Appendix I – Rhombic and Beveridge Aerials

An aerial, or antenna, is a metallic object used for transmitting radio waves or in which the effect of radio waves can be detected. An aerial must be at least as long as the wavelength of the radio wave it aims to transmit or detect and is usually longer than the minimum. An aerial placed in an electro-magnetic field will produce an 'alternating current' in response to that field – 'radio frequency induction'.

Rhombic and Beveridge are forms of 'long wire' aerials. This category of aerial is much longer than the wavelength of the radio waves to be detected. The greater length allows for easier detection. 'Multi-element' aerials are even more effective, but are more complex to design and construct. The Rhombic aerial is simple to make and easy to operate over a number of wavelengths/frequencies. Another advantage of long-wire aerials is that they have sharp directional patterns in both the horizontal and vertical planes. Also, they tend to concentrate the radiation at low vertical angles.

The Rhombic aerial is 'diamond' shaped, with the main axis horizontal, or angled close to horizontal, (a 'rhombus' is a quadrilateral with all sides equal in length and with parallel sides). It is pointed with the main axis in the direction in which the signal is expected; a resistor is attached at the end of the axis pointing to the receiving or transmitting direction and plays a key role in the way the aerial works.

A Rhombic aerial can transmit, or detect radiation, close to the horizon, or at a higher angle, depending on length, width, and height relative to the operating frequency. The beam can be narrow or broad. Designing a Rhombic aerial involves determing the best combination of size, height, angle and operating frequency. Different combinations are used for short- medium- or long range communication.

The inherent features of the design of the Rhombic aerial when used to transmit radio waves means that a considerable amount of power is lost in a resistor at the transmitting end of the diamond-shape. However, it is this resistor that allows the directional effect to work. The design characteristics, however, also mean that for receving aerials, signals from the rear are not picked up at all.

The very size of the aerial means that it requires a lot of space (each leg actually needs to be at least eight to ten wavelengths long), but the same factor also means that it can pick up signals over a wide area, minimizing the effect of 'local fading'. The Rhombic aerial is best suited for detecting 'point-to-point' circuits that are fairly stable (because re-aiming the aerial involves moving the masts).

The Beveridge aerial is even simpler with a single wire stretched across a number of supporting masts. Its design features are less critical, but it is also less sensitive.

[see accompanying three diagrams: 1) Rhombic aerial; 2) how it works; 3) Beveridge aerial]