

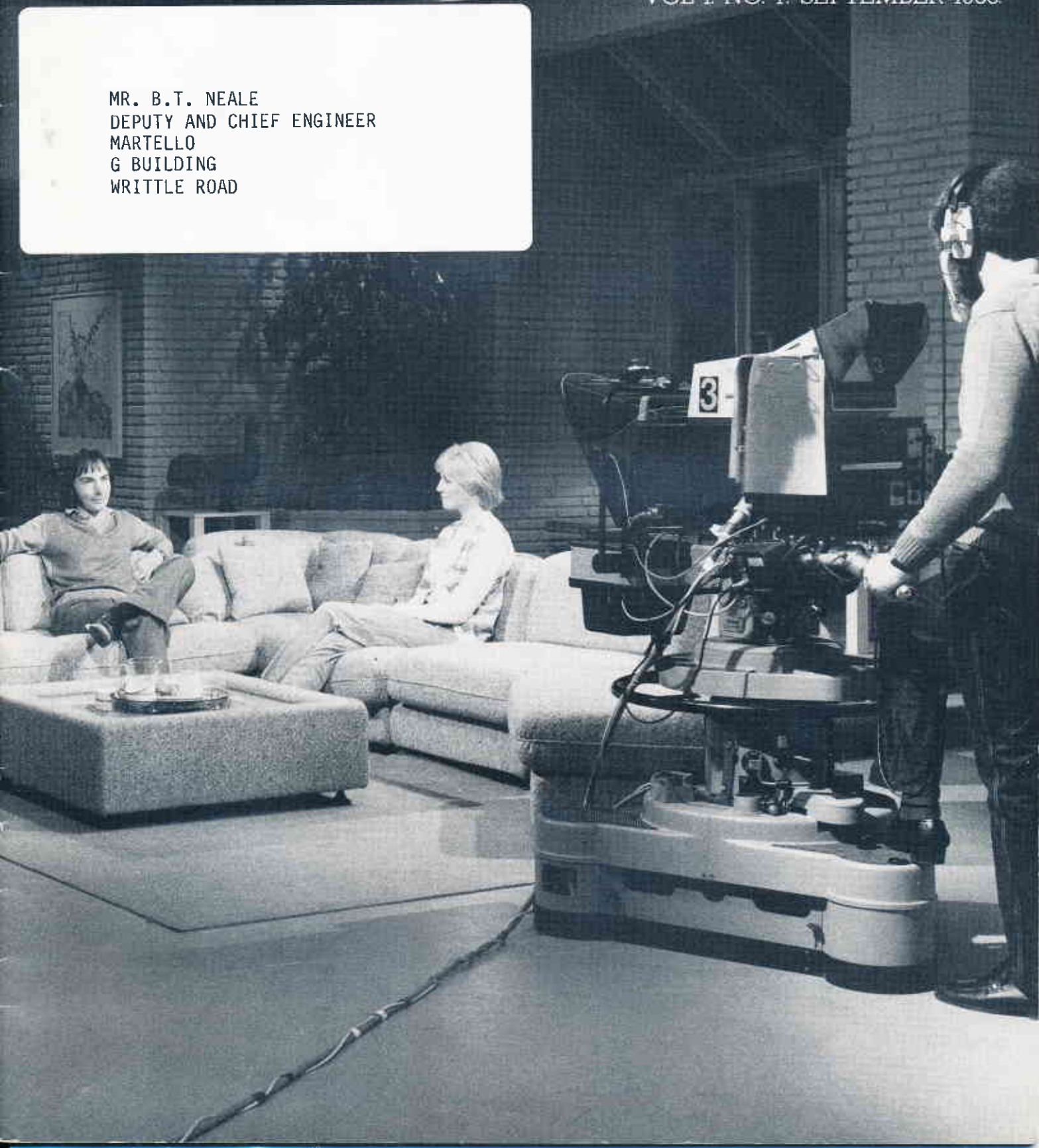
NEWS AND TOPICS RELATING TO THE MARCONI MANAGEMENT



THE MARCONI DIGEST

VOL 1 NO. 1: SEPTEMBER 1983

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DEPUTY AND CHIEF ENGINEER
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WRITTLE ROAD





THE MARCONI DIGEST

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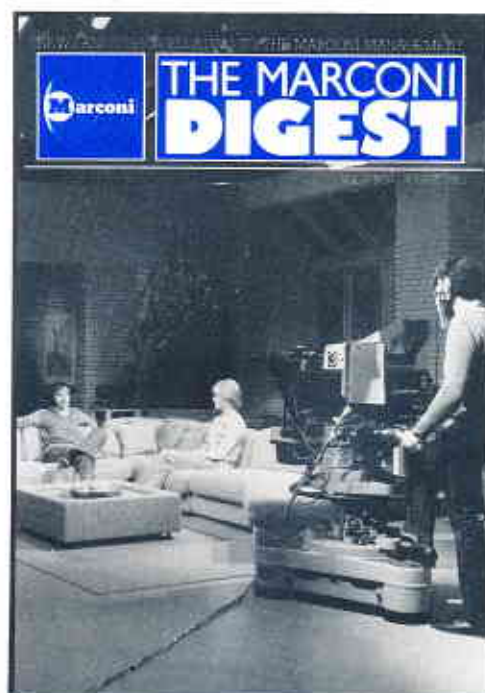
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Published by the Public Affairs Department,
The Marconi Company, Stanmore.

Designed and Produced in the UK by The Facet Group.

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COVER

Showing the TV-AM studios for which MCSL were responsible for the system design and installation. The studio equipment includes 11 VTRs, 7 Mk IX cameras and a Telecine *all* supplied by MCSL.

Forum

CREATING THE *DIGEST*. ALARM: A TRIUMPH IN TECHNOLOGY AND DEBATE.

Long before the word 'communicate' became fashionable, Marconi was in the communications business.

Ever since the early days at Writtle, the company has been in the forefront of developments and innovations in the science of conveying information by radio and electronics across vast distances, virtually instantaneously.

But communications mean more than just the transmission and reception of signals – be they pulses, blips, figures, words, pictures even. Today the means of communicating have become so sophisticated and complex that we are in danger of losing sight of the human element.

Our Raison d'Etre

Machines cannot put feeling into the data they convey, cannot emphasise, cannot enthuse, cannot seize the imagination like the written word.

That is the *raison d'être* of the *DIGEST*.

It will be a quarterly publication, issued from the Public Affairs Department at Stanmore, and will contain Group information, news, views and opinions of Marconi management, for Marconi management.

In the Marconi Group, although each of the seven companies enjoys a high degree of autonomy, the fullest communication between them is of the utmost importance to enable each to contribute to the group success from which we all benefit.

With a Group workforce of over 26,000 at more than 30 sites throughout the country (and an export list in excess of 40 countries); covering a very diverse range of markets, technologies and disciplines, there is a need for an inter-company publication to circulate news about a selection of key topics of interest to managers.

The *DIGEST* will, therefore, augment the internal house journals and newspapers issued by the constituent companies. In no way is it intended to take their place.

These contemporary company publications will form a valuable source of material, because news of new products and techniques in one company will not only be of interest in themselves but will be seen in perspective in the Group context.

Informative, Authoritative...

News from the companies in the Group will form a large part of each issue – articles about products, new contracts, technological developments; stories about people, new facilities, successes (and, perhaps, the occasional cautionary tale!); plus a view of topics that impact on our business.

Added to these, and complementing them, will be Marconi Company news. The *DIGEST* will carry authoritative information relative to the Group as a whole. It will tell the global story and set the background for the companies' own news.

Above all, it is a forum for the lively exchange of news and views between company managers.

Its success will depend on the co-operation of all its readers in providing the material for it.

As editor, I shall be looking forward to hearing your opinions about this first issue and your ideas for the future.

Let's make the *DIGEST* the management link – with the personal touch!



Alarm: The Marconi Factor

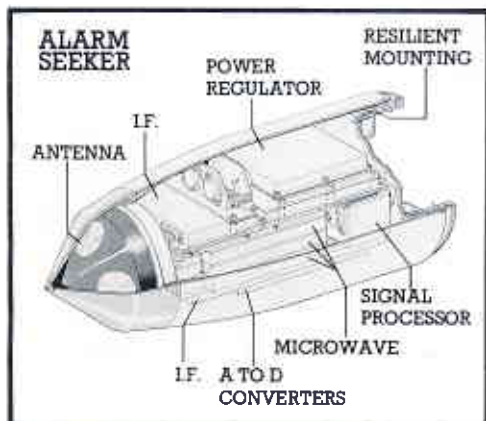
One of the most hotly-contested defence procurement battles in years – that for the Royal Air Force's new defence suppression weapon – was concluded at the time of going to press with the government decision to buy British. The

£250M decision, made in favour of British Aerospace/Marconi and ALARM (Air-Launched Anti-Radiation Missile), brought to a close many months of debate during which almost every aspect relating to the purchase had been publicly scrutinised, challenged and counter-challenged.

The decision also brought to fruition six years of private-venture and government-funded work undertaken by Marconi Space & Defence Systems. As the seeker design authority and a principal sub-contractor on the ALARM project, MSDS has been working closely with British Aerospace's Dynamics Group to produce a brand-new passive seeker package for ALARM. Novel signal processing and LSI techniques, new plastics material and considerable flexibility in programming are just a few of the technical triumphs incorporated in the ALARM seeker design by the 150-strong MSDS project team at Stanmore. The undisputed excellence of this all-British guidance system (one of the few areas that went largely unchallenged throughout

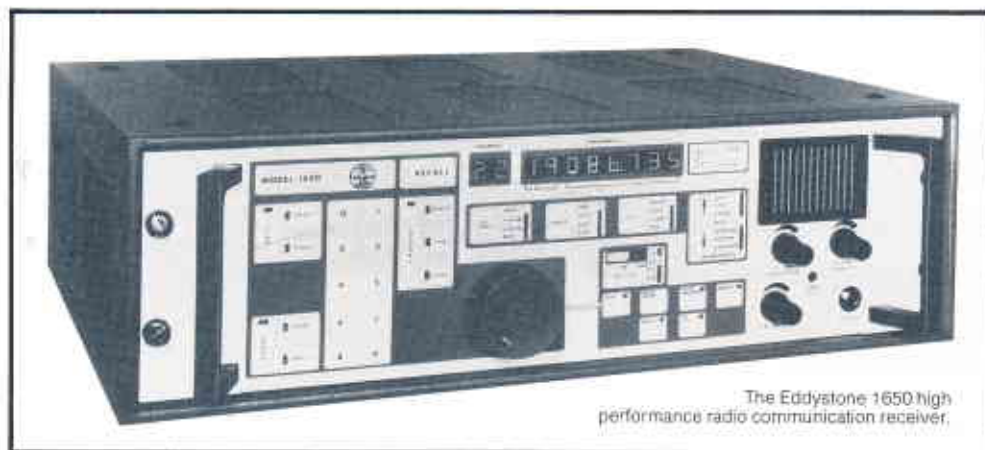
the debate) augurs well for the future export sales that are essential to ALARM's total success. There is little secrecy about the fact that several of our NATO partners are currently in market for such a missile and that British Aerospace aims to capture a sizeable slice of the worldwide market, estimated at between 15,000 and 20,000 ALARM-type weapons.

The award of the contract has safeguarded up to 500 jobs within MSDS, primarily at Stanmore and Portsmouth, but also at the company's site at Hillend in Scotland. MSDS will also be directly sub-contracting to well over 100 British companies for materials and components during the production phase. The contract will maintain Britain's lead in missile guidance technology and retain skills that will be needed for future projects such as SRARM (Short-Range Anti-Radiation Missile). The latter has already been identified within the UK and NATO as the next generation of anti-radiation weapons.



Products

INSIGHT INTO THE LATEST EQUIPMENT



The 1650 Receiver

Eddystone Radio's 1650 Receiver is the first of a new range. It provides the professional user with an equipment that is sophisticated, simple to operate and low-cost.

Its many operational features, made possible by a built-in microcomputer, can be called up by a single keying action. It covers the frequency range 10kHz to 30MHz in synthesized, 5kHz steps, and is suitable for a.m., s.s.b. and c.w. operation, though other modes can also be accommodated. On each receiver, seven different bandwidths can be made available, of which one can be for marine use.

The store can handle up to 100 frequencies and their associated control settings in numbered channels. These settings can be made without interrupting reception. Stored channels can be scanned or two adjacent channels can be swept at adjustable rates. Remote control is possible, and the store can be programmed by sources such as bar-code readers or mimic receiver control units.

A True RMS Voltmeter

The RMS Voltmeter 2610 from MI is a microprocessor-based, digital equipment. Its unique balanced thermal sensor gives accurate measurements of almost any signal waveforms, including sine, squarewaves and asymmetric waves as

well as complex signals such as pulse waveform and noise. It is not subject to the large errors that can occur with other voltmeters using average sensing rms techniques to measure complex or distorted signals.

The 2610 is for use over the bandwidth 5Hz to 25MHz and has seven ranges between 2mV and 700V. It provides for V, dBV and dBm measurements, which are shown on a four-digit, liquid crystal display at a rate that is selected by the user. An analogue dB meter is incorporated for peaking and nulling.

Features include the keyboard entry of dBm reference impedance, averaging and damping for i.f. measurement stability, full autorange or manual selection, an off-set function for V, dBV and dBm, a d.c. output for recorder or control applications, optional GPIB operation and an optional, rechargeable battery.

Automet

Marconi Marine's *Automet* has been specifically designed for use with NAVEX, the radio telex service, which issues navigation warnings to those sailing in coastal waters, and which is a requirement for all ships proceeding more than 25 nautical miles from a coast radio station. *Automet* provides the shipowner with the means of receiving those warnings. It is a small unit, comprising a receiver, fixed-tuned to the NAVEX frequency of 518kHz, a microprocessor-controlled message decoder and a 40-character-per-line printer. The receiver can operate from a wire or whip

antenna, from any 50 ohm antenna distribution unit or from a purpose-designed, active receiving antenna. *Automet* checks that the message is correct before printing it out, rejects messages that have already been received within the past 72 hours and allows the user to exclude unwanted stations or types of message. Reliability is assured through a built-in self-test facility.

ATE System 80R

MI's latest addition to the System 80 series of in-circuit ATEs is System 80R. It is the world's first commercial ATE designed specifically for integration into automated, high-volume manufacturing facilities, particularly those using robot equipment for handling p.c.bs.

It can be coupled directly into an automated board-handling line, and is triggered by the production line's controlling computer. The p.c.bs are automatically loaded and unloaded to and from the ATE's test fixture.

Within the factory, System 80Rs can be networked together and added to the sophisticated test support systems provided with the System 80 series.

This latest in-circuit ATE is machine-orientated and has programming facilities especially designed to ensure the cost-effective exploitation of the automated factory.

New 100 Watt Linear Amplifier

MSDS has introduced a new high-specification 100 Watts PEP linear amplifier. The equipment has been developed by the company's Military Engineering Division based at Kidsgrove in Staffordshire and is designed to satisfy a variety of maritime and land-based communications requirements including those of mobile radio networks.

The amplifier offers a flat frequency response between 30 and 88MHz (extendable to between 15 and 100MHz) and is available as a uniquely compact, fully self-contained rack-mounted unit with built-in power supply, cooling fan, solid-state transmit/receive switching, and an antenna low pass filter which

functions on both transmit and receive. The amplifier is also available as a basic RF module.

The design is based on three series-connected push-pull amplifiers with interstage coupling via wide band ferrite transmission line transformers. The active devices employed are power FETs with an upper operating frequency of 175MHz.

Additional features include an automatic level control, good pulse performance, rapid bias-up (less than 50 micro-seconds), a thermal overload cut-out, and continuous operation at full power in any mode (i.e., F3, A3, A3J and A1).

Maricom – A Fully Secure, Fibre-Optic Intercom System

Marconi Space & Defence Systems Limited has introduced a brand-new, fully secure intercommunication system based on the use of fibre-optic cables that offers immunity to current and projected Radio Direction Finding techniques. As such, Marconi MARICOM is ideally suited to military applications at field headquarters level and at advance battlefield positions.

The system has been developed at the company's Military Engineering Division at Kidsgrove in Staffordshire and follows-on from work on the MINSTREL total radio system, the MARNET manpack radio, and other communications projects.

MARICOM is designed to simultaneously carry a maximum of twelve 2-way digitised speech and/or HDB3-coded data transmissions within a network consisting of up to 120 microprocessor-controlled intercom stations. Individual intercoms can serve either as remote portables or as base station units and are linked into a ring structure via a fibre-optic cable.

Individual MARICOM units are compact (300×150×300mm approx), light (3Kg), and designed to withstand temperatures within a range of -40°C to +70°C. As well as being suited to hazardous and inhospitable environments in which normal electrical cable would either constitute a security risk or fail to operate, MARICOM is designed to EMP and defence standards and can incorporate a nuclear hardness capability.



An illustration of a MARCONI ARPA integrated in a Radiolocator 10cm and 3cm interswitched system.

Marconi Voras – A New Computer-Based Map Display System

Modern Command, Control, Communications and Intelligence (C³I) systems, whether for civil or military applications, all call for a fast and flexible method of updating, storing and retrieving large amounts of data on a real-time basis with the aim of matching needs to resources.

In most cases, this requires a method of generating a map display which can be overlaid with information concerning the current situation and the available resources in terms of manpower, vehicles, stores or other parameters. Computer-generated displays have been available for some time to meet this requirement but have tended to be expensive and somewhat inflexible.

MSDS has approached the requirement by combining two familiar areas of technology – microcomputers and the video disc – and then added special software to produce a new Video Overlay Resource Availability Systems (VORAS). Together, they provide a very detailed map background in full colour with computer-generated overlay graphics at a considerable cost saving over conventional systems.

VORAS has been developed by the Commercial Products Division of MSDS, located at Kidsgrove in Staffordshire, and is based on the use of a small microcomputer and an adapted video disc player. Although designed primarily as an intelligent work station for interfacing with external C³ computers, VORAS can also be operated as a stand-alone system.

New ARPA System Launched

At a series of press and customer meetings held on 12 July, the new Marconi ARPA system was officially launched by Marconi International Marine Company.

The Marconi ARPA is an Automatic Radar Plotting Aid which can be fitted either as an integrated display or as a stand-off display to many existing radar systems.

Its immediate attraction is the clean, ergonomic design. This allows operators to acquaint themselves with the system without being overwhelmed by its complexity or the rate at which information is presented.

Its many features include true or relative motion radar display; automatic acquisition of up to 20 targets; manual acquisition of up to 25 targets; target tracking up to 24 nautical miles; visual and audible warning for infringement of CPA/TCPA limits; guard band intrusion; target loss and sensor input failure.



The new MARICOM intercommunication system.

Contracts

FOCUS ON NATIONAL AND INTERNATIONAL SUCCESSES.

Propulsion Systems

ESA has awarded MSDS a contract to study advanced orbital propulsion systems for future communications spacecraft. The 12-month study, is considered to be of major importance to spacecraft technological advancement. It will provide a clear comparative assessment of the various propulsion alternatives and will identify the propulsion developments needed in Europe over the next decade.

The Ministry of Defence has also placed a propulsion system contract with the Company. This calls for research into bipropellant propulsion systems for the next generation of satellites. Assembly and test firing are included in the contract, and the firing tests, planned to start in the summer, will be the first bipropellant firings to be carried out by UK industry.

Volmet

MSDS is to supply and instal a VOLMET automatic weather broadcasting equipment for the RAF.

VOLMET enables airfield weather information to be broadcast automatically in clear standard English, indistinguishable from natural speech, on a round-the-clock basis, obviating the need for teleprinters, operators or mechanically-sequenced tape loops. The words and phrases are selected by a computer from a digital store in accordance with the latest weather information received by the computer in METAR telegraph code.

The equipment will be similar to that which MSDS supplied to Heathrow, where it has been in use since May, 1981.

NTC-1 Down-Under

The Royal New Zealand Navy has ordered MCS's h.f. communications system, NTC-1, for HMNZS *Wellington*.

The up-dating of the *Wellington*'s existing system will be carried out by the RNZN in New Zealand.

A fully integrated NTC-1 system provides the command and combat system controllers aboard ship with a full range of l.f. to u.h.f. external circuits and comprehensive internal communications.

Antennas and Amplifiers for BBC

As part of its on-going programme to re-equip its v.h.f./f.m. service, the BBC has recently brought MCS antennas into use at Llangollen and Brighton, and has placed an order worth nearly £300,000 with Eddystone Radio for v.h.f./f.m. amplifiers to be used as a gap-filler and for the local radio service.

Manning the Pumphouses

Untreated sewage, if not contained, can be a serious risk to public health. Furthermore, failure at any of the pumping stations that send it along the complex sewerage system to the treatment sites could create untold problems.

Thirty-five unattended sewage pumping stations in the South Northamptonshire District Council's area are to be monitored by an MCS radio network that will not only monitor their performance but will also automatically inform the manned control centre so that an engineer can be sent to deal with any emergency.

Police Base Stations

The Home Office has placed another order with MCS for the 770H base station. Sixty-five sets are being supplied.

The 770H is used in police command and control networks throughout England and Wales. It is an a.m. equipment, intended for single- or two-channel working, either simplex or duplex, and can be controlled locally or remotely.

Broadcast Transmitter Order from Italy

One of the latest customers for the B6038 1kW m.f. sound broadcasting transmitter is Radio Televisione Italiana, which ordered twenty-four from MCS. They will be supplied as twelve parallel pairs to meet RTI's requirement for 2kW output power, and will be used as replacements for gap-filling stations in the Italian national network.

MFT for MoD

MCS is to provide the RN with three more 10kW fast tuning (MFT) transmitters and the RAF with a further nine.

MFT is the backbone of the RAF's long-haul communications network and provides the world-wide ship-shore link for the RN. It won the Queen's Award for Technological Innovation in 1981 and has notched up orders worth more than £50 million.

Major Naval Project

Contracts worth more than £2 million have been placed with MCS for a major remote control system for the RN's communications in home waters.



Based on the U7000 series microprocessor, the system will enable the Royal Navy to carry out from command and supervisory centres the full control and monitoring of all equipments in remote sites throughout the UK. These equipments include transmitters, receivers, antenna switches, power banks and station services. It will integrate with the Marconi MFT2 fast-tuning system, which is widely used by the Royal Navy.

Spectrum Analyser Contract

MI is supplying the People's Republic of China with TF 2370 Spectrum Analysers. The contract, worth over £200,000, was placed by the China National Technical Import Corporation in Beijing as part of a World Bank funded programme to provide equipment for universities in China. Fifteen universities and research institutes throughout the People's Republic will receive the MI equipment.

Signal Generator Orders Top £3½ million

Rounding off a successful first year for MI's 2018 and 2019 Signal Generators is a major order from the Royal Australian Air Force for 58 equipments for use in the maintenance of a wide range of sophisticated radar and radio-communication equipments.

This order brought the total combined first-year's sales of the 2018 and 2019 to £3½ million.

Jack-up Rigs to Keep in Touch

Two jack-up rigs, *Morecambe Flame* and *Bay Driller*, under construction and scheduled for use in the Morecambe gas field are being equipped by Marconi Marine with a full range of communications equipment.

The main items of equipment for each rig include a high power transmitter and receiver; v.h.f. radio; error correcting equipment; a comprehensive u.h.f. communications system; a v.h.f./a.m. system for communication with helicopters; a non-directional synthesized aeronautical beacon; v.h.f./u.h.f. hand portable transceivers; the rig's entire public address system; entertainment units for off-duty personnel and an electronic telephone exchange.

Marconi Marine's latest contract for the Morecambe field calls for a field-wide supervisory and engineering order wire system (EOW) to provide effective monitoring of system status and the co-ordination of fault-finding and maintenance activities, together with an emergency shut-down system.

BBC Shortwave Orders

MCS equipment will play its part in the major updating programmes for the BBC's External Services transmitting stations.



At Rampisham in Dorset, the updating includes the installation of a number of 500kW equipments, including four type B6127 PULSAM transmitters. In the patented PULSAM transmitter, the advantages of pulse width modulation and those of the Class B modulation system combine to create a low loss modulator. PULSAM allows the modulator to process only the audio power needed to modulate the transmitter and thus achieves a considerable improvement in the overall efficiency and a significant reduction in operating costs.

The Company will also be providing two new BBC-designed broadband curtain array antennas and a major switching matrix, which will handle 36 antennas and 10 transmitters.

Portugal Chooses Scimitar H

The Portuguese Armed Forces are to be equipped with a communications network based on the new, high-technology *Scimitar H* h.f. combat net radio from MCS.

The introduction two years ago of the *Scimitar* family, to which both MCS and MSDS contribute, signalled also the introduction of the only truly effective means of tackling electronic warfare in communications.

Scimitar, being a frequency-hopping system, is highly resistant to interception and jamming. And, with the addition of the newly-developed electronic counter-counter measures module, it is attracting considerable interest. Orders have already been received from Sweden and Finland, while it is being evaluated by a number of other countries within and outside NATO.

Cash on the Nail

A £100,000 order has been received by MRS for a three-field-site IVR-Met system for Leeds and Bradford Municipal Airport at Yeadon.

The system, which includes three MET-1 transmissometers, will be installed on a runway extension that will pass over the main road near the airport.

An unusual feature of the transaction is that full payment was made at the time of ordering!

Computerized Modular Monitoring

Two contracts totalling some £600,000 have been secured by MRS for the supply of Computerized Modular Monitoring equipment to the UK Civil Aviation Authority.

The first contract is an extension of one awarded of ten radar station control and monitoring systems (RSCMS) for the

CAA's radar replacement programme. Three airport display systems are to be provided, which will display information, gathered by the RSCMS, at three associated airport control towers.

The second contract covers the purchase of a dual RSCMS and airport display system for a new radar station to be installed on Tiree, off the west coast of Scotland. It will control and monitor the dual primary and secondary radars that will give the Scottish Air Traffic Control Centre greatly increased cover on the Western Approaches.

Jordan Chooses Marconi Airfield Radar

Jordan has selected the Marconi ASR511 airfield surveillance radar for Amman's new Queen Alya'a International Airport.

The turnkey contract, valued at nearly £4 million, signals the first export sale of the new radar. Over the next two years, MRS will supply an ASR511 for dual-diversity operation, an S464 secondary surveillance radar, four operations displays, complete with consoles, and an air traffic control simulator.

The contract follows a recent order from the British Civil Aviation Authority for thirteen ASR511 transmitter/receivers.

Multi-million Pound Fuze Order

The Ministry of Defence has placed a multi-million pound initial production order with MSDS for the manufacture of two new 'add-on' fuzes for the British Army's *Barmine* anti-tank barrier system.

The quick and simple addition of these fuzes to the well-established *Barmine* will extend the mine's attack capability to the full width of the target vehicle and significantly increases its destructive potential.

Nimrod Trainer goes into Service

In April, MI officially handed over Europe's largest aircraft simulator, the Mark 2 *Nimrod* Maritime Crew Trainer, to senior officers of the MoD (PE) and the RAF. This trainer is the first of three Mark 2s ordered for the RAF—a contract worth some £20 million spread over twelve years.

Housed in a high-security building at RAF Kinloss, the new trainer provides comprehensive training facilities for crews of the *Nimrod* by simulating the aircraft's operational roles and the environmental conditions affecting them.

Anti-submarine operations, long-range reconnaissance and patrol, surveillance and monitoring of enemy surface and submarine forces, air-to-air surface strikes against individual vessels, and search and rescue operations can all be practised and developed with the MTC.

The instructors' console accommodates up to seven men, who can set a range of programs, alter them in mid-sequence and introduce fault and failure conditions.

The successful GRADUATE

An enhanced version of MI's digital ATE system, GRADUATE 8060, has been delivered to a large computer manufacturer on the west coast of Scotland. It incorporates specialized software and exceeds the specification of any other MI ATE system so far delivered. The contract was won on the Company's ability to meet these special requirements, which included rapid delivery.

Transportable Broadcasting Station

Bahrain's Ministry of Information, the broadcasting authority for this influential Arabian Gulf State, is now in possession of two transportable m.f. sound broadcasting stations from MCS.

Each consists of a studio containing a comprehensive range of control equipment and cassette tape recorders, two B6038 1kW m.f. sound broadcasting transmitters and an R5075 tunable umbrella antenna, installed in an air-conditioned 20-ft long ISO container, which also has a storage generator area.

Containerization is an increasingly attractive option. The container is both the package during delivery and the station accommodation. Thus, commissioning is carried out at Chelmsford and setting-up tests are all that are subsequently needed.

Breakthrough Order for Marconi Sonar

A new 360 degrees underwater surveillance sonar, designed and developed by MSDS, has been ordered by and delivered to the UK Ministry of Defence for immediate operational deployment.



360° degree Sonar Automatic Target Detection equipment.

This order represents a major breakthrough for the company's Naval and Ocean Engineering Division, based at Frimley in Surrey, and is a significant milestone in a programme aimed at satisfying the hitherto unfulfilled need for a fast-scanning underwater surveillance system.

The electronically-scanned sonar provides all-round visibility against hostile divers, chariots, submersibles and submarines. By detecting their presence sufficiently early and by accurately determining their range and bearing, the equipment enables effective countermeasures to be implemented with great speed and high confidence. The sonar can be used to protect ships at sea, harbour entrances, naval and military shore bases, oil production platforms, dams, bridges and other establishments in or near water.

£2 million Orders

Simulators have played a major part in a couple of orders received by MRS, amounting to over £2 million.

The Middle East has called for two training simulator systems of which one is to be a 'stand alone' system, while the other is for integration with an S600 Furnace system, supplied under an earlier contract.

A Ministry of Defence order calls for the enhancement of two simulators ordered previously, and also for a data handling system to replace one supplied in the Linesman project.

IVR-Met Success

An IVR-Met system, valued at £450,000, has been ordered for the airport at Bratislava in Czechoslovakia. It is in addition to the system ordered for Prague International Airport earlier this year.

The Bratislava installation will employ five MET-1 instruments and full meteorological sensors, covering two runways, with further sensors installed on top of Maly Javornik, a nearby mountain.

In another recent order, worth nearly £400,000, IVR-Met will be put to novel use. It will monitor two tunnels on the M25 motorway. Four instruments in each tunnel will measure the visual range and carbon monoxide, and a system will be included for controlling the level of the tunnel lighting.

Marconi Aims High with New Data Bus Unit

MSDS has received a contract from the European Space Agency (ESA) to develop a digital bus interface unit for modern generation satellites.

The unit will allow microprocessors, located in each satellite sub-system, to be interconnected by the On-Board Data Handling bus being specified for future ESA spacecraft (ESA OBDM standard). This will form a distributed data processing network with the potential to automate many of the control and information-handling tasks that currently rely on manual intervention from ground control centres.

One of the principal requirements of the new bus interface unit is that of improved protection against the high level of natural radiation that progressively degrades the performance of micro-electronic systems in geo-stationary orbit. To meet this need, MSDS is finalising the design using a radiation-hardened silicon-on-sapphire very large scale integration (VLSI) process perfected at GEC's Hirst Research Centre. This process achieves the required degree of protection with the added benefit of much lower power consumption than hitherto. The Marconi organisation has already developed integrated circuits based on this technology for defence applications, such as the Scimitar family of frequency-hopping combat radios, and leads the world in this area of advanced microelectronics.

The unit being developed for ESA will use three custom-designed complementary metal oxide semiconductor silicon-on-sapphire (CMOS-SOS) integrated circuits in place of many discrete integrated circuit packages, thus giving significant reductions in size, mass and power consumption. These factors, when coupled with the unit's radiation-hardened design, will contribute to more reliable and long-lived satellite electronics packages.



Data Bus Handling Unit Design at MSDS Portsmouth.

Uses latest CAD techniques: This Computervision 3-colour interactive graphics terminal permits simultaneous work on PCB, Thick-film, mechanical, numeric control, LSI and VLSI design work.

Supplement



EXPLORING GEC RESEARCH BY KENNETH FLEET OF THE STANDARD. SPACE: THE LAST FRONTIER.

Frying tomorrow's chips at GEC.

GETTING MONEY out of GEC's Arnold Weinstock, people say, makes squeezing blood from stone seem simple. Just look at the £1,073 million of 'cash at bank and in hand' not to mention the £276.8 million of 'investments' (mostly short-dated securities) in the new balance sheet.

Derek Roberts is the man who must get money for way-out projects out of GEC's tightly held purse, and he says that's claptrap. "Having sat through 400 budget discussions there's not been a single engineering expenditure he has cut back," he says.

Mr Roberts is GEC's director of research, and will spend millions of pounds of the company's money this year doing things far beyond the understanding of most of us, often years away from any obvious market place.

GEC spent £530 million last year, says chairman Lord Carrington, on "research and development and engineering of new products." That's a fine figure to catch the headlines, and takes in millions spent "routinely" by the companies that go to make up our biggest private sector employer. Mr Roberts will spend £33 million this year, plus another £8,000,000 on equipment, peering into the future.

I went to the Hirst Research Centre in Wembley to see the bewildering display of things they are doing with chips and telecommunications. They are designing out the moving parts from the humble telephone (about time too), producing exotic materials, working on a device for processing the output from a video camera while the image is on its way to the screen, and much, much more.

It's enough to make your head spin—and they should have something for that, too. Nuclear magnetic resonance and ultrasound devices look promising for replacing X-rays. Mr Roberts will even talk of a marriage between silicon-based micro-electronics and organic compounds, so you can have a tiny implant to monitor, say, blood sugar levels. GEC will not become a pharmaceuticals company.

He draws the line, too, at computers made from similar materials to the human brain. "There are those who want to build electronics out of protein. Bloody idiots," he says. "You'd get a computer that might be brilliant, but is likely to end up saying 'I can't remember'."

GEC get criticised for their cash hoard more than for anything else. Instead of doing painstaking, piecemeal research, why not use the money to set up GEC as a volume producer of chips, like Hitachi in Japan or National in the US?

To show just what a disaster that could be, Mr Roberts points to the example of Schlumberger. They paid 425 million dollars for Fairchild Semiconductor four years ago. They have injected more than a billion dollars into the business, but Fairchild are still a disaster area: losing money, managers leaving and market share shrinking.

Just one ill-judged venture like that could wipe out even GEC's cash resources.



Derek Roberts.
Head-spinning blue-prints for the 90s

Both Mr Roberts and Lord Weinstock would happily spend more on research, and the activity has doubled in five years to 850 staff at Hirst, more than half of whom are graduates. Shortage of good people is the main constraint, and the fact that research takes time. "You can't make a baby in a month by getting nine women pregnant," is Mr Roberts' graphical analogy.

So will Hirst change GEC in the 1990s? A key element of the work is on chip "architecture"—devising systems for making ever more complex chips in a reasonable time. Some of the work is far beyond me (despite an engineering degree) and I couldn't even follow the explanation of what a convolver is. One joint-venture project which should yield powerful results is the "UK 5000" chip, with 5000 logic gates on it, and a design which allows the user to finish it off any way he chooses. It has taken the partners 34 man-years to develop.

One clear area of growth is in medical electronics. The trend in medicine is to make machines useable by fewer and fewer skilled people, starting with specially trained personnel, moving to doctors and, finally to the patient himself. "The throwaway X-ray machine" is how Mr Roberts describes it.

Looking further ahead, the GEC Rectangular Image and Data processor (GRID) opens up the prospect of enormous computer-power at a lowish cost. GRID enables large numbers of relatively simple computer operations to be done simultaneously, and therefore quickly. A single board can intercept an incoming video signal, process it and display it without any delay.

MELTING

For defence purposes, it will allow a target to be picked out and analysed from other moving objects on the screen. An architect, drawing his building on a small computer, could simulate an earthquake and see how his building stands up. A prototype, GEC reckon, should be working next year.

GEC produce a modest mountain of technical literature, the sort of thing I imagine they spend hours reading at the Soviet Embassy. Some of the materials of tomorrow, like gallium arsenide and cadmium mercury telluride, which should eventually replace silicon as the basic chip semi-conductor, are so lethal that nobody even knew their melting points until GEC did the research.

So why publish this vital information? Says Brian Isherwood, the newly promoted head of materials science: "We encourage our people to publish. It's the way our customers know we are serious. If they know what we are doing, they are more likely to come to us with their problems."



Space: the last frontier — and the most lucrative — for world communication

With the launch of an Ariane satellite last June — and another planned this month — we provide a European overview of the satellite industry, and its potential both as a communications channel and as a profitable enterprise. A closer look at Ariane is provided on the following pages.

(Reproduced by Kind Permission,
Communications Management: August 1983)

Illustration:
Martin Ingley

SATELLITE communications have come of age. It is now 21 years since the world's first experimental commercial communications satellite, Telstar I, provided direct exchange of television broadcasting across the Atlantic, some five years after, the USSR put Sputnik I into orbit. Another Telstar first was a demonstration of transatlantic telephone communication offering an alternative to submarine cable. By the standards of today, Telstar was unsophisticated. It moved in low elliptical orbit, providing communication for less than one hour in four, but it did represent a major advance from the earlier experiments that involved the simple reflection of relay signals.

Just two-and-a-half years after Telstar I began life, the number of two-way telephone circuits via satellite between Europe and the USA was 100. Another 15 years saw the comparable international satellite communication links figure rise to more than 20,000 — a number that will double by 1985 and is predicted to be 150,000 by 1995.

Way back in 1964, with remarkable foresight, a dozen nations banded together to form Intelsat (the International Satellite Telecommunications Organisation). There are now more than 100 members of the organisation which, unusually for such a body, operates on profit-making principles. Intelsat revenue comes from the leasing of circuits created by its geostationary satellite network. As the capacity of satellites has increased, the cost of a year's lease of a circuit has fallen from almost \$30,000 to less than \$4,500. Europe is to prosper from the next generation of Intelsat satellites with British Aerospace being a prime subcontractor to Hughes Aircraft, with whom Intelsat have placed an order for five huge Intelsat VI satellites. Intelsat also, in the last quarter of 1982, awarded research and development contracts to three European organisations. the Institut fur Angewandte System — Technik in Austria won a \$96,000 contract to extend the diversity radiometer measurements and data analysis. Plessey Research in the United Kingdom is to conduct a further \$503,000 of development into the monolithic wideband 6 GHz receiver and Harwell Research, also in the UK, was awarded a \$240,000 development contract into advanced nickel hydrogen cell components.

Intelsat VI will have twice the payload, power and number of transponders and three times the capacity of the present generation of Intelsat satellites. Major advances are a six-fold re-use of the 6/4 GHz frequency spectrum, or 'C band'. Dynamic switching is made for the interconnection of the satellite's six antenna beams using SSTDMA (Satellite Switched Time Division Multiple Access) on the 39 feet high by 12 feet wide solar powered device. For launch, via Space Shuttle, the outer solar panel is positioned outside the inner array and body of the satellite to make for launch dimensions of only 17 feet by 12 feet.

The only organisation that rivals Intelsat for size and coverage is Intersputnik, operated by the USSR and employed by a number of Eastern European countries.

Comparatively new in the satellite communications business and enjoying very rapid growth is Inmarsat (International Maritime Satellite Organisation) with its

headquarters based in London. Inmarsat provides for ships and offshore operations such as oil rigs to utilise satellite communications and overcome traditional problems with radiotelephone and radiotelegraph links.

Providing one repeater station in Inmarsat's ship-to-ship or ship-to-shore communications is the Marecs-A (Maritime European Communications Satellite) containing receivers and transmitter equipment built by Marconi Space and Defence Systems in Britain. The seven year life-span Marecs satellite was derived from the European Space Agency's ECS general broadcast and communications satellite.

Inmarsat leases three satellites from Marisat, a joint venture of Comsat, RCA, ITT and Western Union of the USA and employ one Marecs A satellite. The Marecs has a 40 voice channel capacity and is positioned, 36,000 kilometres up, at 26 degrees East over the Atlantic.

The services provided by Inmarsat extend beyond the

'As the capacity of satellites has increased, the cost of a year's lease of a circuit has fallen from almost \$30,000 to less than \$4,500'

first uses to come to mind, including emergencies. Data communications such as seismic readings from oil rigs, ship performance and routing, cargo manifests can be transmitted and, easily forgotten by those of us on land, satellites play a valuable role in navigation. The cost of installing an earth station on board ship (curious though that may sound) is typically around \$50,000, but potential savings from the more efficient use of fuel, increased ship utilisation and the cost effective use of voice and text communications, data transmission and facsimile transfer can quickly recover the initial investment.

Above and beyond the commercial attractions to ship owners of Inmarsat are the facilities for creating distress signals. A special key on board the ship provides immediate access to telex or telephone connection to the most appropriate coastally-located earth station via a priority access to the space segment. In the majority of instances, the connection is effected automatically. The coastal earth stations in Europe are currently located at Eik in Norway, Goonhilly in England, Odessa in Russia and Fucino in Italy though many more installations are planned or already under construction. A typical coastal earth station has 22 telex channels permanently assigned to it as well as the high speed data and telephone channels. It will consist of an antenna of up to 14m diameter and control and signalling equipment.

Satellite communications have brought to the maritime world relief from the congested mf and hf bands, a wider range of communications services and increased reliability. For those in peril on the sea, satellites must represent a blessing from above.

Representing Europe's national telecommunications authorities is an organisation known as Eutelstat which is

FEATURE/SATELLITES

► providing widespread coverage through a network of three metre diameter ground antennas, but the system will be enhanced in 1986 with the introduction of L-Sat, being manufactured jointly by GEC-Marconi and British Aerospace. A novel development for L-Sat is the satellite's facility to radiate beams to provide concentration of coverage in the areas most needed. L-Sat 1 has huge, by satellite standards, 27 metre-wide solar panels of a plastic material covered with silicon to collect the rays of the sun and convert them to more than 3,500 watts of electrical power. These 'wings' are to unfold on extending booms when the satellite is in orbit.

The wings of the 2,300 kilogram L-Sat would be very flimsy under the influence of earth's gravity; a problem that does not, of course, exist in space. When in space, three wheels continually rotate in the direction of the three principal axes to point the antennae to the required part of the earth's surface and the solar panels towards the sun. The wheels are driven by electric motors operating at different speeds to keep L-Sat on an even keel. The wheels gradually revolve faster and faster as they perform

'The revenues and profits to be made from the satellite business are significant . . . (companies) are competing for budgets estimated to be worth in the region of \$7,500m by the end of this century'

their compensating and controlling processes. Eventually, the wheels reach their maximum speed, which requires that the system be turned off and restarted. While the wheels are out of operation, gas jets perform a standby function and it is, in effect, the continuing supply of gas that determines the likely life of each L-Sat — a period probably in excess of ten years. The value of British Aerospace's contract with the European Space Agency is some \$240m.

L-Sat has its heritage in the first European satellite, OTS (Orbital Test Satellite) 11, launched in 1978, and represents a joint European collaboration to lessen dependence upon Intelsat. OTS 11 was designed to beam signals throughout Western Europe, but short-term expectations of a more sophisticated device were shattered last year when the launching rocket, Ariane, crashed 13 minutes after lift-off from French Guiana. On board were a Marecs B and Siro 2 satellite and the ensuing insurance claim has been reported as being for \$18m.

Safety in satellites is, of course, a matter of world concern, but Europe is particularly sensitive to the potential danger of nuclear-powered satellites because of the high concentrations of population density compared with other areas of the world. To put this in perspective, the United Kingdom has about a quarter of the population of the USA, but in a geographic area perhaps one twentieth of the size. It is the prospect of being the unwilling

landing ground for a satellite at all that makes solar power look highly attractive compared to nuclear source.

The loss of Ariane was a setback, but it serves to focus attention upon the reliability that is taken for granted with satellite communications. According to Intelsat, satellites are operational for 99.5% of their life and, again despite the crash, insurance premiums typically represent only one percent of the project's total cost.

The European Space Agency has spent almost \$750m on developing the predominantly French (63%) Ariane, a rocket launcher that can lift more than 2,500 kilograms into orbit which represents the opportunity for shared cost, multiple launches and thereby competing with the low cost of re-usable shuttle launches. Another consideration of the rocket versus shuttle argument concerns the shape of the payload. Rockets tend to favour longer, thinner satellites while the shuttle is more attractive for the designer of shorter, stubbier devices. Costs mentioned in respect of putting a large satellite into orbit by Ariane are in the region of \$25m and, at the time of the crash, launches were fully booked through to 1986.

Arianespace, the company formed to market the Ariane launcher, last year received the go-ahead from the European Space Agency to develop a new version of the rocket to be capable of carrying a 4,300 kilogram satellite into orbit. It is hoped that this increase in payload will keep Ariane competitive with other expendable carriers such as the Delta from McDonnell Douglas.

The revenues and profits to be made from the satellite business are significant. The American Hughes Aircraft is the established market leader with RCA, Ford and the General Electric Company of America representing the main US competition. In addition to those already mentioned, Europe is competing through organisations including Eurosatellite, a joint Messerschmitt/ATN/Aerospatiale and Thomson CSF venture and Satcom International, comprising Matra and British Aerospace. These and others are competing for budgets estimated to be worth in the region of \$7,500m by the end of this century.

In the United Kingdom, satellites have brought about a rare and highly welcome example of collaboration between government, industry and educational sectors in the form of a \$4.5m research study known as Project Universe. This project effects communication between two means of communication; high speed satellite links and local area networks (LANs). LANs have been successful in providing communication between closely located devices and in making available the sharing of what might otherwise be uneconomic resources such as data files or printers for microcomputers. (See: *Communications Management*, May 1983.)

Satellites have a major role to play in teleconferencing and there have recently been a number of suitably impressive satellite-linked demonstrations throughout Western Europe. In April next year, there is to be an International Teleconferencing Symposium and on at least one occasion during the symposium it is planned to have a Worldwide session with all five venues (Sydney, Australia; Tokyo, Japan; Toronto, Canada; Philadelphia, USA and London, England) simultaneously participating. ■

Exhibitions



Marconi Prefix equipment, as displayed at Montreux, is here being used for pre-programming all the controls on the B3410 Telecine in the background.

Exhibitions

During recent months MCSL, MSDS and MI have jointly participated at two major Overseas exhibitions, in Switzerland at the bi-annual Montreux Television Symposium, and in the USA at the annual AFCEA Convention (Armed Forces Communications and Electronics Association) held in Washington. MEDL participated at GEC '83 held in Brighton, the Mobile Radio Division of MCSL at Comex '83 in Coventry and at the Essex Show in Chelmsford. During July MRSL, MUSL and MCSL attended a major Chinese Naval Exhibition in Shanghai and in September the Company will mount a major presence at the Royal Navy Equipment Exhibition (RNEE '83) on Whale Island, Portsmouth. Marconi

Company in addition to a large indoor stand will have a major outside exhibit and a six unit Chalet Complex where senior guests, many from overseas, will be entertained during the week.

Autumn is always a hectic time with many major exhibition commitments around the world, in Madrid, Ljubljana, Washington and Shanghai (again) and particularly in Geneva where Telecom '83 will be held from October 26 until November 1. This important event, organised by the International Telecommunications Union is held every four years and Marconi Companies will feature prominently together with a number of GEC Companies. A full report on this event will appear in a future issue of DIGEST.



Exterior visualisation of The Marconi Company Chalet complex at RNEE '83 to be held at Portsmouth September 11/16 this year.

Interface

COMPANY ASPECTS AND AFFAIRS

Goonhilly 5 Goes Operational

British Telecom's maritime satellite telecommunications terminal at Goonhilly Downs in Cornwall became operational on 1 February this year. Built by MCS, Goonhilly 5 is the first maritime coast earth station in the UK and one of only seven in the world, though further terminals are being built in Oman and South America.

INMARSAT provides the interface between the national PTT organizations and the ships, and is responsible for the 'space element' alone. The ship owners control the small shipborne terminals and, in Great Britain, British Telecom provides, through Goonhilly 5, the link with national and international telecommunications networks.

While British Telecom transmits to the satellite at 6GHz and receives at 4GHz, the link between satellite and ship is based on 1.5GHz downlink and 1.6GHz uplink. This enables high power, single-carrier pre-channel techniques to be used to reduce the size, weight and complexity of the shipborne terminals.

Reactor Control Room Simulator

In March of this year, the Devmat III Nuclear Submarine Manoeuvring Room Training Simulator was accepted into service with the RN. The equipment simulates the reactor plant control for Britain's latest class of submarine, HMS *Trafalgar*, and is an exact replica of the ship's control room. It includes all the controls, instrumentation and equipment normally visible to, and operated by, the crew.

The instructor's station, which overlooks the interior of the control room, comprises a console on a raised platform. The console contains a control system enabling the instructor to initiate the training exercise, monitor trainee operation and introduce system faults.

The three-year timescale, agreed when the contract was placed by Rolls Royce and Associates, reflects the complex nature of the project. The task was made more difficult because the development and build programme of this new class of submarine ran in parallel with that of the simulator.

UNISAT

MSDS, through GEC, teamed earlier this year with British Telecom and British Aerospace to form United Satellites Limited (UNISAT) and will provide the communications payload for two Direct Broadcasting satellites under an agreement with the BBC. The two satellites will have the capability to beam television programmes directly into homes equipped with a small dish aerial. In addition to the two DBS (Direct Broadcasting by Satellite) channels aboard each spacecraft, a total of four fully backed-up telecommunications channels will also be available to serve the UK, parts of Europe and North America.

Mr Daniel S Gruneberg, General Manager of the MSDS facility at Hillend in Scotland since 1981, has been seconded to UNISAT by GEC and took up the appointment of Managing Director of USL in May of this year. For Mr Gruneberg, 21 years with GEC, this appointment is the second involving a major satellite project: in 1972 he was 'loaned' to ITT for three years as programme manager of the NATO Phase 2 satellite communications project.



Daniel Gruneberg

Marconi DFCS Firing Trials Successfully Completed

Several days of exhaustive field testing, recently undertaken by Marconi Space & Defence Systems Limited, has resulted in a big thumbs up for the Company's new Digital Fire Control System (DFCS).

Preliminary firing trials of this all-armour gunnery control system, developed by the Company's Frimley-based Military

Weapons Control Division, took place at the Lulworth firing range and were carried out with the co-operation of the British Army's Trials and Development Unit. The DFCS was installed in a Cadillac Gage Commando V150 light armoured vehicle with the Commando 90mm turret integrated with the Cockerill 90mm Mk 3 main armament. HEAT ammunition supplied by PRB was used exclusively during live firing sequences against both static and moving targets.

Integration and co-ordination between DFCS and the basic gunnery fit was successfully established and substantial improvements in hit probability and engagement time were consistently registered. One of the major advantages foreseen for the new system is against moving targets and in this respect the Lulworth trials confirmed that DFCS fully measured up to predicted performance.

Further firing trials are planned to take place over the next few months.

Bid for INMARSAT Programme

MSDS, Ford Aerospace & Communications Corporation and Aerospaziale have reached an agreement to submit a joint proposal for the design and manufacture of a second generation of INMARSAT maritime communications satellites. Marconi will lead the team.

The three companies will be working closely over the next few months to produce a satellite design that will meet the specifications laid down by the INMARSAT organization. Their experience in satellite technology, communications systems and the management of large projects will enable them not only to resolve the complex problems posed by the introduction of these satellites in the late 1980s but also to offer satellites based on proven hardware.

Golden Jubilee

On 11 February this year, MCS celebrated the 50th anniversary of the inauguration of the world's first commercial microwave communications link, installed between the Vatican and the Pope's summer residence at Castel Gandolfo.

In the late 1920s and early 1930s, Marconi's Wireless Telegraph Company, later to become The Marconi Company, put a lot of money and effort into the investigation of frequencies of less than one metre, much of the work being carried out at Chelmsford and by Guglielmo Marconi himself in his private laboratory in Italy.

An 11-mile link near Genoa provided the first practical demonstration in October 1931; a duplex telephony link of some 22 miles followed in 1932; but it was Pope Pius XI's Vatican link, spanning some 15 miles, that marked the beginning of the commercial microwave communications era.



Cliff Deamer using G2MT callsign for the first time after a 60 year break in transmission.

Radio Society Re-launches Historic Callsign

After a 60-year break, 2MT (Two Emma Tock), the callsign that introduced Britain's first scheduled radio entertainment broadcast, went on the air from Stanmore at 1200 hours BST on Saturday 1 July.

The Home Office granted approval for the callsign G2MT to be used by the Marconi Radio Society, a group formed recently by amateur radio enthusiasts employed at the Stanmore Site of MSDS.

The station equipment included an Eddystone h.f. Receiver 1837/2 loaned by the company for the event. The equipment performed superbly, resulting in over 150 contacts on the h.f. bands alone.

The founding of the Marconi Radio Society and its use of the historic callsign (the addition of the 'G' for England is to accord with current practice) is of particular relevance during World Communications Year. The Society's Patron is General Sir Harry Tuzo and its President is Dr W. Bardo.

ITeC Sponsorship

An agreement has been concluded between Marconi Hillend, the Manpower Services Commission and the Fife Regional Education Committee to set up a Fife Information Technology Centre on the Hillend Industrial Estate. When it is operational, the Centre will cater for 30

young people for a 12-month period. It will also act as a resource for the community, which means that local people will be encouraged to book time there, carry out their own projects, learn about microelectronics and possibly even run business enterprises using ITeC equipment.

The training of young people will cover three main areas: the office of the future, computer programming and electronics. A wide range of microprocessors and word processing and Prestel stations will be available. Students will be encouraged to learn by doing, and it is intended that the Centre shall generate products for sale to microprocessor users.

MEDL's £¼ million Computer System

A Hewlett Packard 3000 computer, installed at MEDL's HQ in Doddington Road, Lincoln, is linked to other MEDL sites at Carholme Road, Billericay, Wembley, Portsmouth and Swindon. Furthermore, each Division is to have its own Hewlett Packard 1000, which will work with the central machine, and there will be up to 30 terminals throughout the various sites.

The HP 3000's first task is to handle orders and sales, and its duties will gradually be extended to cover stock and purchases, production control and word processing. Technical calculations will be handled locally by the HP 1000s.

The Exosat Mission

The intended two-year mission of ESA's EXOSAT, which was launched in May, is to observe some of the most violent and unusual events that occur in the known universe; for example, the disappearance of matter into a 'black hole', the cataclysmic effect of supernova explosions and the prodigious out-pouring of X-Rays from some remote radio galaxies. The accurate positioning and re-positioning of the satellite to observe these events are critical manoeuvres that rely on a new MSDS microcomputer-controlled thruster system. With its vaporized propane thruster jets, it can position the satellite to point at an object to within an accuracy of one thousandth of a degree of arc.

Another EXOSAT feature, developed by MSDS, is an automatic system for power collection that is able to steer the satellite and its solar panel array when the craft is out of contact with ground-control.

Marconi Generator Keeps Track

MI's microprocessor-based signal generator 2018 is the US choice for a satellite tracking receiver capable of fixing the position of deep space probes with pin-point precision.

The Jet Propulsion Laboratory in California is designing the very high baseline interferometry (VLBI) system, which will provide fixes of unprecedented accuracy on NASA spacecraft reaching out, like the recent *Voyager* series, into deep space. No fewer than twelve 2018s will be incorporated in each system, giving exactly the kind of extremely high-phase stability and freedom from jitter required for this demanding application. They will, moreover, be more cost-effective than other, more conventional, design solutions.

IBA Thanks Marconi

The part played by MI in the launch of Channel 4 is highlighted in a letter to MI's managing director from IBA's Head of Station Design and Construction:

'Although, in engineering terms, the launch of Channel 4 yesterday was only a passing milestone, it is certainly a milestone which would not have been achieved without the help and co-operation of yourself and your many colleagues at Marconi Instruments. I am very conscious that we asked you to undertake complex work and had to impose on you very demanding timescales. I know that your success in matching these demands has been the result of a great deal of very hard work at St Albans—I send you very sincere thanks for your efforts and I would be very grateful if you would pass my remarks on to your colleagues.'

Channel 4, in common with broadcasting services in 40 countries, relies on MI's automatic measuring equipment for ensuring the quality of transmitted signals.

Conipole and Conifan Antennas

During 1982, the MCS R7080 Conipole and R5050 Conifan antennas won over £300,000 of orders. They are now in use from the Far East to South America for broadcast and point-to-point communications for military, civil, aeroband and marine services.

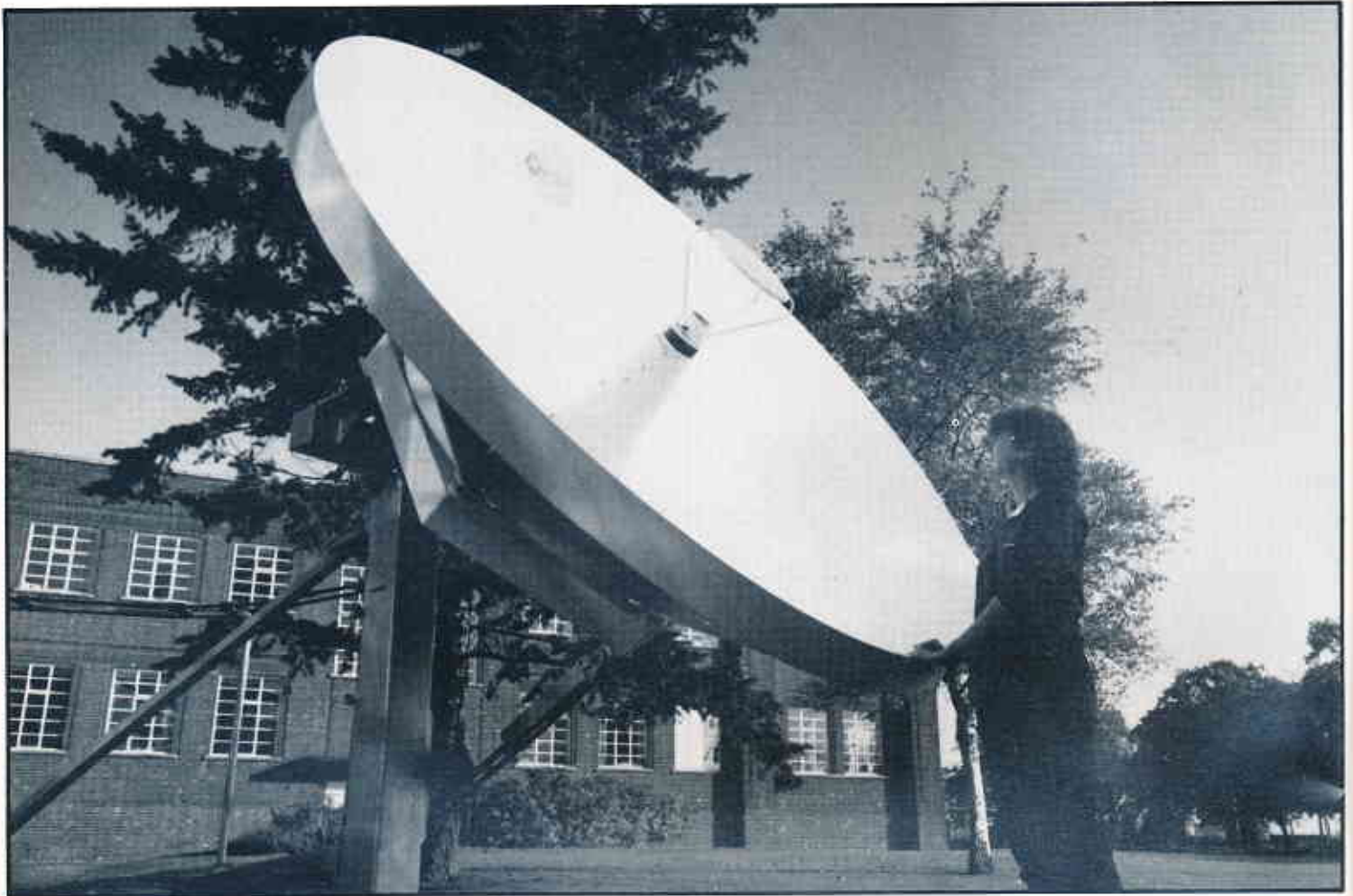
The Conifan is a short to medium range antenna for distances up to some 500 km, while the Conipole covers medium to long range applications. Both are broadband equipments designed for simplicity and speedy erection and dismantling. A number of Conifan options are available, covering different powers and frequency bands within the range 1.5 to 30MHz and with a maximum mast-height of 23 metres.

The Conipole design presents an ideal launching-mode for low-angle waves, ensures minimized reflection, reduces the antenna height requirement by some 25 per cent and eliminates the need for a base insulator.



Fact File

PROJECT UNIVERSE: COMPUTER DATA TRANSMISSION VIA SATELLITE. STONEFISH: THE INTELLIGENT SEA MINE.



Project Universe

The UK's Project Universe aims to demonstrate the viability of intercomputer data transmission between remote computer sites by means of satellites. It is being undertaken by a consortium that involves the Science and Engineering Research Council, British Telecom, GEC and Logica, in co-operation with the Universities of Cambridge, London and Loughborough.

Project Universe is an advance on the European Space Agency's SPINE and STELLA projects, which, since 1980, have carried high-speed data transmissions between remote locations, using OTS. MCS has been closely involved with these ESA projects, for which it supplied earth stations at Villa Franca in Spain, Darmstadt in Germany, Geneva in Switzerland, and

Farnborough and the Rutherford Appleton Laboratories in England. The link between Rutherford Appleton and Geneva is used by CERN, the European Nuclear Research Centre, for the passage of high-energy nuclear physics data, and enables real-time research to be carried out remotely.

Reverting to Project Universe, a powerful new technique is employed for the high bandwidth transmission of data between the computers, which can be of any size or make. It is the result of combining ground-based Cambridge Rings (i.e. local area networks) with the satellite links.

Of the six satellite data terminals that are employed, MCS has built and installed five, while the sixth is a development by British Telecom based on an extended evaluation of an earlier Marconi equipment.

The MCS terminals, which are similar to those used in ESA's projects, are located at Cambridge, London and Loughborough Universities, Marconi Research Centre in Great Baddow, where much of the conceptual work was carried out, and Rutherford, where the earlier terminal will time-share with its other commitments. British Telecom's terminal is at Martlesham Heath in Suffolk.

Operating at 2 Mbits in the 11/14GHz frequency bands, these small terminals are an efficient, cost-effective and versatile communications medium. The 3-metre dish antennas are small enough to be placed unobtrusively on some convenient spot – even on a flat roof – and the terminal equipment is no larger than many filing cabinets.

Stonefish

It has been suggested that mines are the most cost-effective of naval weapons. The history of mining certainly gives a good indication of how effective they have been in the past.

In World War I, a total of almost three-quarters of a million mines was laid by all participants. They accounted for losses on the Allies' side of 586 merchant ships, 87 warships and 152 patrol boats and minesweepers. Naval historians tell us that the total ship damage from mines during that war was greater than that from gunfire and torpedoes.

In World War II, the US and the UK laid down about 300,000 mines and sank or severely damaged a total of almost 3,000 enemy ships.

The sea mine, then, has long shown itself to be an effective and economical weapon and yet, surprisingly, one that has been neglected by all nations since the end of World War II. The design and engineering of existing mines are based on old technology and, perhaps, three generations of technology have gone past without full advantage being taken of any of the developments in solid-state electronics.

In recent years, however, interest in naval mining has been rekindled as part of the general growing importance of underwater defence, brought about by the enhanced level of threat posed by modern vessels, particularly the submarine, and the now highly sophisticated naval warfare scenarios. This means that for mines to continue to be effective they must possess built-in intelligence and operational flexibility, which can best be achieved by taking advantage of the use of microprocessors and digital processing.

The inclusion of such features will provide naval forces with a high deterrent capability at a fraction of the cost of other comparable measures. To meet this requirement, MUSL, in collaboration with the Royal Ordnance Factories, is developing STONEFISH, a naval ground mine, designed to rest on the sea bed and be activated by the passage of ships and submarines.

STONEFISH is the first of a new generation of naval sea mines and will combine the latest technology in electronics and explosives.

Its design provides for the use of proven state-of-the-art technology so as to minimize cost while providing a reliable and effective weapon system; it also provides for control by an on-board computer, which enables data to be pre-set to meet a wide range of operational and tactical requirements, both now and in the future; and it further provides for long storage and operational or laid lives under world-wide conditions. The design is fully compatible with the high safety standards of NATO and the Royal Navy.

There are three variants in development:

- a) The warshot live operational mine.
- b) An exercise version, which is recoverable and measures and records the effectiveness of mine countermeasures and minefield operations.
- c) A drill and practice version to provide handling, programming and development training.

The mine comprises the warhead and tail section. Fitted into this are the power unit, electronics unit and sensors, and the safety and arming unit. Appropriate launch kits (air, ship or submarine) are attached to the tail sections.

It will take about an hour to assemble the mine at depot, i.e. assemble the tail section and launch kits to the warhead, and program the mine. It will then be ready and immediately available for use when required.

Following launch, the mine will settle on the sea bed.

After a pre-set period of time, it becomes active and then adapts to the background environment.

By monitoring changes, i.e. increases, in the local levels, it detects the approach of a target.

When and only when that target comes within effective range will the mine decide to fire.

The effective range is represented by a certain radius. A ship passing within this

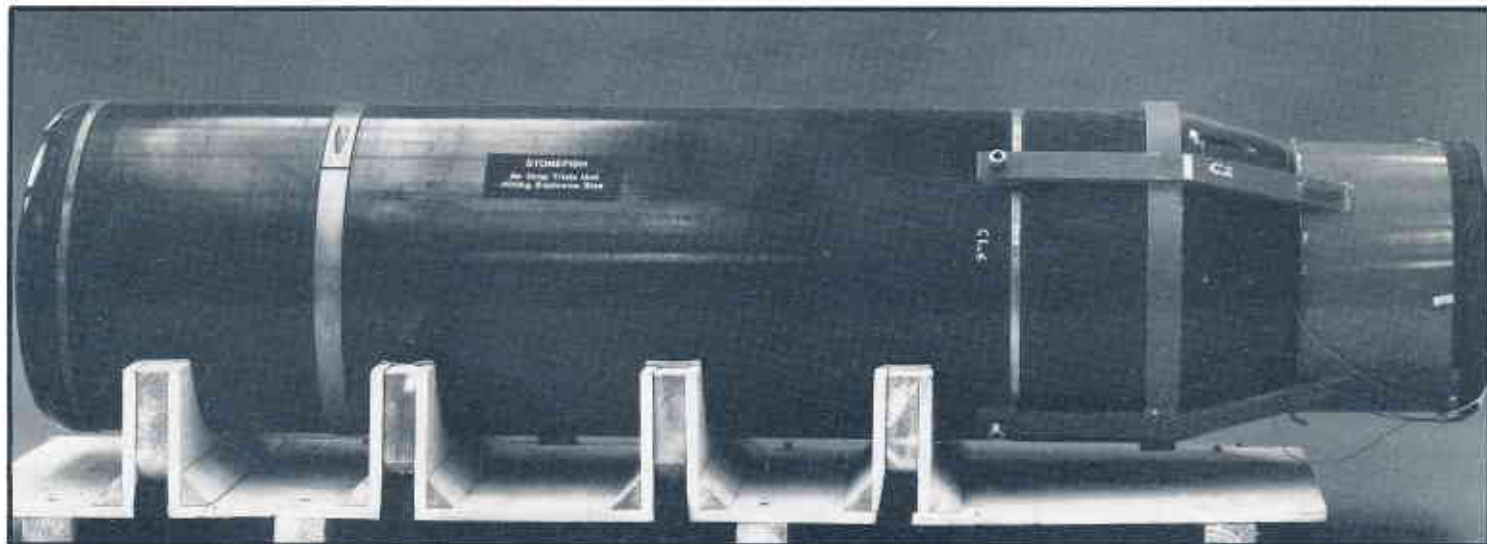
radius will fire the mine at the calculated closest point of approach. This will cause damage ranging from propulsion and weapon system failure to back-breaking and sinking. A vessel outside the mine's effective radius would be disregarded by the mine's on-board computer and no firing would occur.

Should the mine not be activated, then, at the end of its deployment life, a sterilization mode is initiated and the mine is made safe.

STONEFISH is being developed as a total system concept, including test and handling equipment, packaging, storage and launch equipment and a comprehensive documentation and training package. The mine itself is easy to lay, waits in silence, is invisible, highly effective, has built-in intelligence and controllability provided by its microprocessor.

A mine, of course, does not operate in complete isolation; it forms part of a field, which must be laid in a pattern to optimize effectiveness and deterrence. MUSL has the capability to undertake assessments of specific operational scenarios and recommend the number and types of mine that should be used, and the pattern to which they should be laid.

In essence, therefore, the concept embodied in the design of STONEFISH, which is planned to be available for delivery in about two years time, provides a versatility that should enable it to defy obsolescence but permit its owner to continue to maintain operational effectiveness throughout the current and foreseeable spectrum of naval warfare operations.



People



Tuzo



Lloyd



Sturge



Hill

MSDS

General Sir Harry Tuzo retired as Chairman, Marconi Space & Defence Systems at the beginning of September. He joined the company in 1979 after a distinguished career in the British Army culminating in his appointment as Deputy Supreme Allied Commander, Europe.

General Tuzo spearheaded MSDS's public affairs and P.R. activities and has firmly established the company's name in many areas of the community. Indeed, he was recently appointed a member of council for Operation Raleigh, a four year round-the-world expedition involving 4000 young people. He has retained an active involvement in service life as both Master Gunner, and chairman of the Royal United Services Institute.

In his own words he now retires 'to do good works in the country' and takes with him our warmest affections.

G Peter Lloyd has been appointed Commercial Director of MSDS, based at Stanmore. He succeeds M Alvarez, who

becomes Group Legal Adviser to The Marconi Company.

John Sturge has been appointed a Director of MSDS. He retains his position as General Manager of the Brown's Lane facility and will continue to have day-to-day responsibility for its communications and space activities.

Bill Hamilton has been appointed General Manager of MSDS, Hillend. He succeeds Daniel Gruneberg who has accepted the post of Managing Director of United Satellites Ltd (UNISAT), a company formed jointly by GEC, British Telecom and British Aerospace.

At Hillend, Bill Hamilton becomes responsible for the manufacture of Clansman vehicle radios, cryptographic equipment and other specialised defence electronics.

MIMCO

George Hill is appointed Director and General Manager of MIMCO. Iain M Dick becomes Chairman.

Other MIMCO appointments include **David J Pickles** as Sales and Marketing Director; **John Almond**, Marketing Information Manager and **Jim Tyler**, Operations Manager.

MI

Phil Harrison joins MI as UK Instrument Sales Manager. **Terry Boyle** appointed Business Development Manager, Trainers and Simulators Division, **Roy Titchmarsh** rejoins MI as General Military Sales Manager (UK).

Will Foster appointed Marketing Manager, Instruments.

MRSL

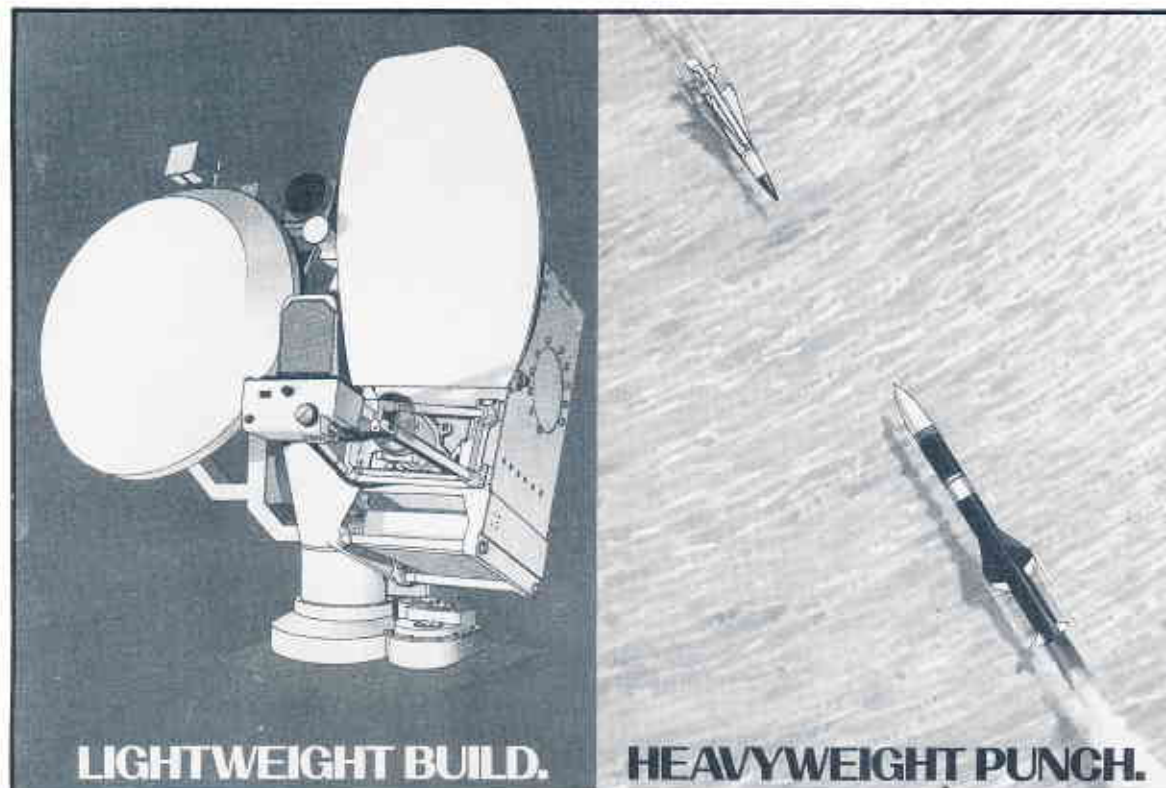
Tom Nuttall has been appointed General Manager of MRSL at Leicester. His replacement as Manager of Weapon Systems Division is **John Neal**.

MUSL

Howard Prothero has been appointed International Sales Director of MUSL at Portsmouth.

Ad News

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