CobWeb Antenna Project

I'd been umm'ing and arr'ing about putting a CobWeb together for some time. After a local amateur, Keith G6NHU got himself a Hexbeam - I started to look at compact multi-band HF aerials for the higher bands. Various solutions exist: G3TXQ Hexbeam, GM3VLB Delta, G3TPW CobWebb, Moxon, VK2ABQ etc. The CobWeb ticked the most boxes for me due to it's 5-band capabilities, reasonable size and not too tricky to build - As it's an omni-directional antenna, I wouldn't have to faff about with a rotator.

Much of the inspiration (not to mention technical details) was obtained from G3TXQ's CobWeb webpage. The antenna compliments my 40m dipole nicely and gives me the most useful HF bands (40-10m) without needing an ATU. Note the spelling of CobWebb vs CobWeb - The original G3TPW was designed by Steve Webb, hence the spelling. As this is the G3TXQ variant, I refer to mine as a CobWeb. Simple, eh?!

Update 28th March 2013 : The CobWeb still isn't up at the intended height - Due to the winter weather, it's been in storage and will be raised once I have given the V-2000 *white-stick* a good seeing-to which has been up on the house for 10 years now. It's due an inspection so this will be a good time to add the CobWeb to the pole.

The CobWeb offers the following features :

- 20m, 17m, 15m, 12m, 10m operation
- Compact and easy to handle - Just 8ft square!
- Doesn't have to be too high - Reasonable performance at 10ft, with 20ft being the ideal
- Can be made with either figure-of-8 speaker wire (folded-dipole) or single-wires and 1:4 balun (for impedance matching)
- Can be constructed with PVC tube or fibreglass poles
- Possibility of being used portable if built right

Depending upon your circumstances, you may find this aerial visually more appealing that a 5-band flat-top fan dipole. The CobWeb can be a great /P aerial, too. A drive-

Parts required for the PZT CobWeb :

- Aluminium Plate : 200x100mm *
- Aluminium Plate : 150x100mm *
- 3x 1" 16swg Aluminium Tube, 1m length *
- 2x 20mm PVC Conduit, 3m length
- 8x 1" Stauff Element Claps *
- 2x U-bolts *
- Instrument Wire - total usage is about 38m.
- 2x FT-140-61 Ferrite toroids - from AMTools
- 4x 550mm of RG316 Coax

over base and some swaged poles make a nice setup for operating from the car.

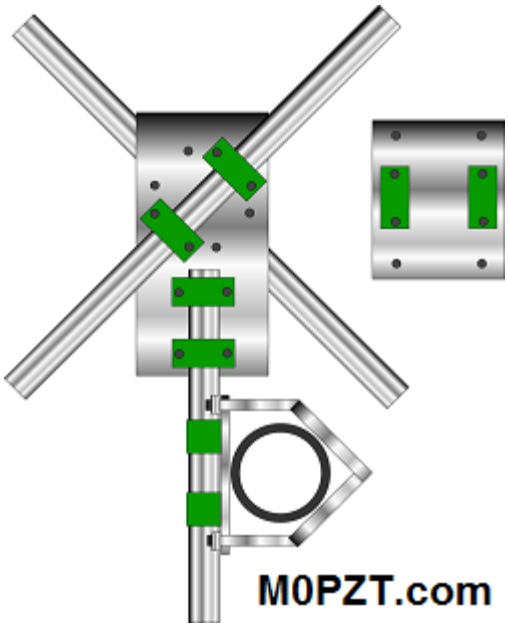
- 1x ABS MB5 Box (150x100x60mm), CPC EN81782 or Maplin YN40T
- 10x Solder-tags, selection of nuts/bolts

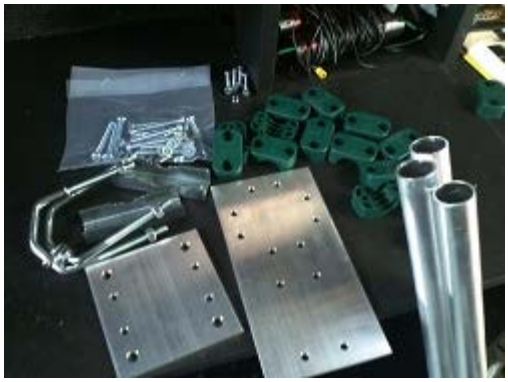
* Metal and fixings obtained from Aerial Parts of Colchester. 20mm PVC conduit from Screwfix/Wickes - After extensive testing, there appears to be no difference between using black or white PVC. YMMV. Fibreglass spreaders are preferred - I used PVC as it was easily obtainable and rather cheap.

The Bits

The main part of the CobWeb is the mounting-plate that holds the crossover poles and boom arm. After looking at the various examples online, I opted to re-engineer the one found on the CobWebb PDF guide so I drew-up the plans using my trusty Serif Draw application. Some designs used either plastic PVC conduit clamps or small U-bolts - I opted to use the rugged Stauff element clamps which I have several of in use already: 2 on my HF Vertical and several on my 6m 3ele LFA Yagi - They hold the ali-poles securely without damaging (ie: denting) the tube.

Original CobWeb Mounting Plate, Kit of Parts, Assembled Mounting Kit





The mounting-plate, ali tube and fixings were obtained from Aerial Parts of Colchester. I confess to not being too great with "metal-bashing" and nor do I have extensive facilities here - I have basic tools but the garden-shed isn't much of a workshop. The mounting arrangement consists of 2 plates - The 1st holding the main crossover poles (1 on top, 1 underneath) and the boom, the 2nd supporting the boom and fixing to a 1.5-2" mast. This design permits the CobWeb to be mounted at any height up a typical 1.5-2" mast.

John G4ZTR supplied the parts as per my drawing above - I supplied the drawing "to scale" with a guide size for the plates. He made some minor adjustments and drilled the metal-plates accordingly. Turnaround time was a couple of days. He welcomes your custom, so if you think this mounting-plate will work for you, just mention that you'd like the PZT CobWeb plate. The cost was ï¿½25 (September 2012). As a slight modification to the boom, I opted to remove 150mm and use an off-cut of the 20mm PVC conduit - This keeps the feed-point and wires away from the metal. Thanks to Steve G4HSK for the tip. Inside the box, I used 2 strips of copper-clad board as a "bus-bar" through each screw - the coax from the balun was then soldered at a convenient point.

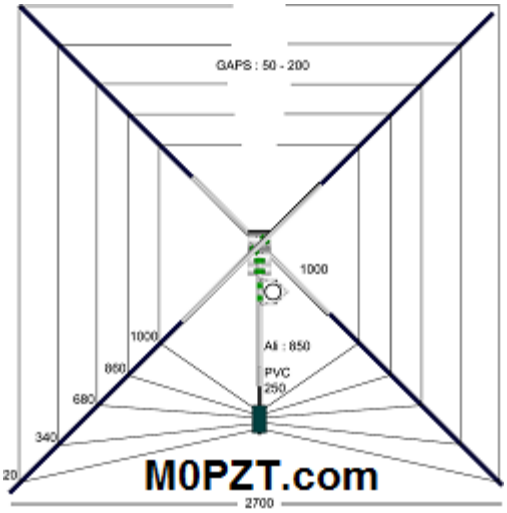
Feed-Box with PVC Extension , Initial Test Build of Metal Parts

The spreaders (which must be non-conductive) are made up of 20mm PVC conduit. The overall diameter fits nicely inside the aluminium poles with a few turns of PVC tape either side of the fixing hole. A fixing screw was chosen over hose-clips as the antenna would be up on the side of the house and not easily accessible - So it needed to be sturdy! Fibreglass is the more common material used for the CobWeb, but I am happy with the PVC tube.

Dimensions

The following details my own build and what worked for me - Each piece of PVC sticks out 140cm past the ali-tube, with 100mm inside the ali and held in place via a through-bolt. The dimensions shown on the plan below are all in mm. The dimensions shown next to each wire are the distances from the outer-end of the PVC tube. The 10m wire is therefore 400mm from the ali-tube. You can also see how I've threaded the wire through the PVC tube - just 2 small holes and the wire is threaded in+out which helps keep it tight. When installing each set of wires for the first time - Secure them onto the PVC using velcro cable ties. This means that you can move the position of them quite easily if you need to make changes.

CobWeb Plan with Dimensions , Wire Fixing Method



Balun Construction

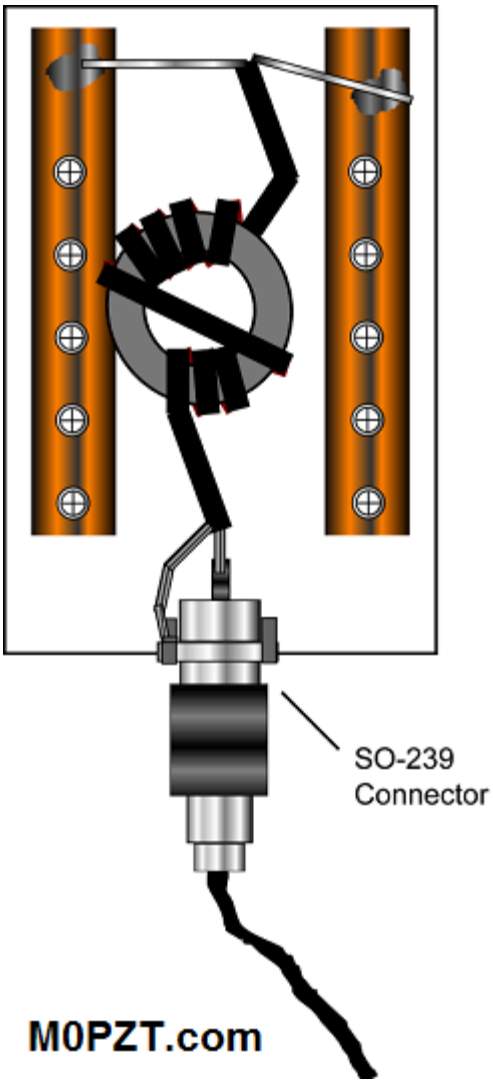
There are 2 ways to make a CobWeb antenna: The original G3TPW CobWebb (note spelling) using speaker-wire forming folded dipoles, or the G3TXQ CobWeb using single-core and a 1:4 balun. I have opted for the G3TXQ version in this case. Typically, when forming a dipole into a square shape, the

impedance presented drops to around 12ohms - Hence the use of a 1:4 Guanella current balun which is mounted inside the terminal box - This, as you've probably guessed, brings things up to around 48ohms. Quite acceptable for the average transceiver.

Current Balun - Single and Completed

You will need 2x 550mm lengths of RG316 (or RG174 for 100w max) which can be linked via a series of short lengths of heat-shrink tubing. You simply wind a total of 8-turns: 4 and then a cross-over and finally another 4. The ends are solded inner-to-inner and outer-to-outer. Make 2 of these and link them together via 2 cable-ties - The ends of both are then soldered in the following way: End 1 is inner-to-inner and outer-to-outer (ie: parallel). End 2 is inner-to-outer which leaves you with an inner and outer. End 2 is the one you connect to the SO-239 socket.

Drawing Showing Balun and Copper Bus-Bar for Screw Terminals



Wires and Tuning

Tuning this type of CobWeb is simpler than finding the "sweet-spot" tapping-point on the speaker-wire - but people generally stick to the "traditional" design. The only drawback with the G3TXQ single-wire version is having to make-up the 1:4 balun! Still, it's far better than messing-up lengths of speaker-wire with incorrect tapping points. YMMV. Thanks to my earlier test (13.2MHz resonance) I knew that the current size of the *beast* was a tad on the large side, so I reduced it by 10cm. This makes mine 270cm square. The height whilst on-test was 10ft, about 4ft under my dipole and the comparison test was quite favourable. See my YouTube video for a live demo. I'll be recording a more details video once the CobWeb has been installed at the "proper" height!

I assembled the antenna with it mounted atop a 5ft pole - when adding a further 5ft pole, the resonance altered - So be prepared to either work at a higher level or you'll have to raise/lower the aerial between adjustments. Here are the final readings from the MFJ - Not bad!

You'll find that, particularly on 10m - It'll need *some help* from an ATU if you plan on running datamodes as well as voice. Expect about 250KHz of 3:1 swing at best. Here's the finished article - Due to the angle of the photo, the feed-point looks like it's raised, but it isn't! After extensive testing, I have came to the conclusion that there is little difference between using black or white PVC tube (the Wickes brand, at least) - Therefore, you can choose the best colour to suit your QTH. I chose black as most of my CobWeb would be sitting just about the roof-tiles.

As of 17th November 2012 (3 weeks of testing at 10ft) - Here's a map of (mostly PSK/RTTY) QSOs made using the CobWeb :