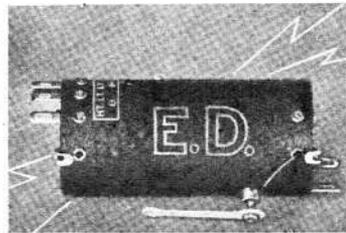
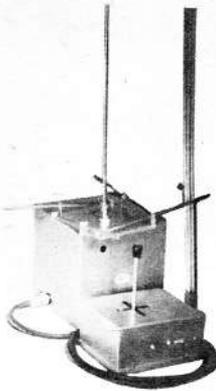


ROCKWOOD'S 5-CHANNEL



POLK'S E.D.



Radio Control Equipment

Now that the F.C.C. has opened up 27.255 mc. for "license free" operation, R/C will really move into high gear; this up-dated report is especially helpful

By HOWARD G. McENTEE

■ It is possible to procure on the market a number of different R/C units, from a single-channel job, the complete receiving system of which adds only about 8 oz. to your plane, up to multi-control units that will provide five different functions at your command, with a total weight of several pounds.

By far the largest number of active R/C flyers today use only a single channel with an escapement connected to the rudder. Lest the uninitiated may feel that such a simple system is kid stuff and strictly limited in scope, we point out that experienced flyers like Walt Good, Gene Foxworthy, Fran McElwee, and many others have won the majority of past contests, both Nationals and others, with just such simple apparatus. Furthermore, they will probably continue to do so in 1952!

Before proceeding further, let's explain this term "channel" as we generally use it in radio control. As normally stated, a channel is considered to be the radio equipment required to operate a single control element in the plane. Thus, one transmitter and one receiver with the necessary antennas, batteries, etc., constitute one channel, and can generally be considered to operate one control, usually the rudder.

This simple definition becomes a bit confusing, for some experimenters use two complete radio channels to work the rudder, one for each direction; and, as if to confuse us even more, one present-day R/C system operates on a single radio channel, but gives you a choice of five separate control operations in the plane, in any order you wish!

It is probably best, therefore, to refer to a system using a single transmitter and receiver as a single-channel system. The five-control arrangement is of this type, but five selective audio tones can

be transmitted over the single radio channel.

As we have noted, it is possible to get lots of control with a single-channel system and an escapement-operated rudder. With this you can do spot landings, turns, stalls, spins, loops, and many other maneuvers. However, the A.M.A. contest rules for radio control include certain maneuvers that can only be accomplished if you can control more than one surface in the plane—consecutive loops are a good example. Multiple control is thus the ultimate, but every additional channel you add means just that many more gadgets can go wrong. As you may imagine, that's one good reason why many of the best R/C flyers stick to simple equipment—they prefer to spend their time flying, not tinkering!

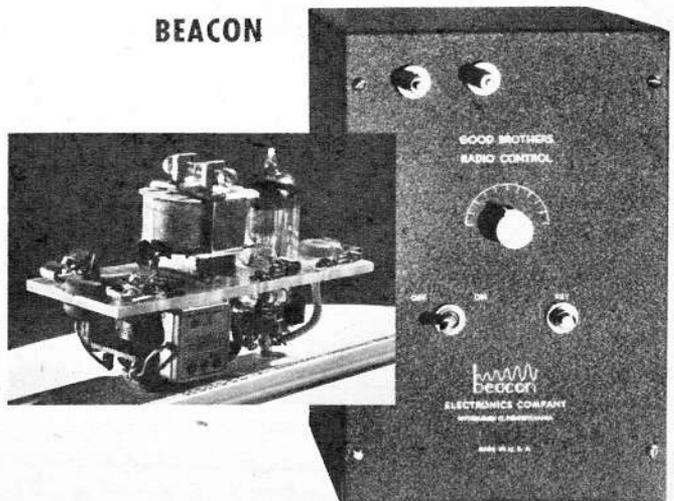
Much of the present day R/C equipment operates on the amateur bands. We won't go into the various license angles here, since the *Air Trails Model Annual for 1952* carried the story on all the bands. Until recently the 50-54 mc. band has been the most widely used, but now there will be much activity on the 27 mc. amateur band. R/C may now be practised on the spot frequency of 27.255 mc. No amateur operator license is required for this frequency, though it is necessary to fill out a simple form and send it to the F.C.C. With this sort of operation possible, we in this country are now on a par with the modelers in England, South Africa, and other countries, where such operation has been allowed for several years.

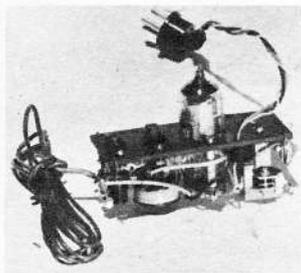
There are many good plane designs from which to choose; the one for you depends on whether you want to engage in contest flying, or whether you will go in solely for sport flying. In the past all radio planes were designed with the same idea in mind. The builders wanted a large job to carry the extra weight.

CONTROL RESEARCH



BEACON





TELASCO'S E.C.C.

one that was very stable in case the radio equipment failed, and the ship had to fly and glide rather slowly, mainly so it wouldn't hit so hard—just in case!

It is generally conceded now that a contest R/C ship is a specialized type; it must be of moderate size, have plenty of power, and fly rather fast. Furthermore it cannot be ultra-stable; it must be able to stall and spin if you want it to.

We will not go into airplane design considerations here, since several very successful R/C ships have been described in past issues of Air Trails. There are more and more ships available in kit form designed especially for R/C work. One of these is Berkeley's Super Brigadier, which is of moderate size. Berkeley also has larger ships that will carry lots of weight for those who want to go in for complex installations. Harold deBolt of Dmecco has just announced the Live Wire for the large A engines, while Vecco will also have an R/C plane design on the market. Jasco offers its R/C Master. We believe that many other kit makers will be entering this field soon.

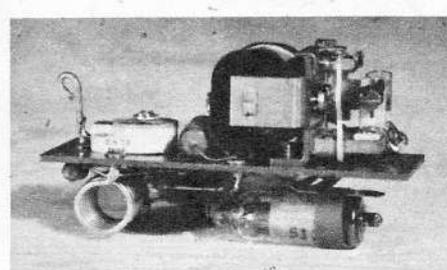
Meanwhile, you can get a good variety of planes suited to radio from past issues of this magazine. Also, there are some free-flight kit planes that may be modified for radio flying.

In general, a radio plane needs rather large cabin area, plenty of strength around the nose and cabin, and a sturdy landing gear. These are the general qualifications of PAA-Load models, kits for which are appearing more and more, and some of which can be adapted very nicely for radio flying.

Radio ships have been getting smaller all the time, until now there are quite a few Half-A radio jobs in use. Half-A radio control has been made practical by the elimination of the ignition system



LIGHTWEIGHT R.C.H.



our ships used to require, by miniature radio components developed during and since the war, and of course, by the remarkable tiny engines we now have.

Although the complex control systems used by some experimenters necessitate airplanes of 8-10 ft. spread, powered by Class C or D motors, the average R/C model today has a span of about 6 ft. and a Class B engine supplies all the power it can handle. At the short end of the scale, perfectly practical R/C models with a span of 3½ ft. or less are now being flown by Half-A engines, and the total weight of plane, batteries, radio and all is well under a pound!

It has been mentioned that the majority of R/C work up to now has been accomplished on the amateur bands, with 50-54 mc. by far the most popular, but there is a radio system operating on the so-called Citizens Band, in this case 465 mc.

With more and more frequencies coming into use, it has become possible to operate several planes simultaneously from one spot, something that could not be done before. We have seen as many as four ships in the air at once, all on different frequency bands, and all under perfect control without interference from each other. It is possible to operate two planes on the same band, but this takes careful tuning and test, and is best left to the experts.

Due to the increasing number of entries in the R/C contests, it will probably be necessary to have several planes flying at once on different bands, in order that everyone may have a chance to get in all his flights. This will call for more judges, of course, but will certainly expedite the flying.

Now let's see what R/C equipment can be purchased today by those who do not wish to design or build their own. Up until a year ago, receivers using the

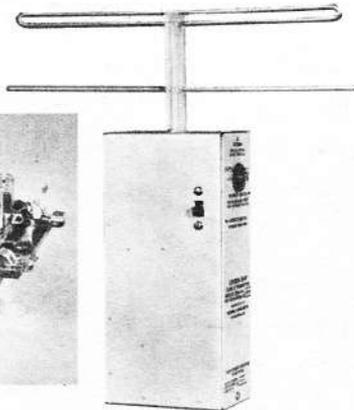
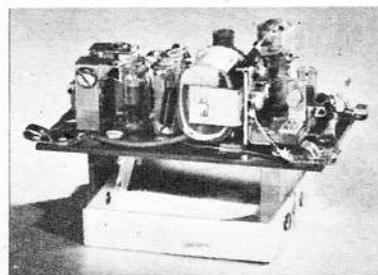
RK61 tube were by far the most numerous, mainly because they are simple and several makers were selling them. This tube was designed expressly for R/C purposes by Raytheon; the first model was the RK62, which came out in 1938 and shortly thereafter a concern known as Radio Control Headquarters was formed to market RK62 receivers and associated equipment.

RCH, as this firm soon came to be known, sold this apparatus right up to the time we entered the war and all amateur radio operation was prohibited. Jim Walker used RCH equipment in his 1941 Nationals winner. Following the war, RCH resumed sale of the same popular line. Several years later, following the growing trend toward smaller planes and lighter radio gear, the receiver was reduced in size and a new lightweight escapement was added to the line.

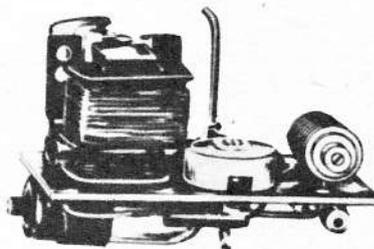
The RK61 receiver shown weighs 3½ oz., and is 3½" x 1¾" x 2" overall; the escapement weighs 1 oz., The RCH line includes motor-driven actuators, sequence solenoids, rubber-powered selectors and so on. Though kits were previously offered for all items in the line, this concern now devotes itself principally to sale of ready-to-use apparatus. However, instruction booklets are available which give details and working drawings of all items in the extensive RCH line. Much of this concern's present output is of the new lightweight line pictured here.

The standard RCH transmitter is fitted in a metal case 2" x 3" x 6" and is furnished with antenna, power cable, and a key or operating button on a long cord. A 3A5 tube is standard, though this transmitter can also be furnished with a high-voltage vibrator power supply and 6N7 tube, to work from a 6V storage battery. (Continued on page 52)

MacNABB



SUPER-AEROTROL



R/C Equipment

(Continued from page 35)

Receivers using the RK61 went into eclipse about a year ago, since Raytheon stopped making them, due to press of Government work. Fortunately, just about this time, an English tube of very similar characteristics appeared on the market, and was imported and used by several manufacturers here. Though the tube proved not to be absolutely like the RK61, it was near enough so that most of the boys could get fair operation from their gas-tube receivers, and so saved the day for many radio flyers.

During the time between the last of the RK61s and the time when R/C men had "tamed" the English tube, the XFG-1, many flyers perforce turned away from gas tubes and worked with various hard-tube receivers, as they are called. The latter have proved so successful in many cases that these flyers probably will not go back to gas tubes, even though they allow the construction of the simplest and lightest receivers.

Most modern commercially-built lightweight radio control equipment stems from that developed in 1946 by E. J. Lorenz. His original developments were taken over and modified by Berkeley Models, Inc., after the concern that first marketed them went out of the model business. Known as DE-Aerotrol, Berkeley's line is available both in finished ready-to-fly form, and in kits. The latter are very simple to assemble and bring tested radio control design within the means of many modelers who could not afford the ready-built apparatus. The receiver weighs 1.9 oz. with tube and measures $1\frac{7}{16}$ " x $1\frac{3}{4}$ " x $2\frac{3}{8}$ ". The self-neutralizing escapement weighs only $\frac{1}{2}$ oz. A single 3A5 tube is employed in the transmitter, which is fitted in a compact plywood case $4\frac{1}{4}$ " x 2" x $1\frac{1}{2}$ "; this unit is so small that some flyers fasten it right on the antenna mast, with separate leads to batteries and push button. The DE-Aerotrol transmitter has a built-in control button, however, and is normally held in the hand during operation. A 3A5 tube is standard equipment.

The escapement and receiver kits make up into finished units exactly like those Berkeley sells in finished form. Both the kit and the finished transmitter come in a wooden case.

With the opening of the 27.255 mc. spot, this concern has brought out the Super-Aerotrol line of kits. The transmitter comes with a painted metal box, which holds all the batteries, and the short antenna is fastened on the side of this case. This unit is intended to be held in the hand, and the circuit, of course, includes the quartz crystal specified by the F.C.C. rules for this frequency.

The receiver is much like the standard Aerotrol, but has a more sensitive relay and tuning is by means of an iron-cored coil, rather than the fixed tuning of the DE-Aerotrol. The transmitter weighs $3\frac{1}{2}$ lbs. complete, and the receiver $2\frac{3}{4}$ oz., less batteries. The Super line is sold in kit form at present, but will probably be marketed built-up later.

Berkeley has pioneered in use of the XFG-1 receiver tube. This tube is furnished as standard equipment in all Aerotrol receivers; the XFG-1 has been found by Berkeley to have considerably longer life. Since it is smaller than the Raytheon tube, it saves a little weight and appears to be more rugged and immune to mechanical damage.

Berkeley has been active in R/C since before the war, when owner Bill Effinger designed the Super-Buccaneer expressly for radio flying. A big plane by present R/C standards, the "Super-Buc" is still popular with experimenters who wish to carry heavy equipment.

Several R/C receiver kits, together with a long list of necessities for those who design and build their own equip-

(Continued on page 55)

(Continued from page 52)

ment are available from Control Research. This concern formerly offered finished equipment, too, but that line has been dropped, and emphasis is now put on knocked-down units, components and raw materials.

Control Research has had an RK61 tube receiver for some time. This tiny set measures only $1\frac{3}{8}$ " x $1\frac{3}{4}$ " x $2\frac{1}{4}$ " and weighs 2 oz. It features the Kurman relay and has variable condensers for both tuning and antenna coupling. When RK61s became scarce a year ago, the English XFG-1 tube was tried in this receiver, but was not too satisfactory. A new receiver was then developed, using two tubes, an RK61 or XFG-1 in the first position, and either of these or a 1V5 hard tube for the second.

This new development is being marketed in the form of a conversion kit for their single tube receiver, or for other makes of receivers of the same general design. It adds only a fraction of an ounce to such receivers, and makes it possible to use gas tubes which refuse to operate in the standard one-tube circuit.

Another advantage is that the current change is from around zero up to as much as .2 ma., which means that the relay may be set for much more reliable operation, or, cheaper and more rugged relays may be employed. Unlike normal gas-tube receivers, the plate current of the conversion job is low with no signal (around .5 ma.) and goes upward when you work the transmitter. This receiver allows much longer life from the gas tube than the standard single tuber.

Control Research is making a specialty of building up special equipment at reasonable prices. The customer may order what he wants, and it will be furnished at little over the cost of stock equipment. One other item this concern is now working on is an escapement built around a sensitive relay. The advantages of this are obvious. You have no extra escapement batteries, no relay contacts to clean, and considerably lighter weight in the whole receiver system. To gain these advantages, it is necessary to use a receiver such as their two-tuber, which gives a relatively large plate current change with signal.

John Worth of C/R advises us the outfit will have a brand-new receiver for the 27 spot frequency that will be quite different—"revolutionary" is the word he uses. The illustration shows the new canned Control Research rcvr.

One other manufacturer has sold RK61 equipment in the past, but does not do so any longer. Rockwood Radio Controls is now concentrating on the sale of a type of equipment not available from any other source. This is the so-called audio-tone apparatus. These are sold only in finished form, and while somewhat more expensive than the other makes of radio control that have been described, they do considerably more.

The top article in the line is a 5-control outfit that allows the actuation of any one of five control functions in the plane independently of the others. This is strictly a de luxe job, but the many advantages of the audio-tone system may be enjoyed at lower cost, for Rockwood makes the same sort of equipment in simplified form, and also makes one and three control outfits as well. To give an idea of the weight of this equipment, the complete 5-control receiver with the necessary surface actuating equipment, and all batteries, weighs $22\frac{1}{2}$ oz.

It should be pointed out, however, that this outfit gives five different control functions in any order you wish—that is, without necessity of observing sequence.

All the receivers have three miniature tubes which afford very long life, and are of the same overall size, about $5\frac{1}{2}$ " x 3" x $1\frac{7}{8}$ ". There is a thin steel reed for each control function, and as the transmitter is operated to send out different audio tones, the appropriate reed vibrates, and actuates a relay to select the desired control function. Each

it has been very successful. Gene Foxworthy won the 1950 Dallas Nationals R/C event using Citizen-Ship equipment in a plane described in the May, 1950, issue of Air Trails.

MacNabb has just announced an item of interest to all R/C flyers, not only those using the Citizen-Ship sets. This is a compact test meter which measures 0-1.5 ma., and has two voltage ranges of 0-6 and 0-150 V. It is housed in a small Bakelite case, with a cord to plug in for the current reading, and pin jacks on the top. Test leads are also included.

This same concern is working on a low cost outfit for 27.255 mc. While final details are not known, we learn that the transmitter will have two tubes and the receiver will employ a single hard tube.

Several American model firms are importing English R/C apparatus, which has had a very good sale in this country. One of the first of these was American Telasco, which carries the E.C.C. line. All the equipment is available for either 27 or 53 mc. There is a small gas tube receiver using the XFG-1, and which is protected by a Bakelite case. This is their No. 950, and a 951 using a single hard tube, the 3Q4, is available at the same price. The two are almost identical in size and weight. 1½" x 2½" x 1⅛" and 2 oz.

This firm offers the E.C.C. sensitive relay separately; at ½ oz., this is the lightest sensitive relay to be had. American Telasco also carry the E.C.C. International transmitter, a de luxe job which has two 3A4 tubes, a plate meter, pilot light, etc., and comes in an attractive metal case which has plenty of room inside for all batteries. It measures 15" x 8½" x 5½" and the power input is about 4.8 watts. The same transmitter is sold in kit form with a completely finished R.F. unit, meter and all other parts, but less the case. No receiver kits are available at present.

Polk's Modelcraft Hobbies imports the English E.D. apparatus, which features a 1¾ oz. receiver completely enclosed in a Bakelite tube, which is said to be practically crashproof. The E.D. transmitter uses a single 3A5 tube and is enclosed in a metal box. The antenna mounts on the side, and is of the vertical type. E.D. apparatus—though of a more complex design than that described—was recently used to steer a model power boat across the English Channel, during which run the radio equipment functioned without a miss. Polk's has arranged to convert 6-meter E.D. sets to 27 mc. at a cost of \$12.50.

Still another English outfit, The Roland Scott Comet line, is being handled by All American Motor Exchange. The equipment consists of a gas tube (XFG-1) receiver of very light weight, a simple 3A5 transmitter and self-neutralizing escapement.

All of the R/C concerns we have mentioned sell actuating equipment of one sort or another, but we will cover this in a later article. Also, even though we have not mentioned it specifically, it is certain that they will all have equipment for the 27.255 mc. spot. Some will simply convert their present line to the new frequency, while others will bring out entirely different transmitters and receivers.

The immediate future of radio control is strictly dependent upon world conditions. Most R/C manufacturers are actively marketing the equipment we have described even though some materials, tubes especially, are becoming hard to get. Several of the concerns we have covered have new items under development. When these units will be available is a question, but in the meantime you can purchase the equipment we have described here, and get into this fascinating game right now.