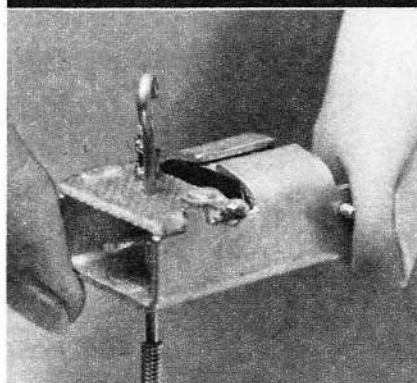


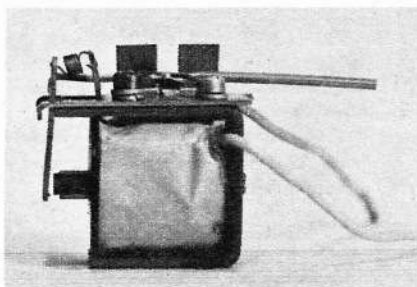
HELPFUL DATA ON SURFACE MOVEMENT DEVICES



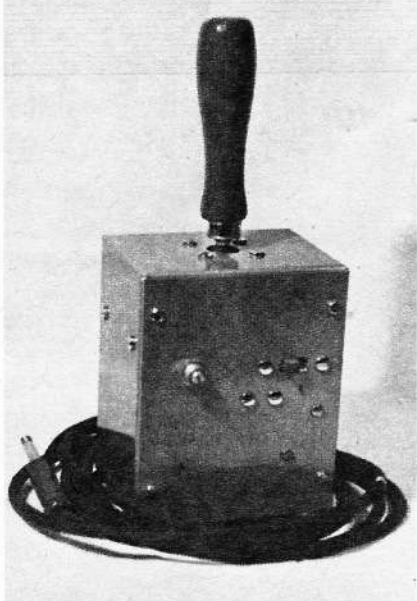
Strat-O-Seal's rotary magnet Strat-O-Flite actuator shown mounted in fuselage mockup.

RADIO CONTROL EQUIPMENT

E.C.C. Telecommander's escapement.



Ace Radio Control's hi-resistance actuator. "Rite-Controller"; pulsesequence or proport.



■ Today the escapement is still the most widely used surface mover, but various forms of proportional control are catching on fast. Just to get our terminology straight, let's jot down the names of some of these units, and then discuss them at more length. While we're at it, we'll include the control boxes used at transmitter for the various systems.

Escapement—generally considered to be a sequence-operating device; to get control movement, you have to go through a set sequence of positions, such as left—neutral—right—neutral—left—etc. Usually the power to move the surfaces comes from a twisted rubber band, and this power is controlled by an electrical magnet, which in turn, is controlled by the receiver.

Actuator—an electro-magnetic device utilized to move the surfaces in proportional control systems. Most of them have a rotating permanent magnet, with some sort of electrical winding to move it.

Servo—These are usually electric motor-driven units, with a gear reduction system to increase power and reduce speed of the operating arm. Often fitted with limit switches, which open the motor circuit at predetermined points either side of center. May also have centering switches to return the control arm to neutral when the signal is cut off.

Keyers and Pulsers—control boxes attached to the transmitter, which send the correct length and spaced pulses to actuate proportional control equipment in the model.

Beep Box—an automatic switching device connected to the transmitter which sends the necessary pulses to work an escapement in the model. Even though the escapement may require full sequence operation, the Beep Box allows the operator to get successive right or left turns in any number he wishes.

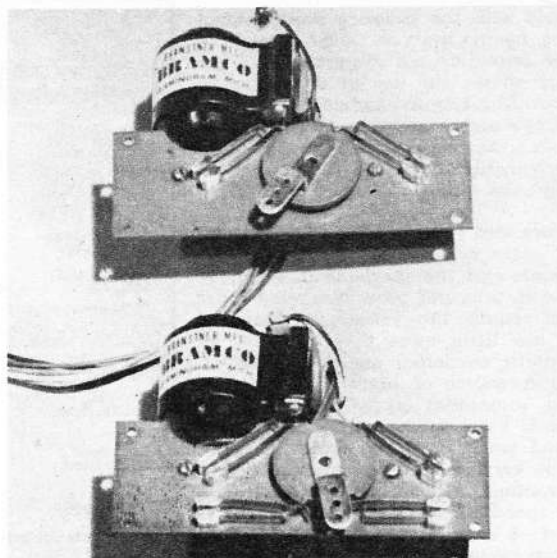
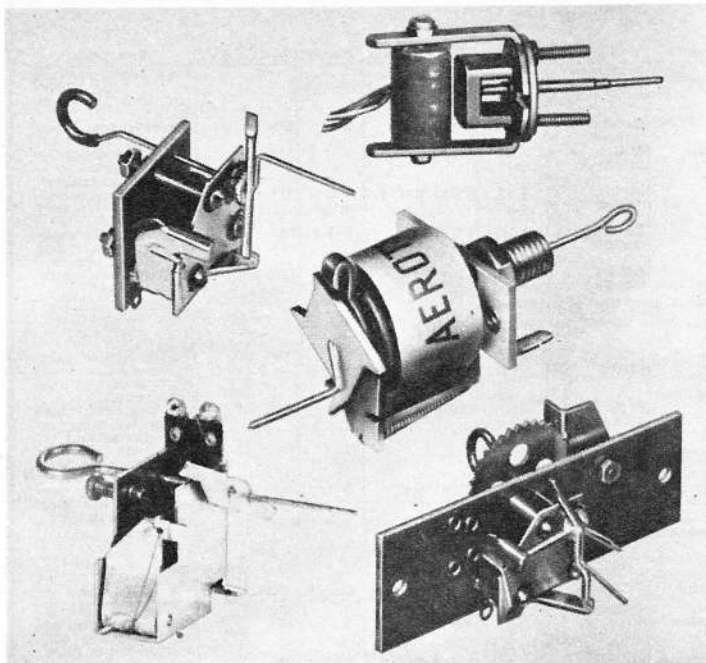
Not so many years ago, things were very simple; almost every model was fitted with an escapement, and the only control in wide use at the transmitter was a plain pushbutton. Things have really progressed since then! Below is a quick rundown of the various new types of equipment that you can purchase today; it will be seen that there is no longer a sharp dividing line between the different sorts of mechanisms.

Escapements. You can no longer visualize these units as something to which you must attach a rubber band. We now have them powered by clockwork and also by electric motors; the latter, incidentally, are called "servos" by the maker, further confusing things! The deBolt "Multi-Servos" are really electric-motor driven escapements, and are made in four types as seen in the chart.

The traditional type of strictly sequence escapement is still in wide use, and is the lowest-cost style to be had. Most of them have two control positions and two neutrals, and you have to hold the signal on as long as you want the control surface to be held off center. This is considered a safety feature in some ways, since if your model gets out of range the control surface returns to—or stays in—neutral. This type of escapement is generally called a two-arm type.

Three and four-arm escapement have been used, but are not widely popular, and only a few of the latter are sold at present.

The first commercially available escapement that removed the sequence requirement was the Bonner Compound, with which you can get any number of rights or lefts at will; the surface is always centered when the signal is cut off. This unit offers another feature—a third position in which a set of electrical contacts is closed, allowing a very simple



Branstner's motor-driven servo available in two types.

Clockwise from lower left: Citizen-Ship PSN escp.; Bonner's Standard escp.; Adams rotary magnet actuator; Berkeley's Super Aerotrol escp.; Bonner's Compound escp.

means of working a second escapement for elevator or other auxiliary control action.

It is interesting to note that the Dmeco Model 3PN affords the same features—that is, two rudder control positions, plus a set of contacts that may be closed at will, to work another control.

Several multiple-type escapements have been marketed which can control two surfaces, such as rudder and elevator; they require close attention to the proper number and spacing of pulses and are usually utilized with a special switch at the transmitter. The ECCO Multi-Position escapement is an example; it has two control shafts that may be linked to rudder and elevator, but uses only a single rubber band for both surfaces.

Actuators. There are two forms of proportional control in use: one—which we usually term “semi-proportional”—allows only left, right and neutral control positions; full proportional allows the operator to have any control position he wants, from full right to full left. No sequence is involved in either, of course. The equipment in the model is the same for either, the difference being at the transmitter control box, or pulser.

Proportional actuators may be of sev-

eral types, the most widely used being fitted with a shaft-mounted permanent magnet, which is caused to move by one or more electrical windings. Again, the most widely used type has no other iron in it besides the magnet itself (and possibly the shaft); this type is available from several concerns and is, in some cases, very inexpensive. One example of the “iron pole” style of actuator on the market is that made by Adams.

Some actuators have only a single winding, and require two sets of batteries to get right and left deflection. Others have dual or center-tapped windings, which can give the same results with a single battery. In both cases, a receiver relay with single-pole double-throw contacts is usually required. Even this latter is not universal, though, for certain actuators are made to pull only one way, the return motion being obtained from a spring of some sort. The Flyball actuator is an example of this design.

The Ace High Resistance actuator is connected right into the plate circuit of the receiver tube, thus eliminating the sensitive relay and also the power supply needed for the normal low resistance actuator.

Also in this field is the Fenners-Pike actuator, an electric motor-driven unit

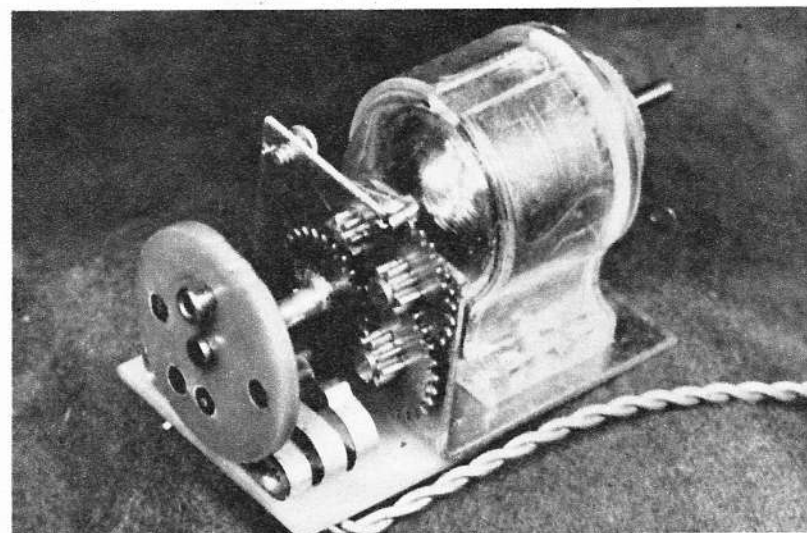
which has a means incorporated for obtaining a second control action, when wanted. Both controls may be worked at the same time. As with other styles of electric-motor-driven mechanisms, this one has considerably more pull than the strictly magnetic type.

Servos. Servos on the market are powered by small electric motors. Some are fitted with limit and centering switches, others are not. In general, the units with both limit and centering switches have been used for elevator control, while those with only limit switches work the rudder. Limit switches are always fitted, however, as they open the circuit when the control arm reaches an extreme position off-center, and so prevent jamming of the gearing; connections are such that opposite rudder (or elevator) will always bring the surface back to center.

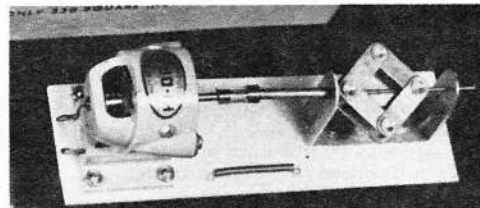
Lately, more and more flyers are using what is called “trimmable elevator,” which means simply that the elevator stays where the operator puts it and does not automatically go back to center when the control signal is cut off. This system is a lot harder to learn to fly properly, but offers much more flexibility in aerobatics, flying in the wind, and so on.

The Bonner servo, which is specified

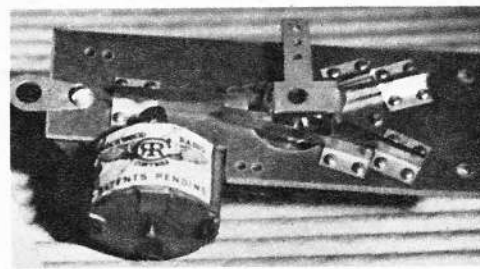
Dmeco (deBolt Model Engineering Co.) 3PN Multi-Servo; one of four versions.



Here: Polk's motorized centrifugal Flyball actuator.



Rockwood Radio Control's motor-operated servo.



and sold with the Babcock multi-control system, has no limit or centering switches; the latter are not required, since the makers advise the use of a trimmable elevator. Limiting is handled by mechanical stops and a slipping clutch in the drive gearing; when either limit position is reached, the operating arm stops moving, but the motor continues to turn.

Keyers and Pulsers. These are made in three main types, the relay type, the electronic and the mechanical. All have their own pros and cons. The relay types do not require any tubes, and many of them are little more than a relay, an electrolytic condenser and a variable resistor. A source of high voltage is required, sometimes tapped off the transmitter B battery. Current drain is quite low and small batteries of 45 V. or so may be carried in the same case. Chief disadvantage of this type is that the pulse speed varies as the pulse length is altered—a condition that is troublesome in some cases and not in others.

The electronic pulsers have one or more vacuum tubes, and hence require both A and B power. They are somewhat more flexible than the relay type, and usually the speed and spacing of the pulses may be varied quite independently of each other. With miniature battery tubes, power requirements are low and all the batteries may be put in the pulser case. A relay is always used to connect the pulsing circuit to the transmitter.

The mechanical type is felt by many to be the most reliable, but is the toughest to make and often quite noisy. An electric motor is geared (or belted) to a set of rotating contacts, with a control lever arranged so that the pulses may be varied in spacing. Since battery motors are normally fitted, quite good life may be had from flashlight cells, and these are sometimes carried in the pulser case. The PRC-100, Stanco and Fenners-Pike are good examples of this type.

One other motor-driven unit should be mentioned, the Rite-Control Pulse sequence box, which affords both rudder and elevator operation on the model; a single 2-arm escapement is all that is needed in the plane, but since it is stepped around continuously, it must be fitted with a long rubber band. Rudder and elevator may be applied separately or together and in any degree and combination.

The control box comes with an extra contact plate, which when installed allows it to be used as a regular proportional pulser.

Some manufacturers have adapted various sorts of rotary switches for transmitter control. The ECCO dual escapement is stepped through its paces by such a switch, and Gyro lists a Beep Box, which is a rotary switch so made that it can be turned in only one direction, and will step a regular 2-arm escapement around to the desired control positions as fast as you can turn it.

To our knowledge, there are no motor-driven Beep Boxes on the market, though a few custom-made jobs may be had.

From the above it may be seen that the complexity of control equipment is increasing. Enterprising builders combine various of the units mentioned above and in the chart, to get all sorts of special arrangements. Of course, many of the units we have presented are equally useful for boat and other model purposes; for such use, the electric motor-driven equipment is preferred, due to the greater force needed to move boat rudders or car wheels.

Stanco split drum belt drive mech. pulser.

ACTUATORS							
Maker	Model	Type	Wt. oz.	Dimensions	Rec. V.	Ma. at 3 V.	Remarks
Ace Radio Control	High Res.	Armature extension	2	1 3/4 x 1 1/4 x 1 1/4			Used in plate circuit of rec. tube 10,000 ohm. coil 2.2-ma. or higher.
M.S. Adams		Rotary magnet	1.9	1 1/2 x 1 3/4 x 1	3-6	100	Polepiece type. Uses single battery.
Polk's	Fenners-Pike	Motor-driven	2.65	2 1/4 x 1 3/4 x 1 3/4	3	***	Follows control stick exactly. Extra control always available.
Polk's	Fly-ball	Motor-driven	2.95	4 3/4 x 1 3/4 x 1 1/2	3-6	***	Motor-driven centrifugal design, very powerful pull.
Southwestern R/C Supply		Rotary magnet	1.7	1 1/4 x 1 1/4 x 1	3-9	50	Two coils allow many different connections and current drains.
Strat-O-Seal Mfg. Co.	Strat-O-Flite	Rotary magnet	1/2	1 1/4 x 3/4 x 3/4	1 1/2-3	350	Requires two separate batteries.
***Current depends somewhat upon load or pulse-rate.							
SERVOS							
Branstner Co.		Motor-driven	2.5	3 1/2 x 2 1/2 x 1	3	***	Has limit switches, comes with or without centering switches.
Bonner Spec.		Motor-driven	3	3 3/4 x 1 1/4 x 1 1/2	3	***	No switches; mechanical limiting, no centering action.
Rockwood Radio Cont.		Motor-driven	1 1/4		3	***	Has limit and centering switches. May be had less latter.
Schmidt Radio Cont.	CMR5	Motor-driven	1.9	2 3/4 x 1 1/2 x 1	3	***	Has limit and centering switches. May be had less latter.
***Current depends somewhat upon load or pulse-rate.							
ESCAPEMENTS							
Maker	Model	Type	Wt. oz.	Dimensions	Rec. V.	Ma. at 3 V.	Remarks
Bonner Spec.	Standard	2-arm SN*	.5	1 1/2 x 1 1/2 x 1	3	450	One neutral, no sequence, closes contacts in 3rd position. For use with twin needle valves.
Bonner Spec.	Compound	4-pos.	.8	3 x 1 3/4 x 1 1/4	3	400	
Bonner Spec.	Motor Cont.	2-pos.	.8	1 3/4 x 1 3/4 x 1 3/4	3	450	Motor-driven, 2 pos., self-neut., no sequence.
Citizen-Ship dmeco**	PSN	2-arm SN	.62	3/4 x 3/4 x 3/4	1 1/2-3	400	
	2PN		1.9	2 1/4 x 1 1/2 x 1 1/2	1 1/2	500***	Same, 3 pos., closes contacts in 3rd. No sequence.
dmeco**	3PN		1.9		1 1/2	500***	Same, 2 control positions and 2 neutrals. Sequence operation.
dmeco**	2P2N		1.9		1 1/2	500***	Same, 3 pos., no neutral.
dmeco**	3P		1 1/2		1 1/2	500***	Extremely compact. Driven by clock-work spring. Can be used as either 2 or 4 arm type.
E. C. C.	No. 202	2 arm SN	1/2	1 x 3/4 x 1/2	3	1200	Double coils and contacts — pulls in at high current, holds at low.
E. D.	Clock-work	2 or 4	2.75	3 3/4 x 1 3/4 x 1 1/2	4 1/2	300	
E. D.	Current Saver	2-arm SN	.85	2 1/4 x 1 1/4 x 1 1/2	4 1/2	150-250	Has two shafts for rudder and elev.
ECCO Mfg. Co.	Multi	Special	2	3 x 2 3/4 x 1	4 1/2-6	1100 at 4 1/2 V	Mounts with single hole only.
RCH Berkeley Models, Inc.	Super Aerotrol	2-arm SN	1.3	1 x 1 x 1	3-4 1/2	200	
*Self-neutralizing. **These units are called "Servos", are included here since they give same action as escapements. ***Current depends upon load, also setting of "brake."							
PULSERS, KEYS, BEEP BOXES							
Maker	Model	Type	Dimensions*	Voltage	Remarks		
Curtis Machine Products Co.	PRC-100	Mechanical**	6 1/4 x 3 3/4 x 2	3, self-contained	Uses two D cells. Strong bakelite case; has button for escapement use. Must be turned counter-clockwise only. No power required to operate. Very compact. Has rheostat, also button to change motor speed rapidly. Compact hand-operated switch. Can be turned only in correct direction. Used to key transmitter for self-neut. escapements. Uses two D cells. May be adapted for either "Pulse sequence" or normal proportional operation. Relay style, controlled by variable resistor. Split drum type pulser; drum is belt-driven.		
ECCO Mfg. Co.	Ground Controller	Rotary switch	4 3/4 x 3 3/4 x 1	None			
Polk's	Fenners-Pike	Mechanical**	3 3/4 x 3 x 1 3/4	3			
Gyro Elect.	Beep Box	Rotary switch	2 1/2 x 2 1/2 x 1 1/4	None			
Rite-Control	Rite-Controller	Mechanical**	3 x 4 x 5	3, self-contained			
Southwestern R/C Supply		Relay					
Stanco Manufacturers		Mechanical**	3 x 4 x 5	3			
*Less knobs, levers, etc. **Driven by electric motor							

