

# GHOST RIDER

High performance with Galloping Ghost? Try Dave Boddington's pocket-sized aerobatic model for .09 to .10.

Most R/Cers have, at one time or another, dreamed of a pocket-sized aerobatic model that is easily transportable, easy and cheap to operate but possessing the flight characteristics of a larger model. Until the last year or two this has had to remain purely as a dream, but with the advent of new R/C equipment, i.e., pulse proportional systems, it is now a practical proposition.

The re-birth of Galloping Ghost has made a tremendous impact and is helping to bridge the gap that always seemed to exist between the single channel flier and the multi brigade. Now, and thanks mainly to the Rand actuator, many modelers



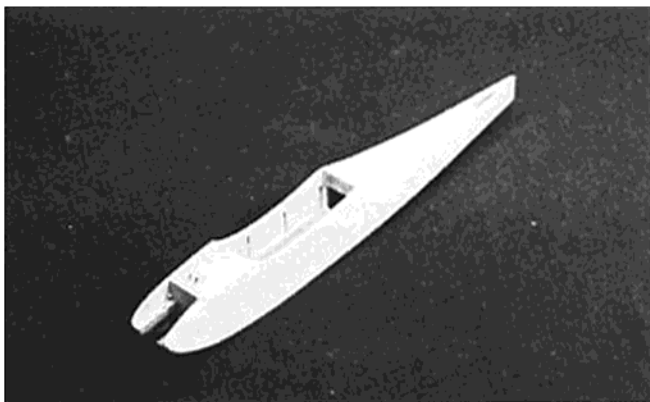
who have been struggling for years with escapements are experiencing the fun of flying models of convenient size with simple proportional control. This new revolution can only be beneficial to the hobby as it widens the avenues and increases the scope of the weekend flier — and let us not forget that he makes up the vast majority of R/C participants in all countries. It is not only the lesser button-pushing single channel sportster that is taking up the G-G habit, however, I have noticed quite a few of the 'dyed in the wool' full house proportional boys are sneaking out with these pulse system models. One thing's for sure, flying pulse



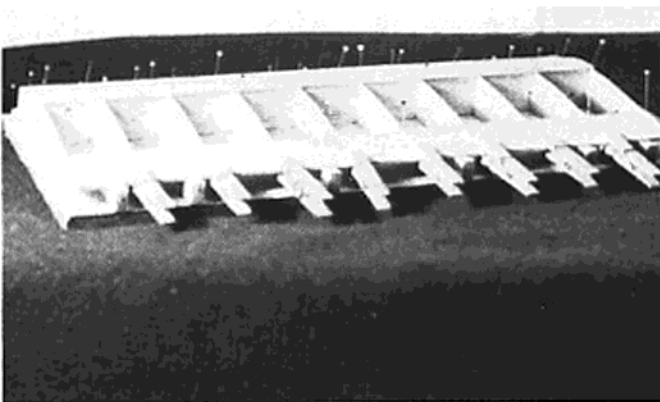
All the parts—ready for assembly.



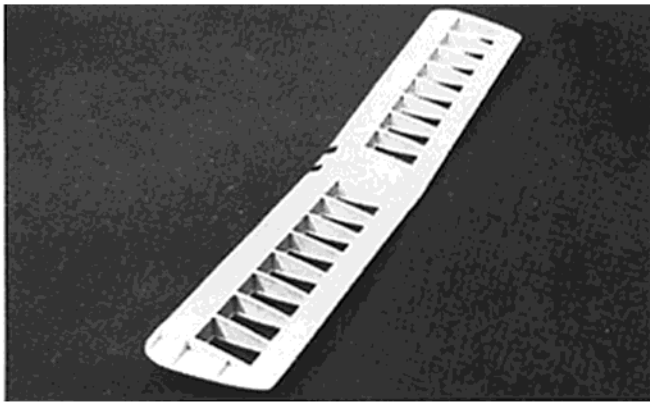
The completed fuselage sides.



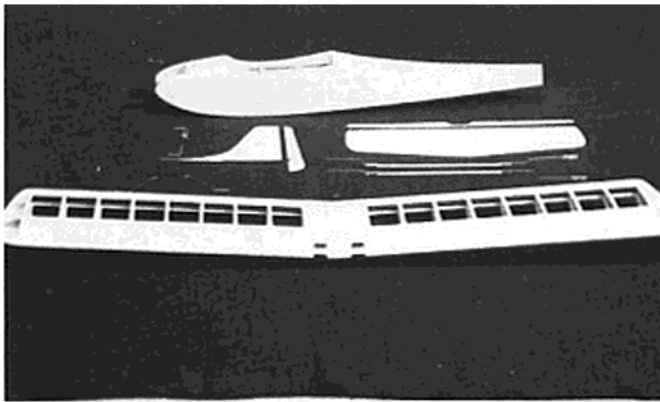
The fuselage—completely assembled.



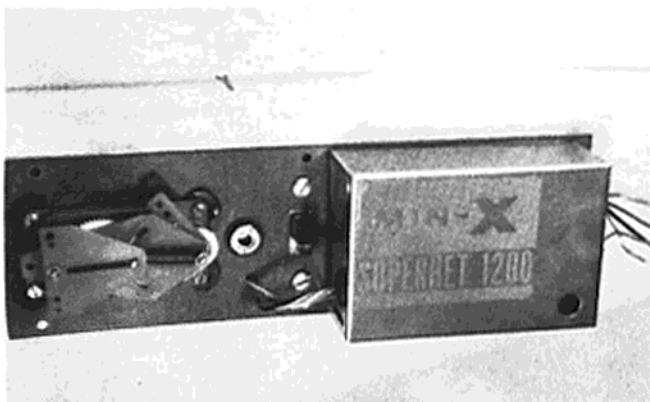
The wing structure jugged in place.



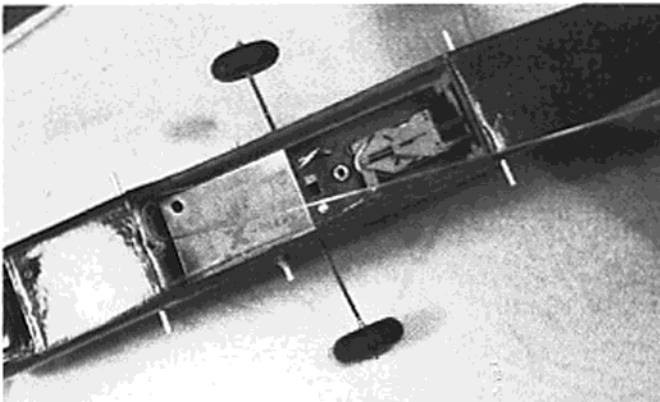
Wing panels joined and ready for covering.



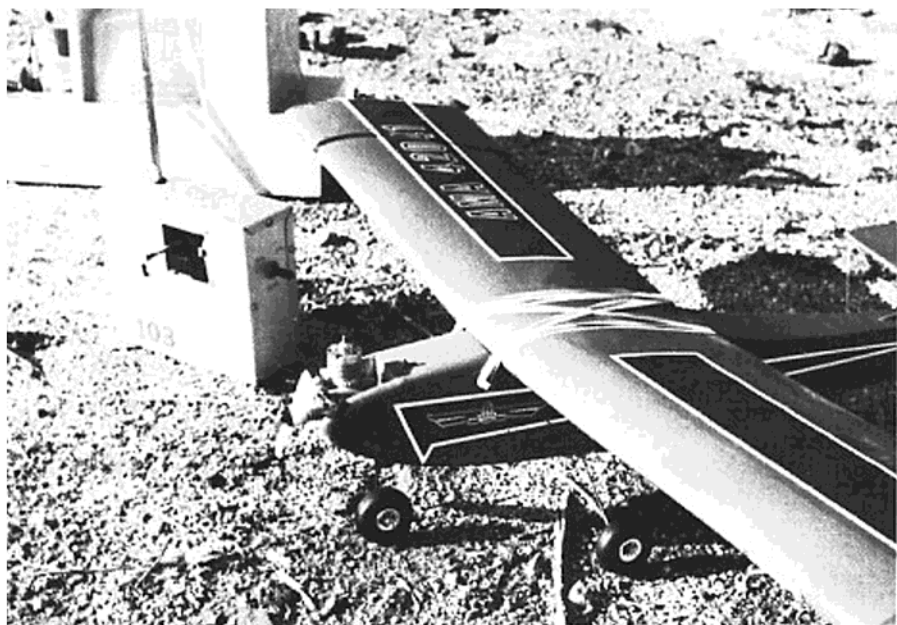
One Ghost Rider—ready for MonoKote.



Home made actuator board holds the radio gear.



Equipment installation in the Ghost Rider.



propo is easier on the nerves and the bank balance and that can not be bad in these days; much better to have fun flying with the Smiths rather than having ulcers keeping up with the Jones's.

The Ghost Rider is a natural and logical development from a series of G-G models starting with the 'Ugly Bug' 60" span model powered by a .19 cu. in. motor. This original model was used to evaluate the first three of the new G-G systems commercially available over here, one was American and two British but all featured the Rand LR3 actuator. To some extent I was lucky with this design — it was a hybrid consisting of wings and tail and originally intended for a pylon racing model and a new fuselage. It turned out to be a quite suitable design for G-G work but I did not really appreciate just how much until after designing two more models that were considerably less suited for this system. I cannot help feeling that a lot of the designs published for G-G operation, or existing designs now recommended for it, fall a long way short of being ideal as a vehicle for pulse proportional systems. Most people will, I am sure, agree (and if they do not I am wasting my time anyway) that G-G is an excellent system giving the 'mostest for the leastest,' it is however, a system with limitations. These limitations include the interaction of up elevator with full rudder deflections, up elevator effect when operating motor control and the limited power available from the actuator. Although none of these limitations are, in themselves, serious they must be accepted, and everything possible done to minimize their effect in the design of the airplane. For example, if we use a swept back rudder on the model, we shall tend to get an aerodynamic up-elevator effect from this when the rudder is operated. Now this is the last thing we want as we know that we are going to get some actuator up-elevator interaction from operating the rudder, anyway. Therefore, it makes sense to have the rudder hinge line vertical, or possibly raked forward, to give a slight down elevator effect from the rudder in

turns. In the 'Ghost Rider,' I have tried to incorporate as many of this type of design feature to make a more 'flyable' model.

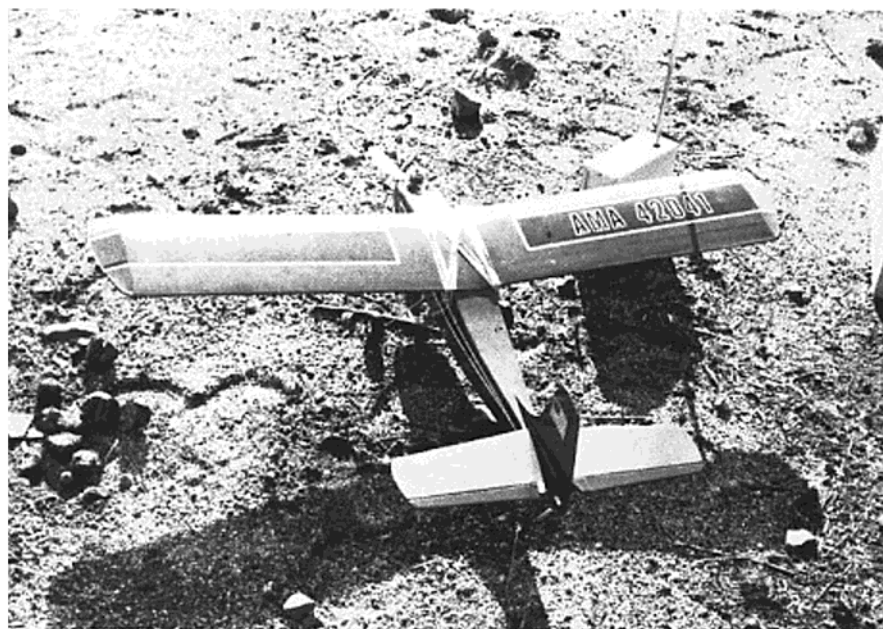
With some models you know they are going to be 100% as soon as you have finished them, but with others you face the flying fields with great trepidation — hoping that you will be alone for that first flight. Fortunately the G-R was one of the former types and the test flights quickly proved that this initial confidence was not misplaced. She had less teething troubles than my old granny with her two sets of false 'chompers,' in fact it is one of the few models that I have designed where I have been able to resist the urge to 'improve' the model. Most of our flying is carried out in grass fields where the length of grass and roughness of the ground prohibits take-offs, but on the occasions that I have flown the G-R from a tarmac strip, the way she tracks and lifts off has caused appreciative comments from the onlookers. With the Rand

Pak installed, giving less up elevator during changes of motor control setting, it is possible to do fine 'touch and go's' but remember to hold on down elevator during the opening up of the throttle on the tarmac, to prevent a premature lift off. Should you prefer it, the nose wheel and main undercarriage assemblies can be removed completely for those flying regularly over grassed areas — it certainly saves nosing over on landings!

Because of its relatively small overall size and low weight, the G-R is fairly crash resistant, the first prototype has flown some 150 or so times now without any undue signs of wear and tear. Construction is conventional and straight-forward (have you ever read of a model that was not) and she does not take too long to assemble, even compared with those boxes of thousands of bits known laughingly as "prefabricated quickies." A detailed description of the method of sequence of construction is not necessary for the average builder but a few general pointers may be of value.

#### WINGS

The wing features a thicker section than most models, either single channel or multi for reasons connected with both flying and building. The thicker wing has the advantage of a lower and less critical stalling speed, it also helps to maintain an even speed of flying regardless of altitude, i.e. less build up of speed in a dive due to increase of drag from wing, with speed increase. From the construction point of view, the advantages are considerable, with the large area of wing rib surface for gluing it is possible to eliminate the use of dihedral braces for joining the two wing panels together. Having dispensed with dihedral braces on this model and larger models featuring the same form of wing construction, I am 100% convinced of the rightness of this decision. The full depth sheet main spar and leading edge sheeting top and bottom form a rigid 'D' box and this, together with the thick section and rib capping strips, makes for a virtually warp-proof lightweight wing. With covering mater-



ials such as MonoKote, the inherent strength of the wing structures is most important and this one, I promise you, fills the bill entirely. The wing ribs are formed by sandwiching 6 No. 1/8" and 14 No. 1/16" wing rib blanks between 1/16" ply rib templates with studding (threaded rod) holding the block together. This is the quickest and most accurate method of producing a set of wing ribs that I know of. Before constructing the wing panels make sure the building board surface is level and true. Pin down the main spar and the leading edge (over a piece of 1/4" scrap balsa), the bottom trailing edge sheet is pinned onto shaped supports spaced at each rib interval. Glue all ribs into position followed by the top trailing edge sheet and top leading edge sheeting. Remove from the board and all bottom leading edge sheeting and capping strips. Please—please do not be tempted to 'beef up' the construction either of the wings or any other parts; the pleasant flying characteristics of this model will fall off rapidly with increases in weight, as with most small models.

#### STAB AND FIN ASSEMBLY

No worries with these sheet structures; choose hard balsa for the rudder and good straight stock for the stabilizer. The elevator is cut from 1/16" plywood with 1/32" plywood stiffeners at the center cut out area. Plywood seems to stand up to wear better than balsa for the elevator with no tendency for the elevator horn to 'pull through'.

#### FUSELAGE

Select the balsa carefully for matched fuselage sides and mark out accurately the positions of all formers, doublers, etc. on the sides with a ball point pen. The method of leaving gaps between the doublers for formers may seem odd but it positions the formers precisely and makes a strong completed structure. Personally, I use white glue for all of the construction as it is equally suitable for balsa and the plywood former and engine bearers—your Titebond sounds excellent for this job as it overcomes the one failing of most P.V.A. glues, the difficulty of sanding it. When you have decided which engine you are going to use check the width between bearers for suitability. (Spacing shown on the plan is for the Enya .09 TV III.) The bearer width can be adjusted by varying the thickness of the nose doublers and the positions of the holes in F1. Do not forget to line the battery compartment with foam rubber (not foam plastic as this tends to compress too easily) before the tank shelf is secured in position. Liberally coat the fuel tank area with proofer to prevent the ingress of fuel in case of a leak in the tank, (it would not be the first time!) A home constructed metal fuel tank is indicated to make maximum use of the space available although a commercial tank of suitable dimensions could be used. I prefer a metal tank to a polythene clunk tank for a model of this type, they are easier and neater to install using an epoxy glue for fixing. Feed pipes, filler and vents should be positioned to suit your particular engine as should the nylon tube bearing the throttle linkage.

Undercarriages can be a mixed blessing; nothing is prettier than a real 'greaser' of a landing on a paved area but over rough pastures they can do more harm than good. The Ghost Rider U/C is designed so that the nose wheel leg and main gear are quickly removable by using miniature nylon saddle clamps to hold the wire in position. Some rebalancing of the model may be necessary when the U/C has been removed, but the ply underside of fuselage will take the landing shocks without damage.

#### FINISHING

Any type of finish may be used on the model provided only that it is reasonably light. A seven coat paint job may look "out of this world" but it is more likely to be the end of the model. One of my favorite sayings applicable to designing and building model airplanes is "Simplify and add lightness." There is no doubt that for a model of these dimensions MonoKote is an ideal covering material, I always swore that I would never get hooked on it but after using it once or twice it is difficult to get out of the habit. It makes a change to be able to sit at the table covering and finishing a model while watching the T.V. and without the wife and kids accusing you of trying to kill them with lethal fumes!

Give the engine bay a real good soaking of fuel proof paint and seal the edges of the MonoKote around this area with epoxy resin. It is also worth contact cementing a small piece of steel shim on the nose doubler immediately opposite the exhaust stack of the motor to prevent charring of the finish. Color decoration gives the modeler a chance to show some of his individuality so why not think up some new color schemes and patterns. It never ceases to amaze me when I see a model that faithfully reproduces the decorative scheme of the original—you can probably do better than the designer so let your imagination fly.

One small point on the MK Wheels, if you use this type, remove the air-trap tire and smear some epoxy glue to the hub before replacing the tire, this prevents shedding the tires on landing.

#### INSTALLATION

Some things I feel really strong about

and radio installation is one of them. Get me to lecture you some day on the poor standard of radio installation and the dangers involved from these 'botch ups' — I will bore you for hours! Nothing looks worse, or is potentially more dangerous, than a rat's nest of wires creeping all over the innards of the model. The more loose wires, plugs and sockets and individual items of equipment can be avoided, the greater the reliability of our equipment. With G-G we have an excellent chance of doing just this with only one actuator and a fairly simple wiring arrangement. The mounting board system shown on the drawing has been used for almost a year now in seven or eight different models and has proved itself time and time again. To change the board from one model to another takes only a matter of minutes and can be carried out quite simply on the flying field. All wires except the leads to the DEAC pack are securely contact cemented to the underside of the mounting board and thus avoids any risk of failure through flexing. A straining line should be fixed from the battery pack to the mounting board, shorter than the leads, to prevent any strain on the latter. Halco Products 103 Galloping Ghost system features the receiver, actuator switch, etc., ready mounted on a p.c. board and this also suits the Ghost Rider fine — just adapt the hardwood bearers to suit.

#### FLYING

Little information is to be gained from test glides with this model, much more important is to be sure that all flying surfaces are true, correctly aligned and the center of gravity is in the place shown. Pick a day when as many things are in your favor as possible, you know, the wife has taken the kids to stay with her mother for a few days, your bank manager has gone on holiday and his stand-in does not know about your overdraft, and the weather conditions are perfect (it takes about two years to co-ordinate that lot over here!). Take your courage in both hands, or from the bottle, and fire the engine to full speed. Check, and check again, that all systems are go and throttle back to about 2/3 revs by the transmitter button or switch. If you have a good take-off strip available, start right



## From RCL 1968

off with an attempted take-off. If you only have a grass or dirt area then get someone to launch the model fairly fast and straight ahead. Do not be tempted to over control in the early stages, just concentrate on making only sufficient control movement to keep the model heading up-wind. When you have reached a reasonable height, (100-150 feet) and you have had time to wipe off the beads of perspiration from your forehead, try opening up the throttle, but first put the model into a turn to avoid the pitch-up movement normally associated with motor control changes. Correct any natural turn and climb or diving tendencies with the transmitter trims, noting the action taken. Although the trims on the transmitter are extremely useful in initial trimming flights they should not be considered as a substitute for correct trimming of the model and first flights should be aimed at achieving just this. After those first few flights you should be getting the feeling of the Ghost Rider and ready to try out some more exciting maneuvers — sure there is still plenty of life in those batteries? Try a loop to start with, put the model in a slight dive into wind to build up a little extra speed and pull back on the stick. If the model is correctly trimmed she should go round without dropping either wing, the speed build up during the last quarter of the loop is sufficient to carry on with consecutive loops. A word about the Enya .09 engine used in the original Ghost Rider — it is one of the best and most powerful small engines I have had the pleasure of handling. Starting characteristics are first rate, even in sub-freezing temperatures, and throttling, too, is excellent with good pick-up to its powerful top revs. The Tornado 7" x 4" nylon prop suits this motor very well on the Ghost Rider.

Other aerobatics maneuvers you will soon learn to master, includes barrel rolls, (raise the nose about 30° above the horizon and give full rudder) stall turns, wing overs, Immelman turns, Cuban eights, etc. Inverted flight is possible, but difficult, the reason for this is because of the interaction of elevator and rudder. If you need to apply rudder correction when the model is inverted the elevator interaction causes the model to dive and the elevator movement available is usually insufficient to correct this dive. For those of you for whom aerobatics are the prime importance the size of the rudder and elevator can be increased but this may be at the expense of a slight 'gallop' becoming apparent in flight. With the rudder and elevator sizes as shown on the plan the Ghost Rider flies as smoothly as the proverbial silk, absolutely no twitching when the Rand Pak is used.

So there she is! A few evenings at the work-bench and you too can join the miniset and enjoy small model flying in small flying areas. If you have any comments about the model, rude or otherwise, just send them in to Don Dewey and he will pass the nice ones on to me. Do not hesitate to look me up if you come over to this country and don't forget to bring your dollars with you — we need them.