Radar Systems International

MARCONI

No. 13

S600 Radar adds to its success

Eight steps keep mobile radar moving ahead

Increasing recognition of the successful performance of the S600 Series is reflected in sales around the world totalling over £30 million.

This continuing success can be attributed to no less than eight successive developments following rapidly one upon another.

These recent impressive advances have ensured that this most reliable and versatile complex of early warning and ground control intercept facilities has kept its place as the leader in the field—and in the air.

Eight more reasons why five more countries buy S600 Radar.

● **Fitting of MARCONI Digital Signal Processing**
The replacement of analogue with digital techniques has very considerably improved the consistency of performance, resulting in more effective plot extraction and at the same time increasing its range of facilities. Operators agree that this modification enables information to be presented more clearly, more precisely, where it is needed, when it is needed.

● **New, MARCONI Display Control Logic Units in Operations Cabins**
S600 operations cabins now incorporate the greatly improved facilities available from full SIF decoding, including both passive and active read-out.

● **New MARCONI Paramp in Receiver**
The improved solid state circuitry in this modified paramp adds further to the high-level efficiency demanded by the exacting requirements of mobile radar today.

● **Improved Communications Facilities**
The latest communication cabins provide facilities for ground-to-air communications on UHF and VHF and ground-to-ground communications on UHF and HF, together with comprehensive telephone communications and recording facilities.

● **New Air Conditioners**
These air conditioners provide the essential working atmosphere for both comfort and safety. Up-dated, and using Refrigerant 22, these units embody the expertise gained from operations in widely varied climatic conditions ranging from the freezing arctic to the intense heat and humidity of the tropics.

● **New Air Compressor**
Fitted with a top canopy that gives added protection from driving rain or intense sunshine, this strengthened unit feeds the transmitter, aerial and waveguide run with a constant supply of clean, dry air at a pressure adjusted to ensure adequate power-handling capability.

● **Enhanced Performance from Height Extractor**
It is in multiple target situations that confusion might conceivably arise and it is into these situations particularly that the latest height extractor introduces a new order of clarification.

● **New Running Gear—Servo Assisted Brakes**
The most recent servo-assisted braking and improved independent suspension on this unit ensures safer, more effective mobility under the harshest working conditions.

These eight steps forward are only the most recent additions to the steadily progressive development of the S600 Series.

This rigorously tested front line defence equipment has maintained its lead position through the continual updating of its capabilities and performance. Since its launch in 1968, the Series has had the benefit of continuous small changes and refinements of design, reflecting the experience of the many customers who have proved its worth in many different environments. These constant improvements have been incorporated into the production models and design requirements, resulting in even higher standards of performance and reliability, and establishing still more firmly the merited place of the S600 Series as the most cost-effective basic ingredient of tactical air defence today.

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Who does what in new management set-up at Chelmsford

The new management structure has now been firmly established at Chelmsford and is operating effectively within and between Divisions, to provide more extensive and more flexible contact with outside companies and customers.

Members of the restructured Chelmsford management team, left to right: Ian Donaldson, Roy Simons, Brian Carey, Nigel Ellis-Robinson, John Sutherland, Mike Wolf, Iian Butler, Ron Bernhardt, Ron Sherwin and David Candy

Mike Wolf (the Company's Marketing Director since the outset and Marketing Manager of Marconi Radar Division for a number of years before that) intends to retire from full time activity in the spring of 1974, but will be Marketing Consultant after that date. We are preparing for that situation by creating the new post of Assistant Managing Director which enables him still to play a full and active part in the Company's marketing.

Roy Simons, as the new General Manager, Chelmsford, with his newly appointed Divisional Managers, takes the line responsibility for all Chelmsford activities including marketing, using Mike Wolf's guidance and advice in setting up his organisations.

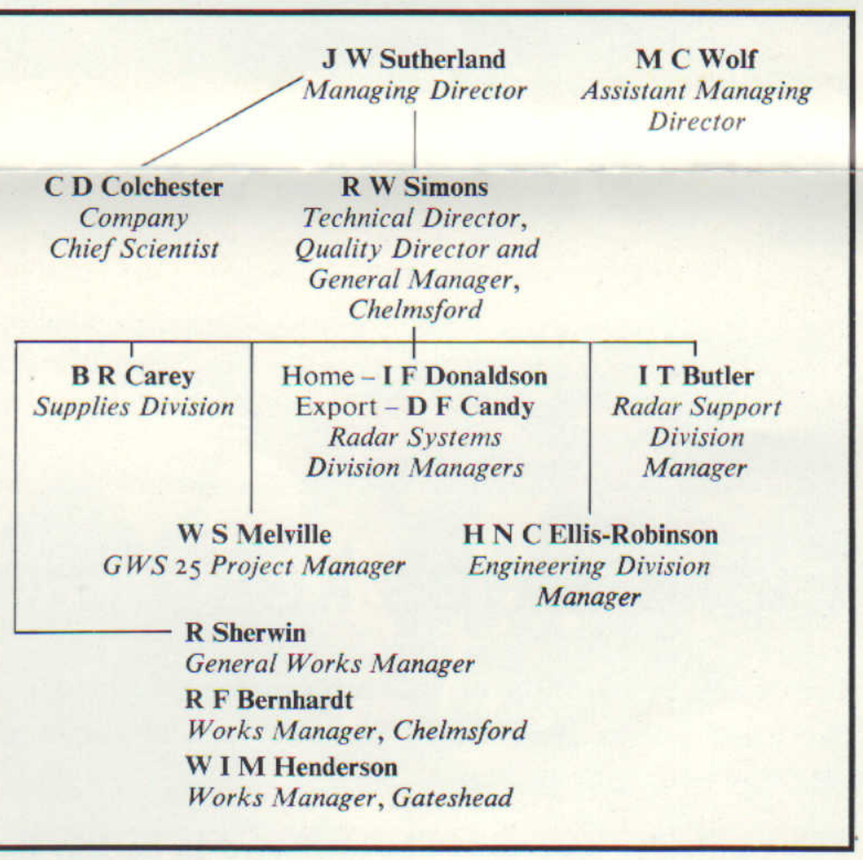
New Systems Division
The operation of selling and contract implementation, with all the associated systems engineering, commercial services and project management, is carried out through the Radar Systems Division, headed by joint managers **Ian Donaldson** and **David Candy**, with the former responsible for British Government work, the latter for Overseas.

Manufacturing
Ron Sherwin is General Works Manager with responsibility for manufacture in Chelmsford and Gateshead. His team consists of Ron Bernhardt, Works Manager, Chelmsford and Bill Henderson, Works Manager, Gateshead.

Engineering Division
This remains in the capable hands of Nigel Ellis-Robinson.

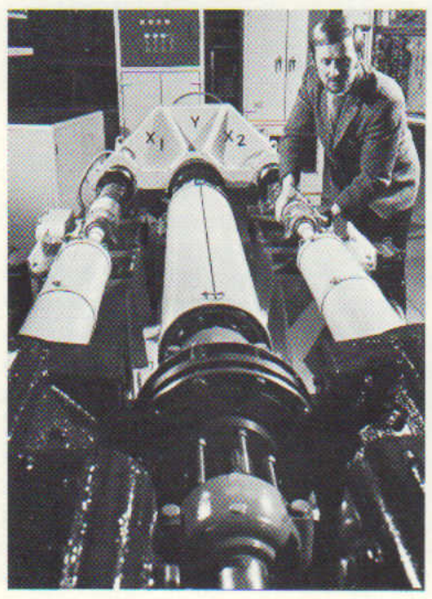
Support for the Customer
Iian Butler is in charge of the various support activities, including field services, technical services, spares, repairs and handbooks.

Supplies
Chelmford's new Supplies Division is now completely established. Bought-in material constitutes a major part of the Company's design work, products and projects, and it is vital that it is purchased and handled in the most economic and efficient way. This important task is in the hands of Supplies Manager **Brian Carey.**



CLASSROOM GUNS

Marconi Radar Systems is currently manufacturing its twenty-first solid-state electronic control system for the Vickers 4.5 inch, Mark 8 Naval gun. To date, twenty of these new systems have been supplied to the Barrow Engineering Works at Vickers Limited. The first of the systems to be fitted by the Royal Navy was installed aboard the new guided missile destroyer, HMS Bristol. A further seventeen equipments are in various stages of production for the RN and overseas navies.



The system employs many new techniques. Rotary amplifiers have been replaced by solid state thyristor power output amplifiers. This gives a marked improvement in reliability together with faster response, reduced power consumption, and a much faster run-up time.

In order to train their electronic engineers to set up, maintain and repair such equipment, prior to joining an operational ship, the Royal Navy have installed one of these advanced systems as part of a simulator at their training establishment, HMS Collingwood at Fareham, Hants. The simulator is also used for teaching and demonstrating, to trainees, servo theory from basic concepts to advanced techniques.

As with other gun control systems, setting up is a skilled task which must be carried out in the presence of the mechanical resonances that are caused by the gun. However, to overcome the economic and physical disadvantages of using an actual gun turret, the Control Department of Marconi Radar Systems has developed and supplied a mechanical analogue to simulate the training motion and resonances of the gun turret and its associated gearbox. This is the first system of its type to be installed.

The cabinets in the background of the picture are almost identical to those on board ship and house the electronic control system. The gun simulator in the foreground reacts to the control system to give exactly the same effect as the turning motion and inertias of a gun turret. This enables the trainee quickly to establish the correct setting up procedures to achieve optimum performance, i.e. rapid positioning of the gun with the minimum of mechanical oscillation, and he is able to gauge the effects of his adjustments both instrumentally and physically.

In addition, simulated faults can be put into the system by the instructors to give trainees first-hand experience of trouble-shooting, to ensure that, when they are posted to an operational ship, their fault-finding techniques are well established.

BEDFORD RADAR UPDATED

The Type 14 radar at the Royal Aircraft Establishment, Bedford, is one of the earliest radar systems ever purchased for service in peacetime operations. Using off-the-shelf equipment from the Company's range of S600 modules, it is now to be transformed into a virtually new radar, capable of dealing with the demands of the most varied and complex flight patterns in Europe.

These patterns include the RAE's performance-envelope testing, involving small military targets at ranges of more than eighty miles, as well as the Blind Landing Experimental Unit's activities. There are also transport training programmes at Bedford and even, in one corner of the field, carrier deck landing training. All these have to be integrated with each other and the whole related safely to overflying aircraft.

A new 1MW 10cm transmitter/receiver, the S2010, which has a tunable magnetron and is specially designed for moving target indication, is to be fitted to the surveillance approach radar which is also to have new digital signal processing and a new display complex. The receiver signals will be processed in an S7100 digital signal processor to provide radar returns cleared of clutter and other unwanted signals. An autonomous S3017 display is to be provided for each of five controllers and a sixth display will be supplied for technical monitoring.

To match the performance of the rest of the system the existing aerial turning gear is to be extensively modernized and refurbished.

The extended range and increased accuracy and reliability will provide Bedford with a modern air traffic control facility in the most cost-effective manner, combined with minimum disruption of operational use.

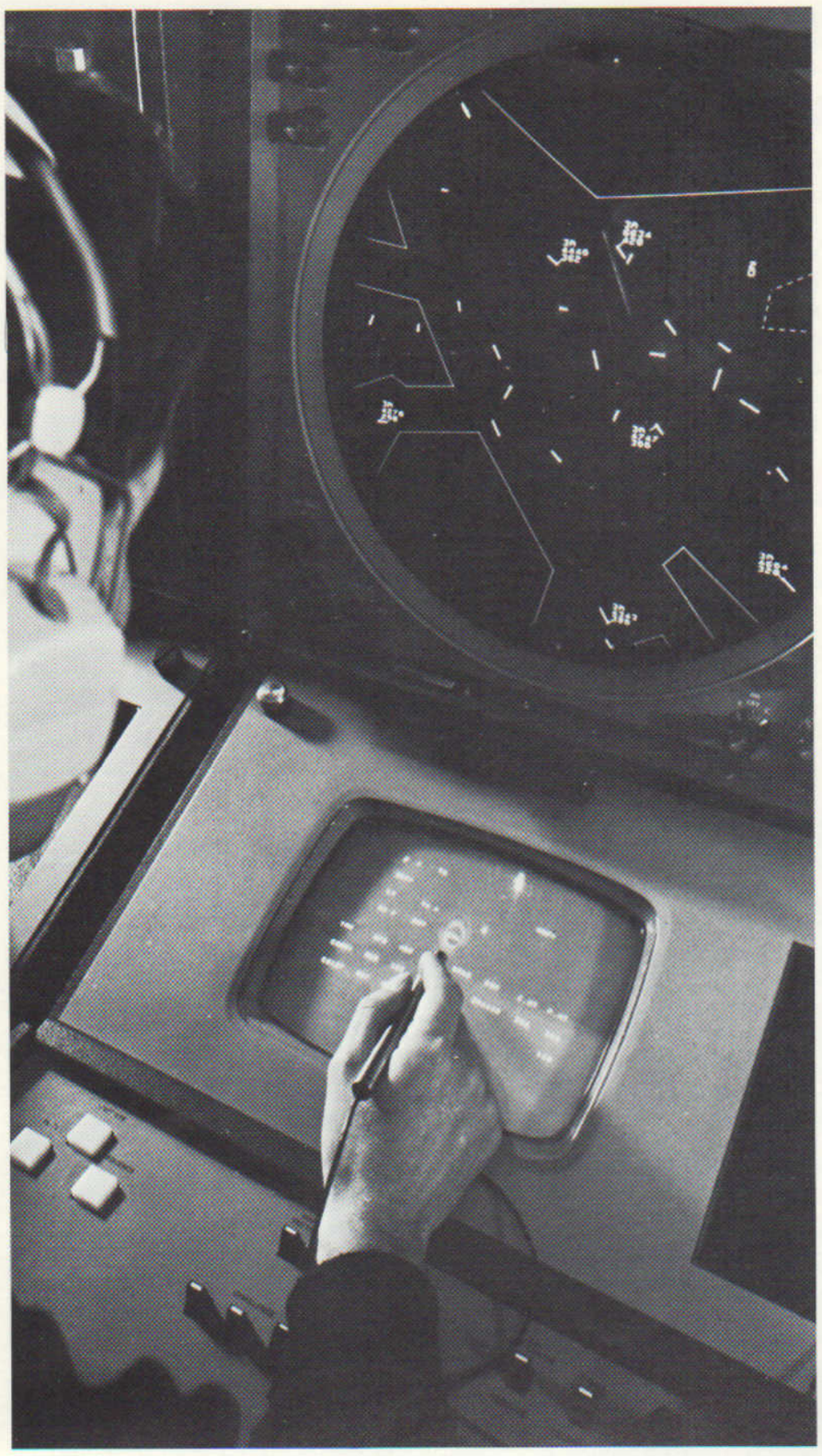
Sweden's invisible submarines

To make three of Sweden's latest submarines 'invisible' to magnetic mines or magnetic sensors, Marconi Radar Systems is to supply very advanced automatic degaussing equipment to each of three type A-14, Nacken class vessels. In the same order, which was won against international competition, the Company is to supply static power inverters which will provide each of the submarines with all the 60Hz and 400Hz power supplies on board.

Degaussing of a submarine is achieved by supplying power to coils distributed about the vessel to counteract its effect on the earth's magnetic field. The coil currents are automatically and continuously varied to maintain the vessel in a degaussed condition, no matter how the submarine moves in the water or changes its global position.

The inverters and degaussing equipment take advantage of the latest developments in both component and circuitry techniques and are designed and manufactured to the highest standards to comply fully with stringent naval requirements for operation on widely varying conditions of temperature and shock.

The order, which will be implemented by the Company's Control Systems Department at Leicester, represents a breakthrough into the Swedish market and was achieved with the co-operation and assistance of the Company's Swedish associates, Svenska Radio AB.

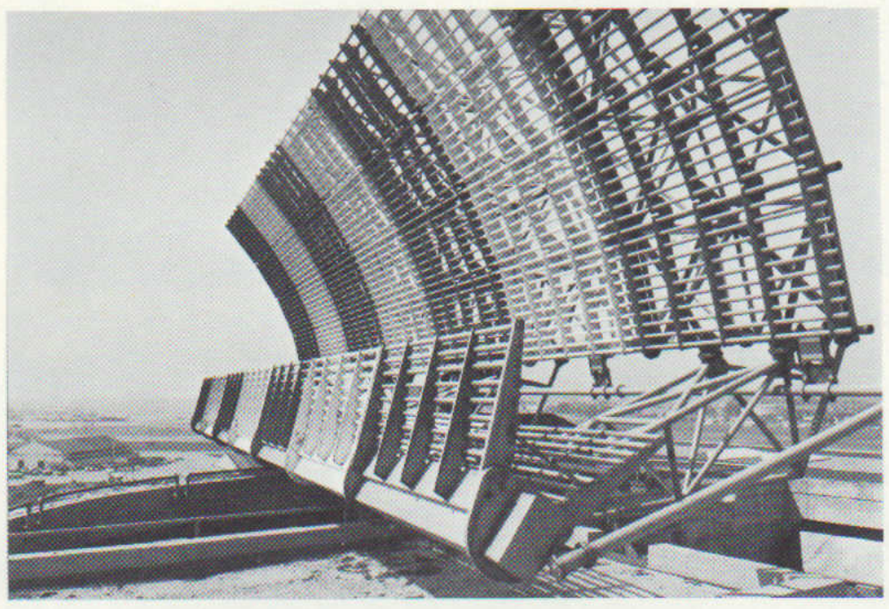


MARCONI RADAR PROVIDES AUTOMATIC TRACKING CAPABILITY FOR RRE

To evaluate the efficiency of the track extraction concept, the Royal Radar Establishment has purchased from Marconi Radar Systems an integrated plot extraction system for both primary and secondary radar, a Marconi Myriad III computing system and a company-developed software package for automatic track initiation and following.

Automatic tracking of aircraft has two significant advantages over the operator/PPI manual system. First it maintains a consistent performance and second it reduces the manning requirement to supervision level only. This means that a much greater and more accurate tracking capacity per man is obtained. A secondary advantage appears, by virtue of the data being immediately available in digital form, and that is the use of narrow band links to provide inputs from remote radar at low cost. Thus a system of greater scope can be implemented at a very cost-effective level.

The hardware comprises the primary plot extractor S7200, the secondary plot validation unit S7300, the decoder S7310 and the link buffer unit S7210. Currently, the primary side only is in use, working from the Blue Yeoman 3D radar. The unique system of parameter selection enables optimum conditions to be achieved for this or any other radar. The configuration underwent extensive evaluation at one of the company's test sites at Rivenhall, Essex, using the S650 radar covering a wide variety of targets, under observation by a team of RRE experts.



Although the provision of clean, clear, accurate plot data is an essential, the heart of any tracking system is the software, working through a reliable fast computer. Using the Myriad range of machines in its own bureau, the Company has sponsored the development of a complete suite of programs capable of taking manually-initiated plot data, passing it through coarse and fine position filters with probability weightings and providing a smoothed track output. This process is simple for the theoretical straight and steady ideal target, but in the real world of turning, crossing and fading tracks mixed with unwanted plots from clutter, the program ramifications can reach impossible proportions unless very rigorous and practical task analysis is carried out. As further stages, fully automatic initiation of tracks, track maintenance and repair and target simulation are performed by additional program suites. This hardware/software structure forms a very powerful tool for research and a very desirable working environment for a busy operational system, both military and civil. Coupled with the development of more powerful but cheaper computing systems and their associated man-machine interfaces, the continued enhancement of tracking software represents the most outstanding advance in the automation of air traffic control.

Runway Visual Range sales to United States, Czechoslovakia and Saudi Arabia

Marconi visibility assessment equipment for airports is being evaluated by the Federal Aviation Administration at their test centre in Atlantic City, New Jersey. This completely automatic equipment has been developed by Marconi Radar Systems and is currently in service at several of Britain's international airports.

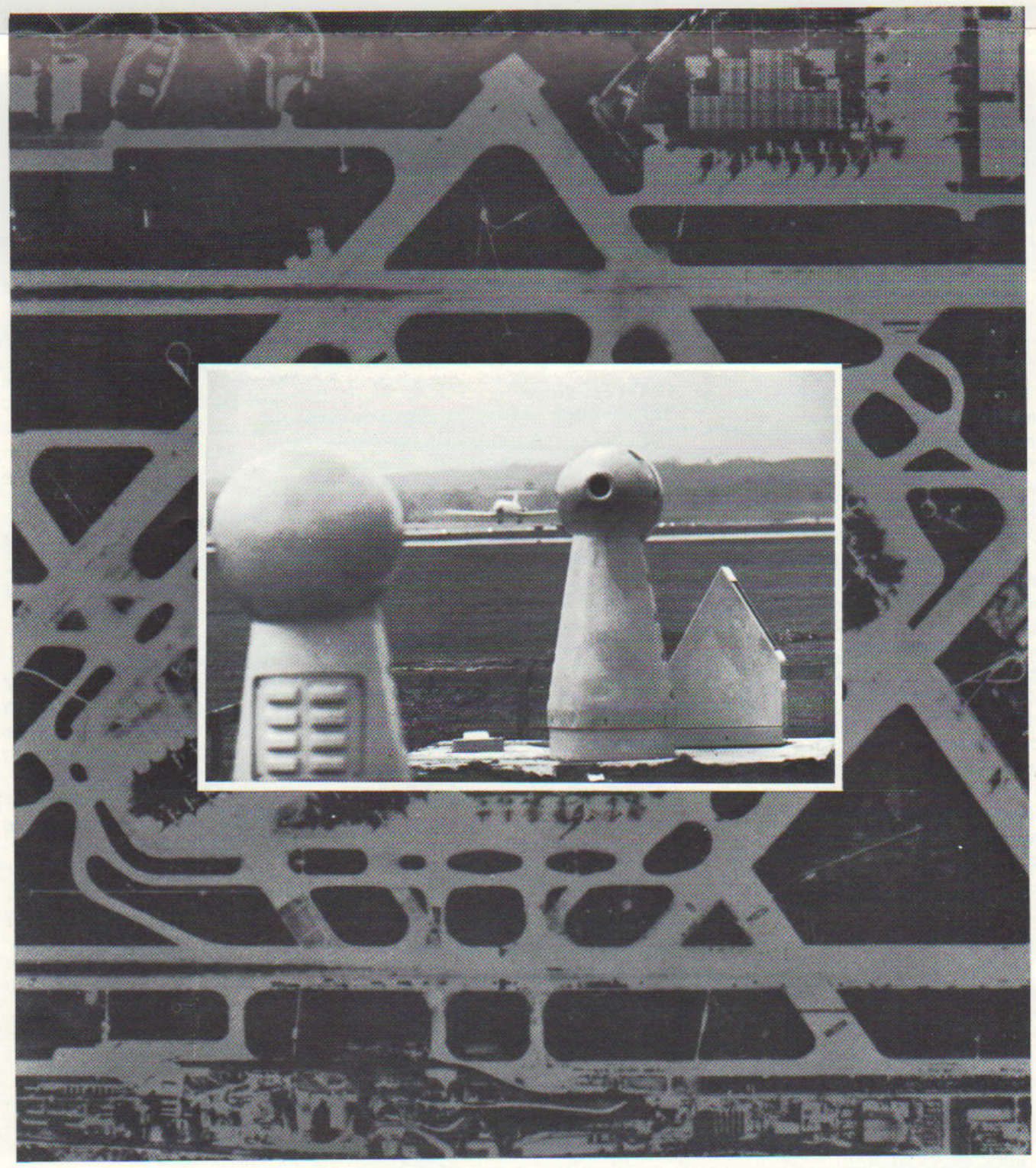
This American evaluation is part of a programme designed to assess differences in runway visual range standards between countries and to determine if these differences stem from the sensing and processing methods used rather than from differences in actual fog characteristics. Results of the tests are expected in about six months' time.

The Instrumented Visual Range System, the Marconi IVR1, already has full UK Civil Aviation Authority approval to its credit, and has been operational in Britain for over a year. It is installed at Heathrow and Gatwick Airports, London, and at Manchester, Liverpool and Glasgow. And now, as well as for the tests in the United States a derivative, IVR2, has been ordered for Czechoslovakia's Prague Airport and by Saudi Arabia, for Jeddah and Riyadh.

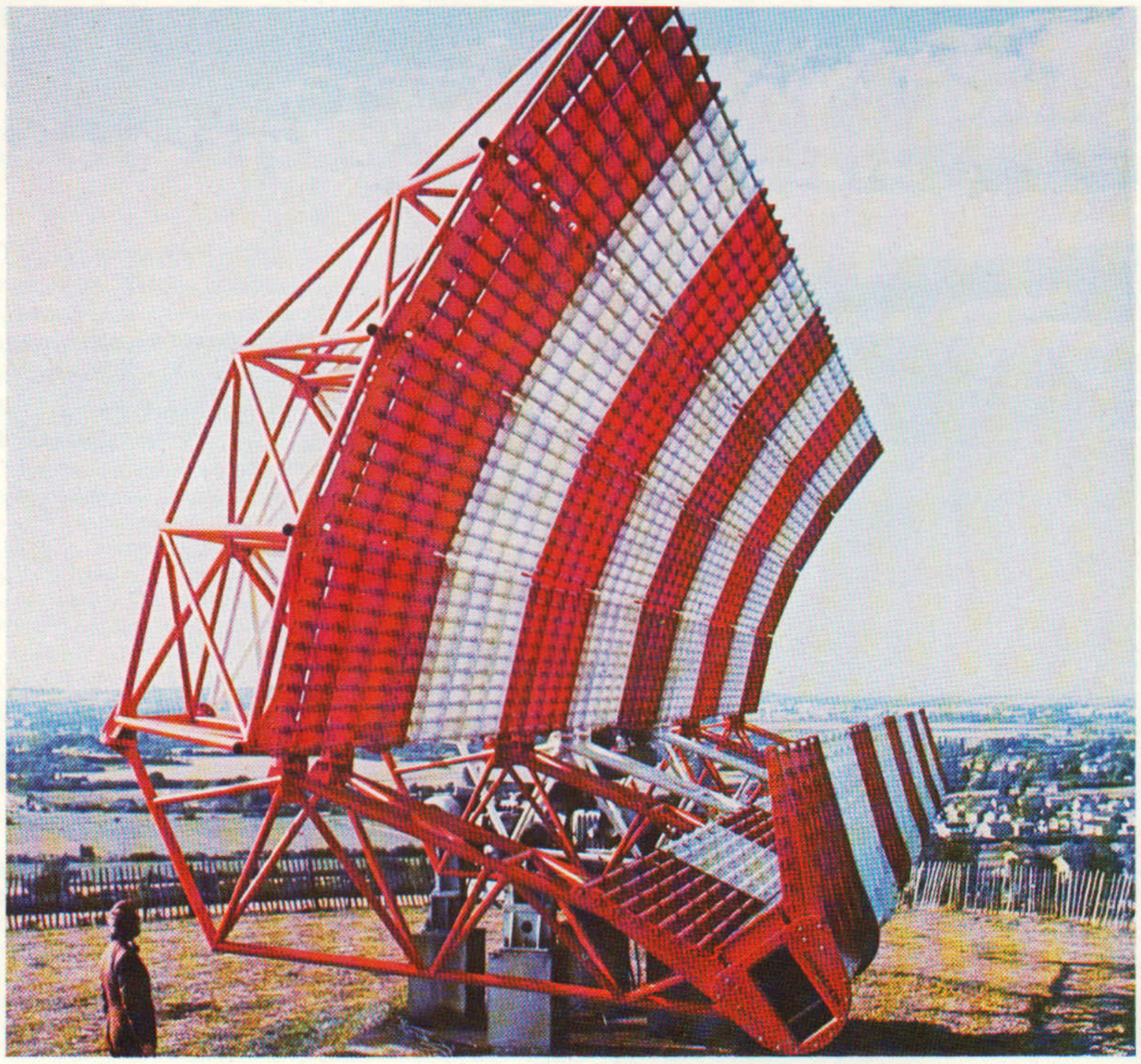
Technical Advances Considerable technical advances have been made in achieving safe and accurate assessment of visual range particularly in the method of processing visibility data to provide an accurate and stable IVR display. The optical system is housed in specially developed environmentally conditioned casings which are based 10 metres apart on the field sites. A computer scales the optional data against calibrated references, and displays the visual range in digital form.

The accuracy with which photometric measurements are carried out at the unattended field sites is extremely high, typically errors of less than 0.25% are regularly achieved. In order to accommodate rapid fluctuations in atmospheric transmissions data, the system samples the atmosphere at a rate well in excess of 100Hz, which is the highest frequency component of fog, and then applies analogue smoothing.

Computer calculation of a running mean further improves the IVR output until it is decidedly better to use than the reports of human observers, who do not have powers of quantitative association of a series of readings.



Instrumented Runway Visual Range System Type IVR1, designed by Marconi Radar Systems of Leicester to the United Kingdom CAA specification, is now undergoing FAA evaluation tests at Atlantic City, New Jersey



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.

The £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.

Keeping it under control — with Computerized Modular Monitoring

Every day our lives seem to be governed more and more by the use of complex electronic or electro-mechanical equipment, which we have come to rely on in many different ways — whether in military defence systems, aircraft landing devices, automated production lines or even our computerized bank statements. Inevitably, however, this raises the question — exactly how reliable is such equipment?

The only way to ensure the constant reliability of such sophisticated equipment is continually to monitor its performance, and until now this has meant employing intensive training procedures and highly-skilled personnel, both of which can become time consuming and expensive.

It is basically for this reason that Marconi Radar Systems Limited has developed the concept of Computerised Modular Monitoring (CMM). The CMM system provides a kind of nerve centre which can quickly gather and process information from a selected number of key points in almost any group of electronic or electro-mechanical equipments. It gives a rapid assessment of the extent of any failure and helps to optimize the performance of the equipment.

What CMM Does

CMM provides constant automatic checks at every level of operation, detects the development of faults as they happen and gives valuable warning time which enables immediate remedial steps to be taken.

By including suitable computer programs, CMM provides a monitoring system that gathers data, analyses the results and supplies the information necessary for speedy, unerring maintenance with a minimum staff involvement. CMM makes continual manual checks unnecessary, saving not only time but also labour.

Control facilities of CMM can operate over the same network as that used for data gathering and can be used to bring a standby unit into service or, during maintenance, institute marginal testing.

Specific Functions

The CMM system performs the following specific functions:

Performance Assurance — definite proof of whether the monitored equipment is operating at peak performance or at a degraded level.

System Checking — a complete check on which systems are fully operational and which have a degraded performance.

Fault Location — automatically presented, immediate information in plain language.

Drift Analysis — allowing organized preventive maintenance and revision of standard maintenance procedure.

Record Keeping — records are printed or punched automatically and, if required, sorted and abstracts prepared.

The computer facility can be enlarged by the addition of a disc backing store, and the interface between the operator and the computer can also be extended by the inclusion of an alpha-numeric cathode ray tube display. Other extensions include a line printer and terminal equipment to enable the digital data to be transferred over long distances.

The Demand for CMM

The Marconi CMM system has aroused considerable interest in many quarters, and a flow of orders and enquiries is already coming in from leading authorities.

- CMM has been ordered for remote control and monitoring of a CAA radar.
- MoD(PE) has ordered CMM for evaluation in defence equipment.
- Marconi have been invited by the CAA to produce a specification for the control and monitoring of a new ATC centre — a major project.
- Production CMM equipment has been ordered by the MoD for use by the Army.
- The MoD has ordered evaluation equipment for Naval applications.
- Long-term evaluation of CMM is being carried out by the Royal Radar Establishment, Malvern.

Data Selector Unit

More experts see for themselves

Mr J. W. H Daw of MoD(PE) and Air Commodore E. B Sismore who leads a team of Royal Air Force experts to define Britain's latest air defence radar and data handling requirements, were among recent experts to visit Marconi Radar Systems at Chelmsford.

Another group to make a tour of the Chelmsford works comprised Air Chief Marshall Sir Neil Wheeler, Defence Ministry Controller, Aircraft and Radar, and Mr J Gait, Mr J Davies and Squadron Leader C. E Evans, all of MoD(PE).

A more recent visitor was Mr J Alvey who is Director General, Air Weapons and Radar, of MoD(PE).

All of the visitors were able to see the Company's research, development and production facilities and particular interest was shown in a number of new systems and equipments including novel types of radar aerial arrays, new types of data display and an advanced design of data processing elements which will revolutionize future data handling systems.

The visiting experts were also able to see the latest developments in the S600 range of transportable radar equipment including the new digital signal processing and track extraction system which has been introduced by the Company. The S600 series of radar equipments is one of the most successful ever produced by the company, with sales in the competitive international market now well over £30 million.

Looking at some of the equipment used in the development of the new concept of distributed data processing. Left to right: Mr A Young, Air Cdre E. B Sismore (RAF), Mr J. W. H Daw (MoD), Mr K Rider.

Left to right: Mr I Davies (MoD), Air Chief Marshall Sir Neil Wheeler (MoD), Mr J. W Sutherland, Mr I. F Donaldson, Mr J Gait (MoD).

Left to right: Mr J. W Sutherland, Mr J Alvey (MoD), Mr R Worby.

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