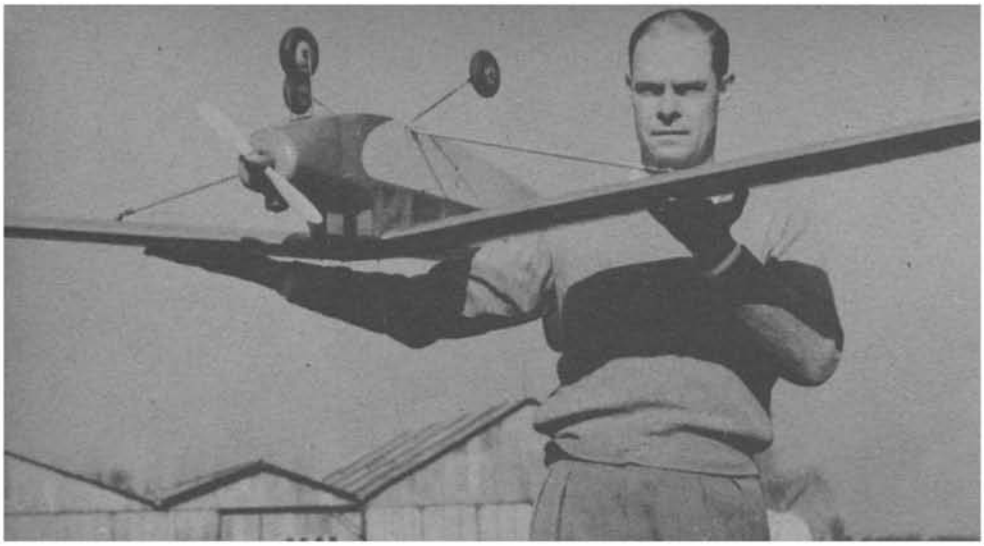
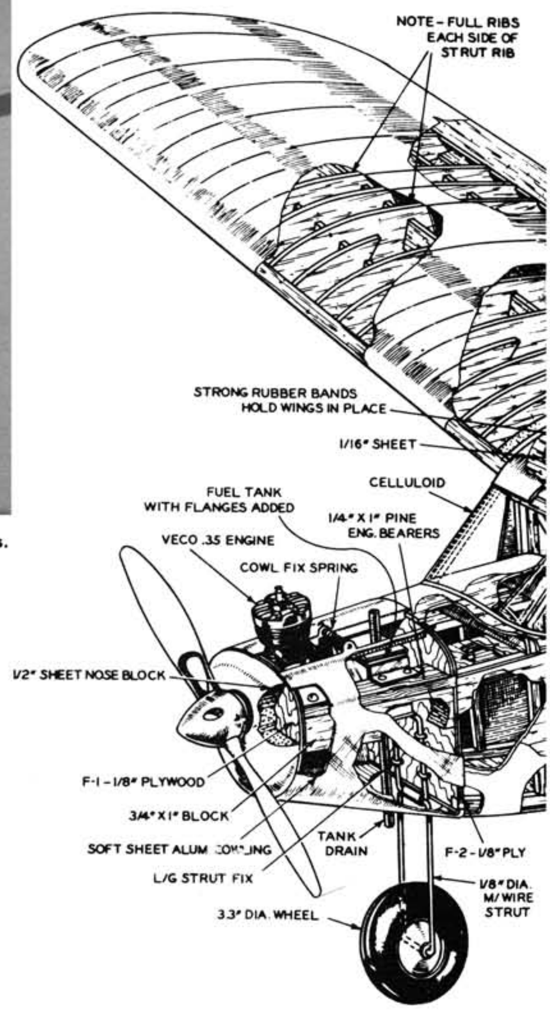


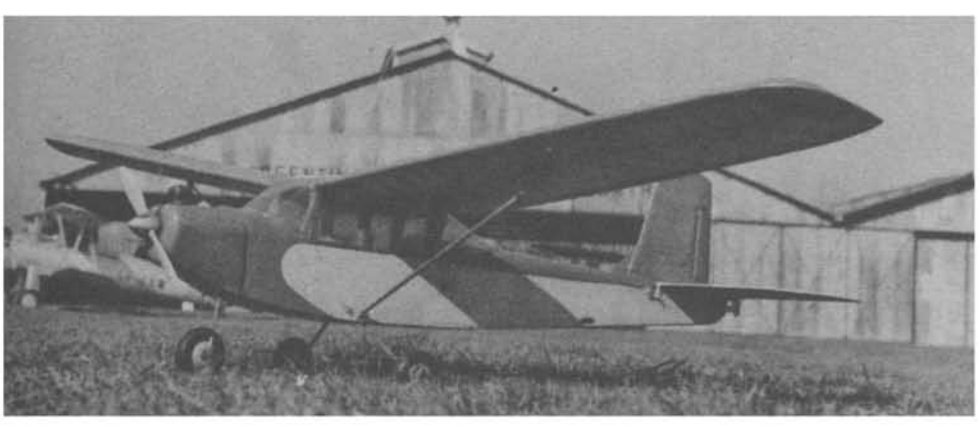
The wings go to this negative angle of dihedral when the aircraft flies inverted. Really works.



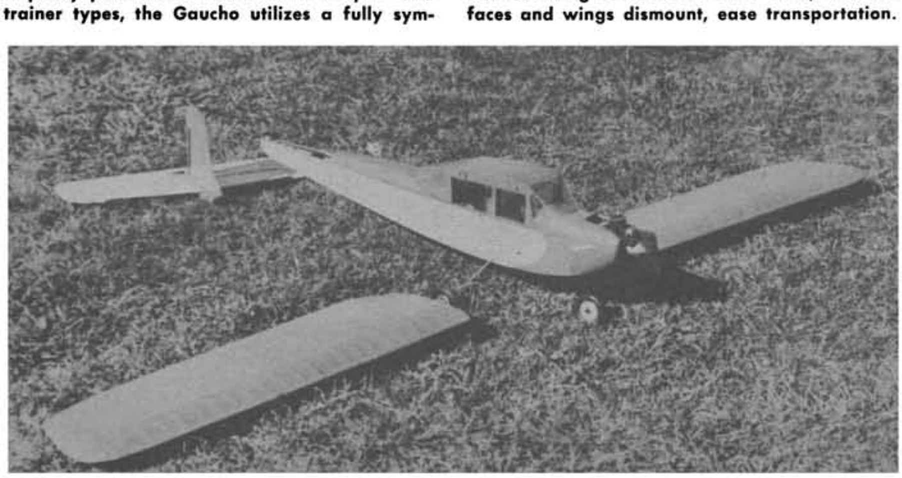
Gaucho

by JOSE IGNACIO IRIARTE

Argentine National RC Championship plane is a fantastic stunter on just single-channel radio. Reversible dihedral and clever use of a simple servo allow an inverted pattern and aerobatics.



A pretty plane that looks like most sport and trainer types, the Gaucho utilizes a fully symmetrical wing section. As seen below, tail surfaces and wings dismount, ease transportation.

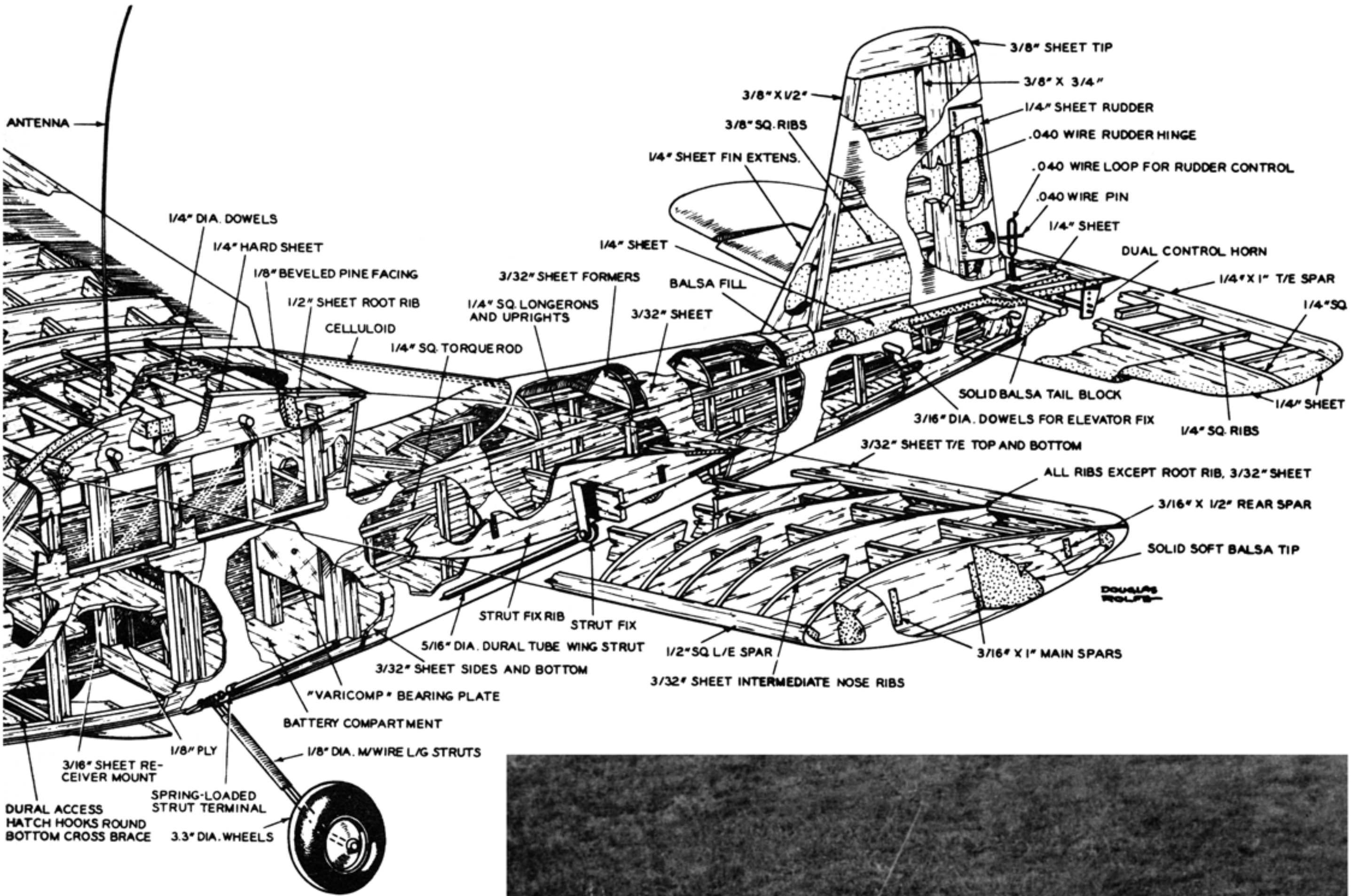


► Although designed to make inverted flight as easy as normal flight, Gaucho has many structural and aerodynamic characteristics that recommend it for both sport and contest flying.

Central idea is the symmetrical wing section (NACA 0015) combined with telescopic, supporting wing struts. These allow the dihedral angle to be altered to a new position during inverted flight, which gives the machine great stability when inverted. Stability while inverted is equal, if not greater, to that in normal flight.

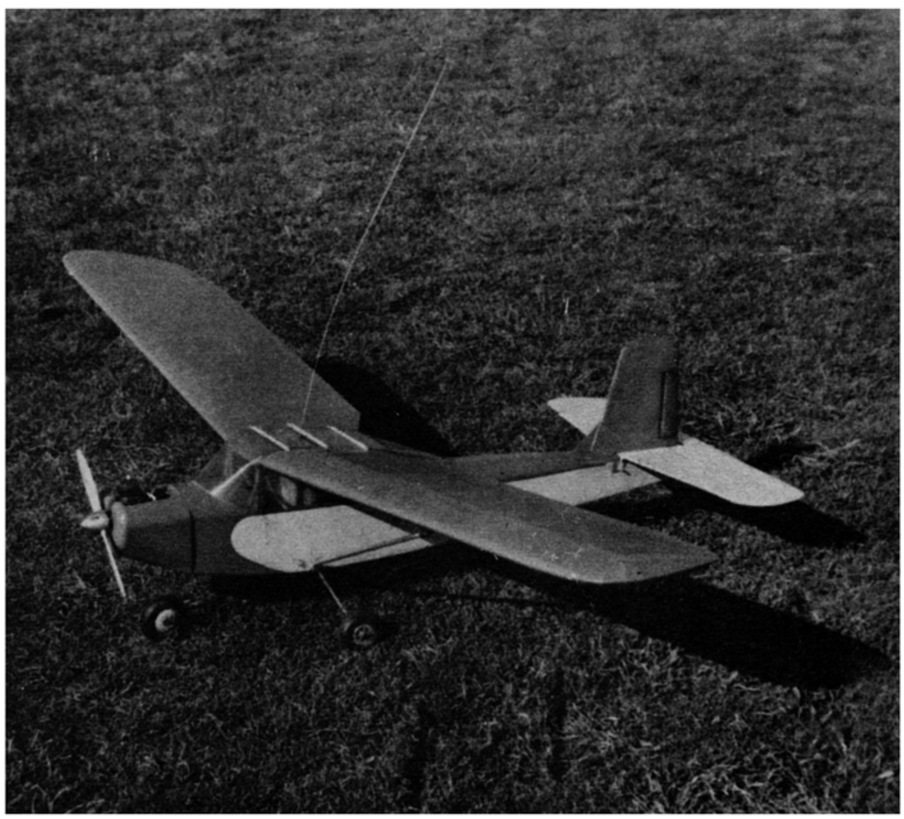
The horizontal stabilizer has the greatest possible area movable so that only very small angles, and thus loads, have to be carried by the elevator during inverted flight. A large capacity tank allows the engine to function whether upright or inverted. The model is exceptionall robust, having survived several earthshaking accidents, suffering only slight scratches of the paint job. The accompanying photographs were taken after more than 150 (not all successful!) flights.

The radio equipment is neither costly nor complicated. We use a Citizenship 27 single-channel receiver that actuates a Bonner compound escapement of three positions, to which a fourth contact has been added so as



to allow the "blipping" of the engine's Bramco throttle—which gets its muscle power from a Bonner carburetor escapement. The elevator is moved by a deBolt 2P2N that is controlled via the third position of the Bonner escapement. This seems contradictory because the Bonner works on three volts while the servo needs only 1½ volts. What happens is that when both the Bonner and the servo are working simultaneously, the voltage drops sufficiently so as to not allow the servo to pass its correct position. On the other hand, the greater-than-normal-voltage assures us that the servo will function perfectly at all times.

The aerodynamically-balanced rudder is actuated by means of the familiar torque rod. The elevator also is moved by a torque rod, for which an opening with an appropriate bushing is made in the rear of the fuselage. This torque rod has at its end, a short piece of soft wire; a spiral is bent in the soft wire and an extension of the wire penetrates into the elevator control horn. According to the way this wire is bent, more or less movement is obtainable at the elevator. The incidence of the latter is graduated by means of the two cross wires of the elevator control horn. These are moved up and down on the dural supports which have a series of holes 3/32 inches apart. Care must be exercised when drilling these holes to make certain that corresponding holes will place the wire parallel to the elevator surface.



Strong rubber bands—just keep them fresh—provide reliable tension, along with telescoping wing struts to hold wing panels in plane. Ship had 150 flights logged when article was written.

Various combinations can be obtained with this system. For normal flight only, the neutral positions of the servo are made by bending the soft wire attached to the elevator torque rod to coincide with the high and low positions of the elevator, thus allowing the elevator to be moved to three different positions. Lower neutral is for normal flight; with the signal on an intermediate (*Continued on page* 42)

FULL PAGE PLAN ON NEXT PAGE

Gaucho

(*Continued from page* 17)

attitude of flight is obtained; with the high neutral, a stalled flight is achieved. This allows beautiful loops for, with the lower neutral position, you gain flying speed by means of a spiral dive, pass thereon the elevator position to the high neutral, and thus obtain very tight round loops at all times, having rudder control available in case of any drift.

These positions also enable us to achieve very realistic landings, as the position is first held at low neutral to make the approach, changed to intermediate for the final precise maneuvering, and finally allowed to go on to the high neutral, flaring the model out for a perfect three point landing—at a very low speed. Having the neutrals coincide in two intermediate positions, we thus have four positions of the elevator available: low neutral for fast flight, high neutral for almost stalled level flight, high position with signal on for a looping or very stalled level flight, and finally low position with signal on for a very sharp power dive. The landing is made by allowing the ship to approach in the high neutral position, always having control of the rudder available, and flaring out about three feet off the ground by giving the signal and passing the elevator to its highest position. Care must be exercised as to the sequence, for a nose dive might result instead of a flare out, with the corresponding loss of points—and face.

For normal level and inverted flight: the high-neutral point is made to position the elevator for normal level flight and the low neutral corresponds to normal inverted flight; we then have two more positions which will give us a mild, (90°) dive, and inverted loops. The elevator must move approximately ⅝ inches between extreme positions. The easiest way of entering inverted flight is by means of the following precedure: the engine is throttled down and the elevator is pulsed to its lowest position. The model executes an outside loop from which you recover at the bottom by simply releasing the "button", letting the elevator neutralize in the positions corresponding to normal inverted flight. In this position, all kinds of simple maneuvers, such as, lazy eights, turns, mild spirals, etc., are feasible.

With a good motor control, "grass cropping" inverted flying is possible. This last maneuver is not only nerve racking but also, very impressive as far as the judges are concerned and, believe it or not, quite safe. Anyway, you will quickly learn how to rebuild rudders in a single spare evening's time! Seriously, though, you need not worry about the invertible dihedral, as with boring regularity the wings assume their correct positions whether in normal or inverted, thanks to the telescopic wing struts. The only warning in this respect is that the wings must be very firmly secured, with strong rubber bands that will not deteriorate with either the fuel used or the sunshine, for weakened bands can cause your wings to separate from fuselage when entering inverted flight.

CONSTRUCTION

The fuselage: Is completely sheeted with medium 3/32 balsa over its ¼ square balsa framework. The two sheeted sides can be assembled upon a flat building board, thanks to its rectilinear top profile. The cabin is assembled with very hard ½ square balsa, properly aligned, and then the rest of the structure, including the reinforcements, is added. Next are the front and back turtle decks. It is necessary to install the motor control escapement before installing the front turtle deck. This will save time and trouble later. You probably will find that the same can be said for the rudder escapement and the elevator servo. The whole airplane, including the fuselage, is covered with heavy Silkspan, or, even better, silk. Now is the time to do this with the fuselage, doping and sealing it properly.

The landing gear and the inspection doors are next installed. The latter are made of thin aluminum, bent so as to fit over the framework, and with two clothes snaps in the back. There are three inspection hatches: one for the motor escapement, one for the radio equipment, and one for the servo and escapement. The bent edge faces the front. The radio equipment is mounted on a sliding panel which is positioned against the foremost cabin bulkhead. The motor is mounted on false bearers, which allow for any adjustment that is found to be necessary, and also allows the rest of the plane to come unscathed from any "accidents" you might have. Both engine and fuel tank are mounted under an aluminum turtle deck, which allows fast checking of these components, similar to full-size practice. This turtle deck is secured by means of springs. The gas tank should be of an appropriate capacity—from two to four ounces. Either the "clank" type popularized by deBolt or the Henry Eng. "clunk" type common to "Smog Hogs" will do splendidly, allowing the full range of possible maneuvers to be executed without the worry of improper feeding.

Wings: The two half wings are perfectly symmetrical and could be interchanged were it not for the wing strut mounting. The ribs are made of medium 3/32 inches balsa. The wood sizes are indicated in the plan. The spars should be medium hard, the same as the leading edge. All the rest should be medium-weight wood. The rib corresponding to the strut support should be made of two regular ribs cemented together. The inboard end rib is made of ½ inch hard balsa, backed with ⅛ pine. This last reinforcement is so that the 3/16 dowels do not cause an enlargement of the holes through long and continuous use. The strut support should be made of dural and firmly cemented and tied to the main spar of the wing. Finally we cover the wings with silk, doping carefully so as not to cause any warps. The drilling of the holes for the dowels will be explained in detail later.

The wing mount struts are of 5/16 dural tubing, with one end flattened for its attachment to the fuselage. This attachment can be made with a bolt and locknut, but I prefer preparing a ⅛ x 5/16 copper rivet with a hole in its end. This is passed through the strut and support and secured by means of a bolt and locknut that end of the strut has an insert made of bronze and screwed in, with a ⅛ hole drilled in it. Through this hole goes a ⅛ steel wire, with an eyelet bent into one end and a screwed top fastened to the other. Two small springs dampen the shock of the abrupt change of dihedral. The strut is fastened to the wing support by means of a bolt and locknut that passes through the eyelet bent into the wire and the wing strut support. Some tolerance should be allowed for at this particular connection.

Control surfaces: These are of simple construction, being made of ¼" lightweight sheet stock. They are removable being fastened to the fuselage by means of rubber bands. The elevator is secured to the stabilizer by means of the popular thread hinge that is sewn in the shape of an eight. The elevator control horn must be securely fastened to the surface. If the elevator control horn came loose, the elevator would go into an undampened flutter, resulting in a rather messy nose dive. The horn cross wires are 1/32 music wire. The rudder hinge is a music wire, inserted at the quarter-chord point to balance the rudder aerodynamically. The fin should be well filleted, so as to direct the air stream entirely to the rudder. The whole unit is also covered in silk, and well doped, taking care that no warps appear.

The final, and perhaps most delicate, step is that of the drilling of the holes in the wing root for the insertion of the dowels that maintain the wing in its correct position. The simplest way is to prop up the fuselage so that its top is parallel to the surface on which it rests, and then to position the wings with between three and four degrees of positive incidence. The positions of the holes are marked on their proper places and the holes carefully drilled. These holes should open up from root to tip, in the shape of a funnel, to allow for the arc of motion of the dowel inside of them. Extreme care should be exercised so as to secure both wings with the same incidence.

The model now is finished. A durable paint job is a worthwhile addition. Our original was light grey and red.

It is recommended that the elevator be connected in the way indicated and that the travel of the same be short, say, ¼ in. for the first few flights. The center of gravity should be about 1/3 of the chord from the leading edge. Only when complete familiarity is achieved with both the model and the radio equipment, should the inverted flights be attempted. An "inverted" accident at a low altitude can be rough on the model. If care is exercised, this won't happen. It is my sincere hope that you will derive as much pleasure and satisfaction from this model as I have.