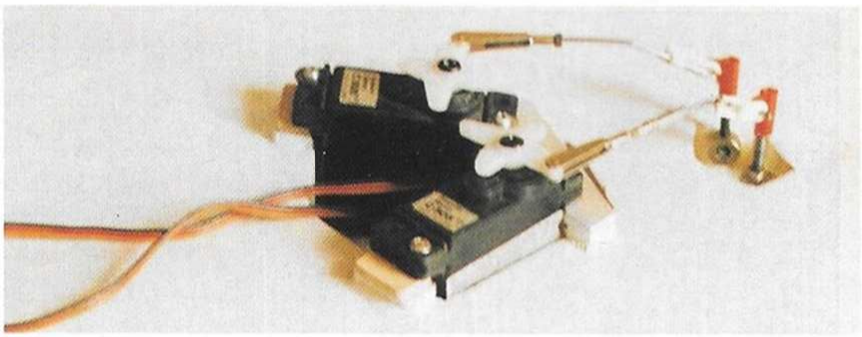
EVER FANCIED A SLICE OF PSS? THEN WHY NOT WHITTLE YOURSELF A SOARER? GIUSEPPE GHISLERI TALKS US THROUGH THE CONSTRUCTION OF HIS 'ALL FOAM' EXPERIMENTAL FLYING WING

NORTHROP X-4 BANTAM

(FAR LEFT) Not only is this model cheap to build, it's pretty economical on servos too! The elevon servos are mixed electronically using computer radio.



I live in Cremona, a little town in northern Italy, some 60 miles south-east of Milan. Cremona lies in the heart of the Padus valley, which is an absolutely flat piece of land. The nearest alpine hills are to the north, a distance of some 30 miles and to the south the Appennines are 20 miles away. Nevertheless, I fly slope models with great pleasure, mostly at a site called Grone, in the Alps.

At Grone we fly mainly four metre scale models such as the Discus, DG 600, DG 800 and ASW 24, however, one particular flyer builds very large models which are often as big as 1/2 scale - and he launches them by himself! These particular gliders can weigh anything up to 20 kg or more depending on the type reproduced. Between us, we have even confused some of the full size glider pilots, from a nearby airfield, who sometimes wonder if they are watching a model or indeed a man carrying plane.

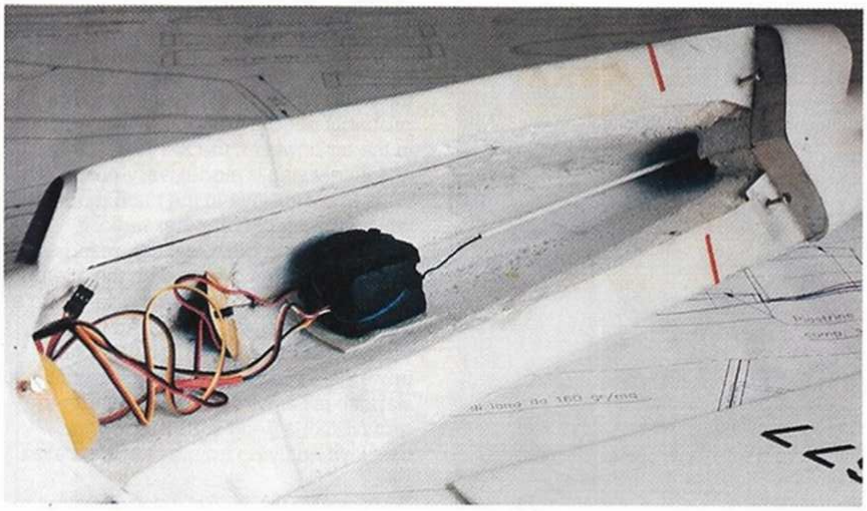
The kind of flying in this environment is almost exclusively thermal and I have to say that I enjoy flying over the valley, chasing for lift and circling, gaining height and then diving for aerobatics, or for a simple fly-by along the hillside. Nevertheless, being a modeller since the age of 11, (I am now 51) I have tried and enjoyed almost every kind of model flying discipline, and when I see something new, I am almost always attracted to it. To cut a long story short, I recently saw an article in an English magazine on PSS and immediately fell in love with the idea.

In Italy we do not have the kinds of slope usually found in Atlantic facing countries and suitable hills with lifting winds are a rare thing, but I was so intrigued that I could not resist the temptation and as a result I built an MB339 PSS model.

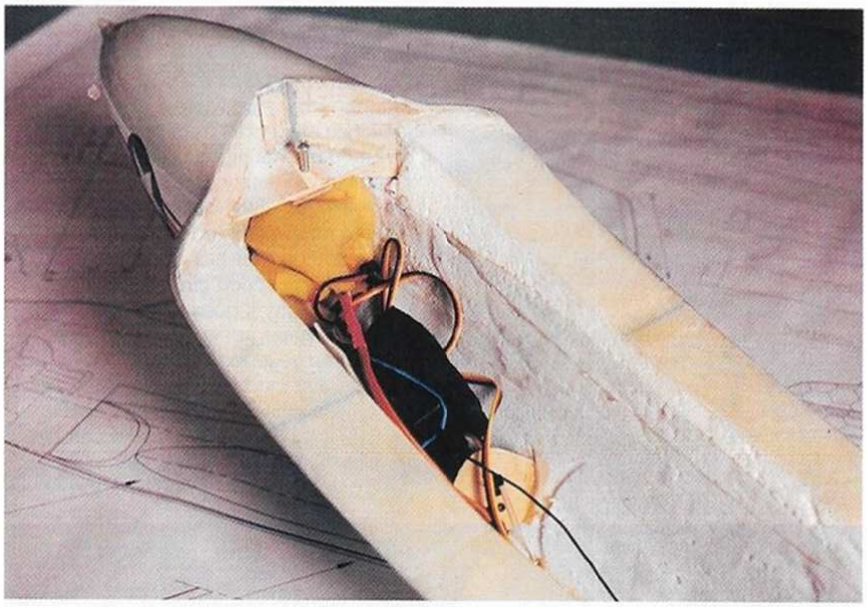
In order to fly it I had to travel to the hills facing the 'Gulf of Genoa', some 100 miles away. Whilst I was lucky enough to find the weather ideal for flying i.e., sunny with the correct wind direction and force, I reasoned that maybe I would never find such favourable conditions again and consequently I started thinking about a model that I could fly with reasonable frequency from my usual flying site in Grone.

Some 200 metres to the right of our launch site at Grone the land falls abruptly for 900 metres to the bottom of the valley forming a rocky precipice which is exposed to direct sunlight. As a result of this you can invariably find very strong thermal activity in the early afternoon. All I had to do therefore, was design a model that would fly in strong thermal lift without having to rely too strongly on wind.

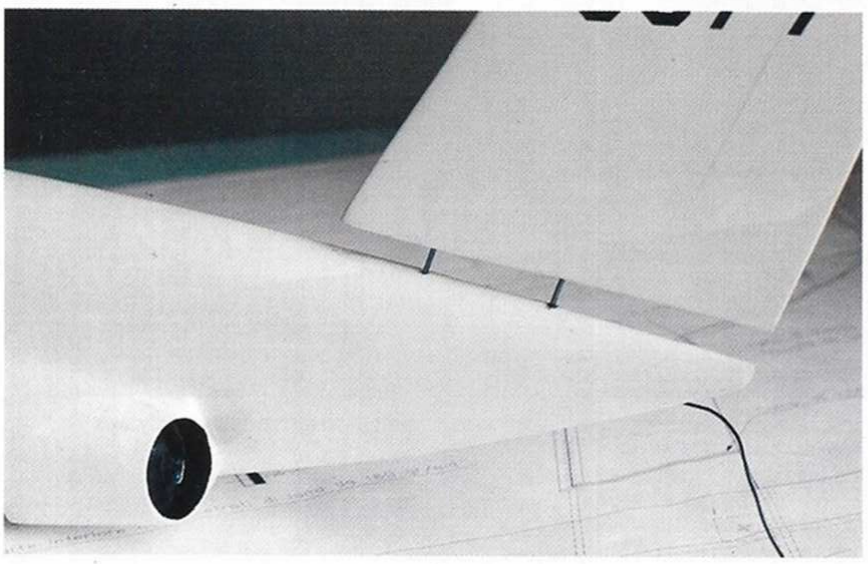
A large, high aspect ratio aeroplane would have been the logical choice, say a U2, or a B52, but as I am sure you know, we modellers seldom make the most obvious or informed choice especially if there's a particular aircraft that we fancy building. At that time mine



The fuselage is simply a hollowed out foam plug covered in glass cloth.



An ample wing seat, with 'balsa faced' leading edge 'sweep back' and wing retaining screw.



A removable fin helps to reduce damage during transit.

was the Northrop X-4 Bantam, which I first saw in a book on the F89 Scorpion.

TRANSONIC FLIGHT

In June 1946 Northrop received an order from the U.S. Air Force for two X-4 aeroplanes. Their task was to investigate the manoeuvrability of tailless aircraft in transonic flight (beyond the speed of sound). Its design was influenced by the German wartime Me 163 Komet and from the de Havilland 108 Swallow.

It reached mach 0.94, but at this speed it had serious stability problems. The wing was very stiff, with a loading factor of 8G. Overall the aircraft was very manoeuvrable and could do loops and rolls and other aerobatics with ease. It was powered from two Westinghouse jet engines, each rated at 725 kg of thrust. The canopy had no stiffener and it was the first X-plane to have a seat which could be jettisoned.

THE MODEL

Using the reasoning that a flying wing would be quick to build with low drag, I decided on a wing profile to use and got started.

The wing chord at the root is more than twice that at the tip. The cutting of the wing cores is therefore a tough job. Having ruined two sets I decided to bring in a friend of mine who owns a computer driven cutting machine and eventually got two perfectly cut cores that required only sheeting. Luckily Nexus can relieve you of this particular burden by supplying a set of obechi veneered foam wings for a very reasonable £14.60 plus p&p. The root profile is an E224, which changes to an E230 at the tip. According to Mr Eppler, a wing with a sweep of 1.1/2 mean aerodynamic chord, employing an E222 at the root and an E230 at the tip is aerodynamically stable and does not need any tip washout. Although I didn't have the required sweep-back, I used E224 as root profile in order to give an equally stable wing with less sweep-back.

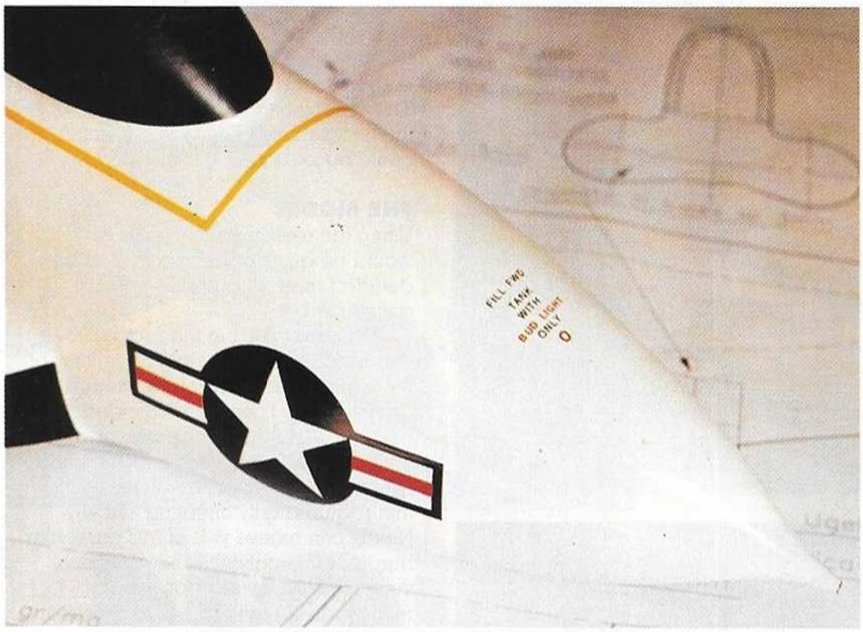
If you opt to make your own you will need to sheet the cores with 1/16" balsa or with obechi veneer. Cut the elevons and face the leading and trailing edges with 3/16" balsa. Note that the elevons are operated via a torque rod passing through a 3mm hole which must be drilled from the bay to the elevon itself. Bend 3 mm O/D piano wire to form a torque rod and face the emerging ends of foam with 1/16" ply to act as a bearing for the rod. Note that the rod is bent at 90° only one end (the outer end). Insert the torque rods, glue together the wing halves and band with glass as is standard on most power models. Install torque rod inner ends as desired using your preferred arrangement. I chose to mount a wheel collet fixed in place with a long bolt. Glue and shape the wing leading edges and wing tips. The wing fences are cut from 1/16" ply. Complete the wing by gluing the hardwood dowel for the wing mounting.

FUSELAGE

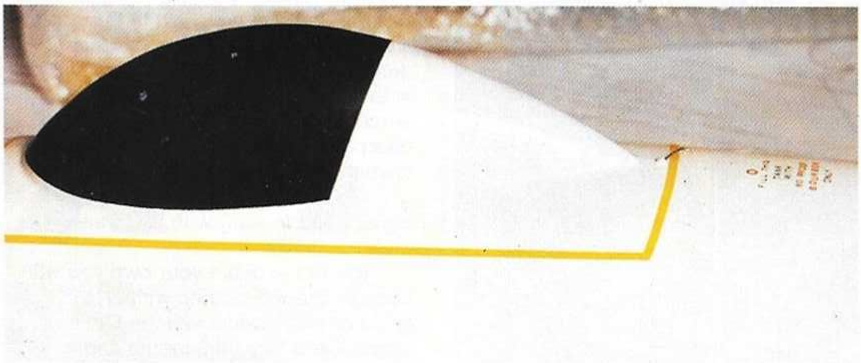
The fuselage is made with blue foam and glass in a very similar way to the 'lost mould' technique, the only difference being that the mould is not dissolved afterwards. Instead I prefer to leave a hollowed core inside which avoids the mess of dissolved foam and leaves a lighter construction as you are able to use less glass.

When building the fuselage, it is easier to use two blocks of foam rather than one. The joining surfaces will give an accurate longitudinal axis. Hold

Not bad for a lump of old foam is it?



The radio switch is housed discretely behind the cockpit.



FLYING

The launch is slightly difficult because of the (almost) flat bottom, so you will probably need a friend to fly with. Once in the air however, the X-4 is an absolutely stable model, very easy to fly, but a little sensitive in the pitch mode. If you own a set of computer radio, it should be possible to set commands so you have more movement on the aileron mode than on the elevator mode. Being a delta the model will not stall, in fact, as you feed in more elevator it will rotate upwards, its nose loosing speed, until it starts to fall almost perpendicular to the ground like a dead leaf. This is very useful when flying from a restricted area site.

Ultimately the model was conceived to fly in slope wind and strong thermals and I can honestly say that I have achieved my goal.

When I fly at Grone, I position myself near the precipice while a friend launches the model from the usual site, some 50 metres higher and 100 metres away. I immediately direct the X-4 to the precipice and if the conditions are good when it reaches the edge, it immediately lifts as if full power has been applied. The X-4 flies high speed circles and in thermal activity it goes up very quickly. In dives it gains speed nicely and will execute large loops with ease. I have not yet tried inverted flight.

I have a video tape of the full size aircraft and I have to say that the model reforms just like the prototype.

At one time whilst flying over the precipice all thermal activity was suddenly lost leaving the X-4 scraping for lift. As the model slowly lost height it looked almost inevitable that it would be lost in the woods below and I began to fear the worst.

Suddenly, I realised that the Bantam was not sinking anymore, so I started circling in the light thermal I had found. Very slowly (almost too slowly for my nerves) the X-4 started gaining height enabling me to land the model near my foot much to the delight of my fellow modellers.

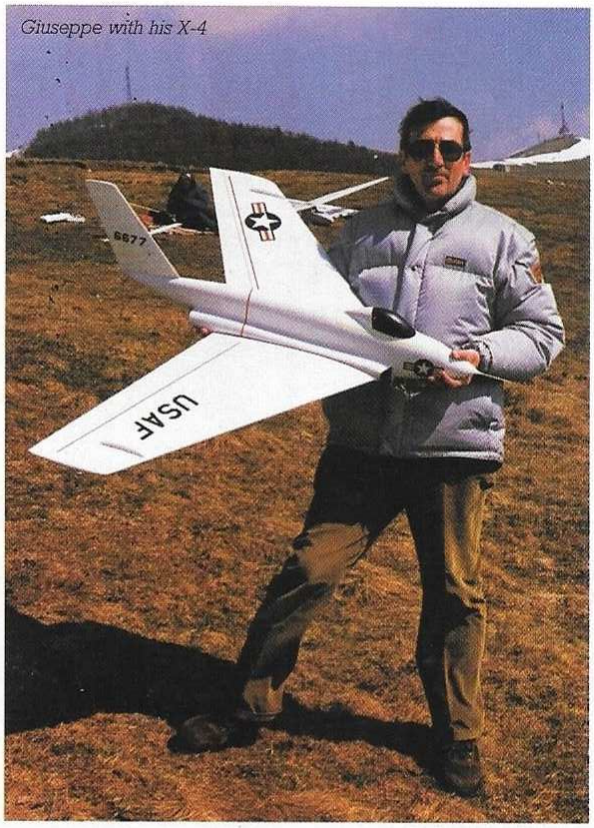
Later, I brought the model to a lift site,

On the first launch the X-4 touched the ground but luckily she took to the air again.

The X-4 at rest on the hillside. A satisfying conclusion to a very successful project.

together right and left blocks with double sided tape during shaping. With this type of model it is very difficult to obtain an accurately cut wing seat so the use of the upper foam wing off-cut helps enormously. To this end, simply cut two blocks with a rectangular shape in side view and the sweep-back of leading and trailing edges in plan view. The height of the cut depends entirely on the blocks used for the wing cores.

There is no real former in the fuselage other than the one placed at the engine exhaust end. This serves as a template for shaping and gives an accurate surface on which to glue exhaust cones. Other pieces of balsa at the leading and trailing edges of the wing have the same purpose. I usually fix the wing on the fuselage with self tapping screws and find this method very easy to make and absolutely safe. The fin is removable to make transportation easier and it remains in place during flight without any particular method of fixing. The nose probe and pitot tube are also removable for obvious safety reasons and all in all, it is an easy model to build.



Giuseppe with his X-4

but the conditions were very marginal. I tried to fly and realised that, being a PSS, it is a real floater. I hope to find, sooner or later, a good day to fly in strong lift; I am sure that the X-4 will give me a lot of pleasure.

With the C.G., shown on the plan, the model needs a touch of up elevator to fly level but of course, this is detrimental to the overall efficiency so I have since tried to move the C.G. back just a little. The result was as expected, less up trim leaving the model more sensitive in the pitch mode.

Having had so much trouble finding the correct conditions, I tend not to waste too much time fiddling. I just fly the X-4 as it is, and enjoy it very much!

It would probably benefit from a change of root profile, from E224 to E226, but this way the wing will loose some of its lifting ability.●

(BELOW) No matter how hard you try the model won't stall, but it does a pretty good mush!

X-4 DATA FILE

Name	**Northrop X-4 Bantam**
Designed by	**Giuseppe Ghisleri**
Aircraft type	**1946 experimental tailless jet.**
Wingspan	**53"**
Wing area	**248 sq.in.**
All-Up-Weight	**3lb 5oz.**
Wing loading	**12 ozs./sq.ft**
Fuselage length	**41"**
Req. No. of channels	**Two**
Control functions	**Elevons**
BUILD MATERIALS	
Fuselage	**Foam and glass**
Wing	**Obechi veneered foam, also available from the Nexus plans service**