



Black Diamond

All I knew about my next model was that I wanted it to be different. But different from what? Different from everything I suppose. I remember looking at PSS kits and being mildly disappointed at not finding a twin boom subject. Anyway, I thought, twin booms are probably a bit vulnerable so perhaps I'll abandon that line of thinking and build a flying wing instead. But somewhere along the line I must have got hooked on the idea of attaching the tailplane at the ends, so this self-contradictory concept of a flying wing with a tailplane began to take shape.

In truth it didn't take shape for quite a long time. I am an inveterate doodler

Build Trevor Hewson's

51 inch span sloper

for a sparkling

performance

and time after time these peculiar not-quite-flying-wing shapes kept appearing. In the interests of keeping my job, I knew I had to get this thing out of my system!



Eventually all the lines came together in a not entirely repulsive shape – just at the time my new model room was finished. The new building board





Photos, left to right; Trevor (left) and Peter Chaldecott display the two prototypes. Mixed wing construction is possible – Trevor's is foam, whilst Peter's is built up.

beckoned enticingly! The next club meeting was foam wing cutting night so the omens were good to embark on this project. Since almost every aspect of this

end up with a span of just over 50 inches. This was definitely going to be a one piece model so this seemed to be quite a handy size.



design was experimental I thought it would be a good idea to at least start with a wing section that was known to fly. I therefore looked out the plans for the Obelix, a slope flying wing from RCME&E (Jan. 1983), and used the templates from this to cut a pair of outer wing panels. The size of these was determined by the foam block that came to hand and following the proportions of my best sketch, it looked like I would

Diamonds are forever
The wing centre section is the key to the shape of this model so this was clearly the first thing to build. The dihedral has to be quite steep in order to get a good diamond effect to the model when viewed from the front (or from the rear) and also to ensure that the tailplane has enough projected vertical area to dispense with the need for a fin. I opted

to build up these inboard wing panels with all the ribs inclined so that they would be vertical when the panels were joined. There is no particular structural advantage in this approach but it does make it possible to use the sandwich method for cutting out the intermediate ribs. The second prototype was built by Peter Chaldecott (to whom I am indebted for drawing the plan and taking the constructional photographs) and has a fully built-up wing. Full details of this are shown on the plan but any permutation of foam/built-up inner/outer panels (preferably the same for both sides!) should do.

The additional half ribs support the ends of the servo bearers and provide an anchor point for the snakes. By extending these half ribs downwards to the full depth of your servos they also serve to define the cross section of the fuselage. It is worth doing a trial fit of the servos at this point and making sure you are really satisfied with the run of the control snakes. I would also strongly advocate the installation of an aerial tube in the wing to avoid having a long, untidy and vulnerable wire streaming out the back of the model.

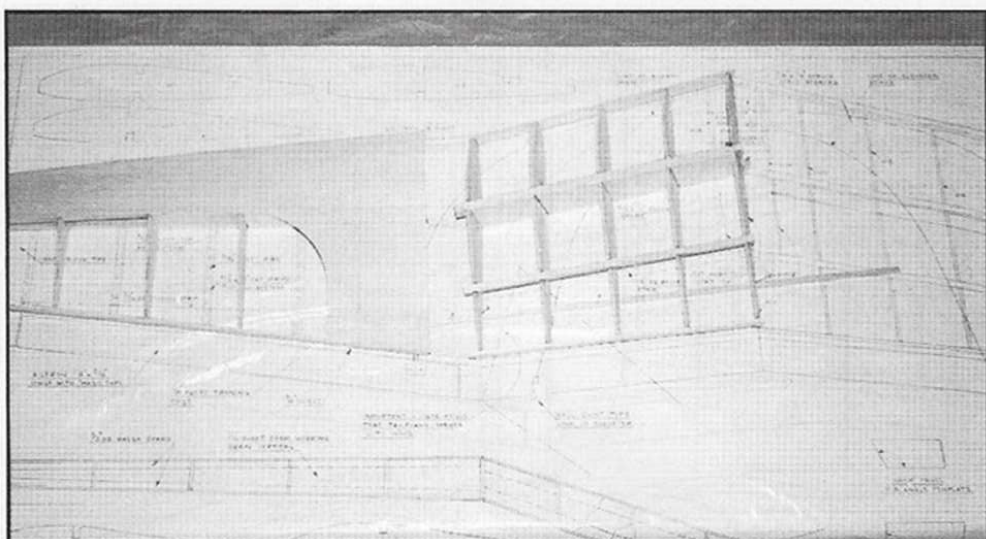
In spite of the unorthodox appearance the controls are perfectly conventional, using ailerons and elevators. The only minor complication is the need for twin snakes for the two elevators. Remember that, unlike the ailerons, the elevators should both move the *same* way! I resisted the pressure from some fellow club members to fit a V-tail mixer for rudder operation, but did agree to make sure the aileron differential worked in the right direction. When using direct snake linkages, putting the horns on the top of the ailerons makes it easy to provide any amount of differential at the servo. If you don't fancy the horns on the top you can either mess around with bellcranks or, heresy of heresies, forget the differential altogether and remember to put a bit of reflex in the ailerons instead. More letters on that one, no doubt! You can now sheet in the complete wing panels, and add the leading edges, trailing edges and tips. Finally join the two wing halves together inverted with the tops of the outer panels flat on the board. You did remember to thread the servo bearers in didn't you?

The fuselage is little more than a battery box on the leading edge, faired in along the wing centre line. Fit the ply doublers first, gluing them to the protruding half ribs, then drawing them in on the nose former. Next cut away the centre section sheeting and root ribs behind the main spar sufficiently to accommodate the receiver. A little glass and epoxy, particularly around the joint in the top spar and webbing, will make up for the damage you have inflicted. You can now add 1/4 inch and 3/16 inch balsa to build up whatever shape fuselage you fancy – just make sure you can get the gear in and out!

Now to the tricky bit. Aesthetically the tail ought to grow out from the dihedral break, but this would result in a positive angle of attack with respect to the wing – precisely the opposite of what we need! Drawing in the leading edges of the tail overcomes

the problem, the only difficulty being just how much reflex to impart. I was offered the loan of an incidence meter to check the reflex but, since I had no idea of how much there should be, I felt I would be none the wiser for knowing just how much there actually was! Similar thoughts surrounded the cg position. I did seek advice on this and there was a surprising degree of agreement – everybody agreed it would be critical! Unfortunately that was where the agreement ended, so once again it was going to be a case of trial and error. You of course will be deprived of all this excitement – unless you get someone to obliterate the CG mark from the plan before you start!

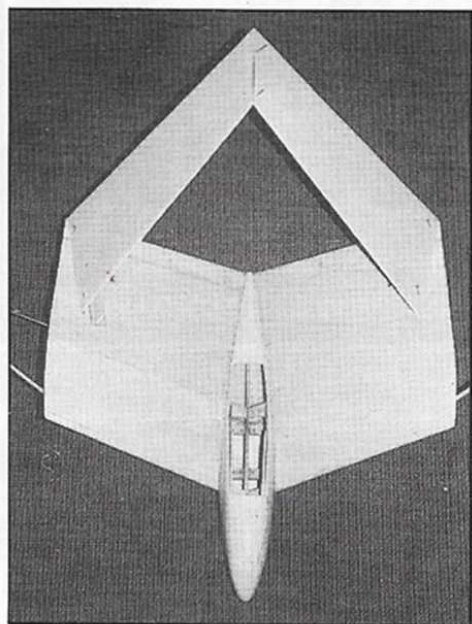
Right: Lightweight construction takes place quickly over the plan.



The name game

Having used the Obelix wing sections my initial inclination was to find a name that hinted at this lineage. The most creative suggestion was 'Asterix' but the character somehow didn't seem to fit, and I think Chas Gardiner has beaten me to that one too. As the model took shape it became obvious that, from almost any angle, it was diamond shaped and so perhaps the name should reflect the shape rather than the parentage. 'Double Diamond' was favourite for a while, but to avoid copyright problems I eventually settled on 'Black Diamond' (on second thoughts maybe I could have got sponsorship). Anyway, by now the Diamond theme was well and truly established and the colour scheme had to reflect this.

I normally reach this stage with good weather forecast for the coming weekend, only to realise that the chore called finishing stands between me and a golden opportunity to try out the new creation. I am therefore a confirmed Solarfilm man, since this is widely regarded as being the quick and lazy route to a good finish. I had been slaving over the iron for the best part of a week before I paused to count the number of pieces of film in the scheme I had chosen. Eighty six – and all this in only three colours! Perhaps painting is quicker sometimes! Anyway, eventually it was finished and, with the additions of black diamonds down the spine and a diamond shaped 'cockpit' with diamond

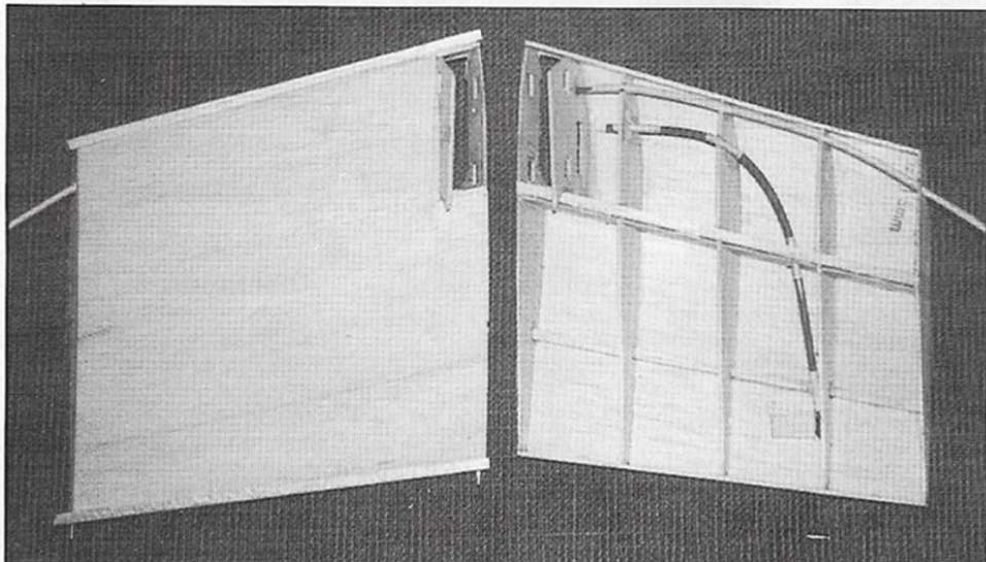
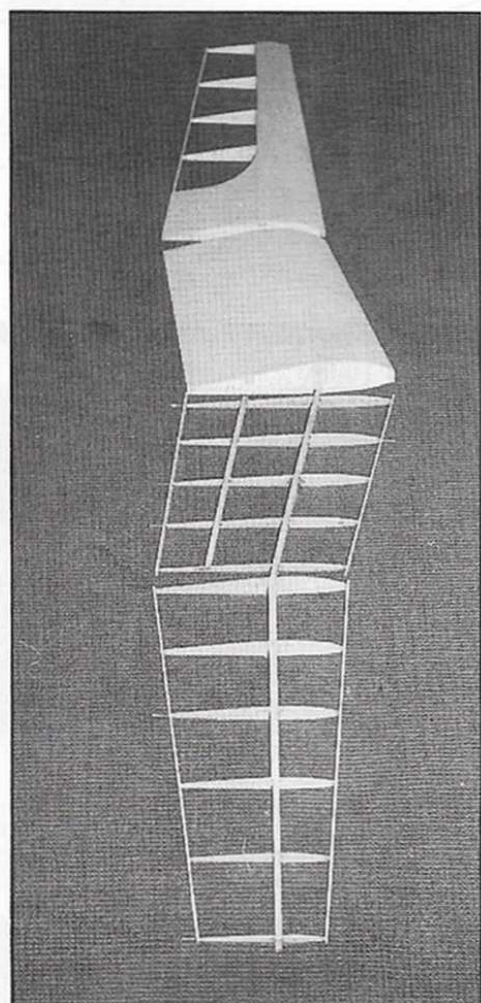


Above and right: The gull wing can be foam or balsa – or a mixture of both! Left: ready for covering; film is ideal. Plenty of room for standard R/C gear. Below: Snakes are used for elevator and aileron control.

'eyes' in the corners, it looks suitably arresting – a cross between a bird, a bat and a reptile and perhaps, with luck, an aeroplane?

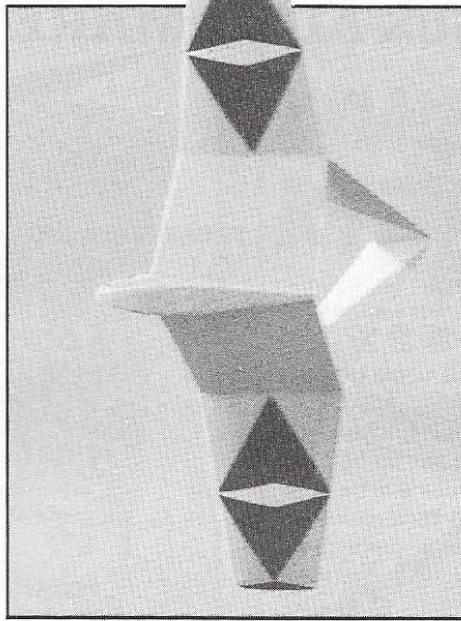
Diamond flight

It is only fair to say that I had received many comments on this model during



its construction. As I contemplated the forthcoming test flight some of these comments came drifting back. 'Interesting' was probably the most frequent description. Similar non-committal epithets like 'very bold', 'different' and 'unusual' also seemed rather lacking in reassurance. A slightly more verbose friend, after studying the model for some time, eventually pronounced in a not altogether convincing tone that he couldn't come up with any *really* good reason why it shouldn't fly. In the same vein of well-intentioned discouragement was, 'Have you thought of test flying it before you take the trouble to cover it?' and 'Please let me know when you are going to test fly it!' I therefore approached the maiden flight with more than a little apprehension.

I had woken up that morning haunted by fears of pitch instability and pushed an ounce or so of lead up the nose but in truth pitch stability and pitch trim were still unknown quantities. Not for long! On launch the Black Diamond raised its nose and headed for the skies. I never got near the trim lever and only when I got the stick pushed fully forward did the model respond. Even with the stick pressed hard against the end stop there was no question of penetrating the 20mph breeze and for what seemed like an age the model sat there in an apparently stable hover drifting slowly back toward the bushes. Suddenly the nose dropped and in a flash the model was down with a thud. Fortunately damage was limited to some shock



Black Diamond whistles past, showing off its distinctive gull wing and inverted V tail.

cracks around the base of the tailplane and, since it was obvious that the reflex was excessive, the tail was destined to come off anyway! The sudden tuck-under seemed to be indicative of a rearward CG so, with a touch more lead and a generous helping of down elevator trim, we came to flight number two. Considering that almost 3/8in of down elevator was necessary to counter the excess reflex the model flew remarkably well.

I have since re-aligned the tail and, freed of the induced drag from all that down elevator trim, it now handles very cleanly and is remarkably efficient in light lift. Rolls are an interesting manoeuvre to watch (where do *you* think the axis of an axial roll should be?) and loops are very groovy. Inverted performance is very good, thanks to that Obelix section, and roll stability seems to be greater upside down than the right way up – perhaps due to the gull wing configuration? Surprisingly, pitch control is impeccable either way up and the model flies happily with no aileron reflex. The prototype weighed in at just 28 ounces and with a fully built up wing even lighter Black Diamonds should be possible. Ballast can be accommodated behind the main spar if the going gets rough. The Black Diamond *will* tip-stall, but not without warning, and it can be safely 'hovered in' (or even caught!) at cramped landing sites.

Conclusion

Having set out to produce something so different I must admit to being more than a little surprised to find the Black Diamond flies so well. It is a very pleasing sight in the air and there is no danger of confusion with other models in a crowded sky. The only problem I have had so far is that it is so distinctive that some of the more combat-minded flyers seem to regard it as a good target – I keep hearing remarks along the lines of 'I wonder if it's possible to fly through that hole in the middle!'