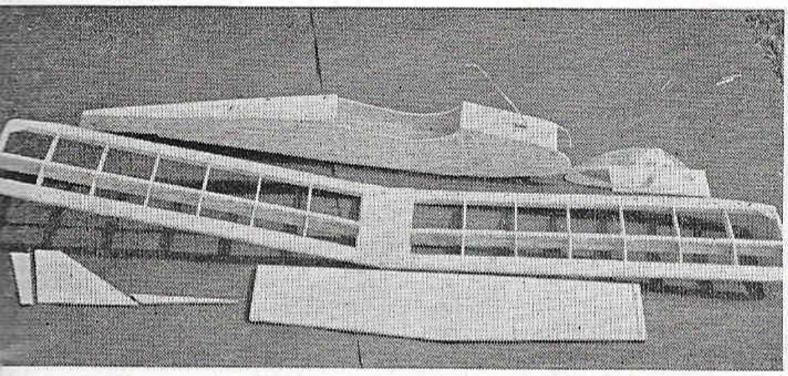

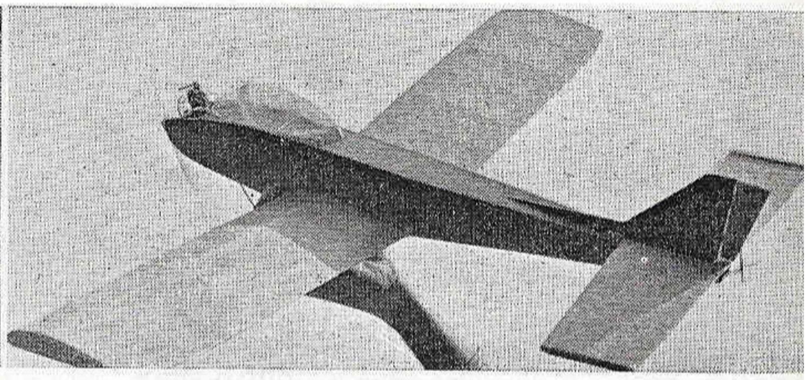

# Sleek Streak.....

## A SIMPLE PULSED RUDDER MODEL FOR SMALL ENGINES AND SINGLE CHANNEL RADIO

**Designed by PETER HOLLAND**

HOW about a low winged model for a change? With modern lightweight equipment the small low winged model becomes a more practical proposition. Escapements, whilst an admirable solution for many models are now starting to be eclipsed by the use of ultra simple pulse rudder control. The recent contest at Rouen showed how well this form of control performed, in fact the winner of the single channel contest was a low winged, pulsed rudder aircraft of about 36 in. wingspan. If you use a pulse transmitter or fit an extremely simple pulser to almost any single channel transmitter quite an accurate degree of control can be available.

The standard circuit for multivibrators shown on page 387 could be made to switch a transistor transmitter such as the Easytran, or a relay used to switch almost any other transmitter. A small receiver which is insensitive to interference when using motors of the Mighty Midget, T03 or T05 types is simple to wire up either by using the bridge network shown in our "Pulcycle" in the June 1964 issue or a T.A.S.A. to boost the drive to the motor. A model as small as this does not need much torque to move the rudder so the T05 and the 141:1 gearbox can cope with the load.

Sleek Streak has a simple box fuselage but the side profile gives the appearance of a more sophisticated aircraft. The forward position of the cockpit serves to tidy up to nose and provide forward side area which has proved to be a useful aerodynamic feature. $\frac{1}{16}$ in. sheet sides are reinforced with $\frac{1}{32}$ in. plywood doublers from behind the T.E. right up to the nose. The tank and battery bay is accessible by removing a small hatch which carries the cockpit canopy. The battery leads are terminated in a polarised snap fastener and plug on to a similar fastener on the outside of the fuselage. This eleminates switches, permits monitoring of the battery voltage, receiver consumption, and may be used to connect a charger if DEAC cells are used. A flexible mounting is used for the T05 motor and a torque rod to the rudder ensures that slight fore and aft movement of the motor does not affect the rudder neutral position. A thin piano wire coupling is used to connect the torque rod to the slotted end of the gearbox shaft and a rubber band serves to centre the rudder. The band need not be tight enough to bring the rudder central when the batteries are disconnected, the band merely biases it towards neutral when a pulsed signal is fed in. Almost any pulse rate can be used between two and 10 C.P.S., the higher the rate the smoother the rudder movement but some receivers may not follow a high rate accurately.

### Wings

Whilst the author prefers expanded polystyrene wings for speed, simplicity of construction and general toughness; orthodox construction is shown on the plan. Parallel chord has been chosen so that all ribs are cut to the same profile and thick preformed leading and trailing edge stock is used. The spar is cut from $\frac{3}{32}$ in. hard sheet and notched half way down at each rib position. This makes an accurate assembly when the spar, leading and trailing edges are pinned to the building board and the ribs cemented into the slots. A $\frac{3}{16}$ in. square spar is

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then cemented into the upper rib slots and when cemented to the top surface of the spar, restores the strength therein, which otherwise would have been lost when it was slotted.

No leading edge sheeting is used and the two centre bays are sheeted top and bottom with $\frac{1}{16}$ in; laid over the ribs, spar, leading and trailing edges on the upper surface and let into each bay of the centre section on the lower surface.

No dihedral brace is used at the trailing edge, but a piece of 16 s.w.g. piano wire 3 in. long, bent to the appropriate angle is cemented to the trailing edge with a piece of bandage. This prevents the wing bands cutting into the wood.

Access to the radio compartment is obtained by removing the wing. No undercarriage is fitted, for grass flying landing gear tends to be more of a hindrance and a plain skid such as that used on "Twophin" is quite sufficient.

A small two wheeled undercarriage could be bent from thin dural, screwed to a strip of $\frac{1}{16}$ in. plywood and retained under the wing bands. The nose skid would still prevent the model nosing over when landing, and the undercarriage should be almost as effective when operating from a runway.

**Tail Surfaces**

Medium quarter grain sheet balsa is used and the top of the fin and tips of the tailplane are prevented from warping by cementing strips of $\frac{1}{4}$ in. by $\frac{1}{16}$ in. balsa each side as shown in the sketch. This is best done after sanding the sheet smooth. The rudder is hinged on strips of .005 in. polythene or Mylar; slit the rudder and fin at the adjacent edges, push the Mylar in after coating it lightly with cement and when set drill two holes so that it may be pegged in place with a scrap of dowel or cocktail stick.

The usual 20 s.w.g. yoke assembly is fitted between the rudder and the torque rod, the rear bearing of which is a scrap of tin crimped round the back of the fuselage.

**Covering**

The wings may be covered in silk or heavy Modelspan and the fuselage and tail surfaces with light Modelspan. If you use a heavy colour finish, the model may need about .75 c.c. for the best performance, the designer prefers to keep the model as light as possible by using natural coloured coverings to provide the colour scheme chosen and a small amount of lining with colour dope. The original model uses a Dart .5 c.c.; in general low winged models seem to require less power when flown single channel or free flight. The motor which on the installation is shown as a radially mounted unit may be screwed directly to the $\frac{1}{8}$ in. plywood bulkhead (F.1), beam mount versions have stub bearers Durofixed to the plywood doublers and reinforced with scraps of $\frac{1}{4}$ in. square balsa.

**Installation**

The model may be used with a conventional escapement but no tests have been made with the model using this form of control. Providing the electric motor, receiver and the batteries are placed as shown in the plan the model should balance on the designed C.G. position. Different wood selection and finish may make the model tail heavy, a larger motor may offset this, move the batteries to obtain the correct balance. A firm padding of sponge rubber or plastic in the battery bay ensure that they do not move unnecessarily and the fuel tank should be similiarly packed for the best feed position. The tank may be a very small polythene bottle or a metal Team Race C/L type. Make sure that the vents are terminated in Neoprene tubes led out through appropriate holes in the fuselage. The receiver is lightly packed in with foam rubber and all wires are first doubled back for 1 in. and Sellotaped firmly to the receiver, etc., this makes sure that the leads do not fracture within the case or at soldered connections. It pays to make up several sets of dry batteries (a couple of U7s) with flying leads terminated in polarised snap fasteners. This makes battery changing the work of a few minutes.

**Two Circuits**

If you build a T.A.S.A., no centre tap is necessary, but it does take five extra transistors. The bridge system using a 10 ohm wire wound resistor in place of the escapement means that a separate centre tap lead must be taken from the batteries and connected to the motor via a third snap fastener inside the model. This need not be disconnected when switching off as both the other battery leads (+ and −) are broken by unplugging the main polarised snap fastener.

**Flying**

Don't be frightened . . . you may have heard that low winged models are not so stable as the old cabin high winged type, the fact is, modellers have been flying shoulder wing single channel aircraft successfully for years. Increase the forward side area slightly, keep the centre of gravity fairly low, use a good solid form of wing construction with a spot of wash-out, more dihedral; and the stability is hardly changed. Furthermore with the thrust line high in relation to the centre of drag, stalls are ironed out more quickly than with a really high winged model.

Proportional control ensures that the model is not over controlled (unless the pilot is completely new to the game) and an instinctive movement of the control knob will control stick enables wide turns to be made without the twitching associated with escapements.

For flying a precision course; add a little downthrust, or a very small elevator trim tab to give less climb. Beware of a nice brisk climb, this is the easiest way to make rudder only control, whether it be proportional or bang-bang, into a series of stalls and loops.

Most beginners fall into this trap, for once the model has started zooming and stalling all over the sky, control becomes ineffective and the only thing to do is to wait until it has flown itself into a stable state again. It takes skill to apply rudder at the right time to kill a stall so for those first few flights if you are a beginner, let the model have its own way a bit, gently displace it in the direction you need a little at a time. If you want to do a ground to air range check; fly it up wind, if you lose control it will drift back to you where you can see the effect of your signal as it comes back into range. With proportional rudder the model will probably turn as it gets near the limit of its range and this will be a good indication how far to go. In any case the model is quite tough so that with complete lack of signal it will spiral down. After all, damage is better than complete loss.