Canterbury Sailplanes Arrow

by Klaus Weiss

The wonders of CNC hot wire foam cutting. I have cut a couple of thousand foam wing cores, with my trusty cantilever hot wire cutter, but I am sure that it would take me a lot of man hours to cut the shapes and steps, which only take a few minutes with a CNC hot wire cutter.

Canterbury Sailplanes use the excellent, Austrian manufactured, Step Four CNC machines and the Wing Designer software which complements it, to produce their great range of EPP model aircraft. The Arrow is one of the latest models from this manufacturer, and has been developed from the Jazz flying wing. It is suitable for both beginners and experts alike.

The kit box contains almost everything you will need to complete the Arrow.

- CNC hot wire cut EPP Wings & Fuselage.
- All Hardware, fibreglass spars etc
- Balsa Elevons, Coroplast (plastic) fin.
- 1 roll coloured tape and 1 roll fibre reinforced tape
- 13 page Instruction Manual with pictures and plan
- Gorilla Glue all purpose polyurethane adhesive

I also obtained a can of 3M77 Super spray adhesive, AS3 Plus electronic elevon mixer and lost model alarm, extra coloured tape and a roll of Diamond hinging tape from Airsports R.C. here in Sydney. Apart from a few basic tools, that was all that is required to finish the Arrow.

The instructions are straight forward, and I recommend that you read them before you commence building the kit. The natural tendency is to get stuck in, and refer to instructions only once in a while, or when you get stuck. I do it, and sometimes have to backtrack. On the odd occasion, I have had to get new parts. Read the instructions!! They give a comprehensive overview, and explain various steps in detail.

THE WING

The first step in the construction is to shape the wingtips to a 100mm radius. I drew a 100mm radius template from cardboard, and transferred that onto the wing. A sharp blade in the OLFA cutter, sliced the foam off the tip, and the Permagrit sanding block had it to shape within a few swipes. The supplied fibreglass spars are more than adequate for the job, but if you want to save grammes, you could substitute the spar material with solid carbon rods. Simply glue them into the aluminium joiners, with thin CA. Pull the wing cores out of their 'jackets' and spray the wing roots with 3M77 adhesive, then leave to dry for 5 minutes or so. Cut the two bottom 'jackets' free and lay them on a straight building board, ensuring they are level. Lay the wing cores into them and join the halves, weighing them down, so that they remain flat.

Next task is the spar installation. A bottle of polyurethane, Gorilla Glue is supplied with the Arrow kit, especially for this task. As the name suggests, this is a strong adhesive. It cures a little differently to other wood glues, in that it reacts with moisture, foams and expands. I just dampened the glass rods with a cloth and squeezed a bead of glue into the spar channel. The spars were inserted into the pre cut channels and taped over, to ensure a smooth finish. Repeat on the other side and place the cores in the bottom jackets, weighting them down, to be left overnight.

I started on the fuselage next, and there is not a lot to do here. The slab sided profile, needs to be rounded off and shaped to the plan diagram on the back page of the instruction leaflet. I marked the centreline along the top, and then a couple of more lines along the top and sides, to guide me in cutting off the waste material. The Olfa blade was used to slice the corners off and a 560mm Permagrit sanding block was used to finish off the shaping. Took me around five minutes to complete the shaping.

The cut outs for the servos, were too large for my liking, as I like everything to fit snugly. I just cut some EPP fill pieces from stock I had lying around. For those of you who don't have EPP in your workshop, 'normal' EPS foam will do fine.

Next day, a little clean up of the spar and wings, where I had put a little too much Gorilla glue in the channels, as it had foamed out in a few places. The hard beads easily picked off, so no problems there. The top of the wing was misted with 3M77 spray adhesive, and the filament tape laid down. I didn't cover then entire wing, as per the diagrams, as I have found with my Vector wings, that a more economical pattern is just as good. When taping, do try to ensure that you don't pull too tightly on the tape, as it is easy to pull a bend into the wing. I just pull out a good length, fix it to the building board near the tip of the core, and smooth it down with a nylon squeegee as I go along the span. When the filament taping is all done, the wing gets another misting of 3M before it is time to do the colours.

The Arrow and a Vector, at our local slope.

I used tape again, but some pilots have had good success with Profilm or one of the other low heat covering materials. The top of the wing received a yellow and black scheme, which I have found to be highly visible. The misting and taping was repeated on the bottoms of the wing, albeit with a couple of additional strips of 55mm wide filament tape. The bottom of the wing was done in black, yellow and red.

Next step is to tack the elevons on with a few bits of tape, and cut the balsa to the required angles. Both the inside and tips of the elevons need to be cut. I covered them in matching colours on the top and bottom of the wing cores.

Back to the fuselage. The servos, with arms removed, were placed in their relative openings, and the wires laid in slits, cut with an Exacto #11 blade. (Just a tip, place the servos in their respective openings, with the output arm towards the rear of the fuselage, otherwise the rods will not reach the elevon horns – don't ask how I know.) Do the same for the battery cut out. I also enlarged the space where the receiver fits, as the Futaba Rx has the plugs and crystal located on the top. The AS3 mixer and a switch also fitted into this space, with only minimal enlarging. These were then taped over with filament tape. I sprayed one side and the top of the fuselage, and commenced taping with 5mm and 12mm wide strapping tape. Try to avoid getting wrinkles, and cut the tape where it needs to go around complex curves. Cover the entire fuselage in the colour scheme you desire.
Plug in all the radio equipment, turn it on, and ensure that the servos are centred and going in the right direction. When all the trims are centred and you are satisfied all is as it should be, attach the servo arms.

Trial fit the wings and make sure that they are properly aligned. I taped the elevons on with the Diamond tape. This excellent hinging tape is becoming

hard to get, so when the stock runs out, I will have to find something else. There may be some out there who are not sure on how to do tape hinging, so I will quickly explain how I do it.
Tape the elevons in place, with three pieces of tape to hold them flush with the top surface of the wing. Flip each one over in turn, and lay a length of Diamond tape along the inner surface of the balsa elevon and the TE of the foam wing, making sure that there is no gap. Next, flip the elevon back, and tape the top surface, making sure to remove the three strips as you go along. Make sure that you deflect the elevon to its full downward travel, as you tape along the top. Now you have a sealed hinge, which deflects in either direction and is friction free. Attach the rods and clevises to the servo arms, then line up the elevon horns so that they are correctly aligned on the hinge line. Drill through the balsa and attach them. Attach the wing to the fuselage, and once again ensure that it is properly aligned. Glue the fuselage and wing together, with the supplied Gorilla glue.
Finally, glue the fin in place, ensuring it is vertical and set at 90 degrees to the wing.

I used a basic 2 channel radio and electronic mixer for this review. More and more pilots are buying multi channel computer radios for their slope soarers, but I think that the majority of slope pilots will be using the more economical 2 channel units, particularly on foam slope soarers. If someone wishes to use a multi channel computer radio, then the mixing possibilities will be far greater than those using the 2 channel unit. As it is, I only need to set the travel adjustment to where I want it on the mixer, and go flying.

There is a page in the instructions, detailing final balancing and control setup. Follow these instructions and the Arrow will fly very well. Fine tuning can be done later, to suit individual preference. For the initial balancing, I had to add a few grammes of lead to the port wing, for lateral balance. There was no weigh required in the nose to balance at the recommended CG in the longitudinal plane.

As is often the case, I had to wait for weeks to get the right conditions for our local slope. When it was working, I couldn't find anyone to take pics. When there was someone available, the conditions were wrong. Our poor, longsuffering editor must be going grey. I managed to get a couple of sessions, one in the rain, and with poor light conditions and another, where the wind was quartering on the slope and very buffeting.

I had an attempt to fly at a local slope, a few days before actually having the maiden flight. I would call this attempt 'the maiden launch'. The wind was very light, only around 4 knots, and the Arrow flew out, losing height as it went. Air speed was right on the point of stalling, and a gentle bank saw it go down into the bush, about 100m down the 'hill'. The AS3 mixer has a built in alarm, so I had no worries about locating it. I

slipped and slid down the mountain side (it isn't a hill, when you are unfit like me) and quickly located the model. Sydney was in the grip of a heatwave, and the humidity was 92%. I reckon I lost a kg on that short excursion. Got back to the top, puffing and panting, only to notice my mobile phone was no longer in my pocket. Backtracking down the mountain was harder, and the phone didn't have a lost model alarm, but I did find it. On rubbery legs, I decided to wait for a better day to do the test flights.

A reasonable day finally came, and the Arrow was tossed off a slope which is only around 12m high, and where the ocean is only around 30m away. A firm toss and it ballooned up, almost into a stall. A bit of down stick and it sailed out straight and level. It needed only 3 clicks of down trim to see it right. The Arrow was quite sensitive in pitch, with only small movements of the elevator required. I did have the CG quite rearward, so a few millimetres forward, should dampen the pitch for those who prefer more stability. For me, I will just have to reduce the elevator throws to 50% on the AS3 plus. At this location, the wind was not straight onto the face, so I only had a small area to work in. The Arrow needs a little more wind strength than some of the other foam wings I fly, but it seemed quite solid. For this flight, I only did figure eight circuits and a few loops. Balancing the wings laterally, ensured that the loops were really smooth, with no corkscrewing. Landing was just a matter of keeping up the airspeed and gliding in. At this location, with this particular wind direction, the landing was crosswind, but presented no problems at all. Another hour saw the sun getting pretty low, and the wind dying off. The Arrow flies well, straight off the building board, and as long as the builder takes care to ensure everything is straight and aligned, it will not give any unwelcome surprises.

Another day, another opportunity. The winds continued to blow from the north for weeks, so flying locations for me, were limited. I couldn't find anyone who would take a Friday off work, to take a few pictures, so my wife finally succumbed and came with me. The wind was blowing at a steady 25 knots onto the little slope, and the Arrow took it in its stride. Fast, whistling

passes were the order of the day, and she got quite a few scenery shots of where the glider had been a micro second before the shutter was pressed. Not to worry, there were enough airborne shots taken in the first hour, to satisfy me. The Arrow was a bit 'tippy' in the crosswind, but in all fairness, it was quite strong. A bit of ballast would no doubt have made it track much better. Inverted flight required only slight downtrim, and rolls were fast and crisp. Landing was uneventful, but I notice that I had to keep the speed up, to prevent slight tip stalling. My wife was happy to spend quality time with me. She was particularly overjoyed to be windswept, salt spray encrusted and after stubbing her little toe and breaking it, none to keen on being asked again. Women!!!

I was very happy with the Arrow's performance. It is easy to build, and easy to fly. It is responsive to control, without being twitchy. With the fin and fuselage, it is easy to orientate. All the radio gear fits into the fuselage, with room to spare. If you are looking for a foam slope soarer, this one is up there with the best.

Specifications:

- Span: 1.4M
- Length: 0.7M
- Weight: 750gm
- R/C: 2Ch, Elev/Ail
- Wind: 10km/h+
- Suits: Beg—Exp.