

Radars Systems International

MARCONI

No. 10

S600 series sales approach £20 million

— and another £20 million to come!

Sales for the highly successful Marconi S600 series of compatible radar equipments, on show at Farnborough Europe 72, are approaching £20 million. Furthermore, the Company is actively pursuing another £20 million worth of orders for S600 radar—the world's most cost-effective range of radar equipment designed to meet a very wide variety of operational requirements. The last year has seen the receipt of several valuable contracts for S600, including a recent major order valued at £4 million.

The concept of a family of fully compatible radar units which can be built up to form specific systems—static or mobile/transportable—capable of satisfying almost any air defence or traffic control need, has proved itself as the most effective means of fulfilling radar requirements for the 1970s.

High standards of performance, together with great flexibility and cost effectiveness, high reliability, compactness and ease of operation have all contributed toward the unparalleled success of S600.

With production of S600 going ahead since its introduction 4 years ago, development of this unique radar has also continued. The available range of S600 series systems continues to expand and some of the variants on offer are illustrated overleaf. Development of the automatic height extraction channel enables Marconi to offer the only available mobile/transportable nodding heightfinder radar in the world which is capable of entirely automatic long-range height finding. New equipments such as the digital signal processor and fully compatible automatic plot extractor have successfully been used operationally. Automatic track initiation within a computer controlled GCI station is now achievable and

furthermore, data from the plot extractor can be transmitted down a pair of telephone lines to a remote operations centre. The new dual-beam S600 series air traffic control radar, the Type S654, is at present operating in mountainous, high rainfall areas in Canada and West Germany, where the twin-beam aerial system minimizes clutter and 'angel' problems. London Airport (Heathrow) is now equipped with an S600 series 50cm Band radar, the Type S650, mounted on a building 140 feet above ground level, to aid precision control of aircraft within the terminal area in all weathers.

For military applications, both mobile/transportable and static systems are available. Mobile systems range from a simple early

warning post with a surveillance radar and its associated electronics cabin, to a sophisticated area control station complex, comprising up to 2 surveillance and 2 heightfinder radars, computerized operations cabins with a data processing cabin and a number of communications cabins. Static systems range from a single channel S or L Band surveillance radar to the high power S Band heightfinder Type S669 and the sophisticated back-to-back S and L Band surveillance system employing multiple transmitters and full ECCM facilities.

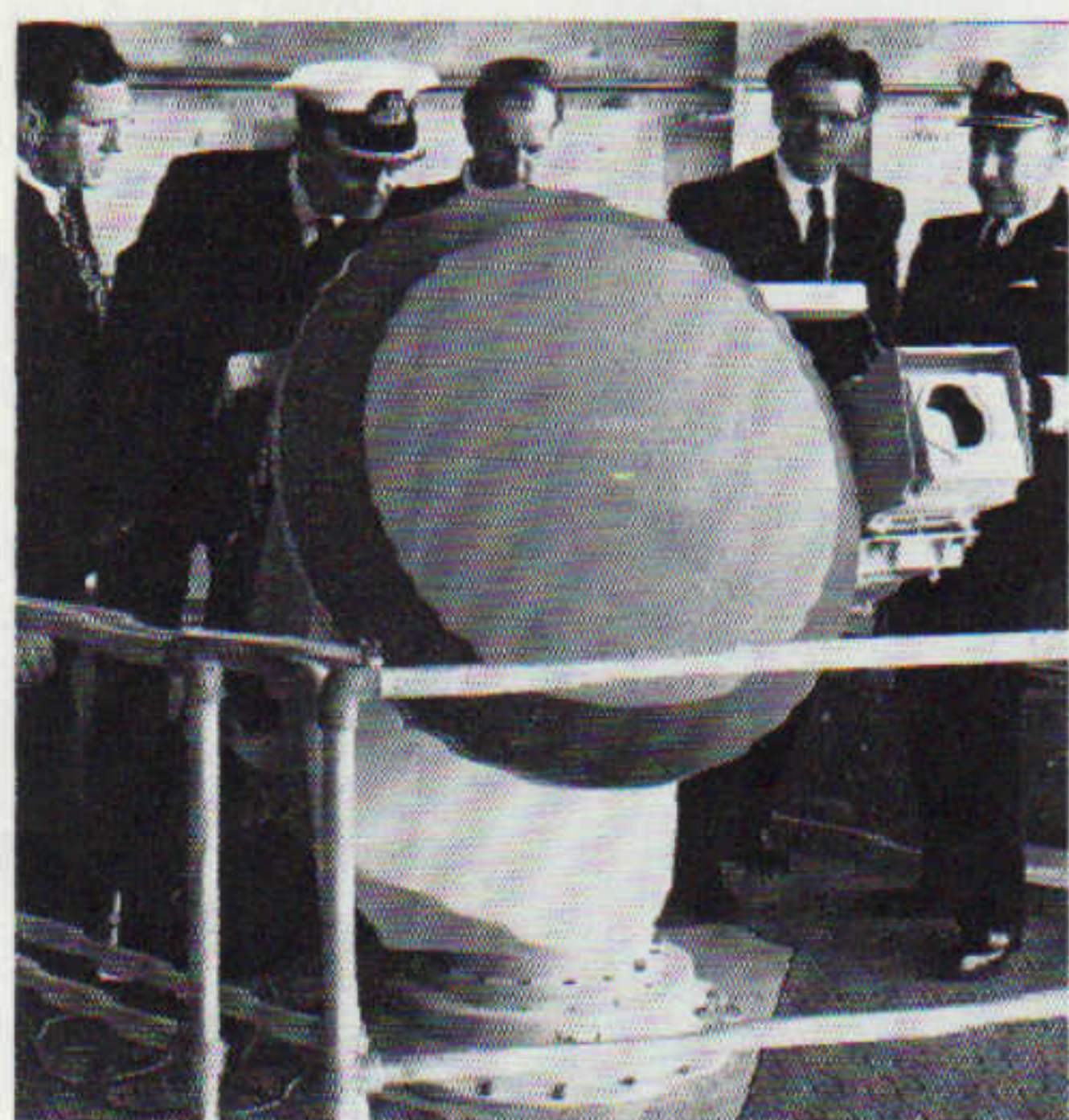
For air traffic control applications, the S600 mobile/transportable elements are equally suited to civil or military roles. The S Band surveillance and C Band heightfinder systems were, for example, used by the Board of Trade in studies for the siting of the third London Airport, while the L Band surveillance system has been used in Europe and North America for military air traffic control. As well as the Type S654 dual-beam radar, static air traffic control radars available from the S600 series include the 50cm Band Type S650, S650H and S670 radars—all using the well-proved 50cm Band to achieve high performance in all types of weather.

Air Marshal Sir Dennis Smallwood, KCB, CBE, DSO, DFC, RAF, Vice-Chief of the Air Staff pictured (2nd left) during his visit to Marconi Radar Systems Limited at Chelmsford. With him looking at S600 mobile/transportable radar are Mr. R. W. Simons, Technical Director, (right) with Mr. N. F. H. Smith (left) and Mr. F. H. P. Austin, all of Marconi Radar Systems Limited.



ANNOUNCING THE 800 SERIES

New weapon radar systems



The Assistant Controller of the Navy, Rear-Admiral J. R. Llewellyn (right) accompanied by Commander R. B. Brooke looking at the ST801 radar during their recent visit to Marconi Radar Systems Limited at Leicester. Mr. Peter Way, General Manager (left) Mr. R. M. Johnston, Engineering Manager, Radar and Antenna Department (centre) and Mr. W. M. Stothard, Technical Manager, (right), of Marconi Radar Systems Limited accompanied the visit.

The 800 Series is a range of highly reliable and essentially simple weapon radar systems developed by Marconi Radar Systems Limited for shipborne, land or coastal defence applications.

The systems all operate in the 3cm (X) Band frequency range, and were designed for maximum operational flexibility using reliable and proved techniques as an integral part of modern accurate and fast-reacting weapon systems. The radar equipment can be used to enhance the scope of existing weapons, for example, with our automatic television control system to give the Short Seacat or Tigercat a 'dark-fire' capability, or can be incorporated with any anti-aircraft or anti-ship missile or gun. The 800 Series is on show for the first time at Farnborough Europe 72.

All the equipment in the series is compact and lightweight, and was entirely developed in under two years. A number of radar heads including autotrack aeriels and stabilized surveillance aeriels have been designed, with various transmitter/receiver and signal processing options. These will meet a range of requirements from simple radar surveillance or tracking to complete fire control and ship

navigation systems, capable of detecting and tracking low-flying targets at maximum horizon range.

Although the designers have avoided complex, ultra-sophisticated techniques in the series, the systems do incorporate the most advanced proved techniques. Extensive solid state circuitry and comprehensive maintenance and operational test facilities are incorporated throughout, and the designs are based on the Company's wide experience, which includes some of the most advanced weapon systems in the world.

The 800 Series ranges from a tracking radar (Type ST801) to a complete missile or gunnery

radar system incorporating television assisted tracking and surveillance. The Series is designed as follows:

Type 801 to 839 — Naval weapon radar systems

Type 840 to 849 — Coastal defence radar systems

Type 850 et seq. — Land-based weapon radar systems

Prefix S — Surveillance

Prefix ST — Surveillance and tracking

More details of the new equipments are given overleaf.

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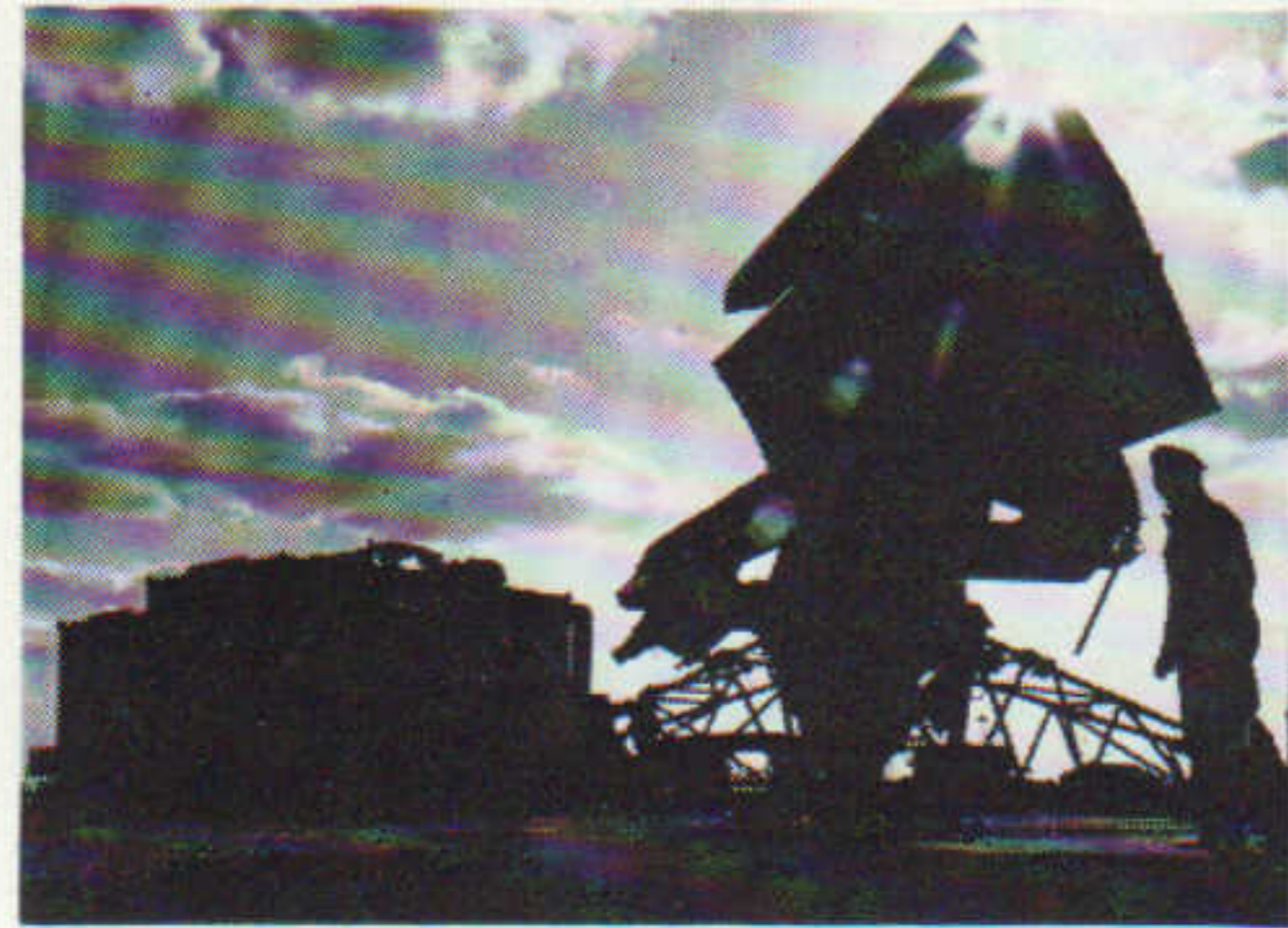
Telephone: Chelmsford 67111. Telex: 99108

Radar systems and equipment from Marconi

The major items of radar systems and equipment available from Marconi Radar Systems Limited, are outlined on these pages. Many variations of these products can be made available to suit specific requirements.

In addition to the radar systems and equipment featured below, the Company's product range covers naval and fighting vehicle control systems and equipment, speed measurement devices, marine radar beacons and computerized modular monitoring equipment.

Air Defence Radar Mobile/Transportable



Surveillance Radar Type S600, S601, S604 and S605

These radars have many variants, the most common of which is the 2 MW diversity powered 18-foot squintless feed aerial system operating at 23cm (L) Band. Other versions employ 10cm (S) Band transmitters and squintless feed aerial systems, with a choice of cosec² or parabolic profile.

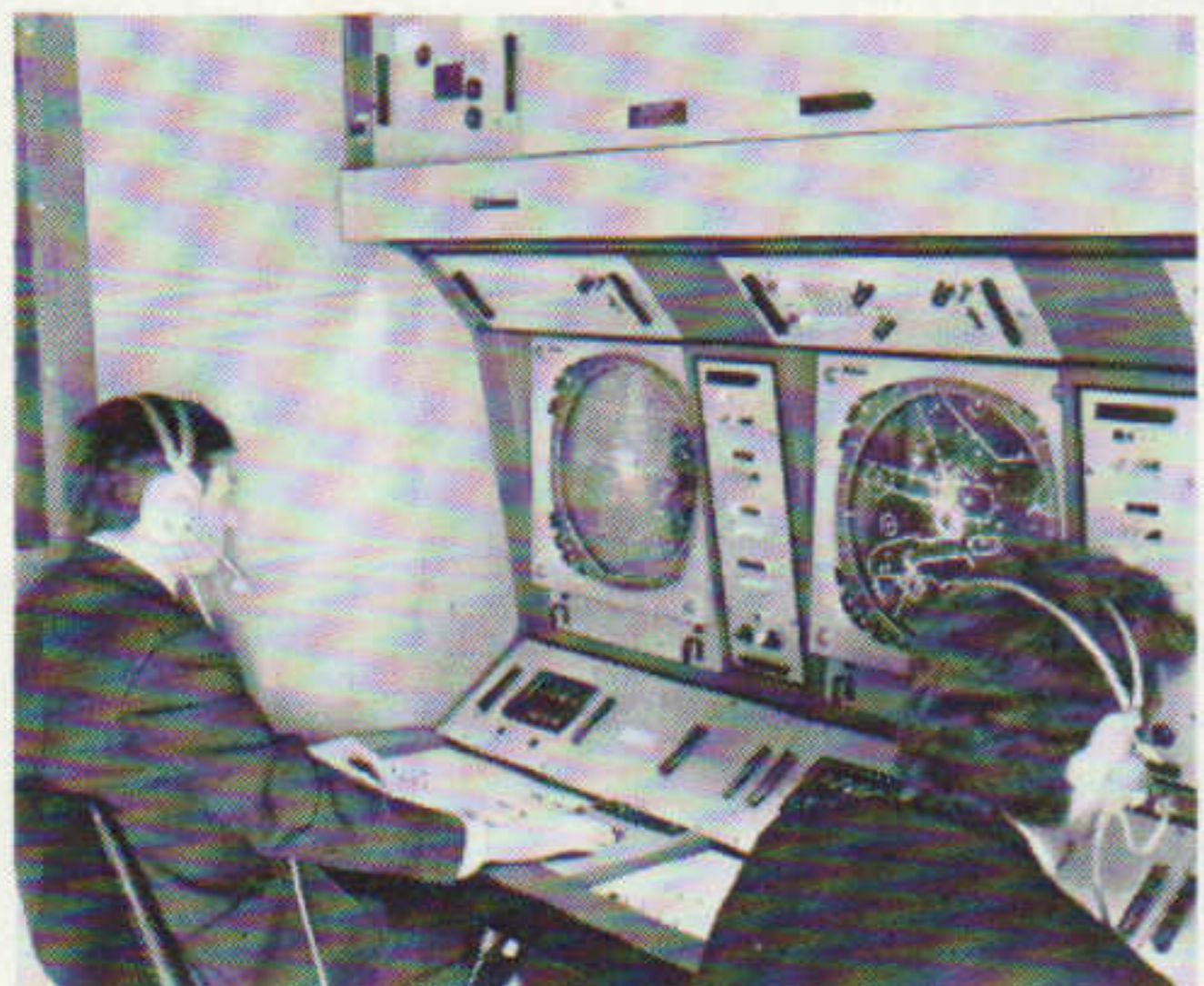


Heightfinding Radar Type S613

A high-power 5.5cm (C) Band heightfinding radar. Usually associated with the S600—S605 surveillance radars, it can be used with the Marconi automatic height extractor making it the only available mobile/transportable nodding heightfinder radar in the world to provide long range height information entirely automatically.

Surveillance Radar Type S660

A lightweight S Band surveillance radar giving coverage out to 100km. Comprising one electronics cabin with surmounted aerial and turning gear, this radar is highly mobile and suited for target acquisition in all aspects of anti-aircraft defence.



Manual Operations Cabin Type S5013

Housing a solid-state display system containing three PPI units, rapid height read-out units digital relative range and bearing calculation facilities and air/ground communications control. Usually deployed with radars Type S600 to S605 and Type S613 for gap-filling, forward area surveillance and ground controlled interception purposes.



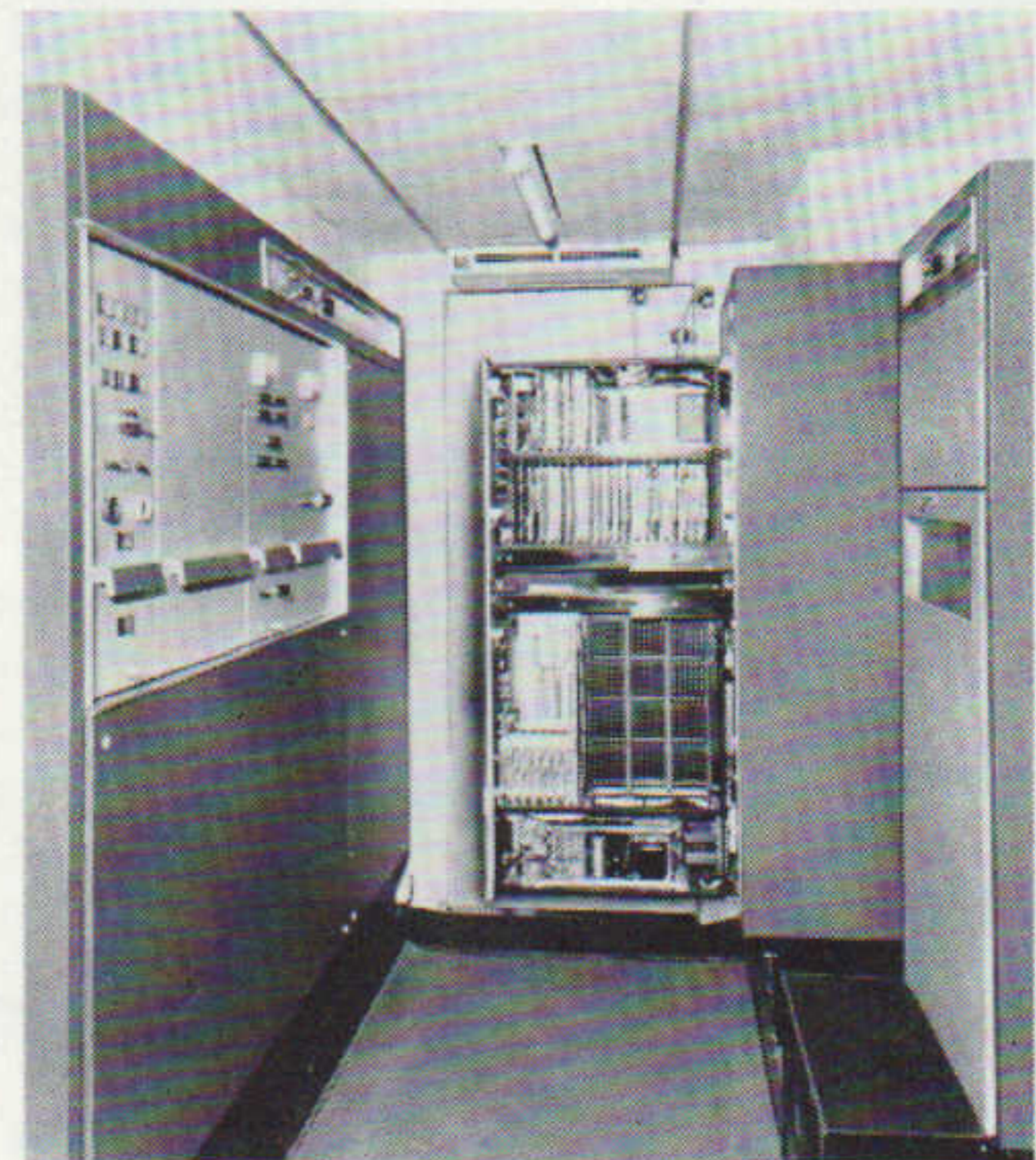
Computerized Operations Cabin Type S5014

More sophisticated version of the S5013, having alphanumeric marked displays, electronically displayed track data and rate aiding. Employs small processor and can be linked to other cabins or more powerful processing complex.



Data Processing Cabin Type S5021

A complete air defence system data processing capability, employing the Marconi Myriad III—the most advanced highspeed real time computer available for radar application.



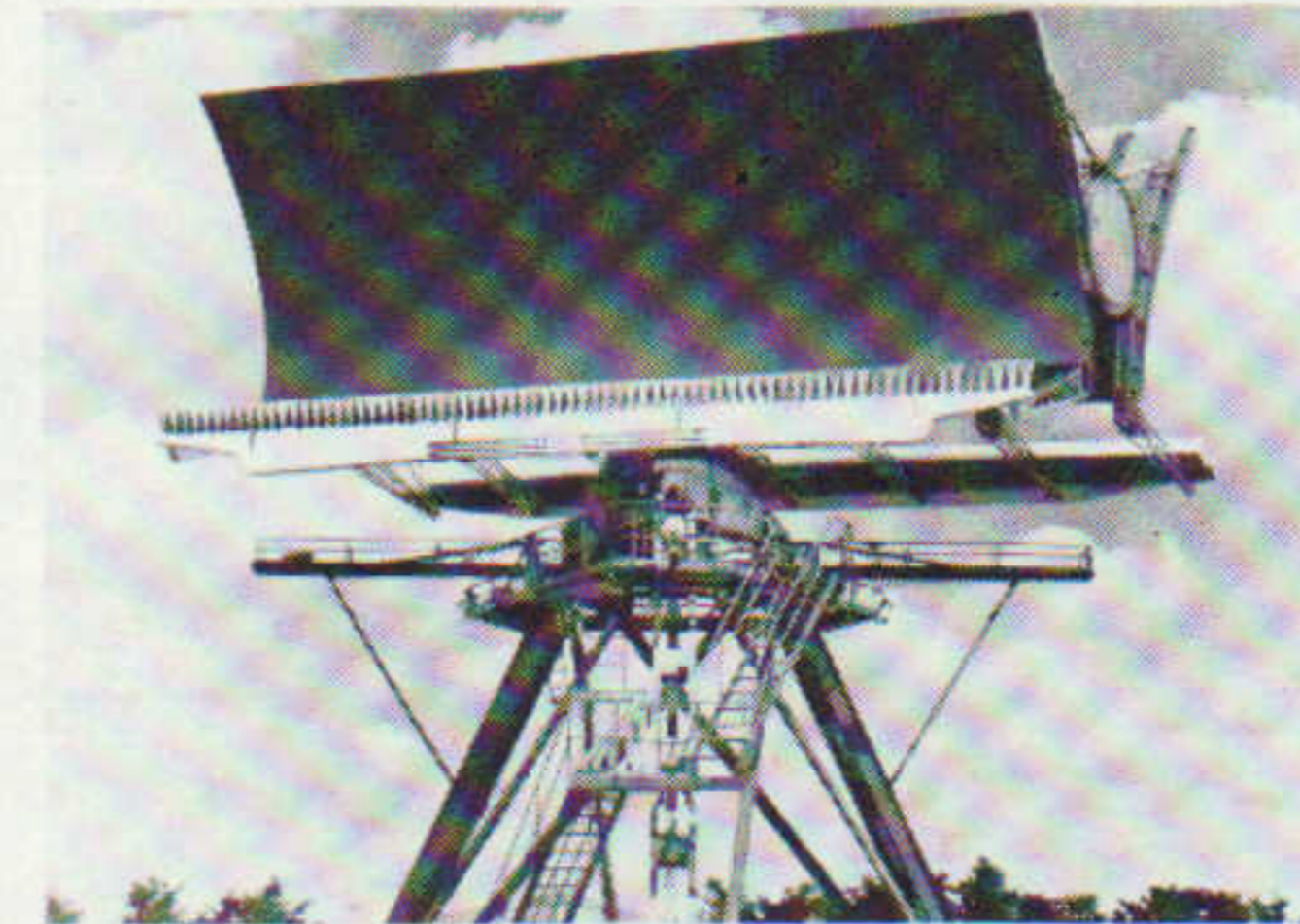
Electronics Cabins Type S5011, S5012 and S5016

Cabins housing S Band, C Band and L Band transmitter/receivers respectively, with associated signal processors, height extractor, servo controllers, air drying equipment and radar displays as applicable.

Target Tracking Radar/Television System Type ST850

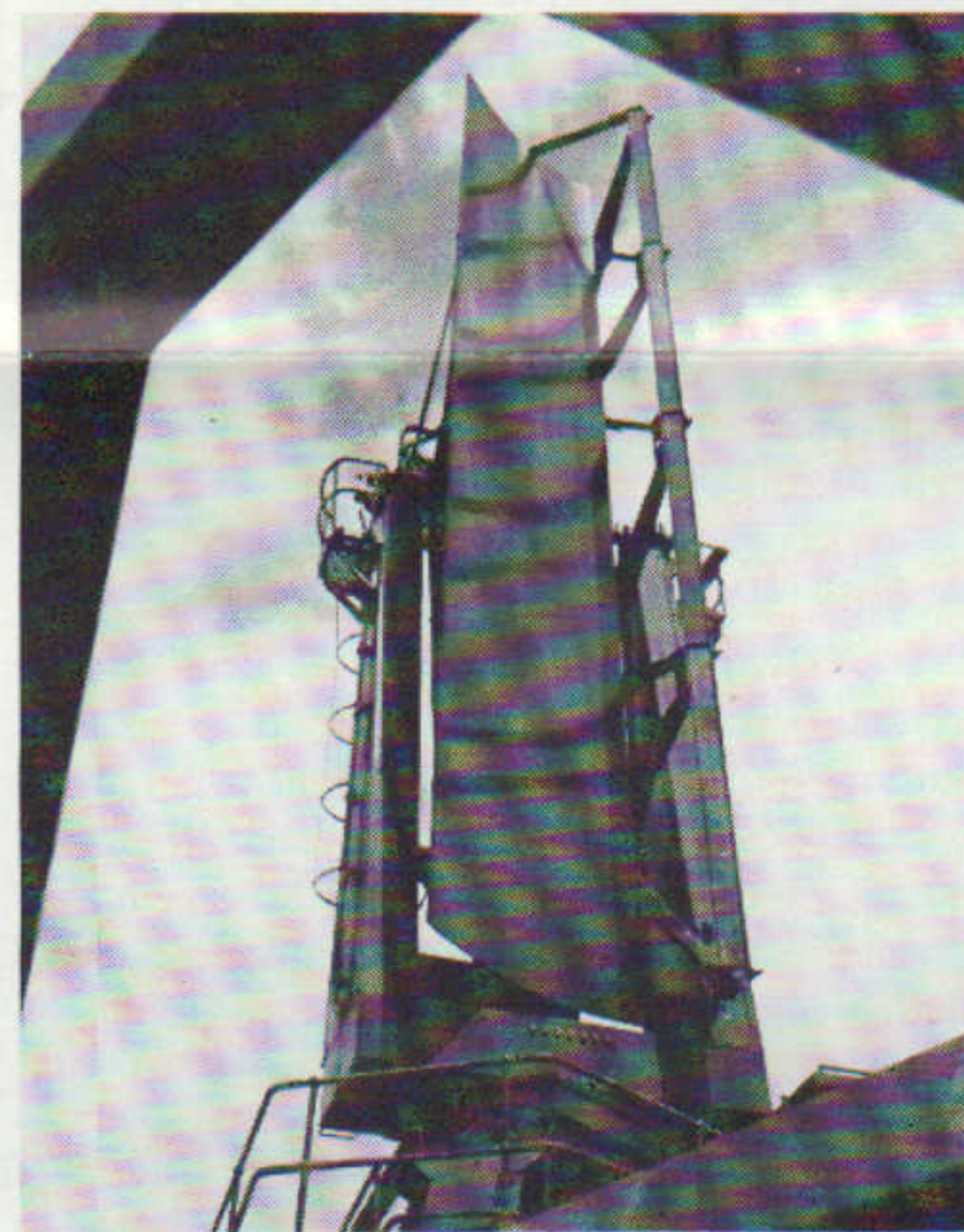
Part of the 800 series of X Band weapon radar systems Type ST850 is a target tracking radar and television system, designed in co-operation with Short Bros. and Harland, as an integral part of the Tigercat weapon system to improve its performance in conditions of poor visibility by giving 'dark-fire' capability.

Static



Surveillance Radars Type S647 and S631

Based on the NATO early warning high power radars the S647/S631 back-to-back system is equipped with squintless feed. Long-range cover of 300 nautical miles is obtained with 45-foot reflectors. Probably the most powerful, cost-effective anti-jamming radar in the world, equipped with IFF.



Heightfinding Radar Type S669

High-accuracy, solid state, 2½ MW, 10cm (S) Band heightfinder basically the same as the Type S269 designed for NATO. Absolute height accuracy of +1500 feet at 150 nautical miles range. Various operating modes available including sector scan and burnthrough.



Challenger SSR System

Comprises an interrogator/responder with 30-foot or 14-foot aperture aerial for control/interrogation. Meeting all ICAO requirements, this solid state system gives all-mode operation.



Secondary Radar Manual Decoding

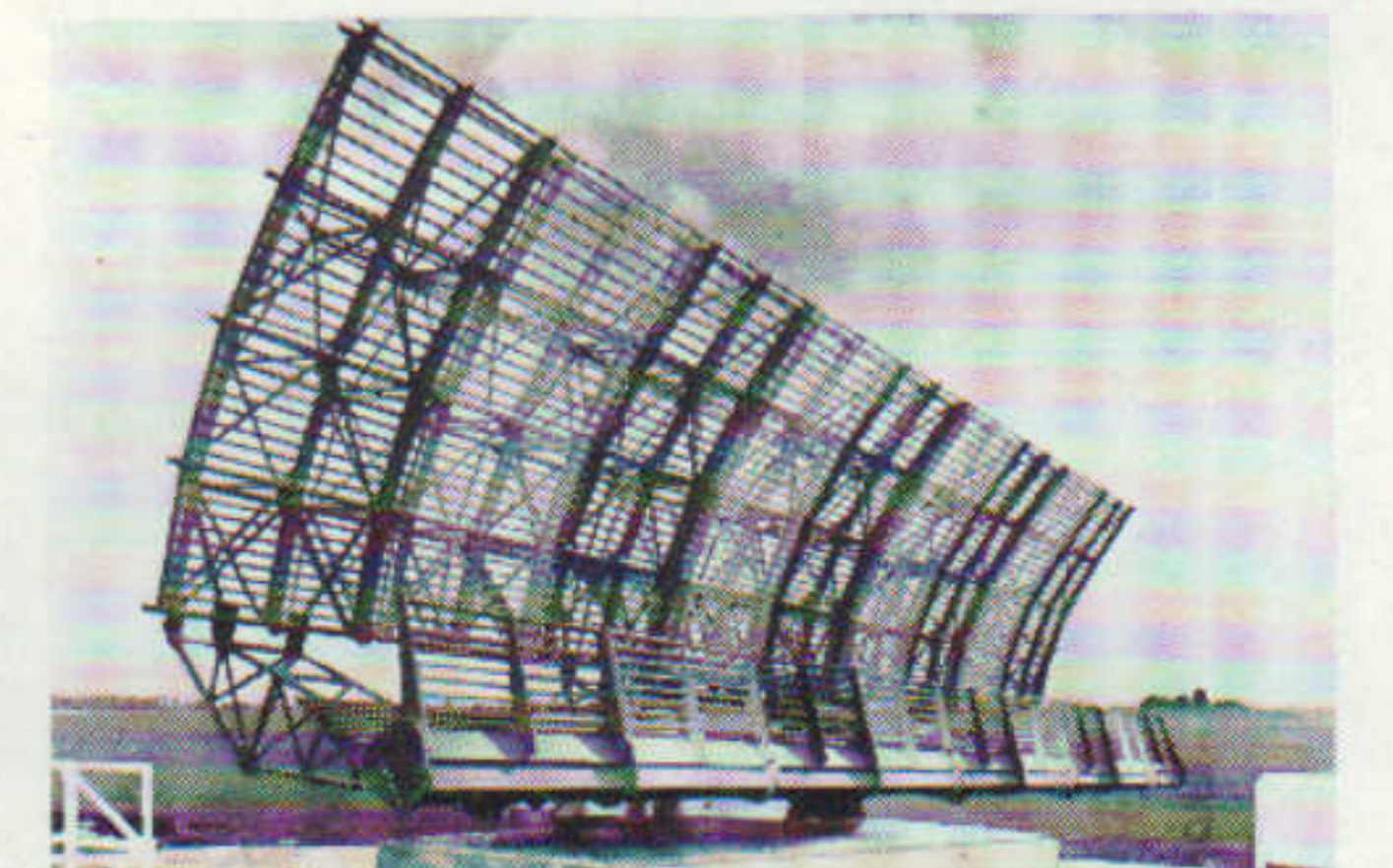
A modular readily extendable system employing central defruiting and decoding units to provide signals for up to 10 display positions for Passive Identity Selection. Passive Height Selection, Active Identity Readout, Active Height Readout, Emergency Detection and Display, Challenge Control and Video Generation.

Air Traffic Control Radar



Dual-Beam Radar Type S654

A 2 MW 23cm (L) Band dual-beam radar for APP/TMA cover or TMA/long range cover for civil or military ATC. Dual-beam techniques, with a 32-foot double curvature reflector, maximize signal to clutter ratio in areas of high ground and weather clutter.



50cm Band Radars Type S650 and S670

These radars employ 52.5-foot and 67.5-foot aerial reflectors respectively with a durable, fully coherent klystron transmitter/receiver of the highest reliability. Inherently impervious to weather-clutter, these radars give precise performance where positive control is needed for safe and efficient aircraft movements.



Flight Plan Processing Systems

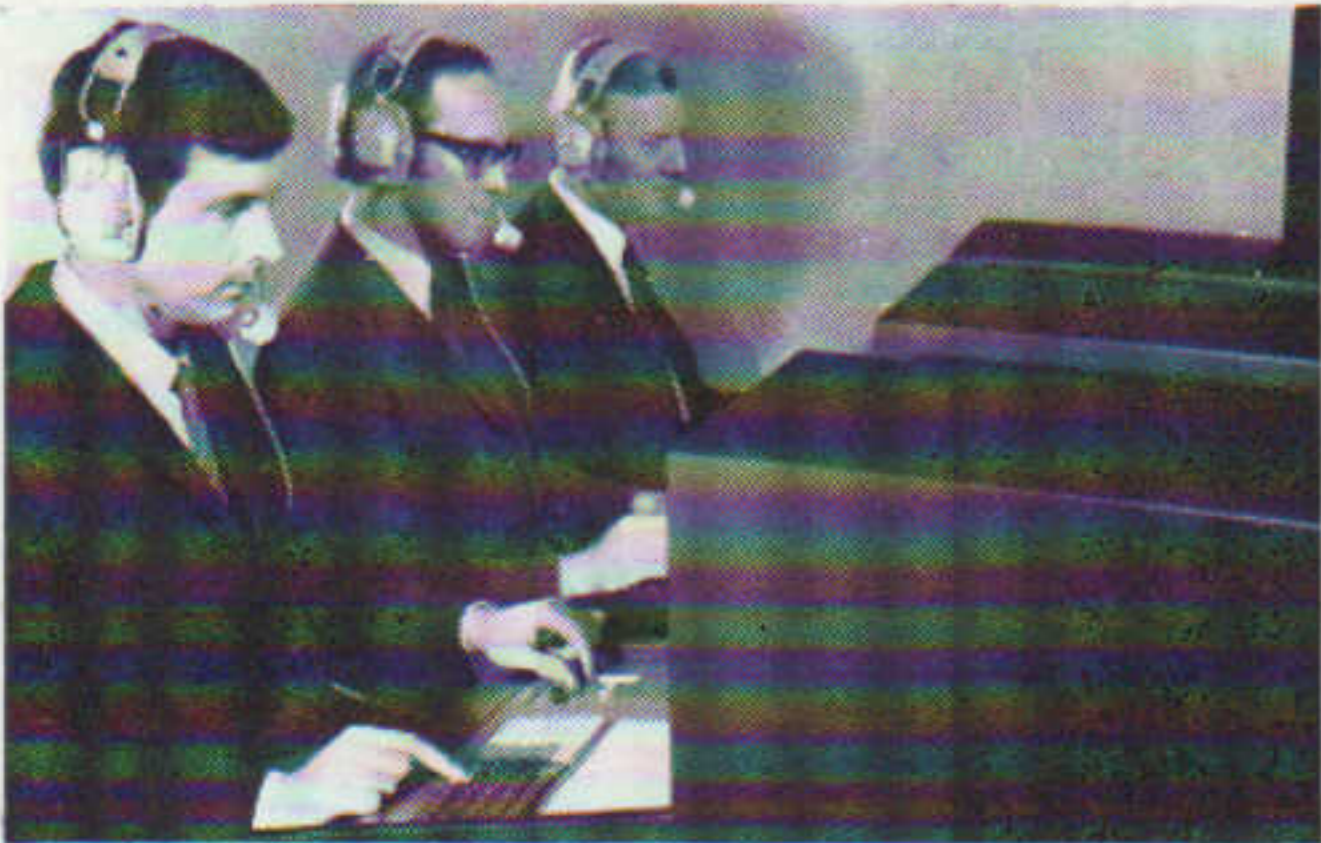
The computer-controlled flight plan processing system for the modernized U.K. Airways Surveillance System has been supplied by Marconi Radar Systems. Myriad computers are employed for this purpose at the London Air Traffic Control Centre.

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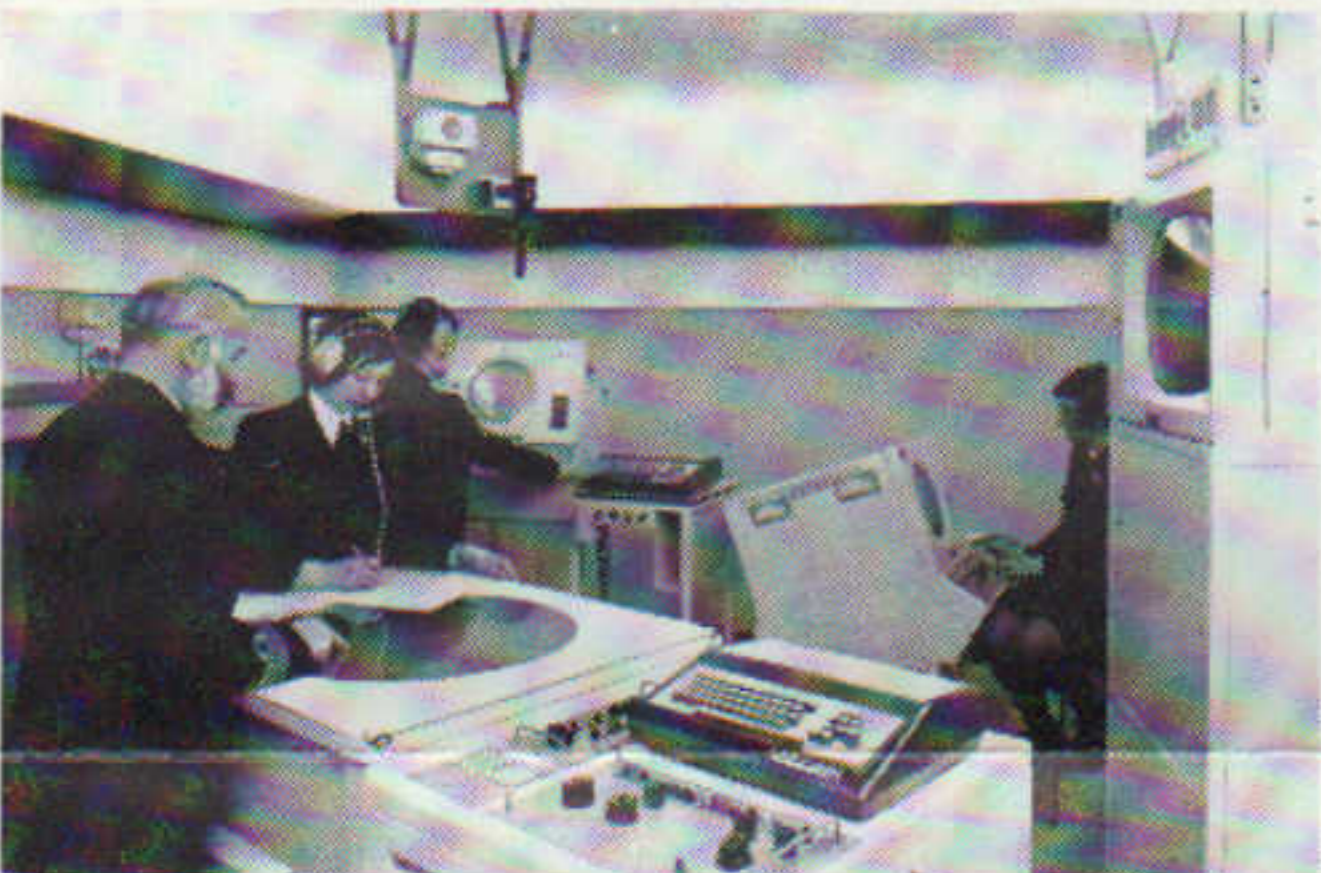


Instrumented Runway Visual Range System
System Type IVR-1 is installed at all major U.K airports and provides fully automatic reporting of runway visual range. It meets ICAO recommendations and operates down to Category 3B conditions of airfield visibility.

Radar Simulation



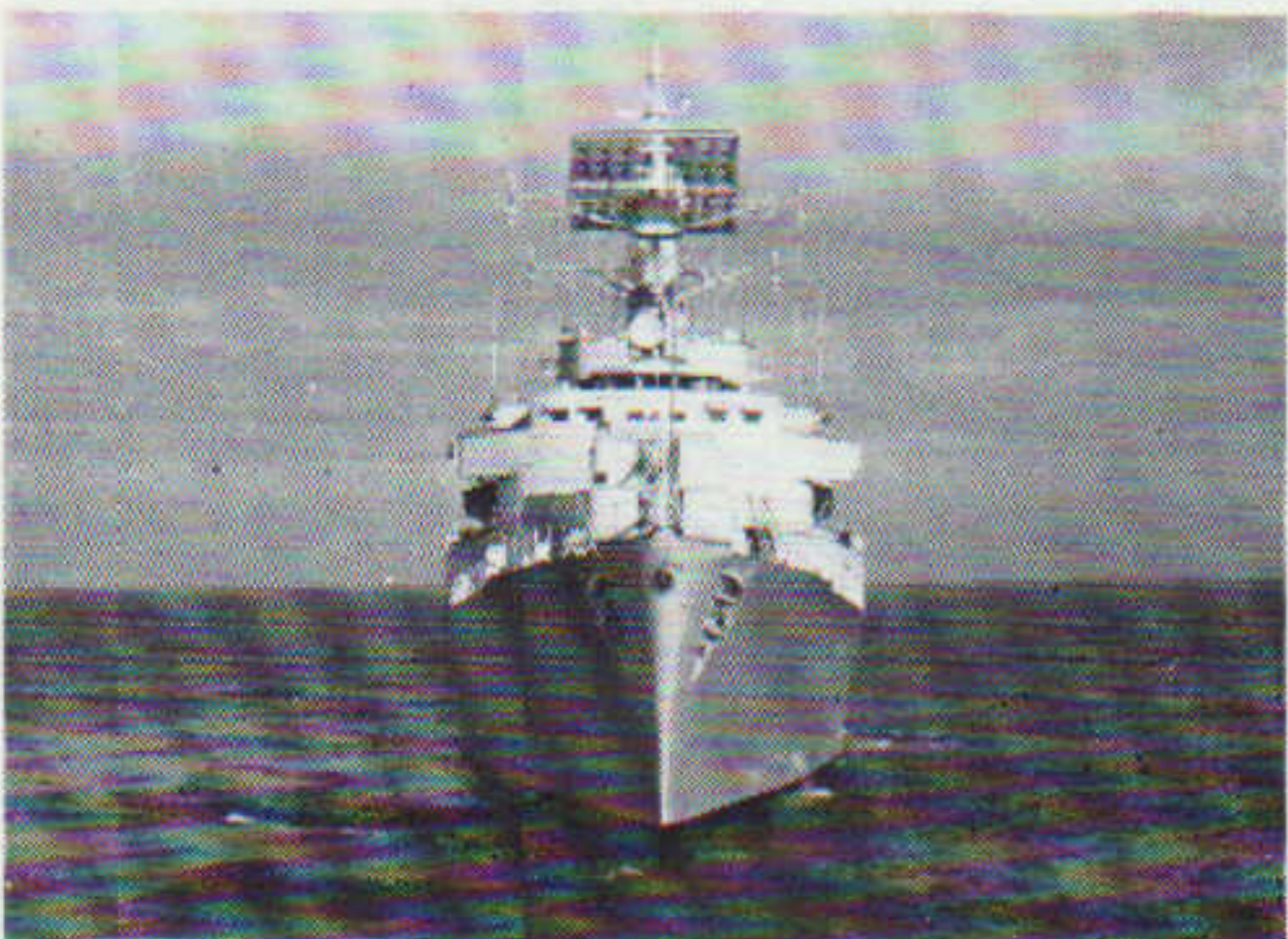
ATC and Air Defence Simulation
More than £2 million of research and development work enables the Company to offer standard packages of both hardware and software programme to produce a system tailored to a specific requirement.



Naval Simulation
The Company is supplying the Sea Dart radar simulator to HMS Dryad, the Royal Navy's action trainer at Southwick, one of Europe's most sophisticated tactical trainers.

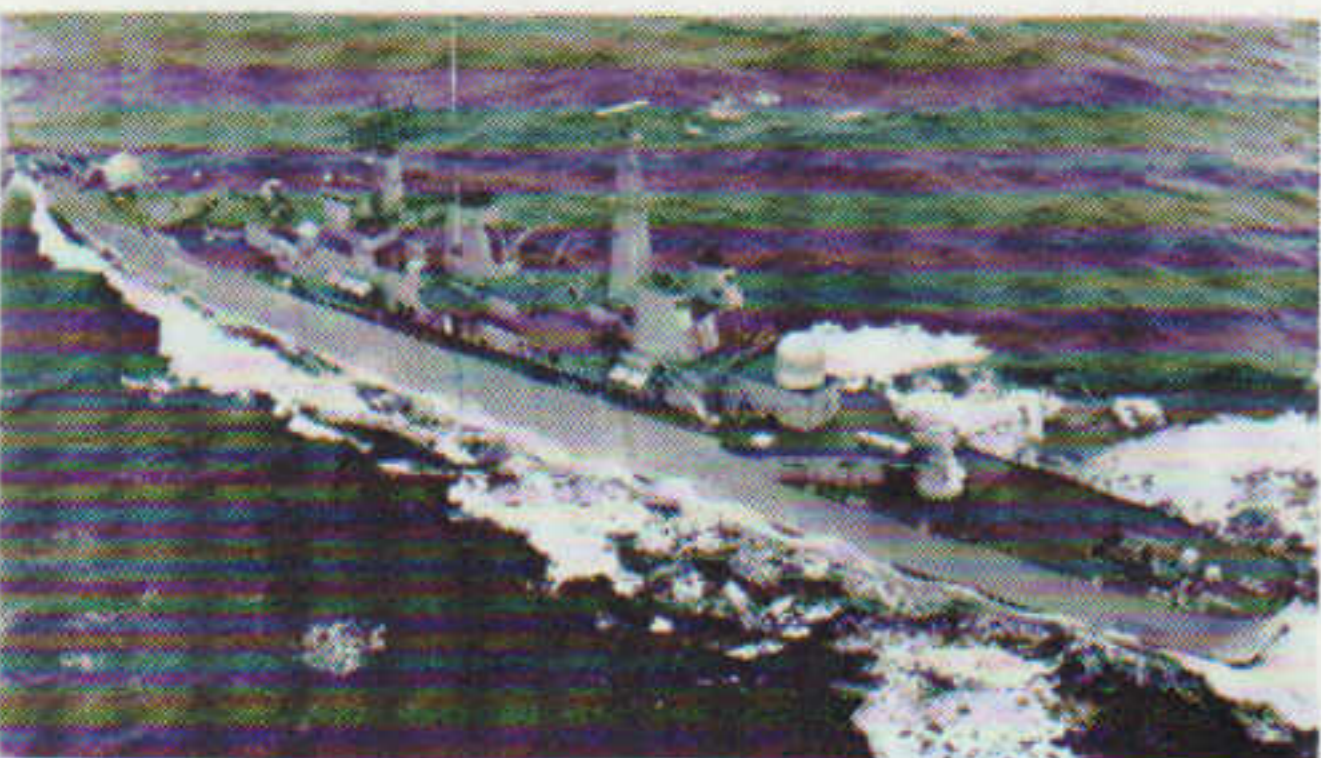
Naval Radars

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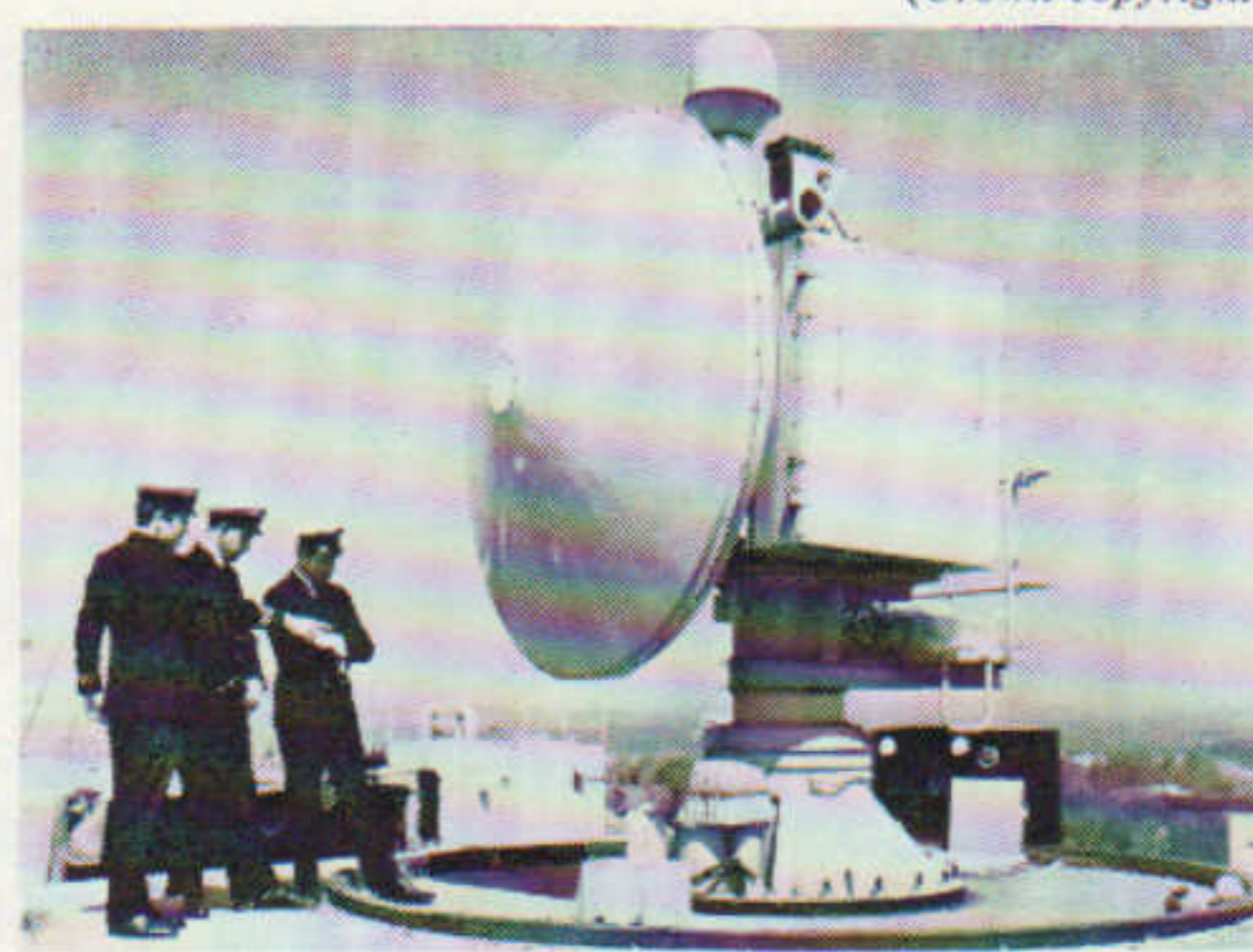


Surveillance Radar Type 965
A metric wavelength radar which provides long range aircraft warning and which is also equipped with IFF facilities. This radar is in use with the Royal Navy and many foreign navies.

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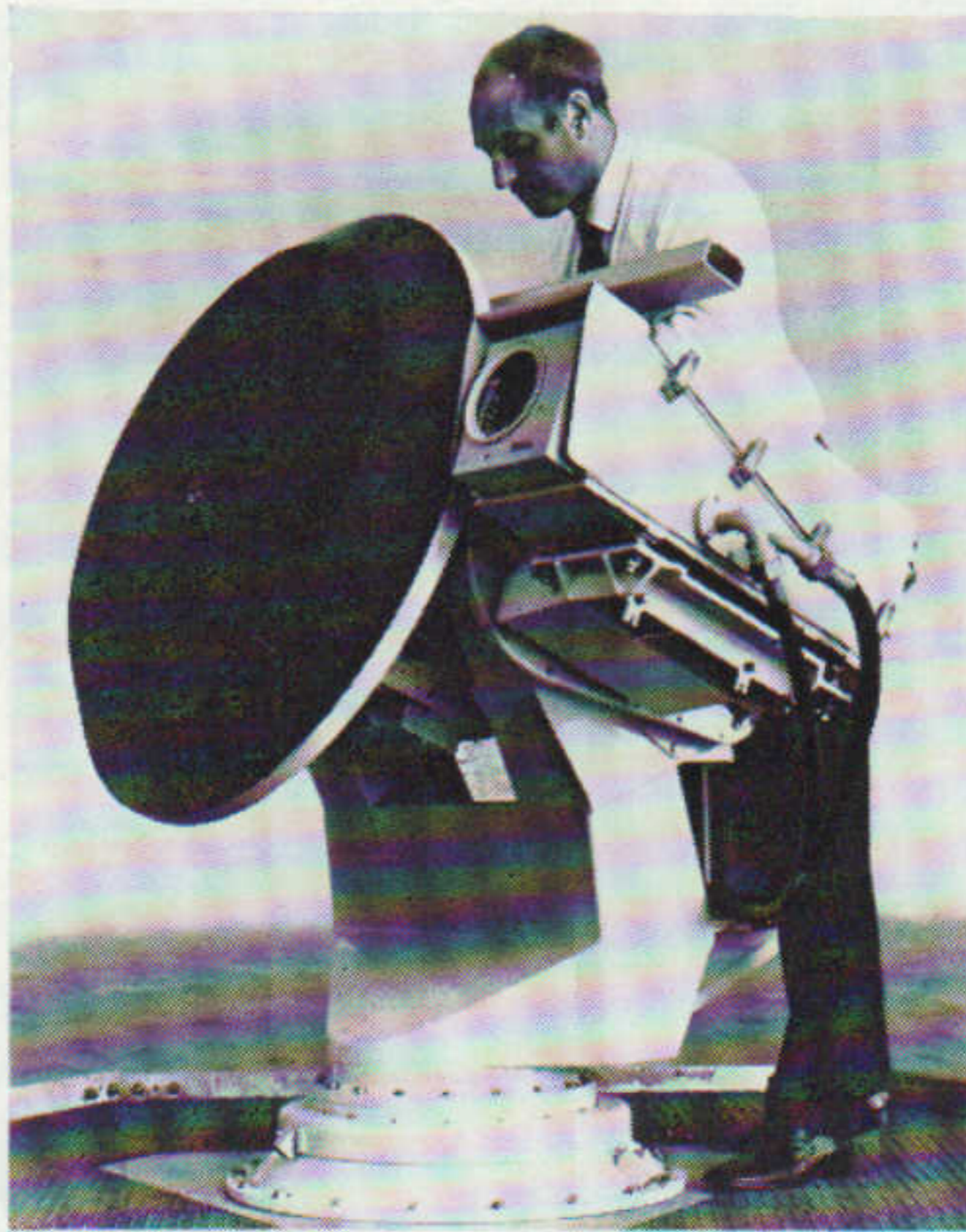


Surveillance Radar Type 992
A fully stabilized 10cm (S) Band medium range surveillance radar to provide warning and indication of air or surface targets, weapon direction for surface targets and navigation for general purposes. This high pulse power radar is fitted to many destroyers and frigates of the Royal Navy to provide the primary source of surface/air information.



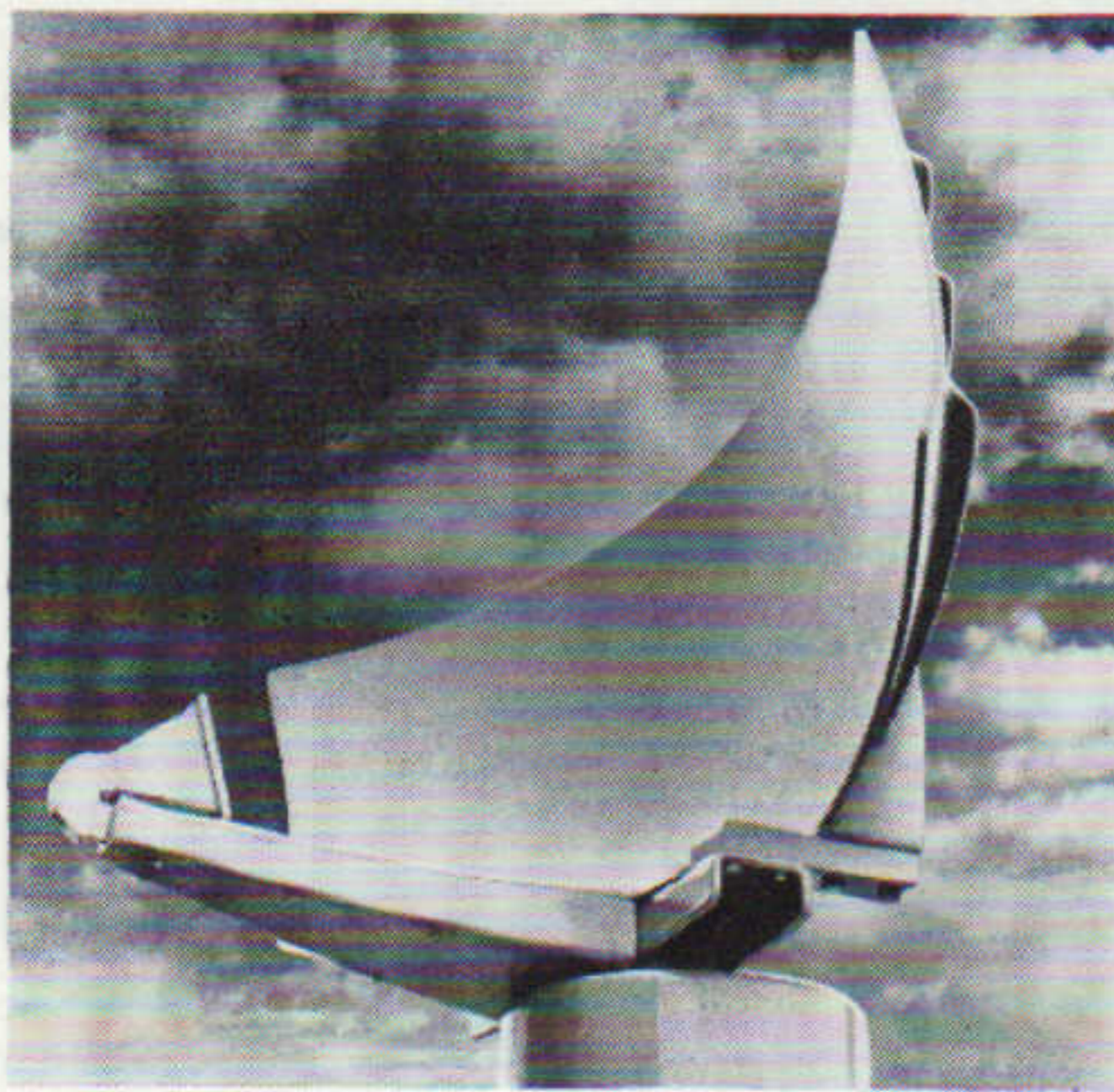
Sea Dart Tracker/Illuminator Radar
Provides target illumination for guidance of the Sea Dart missile and can also be used for gunfire direction. The radar incorporates a number of special features designed to reduce the effectiveness of enemy jamming and other countermeasures or decoy techniques.

800 series Radar



Tracking Radar Type ST801
A monopulse naval tracking radar with MTI for use as the auto tracking element in gunfire direction systems and in missile launching and guidance systems with automatic operations controlled by a central computer complex. For automatic control of command to line of sight missiles, provision is made to incorporate a television camera and associated electronics.

Tracking Radar Type ST802
The autonomous version of the Type ST801 with the facilities necessary to allow it to function on its own, without the interface and control by a weapon system computer. The Type ST802 with a television camera aligned to the boresight provides independent control and 'dark-fire' for weapons such as Seacat.



Surveillance Radar Type S810
A stabilized naval surveillance radar with MTI. Its vertical cosec² aerial, mounted in a radome, ensures good coverage against air targets whilst the narrow horizontal beamwidth gives accurate target indication data for pointing weapons and putting on tracker radars. This radar can also be used for navigation.

Surveillance Radar Type S811
A stabilized naval surveillance radar similar to the Type S810, but without MTI.

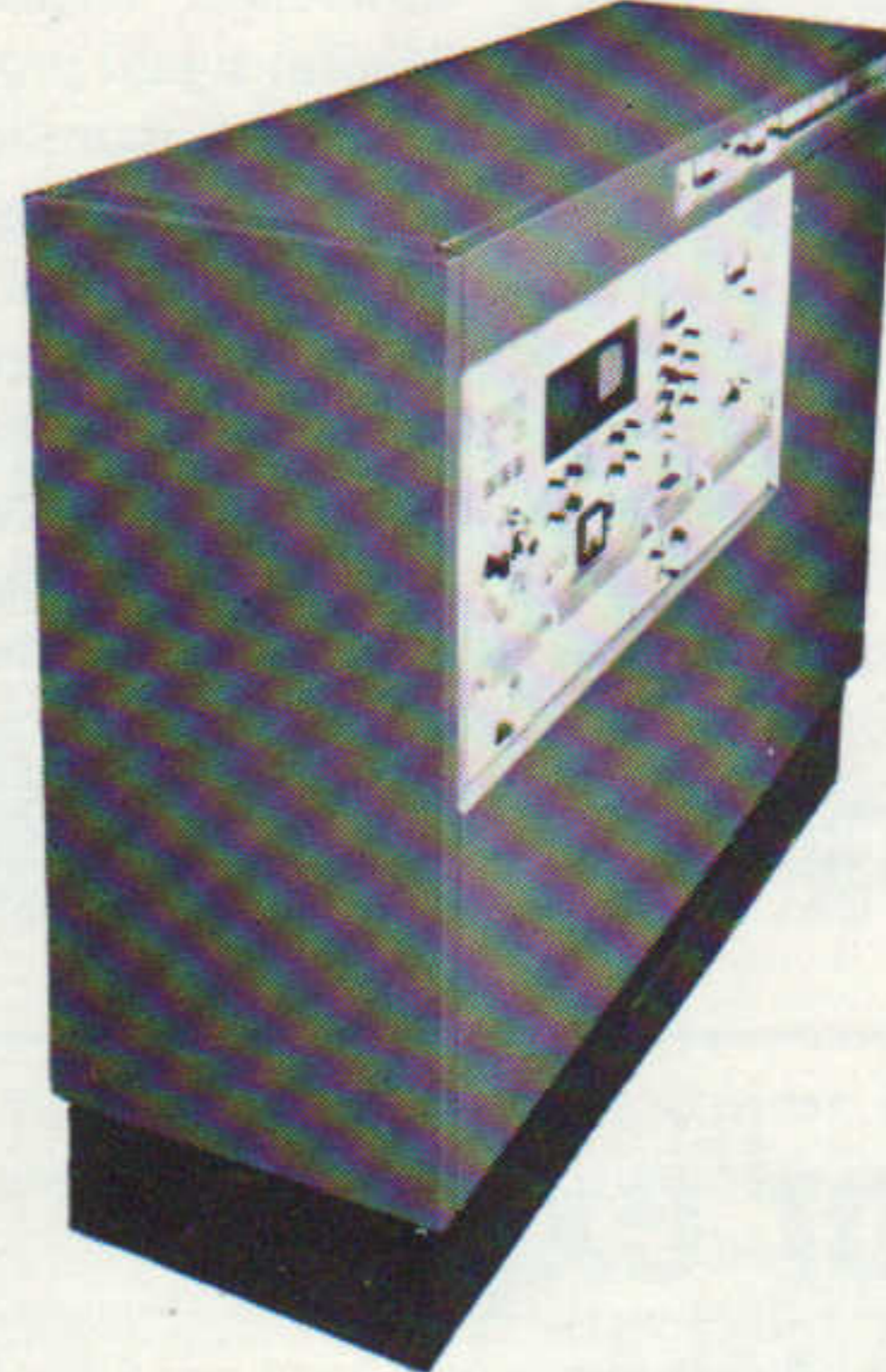
Surveillance Radar Type S812
A naval surveillance radar with MTI. It is specially designed for the detection of low flying missiles and aircraft, incorporating doppler processing to reduce sea clutter with a

pencil beam aerial on a stabilized two-axis mount. Can be fitted to fill the gap in radar cover at low-level.

Coastal Surveillance Radar Type S841
A mobile coastal defence surveillance radar which provides and continuously updates accurate range and bearing co-ordinates on surface targets for weapon fire control systems.

Coastal Surveillance Radar Type S842
Similar to the S841, but has greater operational flexibility using a broader band squintless feed aerial system and a tunable transmitter.

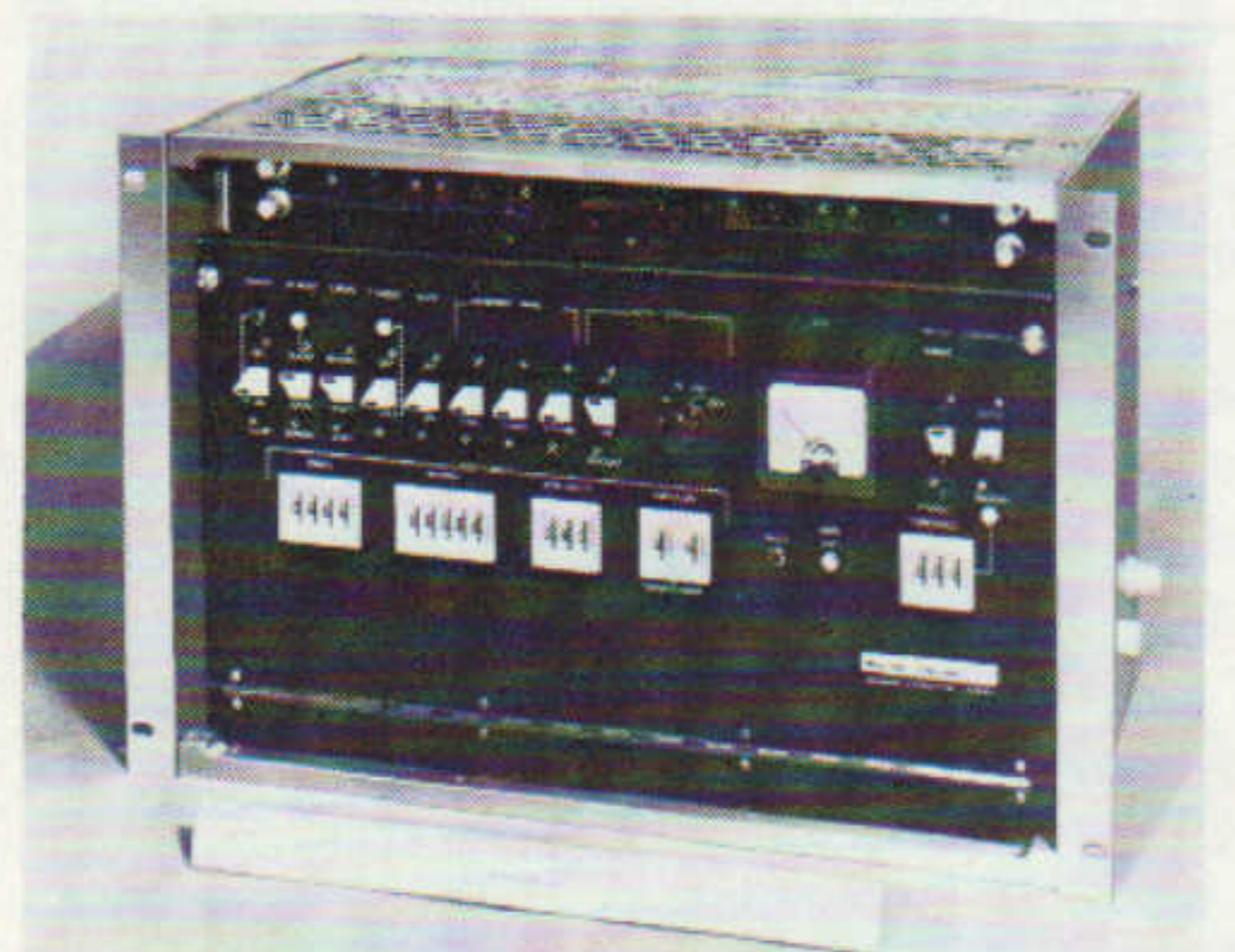
Radar Equipment



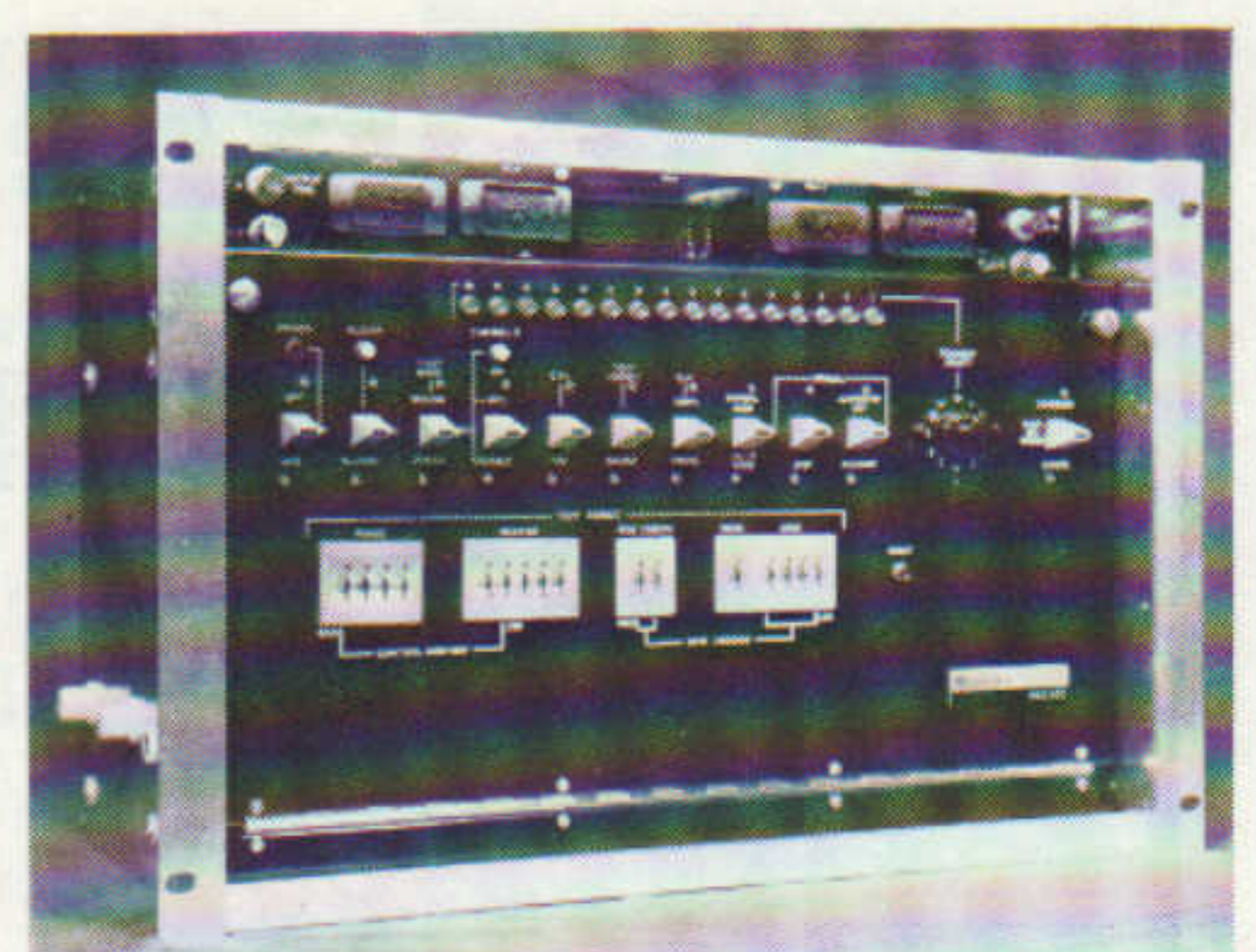
Transmitter/Receivers
These high-reliability, solid-state equipments include the 1MW 10cm (S) Band Type S2010, the 23cm (L) Band Type S2011 (2MW) or Type S2021 (800kW), the 2 1/4 MW 10cm (S) Band Type S2012, the 1MW 5.5cm (C) Band Type S2013 and the 500kW 50cm Band Type S2020.



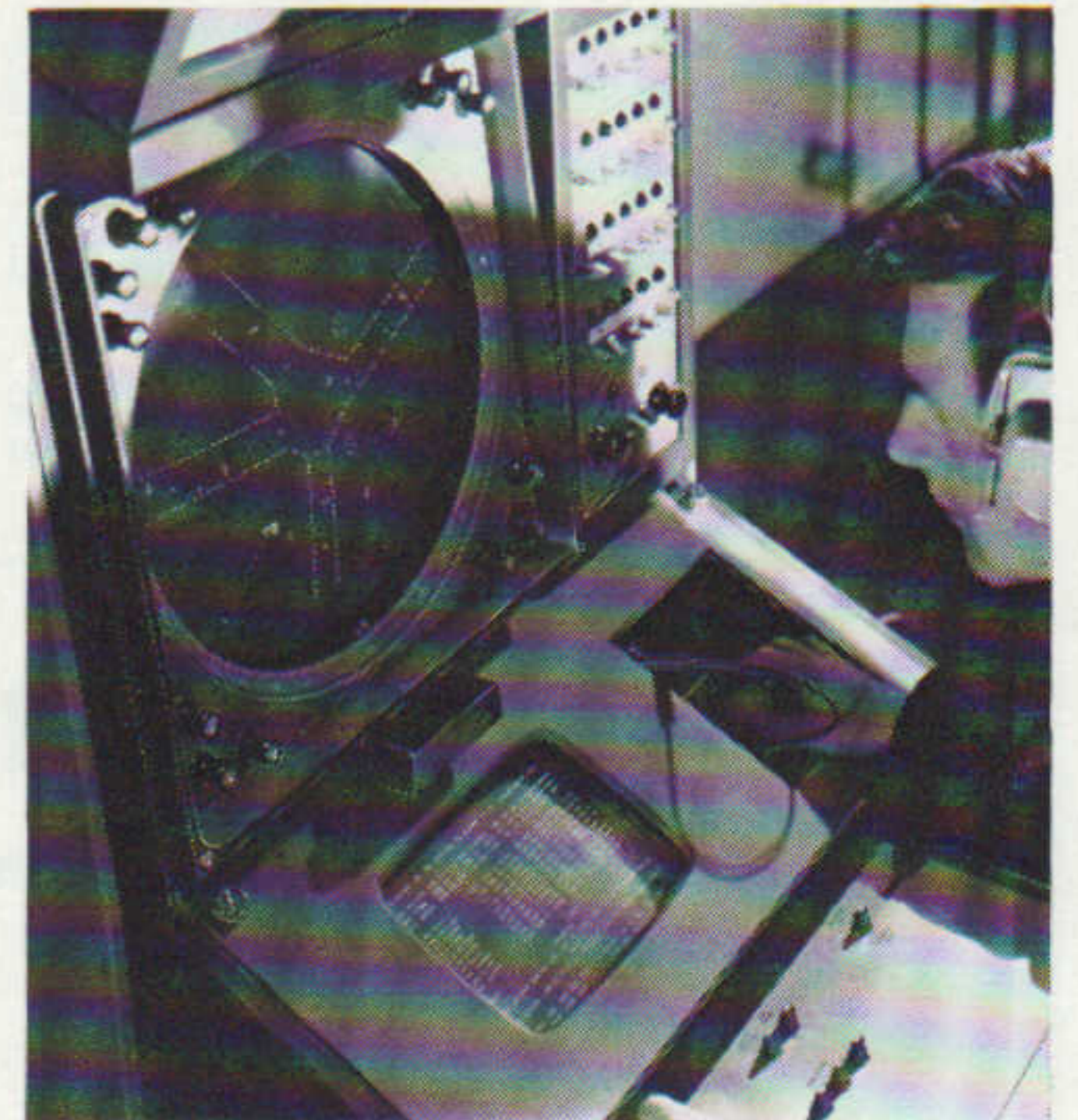
Signals Processors
As well as a range of analogue equipments the Digital Signal Processor Type S7100 offers double cancellation MTI, p.r.f. stagger, p.r.f. discrimination, clutter constant false alarm rate control and special clutter switching, with a range of trigger outputs to drive a complete radar system.



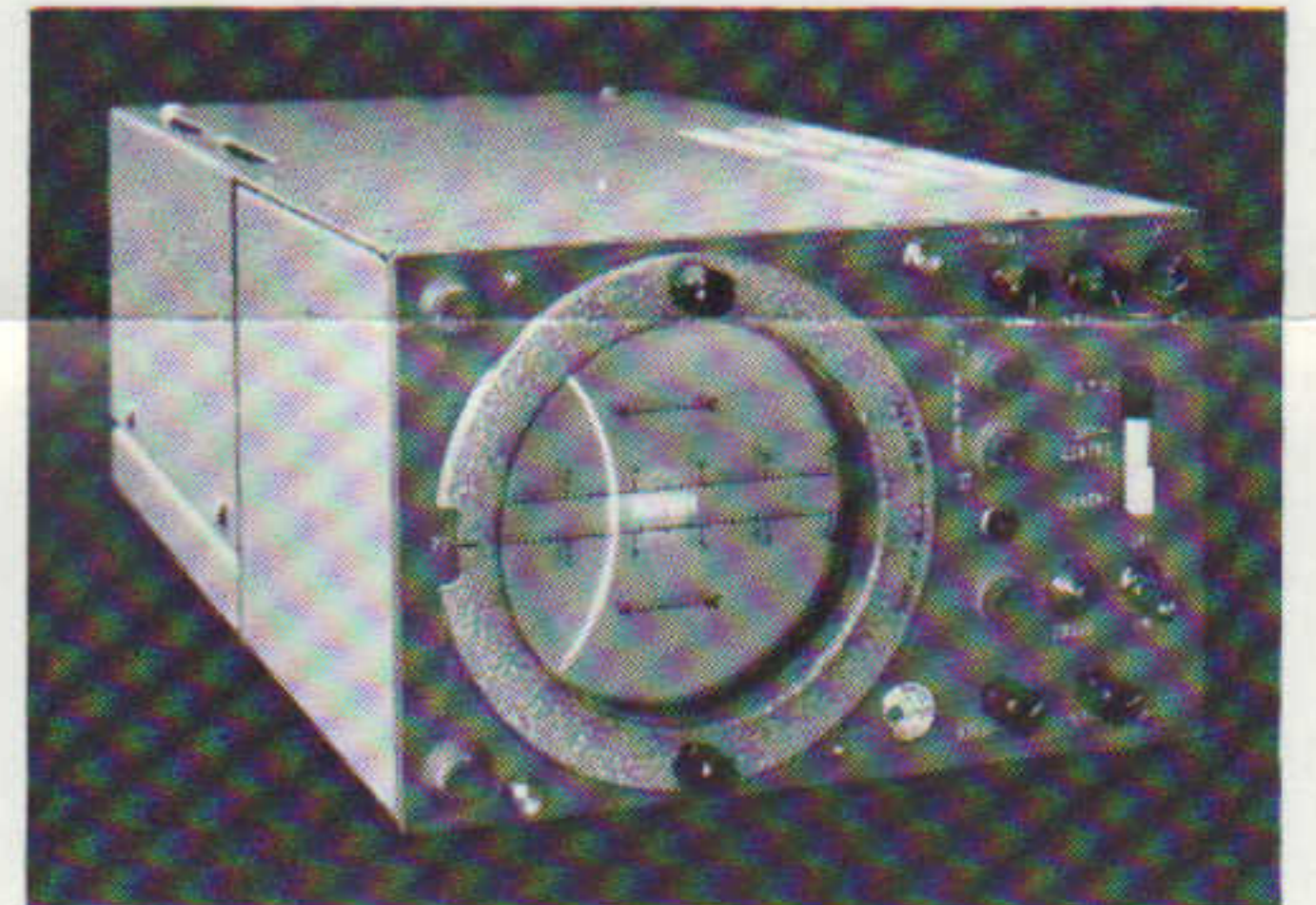
Primary Plot Extractor Type S7200
A small unit employing modular construction for system flexibility. It has an analogue or digital unit interface and can be mounted in one drawer of the Type S7100 processor cabinet. The unit provides extracted plot data either direct to a computer for data processing or via a serializer for transmission to a remote site over a narrow-band link.



Secondary Radar Automatic Decoding
This includes a Type S7310 decode unit and a Type S7300 plot validation unit providing facilities for extracting plot position and code data of replies on all modes. Narrow-band output data can be applied direct to a processor or to a serializer for remote transmission.



High-Speed Displays
A large range is available, incorporating monochrome or three-colour displays using circular and rectangular viewing units and rear-port projection techniques.



Daylight Displays
These include the Type S3004 distance-from-threshold indicator used to indicate continuously the distance of aircraft on final approach from the runway threshold; also the S3006 bright display which is used as a normal PPI display, accepting inputs from multiple primary radar videos, range marks, video map and secondary radar.



Myriad III Computer
A high-speed, real-time computer, specially developed for radar data processing. It operates with an 8-level priority and has a directly addressed store of up to 524 288 words of 24-bit length.

BAC order 50cm radar equipment

Jaguar and MRCA test flight programme

Marconi Radar Systems Limited has received an order from the British Aircraft Corporation to supply radar system electronics equipment and spares valued at £140,000.

The new equipment will be used by the British Aircraft Corporation at their establishment at Warton, Lancashire during the intensive development programme for sophisticated military aircraft. New radar system electronics will provide enhanced coverage during the flight proving of the Anglo-French Jaguar advanced strike/trainer aircraft and will obviously be applied to future flight test programmes including the Multi-Role Combat Aircraft (MRCA). Marconi's clutter free 50cm radar ensures the high degree of in-flight safety essential in test flying procedures.

To obtain the desired radar performance

on these high-speed aircraft of small echoing area, Marconi Radar Systems will supply and install new system electronics to be operated with the existing S264 aerial. The new equipment will form a complete radar channel and includes a 500kW solid-state transmitter/receiver Type S2020, a digital signal processor Type S7100 and two of the autonomous displays Type S3017 which have recently been developed as part of the new Marconi range of high-speed analogue or digital displays.

This order illustrates Marconi Radar's ability to expand and improve existing radar systems, in a truly cost-effective way. The application of the latest electronic techniques and equipment modifications will increase the coverage of BAC's S264 radar by about 30% and significantly increase the life of the system.

50cm ATC radar for export

Complete coverage of Malaysian Airspace

A major air traffic control radar export order has been won in Malaysia by Marconi Radar Systems Limited, against strong international competition. This £750,000 turnkey project will provide the airport at Kuala Lumpur, one of the most modern in the world, with an advanced air traffic control capability well able to cater for the rising volume of air traffic.

A giant 50 centimetre radar station, the most powerful ever built for civil use, is to be sited on top of a 6,000 foot mountain, to give full coverage of the whole of the Malaysian airspace, up to ranges well in excess of 200 miles. Signals from the radar will be processed at the aerial site in a digital signal processor and plot extraction system, after which the 'clean' radar picture will be passed, in digital form, over a narrow-band radio link to the Air Traffic Control Centre at Kuala Lumpur's Subang Airport, some 20 miles away. Here the 'clean' clutter-free radar pictures will be presented to controllers on the latest Marconi displays. The 50cm radar system provides greater freedom from rain and weather clutter than any other type of radar in use today.

The Marconi contract with the Malaysian Ministry of Transport includes full surveying of the radar site and civil engineering work, together with the supply, installation and commissioning of all equipment, both at the aerial site, and at the air traffic control centre. The civil engineering work will be managed for Marconi Radar Systems by the General Electric Company of Malaysia Limited. The access road to the mountain site will be provided by the Malaysian Government.

The contract also provides for training of Malaysian engineers at the Marconi College in Chelmsford. The training will cover the operation and maintenance of the complete system, together with any technical assistance which may be required after the installation of the equipment. The full programme is expected to take two years to complete.

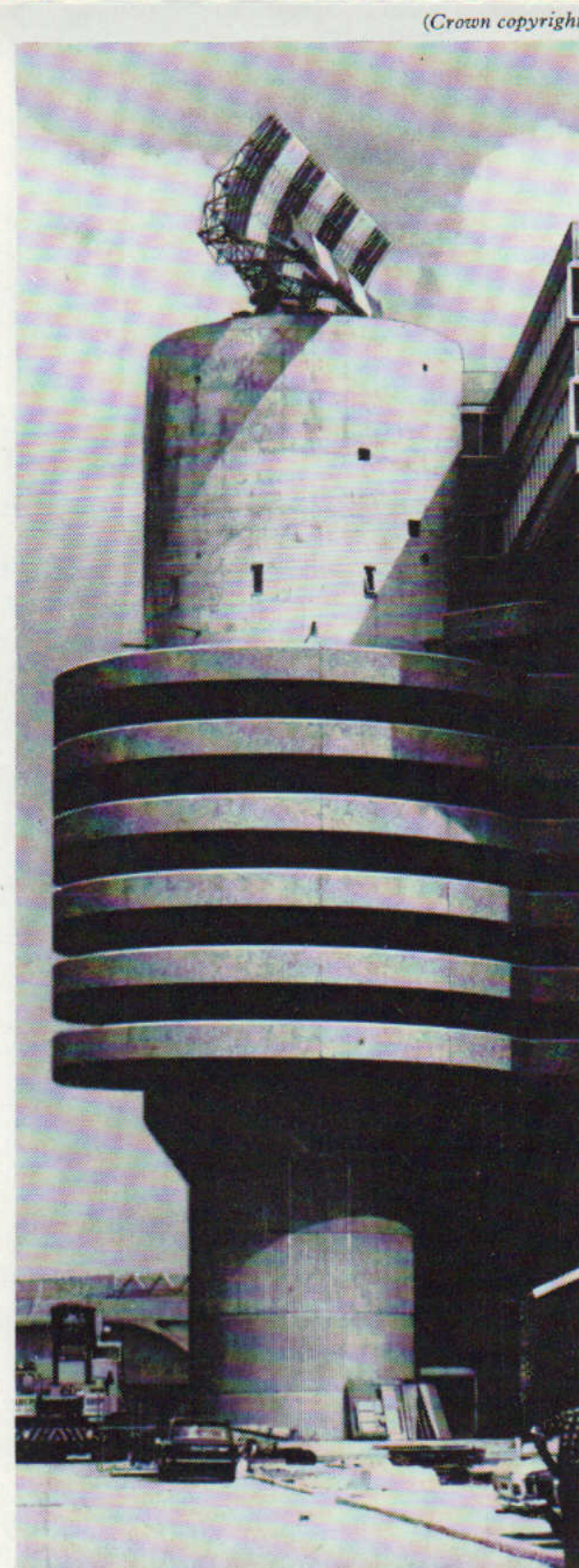
The use of 50cm high power radar systems for air traffic control was pioneered by Marconi in the 1950s, and has since proved its success in Europe, Asia and Australasia. A number of customers, including the Italian and the British aviation authorities have recently purchased the latest Marconi 50cm radar equipments because of the high confidence they have established over the years with earlier variants.

System equipment

The massive aerial, Type S1070, is the largest civil radar aerial ever produced by Marconi. Over 20 metres (67 feet) wide, and 4 metres (13 foot) high, it will produce a horizontal beamwidth of only 1.7° giving excellent

definition, even at extreme ranges. The transmitter/receiver unit, Type S2020, provides an output power of 500kW peak power. The complete equipment is fully transistorized except for the output klystron and the travelling-wave-tube stage which drives it.

The display system at Subang Airport will use the latest 400mm (16 inch) Marconi displays, Type S3017. These are fully transistorized, fixed coil displays, able to accept either raw radar or plot-extracted synthetic radar information to provide an accurate and stable radar picture.



Marconi 50cm Band radar mounted 140 feet above ground on the roof of the BOAC multi-storey car park and office block at London's Heathrow airport.

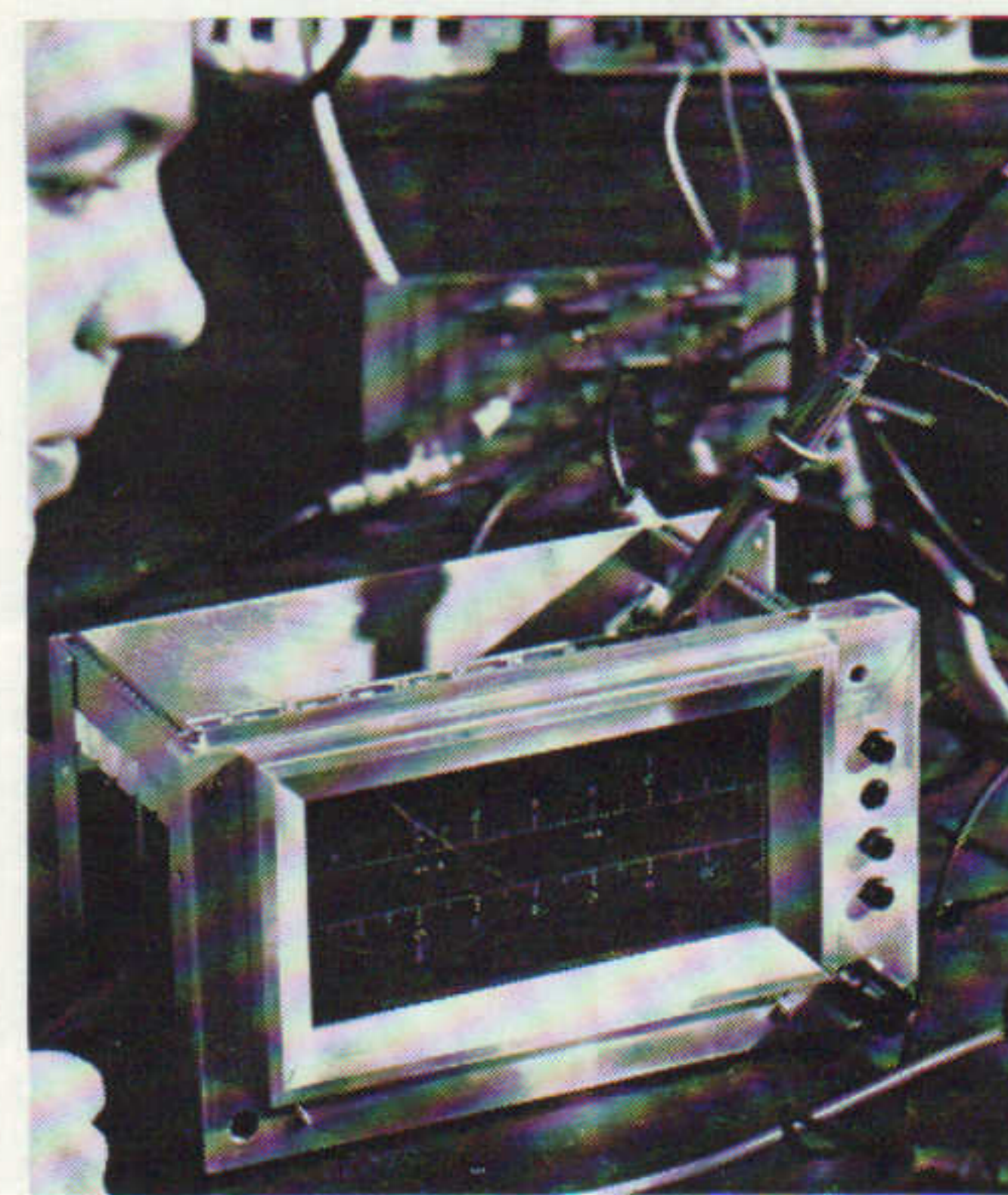
NEW RADAR DISPLAY TECHNIQUE

A completely new form of radar display is being shown in operation by Marconi Radar Systems Limited at Farnborough Europe 72. It is totally solid-state, based on the use of a matrix of light emitting diodes (LED) and has only very recently been announced by the Company. The display is less than 1 inch thick and, with its associated system, is capable of being let into an operator's console.

The prototype system, developed in the Great Baddow Research Laboratories of GEC-Marconi Electronics Limited, takes the form of a Distance-from-Threshold Indicator (DFTI)—a daylight display used for indicating the distance of aircraft on final approach from the runway threshold. Light emitting diodes provide a bright display which can be seen without difficulty in the high ambient light levels within an airfield control tower.

The new display uses a matrix of gallium arsenide phosphide diodes, mounted in groups and wired directly on a double sided printed circuit board. Up to 1000 foot-lamberts light intensity is obtained from the diodes which are mounted close enough to give an effective 1/4-mile resolution on the new DFTI. Only a 5 volt, 15 watt power supply is required, other inputs are radar tuning information and raw radar signals processing with moving target indication (MTI).

The complete display is only a fraction



The new light emitting diode display pictured during its development.

of the size of the equivalent cathode-ray tube equipment and as it requires less than a twentieth of the power supply, heat dissipation is much less and the requirement for air conditioning and cooling is very much reduced. Marconi engineers predict that the reliability of this type of display will be many times higher than that of conventional displays. The LED device is inherently very rugged and reliable—and even if one should fail, then only a very small portion of the complete display would be lost and this would be quickly and easily replaced. Under normal operation, the new DFTI would have at least two diodes lit at any one time to signify a directional tail as the aircraft echo moves across the screen.

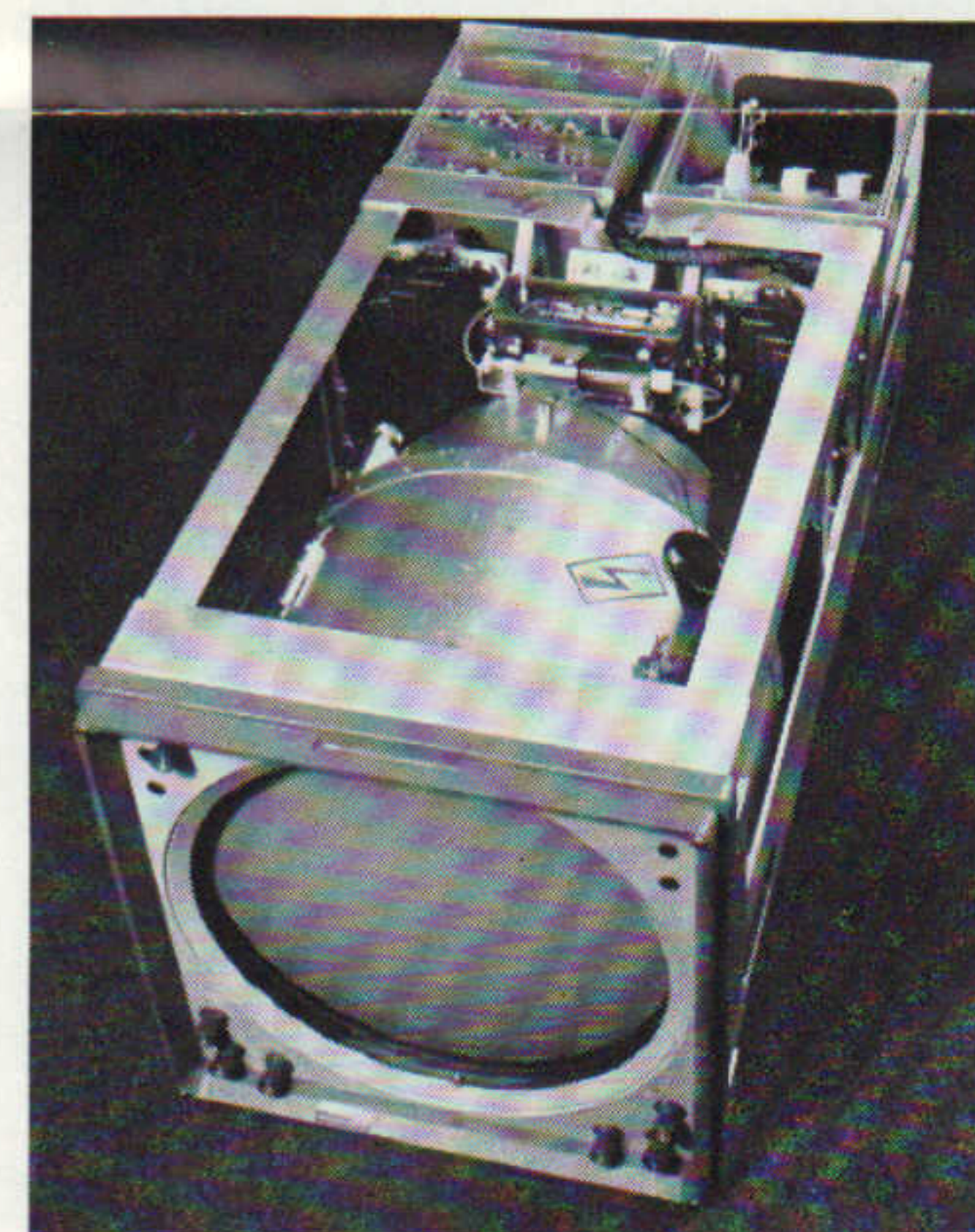
NEW REAR-PORT PROJECTION DISPLAY

Full colour detail superimposed on radar picture

A new radar display system, which enables projected information from 35mm colour film to be superimposed on a normal radar display, has been developed by Marconi Radar Systems Limited, a GEC-Marconi Electronics Company. The new display is based on units from the company's existing radar display range and is compatible with existing display systems produced by Marconi and, in some cases, by other companies. All the main features of a normal display are retained.

The Company is to supply three prototype units for evaluation by the Royal Radar Establishment, under a contract awarded by the Ministry of Defence (PE).

The new system is based on the Marconi 400mm (16 inch) radar display, Type S3014, which provides a high-speed, analogue radar presentation with full facilities for electronically written labels and symbols. The external appearance of the unit will be virtually unchanged. An optical window at the back of the cathode ray tube enables full colour airways maps and procedural charts from 35mm film frames to be back-projected onto the tube face, and superimposed on the electronically written display of live air traffic situations. Far more detail is achieved than is possible using even sophisticated and costly computer



The new Marconi Rear-Port Display Type S3018, graphics techniques.

Selections from an extensive repertoire of written instructions can be back-projected onto the screen during doubtful or emergency situations without degrading the quality of the live picture at a crucial time—these are the unique features available to the user.

Aerospace Minister sees Marconi Radar

Mr. Cranley Onslow, M.P. Parliamentary Under Secretary of State for Aerospace, recently visited Marconi Radar Systems Limited in Chelmsford to see for himself the Company's work and experience in radar and data processing systems.

He is shown here (centre) having the complexities of the Marconi Myriad III computing system, the most flexible real-time system of its type in the world, explained to him by Mr. John Sutherland, the Company's Managing Director.

