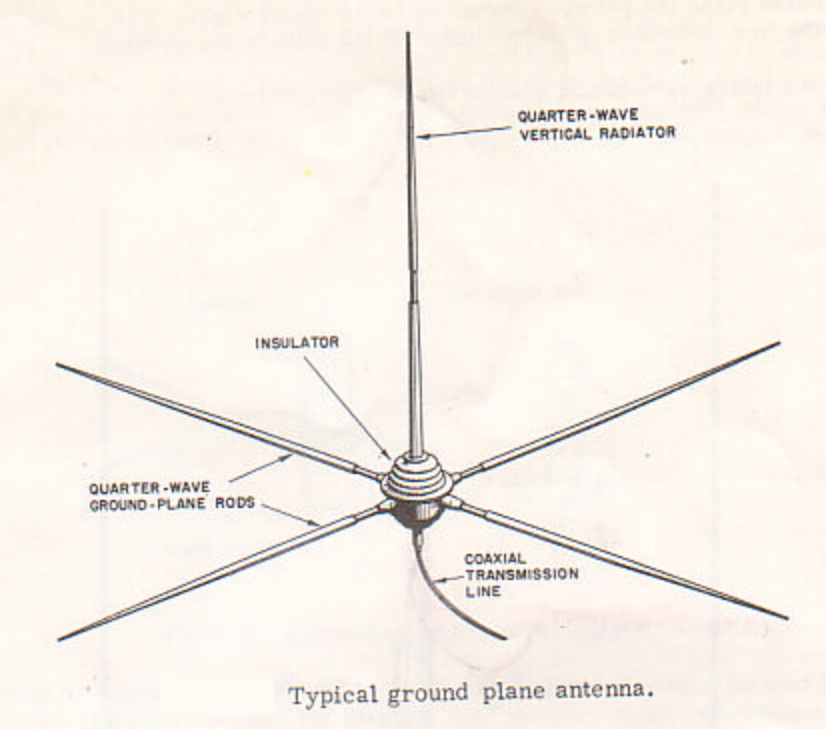
MARCONI ANTENNA

"Quarter-Wave", "Ground-Plane" or "Grounded"



Typical ground plane antenna.

Figure-1: Typical (¼ λ) Ground Plane Vertical 'Marconi' Antenna

When Radio Frequency Alternating Current (RFAC) energizes an antenna from a transmitter, current and voltage variations occur along the length of the antenna, which produce an ElectroMagnetic (EM) field that is radiated by the antenna. Since the strength of the radiated EM field depends on the amplitude of the antenna voltage and current, a large amount of RFAC must be supplied by the transmitter. Basically, the relationship requires that the RFAC be such that the antenna appears to the transmitter as a ***resonant circuit***. For this to occur, the antennas physical length must be some multiple of the electrical wavelength of the applied RFAC. Most commonly, this multiple is one-half wavelength (½ l). In other words, an antenna whose physical length is equal to one-half the electrical wavelength of the applied RFAC.

A one-half wavelength (½ l) antenna for Low Frequencies (LF) and Medium Frequencies (MF) is very long. Such a long length is highly undesirable when the antenna is to be used with portable transmitting equipment and often completely unfeasible. This length disadvantage can be overcome somewhat by using a ***Marconi*** antenna. **Figure-1**

If a one-half wavelength (1/2 λ) antenna is mounted vertically and the lower quarter wavelength (¼ λ), is replaced by an extensive conducting plane, no disturbance is caused in the propagated waves from the upper quarter

wavelength (¼ λ). In other words, the remaining one-quarter wavelength (¼ λ), will continue to radiate much in the same way as a one-half wavelength (½ l) antenna, provided an extensive conducting plane is present. A practical form of such a radiating system is the Marconi antenna, in which the antenna vertical radiator provides one-quarter wavelength (¼ λ), and the conducting plane supplies the other one-quarter wavelength (¼ λ). The total electrical length of the Marconi antenna is then one-half wavelength (½ l).

Electrically*, a Marconi antenna operates as a Hertz antenna, but *physically* it is only a one-quarter wavelength (1/4 l) long**. This is possible because a Marconi is operated in conjunction with a ***ground. One end is fed near ground. **Thus, the ground provides a *reflection* of the current and voltage distribution set up in the antenna. The result is that a electromagnetic wave is emitted from the antenna and ground combination that is the same as the electromagnetic wave emitted by a *Hertz* antenna operated at the same frequency. Electrically, therefore, a *Marconi* is the same as a *Hertz but* physically it is only half as long.**

Establishment of a good ground-conducting plane is not always easily accomplished, since the ***earth ground*** in many localities is dry and sandy. When this is the case, an ***artificial ground*** called a ***counterpoise or ground plane*** can be constructed. One form of a counterpoise is a system of radials with a minimum quantity of 3 or 4 and each individual radial length is one-quarter wavelength (¼ λ) long at the resonant frequency of the antenna.

The main advantage of the Marconi antenna lies in the fact that, for any given frequency, it is much shorter than the Hertz antenna. This is of particular importance in all man-packed portable or vehicular radio installations. Typical Marconi antennas are the called "**inverted-L", the "whip", the "ground-plane", and the "modified ground-plane"** antennas.

Modified Marconi antennas are made with either a single or multiple (¼l , ½l or 5/8l) vertical radiator, and 3 or 4 one-quarter wavelength (¼ l) long radials. See Figure-2 below.

Figure – 2: Modified “Marconi” Antenna with Multiple 5/8 Wave Vertical Radiator and ‘3’ ¼ λ Radials (Diamond X510NA)

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