



Aerial System for Tropospheric Scatter Communication

TO MEET THE NEED for an efficient aerial for tropospheric scatter communication, special equipment has been developed.

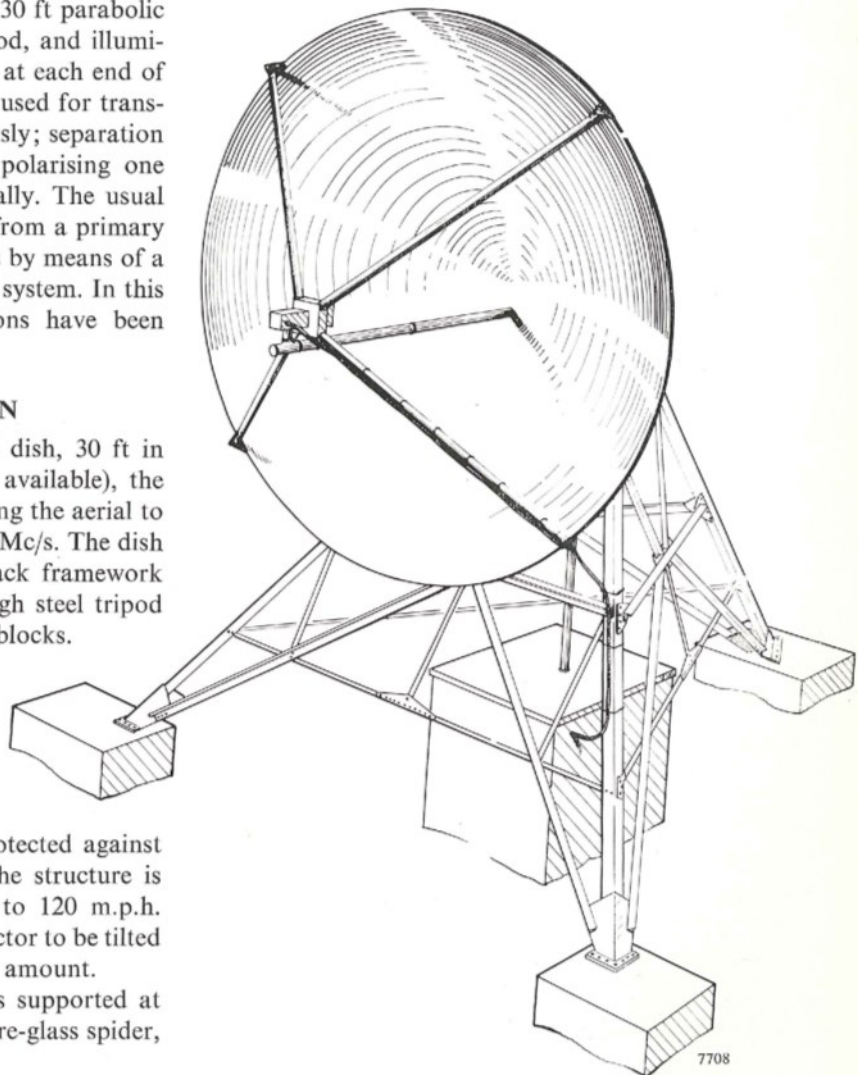
The aerial system consists of a 30 ft parabolic reflector mounted on a rigid tripod, and illuminated by a horn feed. The aeriels at each end of the link are identical, and can be used for transmitting and receiving simultaneously; separation of the two fields is effected by polarising one vertically and the other horizontally. The usual practice is to illuminate the dish from a primary feed and to separate the two fields by means of a diplexer at some stage in the feed system. In this equipment, however, the functions have been combined in one element.

CONSTRUCTION

The parabolic reflector is a steel dish, 30 ft in diameter (a 60 ft version is also available), the surface tolerance of $\pm\frac{1}{4}$ in. allowing the aerial to be used up to frequencies of 2000 Mc/s. The dish is supported by a steel strong-back framework mounted on a very rigid 30 ft-high steel tripod anchored to concrete foundation blocks.

All the metalwork is amply protected against the effects of the weather, and the structure is designed to withstand winds up to 120 m.p.h. Two adjusting bolts allow the reflector to be tilted $\pm 2^\circ$ and to be slewed by the same amount.

The square-section feed horn is supported at the focal point of the dish by a fibre-glass spider,



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and two feeders are brought up to it. The transmitter feeder is a $3\frac{1}{4}$ in. diameter rigid coaxial line, made up of hard-drawn copper tube outer conductor lengths, flanged and bolted together, and copper tube inner conductor lengths fitting together by plugs and sockets. This feeder is brought up behind the dish to a system of rotating and sliding sections to allow for adjustments in the position of the dish, and is then taken out through the surface and connected to the feed horn. The receiver feeder is $1\frac{5}{8}$ in. diameter low-loss aluminium-sheathed helical membrane cable,

which is strapped to one of the legs of the tripod, looped across to the edge of the dish and is then strapped to one leg of the feed horn support spider.

Diversity reception. A normal installation would include two dishes, each mounted on a tripod at either end of the link. One of each pair is used for transmitting and receiving; the other, which is identical except for the omission of the transmitting feeder, is used for receiving only. The better of the two received signals is selected by a diversity combiner in the receiver.

DATA SUMMARY

Details of dish

Diameter: 30 ft (9 m) (a 60 ft version is also available).

Focal length: 10 ft (3.05 m). Dishes having other focal lengths can be supplied to special order.

Profile: Parabolic, with a tolerance of $\pm\frac{1}{4}$ in. (0.64 cm).

Working frequency: May be used at frequencies up to 2000 Mc/s. (Usual frequency range for tropospheric scatter equipment is 750–1000 Mc/s.)

Weight of dish and framework: 7850 lb (3550 kg).

Details of tripod

Constructions: Braced tripod of steel girders, all joints bolted, mounted on concrete foundation blocks.

Adjustments: Dish pivoted, adjustable $\pm 2^\circ$ in elevation and bearing.

Rigidity: Designed to withstand winds up to 120 m.p.h. (193 km.p.h.) without vibration and a loading of $\frac{1}{2}$ in. of ice.

Height to focal axis of dish: 35 ft (10.7 m).

Weight of tripod: 10,000 lb (4536 kg).

Total weight of equipment: 17,850 lb (8086 kg).

Details of Feeder System

Primary feed: From a square-section feed horn.

Frequency range: Versions of the feed horn are available to cover specified bands within the range 750–1000 Mc/s.

Transmitting feeder: $3\frac{1}{4}$ in. diameter rigid coaxial copper tube transmission line. Characteristic impedance 51.5Ω . Attenuation 0.25 dB per 100 ft at 900 Mc/s. Weight approx. 3 lb per ft.

Receiving feeder: $1\frac{5}{8}$ in. flexible aluminium-sheathed helical-membrane coaxial cable. Characteristic impedance 75Ω . Attenuation 1 dB per 100 ft at 900 Mc/s. Weight 172 lb per 100 yds.

Performance data

Forward gain: 35 dB at 900 Mc/s relative to a half-wave dipole.

Beam width: 2° between -3 dB points at 900 Mc/s.

Power handling capacity: Limited only by maximum power that can be carried by the $3\frac{1}{4}$ in. coaxial feeder at the working frequency. Normally the aerial system will be used in conjunction with a 10 kW transmitter.

Protection between transmitter and receiver fields: 57 dB with 50 Mc/s separation.

Standing wave ratio on feeders: Better than 1.1 : 1.

Marconi

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED

Marconi House, Chelmsford

Telephone: Chelmsford 3221. Telex: 1953. Telegrams: Expanse Chelmsford Telex