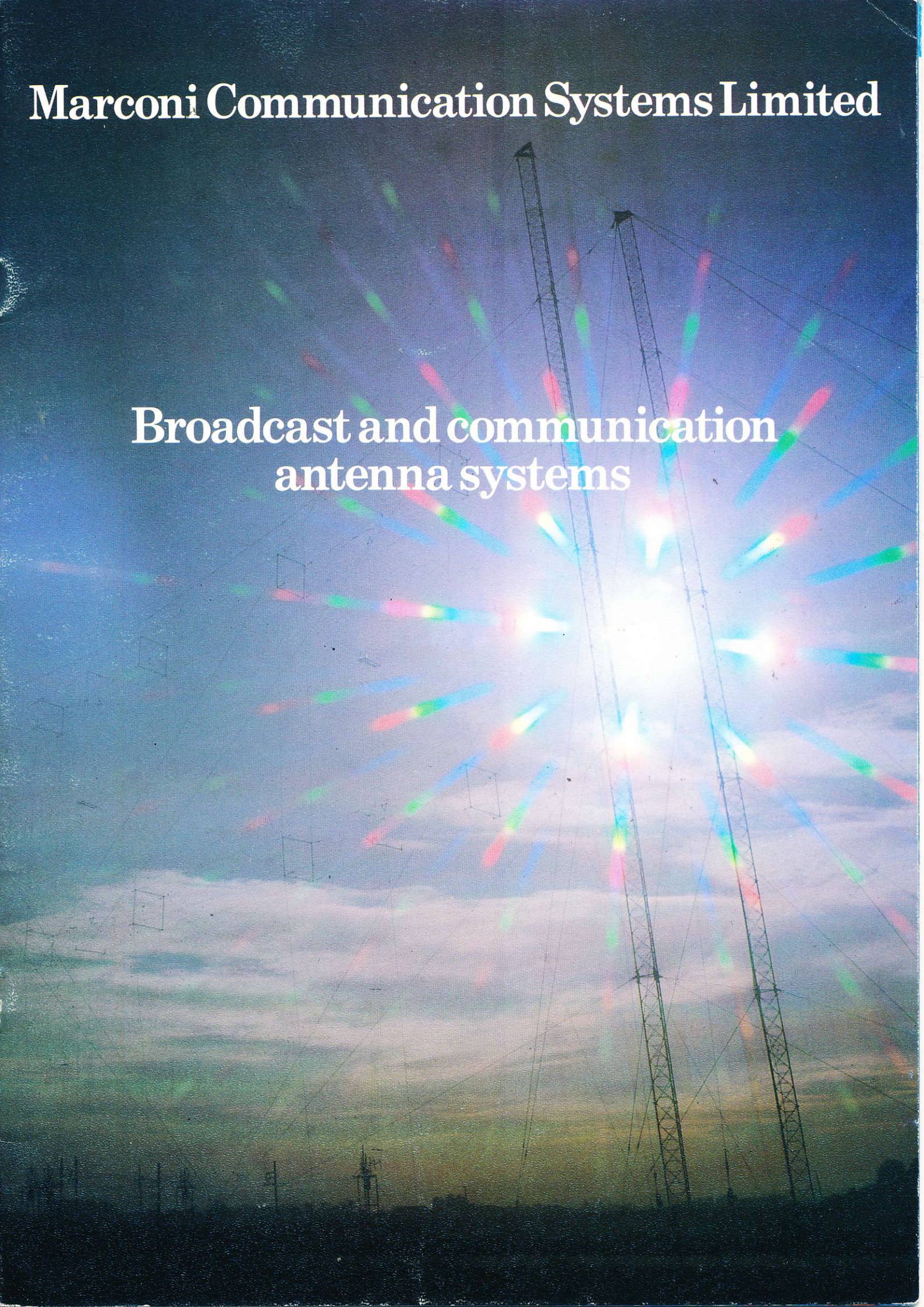


**Marconi Communication Systems Limited**

**Broadcast and communication  
antenna systems**



# MCSL antenna capability



The Antenna Systems Department of MCSL has a complete capability with designs from LF to SHF and comprehensive services covering all aspects of design, manufacture, site survey and civil work, erection, commissioning and maintenance.

A continuous development programme enables the Company to offer designs that meet the latest trends in broadcasting and communication systems with cost-effective, corrosion-resistant, high performance, broadband, high-gain antennas. Special development work can be undertaken where a customer's requirements cannot be met by any of the standard designs.

A complete range of ancillary equipment is available including high power transmission lines, remotely controlled switching systems, matching units as well as standard guyed masts or self-supporting towers. Advice and guidance is also available to customers on the selection of locally produced structures to support particular antenna designs.

The current range of antenna designs include –

- LF Communication Antennas
- MF Broadcasting Antennas
- HF Broadcasting Antennas
- HF Communication Antennas
- VHF/UHF Broadcasting Antennas
- Tropospheric Scatter Communication Antennas
- Earth Station Antennas

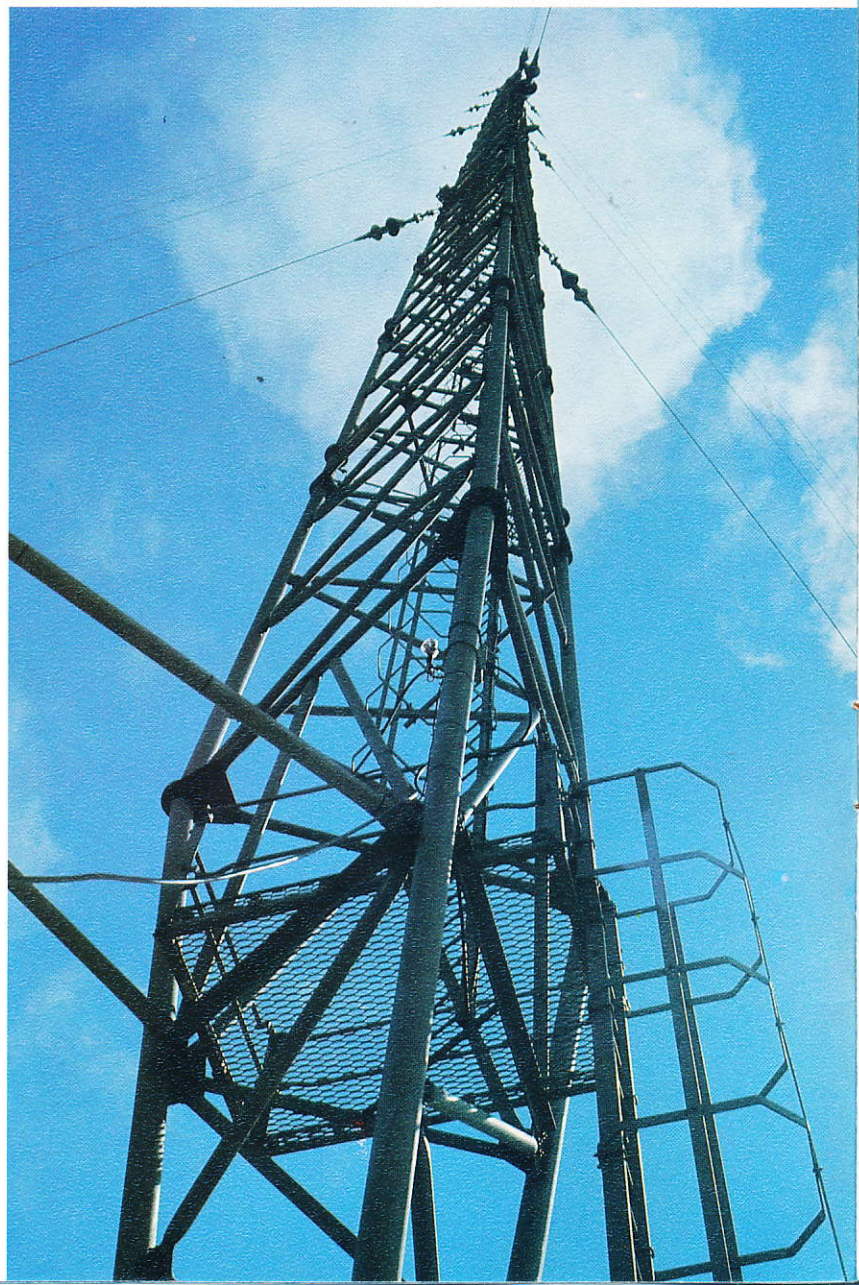
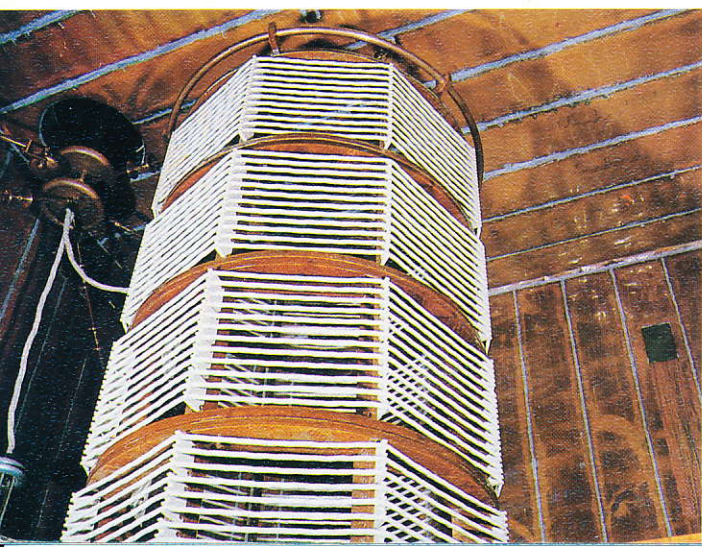
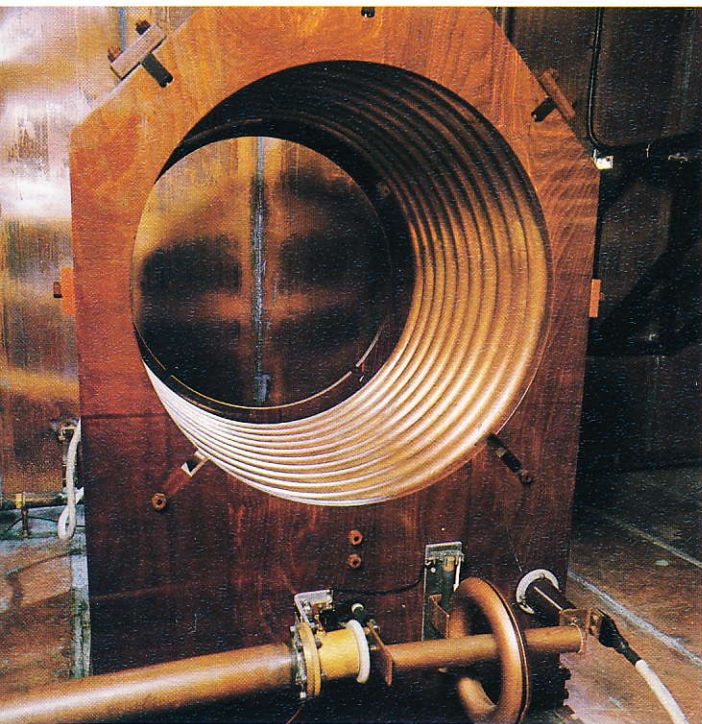
and further details are given in the following pages.

A key factor in the successful implementation of any new antenna system is the installation team. The Antenna Systems Department maintains its own field construction teams, operating throughout the world and specializing in the installation and maintenance of all types of antennas and support structures. The specialist skills include site surveying, supervision of civil engineering work for antenna foundations, all erection and rigging services, testing and commissioning. Where customers favour the maximum use of local personnel for construction work the Department can provide a nucleus of key personnel for supervision from the setting out through to the commissioning stage.

A comprehensive maintenance service is available covering such areas as checking, tensioning and 'plumbing' structures, replacing and greasing guys, renewing antenna elements and insulators as well as general refurbishing and modifying of existing systems.

*Right: 2 megawatt quarter wave MF cage monopole.*





# LF communication antenna systems

At the lower end of the radio frequency spectrum is the long wave or low frequency (30 to 300kHz) band, which because of its severely restricted bandwidth capability is often overlooked. Nevertheless effective use can be made of this particular frequency band provided suitable antennas for ground wave propagation are used.

Over the sea considerable ranges are possible since the ground wave suffers less attenuation than over land so that LF communication plays a vital part in the maintenance of reliable services to ships and aircraft over ranges where medium and high frequency systems prove less reliable due to interference or ionospheric disturbances.

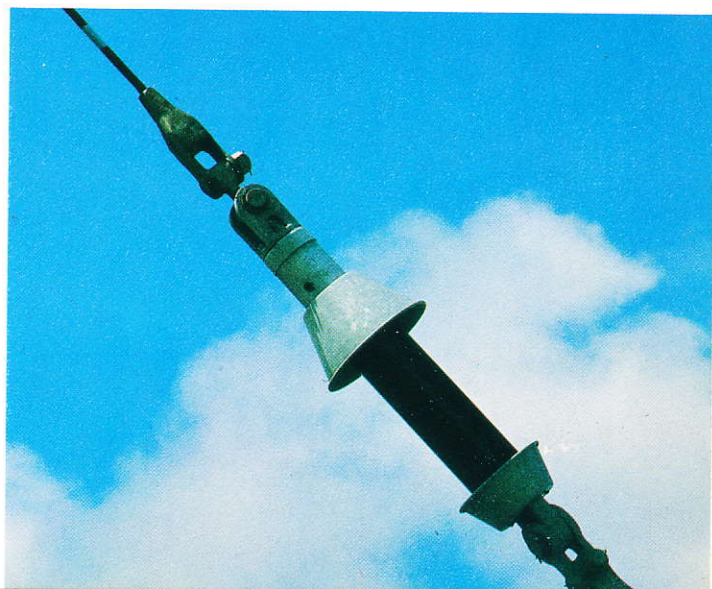
Inevitably the low frequencies involved (generally below 100kHz) mean that any effective antennas are large and expensive. The antenna designer is seeking to achieve maximum radiation resistance which is dependent on the height of the vertical part of the antenna—hence the need for tall masts. Some increase in effective height can be achieved by introducing a 'capacity-top' to improve the current distribution in the vertical portion; such a top also helps to reduce the reactance component in the terminal impedance of the antenna simplifying the design of the associated antenna tuning unit.

Of the three basic configurations normally encountered, 'T', 'Delta' and 'Umbrella' the 'T' and 'Delta' require two or three large support structures capable of substantial headloads to reduce the sag at

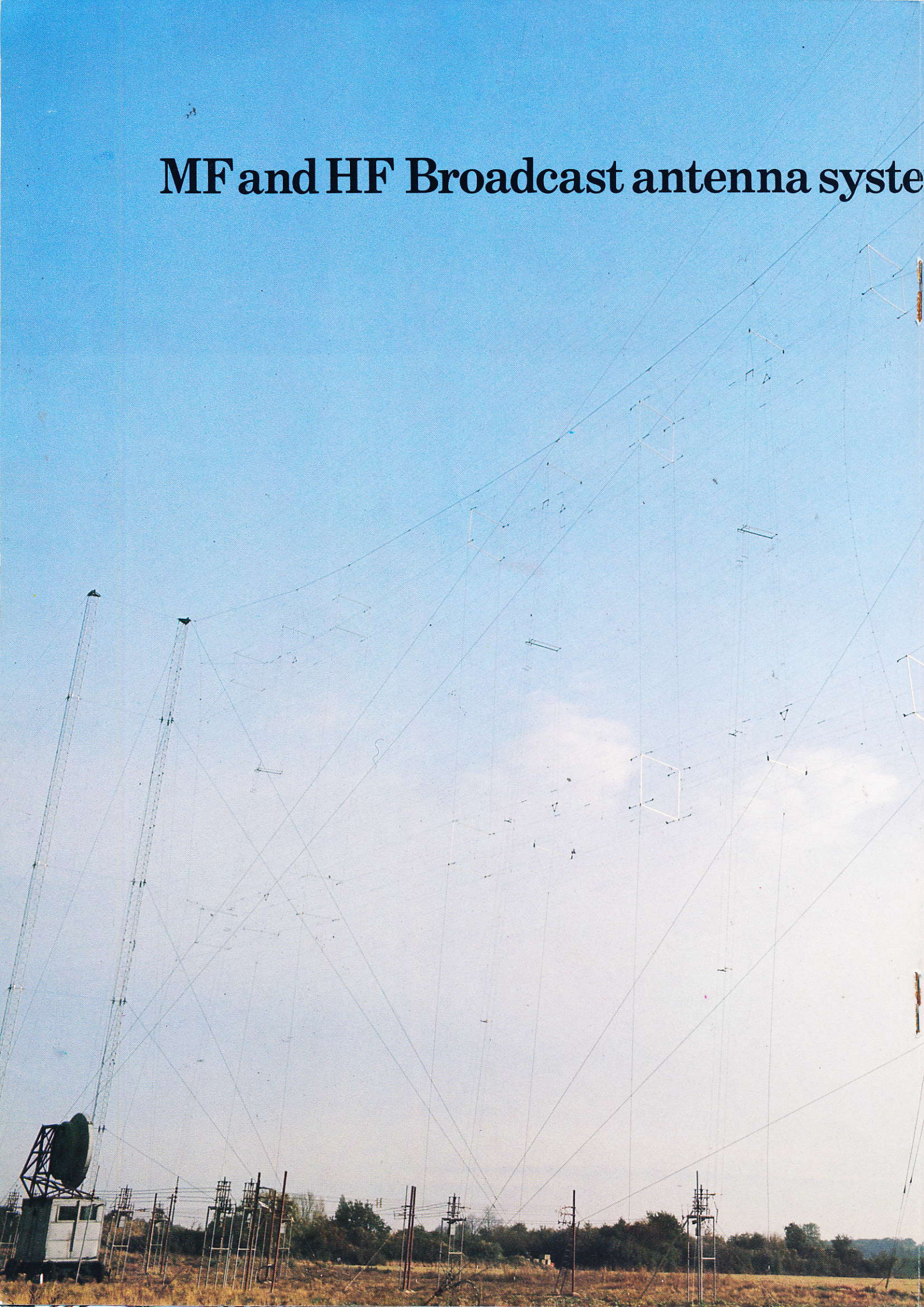
the feedpoint. Under high wind or icing conditions complex balance weight systems may be necessary to relieve the increased tensions and the resulting variations in height also lead to a degradation in electrical performance and give rise to difficulties in tuning.

The Marconi LF umbrella design employs a single tall mast (up to 300m in height) supporting a capacity top comprising a number of radial wire elements. In view of the higher transmitter powers used and the greater reactances involved with what in effect, are 'short' antennas (in relation at least to wavelength) specialized insulation is used at the mast base and in the stays to cope with the very high peak voltages and considerable mechanical loads encountered. The umbrella design offers an economic solution to the need for high efficiency coupled with good operational bandwidth so essential for reliable telegraph services at these low frequencies. The planning, installation and commissioning of LF antenna systems require considerable expertise and MCSL is well experienced in this area and able to supply complete systems on a turnkey basis. A back-up facility is also available to inspect and maintain on a regular or 'on-demand' basis.

*Typical stay insulator LF umbrella.*



# MF and HF Broadcast antenna system

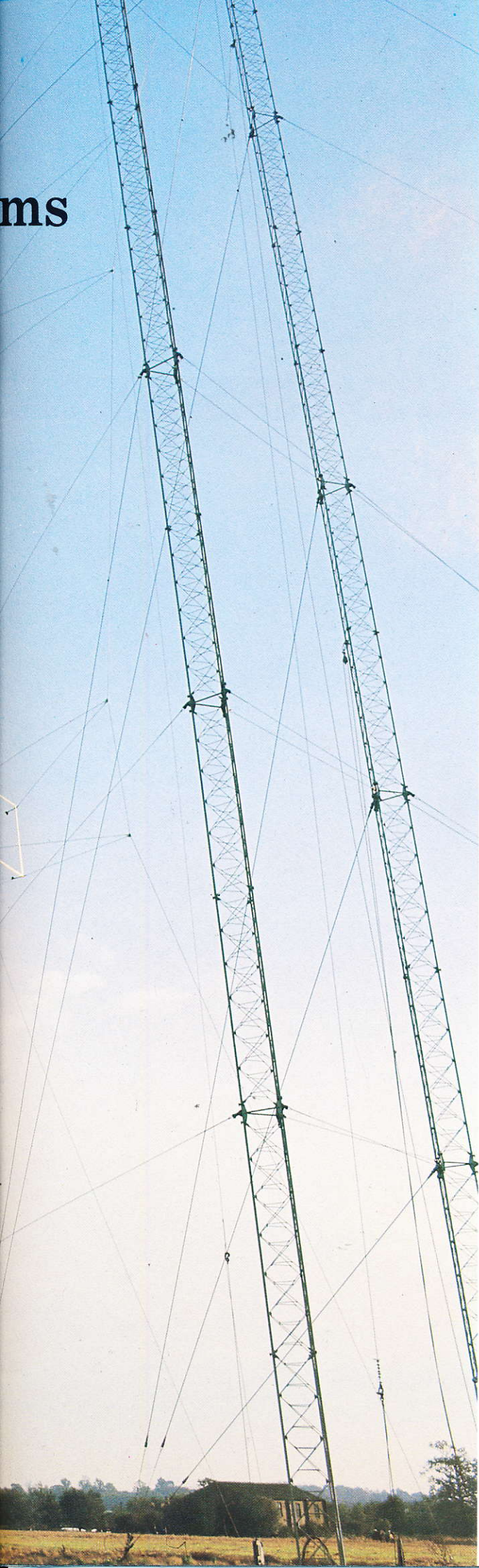


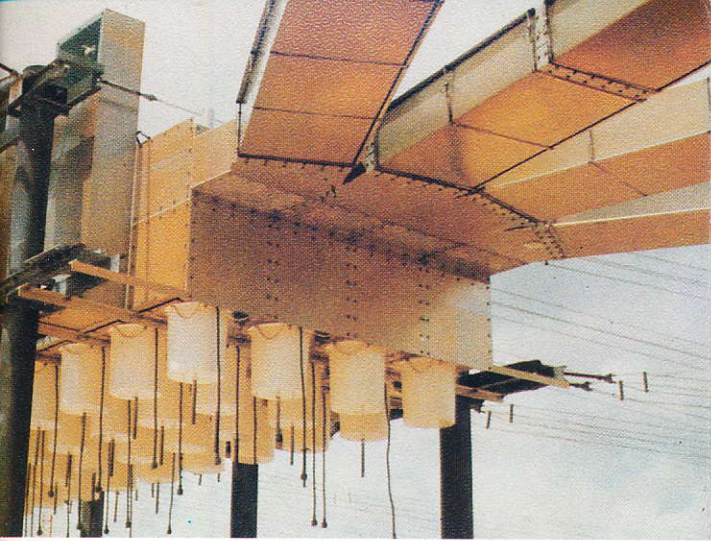
## MF and HF

MCSL offer a wide range of MF antennas from 1kW to 2MW including:-

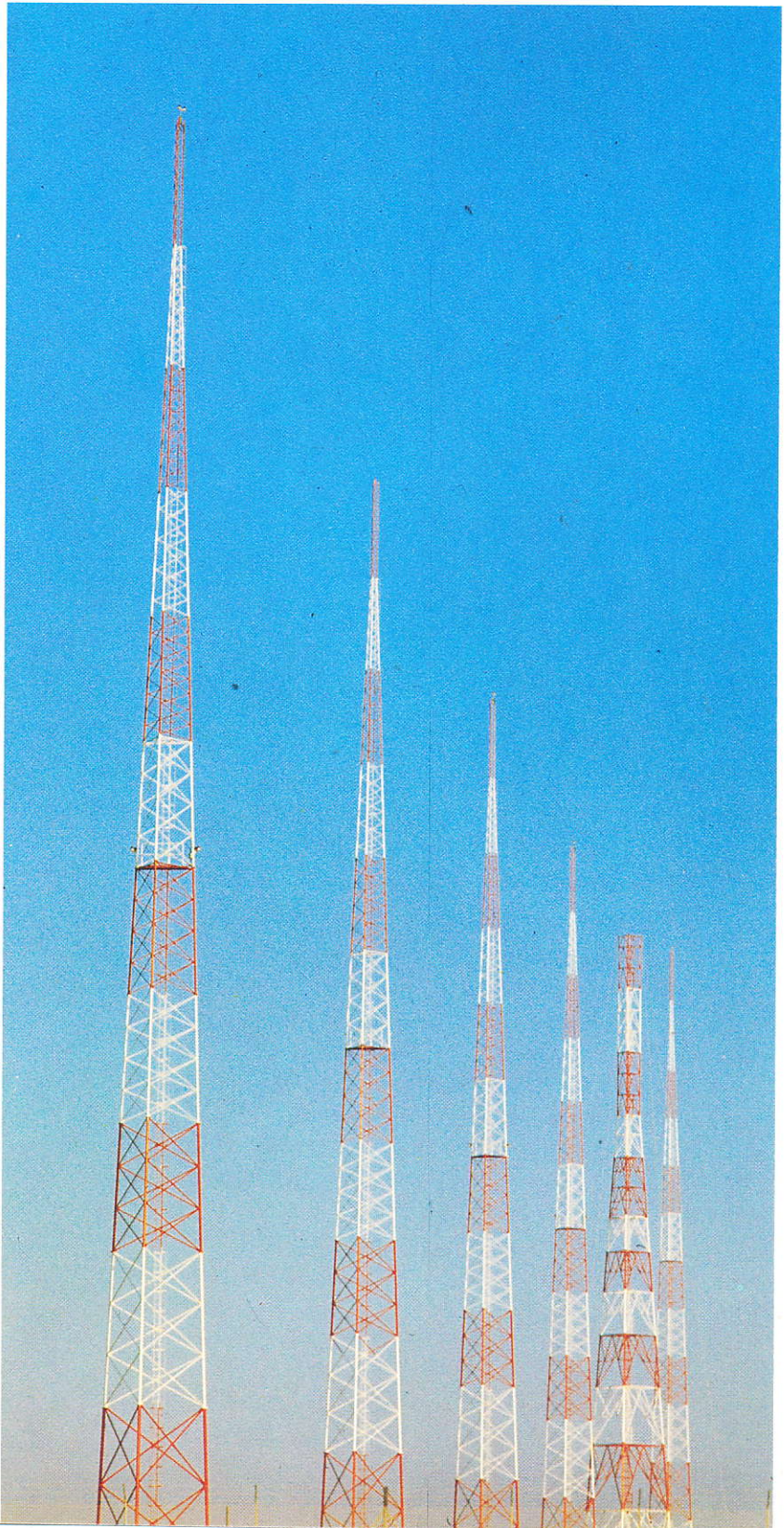
- a) Half-wavelength anti-fading guyed mast or self-supporting tower radiators with matching units.
- b) Multi-radiator systems employing 2, 3 or 4 masts to provide directional coverage for defined service areas.
- c) High power quarter wavelength tower radiators with a folded monopole cage which allows the impedance of the antenna to match that of the feeder thus avoiding expensive antenna tuning units. The towers are also earthed with no need for base insulators, thus minimising the possibility of damage from lightning.
- d) A highly directional yagi array using a folded monopole quarter wavelength radiator with four parasitic director towers and a parasitic reflector.
- e) At lower powers (up to 50kW), folded umbrella antennas on a single guyed mast with height of approximately  $0.1\lambda$  (60m at 500 kHz) make a very effective alternative in terms of cost, bandwidth and efficiency to the twin mast 'T' or inverted 'L' antenna. For spot frequency working the fold can be adjusted to provide a direct match to the input feeder impedance (usually 50 ohms) avoiding additional matching circuits. Fixed and transportable versions are available.

Developments in HF broadcast band curtain arrays have seen the power capability rise from 100kW to 500kW and from arrays capable of working on one broadcast band to those covering four adjacent bands. More recent developments enable the radiated beam to be slewed horizontally up to  $\pm 30$  degrees. The R9010 centre-fed folded dipole array offers these capabilities with a low vswr of 1.4 to 1. For non or small slew systems the R9000 fan dipole array is offered. Compact switching matrices Type R3010, change-over switches Type R3020 and slewing switches Type R3030 together with a 500kW enclosed box feeder Type R3006 complement the HF broadcast arrays.





0 kW HF wideslew wideband broadcast antenna. Top left: R3010 300 kW HF switching matrix. Top right: Lightweight masts supporting R9010 antenna. Bottom left: 2 MW quarter wave MF cage monopole. Bottom right: 2 MW 6 element MF Yagi antenna.





# HF communication antenna systems

The appearance of the communications satellite a decade or so ago with its potential for carrying large numbers of speech channels was thought by some to mark the demise of high frequency communications. Events have shown that both systems can happily co-exist and expand within their own spectrum.

The continued success of HF communications was due largely to the development of self-tuning transmitters and the appearance of wideband antenna systems on which the new generation of transmitting and receiving equipment totally depended. MCSL was in the forefront of the research, development and commercial exploitation of designs such as the log periodic antenna (R1700 Series) and now has a complete range of antennas covering from 1.5 to 30MHz and suitable for short, medium and long range point to point communications or broadcasting services. Other directional designs include the traditional rhombic antenna (R4001 Series) with its high directivity over a limited frequency band as well as a specialized receiving antenna R1709 providing polarization diversity as a compact economic well proven alternative to space diversity systems.

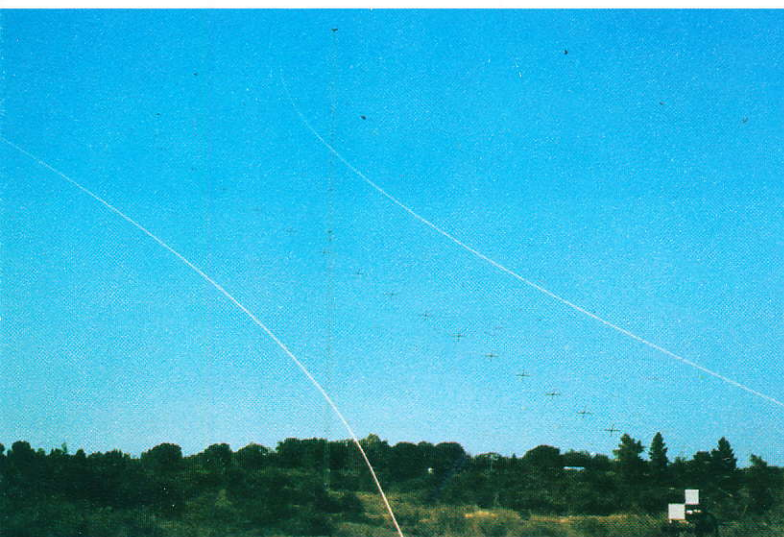
For omni-directional services there are currently two basic designs—one for short/medium range coverage known as the CONIFAN (R5050) and essentially a high efficiency broadband dipole based on a system of multi wire fans supported from a single central mast. The CONIFAN is also available as a lightweight transportable design eminently suitable for the military transportable HF station.



R5059-01 1.5 – 15 MHz 1kW HF CONIFAN.

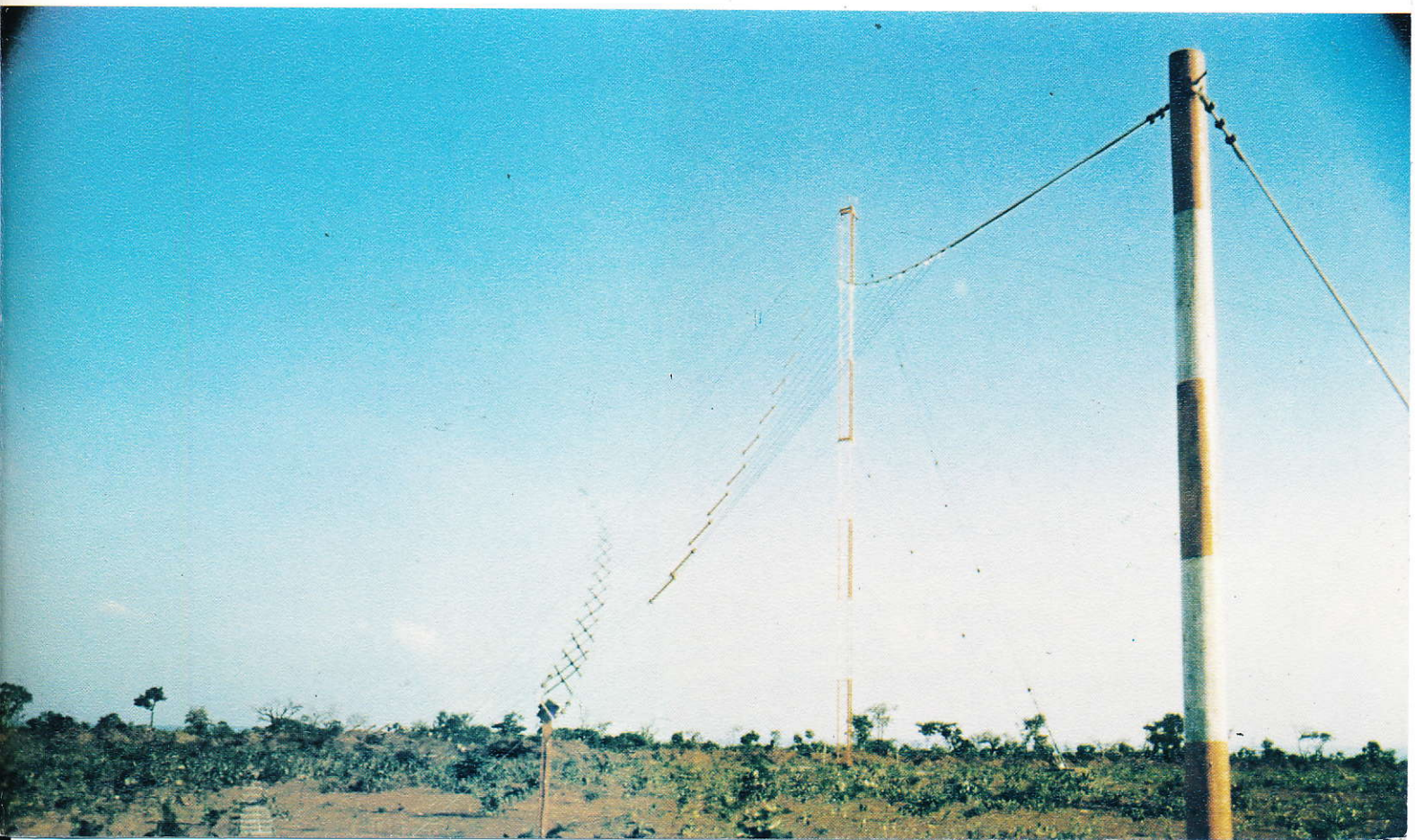
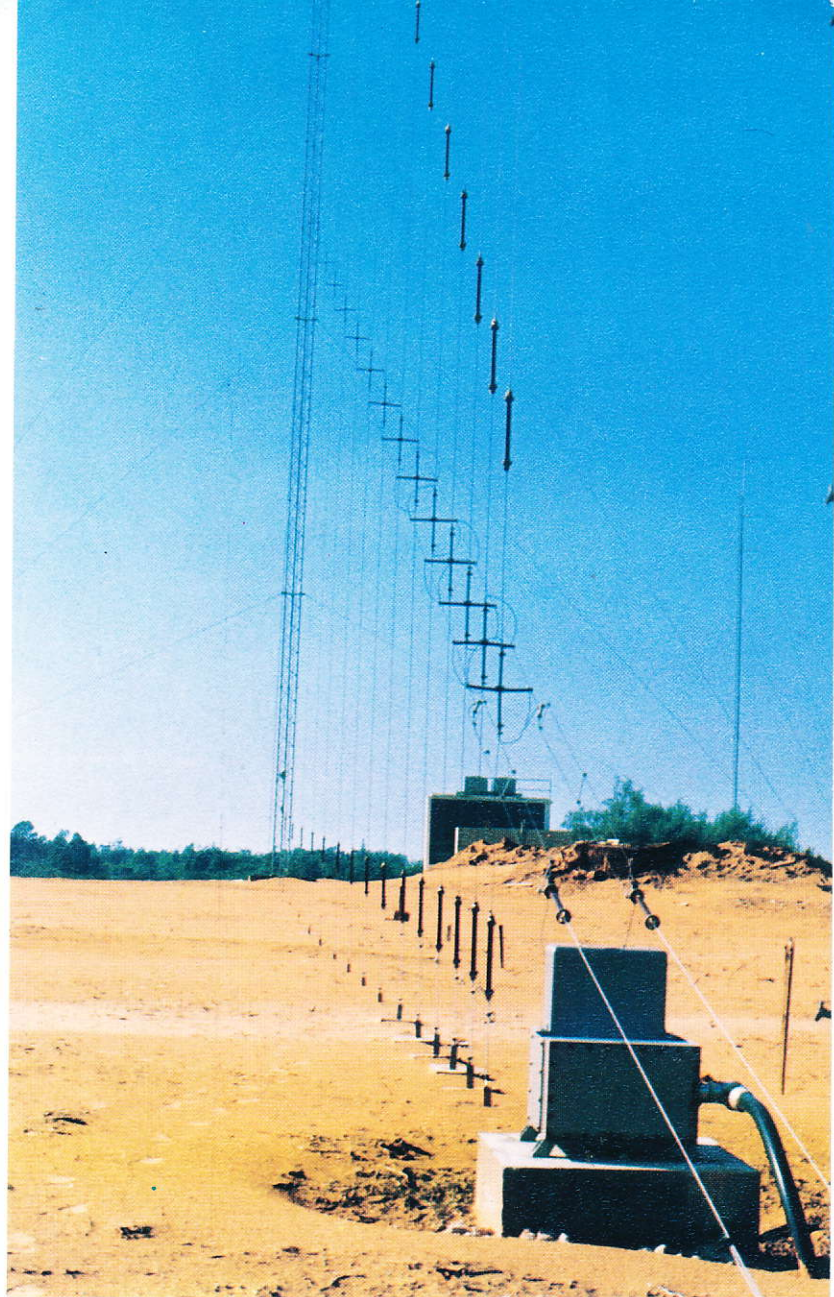
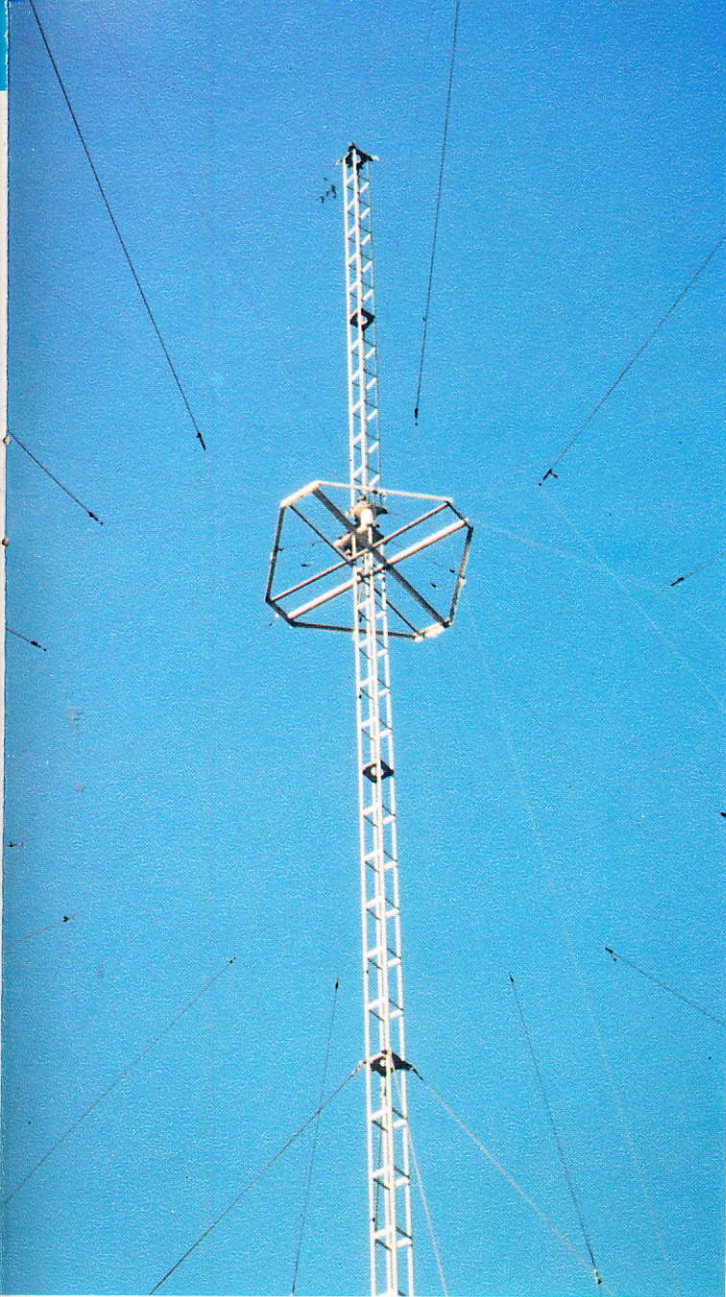
For medium/long range services the R7070 MARCONIPOLE provides a neat, compact solution to problems usually associated with a broadband monopole design in that its elevated feed (based on the sleeve dipole) permits the single support mast to be safely earthed at its base and the disc shaped earth plane conveniently removes any clutter of earth waves in the vicinity of the base.

A policy of continuous development is maintained to keep pace with modern trends. This in conjunction with precision manufacture of pre-fabricated assemblies ensures a reliable high performance product capable of being readily installed throughout the world.



R1702-01 4-28 MHz 30 kW horizontal log periodic antenna.

Top left: R7070-03 3 – 30 MHz 30 kW  
HF MARCONIPOLE.  
Top right: R1706-01 4 – 20 MHz 30 kW  
vertical log periodic antenna.  
Bottom: R1709-02 4 – 30 MHz polarization  
diversity receiving a log periodic antenna.

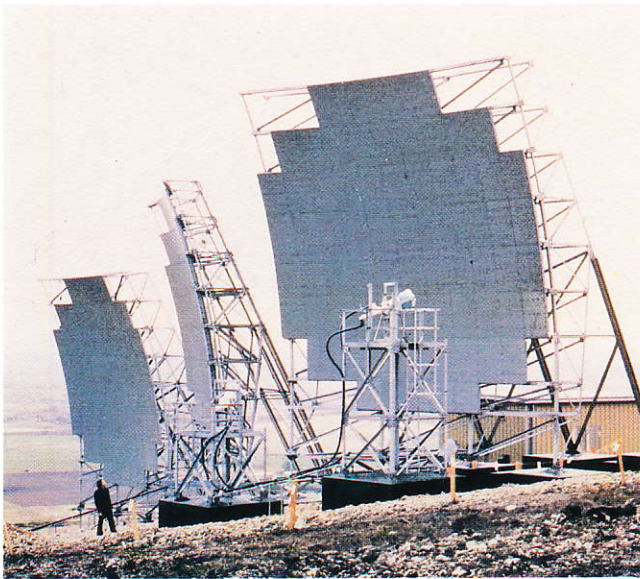


# Tropospheric scatter/earth stations/ VHF and UHF antenna systems

Among the first pioneers of Troposcatter as a communications medium, MCSL has become since original development work in the early 1950's, the largest European supplier of Tropospheric scatter systems with over 50 links, designed, installed and commissioned worldwide.

Antenna systems of proven design are available to meet the most exacting requirements in terms of sites and environmental conditions. Up to 248km/h survival windspeed and  $-7^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  are met from standard designs. Included are 'Billboard' Antennas, offset fed with high efficiency feedhorns of 10kW rating for operation in 900MHz and 2GHz frequency bands. Antenna systems for Civil, Commercial and Military projects are available. For fixed or mobile military applications antennas can be provided for other frequency ranges including 4.5–5.0GHz.

Tropospheric scatter is particularly suitable for communications with off-shore oil rigs and MCSL has unique and extensive experience as a supplier of antennas in this field.



R2051 12m tropospheric scatter antennas.

All aspects of site survey, civil engineering, erection and commissioning for tropospheric scatter antenna systems can be undertaken.

MCSL also has extensive experience in the field of Satellite communications based on early studies and experimental work for Government Departments.



Microwave antenna support tower.

Resulting from this early work Marconi has designed and supplied many large earth stations both in the U.K. and worldwide. For such projects as Apollo, Skynet and Intelsat. A new range of antennas is offered to meet current and future requirements of communication satellite systems. These include 3m and 19m antennas for 11/14GHz operation.

MCSL is able to undertake design, supply and installation of antenna systems with suitable support structures for virtually any professional VHF/UHF requirement. Standard or custom designed systems for bands II, III, IV/V covering FM sound broadcasting, television and line-of-site links can be provided to meet customers' specifications. Alternatively complete project design and implementation can be undertaken.

# A total communications package

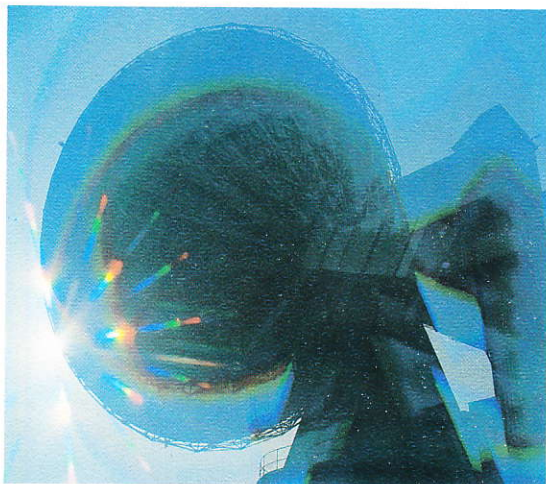
Marconi Communication Systems is a member of the GEC-Marconi Electronics group of companies which is in turn part of the General Electric Company.

MCSL is renowned for its handling of complete 'turnkey' projects, the execution of which calls for the application of many different aspects of systems expertise.

In the pre-contract stages, operational requirements are translated into a detailed system proposal, involving the analysis of the system purpose; topographical, radio propagation and site surveys; and environmental studies of geography and climate. Based on these findings, an objective selection is made of equipment that will form the basis of a reliable, cost-effective system. Liaison is established with outside contractors in the matter of building design, and assessments are made of local architectural standards and civil engineering capability.

When the feasibility of the overall proposal has been proved, systems engineers initiate any necessary development, or modification of the equipment, which they then interface and integrate so that it forms a unified system.

Only a company with the experience and resources of MCSL is in a position to guarantee the success of projects that make such large-scale demands on initiative, engineering skill, and management expertise.



In addition to its complete systems capability in Antenna design and technology, MCSL has an enviable reputation in all other areas of communication. This includes sound and television broadcast equipments, which embraces transmitter and studio equipment. During the year 1976, the Company won the Queen's Award for Technological Achievement in respect of its telecine system which is the world's first telecine with a film transport designed specifically for television broadcast operation and represents a significant advance on all other equipment currently in use. Other activities include, radio communication equipment and systems including point to point, microwave and tropospheric scatter systems, naval communications and satellite communications.



Work is also carried out on digital equipment systems covering PCM, Data Transmission and Error Correction. Additional products include Mobile Radio systems, communication receivers and specialized components.

*The photograph on the left-hand side shows the Goonhilly III Antenna built for the British Post Office. The other photograph is of a receiver from a new Marconi Fast Tune (MFT) range of HF equipment.*

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