The skeleton slot was developed in the UK for TV use soon after WW2. Someone had worked with slot aerials on aircraft, and the use of a half wave vertical slot in a very large piece of sheet metal, results in radiation very much the same as a horizontal dipole. They then set out to find out how much you could reduce the metal around the slot, and have it still radiate.

Here is a close up of the driven element, which is the actual skeleton slot. It is 5/8 wavelength in the direction perpendicular to the radiation polarization, and 5/16 wavelength for the driven element part of each yagi. This sets the spacing between the two yagis at 5/8 wavelength too.

This is well written up in the RSGP books, and a recent RSGB handbook gives a set of curves of gain & SWR for various aerials, including single yagis and skeleton slot fed yagi pairs of 4, 6, & 8 elements. On the version shown I have chosen to mount it vertically polarized, which is convenient because the supporting pipe comes up through the centre, and doesn't interfere with the pattern. I have prepared a MMANA-GAL file you can get from DOWNLOADS.

The published figures for this "6 over 6" version show a gain of 11.5 db (RSGB Handbook 8th edition page 16.4 & 16.5), and its main advantage is that the bandwidth over which that gain is maintained is 5Mhz, about twice as wide as the conventional yagi. Recent computer optimized designs will probably equal this. A word of caution, there are two sets of dimensions given in this RSGB handbook (see also page 16.12), so use all of one or the other, don't mix them up.

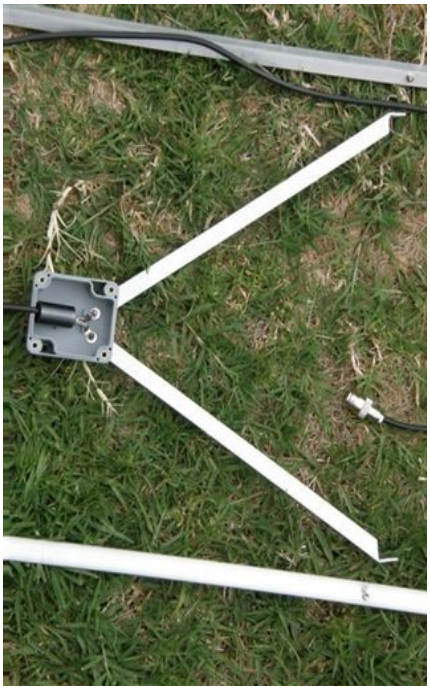
I decided that a simplified means of construction was worth a try, so I used 12 x 12 x 1.6mm aluminium angle (the smallest I could get) for all the elements, and 25 x 25 x 1.2mm square aluminium tube for the booms. This worked well, as two full lengths (6.5m) of the angle and one length of the tube will make the aerial, for under $50 outlay.



The driven element can be pop-riveted or screwed together, but I wanted to be able to pack the aerial onto a car roof rack, to set it up on field days, so I assembled it with M3 stainless steel nuts & bolts.

To build it, make a drilling jig, from a piece of steel, not aluminium, with two 3mm holes, 10mm apart, and 5mm in from the end of the jig. Then drill the elements as shown, and I found that I needed to grind away part of the pop riveter so as to clear the angle aluminium, but the joints are quite firm. I have ordered some Multicore AluSol 45D, a resin cored solder especially for soldering aluminium, and I will use that as well, to make a more permanent joint. A most important point is to remove the drilling burrs by putting a small chamfer on the holes, I simply hand turn a 10mm drill in the hole. This is necessary to get the pop-rivets to tighten well, otherwise the elements will loosen in a short time.

The inside of the terminating box shows a short length of RG58 cable, stripped and soldered to lugs that make contact with the delta matching section via two more M3 SS bolts. Proper weather proofing requires sealing of the cable, else the slow ingress of moisture will gradually build up as serious losses. Although not shown, I have dosed it with a liberal coating of "Liquid Electrical



Tape", as I also sealed the driven element screws too, but they can still be removed with a little effort.

The Pictures show the driven element in "kit form" and the inside of the terminating box. The ferrite around the coax reduces radiation from the outside the cable, and the corners of the driven element are bolted as shown, but if portable operation is not required, pop rivets could be used.

I made no attempt to calculate the effective length of the elements, to allow for the difference between the original design using 6 to 9.5mm diameter tube, as compared to this use of 12 x 12mm angle. I don't currently have an aerial simulation program that does this, but the "proof of the pudding" is that it works very well, and on the FM portion of 2m, 145 to 148Mhz a noticeable drop in signal strength happens by rotating +/- 15°., and minor lobes are well down. Signals that I didn't know were there are now Q5 copy, if the beam is pointing the right way.

Dimensions.	length mm	spacing mm
Reflector	1010	445
Driven Element a	402	
Driven Element b	1192	445
1st Director	902	445
2nd Director	895	445
3rd Director	890	445
4th Director	877	
Delta feed section	300	
Boom length	2265	

The driven element is based on the 3mm holes 6mm from the end of each part, and the RSGB driven element dimensions being centre to centre. These dimensions shown above are overall metal length for cutting.

For horizontal polarization, the centre of each boom is clamped to the vertical support with TV “U” bolts. In this case, for vertical polarization, an additional piece of the square tube is used with a single TV “U” bolt in the centre, and gusset plates pop-riveted to each end, and bolts through the gussets and the booms. Care is needed to not over tighten the bolts and collapse the thin wall boom tubing. There is no reason why a pivot couldn't be put in the centre, so that the polarization could be changed at will.

I built this using the RSGB dimensions from page 16.4, but as the UK band is 144 to 146, and ours is 144 to 148, some pruning may improve the results. As time permits, I intend to do accurate SWR measurements across the band, and beyond the band if necessary, to find the centre frequency, and so judge if pruning is necessary. The original was designed for 75Ω feed cable, and I am using 50Ω cable, so a reduction of the reflector spacing will also be tried first, as I expect this to bring the impedance down nearer to 50Ω.

Checking with MMANA-GAL, the expected drop in impedance with reflector spacing didn't happen, it went up a little. Doubling the diameter of the delta section did reduce the impedance, as did halving the diameter of the two 5/8 wavelength sides of the skeleton slot. It has yet to be tried on the actual aerial. I note that the minor lobes between 90 and 120 degrees off rise as the frequency rises, so this will need to be measured too. Watch this space. Added 2008/12/10.

Peter Ward, VK3ZAV.