

at first!) so that these may be a lead to the more involved manoeuvres that you will be doing later. Another thing to work on is recovery from inverted flight by half an outside loop. This consists of a shallow dive, followed by down elevator to bring the model up and over to normal high level flight.

From here one progresses to the horizontal "8" stage—a stunt that looks a lot harder than it actually is. Simply, it is a half-a-loop, an inverted dive and a recovery as detailed in the previous paragraph. Practice this so that the two parts of the "8" become perfect circles—and for exhibition flying make the lower part of the loop as near to the ground as possible.

When you are able to do horizontal "8's" without thinking about them you are ready to tackle the overhead variety. The essential here is speed—or the model may fall in on you! The safest way, for a start, is to do horizontal "8's" rather high so that the tops of the loops are over your head. Then, when you are used to the higher positions, work up so that the intersection is directly above your head. Again, keep the circles large to maintain plenty of speed. Do not attempt to turn round with the model—stand still and turn your head and shoulders to keep track as it goes over. You can then do overhead "8's" for as long as the fuel lasts without becoming dizzy or losing the model in relationship to the ground.

We do not suggest that vertical "8's" be attempted on anything less than 60 ft. lines. Start a fairly large loop from low level, then apply "down" elevator at the top to complete an outside loop—with the peak point over your head—then apply considerable "up" to dive out and revert to level flight. This is not a simple manoeuvre and one which could be troublesome if sufficient height were not left at the bottom of the outside loop. Break off immediately into inverted flight if ample height is not available—it's much safer!!

Vertical "S's" are simply parts of the "8" and may be started from high or low level. We only recommend the high level start for demonstration flying—where safety may be somewhat sacrificed to thrills for spectators.

The notes given above are, of course, rather abbreviated and do not represent the full story of stunt flying. They will, however, provide you with some ideas on the right and safe way to tackle this fascinating type of control flying. We can only tell you to keep at it—and wish you the best of flying!

The Society of Model Aeronautical Engineers has laid down a standard stunt flying schedule. A copy of this can be obtained from the S.M.A.E., 19, Park, Lane, W.1.

INSURANCE:

Note: All power models should be insured against third party risks, and it is the owner's responsibility to get this arranged before flying, either through your local club, or write to — The Secretary, S.M.A.E., Londonderry House, 19, Park Lane, London, W.1.

POWER MODELS:

Frog "45", 45" span. Free Flight	for "100", "150".
Powavan, 47" span. Free Flight	for "100", "150".
Tutor, 39" span. Free Flight	for "80", "100", "049".
Tyro, 17" span. Control Line Trainer	for "80", "100", "049".
Mirage, 15" span. Control Line Team Race	for "80", "049".
Condor, 32" span. Control Line Stunt	for "100", "149", "150".
Hornet, 21" span. Control Line Team Race	for "100", "149", "150".
Gladiator, 36" span. Control Line Stunt	for "249", "349".
Chimp, 22" span. Control Line Sport	for "049", "80".
Tempest, 26" span. Control Line Scale Model	for "249", "349".
S.E.5A, 22" span. Control Line Scale Model	for "100", "150".

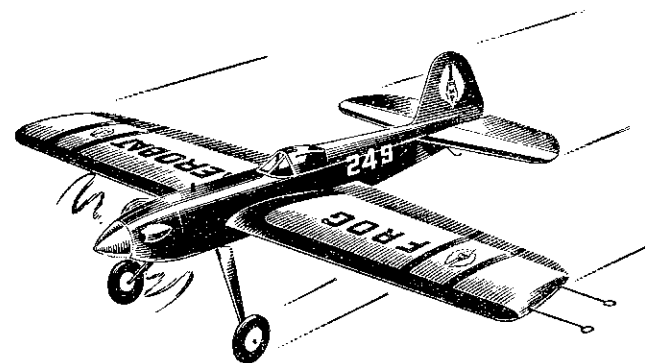
GLIDERS:

Wasp, 12" span, Solid Balsa
 Dart II, 15" span, Solid Balsa.
 Wren, 25" span, Lightweight.
 Vespa, 30" span, Lightweight.
 Diana, 36" span, Medium weight.
 Junior Sailplane, 20" span, Lightweight.
 Skylark Sailplane, 27" span, Lightweight.

RUBBER POWERED:

Junior Series. 12" span. (25 different models).
 Senior Series. 18" — 22" span. (9 different models).
 Mamba, 19" span. Minx, 30" span.
 Goblin, 24" span. Witch II, 36" span.

INSTRUCTIONS FOR BUILDING AND FLYING THE **FROG** **"AEROBAT"**



**FULLY AEROBATIC
 CONTROL/LINE MODEL**
 38" span

CAT. No. 689KP

Made in England by

INTERNATIONAL MODEL AIRCRAFT LTD.
 A product of the LINES BROS. GROUP of COMPANIES.

INSTRUCTIONS FOR BUILDING FROG AEROBAT

FUSELAGE.

Commence construction by cementing the two plywood bulkheads to the fronts of bulkheads B1 and B2 then set aside to dry. The next job is to build the fuel tank; this is straightforward. Mark out and cut the tinplate supplied to the dimensions and instructions given on drawing, and solder the parts together. SEE FIG. 2.

Next mark out the positions of the cross braces on to the 3/32in. balsa fuselage sides; having done this, cement longerons and cross braces in place (make sure to build one side opposite to the other) then cut the slot for the control rod to pass through in the starboard side.

The undercarriage can now be sewn onto bulkhead B2 after drilling the 1/16in. dia. holes as shown on drawing, SEE FIG. 3; also drill an 1/8in. dia. hole in bulkhead B1 for the fuel pipe to pass through; next cut the engine bearers to length and assemble these parts together as shown in FIG. 4. Next assemble the fuselage sides to this unit and add the remaining bulkheads as in FIG. 5.

This is as far as you can go with the fuselage for the time being.

TAILPLANE AND FIN.

Build up the tailplane as shown on the drawing including the control horn; then cement the tailplane in position on the fuselage. Next fix the two fin pieces together and when set, sand to the section given on drawing (the curved surface faces the port or left side) then cement fin into position.

The rear fuselage sides and top can now be fixed, also the tailskid assembly built and cemented into place. Then put fuselage aside to dry.

WINGS.

Build both wing halves over plan following instructions given in FIG. 6, 7 and 8. (Do not fix flaps to wings until these are fitted to fuselage). Assemble control plate onto plywood mounting piece and fix to wing. Next slide the leadout wires through the port wing and assemble them to the control plate with washers as shown on drawing.

Bend the control rod to the exact shape given on drawing, then bind and solder the flap link and washers (this is a short piece of control rod wire) in position. Make the control plate connecting piece from the copper tubing supplied and solder it to the end of the control rod (see drawing). Next slide the control rod through one of the wing openings in the fuselage and pass the rear end out through the slot at back until forward end is clear of the wing openings. When wings are completed, slide them through the openings in the fuselage and fix with plenty of cement. The control rod can then be brought forward again and connected to the control plate with the 10BA nut and bolt (see drawing) and at the rear to Elevator horn, fixing with washer (see tailplane drawing).

FLAPS.

Cut flaps to shape given on drawing and sand to correct section. These can now be assembled to the wings with strips of tape. Bend the flap control wires to shape. Now pass the looped end of the flap wires through the holes in fuselage where the trailing edges of the wings meet the fuselage; then fix them to the flaps with tape as shown on drawing of wing. Having fixed the flap wires, spring these over the short link on control rod (see drawing).

FUSELAGE CONTINUED.

The front fuselage top can now be covered with 3/32in. sheet; also the bottom of fuselage.

Cut the undercarriage fairings to shape and assemble to undercarriage wires. Next fix the wheels into position.

Build up the engine cowlings as shown in FIG. 9, hollow out as necessary to clear engine, and carve and sand to shape.

COVERING.

Two grades of tissue covering are supplied, the heavyweight for the wings, and the lightweight for the fuselage and tail assembly.

Cover the wings in the normal manner using clear dope or office paste as an adhesive.

Then cover the fuselage and tail assembly. Clear dope is the best method of fixing tissue to a sheet-balsa surface. Cut the tissue to the shape required, then lay it over the area to be covered, and fix it down with dope, generously applied with a brush on top of the tissue.

When the whole model is covered, water shrink the wing covering, and when dry, give the whole model two or three coats of clear dope. The final

colour scheme is left to the individual, and it is advisable to give the model a coat of fuel-proofing.

This completes the construction.

ENGINE.

Fix this to the model with the 4—6BA bolts and nuts supplied, on the right-hand side of the bearers, with the throttle lever projecting below.

Connect a piece of fuel-tubing from the tank outlet to the carburettor; fit the propeller, then the spinner, using the special bolt which screws onto the end of the crankshaft.

Use an 8" dia. x 6" pitch, or 9" x 6" propeller, either plastic or nylon; if the 9" x 6" is used, thin the face of the hub down a little to enable the spinner bolt to fit on the front of the crankshaft.

FLYING.

You will need a pair of steel control wires 60'—65' long, x .010"—.012" thick, and a control handle, to which the wires are attached. These should have small loops formed at each end—well-soldered to secure them, and use small split key rings to connect them to the model and the control-handle.

STUNT CONTROL LINE FLYING

This article deals with advanced control line flying, i.e. beyond the "wing-over" stage which of course, is reached with a trainer model.

The first important thing about aerobatic flying is that it is not difficult—provided it is tackled the right way and a suitable model and engine are used.

A word may be said here about two very important factors—the weather and the sun. ALWAYS make sure that aerobatics are carried out on the DOWN WIND part of the circle—do not attempt any fancy flying up-wind or in a wind of over 15 m.p.h., until you are really sure of yourself and the model. Also, if the sun is at all strong wear sun-specs or an eye shield.

Length and thickness of control lines are other factors which must not be ignored. Fly the "AEROBAT" on lines of 60/65ft. Wire diameter should not be more than .015in. The control apparatus (handle, lines and bell-crank) should conform to a minimum breaking strain of five times the weight of the model. On short lines—until you have mastered stunt flying and can "unwind" yourself by intervals of inverted flying—you will become giddy. With wires which are too thick—and therefore too heavy—you may run into trouble on windy days. IMPORTANT: Always check your lines for "kinks"; always check the controls, and always do a "pull" test before starting a flying session. THESE CHECKS ARE VITAL!!!

The first stunt is obviously the loop—and, in fact, this manoeuvre forms the basis of many other patterns. It is easy—fly straight, and level, about 25ft. high; nose down gently to increase speed and at 15ft. ease back the control handle—steadily and NOT jerkily—to complete a loop. It is not necessary to use full "up" elevator—too coarse handling will cause a partial power stall or "mushing" with a dangerous loss of height and speed. The thing to remember is that the model must be flown round to maintain a circular flight path. Do not worry at this stage if the height of the loop is above the 60° line angle required for contests—this may easily be reduced later on. Practise loops, one at a time, and with plenty of height, until you are able accurately to gauge the control movements required.

When you have mastered the single loop, try to arrange your "pull-out" to provide the height and speed required for another one. It is now that you will see how essential it is to maintain adequate flying speed all the way round—if you start your second loop with the model "mushing" you will not complete it successfully, so do not hesitate to break off the manoeuvre if in doubt. It is practice—and practice alone—that will enable you to do this correctly, so take your time!

We have already said that the loop is the basis of most stunts—now you may begin to make use of this fact in teaching yourself to fly inverted. Do the first half of the loop in the usual manner but at the top neutralize the controls—only for a second or two for a start—then pull out to complete a rather elongated loop. With practice (here's that word again) you may prolong the inverted period so that you become used to the reversed controls. The vital thing here, is to remember that hard "up" elevator will get you out of trouble if necessary because you started inverted flight high up. Spend a lot of time developing an "inverted" technique, until you are quite happy about the reversed controls. Teach yourself to climb and dive (shallow ones