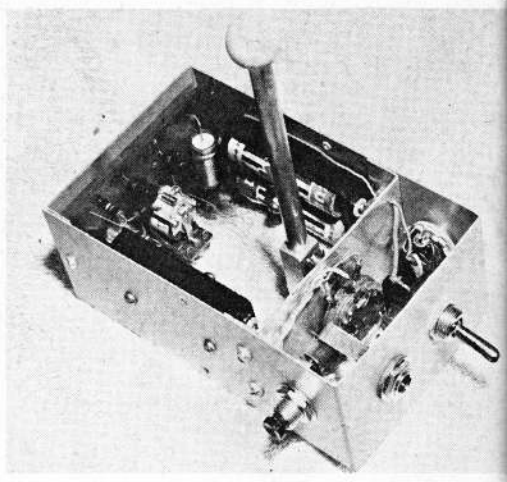
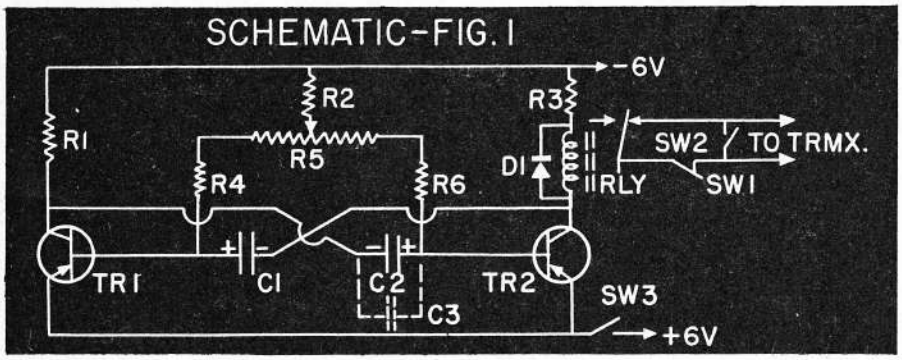
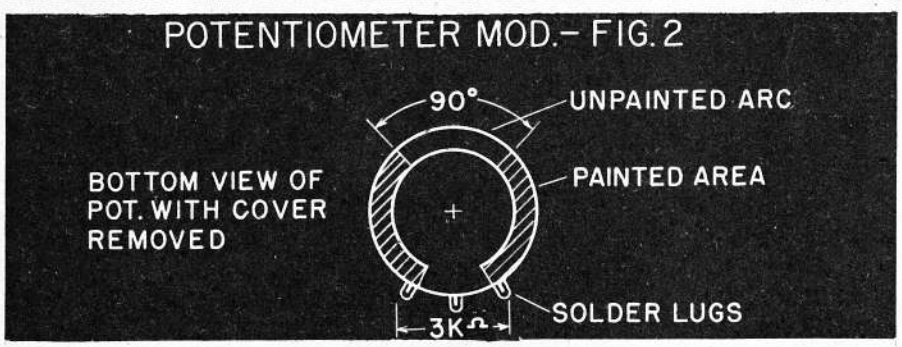
EXCELLENT ELECTRONIC PULSER BY TOP MIDWEST RUDDER ONLY WINNER. DESIGNED FOR RUDDER AND MOTOR CONTROL THE HIGH PULSE RATE HAS RUDDER SLAVE TO CONTROL STICK FOR THE SMOOTHEST POSSIBLE PROPORTIONAL FLYING.

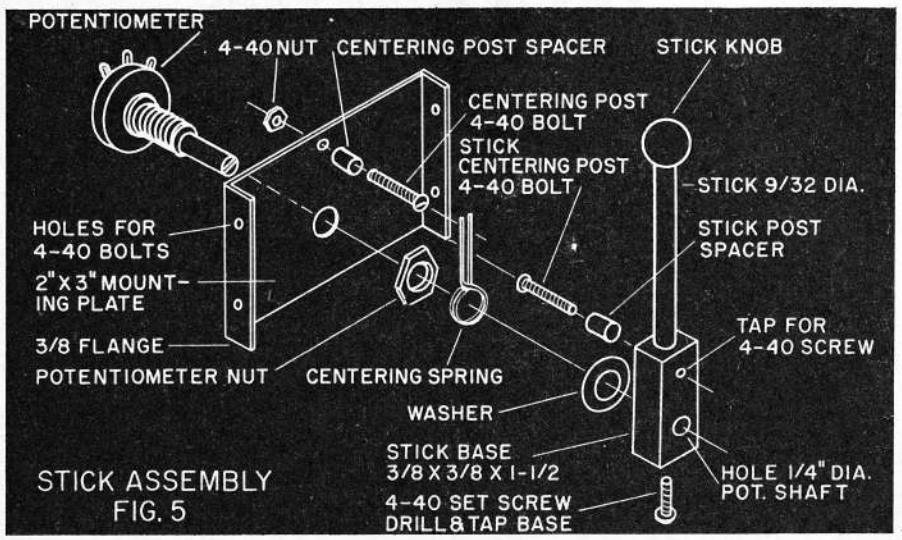
Our brag above is well supported by this glittering array of trophies, all first places too.



Simple installation is shown at peek inside box.







by JAMES SHOWS

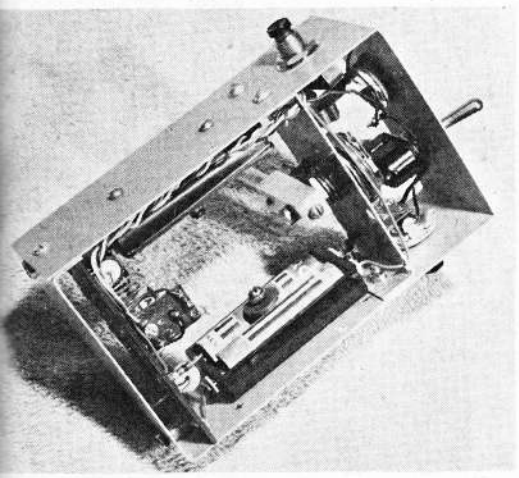
► The proportional control stick box presented in this article is designed to provide pulse width control only and not pulse rate because there are probably 10 proportional Rudder Only fliers to every Galloping Ghost or Kickin Duck fan. In the 1960 Nats for example, 5 of the 6 Rudder Only winners flew proportional. This includes 1st in both Open and Junior-Senior. In the 1961 Nats, proportional again won 1st Rudder Only Junior-Senior. In the 1961 Nats, proportional again won 1st Rudder only Junior-Senior. The unit shown has won 1st place in 8 out of 10 contests entered in the past 2 years with 2nd in the 9th contest and 4th at 1960 Nats.

Flying both "Galloping Ghost" and Rudder Only pulse systems with various type transmitter pulse code systems, the writer found many problems inherent in the systems used. The major problems associated with mechanical units were excessive mechanical wear, noise and relatively high battery drain. Electronic pulsers, on the other hand, did not possess these mechanical problems but required relatively expensive B type batteries which were subjected to relative high current drains. Cold weather flying could be a gamble without a fresh battery. In addition the initial cost of most electronic pulsers was high.

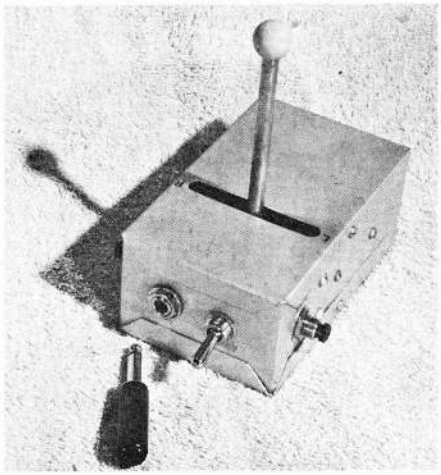
After scanning all literature for over a year without finding what I wanted, it became evident that it would be necessary to design a pulser. The features desired were rather stringent but all highly desirable for good performance; these were:

- Rapid wave shift response time with minimum interaction
- Rugged, with good reliability
- Inexpensive – under $15.00; target

Proportional Control FOR RUDDER ONLY

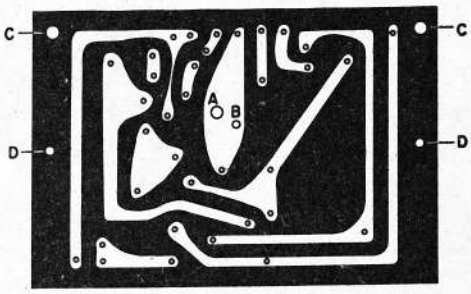


Generous stick movement for good control.



Note sturdy spring for strong stick centering.

PRINTED CIRCUIT BOARD – FIG. 3



ALL HOLES NO. 60 DRILL EXCEPT A, B, C AND D. HOLES A AND B ARE LOCATED FOR RELAY USED HOLES C AND D FOR WIRE BUNDLE AND MOUNTING SCREWS.

price $10.00

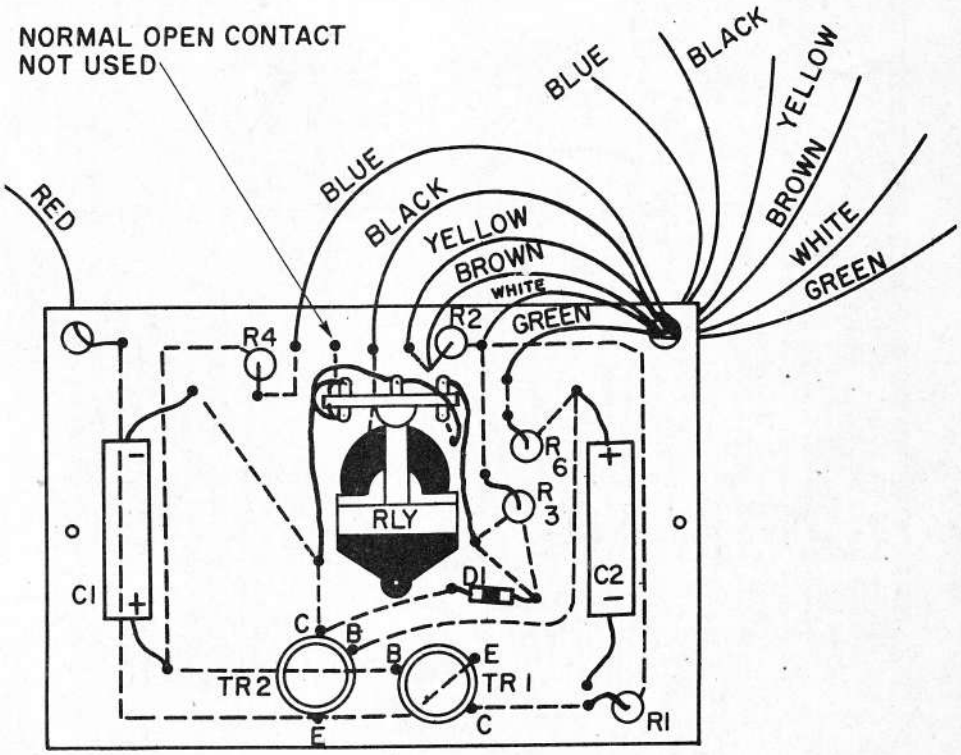
- Low voltage—good battery life
- Compact – versatile enough to use with most transmitters
- Easy to build and maintain

Many of these features indicated an electronic circuit with the low voltage pointing toward using transistors.

To get the low price, inexpensive parts were tested and found to be satisfactory. The transistors used are 59¢ commercial units, with a d.c. current gain of 23, available either from Berstein Appelbee, Kansas City or Lafayette, New York. (The writer has had trouble lately obtaining these units, the Philco 2N226 is an inexpensive substitution.) The relay is a surplus 150 ohm radio-sonde, usually listed at $1.50. Although more expensive, the 100 ohm Gem relay is a superior quality substitution. The only quality part recommended is the potentiometer which is an Allen Bradley CU or Ohmite AB linear taper. The box of the prototype unit, pictured with trophies, is a surplus unit. However, the one shown separately is an ACE R/C #1A 2x3x5 aluminum box. If desired, the box is quite easily constructed using a wooden block and aluminum from a cookie sheet.

The prototype unit has been in operation since March 1960 using only four sets of batteries (4 pencells) in that time. Performance has remained unchanged and this includes 40° weather in St. Louis to 110° temperature at the 1960 Nats in Dallas. Only one malfunction has occurred in that time. This was a broken wire to the printed circuit board caused by repeated removal to show interested individuals. Being self-powered and fitted with an 8-pin tube socket plug, the writer's unit is interchangeable with the TTPW POT. control box for (*Continued on page 42*)

PRINTED CIRCUIT BOARD COMPONENT LAYOUT – FIG. 4



RED – +6 VOLTS WHITE – 6 VOLTS
BLACK – RELAY CENTER TAP
BROWN – RELAY NORMALLY CLOSED
BLUE – LEFT LUG POTENTIOMETER
GREEN – RIGHT LUG POTENTIOMETER
YELLOW – CENTRAL LUG POTENTIOMETER

(POTENTIOMETER LUG POSITION IN RELATION TO THE POTENTIOMETER ORIENTED WITH THE LUGS UP SIGHTING ALONG THE SHAFT.)

from the least, of NIMAS' charter members.

By the time Bud Tenny had the December issue of INDOOR NEWS AND VIEWS ready for the presses—which, surprisingly enough, was December 1st—the purposes of the organization had been outlined by Dick Kowalski and agreed to by the others. They are:

1. To act as the voice of indoor fliers in the United States.
2. To promote indoor in any way, but particularly by encouraging newcomers.
3. To act as a clearing house for comments on indoor rules change proposals.
4. To act as a point of origin for ideas that are becoming rules proposals.
5. To provide, when possible, changes in technology, advanced design data, and other technological information about indoor models.

With the groundwork accomplished membership in the organization is now open, on an equal basis, to all comers. Such membership is urged on everyone in the country who is seriously interested in indoor activities and costs only three dollars a year, two of which pay for INDOOR NEWS AND VIEWS. (Eventually the Society will provide decals for cars, equipment, etc.) Joining is as simple as sending your three bucks to Bud Tenny, Box 545, Richardson, Texas.

Proportional Control For Rudder Only

(*Continued from page* 25)

both multi and single channel operation by simply switching control boxes.

Before construction is started let us first examine the techniques used in the design. To minimize frequency change with change in symmetry and to reduce the effects of temperature, the transistors operate either cut off or saturated at all times. This means that whenever a transistor is conducting, essentially all the voltage drop is across the collector load, even at extreme symmetry position. The author's unit, checked with an oscilloscope, changed less than one cycle per second with full potentiometer travel. A painted POT. (silver printed circuit paint) was used, as multiple POTS. require more space, and are more complex to mechanize which increases costs. Silver printed circuit paint, around $4.50 an ounce, is best obtained in small amounts from a local radio shop at a small fee or as a group, as the quantity required per POT. is only about 2 drops. The POT. is painted from the ends as shown to a 90 degree center arc to insure maximum uniformity of resistance. ACE Radio Control will be kitting this pulser and undoubtedly, the finished POT. will be available from them. Ninety degrees is used rather than the the usual 60° to provide extreme control without excessive sensitivity around center. A strong centering spring is used to provide a positive center and a sense of feel to the fingers. This has found to be most helpful in coordinating the eyes and hand when flying.

The relay current is approximately 25 to 30 ma. depending on the transistors used. With the relay adjusted to pull in at 18 to 20 ma. and drop out at 12 to 15 ma. real snappy action is assured. This also allows the battery voltage to drop considerably before replacement. The prototype units was tested with worn out batteries to determine the minimum operating voltage, which is 3.6 volts. Operation was normal over the voltage range from 6 to 3.6 except for a slight increase in pulse

(*Continued on page* 44)

Proportional Control

(*Continued from page 42*)

rate at the lower voltage.

If you are interested in building a unit by now, scrounge around the parts bin, local radio supply store or mail order house and gather up the small number of parts required. Construction is begun by removing the cover from the POT. and carefully painting out the carbon element from both ends with conductive electrical paint as shown in Figure 2, making sure the paint does not get on the carbon wiper or the inner wiper element. When the paint is dry the total resistance should be approximately 3000 ± 200 ohms. At this point, the writer would suggest bread boarding the components and checking out the operation of the unit. This requires little time and allows easy changes or substitutions.

The printed circuit board is constructed by tracing the circuit (Figure 3) onto the copper laminate with a ball point pen. By pressing firmly a light indention is scribed in the copper. With the use of a fine brush, carefully paint the area to be retained with a thinned dark color dope. This procedure does not result in a professional appearance but for a single unit it is easy and inexpensive. The board is then etched in a solution of Ferric chloride. (For those who prefer, the board can be wired a la Walt Good TTPW style.) After the etching is completed the holes are drilled using a #60 drill bit except for relay mounting holes and PC board mounting holes. The components are then soldered in place as shown in Figure 4. The two-¼ inch-long stand off insulators are cut from heavy fuel tubing. The component board is mounted to the rear of the box by two bolts or sheet metal screws inserted through the rear of the box, through the stand off insulators and fastened to the component board. If bolts are used care should be taken to prevent shorting to the copper printed circuit. The leads to the POT., switches and jack should be left approximately 7 inches in length at this point.

Bend and drill the POT. mounting plate from .040 or .063 inch aluminum as shown in Figure 5. The heavy gauge metal will take a lot of abuse from "body english" in those tight spots without distortion plus provide good structural reinforcement for the box. The stick base is constructed from soft aluminum bar stock as shown. If such material is not available, the base may be bent from sheet metal a la John Worth's Simpl Simul pulser. The centering spring is formed from .032" to .040" music wire with the amount of relaxed position cross over determining the amount of centering pretension. The centering posts are made from bolts and tubing. After mounting the POT. to the mounting plate, install the plate centering post. Slip the centering spring over the threaded POT. shaft with the ends on either side of the centering post. The spring is held in place with a washer and the stick base. The centering post on the stick should not interfere with the post on the plate upon engaging the spring. The post on the stick base serves a dual role by also locking the stick to the stick base.

Drill the box to accept the stick assembly, switches, jack and battery boxes. Cut the stick slot in the upper box cover. Install the stick base assembly and battery boxes. Route the component board wiring around the battery boxes through the mounting plate and solder to the POT. Next install the normally closed push button switch on the left and the normally open switch on the right. (These switches control engine speed when used with a pulse omission detector unit and are optional.) Install on-off switch and cable jack. Cut wires to length and solder. Install pencell batteries. Turn on power switch and check for operation. Next install top and bottom covers. The stick knob is drilled and pressed into place.

The pulse frequency is determined by the capacitor sizes. The 25 mfd capacitors have a pulse rate of approximately 10 cps. A pulse rate of 3½ cycles per second is obtained with 50 mfd capacitors. Changing rate by use of different base resistors changes the base current and may cause undesirable operation.

If a 100 ohm Gem relay is used, it is recommended that the contact arm be spot soldered to the armature to prevent excessive overtravel in the pulled in side which causes pulse symmetry distortion.

Use good soldering practices in wiring the unit and you should have many months of trouble free operation.

Hustler XD-7 Delta

(*Continued from page 11*)

each build our own separate interpretation of what a delta should look like and then, when we could evaluate each design, we would combine the best features of all of them into one and each of us would take it from there again. We began by weeks of searching through every possible source of information, through every issue in our file of model magazines. Articles by Dr. A. M. Lippisch, D. C. Broggini, Alfred Bickel, Laurie Ellis, and others were pored over. Cliff Culpepper came up with NACA reports on various airfoils, information from Frank Zaic and others.

Cliff and Weldon Smith decided to build small free flight models to begin with and each of them got in several flights on their first efforts. Cliff's was a take-off on one of Dr. Lippisch's designs into which he incorporated a high thrust line. It went like a bomb but got into some spiral dive problems that were never really whipped. Smitty's was a flat bottomed airfoil job with a few degrees of dihedral. It was a pusher and flew very well. It was on this model that Smitty based his first R/C try.

Fred Stout and myself were the only other ones in the group to take this challenge seriously enough to do anything about it. We started right out on the R/C models as if we had good sense and knew what we were doing. The following is what we came up with and the orders of their arrival.

Smith—Number One

Weldon was the first to complete an R/C delta in this program. It had 60° of sweep back, a flat bottomed airfoil with about 5-6° dihedral. Power was provided by a left handed K&B .19 mounted at the trailing edge at the bottom of the vertical fin. The radio gear was a CG 5-channel working elevators, ailerons, and engine speed. The elevators were originally mounted up forward on either side of the long nose pod but due to the vulnerable location were always getting knocked off. They were finally incorporated into the aileron surfaces to give elevon action. The elevon surfaces were the two center panels of four that were hinged to the trailing edge. The outboard two panels were manually adjusted trim surfaces only. The wing span was 46". Area was 770 sq. in. and the wing loading was 15 oz. per sq. ft. The fin was brought forward in a straight line from a point about 5" above the trailing edge to a point almost at the apex of the leading edges. There was a sub fin high enough to provide a mount for the steerable tail wheel and clearance for the prop. Due to the lack of an adequate runway Smitty was unable to get up enough speed to get