THE ORBIT PROPORTIONAL

Space Control started it all — Now the long awaited Orbit Proportional System is competing in the fastest growing phase of R/C. Will it make it, or not?

After several years of development, various test prototypes, design changes, and an assortment of successes and failures, the Orbit Proportional System is in full production. The familiar black box with the rocketing Orbit trademark is making its appearance at a time when virtually every major equipment manufacturer is frantically trying to get a proportional rig on the market, and in most cases, just as frantically tries to get it back again for further refinements. Orbit is in something of a hot spot with this new addition to their already extensive line of radio control products — a position of having to live up to a reputation of quality and reliability that they have established over a period of years with their single and multi channel equipment. Since they have set the pace, the question is — will the new proportional system come up to these standards? If so, who needs it, who will buy it, and what will those consumers get for their money?

Basically, the Orbit proportional is an analog system along the classic Space Control lines. Available in both a single and two stick version, the two primary control functions (aileron and elevator) are operated by two audio tones. These two tones are varied through a relatively small change in frequency above and below the center frequencies of approximately 1750 and 3500 cycles per second. This produces the right and left aileron, and up and down elevator response. These tones are not transmitted simultaneously, but in separate segments. That is, one tone is sent for a short period, and then the other. The amount of time involved with the transmission of either tone does not produce an effect on the aileron or elevator. These controls are concerned only with the tone frequency.

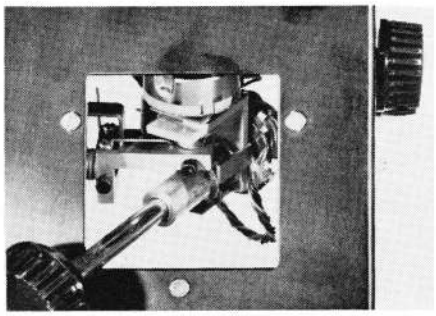
Rudder control is achieved by varying the amount of time one tone is transmitted with relation to the other. This is referred to as symmetry. Through any given period of time occupied by the high and low tones, the symmetry may be varied to a maximum of an 80-20 to 20-80 ratio. That is, 20 percent of the time may be low tone, with 80 percent as high tone. This would result in one extreme rudder position. Reversing the symmetry relationship would be the opposite extreme rudder. This symmetry is also infinitely variable with the 20-80 to 80-20 range for proportional rudder action.

Throttle control is achieved by varying the rate at which the two tones are repeated, with slow rate giving low speed and high rate, high speed.

Therefore, by varying the two audio tone frequencies, the rate of repetition of these tones, and the symmetry relationship, a quadruple proportional action results.

Transmitter

Although our test system was the single stick version, a twin stick setup



Exterior view of single stick assembly.

is available. On the latter, the lever in the upper right hand corner is the throttle. The horizontally operated lever on the right is the aileron control. The black plastic knob just below and slightly to the left of the aileron stick is the aileron trim control. In the center of the transmitter is an on-off switch. On the left is the elevator and rudder control function. The lever in the upper left hand corner is elevator trim. In the top center of the transmitter is an RF meter.

On the single stick unit, the trim knobs will be found at the top on the right hand side of the transmitter. The knob closest to the front panel is aileron trim, while the rear knob is elevator trim. The lever protruding from the side, just below the trim knobs, is the throttle control. The single stick on the front of the transmitter contains all the primary control functions — rudder, aileron, and elevator. The on-off switch and meter function are the same as for the two stick version. Both transmitters feature all transistorized circuits, and incorporate good components. Transmitter output is excellent, and well in excess of normal requirements.

Receiver

The superhet receiver in the Orbit Proportional System is a modular, twin-deck unit, designed for minimum size and weight with a maximum of strength. Circuitry is shown below.

Servos

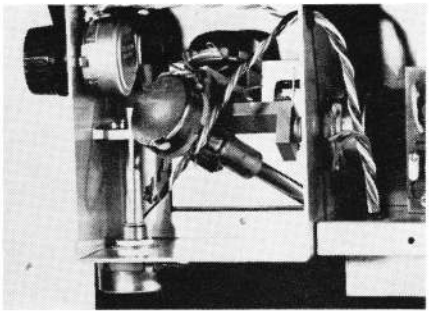
The closed-loop servos used in the Orbit system include a built-in feedback potentiometer for proportional operation. The servos start and running on as little as 12 to 15 milliamperes of current. The amplifier employed utilizes selected germanium and silicon semi-conductors for stable operation under extremes of temperature. Servo transit time is half a second from maximum to maximum. Output is of the disc type.

Battery Pack

The airborne battery pack provided with the Orbit system consists of a pack of four 1.25 ampere hour nicad cells, yielding an aggregate flight time of approximately three hours.

Findings

After a general checkout and examination of the single stick version of the Orbit Proportional System, the unit was given to RCM staff member Frank Justin for flight test evaluation. Walt Findlay, President of the San Gabriel Valley Radio Control League also participated in these test procedures. At Frank's suggestion, and with his assistance, Findlay, a proficient reed flier who had never flown proportional, installed the Orbit rig in an



Interior view of single stick assembly.

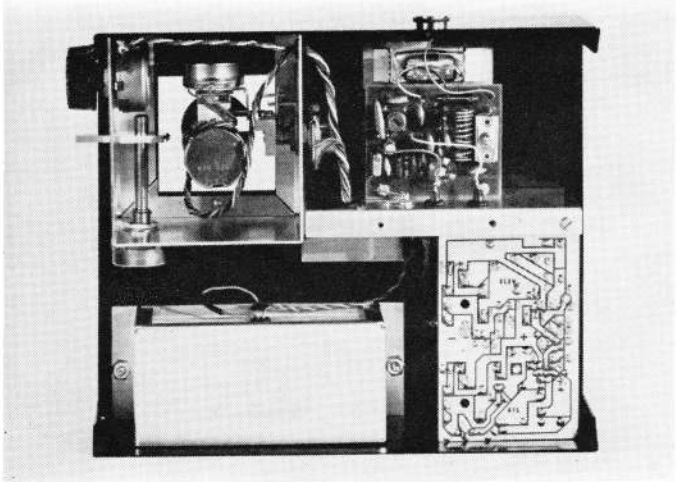
Orion, and proceeded with several days of flight tests so that we might get the opinion of an average RC'er for whom the majority of proportional sales are intended.

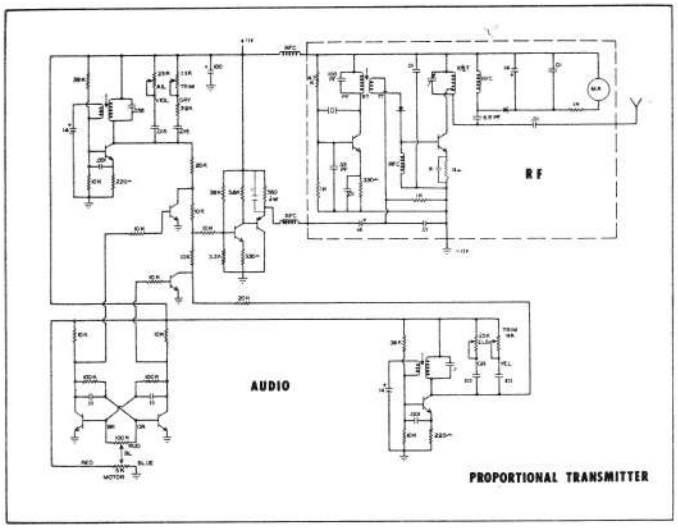
To begin with, this is a proportional multi-reed system. Once the initial flying, and definitely superior to excitement over the vast difference between reeds and proportional is overcome, a flight evaluation becomes a matter of comparing a given system to preconceived "ideals" or optimums of proportional control, as well as comparing that system to others that have been similarly tested.

The Orbit is a good, workable, and seemingly reliable system of proportional control. At no time was there any evidence of interference or blocking. And, like the old saying about "a bird in the hand", it will undoubtedly have a high initial sales impact on the RC consumer who is ready, willing, and able to lay out six hundred dollars for a new rig, for the Orbit is here, **now** — unlike the dozen or so other systems which seem always to be just a promise away. Deliveries are

FIG. 1. Orbit proportional transmitter

Interior of single stick transmitter.





Orbit analog servo

being made to local dealers from current production runs which may hit a high of 150 units a month.

What will the consumer get for his money? For one thing, he will have a complete, packaged, pre-wired and cabled, ready-to-install system of proportional control in his choice of a single or twin-stick version. As mentioned, once the initial thrill of proportional flying becomes somewhat less frenzied, the consumer will find certain aspects of this system which fall short of the so-called "optimums". For one thing, a characteristic of an analog system, such as the Orbit, is poor servo resolution. For example, assuming your aircraft is flying at a speed of fifty miles per hour and you move the elevator control ten degrees, a servo with infinite resolution should go to exactly ten degrees — no more and no less. The Orbit system, however, does not follow the stick exactly, but is proportionate to the load imposed upon the surface — one undesirable characteristic of analog designs. This results in the necessity for moving the stick farther than necessary in order to end up with the required amount of servo travel — say,

Walt Findlay with test unit. Note unique aluminum channel servo mount.

for example, moving the stick fifteen to twenty degrees in order to obtain the required ten degrees of servo movement. These servos also have a noticeable interaction, as well as being overly soft around the neutral position. They do, however, have more than adequate power and are extremely easy to mount in almost any aircraft equipment compartment. One main disadvantage concerns the throttle servo which moves 180 degrees out of phase when the transmitter is shut off, necessitating a very sloppy throttle installation in order to allow clearance for the throttle linkage to describe its arc inside the equipment compartment. Trim functions, and physical trim control location of all functions is good.

Although we feel, as a personal

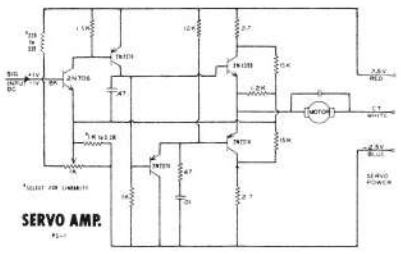


FIG. 2. Orbit servo amplifier

opinion, that a so-called "fail-safe" is unnecessary and somewhat useless with modern day multi designs, most proportional systems include this feature, including the new Orbit offering.

Insofar as the one stick or two stick controversy goes, we will continue to recommend the twin stick setup to both the reed flier and the newcomer, inasmuch as it is virtually impossible for the pilot to move the aileron stick straight across without introducing some up-elevator. The later is due simply to the fact that it is extremely difficult to move the hand and forearm in any but an arcing movement, which in turn, creates a greater amount of up elevator as the movement of the hand draws the stick closer to its extremity, either left or right. In addition, the large rudder knob on the single stick version is somewhat cumbersome, and creates a definite tendency on the part of the pilot to "grab" the stick, subsequently over-controlling the flight surfaces.

This, then, is the Orbit Proportional System. It is here, and available to the radio control enthusiast with six hundred dollars to spend. It is a good, and seemingly reliable system,

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The proportional receiver — sans case

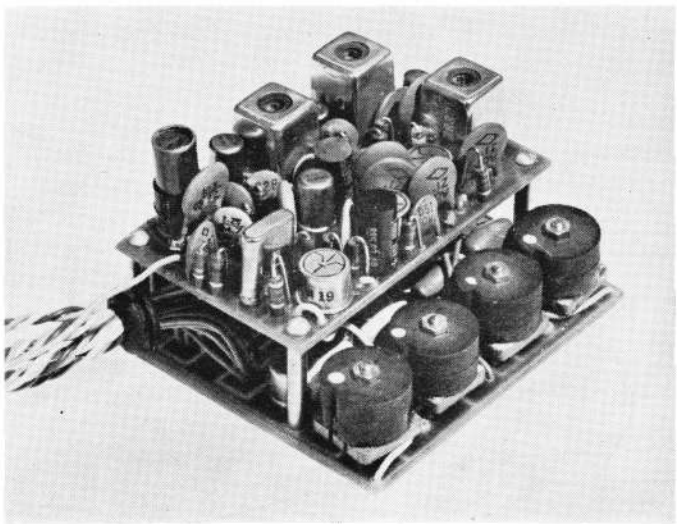
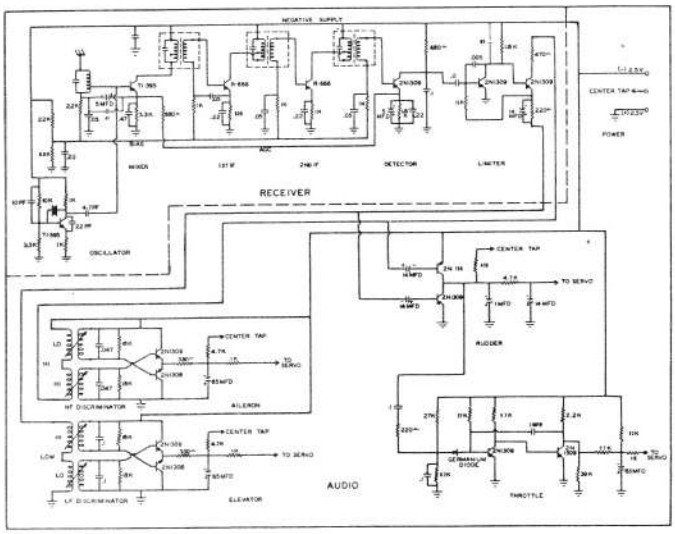


FIG. 3. Orbit proportional receiver



Orbit Proportional

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with each unit individually tuned and checked out by Bob Dunham at Orbit. It does have certain disadvantages, most of them inherent with analog systems in general, and certainly not confinest to the Orbit design alone. As the proportional picture increases in scope, and with over a dozen manufacturers preparing their systems for the ever-widening RC market, we predict that the digital concept, with its infinite resolution and lesser degree of complexity, will become the standard for future proportional systems. This will be a natural evolution, much as reeds emerged as the standard for multi-channel in their battle with bandpass filters several years ago.

Although we have no way of verifying reliability of the Orbit system without extensive air time under a variety of flight and temperature conditions, we are certain that any system bearing the Orbit name will maintain the same high standards of reliability which have keynoted Orbit's progress over the years.