces and struts. Complete decals for the wing, fin, fuselage, and instrument panel are furnished.

At the Enterprise booth, a new R/C plane was shown. Unfortunately, no specific literature was available on a "take home" basis but this particular ship was designed for .09 to .15 ships. As with all of the larger ships, this looked capable of handling almost any R/C gear.

From Pappy DeBolt at his domain in the dMECO booth, a Live Wire Pursuit which is a multi-channel low wing stunt and sport plane for advanced flying featuring a wing span of 66" for power of .29 to .45 engines and radio control of 5 to 10 channels was announced as being available some time in late spring. No price as yet. Also from dMECO a new Live Wire Ercoupe, another 1/2A single channel R/C scale model for light weight radio. Wing span is 36" for power of .049 to .09 engines. Designed for single channel radio gear. A little beauty of a job!

The Positive Flow fuel tank which has found such popularity among the R/C contest fans,

dMECO announced to be available in an 8 ounce size to provide 15 minute capacity for .35 to .45 engines. Also available soon will be R/C canopies. They are formed from fuel-proof and crack resistant plastic and ready to install. CR-1 is the air racer style and is 14 3/8" long. CF-2 is the World War II fighter style and is 12" long. CJ-3 is the modern jet and Delta style and is 15" long. These foregoing also to be available early in 1960.

Dynamic Models, manufacturers of the Holland engines, presented a brand new idea for the new Hornet which will be a two-speed job available in .051 displacement. It features dual needle valve assembly for a two-speed carburetor for radio control. The upper needle valve is for high speed adjustment and the lower for low speed. It has a butterfly valve between which assures proper fuel-air mixture at either speed. This minimizes engine stopping and slow settings due to over-rich mixture by other systems. This will be available first in limited supplies only. The price is an attractive \$10.95.

All of the foregoing point up a recognition of many of the kit and engine and accessory manufacturers of the need for good 1/4A radio planes and equipment. It appears that 1/4A radio is definitely coming into its own with the many fine smaller receivers.

Of interest also to model boat fans was the K & O Models 890K Hercules which, available in kit form with motor, is only \$7.95 and is approximately 18" in length. This unit appears to fill a real need for the small boat R/C modeller.

So much for the Trade Show in Chicago! Now, for some immediate things concerning Grid Leaks. We must point out this fact that, as Grid Leaks is mailed to you, it goes to the last known address we have of you and the post office does NOT give to us any forwarding address if you have moved. They place the burden of notifying the publisher of the move strictly up to the individual. So, if you have moved and begun to miss copies of Grid Leaks, this is strictly understandable because the post office is not under obligation to give us your forwarding address or forward Grid Leaks to you! They feel it is up to you and, in your interests, it's to your advantage to notify us as quickly as possible of such a move.

Now, for the immediate future, we have many fine articles for the coming issues of Grid Leaks. Among them, further material by Phil Kraft on multi-channel receivers and transmitters, an article from France on indoor R/C showing not only models but light weight R/C equipment, Pulsing on Reeds and many like articles.

Until the next issue of Grid Leaks

Yours very sincerely,

Paul
Paul F. Runge
GRID LEAKS

Grid Leaks

HIGGINSVILLE, MISSOURI



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