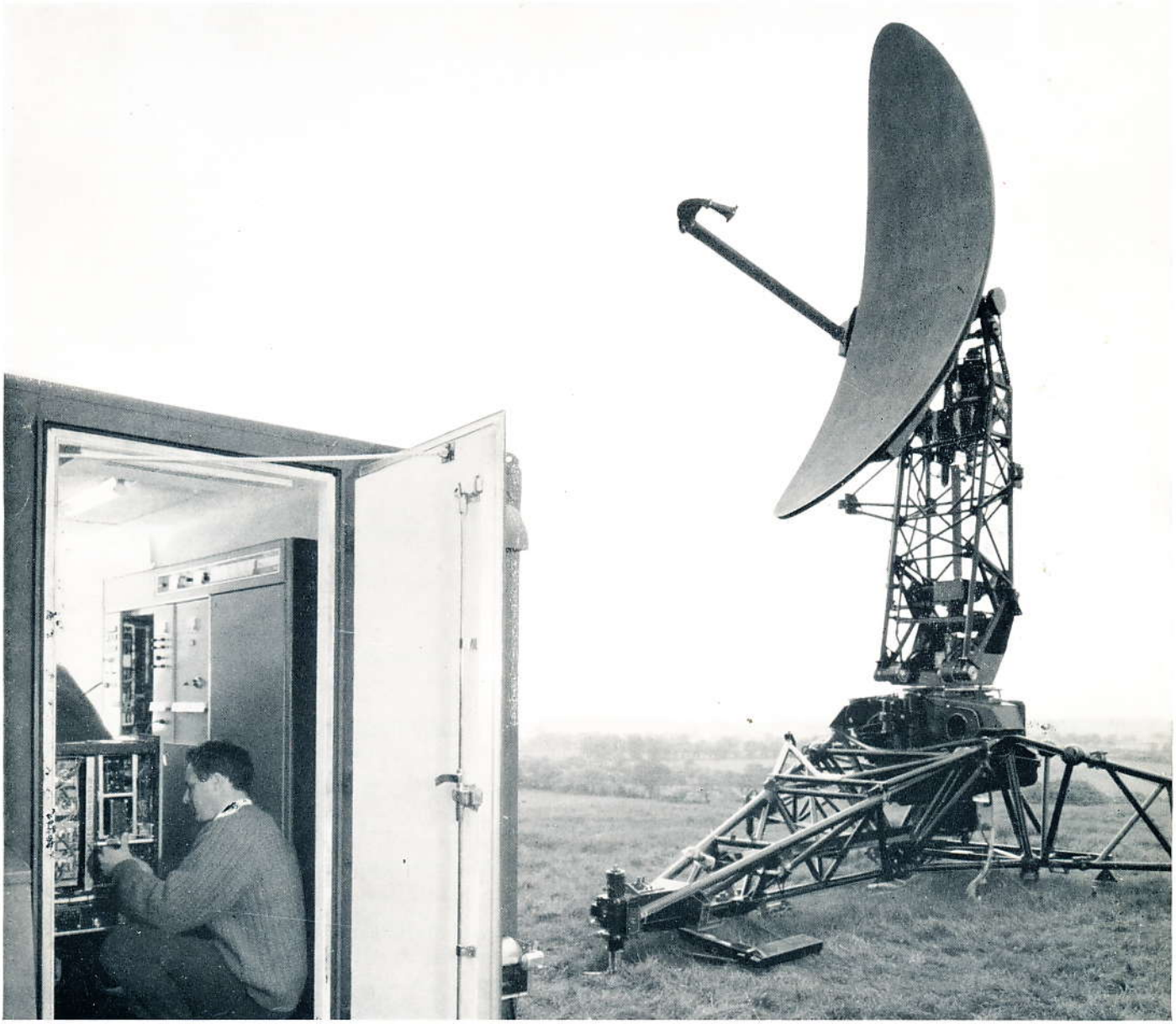
Marconi Radar Data Sheet A3

5·5cm (C) Band Heightfinder Aerial

Reflector size 14 feet by 4·25 feet
Type S1017–Double Curvature



Static or transportable.

Simple 'nodding' mode or computer controlled for automatic operation with Height Extraction for up to 22 heights per minute.

Side lobe levels 25dB down on main beam.

S600 Series

The Marconi Type S1017 is a mobile nodding heightfinder module operating at 5·5cm (C) Band and using techniques and components common to the surveillance aerial modules in the S600 series.

The module comprises a double-curvature reflector, a horn feed, an elevation scanning gear with a data take-off element, a turning gear with data take-off elements, two rotating joints and a slip-ring unit mounted on a combined gantry/chassis. It is suitable for transport by helicopter, aircraft or rail and running gear may be fitted for movement on roads or across country.

The S1017 is used with the Marconi 1MW 5·5cm (C) Band Transmitter/Receiver Type S2013 which is fully described in Marconi Radar Data Sheet B4.

Mechanical Features

Gantry/Chassis

The gantry/chassis consists of a centre section and three legs.

The centre section is a welded tubular steel space-frame which provides support for the turning gear. The top of the frame is basically triangular with the corners turned in to form the mounting points for the gear-box, which is enclosed by the three sides of the frame. Below the gear-box is another triangular frame, turned through 60 degrees relative to the upper one. The centre section is completed by triangular frames between the upper and lower triangles.

The tripod gantry is completed by three legs, also of welded tubular steel space-frame construction and triangular in section, which fit onto the triangular sides of the centre section. The lower main member of each leg is horizontal and the legs taper towards the outer end where jacks are fitted for levelling. The jack feet are 432mm (1ft 5in) in diameter and rest on a pitch circle radius of 3·66mm (12ft) when deployed.

Two of the legs are removable and in the normal transport condition are stowed alongside the fixed leg.

Running gear is attached by locating two tines on each set of wheels into tunnels fixed to the gantry chassis. The forward tine tunnels are carried on a transverse pintle mounted beam 610mm (2ft) from the end of the fixed leg. The locating points for the rear set of wheels are directly below two corners of the lower triangle of the centre section. The roading loads are therefore transmitted through three points of the chassis, reducing torsional stresses to a minimum.

In the roading condition the overall dimensions of the module are 7·19m (23ft 7in) long (towbar stowed) by 2·52m (8ft 3in) wide by 2·69m (8ft 10in) high with a wheelbase of 5·69m (18ft 8in).

Support Frame and Mounting Trunnion

The mounting trunnion, bolted to the output flange of the turning gear, is a rigid channel-shaped member with triangular side cheeks. The support frame is pivoted from the lower corner of the triangle, and the hand-operated screw jack, used to raise and lower the aerial assembly, is pivoted from the top of the trunnion. The support frame is composed of tubular side members joined at the bottom and braced locally at the front and back for torsional stiffness. When deployed operationally the lower face of the support frame butts against the mounting trunnion and is clamped rigidly. The trunnion bearings for the reflector are spherical roller bearings in self-aligning spherical shells. The elevation drive mechanism is gimbal mounted on the support frame in two stiff bearing plates.

Reflector and Feed

The reflector is 4·27m (14ft) high by 1·3m (4ft 3in) wide and is of the double-curvature horn-fed type to permit frequency diversity operation and to give a low moment of inertia. The centre of the support frame carries a waveguide rotating joint and elevation pivot shafts together with the elevation driving arm.

The horn-type feed, including a polarizer, is mounted off-set to the reflector by a tubular support containing the waveguide feed. The feed support arm pivots about the elevation rotating joint and lies along the reflector edge during transportation. There is a built-in surface and feed position checking facility to ensure replacement in the correct relationship during deployment.

Advanced lightweight construction permits exceptional mechanical agility and short slew times (180 degrees in approximately 2 seconds).

Elevation Scanning Mechanism

Elevation angles of the reflector between −5 and +55 degrees and scan velocities up to 45 degrees per second are obtainable. This is accomplished by a d.c. motor, driving through gears to a captive ball screw-nut, which imparts a linear motion to a ball screw. An extension of the ball screw acts on a radius arm fixed to the back of the reflector thus causing it to 'nod'. The elevation screw is safeguarded from over-run by a torsion-bar damped over-drive and fail-safe brake system.

Turning Gear

The turning gear is fitted with a single d.c. motor operating up to 1850 rev/min which drives the aerial through a 100 :1 primary gear-box. Turning speeds up to 18·5 rev/min are available in wind speeds up to 129km/h (70 knots).

S600 transportable heightfinder aerial with reflector assembly being transported

The main casing is a welded fabrication in the form of three box section arms radiating from a central drum. Each arm carries a tapered socket which mates with a plug on the gantry. The plug is free to move on a large diameter ball and thus takes up tolerances in alignment.

The base of the casing forms a stiff platform which carries the drive motors above (on the outside) and the primary gear-boxes below (within the sump). The sump is a fibre-glass moulding bolted to the underside of the casing, enclosing the primary gear-boxes and the main drive gear so that all the gears run in oil. The main gear is connected to the output drive flange by a stiff tube which passes up through the central drum and is supported by a pair of pre-loaded taper roller bearings which are packed with grease. Heaters are provided within the sump and are controlled by thermostats to keep the oil at optimum temperature in a cold ambient.

One of the spaces between the arms is allocated to the drive motor; another space houses the data take-off and gear-box. The basic data take-off is an accurate 1 :1 shaft suitable for a 13-bit digital shaft encoder. Additional output shafts can be provided as follows:

1) 1 :1 for a) auto-align, north marker and sector blanking and/or
   b) a digital encoder, or a sine/cosine potentiometer, or a 3-inch magslip or a size 23 synchro.
2) 16 :1 for a size 23 synchro.
3) 30 :1 for a type 1813 Selsyn.

The aerial may be locked on any azimuth by means of a hand operated brake, and it may be manually 'inched' over a small arc either side of this position.

Electrical Features

Elevation Data Take-off

The elevation angular position of the heightfinder aerial is linearly translated into a voltage by a long-life conductive plastic potentiometer, directly connected to the nod axis of the aerial, driven by a stable d.c. supply. The output from the slider of the potentiometer is added in a summing amplifier to a correction signal from a vertical reference unit.

The vertical reference unit is situated above the turning gear, directly over the azimuth axis and incorporates a suitably damped pendulum and transducer. The output of the vertical reference unit is a voltage, the amplitude and polarity of which is proportional to the deviation of the aerial axis from the true vertical.

The elevation angle data is therefore correct regardless of incorrect levelling and settling of the gantry.

Rotating Joint and Slip-ring Unit

The main waveguide rotating joint is mounted in the mounting trunnion and the drive tube in the turning gear and may be withdrawn from the top. The 19-way slip-ring unit is mounted below the rotating joint and may be withdrawn from the bottom of the turning gear.

Data Summary

Frequency band: 5300 to 5520MHz.
Horizontal beamwidth: 3·0° at half-power points.
Vertical beamwidth: 0·9° at half-power points.
Side-lobe level: −25dB with respect to main lobe.
Gain: 39·5dB.
Polarization: Circular.
Deployment: Ground slope must not exceed 1 in 20.
Ground bearing pressure: 196kg/cm² (2800lb/ft²) max.

Environment

Temperature:
Operational: −30° to +50°C

Storage : −40° to +65°C
Relative humidity :
100 per cent below 30°C
53 per cent at 40°C
32 per cent at 50°C
Wind speed :
Operational : Gusting to 129km/h (70 knots) without tethering
Survival : Gusting to 227km/h (120 knots) with tethering and aerial folded
Ice coating :
6mm (0·25in) max.

Dimensions
Reflector :
Height : 4·27m (14 ft).
Width : 1·3m (4ft 3 in).
Module deployed :
Overall height : 6·75m (22ft 1½in) (reflector vertical).
Overall swept height : 7·05m (23ft) (±6in jacking on level ground).
Pitch circle radius : 3·66m (12ft) with jack centres at 120°.
Jack feet diameter : 432mm (1ft 5in).

Module stowed :
Overall height : 2·69m (8ft 10in).
Overall width : 2·52m (8ft 3in).
Overall length : 7·19m (23ft 7in) (towbar stowed).
Overall length : 8·54m (28ft) (towbar extended).
Wheelbase : 5·69m (18ft 8in).

Weight
Road or air transport trim :
3285kg (7243lb).
Helicopter trim :
2410kg (5311lb).

The information given herein is subject to confirmation at the time of ordering.

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