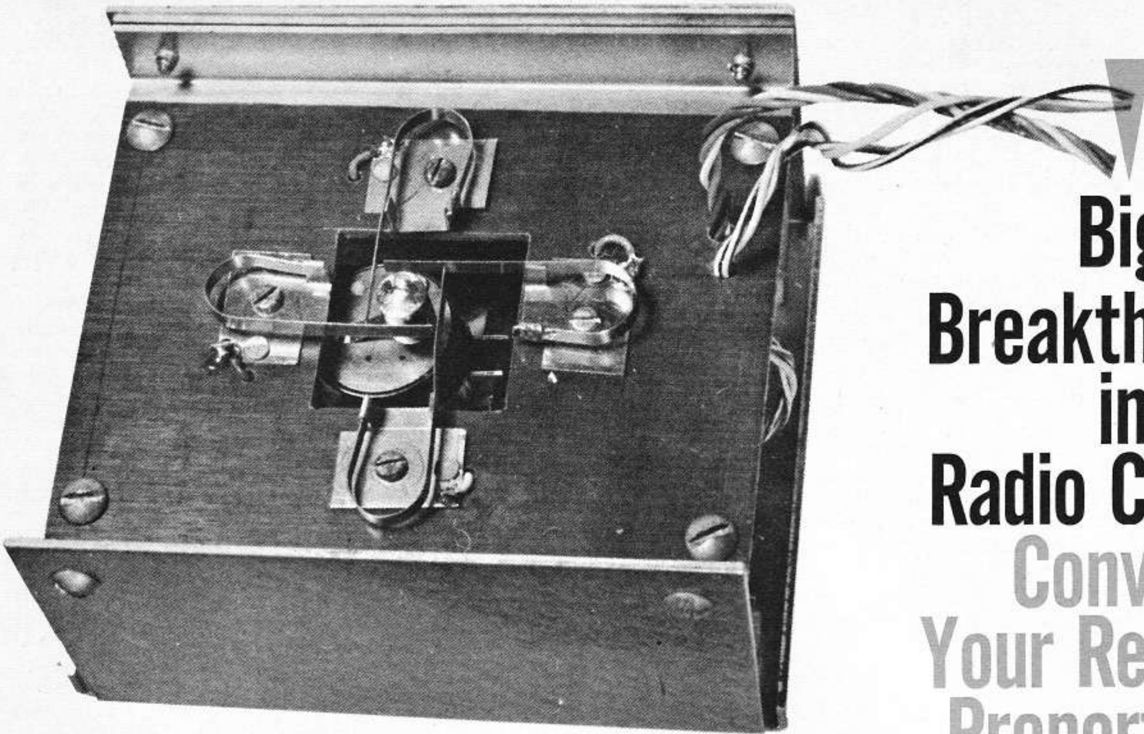
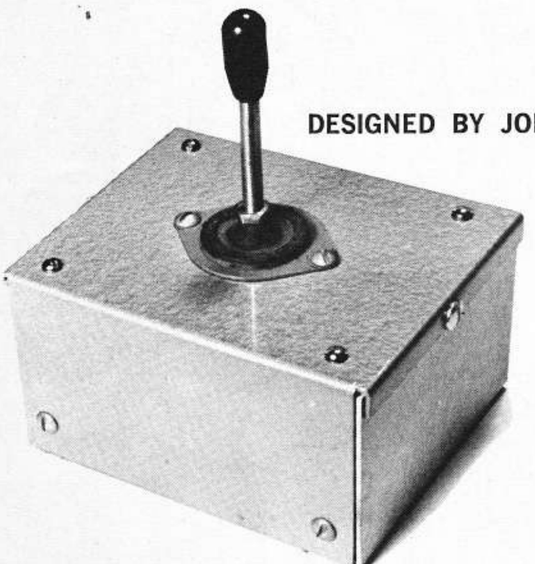


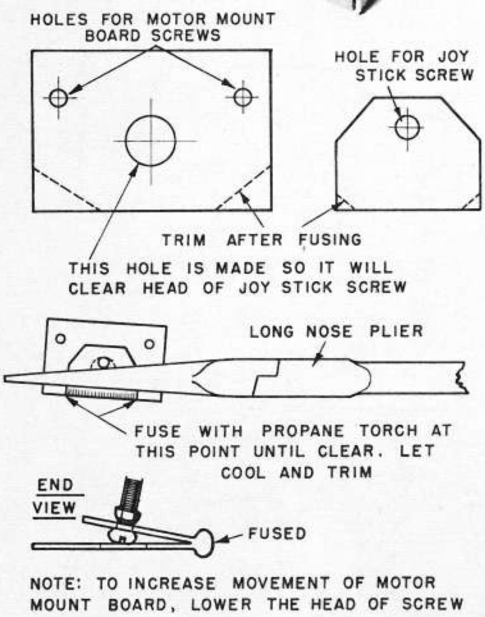
Big Breakthrough in Radio Control

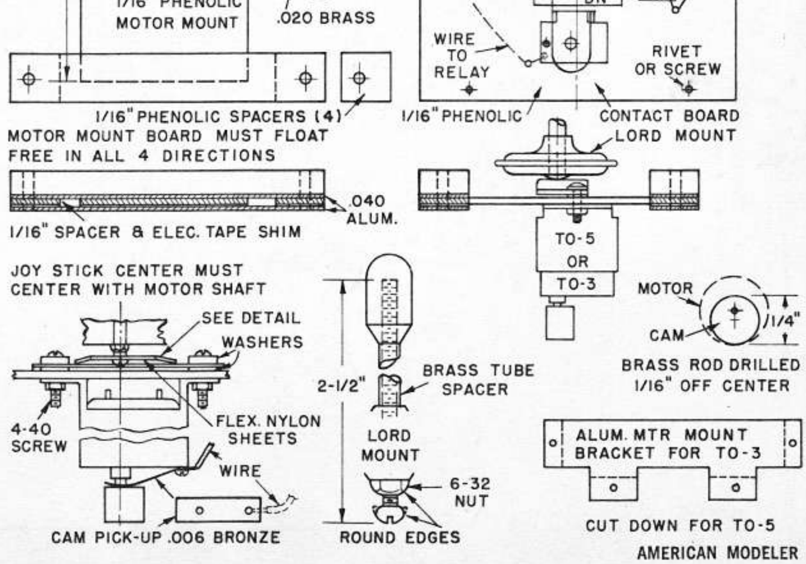
Convert Your Reeds to Proportional Control!



DESIGNED BY JOE DAVID

Now you can operate your current reed system like higher-priced propos and save on batteries to boot. Set-up lets you shift to straight reeds at any time.





With proportional systems all the rage where does this leave the owner of reed equipment? He's faced with the prospect of junking a fairly expensive control system and investing many hundred bux for one of the propo rigs. The reed systems have proven very reliable. If only they could be converted, somehow. . . .

Well, they can! Actually, pulsed reeds are not completely new, such systems have flown in several areas. But in the big rush to develop completely new proportional rigs they apparently have been forgotten by many. But watch a competent reed flyer and you'll see that he really "pulses" the levers with his thumbs. All you need do is evolve a machine that will do this pulsing and the less-talented reed flyer can have the advantages of smooth control in any degree desired.

The arrangements shown here are Joe David's. Several discussion with fellow Weak Signals club member Keith Finkenbiner produced some general ideas; continued needling from Keith finally got Joe to work on the first model. This utilized a rotating drum pulser; by the time all the desired tones had been added Joe had a monster on his hands, very complicated and practically impossible to reproduce. Discarding this machine entirely, Joe came up with the one described here, much simpler for the average R/C tinkerer to build.

The unit was taken out for first flight tests during less than perfect conditions —25-mph wind and very cold. But after three twenty-minute flights the experimenters found the system worked fine, even though the pilot didn't! After having flown reeds for several years it was a little difficult to switch immediately to single-stick propo! This proved a real advantage of the installation; when things got hairy with propo, the pilot could simply revert to normal reed operation, since the new equipment paralleled the existing reed control switches in the transmitter.

Joe worked things out to have pulse elevator all the time and pulse aileron normally. By pushing a transfer button, rudder operation was substituted for ailerons.

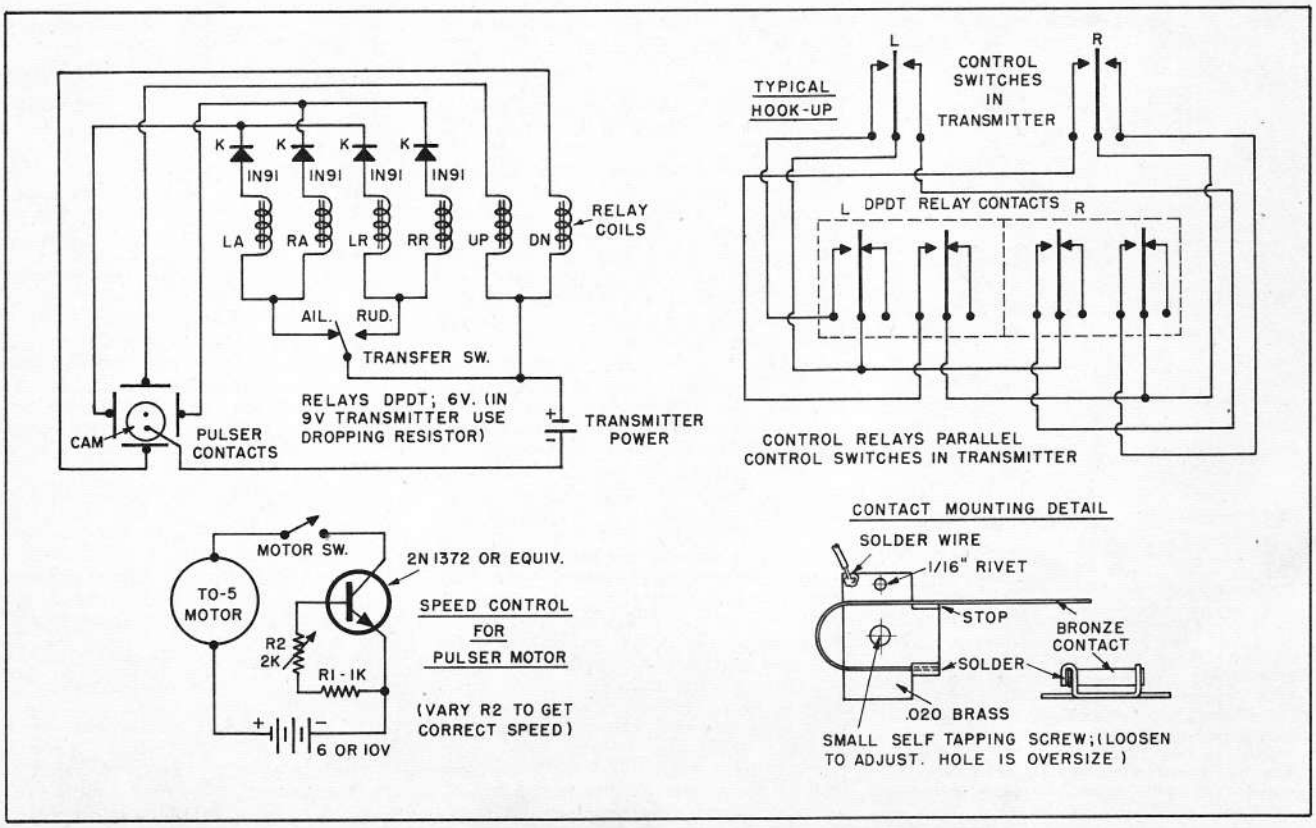
The control stick is held by a Lord Mount, a rubber shock isolation unit widely available in the surplus market. The mount holds the stick firmly, allows movement in any direction, supplies ample centering to bring controls to neutral when stick pressure is removed. The pulser motor with cam attached to its output shaft is held on a motor board which may also move in any direction; the board is linked to lower end of the control stick with a piece of nylon sheet (cut from a coffee can cover). Originally, just a single piece of nylon was used, but after considerable operation it was found that the rounded screw head pulled out of the hole in this piece at extremes of stick movement. Cure was to utilize two pieces of nylon, joined at one edge, per drawings; this allows ample flexing with less strain on the nylon. The parts are held together with long nose pliers, and torch flame played on joint area until the nylon turns clear. Allow to cool, then trim and install. Riveting would do fine, too. Contacts are on another board rigidly fastened to the pulser case. From top view of the contact setup, one can see that if the stick is moved only side to side, just the L and R contacts will vary. If moved at right angles, only U and D vary, while if one moves it diagonally, one "mixes" elevator and aileron action in any percentage required. True proportional operation!

There are no changes at all required in plane installation. Surprisingly, Joe and Keith find they get *longer* flight service from a charge of the plane nickel-cads than with reeds, probably because the pulser enables more efficient utilization of battery power. The same holds true for the transmitter batteries.

Since most reed transmitters require that *two* circuits be closed to key a tone, the job will have to be done with relays. For the full system with aileron (plus transfer to rudder) and elevator six DPDT relays are needed, but not all contacts are required. These may be small low cost units; reed relays should be fine and are very compact. The 1N91 diodes keep the idle relays from shunting those that are in use. The relays may be mounted where convenient, but preferably in the transmitter case, as less long wires will be required. The pulser could also be in the transmitter case, but it will probably be best to fasten it to the front or side of your transmitter. Normally the pulser motor power can be taken from the transmitter batteries, as it is very low.

The "joy stick" is fabricated from a long machine screw. Clamp it in a drill chuck and round off the underside of the screw head. Do the same with one side of a mating nut. The nylon sheet fits between these rounded surfaces. With the nylon in place, push the screw through the Lord Mount center bushing, thread on a clamping nut, follow with a brass tube spacer and a knob on top. To increase movement of motor mount board, lower head of screw.

The Lord mount should (*See pg. 71*)



Reeds

(*Continued from page* 35)

be the style with a flat mounting plate (not a cupped mounting), but shape of this plate is not important. David used an oval plate with two screw holes. His motor mounting bracket is held by two screws to the motor board, the same screws clamping the nylon sheet "coupler" from stick end to motor board.

Either the TO-3 or TO-5 Micro-Mo motor with built-in gearing will do; gear ratio of about 40 to 1 is best. Joe feels the smaller TO-5 is preferable, but he used a TO-3 in his prototype; in any case, the motor mount bracket should be tailored to fit. The cam is simply a 3/8" length of ¼" dia. brass rod. The shaft hole is drilled 1/16" off-center, thus producing a cam. *Don't* make the hole too tight a fit on the shaft and attempt to drive it on, as the gearing will be ruined. Better make it a smooth sliding fit and hold it on with a drop of epoxy inserted in the hole after the cam is on the shaft (keep the adhesive out of the ouput shaft bearing!).

Before the cam is attached, slide the contact over the shaft; the cam itself is one side of the pulsing contacts. Because of this, the entire motor and its battery supply could become part of the circuitry (if motor internal wiring shorted to case); if power is to be taken from the transmitter batteries, keep this fact in mind or short circuit difficulties may result. If in any doubt, use separate batteries to rotate the pulser; a couple of C or D flashlight cells will run either of the motors mentioned for a long time.

Adjustable contacts against which the cam rotates are fastened to a rigid contact board. The contacts themselves are preferably of spring bronze, bent into U-shape, but overbent, so that they will press tightly against their stops. Contact holders are made from .020 brass, with one tab bent to act as a stop, the other doubled over to hold the short end of the spring contact. This end should be soldered after the contact strips are clamped in place.

A 1/16" rivet acts as a pivot for each of these strip holders, with adjustment held by a self-tapping screw through each into the 1/16" phenolic mount board. The strips could be bent to obtain correct adjustment, but Joe's arrangement is much neater. The motor output shaft (see drawings) and thus the center of cam rotation, is directly in line with the control stick. The contact strips are adjusted with the motor running, so that they just do *not* touch the cam, with stick in neutral. One point might be mentioned on the assembly: Even though the motor mount board may rotate a bit from the position indicated, it cannot turn more than just a few degrees before it strikes the spacers. This limited rotation will do no harm and it's unnecessary to try to prevent it.

A bit of Lubriplate on the cam pickup spring and cam face will aid in maintaining reliable contact. A final test of the mechanism should show smooth stick movement in any direction, with no binding whatever of the motor mount board in its guide rails; the cam should move far enough off-center so that at its limits each of the contact strips will make continuous circuit with the cam, thus providing full servo movement in the plane. And as noted previously, with stick centered, the cam should *just miss* all the four fixed contacts.

Joe David rigged a simple transistor speed control for the drive motor, as indicated (a plain rheostat in series with the motor would do as well). Pulser speed should be just high enough that the plane cannot follow the pulsing control surfaces; the latter will probably be seen to wiggle somewhat with stick in neutral. Any higher pulse rate will only raise the average servo current drain considerably and may reduce reliability of control. The shorter reeds will pulse the best, so set speed to accommodate the longest reeds of the surfaces selected. By the same token, it is likely that the more modern "high frequency" reeds will be the best pulsers.

Joe suggests setting up control linkage in the plane so there will be more surface movement than is normal with reed operation. And don't forget—if things start getting a bit out of control, just go back to thumbing the transmitter switches as usual; even though the pulser is still rotating there will be no pulsing action unless the stick is off neutral. Joe calls this a "back-up system", just like they have in the Space field!

Suggested parts: *Case*, LMB #135 or equivalent 3-¾ x 3 x 2-⅛" deep. *Motor*, Either TO-3 or TO-5 Micro-Mo, geared about 40 to 1. *Control Stick*, 6-32 screw run through Lord Mount (series 100 mounts have base about 1¼" sq., center hole large enough for 8-32 screw). *Relays*, low voltage DPDT (only normally-open contacts are used) such as Lafayette Radio No. 30G8687 ($3.70 each).