

Building the Warlock

Builder: Ray Wilkinson



I built this rocket because I wanted to fly Level 2 rockets at our Benington site, which has a ceiling of 2400 feet. I also wanted to use hybrid motors mainly. This meant a fat rocket was needed. Paul Lavin at Deepsky doesn't normally stock large tube as there's not much demand for it - he had one length of 6-inch tube in stock, but that would be too short. He did, however, have a LOC Warlock, which is 7.5 inches diameter but very short. The desired motor was a Sky Ripper 38mm J, which is 36 inches long. As the airframe tubes for the Sky Streak, also 7.5 inches, were on their way it was straightforward to steal a bit of tube from that one to extend this. There was also enough spare coupler in the Sky Streak bits to join the tubes.

The Warlock is quite expensive at 130 pounds, but despite its short length there's a fair bit of material in there, including a huge moulded nose, so it's certainly not bad value. It has an unusual arrangement to hold the fins in place - they extend only a short distance into the tube - and ply plates fit into slots just below the skin. There are reports of fins coming loose, so special attention was paid to making sure they were well supported. When the kit arrived, there were no centering rings, but Paul sent 3. As there are 2 in the kit, this allowed extra support at the forward end of the motor mount and provided for a removable altimeter mount - see later in this report.

Construction was fairly straightforward but needed to be carried out in a specific order due to the modifications made to the stock kit. The enormous tube diameter was a real luxury, especially after working on the tiny Rapier - it seems almost possible to walk down it, and it's possible to get a hand down the tube even with a 54mm motor tube in place.



Motor tube, forward centering ring support collar and harness

A short piece of 1-inch tubular nylon harness was epoxied to the forward end of the motor mount, and thoroughly soaked in epoxy to ensure a good bond. The other end was folded over a D ring from the spares box, and epoxied. The joint to the motor tube is supported by a collar that the removable forward centering ring will sit on.

Although it's usual to fit the centering rings and motor tube first, in this case it was decided to fit the fins first. After giving them a profile with an orbital sander (see **Odin build** for details), the fins were epoxied into place, one at a time. The locking tabs were then smothered with epoxy and fitted, and plenty more epoxy was spread around the whole fin root fitting. Whilst it was still wet, a piece of glass cloth was pressed into the epoxy. A piece of polythene allowed the cloth to be pressed firmly to make sure it was well soaked and fitted snugly, without lifting the cloth. The poly was peeled off when the epoxy was dry and yet more epoxy applied.

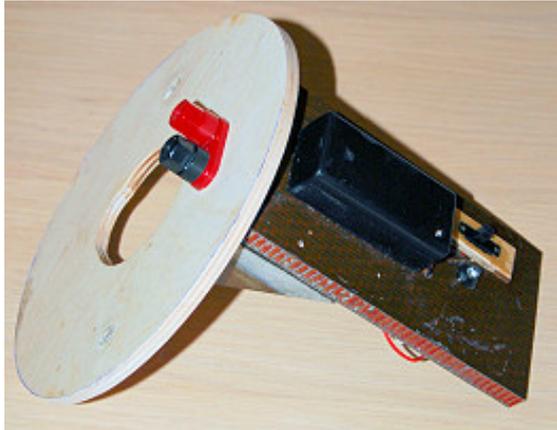


Fillets on front of middle centering ring - the large diameter gives easy access

The standard rocket has a 38mm motor mount, but this was changed to 54mm to allow our Pentamax J hybrid to be used. A 38mm Sky Ripper J was ordered for it, so this will be fitted using a 38mm adapter. The rings were opened out to fit the bigger mount using a drum sander, and the fit into the airframe was adjusted to make it snug using a disc sander. The middle ring was fitted first, and dropped right down onto the forward part of the fin roots. It was epoxied into place, and more epoxy was added to make a joint between the ring and the fins, giving more support to the fin attachments. The aft centering ring was drilled and the captive nuts for the motor retainer were added. This gave something to pull on to remove the ring. The motor tube, 54mm by 36 inches long, was fitted next - epoxied to the middle centering ring.

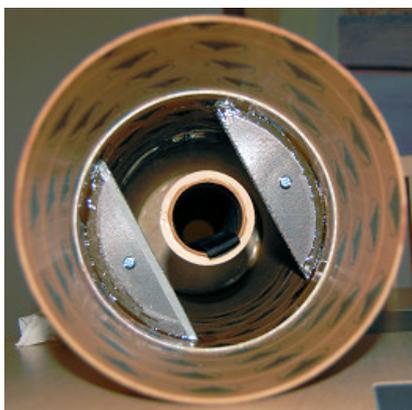
The aft ring was dry fitted to support the tube while the epoxy dried, then the ring was removed. An epoxy fillet was applied to the forward part of the joint between the motor mount and middle centering ring.

Before fitting the aft centering ring, and closing up the aft end, the aft launch lug was fitted. DeepSky provide a set of PML rail lugs with this kit, as the stock lug is just on overgrown drinking straw - there's no way this should be launched off a rod of any size! The aft centering ring was then fitted, again with plenty of epoxy around the aft end of the fin roots to ensure a good bond here. The ring was pushed as far forward as possible. Once dry, a generous fillet of epoxy was applied around the airframe and motor tube.



Forward centering ring has a bracket for the altimeter, battery, power LED and switch, and is removable

Now attention was turned to the altimeter mounting arrangements. Although there is plenty of space in the airframe, the length of the airframe was still a challenge, and it was decided not to have a separate altimeter bay, but to locate the altimeter below the forward centering ring, which would be removable for access. A Fibrelam plate was made and attached to the aft face of the ring, with a couple of triangular gussets to support it. A battery box was fitted to the back of this, and the front carries the altimeter, switch and LED power indicator. These are accessed through a hole in the airframe. A connection block for fitting the altimeter power wiring was fitted, with all other wiring soldered. Two wires were connected from the altimeter to speaker connectors, which appear on the forward face - this means that the centering ring only needs to be removed to fit the altimeter itself and the battery, ejection canisters can be fitted without removing the ring, and doesn't even need a screwdriver.



Fibrelam segments on the airframe tube and a ply collar on the motor mount support the front centering ring

The forward centering ring sits on 2 segments of Fibrelam, epoxied to the airframe, and the ply collar on the motor mount. Two captive M6 nuts under the segments hold the ring in place, and the hole is a snug fit on the motor tube, so the tube is supported properly during chute deployment. There is a slight concern over the location of the harness, as it's only attached to the motor mount, putting a tensile load on the tube. With hindsight, it would have been better to have fitted a U bolt to the middle centering ring and attach the harness to that, but that would have complicated the forward centering ring arrangements. It would be possible to retro-fit an eye bolt perhaps, although access is tight now the segments have been fitted. Normal deployments should not be a problem, but high-speed deployment may break the motor tube.

The completed Warlock first flew in December 2007, and it has flown a number of times since, on both Pro38 J composite motors and the Pentamax J and K hybrids. A heavy landing due to partial parachute deployment saw a broken fin and damage to the forward airframe tube. This was tricky to repair as the aft centering ring had to be removed and a new fin installed. However, it is now fully repaired and ready to fly, in a new paint finish of purple with gold glitter overlay.

