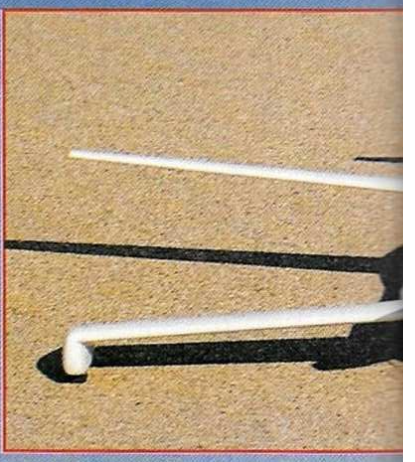


Shades of Star Wars!

AMS Oil

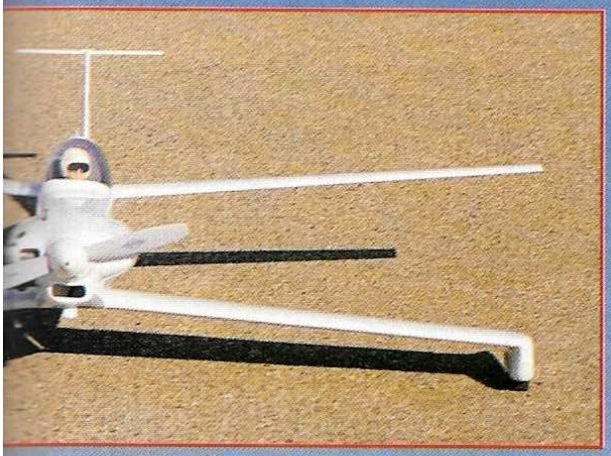
Giuseppe Ghisleri presents his semi-scale model of Bert Rutan s biplane pylon racer

Years ago a friend of mine gave me several back issues of the American magazine 'Homebuilt Aircraft'. Among the many beautiful and colourful airplanes, my interest was caught by a strange looking racing airplane designed by Burt Rutan. At first sight it resembled a 'Quickie', but this was an entirely new design, purposely designed for pylon racing, complete with check cowls in the purest Reno style.

What really attracted my attention was that this plane had two wings like the "Quickie" and an all flying little stabilator, if you can call a flying surface designed by Burt Rutan by any usual name. I had never previously seen this aircraft nor any model reproducing it. It seemed pointless to search for a three view drawing, so I decided to draw the model based upon photographs and overall dimensions as described in the magazine article. The model is therefore not true scale, but a comparison with the full-size photos shows it to be very close.

The Ams Oil was designed by Rutan for Don Mortensen to participate in the Reno races biplane class. I do not know if Ams Oil ever won a race, but it sure looks fast and it clocked 232 mph around the three-mile course at Reno in 1981. Rutan designed a new airfoil, which is said to have a laminar flow of 60 - 61 percent of the wing area in racing conditions. The test pilot reports, *"It took at least 30 seconds with power off to*

Bert Rutan designed AMS OIL for biplane class air racing.



Being all white and of unusual configuration could lead to disorientation, so keep her in close until you re used to how she looks up there.

AMS OIL likes tarmac the best.

Build AMS OIL and test your fibreglass skills. The cowling and wheel fairings are easy to make using the 'lost mould' technique.

slow down from 140 to 80 mph because of the superclean little airplane. At 80, I kept coming back very slowly on the side stick. The needle came down to 70 and, as it was approaching 60, the left wing dropped abruptly - no burble, no buffet, no nothing... I realised there would be no slow approaches in this airplane. The Ams Oil racer is a joy to fly..."

While this last phrase is applicable to the model, I have to say that having employed no laminar airfoil, it is absolutely impossible to stall it. Going back to the aircraft, its dimension are: 22 foot span on the upper wing, 20 foot 9 inches on the lower, and the fuselage is 22 foot long. The airframe is good for +/-12G, while the cockpit section was designed to withstand a 22 G load. The T-tail is no addition; Rutan designed it in right from the start to provide more elevator authority when needed for the 6G vertical turns.

Construction

Building Ams Oil is not a difficult task. Wings are made with obeche sheeted white foam *(wing and decking sets are available from the Nexus Plans Service, price on application)*. The bottom wings are reinforced with spruce longerons to carry the additional loads from the landing gear. A grooved hardwood strip is glued on the wingtip's bottom side, aligned with the longeron. On its side is glued a $\frac{1}{8}$" ply plate to retain the landing gear wire. These parts are better glued in before sheeting. The landing gear fairing is retained by self tapping screws into two little hardwood pieces imbedded in the foam. Glue and sand to shape the leading and trailing edges and glue together the wing halves.

Cut a longitudinal slot. Insert and glue with epoxy the $\frac{1}{8}$" ply wing joiner. Mount the servos as drawn on the plans. Doing it this way will not reduce the wing strength. Reinforce the joint with glass fibre as usual. The ailerons for both wings are shaped from sheet balsa.

The landing gear fairings are made using the "lost mould" method. Shape a block of heavy white foam or extruded blue foam to the form shown on the plan. Add a $\frac{1}{8}$" rib and fill the empty space with scrap balsa or foam. The most difficult part is making the glass tissue stay put, particularly on the bottom where the vertical sides meet the wing. I suggest using many layers of light tissue instead of a single heavy one. It's better to have a light fairing, which will be flexible and consequently less prone to breakage.

The all-flying elevator is made by gluing together two $\frac{1}{8}$" balsa sheets. Install the steel rod axle and control horn before gluing together the parts. The fin is cut from foam with the help of one template only. The cutting wire must rotate at the other end, round the point of intersection of the leading and trailing edge extensions. This is a simple way to cut the highly tapered surfaces. Sheet the foam with $\frac{1}{16}$" balsa and add the leading and trailing edges. Hollow out the foam to make room for the control rod and bellcrank. Glue the ply reinforcement in place and install the bellcrank and rod. The fin's top is glassed with lightweight tissue.

Onto the fuselage

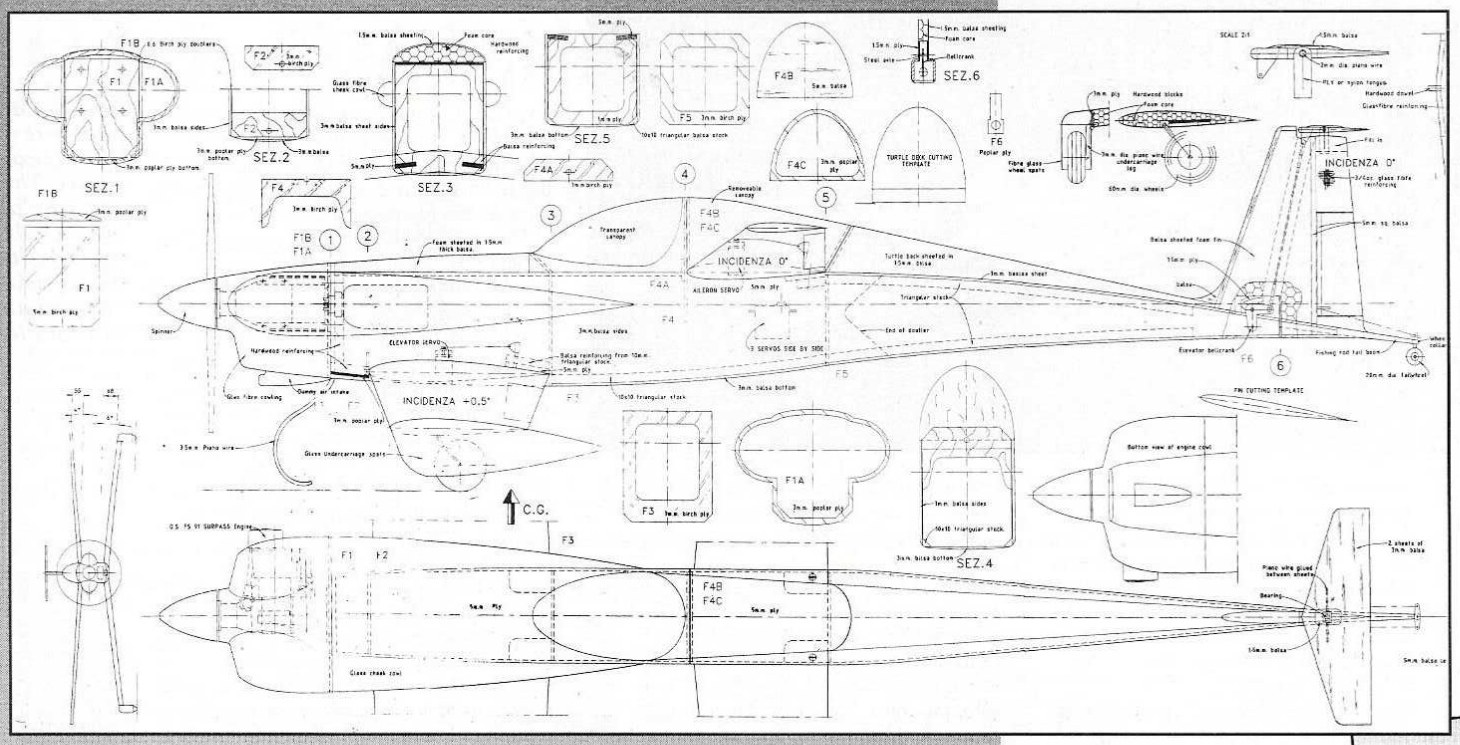
The fuselage is built upside down, as if it were a simple square box. In fact the only difference is the shape of the sides. These are cut from $\frac{1}{8}$" balsa sheet, reinforced inside with $\frac{1}{32}$" ply. Glue triangular balsa stock where shown on the plans. Pin the fuselage formers from F1 to F5 upside down on the building board. Align them accurately with the fuz centre line. With a clothspeg, pinch together the rear ends of the fuselage sides and insert former F6. Keep carefully aligned with the centre line and make sure that the sides are not warped. Glue F6 in position. Cut the fuselage bottom from $\frac{1}{8}$" balsa sheet and glue it onto the fuselage assembly whilst still pinned to the building board. When the glue is set, remove the fuselage.

The tail boom is actually a piece of a fishing rod. A wheel collar with a long screw soldered into its threaded hole will make a good bearing for the rear wheel axle. Cut off the screw head and file some flats. Insert this assembly, using epoxy, into the tail boom. This part can now be inserted into the hole in former F6 and glued to the sides with epoxy. Fill in with scrap balsa. Make sure that the wheel collar is correctly oriented.

Complete the basic fuselage box by gluing $\frac{1}{8}$" balsa sheeting on top. Forward decking may be shaped from balsa sheet or made with balsa sheeted foam. Round the top and bottom corners with sandpaper. Using the templates drawn on the plans, cut the foam rear decking. Once again it is a simple matter if you use the single template method previously explained. Sheet with $\frac{1}{16}$" balsa, add the $\frac{1}{8}$" ply former to the front, then sand to shape to mate with the fuselage top. When satisfied, glue in position. Glue formers F4A and F4B on to the fuselage.

I cut my transparent canopy from a Sig 'Zlin' canopy. It suit Ams Oil perfectly. The canopy is used to hold former F4B firmly in position. Cut a template from stiff cardboard to suit the space between F4B and F5. Remove $\frac{1}{8}$" from the front and rear ends to compensate for the ply former and cut from a block larger and higher than needed. Form the block to follow the wing seating. When done, glue the ply former in position. Hold the block with double sided sticky tape and sand to shape. Cover the block with fibreglass tissue. Remove the foam but leave at least $\frac{1}{6}$" adhering to the glass fibre. Two latches hold this assembly in position and allow for easy and speedy servicing. Make up the engine cowl and side cheeks from glassfibre to complete the fuselage construction.

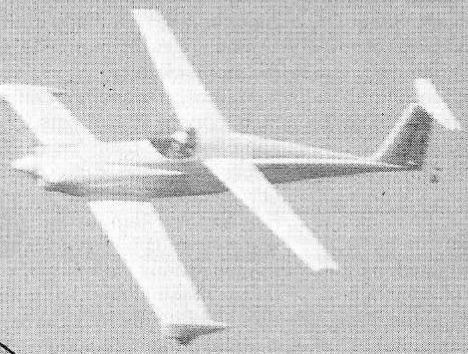
Deadstick for a perfect three pointer.

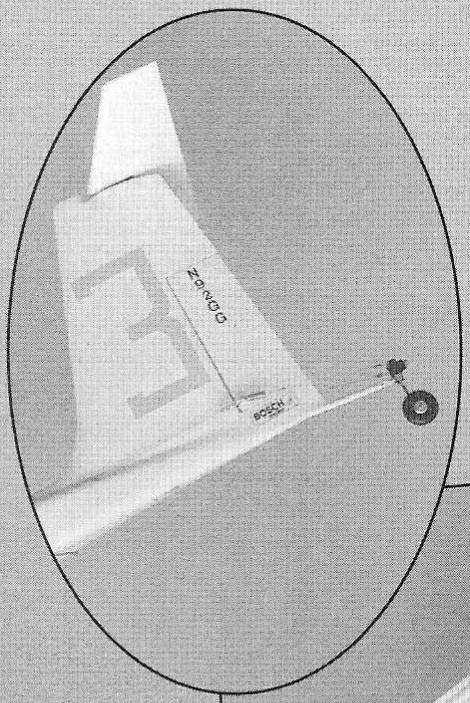


Setting up

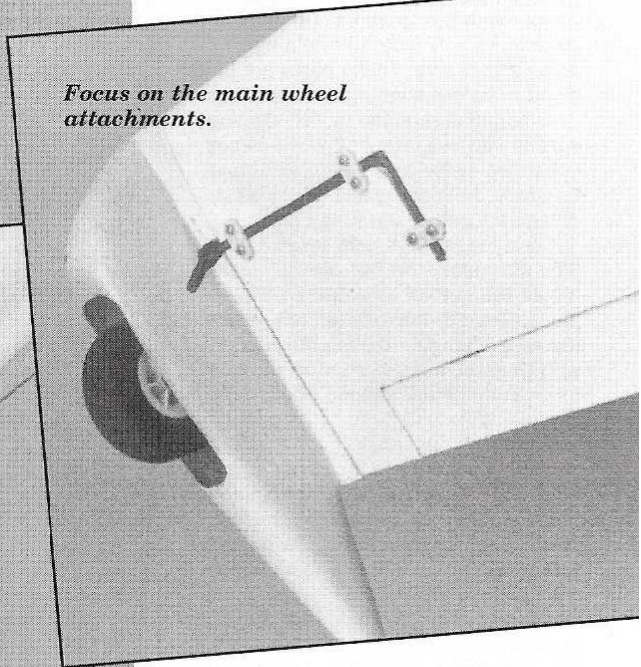
When I designed Ams Oil, I was concerned about the CG location. Having to take in to account not only the two surfaces but also the presence of that little all flying elevator gave me some headaches. I first gave the front wing a 20° positive incidence. The other wing and elevator were both set at 0°. With this setting, I calculated a CG position that required five ounces of lead around engine mount. It seemed like Ams Oil would be a little nose heavy but I thought that this was safer to start with.

I was concerned about ground handling too, but as I can fly my models at our local airport, which

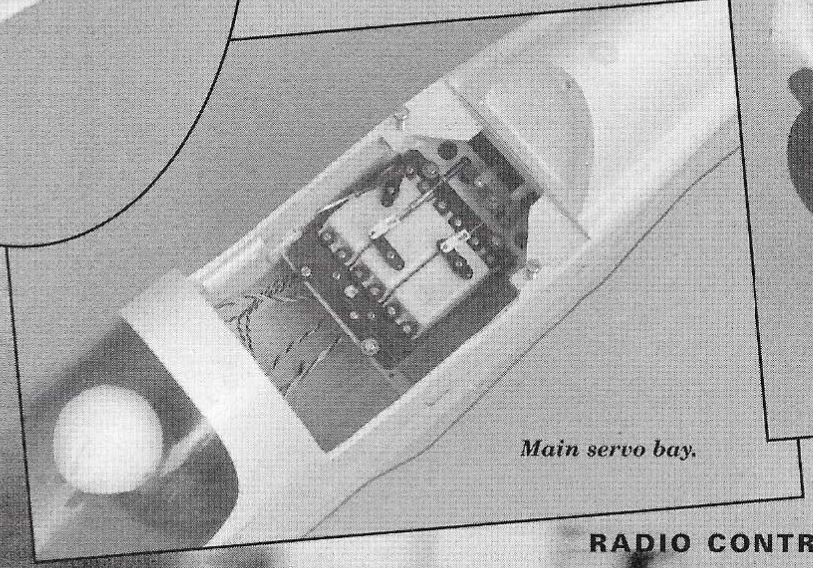




Tailwheel steering is via shock absorbing springs to the rudder closed loop.



Focus on the main wheel attachments.



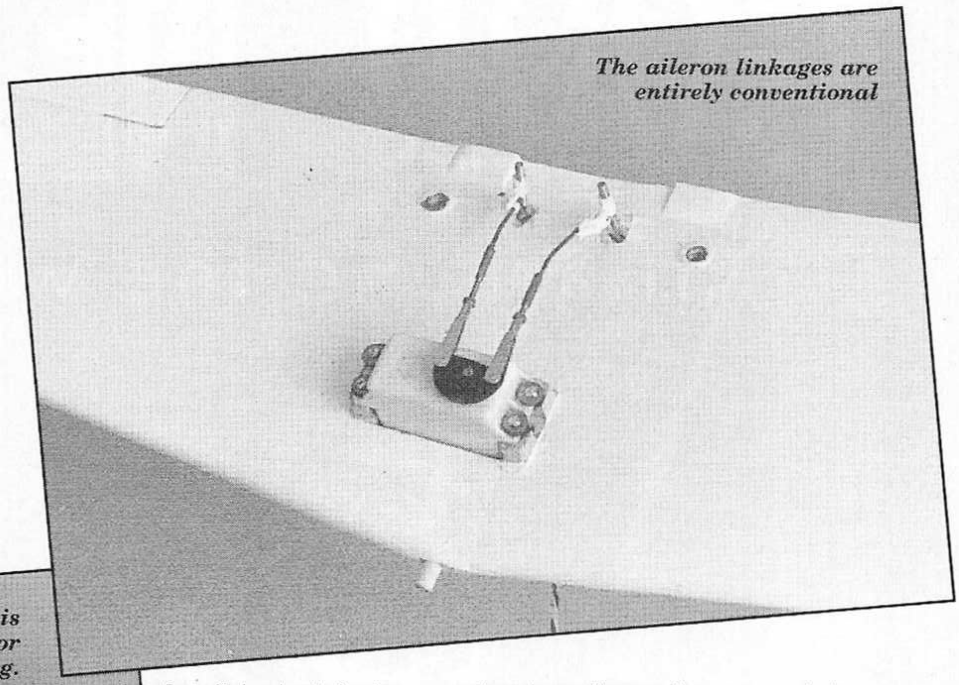
Main servo bay.

has a paved runway 100 foot wide and half a mile long, this was no real problem. My model weighs, ready to fly, $6\frac{3}{4}$lb and is overpowered by an OS 91.

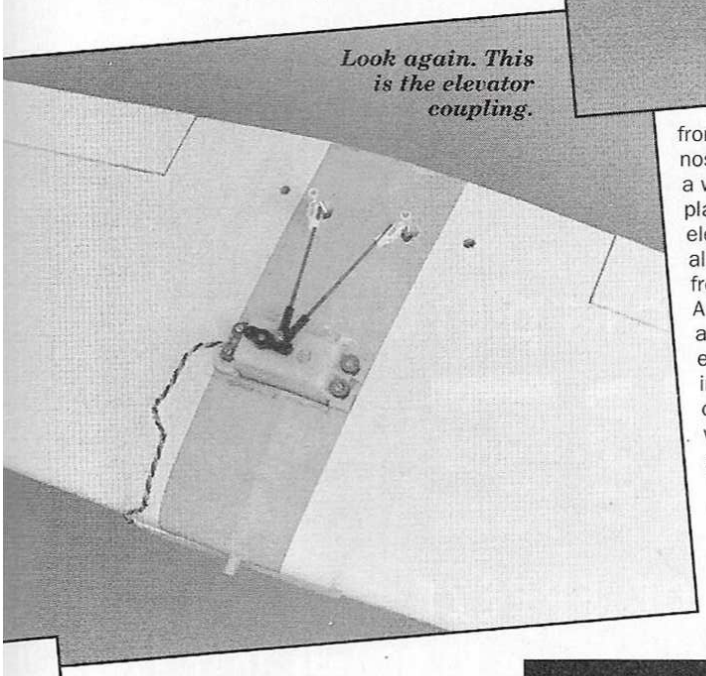
Test flying

The first take off was absolutely uneventful. Ams Oil picked up speed rapidly, pointing straight along the runway. The incidence settings were obviously incorrect as the model kept going upwards, needing all the down trim I could get from my Tx. However, all in all, I was well satisfied as the model handled very well and was very aerobatic and fast. Subsequently, I reduced the front wing incidence to the value shown on plans. With this setting Ams Oil flies "straight and level" with the trims centred.

I was not yet entirely satisfied, as I do not like noseweight in my models.



The aileron linkages are entirely conventional



Look again. This is the elevator coupling.

So, one ounce at a time, I removed the unwanted lead, ending up with no lead at all. The CG position went back by more than half an inch, but Ams Oil seemed not to mind. Having an investigative mind, I tried to bring it back even more and so moved the battery from its position over the front wing to a new one under the rear wing. While remaining completely under control, I felt that the model lost a bit of pitch stability, so the battery was returned to its original location. This indicates that this particular aeroplane seems to be very insensitive to CG location. I also have to say that it is impossible to spin; it only descends in a large spiral.

I am only allowed to use the airport's paved runway on Mondays, when there's no full size activity. On other days my model club uses a grass field that is completely the opposite to a smooth polo ground or golf green and when I first tried a take off from it, I only attained a nose over. So I installed a wire skid as shown on plans. While not being an elegant solution, it allows for easy take off from turf.

Ams Oil is completely aerobatic, spins excluded. It can fly inverted, do axial, slow or four point rolls and it will fly knife edge until almost out of sight. Take care to remember that the moveable surfaces of the bottom wing do not work as ailerons; they are coupled with the all-flying stabilator to control pitch. Obviously, when you feed in "up", they move downward while the stabilator moves in the usual way. Once again Ams Oil seems to be insensitive to different movement ratios. I suggest you set the throws equally on both surfaces. Ailerons are fitted on the rear wing and despite their small size, they are quite effective.

Despite its strange appearance, Ams Oil is easy to fly, with no particular bad habits. I hope you enjoy it.●

Datafile

Plan Specifications

Name	AMS OIL
Designed By	Giuseppe Ghisleri
Aircraft Type	Sport scale
Wingspan	140cm
Fuselage Length	146cm
Engine Range	.61 -.91 cu.ins.
Fuel Tank	10 ozs.
Rec. Number of Channels	Four
Control Functions	Aileron, elevator, rudder, throttle
C.G. (from L.E. of foreplane)	155mm
Sidethrust	0°
Downthrust	0°

Materials Used in Construction

Fuselage	Balsa, veneered foam
Wing	Veneered foam
Tail Surfaces	Veneered foam
Weight, Ready to Fly	$6.\frac{3}{4}$ lbs