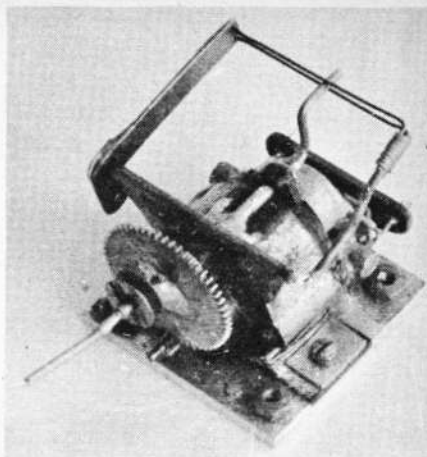




Details of the actuator described in drawings on facing page show up in an actual photograph.

Servo For Simpl Simul

by **JAMES E. KIRKLAND**

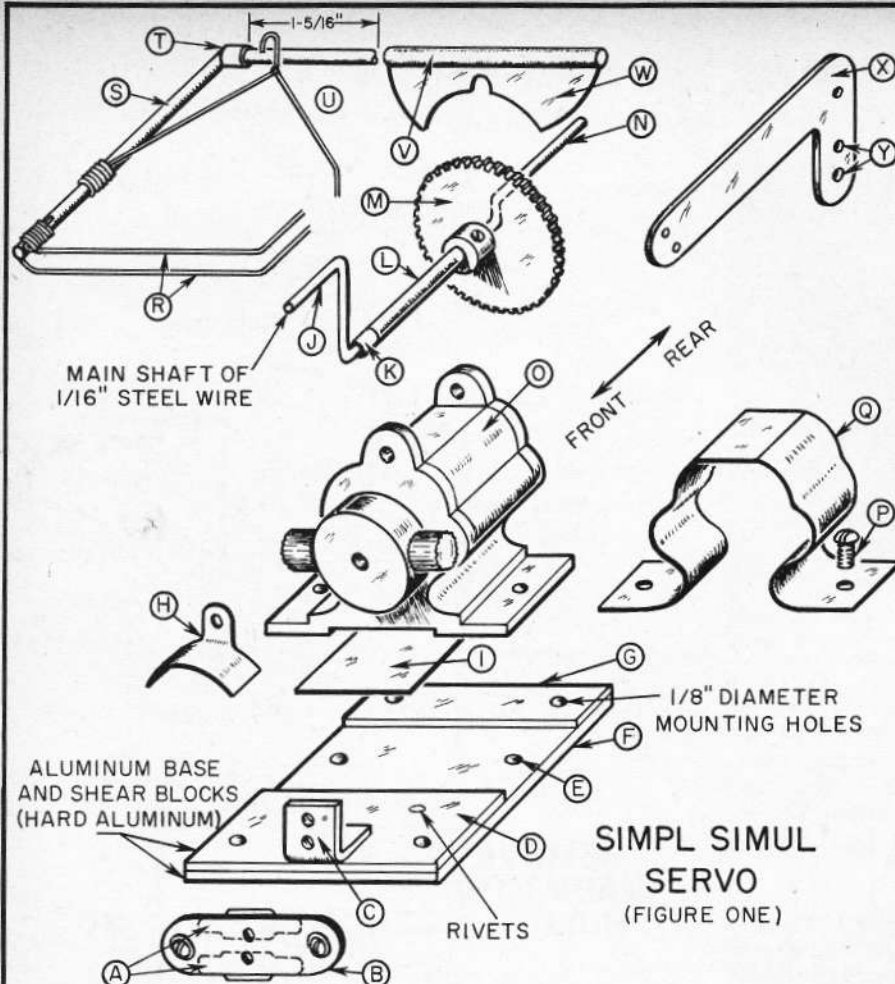
At last, a wearproof and crashproof actuator. So . . .

► This Simpl/Simul servo has proved itself for popularity and adaptability poses no construction problems for the average RC modeler. Of course a knowledge of the Simpl/Simul system helps a beginner. With Mighty Midgets sometimes hard to locate, it is imperative that we have as crashproof and wearproof a servo as possible to insure a long and useful life.

Several of these servos have survived repeated crashes resulting from such causes as pilot error, interference and improper operation of radio sets. None suffered any harmful effects. The only wear that has resulted has been to the brass bearing tubes which can easily be replaced. My particular servo has been in service for over nine months and made over 120 flights. It has gone through two major "down elevator" crackups with no damage. I have replaced the main brass bearing tube twice as a result of having the spring centering on this shaft in place of the elevator yoke as we are now doing in this area. My servo is as good today as it was the day I completed it.

The part of the original Simpl/Simul installation that did not appeal to me was the excessive yokes, wire, etc., on the rear

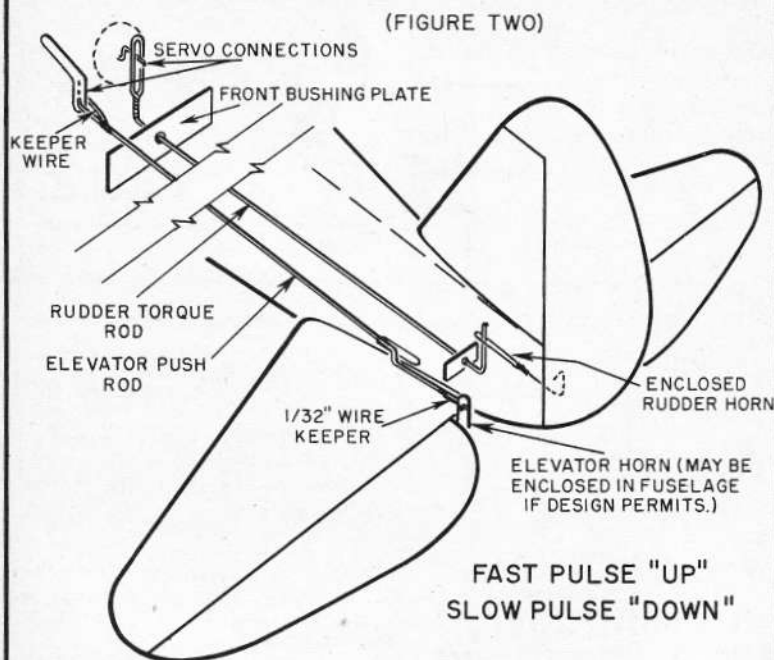
(Continued on page 52)



PARTS SCHEDULE

- (A) DIODE POSITION
- (B) 1/16" BAKELITE TERMINAL BOARD
- (C) ALUM. TERMINAL BOARD MOUNT
- (D) FRONT SHEAR BLOCK (11/16" X 1-5/8")
- (E) TAPPED 4-40 MOTOR HOLES
- (F) SERVO BASE (1-11/16" X 1-5/8")
- (G) REAR SHEAR BLOCK (3/8" X 1-5/8")
- (H) 1/32" BRASS BANGBAR 3/16" WIDE X 3/4" LONG (SOLDER TO PART L)
- (I) FILLER PIECE-MICARTA-BAKELITE-WOOD (CEMENT IN SLOT ON BOTTOM OF MOTOR AFTER REMOVING LETTERS)
- (J) ELEVATOR YOKE ACTUATING CRANK (7/16" OFF SET)
- (K) 3/32" BRASS TUBING RETAINER FOR MAIN SHAFT
- (L) MAIN SHAFT BEARING TUBE 1/16" I.D. BRASS TUBING 15/16" LONG FLUSH AT REAR PLASTIC BEARING
- (M) LARGE MIGHTY MIDGET GEAR
- (N) MAIN SHAFT RUDDER TORQUE ROD THROW (3/8" OFF SET)
- (O) MIGHTY MIDGET MOTOR
- (P) 4-40 MOTOR MOUNTING BOLTS (2 REQ.)
- (Q) .010 SHIM BRASS BAND OVER MOTOR (PARTS L AND W ARE SOLDERED TO THIS BAND DURING ASSEMBLY. SOLDER JOINT IS ADJACENT TO PLASTIC BOSS NEAREST TO LARGE MIGHTY MIDGET GEAR)
- (R) ELEVATOR YOKE OF 1/32" STEEL WIRE (WRAPPED AND SOLDERED TO PART S)
- (S) ELEVATOR YOKE-BEARING ROD OF 1/16" STEEL WIRE
- (T) 3/32" BRASS TUBING COLLAR TO POSITION BEARING ROD IN BEARING TUBE.
- (U) RUBBER BAND HOOK FOR CENTERING ACTION MADE OF 1/32" STEEL WIRE (WRAPPED WITH WIRE AND SOLDERED TO S AND X)
- (V) ELEVATOR YOKE BEARING TUBE OF 1/16" I.D. BRASS TUBING 1-1/8" LONG (SOLDER TO PART W)
- (W) BEARING TUBE MOUNT OF 1/32" BRASS (SOLDER TO PARTS Q AND L PER INSTRUCTIONS UNDER PART Q)
- (X) ELEVATOR YOKE ACTUATING ARM (SOLDERED TO PARTS R, S AND U AFTER ASSEMBLY TO V AND W UNIT).
- (Y) 1/16" ELEVATOR PUSH ROD HOLES.

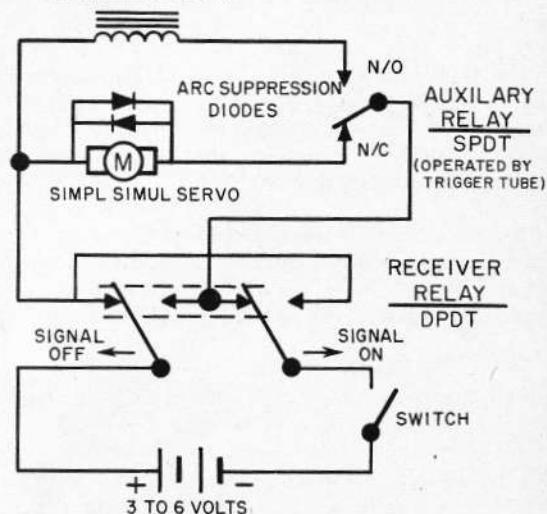
CONTROL SURFACE LINKAGES (FIGURE TWO)



NOTE: TO REVERSE ELEVATOR ACTION ON FAST AND SLOW PULSE TURN SERVO ELEVATOR ACTUATOR ARM OVER SO HORN POINTS UP INSTEAD OF DOWN AS PICTURED HERE. ELEVATOR PUSH ROD BUSHING AND INTERMEDIATE TORQUE ROD SUPPORTS OMITTED FOR CLARITY.

DPDT RELAY WIRING DIAGRAM

MOTOR CONTROL ESCAPEMENT (OR MAY BE SERVO)



(FIGURE THREE)

NOTE: BY USING A NON-POSITIONABLE MOTOR CONTROL SERVO AND AN INTAKE THROTTLE YOU MAY GET SELECTIVE THROTTLE SETTINGS THROUGHOUT THE ENGINE SPEED RANGE. AUXILIARY RELAY PULLS IN AT EITHER SIGNALS "ON" OR "OFF" CONDITION. SINCE RECEIVER RELAY WILL BE EITHER PULLED IN OR DROPPED OUT, DEPENDING ON SIGNAL CONDITION, POLARITY TO MOTOR CONTROL SERVO MAY BE APPLIED AS DESIRED RESULTING IN SERVO RUNNING IN EITHER DIRECTION DESIRED AND STOPPED IN ANY POSITION YOU WISH.

Servo For Simpl Simul

(Continued from page 28)

of the model. Also, individual adjustments of rudder and elevator were a bit odd to make.

Reference to Figure 2 will show how this servo provides the means to completely enclose rudder and elevator connections by means of a torque rod to the rudder and a pushrod to the elevator. On other than scale models, the torque rod might protrude from the rear of the fuselage for ease of adjustment. This separate torque and pushrod arrangement will allow the modeler to make individual adjustments of the model's rudder and elevator for perfect flight trim. Also, the modeler can adjust either the rudder or elevator independently for more or less throw to compensate for different amounts of projected control surface area. This means that scale-size control surfaces may be used with compensating adjustments that will allow the model to perform satisfactorily with this type of control system. While the toothpick elevator has been proven adequate and desirable in most models, it does not enhance the beauty of a scale model.

Construction is straight forward as per the exploded drawing in Figure 1. Dimensions are not too critical, but generally should be followed as close as practical. Start by constructing the base and mounting the terminal connection board and Mighty Midget to the base. Tin can stock will do for use as a band over the top of the motor, though .010. shim brass would probably be better. Pliobond or Weldwood Contact Cement should be used for bonding the motor to the base. Use care in forming the band to go around the motor so that it is a tight fit and has no concave bends that will allow it to "stretch" by straightening out and let the base of the Mighty Midget break in a crash. Use a hand drill and exercise care when drilling out the 1/16" holes in the plastic bearings atop the motor to receive the 3/32" brass bearing tube. Leave as little play as possible between the elevator yoke and main shaft crank pin to minimize lost motion to the elevator actuating arm. However, be sure there is no bind throughout the range of crank pin rotation.

Connect 1N64, 1N69A, or comparable, diodes between the terminal posts of the terminal board with cathodes connected to opposite motor terminals. Use Goo or similar type cement on motor brush collars after connecting to the terminal board posts and tightening down to prevent vibration from working them loose in flight. The use of the diodes as specified provides a direct shunt for the kick voltage from the motor in either direction and prevents arcing and pitting at the relay contacts. The current these diodes draw in the forward direction is approximately 10 per cent of the stalled motor current and the added drain on the battery is a small price to pay for clean relay contacts. Silvercells are very worth while investment for this type of flying.

When mounting the unit in the model, make sure the mount is strong enough not to come loose in a crackup. If 1/16" steel wire is used for an elevator pushrod, bush it fairly loose approximately every three inches from the servo to the rear of the fuselage.

To change rudder throw to one side or the other, bend torque rod at the rear of the fuselage. To adjust the elevator for more up or down, use either a kink or bike spoke and nut arrangement to allow the pushrod to be varied in length. To de-

crease or increase control surface movement vary the control horn leverage ratios between the servo and the surfaces.

If a DPDT relay is available that is easily operated by the available current change in the receiver used, by all means use it in this system. The wiring diagram is shown in Figure 3, complete with fail-safe relay. The use of a DPDT relay allows the use of a single battery power source for operation in either direction of the servo, thus cutting battery requirements in half. Further, it insures balanced servo power throughout the useful voltage range of the batteries used.

For more details on Simpl/Simul refer to articles by Mr. Worth in the July, August and September 1958 issues of MAN.
