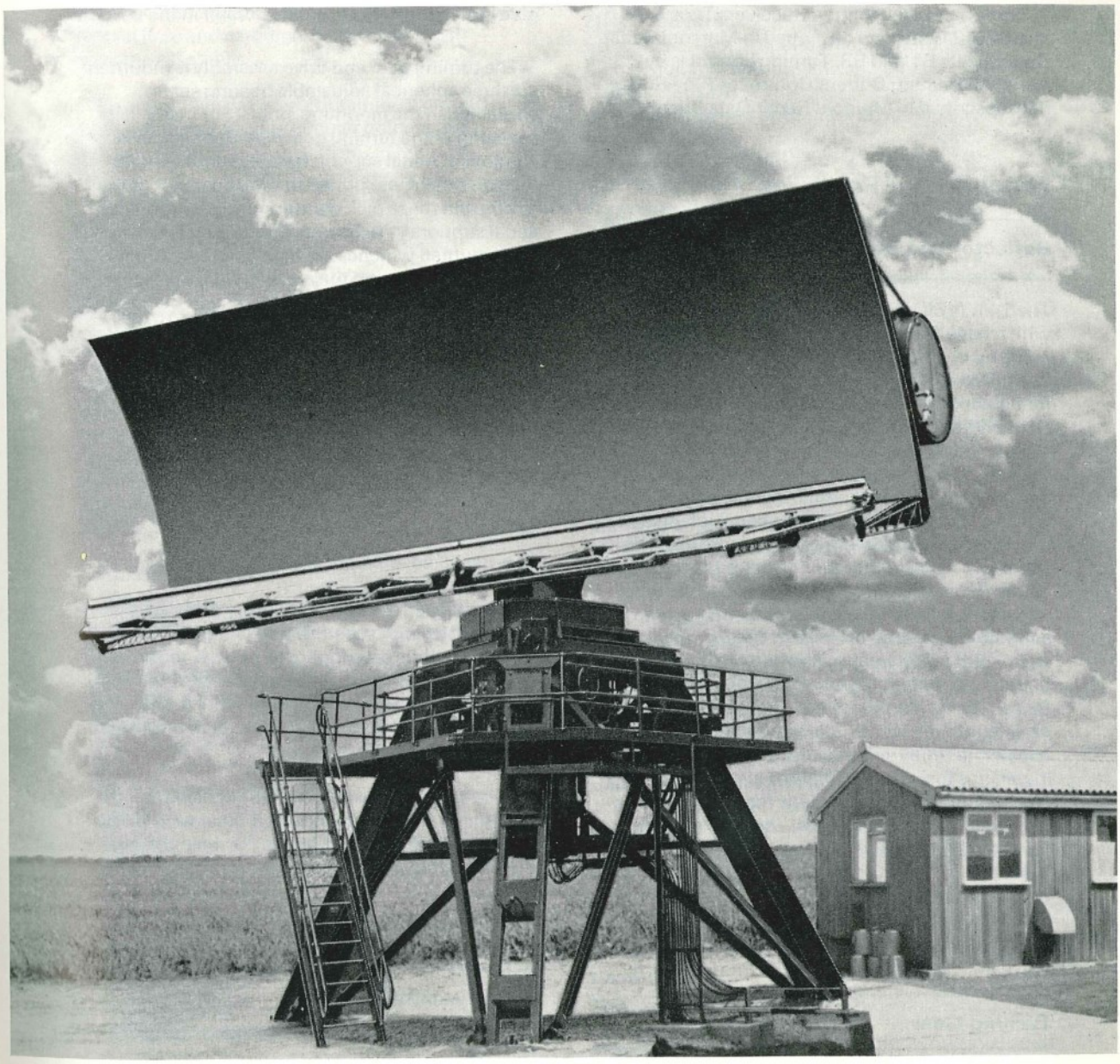
Marconi Radar Data Sheet A4

10cm S-Band Static Surveillance Aerial

Reflector size 45 feet by 15 feet
Type S1011—Single Parabolic
Type S1012—Single Cosec²



Gain: parabolic 45dB ; cosec² 39dB

Side lobes more than 28dB down on main beam

Diversity operation over a wide frequency band

Bandwidth 400MHz

There are two types of 14m (45ft) aperture 10cm S-band surveillance aerials : a Marconi Type S1011, having a single parabolic reflector, and a Marconi Type S1012 having a reflector shaped in profile to give cosec² cover. These aerials are suitable for all static installations and can be mounted on a gantry, plinth or building roof. The reflectors are illuminated by a squintless linear feed, which permits diversity operation to be undertaken by using a Marconi multiplexer, whereby several transmitters can be operated simultaneously into a single aerial.

Both of the aerials can be used with the Marconi 10cm S-band Transmitter/Receivers Type S2010 and S2012 which are described in Marconi Radar Data Sheets B1 and B3. Turning control is by Aerial Alternating Current Controller Type S6014, fully described in Marconi Radar Data Sheet E3.

Mechanical Features

Reflector and Support Structure

The 14m (45ft) parabolic and cosec² reflectors, which have a vertical aperture of 4·5m (15ft), are made up of six sections each 2·3m (7ft 6in) long, constructed of an accurately formed grille framework of square section aluminium alloy tube skinned front and rear with pre-formed 1·6mm ($\frac{1}{16}$in) thick aluminium alloy sheet. Overall thickness is 66mm (2⅝in). The resulting panels are extremely rigid yet lightweight and, because they are straight in one plane, a very high degree of precision in manufacture and contour checking is achieved. A mounting rib of 100mm (4in) square aluminium alloy tube is attached to each vertical edge of each panel. The reflector sections are supported by a steel cylinder in three sections, each 4·5m (15ft) long and 2m (6ft 7in) in diameter, flanged and bolted together. Upper and lower fixing lugs for the reflector are positioned along each length of cylinder and are optically aligned and permanently secured in manufacture. The lower lugs form pivot trunnions to permit tilt adjustment and the upper lugs form attachments for seven tilt jack assemblies. The whole cylinder is supported centrally by a steel structure 1·3m by 2·4m by 1·8m (4ft 3in by 8 ft by 6 ft) with a circular attachment to the turning gear at the lower face and a four-point mounting to the support cylinder at the top.

Turning Gear

The turning gear is housed in a triangular steel fabrication, the main bearing being two taper roller bearings 750mm (30in) in diameter mounted approximately 610mm (24in) apart. The two bearings are permanently surrounded by oil during operation and therefore protected at all times against corrosion. There are no dynamic oil seals which are under pressure, the only seals being mechanical Weir tubes and labyrinths. A clear passage of about 610mm (24in) diameter is provided through the centre of the turning gear for waveguides, rotating joints, etc.

Drive is by one, two or three electric motors, each with an associated primary gear-box connected to a final drive pinion by a quill shaft. The pinion is in mesh with the final output gear which is carried on the main shaft mounted in taper roller bearings. A hand turning wheel, with interlock mechanism, can be fitted to any one of the three primary gear-boxes for manual turning.

Primary and secondary lubrication is provided by pumps mounted in the sumps beneath the main casing. For operation in cold climates sump heaters can be incorporated. Sand filters are fitted to the oil breather tubes. Water detectors give indication of accumulated water in the sumps.

The turning gear and drive assembly is mounted via three spherical adjustable bearing seats contained in the mounting stools. For major servicing of the turning gear a unique system is employed. Aerial support frames, supplied with the equipment, are bolted to the upper part of the gantry and these pick up mounting points on the aerial supports. Jockey-pulley support frames and leg-mounted winches are then used to lower the turning gear, leaving the aerial system in place at the top of the gantry. Using this system the turning gear may be removed and replaced in about two days without the use of any external lifting tackle. For winds above 60 knots steel cables are attached to secure the aerial against high overturning moments during this procedure.

Data Take-off

Two data take-off types are available.

1) The 'blister' type gives two very accurate 1 :1 take-offs with subsidiary 30 :1 and 36 :1 outlets, thus catering for all normal aerial data tell-back systems. The 30 :1 and 36 :1 outputs are by single reductions from the 1 :1 gear. The data take-offs can be obtained at the top and bottom of the drive shafts.

2) The simplified system has 30 :1 take-offs directly from a pinion which meshes with the data wheel mounted above the main drive gear. If required an encoder drive can be supplied.

Electrical Features

Feed Assembly

The reflector is illuminated by an offset linear waveguide feed carried on steel lattice booms extending from the reflector framework. It is well known that linear feeds and reflectors can provide a much lower side-lobe level than centre-fed double-curvature aerials, because of the accurate power distribution that can be achieved. The normal linear feed, however, suffers from the disadvantage of 'squint' and the angle between the radar beam and the normal to the reflector varies with frequency, making frequency diversity impossible and frequency changing complicated.

The linear feed used on the aerial is one of several made to a patented Marconi design which retains the virtues of the linear feed but does not suffer from squint. This is achieved by arranging that the power distribution couplers produce a co-planar phase front at the output flare.

The feed is composed of twelve modules, each of which consists of a stepped taper section which directs power in the correct ratios into a series of side arms. Each side arm is of critical length and ends in a radiating aperture. The modules are assembled so that the radiating apertures are set in a line which extends for the full width of the reflector. The radiating aperture feeds out via a special flare and a fibreglass window which seals the assembly.

An alternative window containing a grating may be fitted to provide circular polarization.

Data Summary

Type S1011 (Parabolic)

Reflector size:
14m (45ft) by 4·5m (15ft).
Contour:
Vertical: parabolic.
Horizontal: linear.
Beamwidth (at 3000MHz):
Vertical: 1·5° at half-power points.
Horizontal: 0·55° at half-power points.
Gain (at 3000MHz):
45dB.

Type 1012 (Cosec²)

Reflector size:
14m (45ft) by 4·5m (15ft).
Contour:
Vertical: shaped to give cosec² vertical cover.
Horizontal: linear.
Beamwidth (at 3000MHz):
Vertical: cosec² up to 35°.
Horizontal: 0·55° at half-power points.
Gain (at 3000MHz):
39dB.

Both Aerials

Horizontal sidelobes:
28dB down on main beam.
Polarization:
horizontal.
Feed position:
offset at bottom.
Fixed circular polarizer available as an optional extra.
Bandwidth:
400MHz.
Power handling capacity:
3MW.
Tilt:
manual.
Tilt range:
−2° to +9°.

Turning Gear

Aerial turning speeds:
3 and 6 or 4 and 8 rev/min standard.
Speed selection:
local.
Performance in wind:
normal operation in wind speed up to 60 knots. 6 rev/min at 80 knots. Will withstand 120 knots without damage or permanent deflection.
Ice loading:
9·8kg/m² (2lb/ft²) in 70 knots.
Drive motors:
up to three, 1- or 2-speed electric motors each of 40 h.p. nominal rating.
Gear selection:
one- or two-speed optional with multiple wet-plate clutches.
Gear ratio (overall):
240:1 and 180:1.
Overturning moment:
79 000kg–m (255 tons–ft).
Data take-off:
1) 1:1 (2 off) Accuracy 12 minutes of arc peak-to-peak referred to aerial flange.
2) Subsidiary 30:1 and 36:1, (2 off each)
3) Auto-align contact
4) Heading marker contact

Hand-turning ratio:
480:1 or 360:1 depending on gear ratio in use.

Rotating Joint

Capacity:
double channel i.e.:
1) 1000MHz coaxial joint for secondary radar (e.g. IFF Mk. 10).
2) S-band waveguide rotating joint for size 10 guide.

Pressurization:
1) 1000MHz joint: 0·35kg/cm² (5lb/in²).
2) S-band joint: 2·4kg/cm² (35lb/in²).

Power handling capacity:
1) 1000MHz joint: 10kW.
2) S-band joint: 3MW.

Standing-wave ratios:
better than 1·2 to 1.
Sliprings:
4 power rings, 8 control rings, 1 earth ring.
Size
489mm×254mm×221mm
(1ft 7in×10in×8¼in)

Environment:

Temperature:
Operational: −30 to +50°C.
Survival: −40 to +65°C.
Relative humidity:
Operational: 95% at 25°C.
Survival: 95% at 40°C.
Pressure:
Operational: 750 mb.
Survival: 420 mb.

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

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