

Radars & Systems International

Farnborough Special

MARCONI

No. 14

More success for S600 Radar

ANOTHER £17,000,000 WORTH OF EXPORT ORDERS

Three major export orders totalling £17 million were won recently by Marconi Radar Systems against strong international competition. These orders are for the three separate defence systems from the highly successful Marconi S600 range of equipment, both static and transportable, including a considerable number of S600 mobile radar convoys with radar data displays and very advanced data processing facilities. S600 sales, including these three systems, places the total volume at over £45 million, nearly all for export. Implementation of these orders is being carried out by the Company's establishments at Chelmsford, Leicester and Gateshead.

S600 series - the world's most versatile range of radar equipment - has been designed to meet a very wide variety of operational requirements. It offers a modular concept of a family of fully compatible radar units which can be built up to form specific systems - static or mobile/transportable - capable of fulfilling the task of any surveillance, air defence and air traffic control systems. The key to the unparalleled success of S600

is Marconi's capability in producing radar equipments which have high standard of performance, great flexibility and reliability coupled with cost-effectiveness, compactness and ease of operation.

Today, S600 series of modular radar are being used in eight countries and their performance is proven by the repeat orders that are received. As a result of this and its other activities in defence and civil radar, Marconi Radar dominates the world radar market outside North America. The Company's ability to fulfil a radar contracts of any magnitude is backed by its people and organization. Every project is meticulously planned to meet the customer's need and every product is qualitatively processed through various stages of production.

One of the principal factors making the Company paramount in the radar world is its systems engineering capability. In the pre-contract stage, the operational and environmental requirements are translated by the expertise of engineers into a selection of individual equipments and sub-systems. Plans are drawn up for the equip-

ment integration, and specifications detailed for interface equipments. The activities are scheduled by computer and the relevant information is presented sequentially to the factories and the client. Before leaving the factory, a system is tested to stringent specification in simulated operational conditions and again when installed, before commissioning.

The execution of a large project (ground or shipborne) involves co-ordination of various departments with many independent activities and possibly other companies within the GEC-Marconi Electronics group and the General Electric Company. The co-ordination of these activities is carried out by the Company's system management department which uses the most advanced techniques to ensure maximum efficiency.

Marconi Radar Systems' unparalleled manufacturing experience is shared by its production units located at Chelmsford, Leicester and Gateshead. Each is responsible for its own planning and material procurement, and each has comprehensive environmental, laboratory, manufacturing,



S600 Cabins being assembled at Marconi Radar Systems' Crompton Works

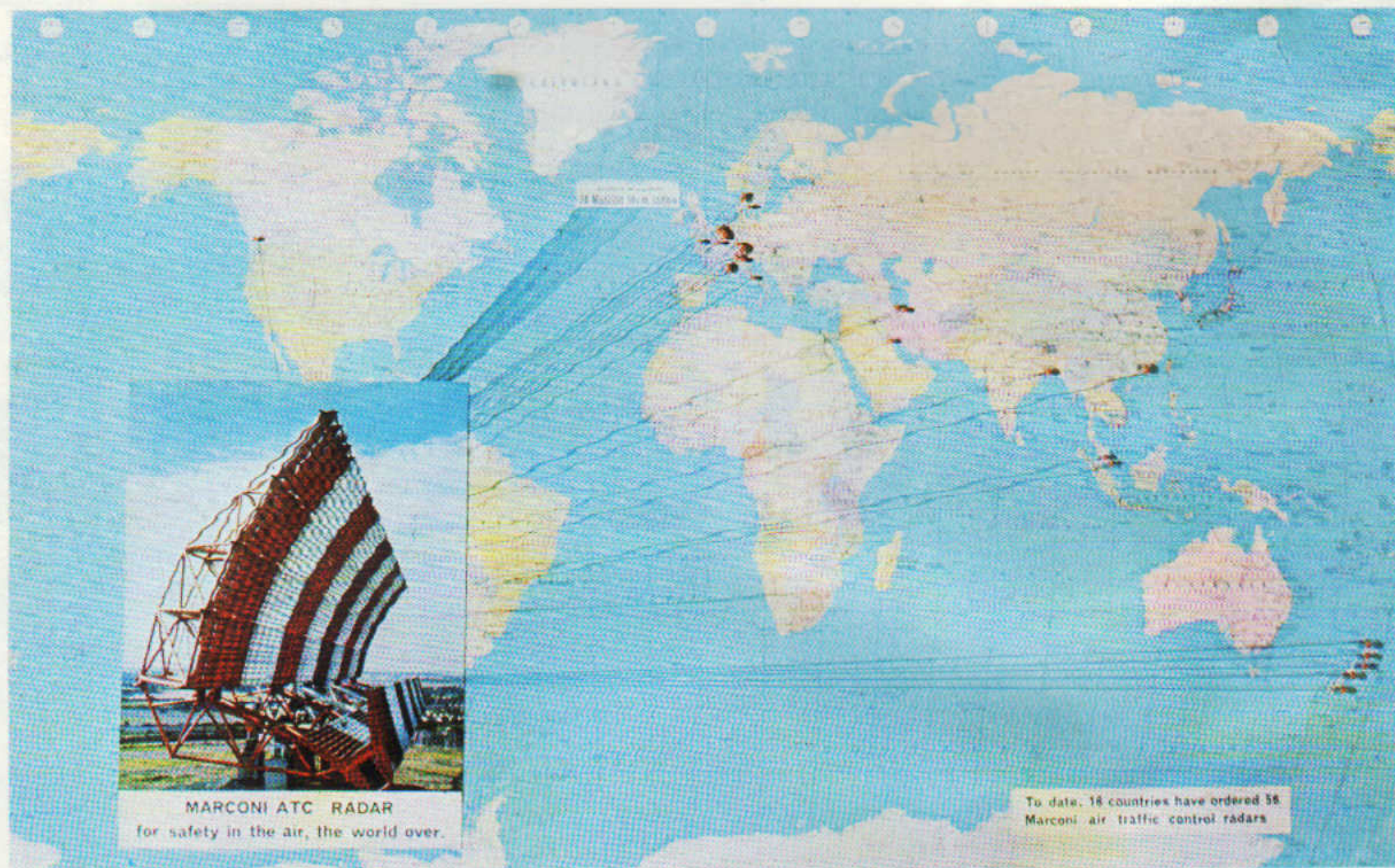
testing, quality assurance and despatch facilities. The Company's comprehensive quality assurance has a high standard which qualifies for inclusion on the British Government's Ministry of Defence contractor's list as being competent to undertake work to the exacting defence Standard OS-21.

Marconi Radar Systems has an excellent, wide-ranging after-sales

organization which provides documentation, spares and repair service. Additionally, the Post Design Service is available to meet specific needs of the client subsequent to handing over of equipments. The other activities of MRSL's organization include research, training and overseas representation to meet the client's need throughout the world.

Marconi Radars for French Government

FURTHER TRIUMPH FOR 50CM



A £900,000 contract for 50cm surveillance radar has been placed by the French Government with Marconi Radar Systems Limited, a GEC-Marconi Electronics Company.

The order has been placed on the recommendations of Centre d'Essais en Vol (CEV) to equip the flight test centres at BRETIGNY and ISTRES with S600 series, third generation, 50cm radars - an S650 at BRETIGNY and, to satisfy the long range requirement, at ISTRES, an S670.

These centres were fitted in the late 1950's with Marconi S232 series radars and it is a demonstration of the many advantages of the 50cm wavelength that Marconi equipments have again been selected.

The French have chosen 50cm radar for its principal feature of exceptionally good performance in clutter environments. This performance is achieved by the natural advantage of wavelength, the system stability and the unique signal processing system. A high level of performance is vital for radars which must provide precise, uninterrupted

efficient surveillance, monitoring and positioning services for aircraft carrying out extended and costly test flights.

The S650 is similar to the 126ft tower mounted radar at London (Heathrow) airport, the modern version of the twenty-eight 50cm radars in the United Kingdom.

Electronically identical to the S650, the S670 has a larger reflector which provides narrower beam width and a coverage range in excess of 200 miles.

The equipment fit comprises the S1050 and S1070 aerials, dual S2020 transmitter/receivers and S7100 digital signal processors. The latter provide full double cancellation MTI with phase and quadrature channels to overcome blind phases and p.r.f. stagger to overcome blind velocities. P.z.f. discrimination gives protection against interference. A particular feature is a new area clutter switch which ensures that MTI video is only switched in when absolutely necessary even for conditions of broken, slow moving clutter.

Marconi exhibits at Farnborough

These pages are devoted to some of the major items of radar systems and equipment, which Marconi Radar Systems will be exhibiting at Farnborough. In addition to equipments outlined below, the Company designs, develops and manufactures the widest range of radar

systems in the world for both military and civil applications. Its associated activities include the production of radar simulators, naval and fighting vehicle control systems, computerized modular monitoring equipments, and speed and visibility sensors.

S600 range of radars

The S600 static and transportable radars fulfil all roles required for ground to air surveillance. Those shown in the relevant parts of the exhibit are:

S669

S band long range static heightfinder as used in NATO.

S600 convoy

A fully deployed surveillance and heightfinder system for early warning air defence.

S613

C band nodding heightfinder element of the S600 mobile system.

S650

50cm approach TMA surveillance radar, used throughout the world.

Using common mechanical and electronic system elements the Marconi series of radars enables considerable reductions in training, maintenance and other support services.



Marconi's new ICR in action



Field view through TEPIGEN

Marconi Racon for safety at sea

Marconi Radar Systems at Leicester, has developed the Sea-Watch 300 range of radar beacons (Racon) which are proven to be fully capable of providing all-weather navigational aids for marine use. The well-established Sea-Watch 300 design has found wide international acceptance. 160 units, which have been sold to date, are being extensively used in important navigational systems throughout the world.

Racons are compact transponders, which operate on an interrogatory transmission from the ship's 3cm (X-band) radar. They are lightweight, solid-state devices, fully sealed in a robust case, designed for operation at unattended sites and economical in power consumption (less than 1 watt). Lightweight racons have many applications and they are particularly suited for mounting on small buoys. Other useful applications are for marking wrecks and



Sea-Watch 300 Racon

temporary obstructions or for use as markers when cable laying.

New Infantry Company Radar for the British Army

Marconi Radar Systems at Chelmsford, has recently developed an Infantry Company Radar (ICR) to a Ministry of Defence procurement specification. The contract was awarded due to the continuing expertise maintained by the Company in pulsed doppler and highly mobile radar systems. The equipment will be demonstrated live at Farnborough

Marconi's ICR is a one-man portable equipment designed to provide a company commander with accurate enemy movement reports in conditions of poor visibility, fog and darkness. It has been engineered for use under battlefield conditions. The range in excess of 2000 m complements the existing longer range devices. It can accurately determine the direction, range, speed and nature of target from its highly characteristic sound signature.

ICR can be used in either the static surveillance mode of operation or worn on a specially developed harness on the operator's chest in the patrol mode. It has a low weight 11.5 kg (25 lb), a good battery life (up to 33 hours) and a long Mean Time Between Failure, MTBF, (in excess of 1500 hours). These features enable ICR to be used with the confidence for a long period away from the maintenance base. The equipment is simple to operate and requires only a short familiarization for accurate use by the operator.

Rear-Port display unit

The Marconi type S3018 will be demonstrated live during Farnborough-International '74, to exhibit the Company's capability in wide range of display techniques. Its features are: optical colour film strip projection for static data, plan position indicator for labelled raw radar data, High-speed writing capability, single printed winding deflector coil. The other outstanding facility it offers is that film frames can be automatically selected from a computer.

S3018 is one of a range of cathode-ray tube display units, built up from common electronic modules and mechanical assemblies. It operates in an analogue mode with modular video and deflection facilities, and is capable of displaying raw radar, a television raster scan and alphanumeric data. The other units from this range of display include S3015, S3016, S3114, S3017, and S3024.

LOCUS 16 New data handling power introduced by Marconi

Marconi Radar Systems announces the introduction of Locus 16, an advanced distributed data processing concept which brings new freedom and power to the design of data handling systems for air traffic control, air defence and other real-time applications.

Locus 16 is designed to eliminate the massive information flows into and out of conventional central computing complexes by concentrating powerful processing and storage where they are needed — at the actual control points.

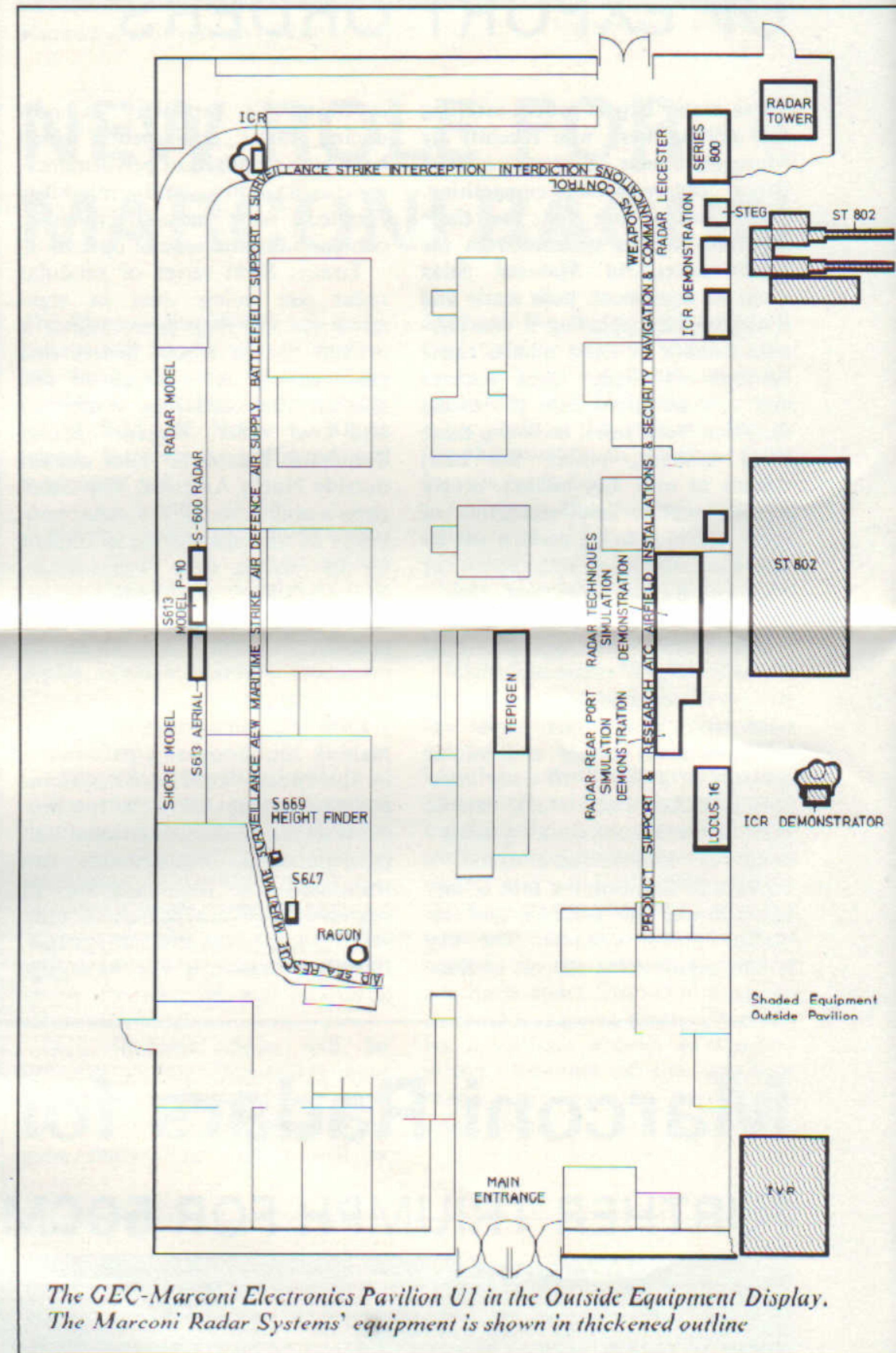
Locus 16 removes the workload from the centre of the network and distributes it in custom-designed packages located at, and designed

for, the various control, display and input points of large systems. The central computer, if it is required at all, can then be used for processing and storing the basic minimum of absolutely essential 'central' data, distilled from the many operating positions, performing protracted calculations at a slower rate.

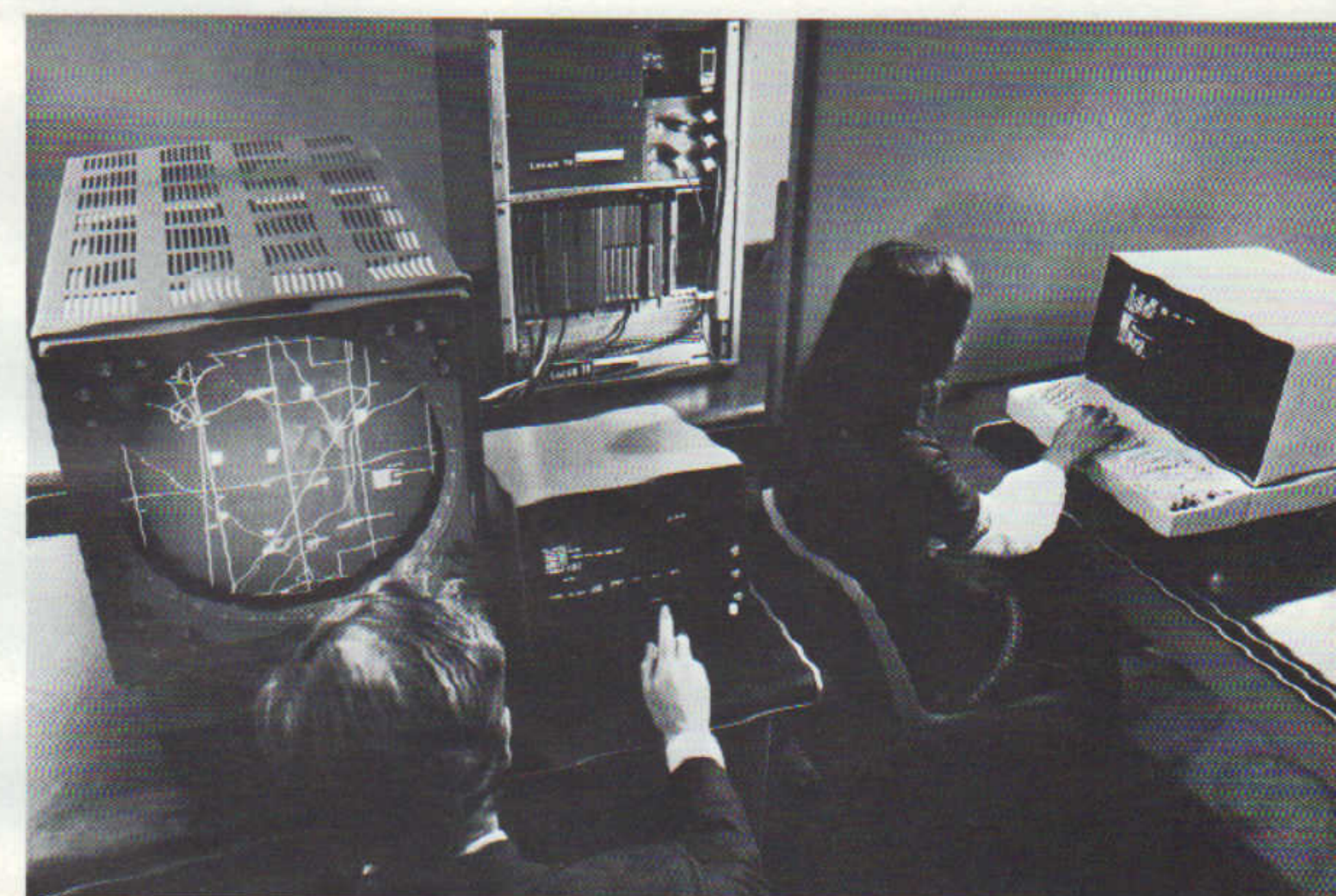
In this way, the total dependence on central computers is overcome and data handling systems of great power can be designed by connecting Locus 16 units into communication networks. Any number of Locus 16 equipments may be interconnected using simple serial links, and networks may cover a number of geographical locations.

The implementation of this configuration will make Prestwick (the new Scottish Air Traffic Control Centre) the world's most advanced ATC Centre which will use a network of thirty-three Locus 16.

Operational flexibility is a key feature of Locus 16. Each Locus 16 assembly is 'tailor-made' to the particular requirement of an application fitting the appropriate selection of standard modules — data processing, display handlers, communication handlers and storage. Redundant facilities are thus avoided at the outset, while ability is retained to add further modules for later system enhancement.



The GEC-Marconi Electronics Pavilion U1 in the Outside Equipment Display. The Marconi Radar Systems' equipment is shown in thickened outline



New LOCUS 16 Units

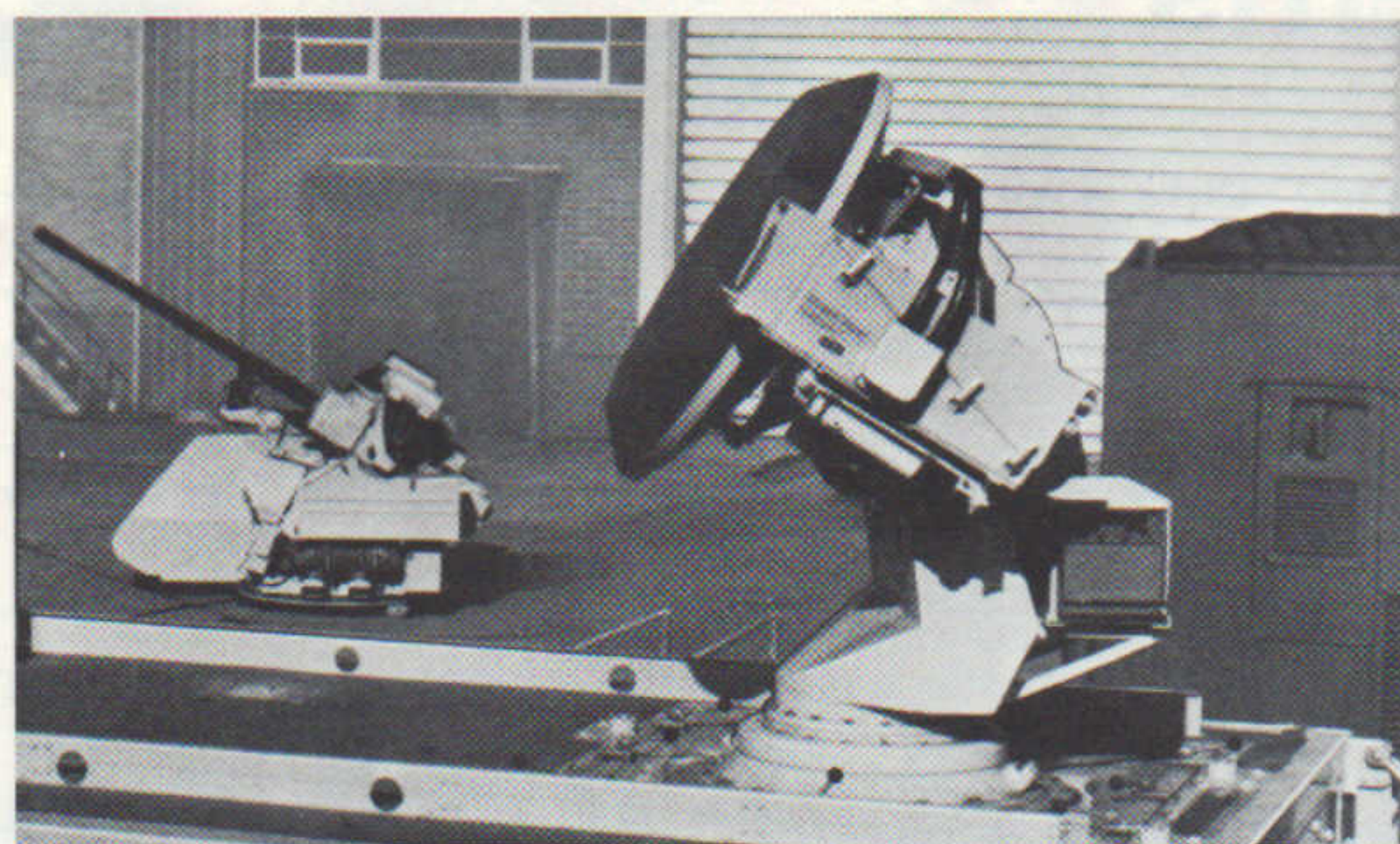
International '74

TEPIGEN — Simulated scenes visualized by Computer

Marconi Radar Systems at Leicester, in conjunction with the Ministry of Defence (Navy) have developed a computer-controlled Television Picture Generator (TEPIGEN) which provides a cost-effective method of pre-operational training. TEPIGEN has been initially developed to present information in black and white for t.v or projection display in the training of Seacat aimers. Current work on TEPIGEN includes an investigation for the Ministry of Defence into the imagery for flight simulators, and a generalized project for training 'vehicle' drivers. TEPIGEN is also being developed in colour and will be demonstrated live at Farnborough.

TEPIGEN is a simulator for training operators who have to observe and react to an external scene. The final picture is a t.v or projection display, but the video waveforms are generated by computer — not requiring cameras or models.

The computer deals first with the scenario—that is, the definition of what the picture must show. A suitable scene, composed of elements of landscape, buildings, sea and aerial views is stored in the computer. The moving vehicles of the scenario — ships, aircraft, missiles — are added to make up a 'contents list' which cites not only the elements of the picture but their orientation and location. The picture generator then accepts the contents list, which is presented to it as a set of digital words, and 'visualizes' it by producing video signals in t.v format for suitable display. The entire picture is re-composed at the 'animation' rate, which is chosen to suit the application, varying from about 10 to 50 frames per second. The picture generator obtains the dimensions and shapes of the objects from its backing store and visualizes them in the proper relationship, those in front obscuring the ones behind.



ST 802 with gun

ST802 with gun

On show from Leicester will be the lightweight Radar Type ST802—an X-band, monopulse, naval tracking radar with MTI for use in auto-tracking for gunfire direction and in missile launching and guidance. The system will be seen controlling the B-MARC Type A32 twin 30 mm anti-aircraft gun by means of a Sperry digital predictor which computes automatically and continuously the offset required.

The ST802 has been developed to meet the demand for a modern, lightweight, general purpose naval tracker for small ships down to fast patrol boats.

Any air or surface target which has been first detected either by the ship's surveillance radar or by the ST802's own search mode is automatically acquired and tracked with the sightline stabilized against ship's roll and pitch motions. The effectiveness of the radar in performing a low-angle air search is enhanced by the selection of MTI signal processing, particularly when

sea clutter conditions are present.

A television camera fitted to the aerial provides automatic gathering of command-to-line-of-sight missiles and provides the means of viewing along the radar boresight. Facilities are provided to control the sightline manually from the visual presentation when required.

The Marconi 800 Series includes surveillance radars and tracking radars for both naval and land based applications and is supplied complete with control equipments for missiles and control and prediction systems for guns. Action information offices and radar display equipment are provided for complete ship weapons system integration, threat assessment and weapon allocation purposes.

Careful system design has resulted in equipments which are lightweight and reliable, and the modular approach gives a flexible system which can be readily adapted to various weapon configurations.

STEG — A new training concept

STEG, a Simulated Timebase and Echo Generator, has been developed by Marconi Radar Systems at Leicester to meet the need for a simple, inexpensive, and completely portable radar simulation system. It is designed for use in the operator's normal working environment, to provide facilities for regular exercising which is essential to ensure instant responses to any combination of circumstances encountered in a 'real' situation. The development of STEG has been backed by many years of Marconi engineers' experience in the design of a wide range of simulators for training operators. Its features are: reduced training costs, can be interfaced with existing radar displays, a simple control from hand-held keyboard, portable and incorporates a mini-computer.

The STEG unit plugs into an existing radar display, to provide the signals necessary to build up a presentation of a simulated tactical situation. It enables the operator to use his own display as a simulator at any time that it is not in operational use. It is capable of carrying out computing and mem-



Training through STEG in progress

ory functions, and many of the features of a large simulator can be incorporated in it. As a result, simulators can be deployed at operational sites and a large number of training positions can be made available without moving manpower from their action stations.

The complete STEG assembly consists of a compact unit, housed in a metal case, to which a hand-held keyboard is connected by a flexible lead. In its simplest form, it can simulate 8 targets, but is extendable to 16. Additional, special targets, can be called up to simulate special effects. The equipment will be exhibited live at Farnborough.

Radar Simulation for control training

Marconi Radar simulators are based on completely digital techniques. Their modular design enables them to be assembled in a wide variety of system configurations in order to meet the training requirements of both air traffic and air defence control.

The equipment comprises a digital computer, typically a Marconi Myriad or 900 Series, to which is attached special purpose peripherals, including an Aircraft Control Unit (ACU) and radar signal and extender units.

Any operationally qualified instructor can, without programming knowledge, specify highly realistic exercises involving the entire operational team.

Marconi's radar processing techniques demonstrated

Marconi Radar Systems at Chelmsford, has designed an exhibit, exclusively for Farnborough which will demonstrate the Company's wide-ranging capability in radar processing techniques. The aim is to show the conditions under which an aircraft can be clearly detected using a wide range of detection techniques developed by the Company. The information will be presented in the form of two radar displays—one, cluttered, before the technique is applied and the other, clutter-free, after the technique has been used.

With regard to the technique demonstration, one's attention is first drawn by the scanning move-

ment of a S654 radar head and light emitting diodes which link the individual section of the diorama with both the A display and PPI simulation.

The central section depicts a Hawker Harrier taking off from a quay in the middle of a crowded dockyard. This presents an extreme case of a target in a difficult environment. The other scenes relate to different environments in which detection can still be very difficult without the use of an appropriate technique. In this situation, a clear detection is demonstrated by the appropriate use of MTI with low p.r.f and pulse doppler, pulse compression, r.f

John Sutherland says:

This edition of RSI coincides with the 1974 SBAC Exhibition at Farnborough. The show this year is 'Intercontinental' for the first time and will attract an even wider audience. Marconi Radar Systems Limited has an outstanding and forward looking selection from its range of products on show again this year which we are convinced will arouse a great deal of interest.

For the first time we shall be showing systems based on LOCUS 16, a new and advanced concept in distributed data processing. This equipment has already sold well in the first month or two of its availability, and promises to be a world beater!

We shall be exhibiting a one-man portable military radar which is unique in its combination of capability and environmental performance. At the other end of the scale, the 800 series of weapons radars will be shown operating in a new configuration. Fascinating possibilities are opened up in the field of operational training and simulation by several exhibits in this field. These are all computer controlled systems. On the display and radar processing side we will be putting forward examples of our new development work.

The constant problem at Farnborough is to select the items for exhibition out of our very wide range of established and new products, and from our current development programmes which best demonstrate our true capability as a systems company.

We welcome our many visitors, old friends and new. We, in Marconi Radar look forward to Farnborough as the great opportunity to meet you all and discuss future prospects and possibilities, and the chance to put our exciting new ideas and products 'in the shop window'.

Marconi's Runway Visual Range Systems

The Marconi RVR system which is on display outside our pavillion employs computerized Instrumented Visual Range equipment (IVR-2) which is designed to measure and record automatically the visibility at an airport runway under varying atmospheric conditions. The continual and accurate presentation of this information is not only a vital aid to safety but helps to maintain schedules and avoid diversions in the presence of unfavourable weather, whether caused by fog, sand or dust.

The Marconi RVR system operates in all three categories of flying conditions and fully meets the

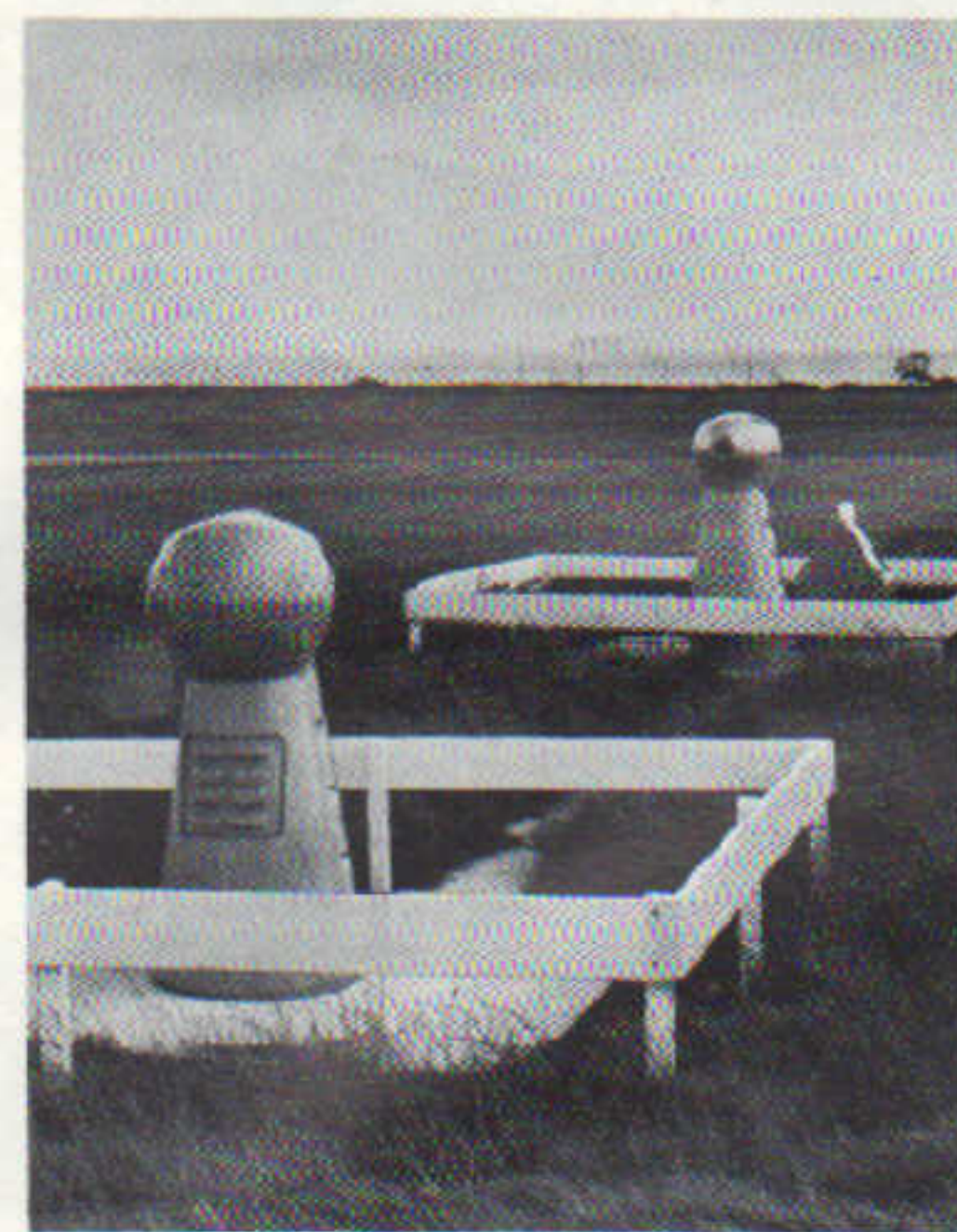
International Civil Aviation Organization's recommendation calling for rapid, simultaneous reporting from a number of observation points. The system employs a variable number of unattended field sites which are installed alongside the runway and which gather photometric data used to assess visual range. These optical systems are housed in specially-developed casings and remain operable in rain, hail or snow, fully protected from sand, dust, insects or birds.

Information from the field sites is transmitted to a central processing unit, where a computer scales the

optical data against calibrated references, assesses the visual range and displays it in digital form.

Considerable technical advances have been made in the method of processing visibility data to provide a highly accurate and stable display, and typically errors of less than 0.25% are regularly achieved.

Marconi Radar Systems, Leicester, have recently received an order for two systems for Cairo International Airport. RVR systems are in operation at several UK airports and it is currently being evaluated by the Federal Aviation Administration at their test centre in Atlantic City, New Jersey, USA.



Scotland to have one of World's most advanced ATC systems

CIVIL AVIATION AUTHORITY AWARDS £1½ MILLION CONTRACT TO MARCONI

Major contract for new processor
Marconi Radar Systems Limited has been awarded a contract worth nearly £1½ million for the new Scottish Air Traffic Control Centre at Prestwick. It is to be supplied with the world's most advanced ATC radar data processing system which will monitor all aircraft in 2 million cubic miles of airspace above Scotland, Northern England and the North Sea. The system will be based on the new Locus 16 data processor.

It will be one of the first systems in the world to use synthetic 'clutter-free' radar information exclusively. This will provide an automated radar data presentation which will make more simple and more effective the control of aircraft in the Scottish terminal area, including in this instance, those areas around the rapidly expanding airports at Glasgow and Edinburgh, and in the upper, middle and lower airspace, in the Scottish Flight Information Region.

Radar sites linked by simple telephone connections

The Prestwick air traffic control

centre will be linked via standard telephone cables to radar sites located in Scotland, Northern Ireland and Northern England. At the sites, most of which have been equipped by Marconi, primary and secondary radar will be used to establish aircraft position, height and identity. This 'raw' radar information will be analysed by plot extractor found in digital form. This will then be fed back to Prestwick. At Prestwick four Locus 16 data processors will evaluate the incoming material and route it through a narrow band data highway to twenty-nine Locus 16 display suites.

A typical display position

Each display suite will hold its own operational and diagnostic programs and will drive a 16in. display. At Prestwick, the displays will have 28 levels of brilliance to suit the ambient light conditions of the control room, and a high enough 'refresh' rate to eliminate flicker. By means of a radar head

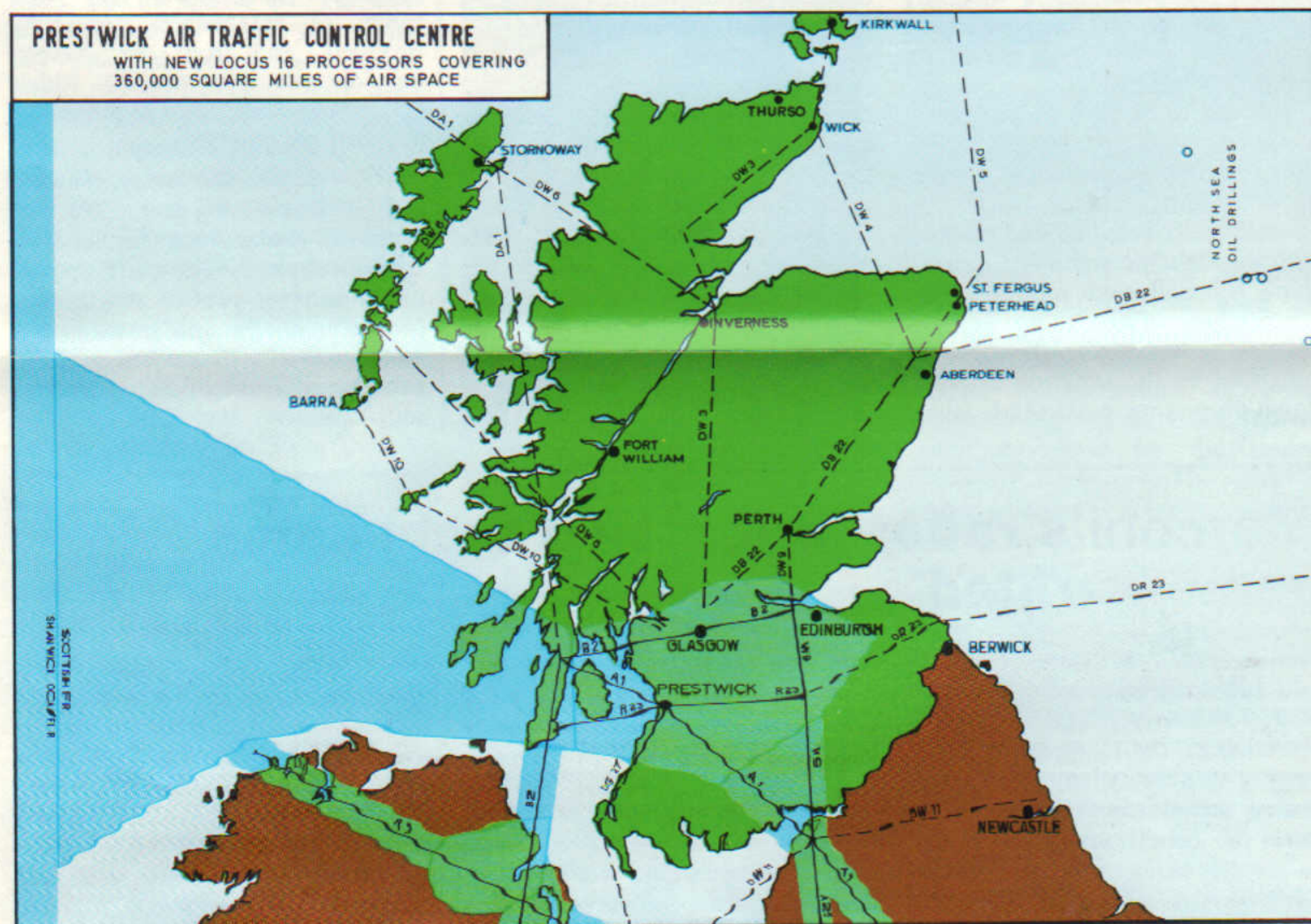
selection switch panel a controller will have access to any of the information relevant to the sector he is controlling as and when it is required. Furthermore, any controller will have access to information from other displays to facilitate en-route control.

Reliability

Earlier ATC systems have been built around large centralized computing complexes in which a hardware failure may cause a complete system failure.

By contrast, the system at Prestwick is based on the concept of 'Distributed Data Processing'. All Locus 16 processors will operate quite independently of each other, and failure in one will not affect the others. Additionally, any of the two types of processor can do the work of any of the others of its type. The reliability of the system will thus be unparalleled.

The system at Prestwick represents a great step forward in use of radar in the exercise of air traffic control, and so the safety of air travel.



The New Scottish ATC Centre at Prestwick with the new LOCUS 16 and the controlled zone



Kurewa and Sovereign off Isle of Wight.

Courtesy: Beken of Cowes Ltd.

NEW ROLE FOR MARCONI RACON

The Marconi Sea-Watch 300 radar beacon will be playing an unusual but important role in the 1974 America's Cup Elimination Races to be held off Newport, Rhode Island, between August 22nd and September 3rd.

The Royal Thames Yacht Club, which has the responsibility for arranging and conducting the Elimination Races between the Australian and French challenging yachts, will be employing two Marconi racons to assist the accurate and speedy laying (or, if necessary, re-laying) of two of the buoys marking the course.

The races take place round a right-angled triangular course of three buoys, starting at a fixed navigation buoy. The other two buoys are laid with geometrical accuracy in relation to the wind and will be laid by the club shortly before the start of, and recovered after, each race.

One Marconi racon will be installed in the Committee boat attending on the windward buoy and the other in the board at the gybe buoy. The racons will be

switched on during the laying or repositioning of the mark buoys, so enabling the mark laying boats to be readily distinguished from other craft in the area and verifying the position in which a mark buoy is being laid.

Although the longest distance involved is about 4½ miles, there are frequent fogs and mists off Rhode Island and it would only be in good visibility that the committee boat could see the mark buoys.

The Marconi Sea-Watch 300 racon, designed and developed at Leicester, is a robust all-weather navigation aid in service with Lighthouse Authorities world-wide. The racon, which is compact and weighs only 16 kg, responds automatically to ships' ordinary X-band radars and returns a clear morse-coded signal indicating its exact position and identity. Once installed, it requires little or no attention apart from changing the external battery at yearly intervals. Its range can exceed 40 km (22 miles). Variants of the standard racon are available for special applications.

New Zealand ATC modernization

MARCONI TO UPDATE WELLINGTON RADAR STATION

New Zealand's Ministry of Transport, Civil Aviation Division, has awarded a contract worth £300,000 to Marconi Radar Systems to modernize the 50cm radar for the air traffic control centre at Wellington. This is the first stage of a series of modernization programmes for the Wellington radar station.

In the early 1960's, Marconi originally supplied and installed radar for Wellington and all other air traffic control systems in New Zealand. It has now been in use for about 16 hours daily during its 13 years of operation. Some of the major units, of the current systems, will be replaced, with duplication where necessary, to overcome the increasing cost and difficulty of maintenance. This will effectively improve reliability and overcome operational limitations.

In the first stage, Marconi Radar Systems is to supply and install a new aerial and receiving equipment, digital processors and a display system with improved performance and facilities to meet the demands of increasing air traffic densities. The improved aerial performance will be achieved by the installation of a new high-cover reflector with a better coverage and a new feed system with the superior side lobe and cross polarization characteristics. A better receiver performance will be achieved by using a new low-noise receiver type S2050. To overcome the current problems of 40-900 knots and to improve greatly the detection of small aircraft in clutter, two new digital signal processors type S7100 have been chosen. These signal

processors will provide moving target indication using double cancellation, pulse recurrence frequency stagger and discrimination and video integration.

The air traffic controllers at Wellington will have Marconi's latest display type S3017 together with three S3202 video map generators. Six S3202 video map displays will be supplied and will have features of interconsole marking, circular polarization filters and digital turning. A seventh display will be installed at the radar head for monitoring purposes.

The modernization programme will be carried out without interruption of the service except for the short period while the new reflector is fitted.



New Zealand: ATC centre at Wellington

Radar Systems International

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MARCONI RADAR SYSTEMS LIMITED

A GEC-Marconi Electronics Company

Crompton Works, Chelmsford, England CM1 3BN

Telephone: Chelmsford 67111. Telex: 99108 and 99449