THE H.F. DISCONE

by Henry Randall – ZS5HF.

In these modern times there must be very few of us who have not at least been to a reasonable sized airport at some time or another and being good Hams, we will have kept our eyes open and will have noticed that spidery looking device perched near the control tower – that spidery looking device is not a lightening arrestor but a broad-band antenna.

Most people associated with radio communication will be aware that UHF and VHF bands tend to be quite wide – spreading over many megahertz. For example the normal aircraft VHF band stretches from somewhere about 110 Mhz to about 138 Mhz and the UHF bands stretch in a similar fashion. Naturally conventional antennas with a bandwidth of a few hundred Khz would be of little value and, therefore, attention has been given to the design of a "broad-band" antenna. The result of research has produced a number of interesting configurations, but one of the simplest is the "DISCONE". This antenna features extreme simplicity of construction an exceptionally low radiation angle excellent omni directional progagation and up to 10:1 bandwidth. The possible disadvantage is that the Discone has a unity gain. However, don't let this put you off because some mighty fine contacts have been made with a ground plane.

As the name implies, the Discone comprises a "disc" or "hat" and a cone – the "disc" portion is the "hot" leg and the cone is at ground potential. Being an unbalanced antenna it is ideal for coax feed and if the dimensions below are followed the feed impedance will be an almost perfect match to 52 ohm coax (RG 8/U / UR67 etc). On the assumption that the lower design point is 7 Mhz the upper limit will be close to 70 Mhz so all bands can be covered, 40 thru' 6, with an SWR of less than 1:5:1 to boot.

Another feature of the Discone is that the height of the radiator is not a determining factor in system performance – the height is actually determined by calculation but the notable point is that for a dipole at the same height the radiation angle would be close on 90° – virtually useless.

Possibly the discone on 40 metres is a little large about the skirt but for 20 or 15 it could be a definite proposition more especially as you could cover way above 2 metres with a single antenna.

References to the sketches will show the principal constructional points. Figure 1 shows the discone in "skeleton" form. The dimensions for L.F. cut off frequencies of 20: 15: and 10 are as follows :

20 Metres

D = 12 feet
L = 18 feet
S = 10 feet
R = 18 feet
H = 15 feet 7 inches

15 Metres

D = 8 feet
L = 11 feet
S = 6 inches
R = 12 feet
H = 10 feet 5 inches

10 Metres

D = 6 feet
L = 9 feet 6 inches
S = 4 inches

R = 9 feet 6 inches
H = 8 feet 3 inches

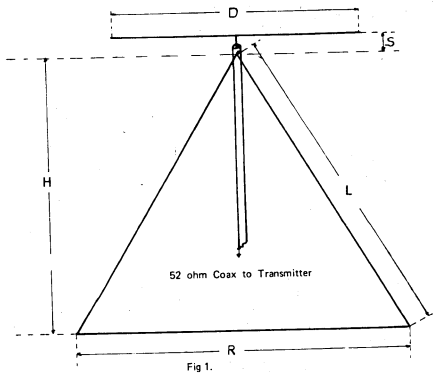

Fig 1.

Feed impedance is determined by distance "S" and should be closely adhered to. If other feed line impedance (say 75 ohm) were to be used spacing "s" could be determined by trial and error.

The supporting structure for the "disc" does not have to contain fantastic modulation properties because of the low feed impedance and, therefore, any hardwood suitably water proofed is perfectly adequate. A more important consideration is that the wood be of good quality and will withstand the strains introduced by the disc in a high wind, though it should be noted the wind resistance is very low with the discone.

The mast section, which may be of wood or metal, is fully supported by the multiple wires forming the cone. If a metal support is used the coax could be fed through the pipe and, therefore, automatically preventing any possible feed line radiation – the balance of the coax being buried for convenience.

The more wires that go to form the cone the better as this will help to smooth out any "kinks" in the pass-band but there should not be fewer than 48.

The centre of the disco is formed by an aluminium plate at least $\frac{1}{8}$" thick, the eight radials are fabricated from $\frac{3}{4}$" x $\frac{3}{4}$" x $\frac{1}{8}$" aluminium stock securely bolted to the centre plate.

The tips of the radials are joined by wire (uninsulated) as are the mid points of each radial. Here a word of caution – try and use aluminium wire – do not use copper as aluminium and copper are too far apart in the galvanic scale and severe corrosion will result.

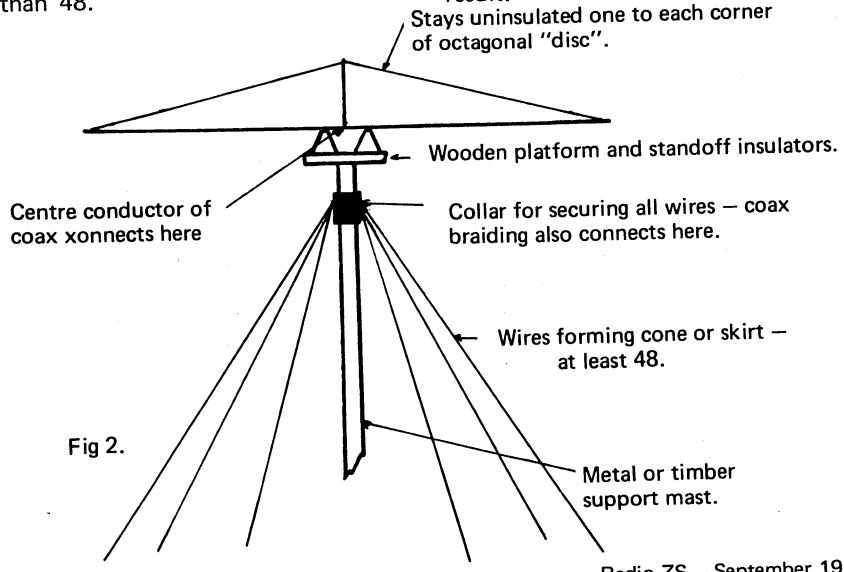

Fig 2.