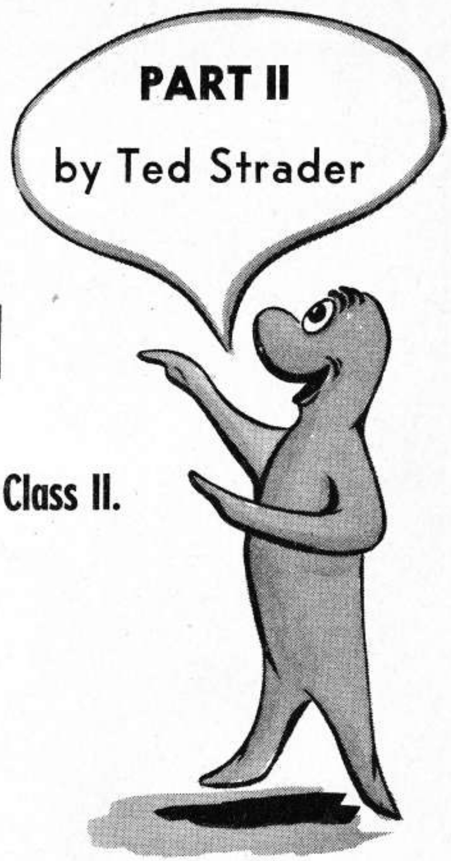
SIMPLE PROPORTIONAL



Second of three parts on simplified proportional control for Class II.

Taking first things first . . . my thanks to the editorial staff of R/C Modeler for asking us to sit in this month and talk about one of our favorite aspects of our favorite hobby — Galloping Ghost.

G-G has been with us for more than a decade, and in much the same form as it originally appeared. Over the years it has been nurtured by a hard core of tinkerers and experimenters who are singularly fascinated by ideas that are just a bit toward left field. Most of us have tried desperately to improve the original concept with somewhat limited success . . . for the fact remains that the original idea — mathematically and mechanically — was pretty nearly complete from the start.

A logical question from the galleries at this point would be — "If this is such a nearly perfect idea, why has it taken so long to catch on?" First, it is not a perfect idea . . . it still remains somewhat a tinkerer's art . . . though part of the reason for recent successes in the area of Galloping Ghost has taken it out of the realm of only a tinkerer's possibility and helped make it palatable to a greater number of modelers.

G-G, to be executed successfully, depends upon a near perfect balance between transmitter, pulser, receiver, actuator, tail coupling, and plane. With more emphasis on pulser, receiver, actuator, and coupling than on the transmitter and the plane, strangely enough! It has been the improvements, of late, in the area of receivers and pulsers which have really helped modelers achieve tangible successes in this form of R/C.

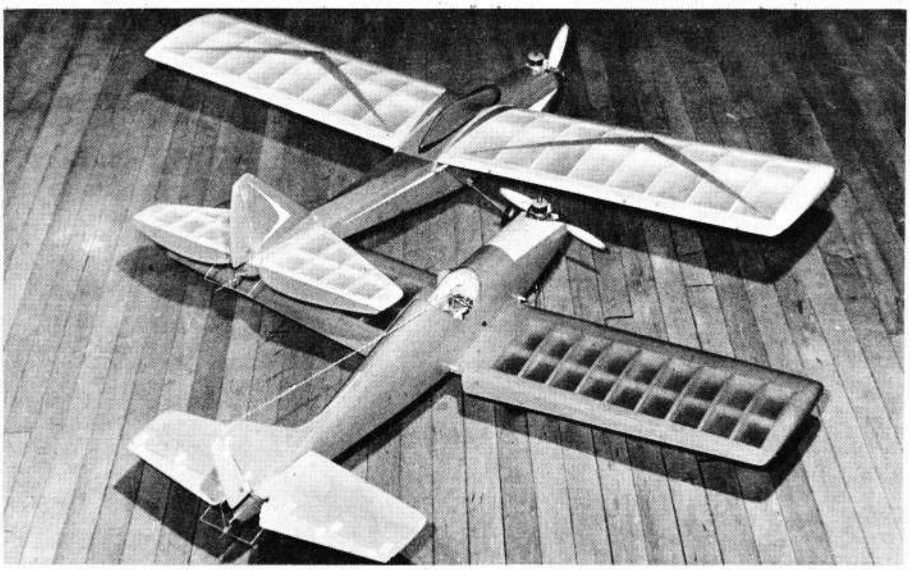
Let's discuss the main components, one by one:

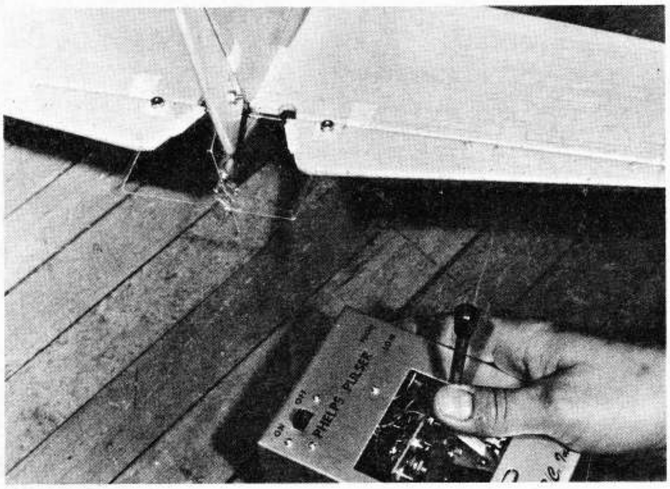
Transmitter: As long as it's stable, most of today's transmitters can be depended upon to do an adequate pulsing job when pressed into service.

Pulser: This has long been one of the areas of weakness . . . though not as long as the newly interested modeler might imagine. In the beginning, we were all hard pressed for a suitable "coder" which would run the range necessary to transform a heterogeneous group of parts into a smooth working team.

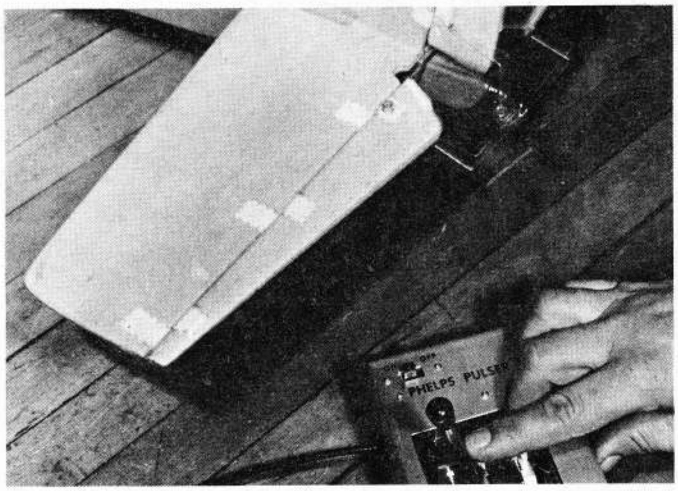
In order to do the job, the pulser had to be able to hammer out ON and OFF pulses of varying lengths — and be expected to maintain specific length ratios while also giving various rate changes simultaneously. Pulse length was not too hard for most. However, when it came time to devise a workable rate change addition, we all had our lumps.

The more electronically adept tackled the two tube multivibrators with reasonable success. Others, like





Right control: Rudder can definitely be seen in right attitude. Elevator is at neutral.



Left control: Elevator making approximately same neutral deflection up and down. Rudder is at extreme left.

myself, went at it from a mechanical angle . . . with everything from fly-ball governors attached to old relay points to rheostats coupled directly to the stick. A great many of these ideas worked well for the individual, but could not be counted on when tossed into the open arena, due in most part to the amount of initial tinkering necessary to get each idea working correctly. As a result, many modelers tried and found the early pulse concepts wanting—wanting more reliable components.

Both methods of varying pulse length and pulse rate exist today. The early tube-type multivibrators have given way to more reliable transistor circuits such as Ace R/C's newest Phelps Pulser. Our original ideas of varying pulse rate by using a rheostat (variable potentiometer) to increase or decrease the speed of an electric motor as it wiped a contact across a half-contact board (for pulse length) were presented several years ago. This was the impetus needed to stimulate several modelers and manufacturers into action. Two of the most widely used mechanical dual pusers are the Glass City and the Ace-Baisden kit. There may be others we're not aware of . . . but the ones mentioned have been used by this writer . . . so at least in this area we feel justified in saying —they work.

This completes the first unit necessary for successful G-G . . . a reliable transmitter-pulser combo.

Receiver: Now that we have a whole flood of pulse information streaming from the transmitter, we have to have something to intercept it completely and be able to transform it into the kind of ON-OFF language the actuator understands.

Most receivers available today will receive all of this information faithfully and even close a relay accurately in harmony with the information being received. The biggest clinker comes from "electrical noise" produced by electric motors used in G-G actuators.

Not all receivers are affected. A great many will reject the electrical noise from an electric motor as if it never existed. On the other hand, another receiver of the same model and manufacture may not be as tolerant. The happy note is that in just about every case, these "noises" can be fil-

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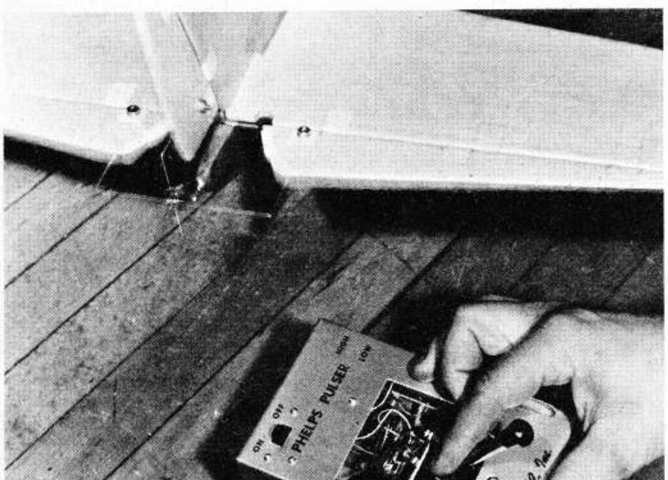
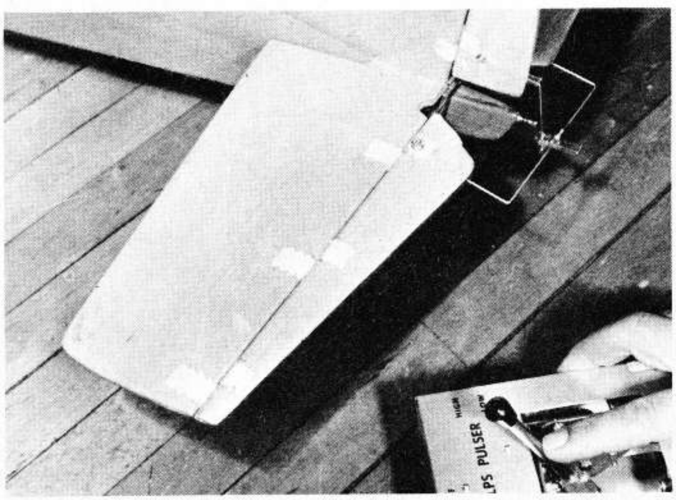
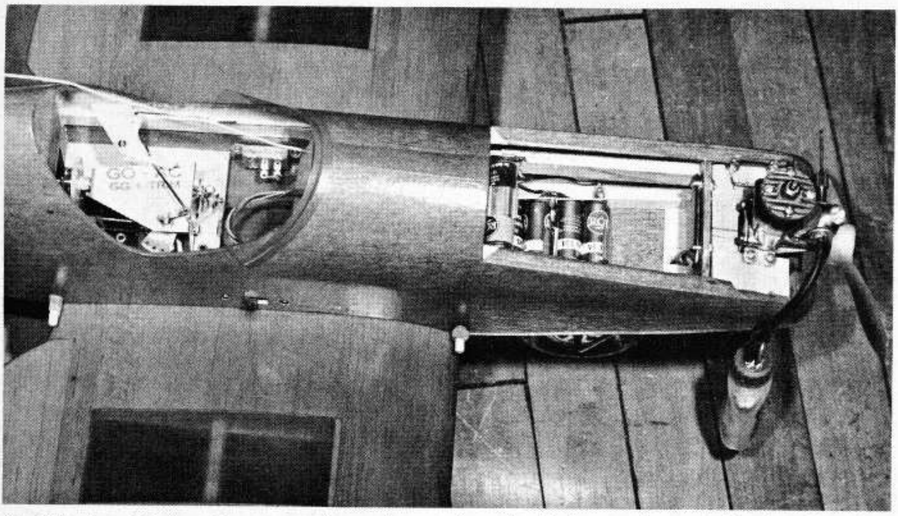
Up Control: Rudder neutral and elevator in up position.



Down control neutral rudder and down elevator.





Go-Wind with hatch removed to show throttle linkage. 4 pencells for Go-Ac, 2 for receiver.

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tered out by the use of filter networks across the terminals of the electric motor if they do occur . . . *if* the modeler will take the time to try one or two and experiment. Another happy note is that because this form of pulse is fast becoming so popular, manufacturers are taking this into consideration in their new receiver models. There are many on the market today which have been designed with this in mind.

Actuators: The next step is an actuator to "decode" the information the receiver gleens from the "sender" on the ground. The prime requisite for this is not only the ability to do the job called for, but to do it reliably. The most important consideration here —providing you are only going for rudder and elevator control— is to select a motor that will pulse well and tie it to an accurate tail linkage and you're in business.

To explain — most D.C. motors familiar to modelers are instantly reversible when the polarity is reversed, via the relay. The idea is to get a fairly powerful motor with a small mass armature . . . one that doesn't build up too much inertia. As for the tail linkage . . . accuracy with no bind whatsoever is the key to success.

Once you get this much working successfully, you can branch out in many directions. Many stay just with the motor arrangement tied to the rudder and elevator. Others decide they want to add engine control. This can take a couple of different forms. One method is to add a POD (Pulse Omission Detector) circuit which will trigger upon momentary cessation of transmitted signal, and in turn, operate either an escapement or secondary servo coupled to your engine throttle.

The other method for adding what amounts to a fifth and sixth control (high and low engine) is to employ a gadget such as the Go-Ac which mechanically moves the throttle on either full ON or full OFF signal.

. . . and, once you've decided upon the extent of the gadgetry you plan to use, you need a good solid ship to haul this stuff around.

Through the years I've seen and flown several different types of aircraft with good G-G results. If memory serves me correctly, the first attempts were made in my Southwind which was somewhat like having a tiger by the tail. Other worthy candidates have been a Whirlwind, Shiner, Strutz, and of course, the Go-Wind. Experience has shown, that while most any type can become a G-G ship, low wing and shoulder wing designs have an edge over wings in that they have less tendency to gallop in a steep climb (such as near the top of a loop). There are, of course, many, many designs by any number of designers which will make perfect candidates for your G-G efforts.

Now that we know what we need to get into the swing (or perhaps I should say gallop) of things, let's see

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how this whole ball of wax works.

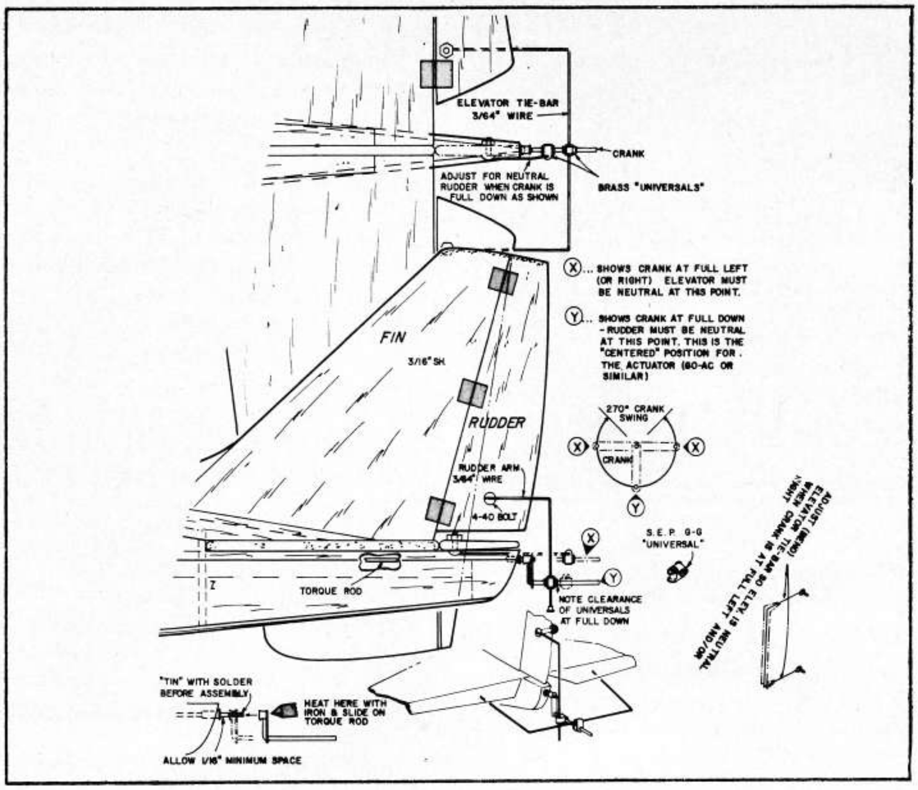
The secret to the entire system is the tie-in between the acutating device and the two control surfaces via the crank—and it's amount of travel. The working amount of crank travel is 270° beginning and ending 45° either side of vertical, or 0°.

Originally, and in many hookups used today, the modeler built in "hard" stops at either side of the top of the crank swing so the actuating sweep could not possibly go beyond 270°. This left a little tolerance for error in the control box — but very little!

The Go-Ac approach to G-G depends upon a smooth working pulse box because UP control has no stops on the crank, and therefore is arrived at by setting the slow pulse (SLOW for UP) at a frequency just high enough to stop the Go-Ac before it makes a complete revolution when going through either clockwise or counter-clockwise sweep. Once the low pulse rate has been set, the system is ready for operation and flight. We particularly prefer this arrangement... having used it since 1954... over an arrangement of hard stops because of its safety factor.

There have been many occasions when — usually because of our own carelessness — we've gone out of range, been caught flat-footed using old batteries or some other infraction where we should have known better. The Go-Ac would, in these cases, detect a malfunction, go into its neutral, and move the throttle to low speed, with a crash thereby averted. Conversely, had our system utilized hard stops, the control would have stopped at either a combination of LEFT-UP or RIGHT-UP and... POW!

It had been our original intent to work up a block diagram of ON and OFF pulses to help explain Galloping



S.E.P. galloping ghost coupler kit eliminates several hours of tedious labor in forming control surface linkages.

Ghost. However, this has been abandoned in favor of a sequence of photos which, taken at a slow speed, show a Go-Ac Galloping Ghost system in actual operation. By studying the photos of each control and then referring from one to the other you can get a much clearer picture of the relationship between Rudder and Elevator during UP, DOWN, LEFT, and RIGHT.

In the series of four control shots, we have shown the Go-Wind using a standard Go-Ac servo for control and a standard SEP G-G Control Coupler kit on the control surfaces. An Ace Phelps Pulser is triggering an Ecktronics transmitter which is sending commands to an F&M Saturn receiver in the plane — and that's as heterogeneous a collection of parts as you could find!

There is one question which is usually asked by newcomers which we should answer at this point. — "How can you get any UP control when the crank never swings the elevator as high into UP as it does into DOWN?" . . . and this is the secret which stumped everyone except the originators. The reason is because of the dwell time of the elevator in the UP position as it swings to its full UP, stops, and then returns toward DOWN. This lapse of time, however small, gives an up control without having to travel as far UP as DOWN.

I hope this little discussion has cleared up some of the mysteries of Galloping Ghost. I'm sure there is much I have forgotten. However, by using this as a guide, you will be able to progress right up to the point where you are perched precariously at the edge of the field with a screaming ship ready for launch. Check that system carefully, because you won't have much time to refer back to this article once you let loose of that tiger you're holding by the tail!