

An original design by the author. Powered by a McCoy 29, and equipped for rudder control, it weighs about 4½ pounds complete. The 3A5 crystalcontrolled transmitter is homemade. An 0-3 ma. meter is used for aligning the receiver. Now that the manufacturers have come to the rescue of r/c enthusiasts with good radio-control model kits and dependable transmitters and receivers, you can enjoy r/c flying without designing your equipment.

GETTING STARTED IN RADIO CONTROL

by Phil Greenberg

This is the first in a series of articles designed to help you make the transition from regular f.f. to radio-control flying

• In the past few years, radio-control model flying has made great strides. Airplanes and equipment have been constantly revised and improved, so that now it is a relatively simple matter for the beginner to get his first ship into the air successfully, with very little trouble. At the same time, the Federal Communications Commis-

At the same time, the Federal Communications Commission has helped the sport tremendously by setting aside the 465 mc. and 27¼ mc. bands for operator-license-free operation of radio-controlled model airplanes. No longer is it necessary to learn how to send and receive Morse code and know the intricacies of technical radio design in order to pass a required test and obtain an operator's license before flying a radio-controlled model plane. Now, as long as you stick to apparatus for use on either the 465 mc. or 27¼ mc. bands, all you need is a Citizens' Radio Station License, which is obtainable free of charge from your nearest Federal Communications Commission Field Office.

YOUR FIRST R/C PLANE: For your first R/C job, we suggest that you build one of the following planes, specifically designed for Radio-Control, and available in prefabricated kit form: Live Wire R/C Trainer, R/C Master, Super Brigadier, the Brigadier RC-38, and the Bootstraps A-RC. All of these are designed to give you enough room and weight-lifting ability to handle any set on the market, and the required batteries. Many beginners have gotten their start by building one of these planes.

Pick the design that suits your own taste, because the flight characteristics of these ships will vary only with the pilot's experience. As you start to pile up the flights, you will find that you can do any maneuver with any of them. When you build the ship, keep the following points in mind. We have followed them for years, and they pay off by giving you an airplane that will stand up under punishment.

In building the structure, *triple*-cement everything. Apply one coat to each part and rub it into the grain. Let it dry. Then apply another coat and assemble the parts. When the frame is completed, go over it again, applying a fillet of cement to each joint.

Many warps develop by removing the structure from the board before it is thoroughly dry. So, allow every frame to dry twenty-four hours before removing it from the board, and be sure to use a straight board.

When joining your wing panels, apply plenty of cement to the spars and the dihedral braces. Then join and clamp them together. Support the panels at the leading edge and the trailing edge, out near the tip, to give the proper amount of dihedral.

When clamping, use small blocks of wood under the jaws of the clamps to avoid crushing the spars or dihedral braces. As you tighten the clamps, the cement will ooze out of the joint and form a fillet. Don't wipe off this fillet, but rather add more cement to make it a smooth, strong joint.

Don't be afraid to add extra braces and planking, if you think you need it. Weight is not as critical in an R/C job as it is in free-flight. The places where you may want to add bracing are: the wing dihedral joints, cabin, landing gear, nose and engine compartment. Knock-out mounts for the engine are an excellent idea. These are made by mounting the engine on small replaceable blocks, and bolting these to the main bearers, which are part of the plane. Small machine screws or wood dowels are used for fastening, so that the main bearers are never damaged, and the small blocks can be replaced if they are broken.

You can complete the wing and tail sections of the plane, including covering, but leave the entire fuselage uncovered until the radio equipment is installed and checked. Use silk or nylon for covering whenever possible. Over sheet balsa areas, SGM Silkspan is adequate. Be sure to include a timer for the engine, and don't let anyone talk you out of it!

Now, let's get on with the radio equipment. Basically, the radio-control unit is composed of four operating units: (1) transmitter; (2) receiver; (3) relay; (4) escapement. While it is not too important to know how the electronic units actually function, it will help you become a better R/C flyer if you know their basic operation:

THE TRANSMITTER: This sends out a signal when you press the keying button. This signal is the same as the radio signal a large radio station sends out. The difference is that we don't send any music or words out with the signal. Our signal is on a certain "frequency." The frequency is controlled in a 27¼ mc. transmitter by a unit called a "crystal." The signal is sent out from the transmitter, which is on the ground, by means of the antenna.

THE RECEIVER: In your airplane, the receiving antenna picks up the signal and feeds it into the receiver, which is tuned to the same frequency as the transmitter. By means of its electronic action, the receiver operation changes when the signal is received. This action in the receiver is called the "plate current" change.

THE RELAY: In the receiver "plate circuit" is a sensitive relay, an electromagnetic device which moves its "armature" when the plate current changes. The armature has an electrical contact point on it; another contact point is fixed near it on the relay. These two contact points are brought together by the relay action when the receiver plate current changes. These points act as a switch to complete the escapement circuit.

THE ESCAPEMENT: This is an electro-mechanical device which turns the rudder or controls other parts of your model. The common variety is rubber-powered (one loop of $\frac{1}{6}$ " flat), and this energy is released by energizing the escapement coil with a battery. When this is done, the common type of escapement moves the rudder to either right or left position, with the return to neutral automatic when the signal is "off."

Let's go over the radio action again. You press the transmitter button and the signal is sent out to the plane. The receiver picks up the signal and closes the relay points. This makes the escapement move the rudder, and the airplane turns.

WHICH UNIT TO USE: The companies which specialize in Radio-Control equipment have developed some very good sets. Our experience has been that it is much better for the ordinary model builder to use a proven, standard commercial set—either built-up or from a kit—than to try building from stray circuits worked out by individual experimenters. Some of these circuits are good, but you can't tell anything about them until you build them and try them out. Even then, you'll find that some of them will work and others won't. So, to avoid the disappointment of gambling on something you know nothing about, stick to the standard sets.

The Control-Research receiver, Control-Master transmitter, the E.D. set, E.C.C. set, Super-Aerotrol set, and Citizen-Ship sets (465 mc. and 27¹/₄ mc.) are a few of the units currently available. All of these have been proven reliable, so you can be sure of successful flight operations by using any one of them. Just to make sure you don't have any trouble with them, future articles will show you how to operate all the different types.

For your first ship you need a good escapement. We personally use the Citizen-Ship SN escapement, since it is a proven job, beautifully made, and one you can depend on for trouble-free performance. However, this is not the only escapement, and it would be wise for you to look over as many types as possible before making your choice. There are at least a half-dozen good escapements available today, and they are inexpensive enough to make it foolish to try building your own.

TEST EQUIPMENT: You will need a certain minimum amount of test equipment to get your R/C ship into the air. For the transmitter, you won't need a meter if it is one of the ready-made factory-tuned jobs. If you build your transmitter from a kit, you will need a 0-50 ma. D.C. milliameter. This meter is used for tuning the transmitter. It need not be an expensive one, as equal results can be obtained with almost any type of meter.

However, we do recommend getting a fairly good meter for checking the receiver. We use a Simpson 2" 0-3 ma. D.C. milliameter and find it entirely satisfactory. If you desire, a larger faced (3") meter can be used, as it is easier to read because of larger graduations. But a larger meter is more expensive and not absolutely necessary for the beginner in R/C.

A multimeter will provide both of the aforementioned meters, in addition to providing a voltmeter and an ohmmeter, and can be purchased at radio or hobby stores. The voltmeter is used to check the battery voltages while the sets are in operation, showing whether your batteries are fresh, useable, or dead. The ohmmeter portion is handy while building or checking circuits, both in the transmitter and the receiver, as well as in the ship.

The multimeter is not essential, but if enough readers are interested in the additional utility that can be had from one, we will, in a forthcoming issue, show how to build an R/C multimeter out of your receiver meter. This meter would be useful for all field service checks.

In the next (April) issue, we will tell you how to fill out the necessary application for your station license, with a brief review of the F.C.C. regulations. We also plan to show you how to tune up a crystal-controlled transmitter, and how to install the receiver, escapement, and batteries in your ship. In the meantime, you can start building the ship and collecting the equipment you are going to use.

Answering Your R/C Questions

Q. Would it be possible to change the frequency of my crystal-controlled transmitter with a small piece of wire across the coil through a switching arrangement, enabling me to operate two receivers with only one transmitter?—FRANK J. ROBINSON, SR., Harvey, Louisiana.

A. Unfortunately no. The reason for this is that the crystal and the "tank" coil and condenser control the frequency of the transmitter's signal. If you change the coil by switching in the wire, then no signal will be generated, since the crystal and the tank must be tuned to the same output frequency.

Don't experiment with this arrangement, because you stand a good chance of burning out the crystal by operating it off frequency. Also, the F.C.C. regulations specify that you must transmit on 27.255 mc. or 465 mc., so any other frequency is out of the question.

We would suggest a multi-control device be used to operate the second control, then only one radio set need be used.

Q. Has any company made equipment for proportional control? I want something that covers rudder, elevators, and engine control.—LEONARD KESSEL, Boston, Pa.

A. You are a bit confused between proportional control and multi-controls. Proportional control allows, you to apply varying degrees of control with a signal, as you would in a real plane, instead of full control. You would need a multi-control device to control the rudder, elevators and engine, as you describe.

A few proportional control systems have been developed, but as yet none are on the market. The new Bonner compound escapement can be used for multi-control installations, but for your first ship we recommend you use only rudder control. After you get a few flights in, you'll be very surprised about what you can do using nothing but rudder control on your R/C plane.

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FLYING MODELS

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Q. What do you think about a low winger for R C? Is it foo unstable? Is it at all feasible?— MARTIN DIETRICH, Kamloops, B. C.

A. Low-wing jobs are pretty tricky, as a rule. This is because not enough of them have been built, and very little is known' about their flight characteristics. If you do run into a good stable design, there's no reason why it can't be made into an R/C ship. However, if this is to be your first radio plane, try one of the kits we mentioned. Hundreds of beginners have successfully started in R/C with one of these planes.

Do you have any questions on radio-control? Send them along to: Phil Greenberg, c/o FLYING MODELS, 215 Fourth Ave., New York 3, N. Y. we'll try to answer them as soon as possible, in a forthcoming issue, as space permits. Let's hear from you!