Building the Bad Attitude

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First impressions when this comes out of the box is that there are a lot of components! It's all fibreglass, over 10 feet long, and dual-deploy (there are two chutes, separately deployed) so there are a lot of fibreglass tubes, and a lot of Kevlar straps. Apart from all the little bits and pieces, there were:

- One aft airframe tube
- One forward airframe tube
- One Electronics bay
- One nose
- Four fins
- One altimeter bay
- One forward altimeter tube
- Main chute deployment piston
- Numerous Kevlar shock cords
- One drogue chute in Nomex container
- One huge main chute
- Sundry items such as keyswitch, separation charge holders, O rings, couplers
- Instructions

The instructions were reasonably comprehensive, though not outstandingly so, but one early problem we found was that some items were referred to by different names in the instructions to those used on the packing list. This wasn't a huge problem, but a single drawing or detailed photo of the assembled rocket would have helped to be sure of what goes where. This was the first dual-deploy rocket we have built, so just knowing where the electronics bay fitted in relation to the other airframe tubes would have reassured us. For this reason, we started the assembly slightly out of order, so we could see what was left before we attempted the bits we were not sure of. It didn't take long before we were clear what was what. A nice touch, though, was that the position of the centre of pressure stated in the instructions had clearly been corrected for our extended version of the rocket.

The first step with most rockets is to assemble the motor mount. However, shortly after we started this, we came across the ambiguity in the instructions, so we halted on this part after attaching the middle centring ring to the motor tube.

Electronics bay forward end showing screw coupling

We moved on to the electronics bay. There's a tube passing through the middle of the bay which is made in two sections. The two sections screw together, holding the electronics section to the forward airframe tube - this joint allows the rocket to be split to load the main chute ejection charge, which then powers the piston-operated ejection. The bay has a keyswitch for the electronics, the wiring for which runs through a slot in the inner tube. Initially, it isn't quite clear what all this is for, but it becomes obvious as the construction progresses.

Another section of the altimeter mount was assembled to a couple of centering rings and epoxied into the aft end of the forward airframe. This contains a screw fitting to match the one behind it, allowing the tube to be split at this point for installing and setting up the altimeter. A couple of large eye bolts complete the assembly.

The nose, also made of fibreglass, has a tube fitted to provide an extra altimeter/radio tracker bay. As the standard bay is pretty small - too small to allow for a dual-altimeter setup - this will probably be used as well, as it's a lot of rocket to risk turning into a lawn dart. However, an altimeter in the nose will not easily allow for deployment of the drogue. The tube is fitted by applying epoxy to the end and pushing it into the nose as far as it will go, which attached it to the inside of the curved surface. The bulkhead at the aft end of the nose is also glued to the nose, and a small cover is screwed onto the tube to close it. A Kevlar loop, epoxied through the bulkhead onto the altimeter tube, acts as the retainer for the nose after deployment of the main chute.

Having sorted out what exactly goes where, we then returned to the aft section. The motor tube was epoxied into the aft airframe, being generous with the adhesive. There are reports on the web of shreds with an M motor in this rocket, so we need to be sure everything is very strong. The actual process is quite tricky - apply some epoxy to the inside of the tube where the forward centering ring will end up, slide the motor mount part-way into the tube, apply some epoxy behind the forward ring, then slide it a little further. Then trickle some more epoxy through the fin slots ahead of the middle centering ring and slide it into its final place and stand it on its aft end. Once dry, more epoxy through the fin slots behind the middle ring and stand it on its forward end so the epoxy stays against the ring. Finally, some more epoxy on the forward end of the forward ring. The epoxy we were using is not very viscous, so it does flow nicely down the tube for all this, but of course it also runs everywhere it's not needed unless a lot of care is taken. The setting time is several hours, so this doesn't help, although slow-setting epoxy tends to be much stronger.

Once the motor mount is fully fitted (except for the aft centering ring, which as usual is fitted after the fins), the fins can be fitted. A jig was made up from ply, which has a cut-out to match the radius of the body tube and a slot to hold the fin square to the tube. A fin jig doesn't take long to make, and makes fitting fins a lot easier. First, check that the fin slots were clear of epoxy after the previous step. Then a small amount of epoxy was applied to the base of one fin and it was slotted into place - through the airframe tube and firmly seated onto the motor mount, then held in the correct position with the fin jig. This was repeated for the other fins. Once complete, all the fin joints were filleted with generous amounts of epoxy - fin to motor mount, and fin to airframe, inside and outside.

All that remains to do now is to fit the launch rail guides, hook up all the electronics and prepare for the paint. We hope to fly the BA on a Pentamax K motor in the late

summer or autumn of 2007. Ray has a RATT L600/M900 combinatiion on order for Level 3 certification, and the M version is a full 6 feet long, too long to fit in the (extended) BA. However, the L600 (at 'only' 42") fits comfortably, so it will fly in this rocket. As it's a Level-2 motor, this might even be quite soon.