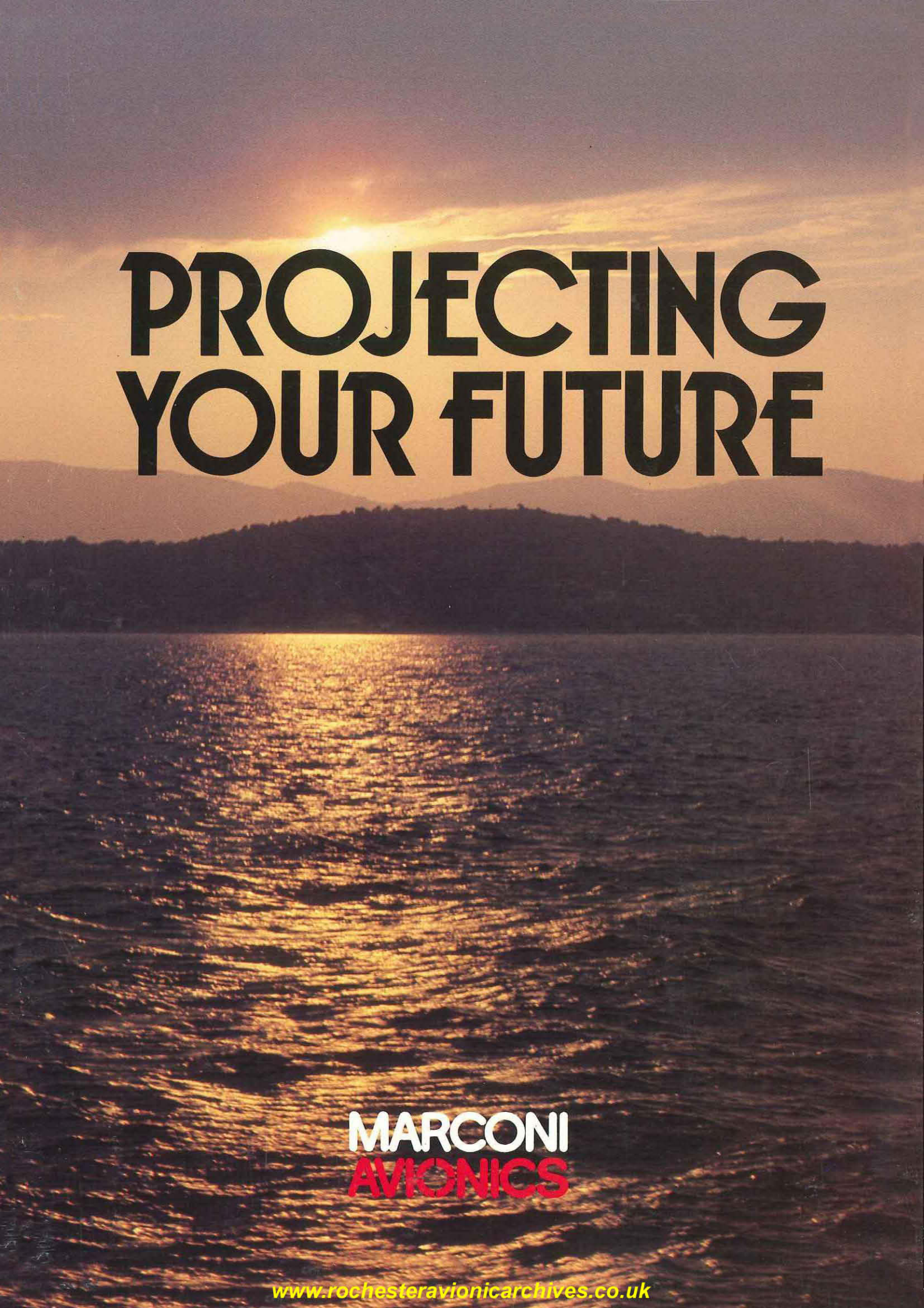


Teamwork in technology

In spurring complex technological change, it might well seem that the age of the inspired individual has gone for ever.

Yet incisive, original insights continue to be made. And innovative thinking is still very much on the curriculum for tomorrow's technical leaders.

So what's the difference today?

Essentially, it's an indication of how the concept of teamwork has developed in recent years. Once the idea of 'designing by committee' might have seemed synonymous with procrastination and compromise. But the sheer pace of current progress, especially when coupled with the diversified nature of the groundbreaking projects that we handle every day here at Marconi Avionics, demands a fresh look at the positive virtues of collaborative involvement.

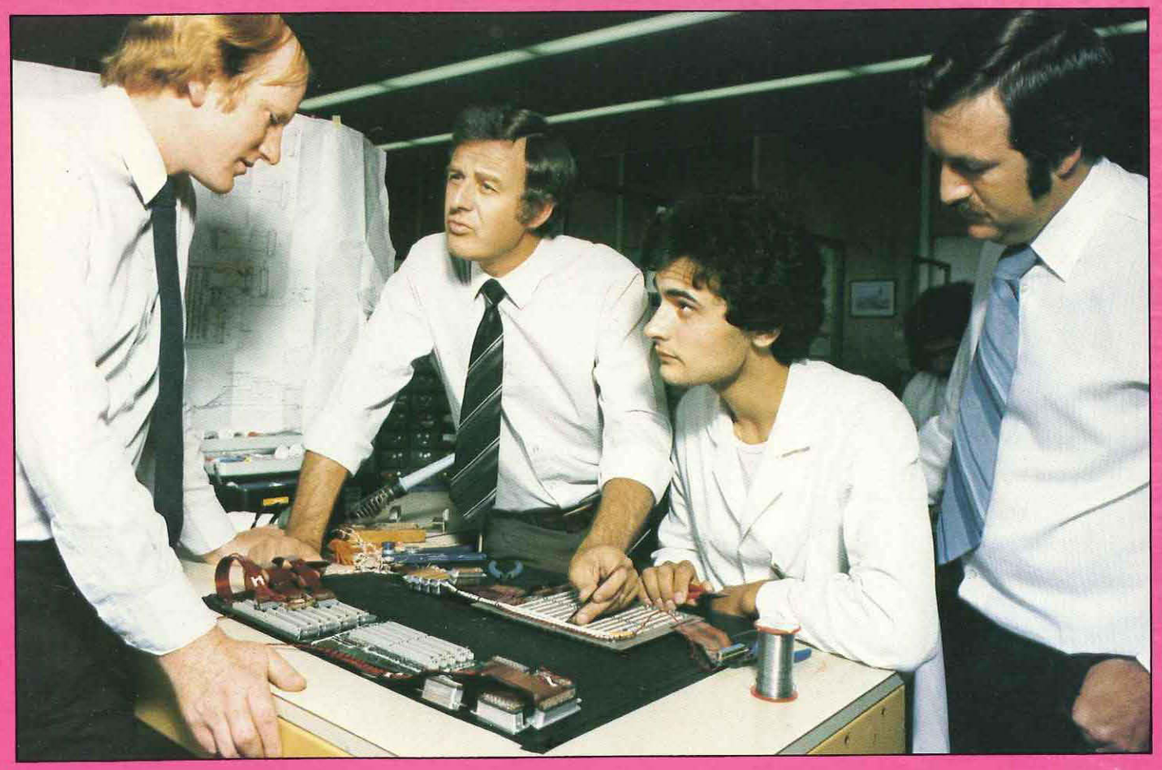
In fact, collaboration across specialised disciplines and at all levels of expertise is the fundamental basis of all our work. It's as much an essential attitude of mind as our determination to ensure that our company stays right at the forefront of future technical development.

So, as a graduate joining one of our project teams for the first time, what are you likely to find?

First of all, you'll have been carefully chosen for the contribution your specific talent and interests can make to the work of that team. Whatever your discipline, you'll be expected to put your own points across effectively in discussion. And very soon you'll be making real decisions, and helping to keep up the team's forward momentum.

If you're a software engineer, computer programmer or applied mathematician, you could find yourself working alongside electronics engineers and applied physicists.

It's no ivory tower. Solving immediate problems calls for very real commitment, and if you have the talent that this company needs in order to progress, we'll draw it out and build on it. If you're ambitious, recognition and reward go hand in hand.



No simple solutions to complex challenges

Marconi Avionics currently supplies advanced airborne electronics for more than 150 different types of aircraft in daily use all around the world. Our products cover applications from communications (air-to-air and air-to-ground), navigation and flight control, to sophisticated weapon control systems and elaborate defence radar networks.

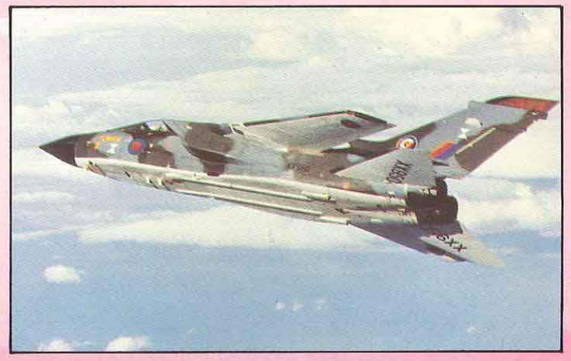
Modern aviation has come to depend on the integrity and flexibility of such systems, and the advent of microminiaturisation in digital processing has resulted in considerable space saving. Now many more inter-related systems can be employed simultaneously. Benefits are immediate and embrace fuel economy, reliability, mission effectiveness and, of course, safety.

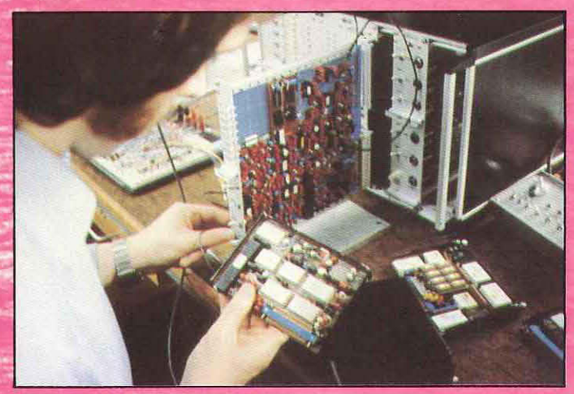
As just one instance, a type of radio navigation system that we pioneered thirty years ago has been progressively refined by the impact of new technologies, achieving a twenty-fold weight reduction and slimming down its volume to one-fortieth of its former bulk. That puts the Walkman phenomenon into perspective!

We pride ourselves on coming up with a range of workable solutions for every fresh technical conundrum posed by our customers. But of course we usually can't afford to wait for the client to voice the question. Even if we don't have to cross that particular bridge for some time to come, we're bound to be aware of the logical next piece in the complex technological jigsaw.

As with the case of very large scale integrated circuits, present paths of development can't be pursued indefinitely. In constructing chips, standard photographic processes come up against such limitations as the wavelength of light itself; similarly in our business we constantly have to be prepared to radically re-think every aspect of powered flight and control technology.

But for us, facing up to these complex challenges is an everyday task.





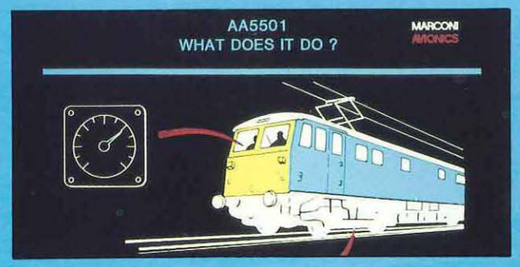
From initial concepts to effective realities

Our Divisional Structure
A mixture of organic growth and historical necessity has resulted in individual projects being pursued by separate Divisions.

Each operates as a completely autonomous unit, compact and streamlined enough to make decisions fast, and to concentrate their own resources on meeting each client's requirement most effectively.

And, although each Division is a profit centre in its own right, the worldwide facilities and buying power of the mighty GEC organisation are there to draw on if necessary. So investment in new premises or computer aids is never slow. That's good to know when you're considering a career with us. Because we believe just as firmly in developing our human resources.

The individual sites' activities will be detailed further in the course of this booklet. But to give you an idea of the way we tackle problems, let's consider four recent projects, from Basildon, Borehamwood, Rochester and Nailsea.



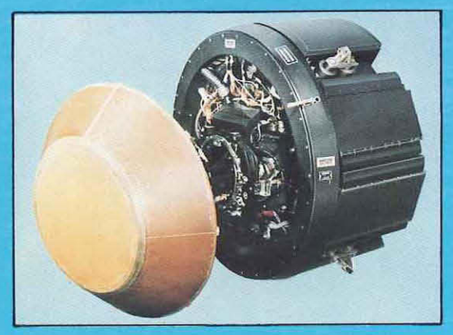
PROJECT: A Speed Sensor for land-based applications
Airadio Products Division at Basildon have been in the forefront of Doppler radar technology for the past 30 years. In early 1981 a requirement was identified to provide accurate vehicle speed data (independent of wheel rotation) for railway slip-slide systems, truck anti-snake and vehicle location systems.

The resulting development programme has now produced the AA5501 Doppler Speed Sensor. This uses two Gunn oscillator modules mounted in line to transmit and receive microwave energy, combined with microprocessor control and Doppler frequency techniques.

The package has a range of 0.4 — 250 km/hr, with forward or backward sensing capabilities. Its housing and components have been built to withstand the high humidity, vibration and shock levels which it may encounter during its working life. This device has already been installed on the Magnetic Levitation railway vehicles at Birmingham Airport.

PROJECT: Tornado — Airborne Interception Radar
Today and in the foreseeable future, the primary air threat is from fast, low-flying intruder aircraft either singly or in groups, and the radar system of a modern interceptor must be able to continue effective operation in the face of extensive electronic jamming.

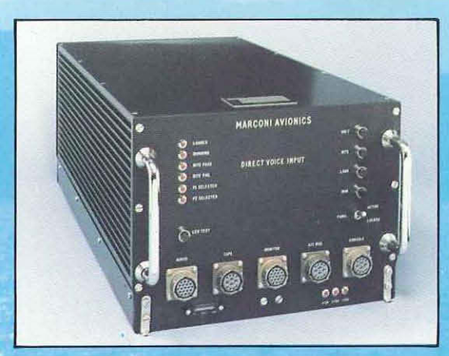
Following two decades of research and trials with coherent Doppler radars, Borehamwood's advanced Airborne Interception Radar has been produced for the Tornado F Mk2 interceptor squadrons of the RAF. Extensive flight trials for this new radar have been carried out in specially-modified Canberra and Buccaneer aircraft, and the project is about to go into production for entry into RAF service in 1984.



PROJECT: Speech Processing — Direct Voice Input
DVI applies automatic speech recognition technology to the cockpit environment, motivated by the fact that pilot workload in a modern military aircraft is unacceptably high. The pilot has to spend too much time managing complex suites of equipment when he should be head-up with his hands on throttle and stick. So voice control has great benefits to offer, if it can be effectively integrated into cockpit operational procedure.

A cockpit simulator was constructed in Rochester's Research Laboratory and various speech recognition techniques evaluated. The results showed DVI to be both feasible and highly beneficial. But they also highlighted severe weaknesses in all commercial speech recognisers. So a team was formed to design a flightworthy continuous speech recogniser.

This is a multi-disciplinary project requiring expertise in software, firmware, multi-microprocessor systems, high speed logic, signal processing, pattern matching, mathematics, ergonomics, human factors and systems engineering. The first prototype unit is scheduled for flight trials at the Royal Aircraft Establishment, and system developments will continue, using VLSI techniques for miniaturisation.

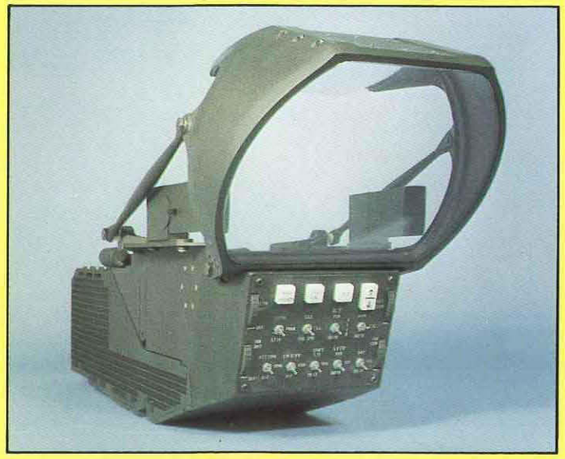


PROJECT: An Underwater Electrical Connector
As part of a development programme for underwater control systems, the Nailsea project team identified the need for an underwater electrical connector. They proposed to use a transformer coupler, essentially an electrical transformer sawn in half. The team involved mechanical engineering and material science specialists as well as electronic engineers and designers. Their solution is shown in the photographs.

Each part of the transformer coupler is made using a glass reinforced plastic case, with the transformer, core and winding securely potted inside using epoxy compounds. Long-term testing in pressure tanks has established that the GRP is very resistant to sea water corrosion, and the metal parts are removed from water contact — enabling safe disconnection and mating under remote control.

This Power Inductive Coupler can deal with power levels up to 500 watts at depths of 1000 feet. Although these are modest requirements for ground-based equipment they represent a considerable step forward in the design and development of sub-sea systems.

Rochester



The headquarters of the Group, employing around six thousand people in twelve Divisions, is based in Rochester, one of the historic Medway Towns in Kent. Work here is concentrated mainly on the integral systems of the aircraft, spanning control systems, navigational aids, airborne displays and test equipment, as well as an important new hardware/software package for the U.S. Air Force and Navy known as SCADS (Standard Central Air Data Computer System).

One of the most spectacular avionics success stories began here 21 years ago, as head-up displays (HUDs) became an essential development alongside the low-level strike capability of modern fighting planes. We developed a sophisticated optical method of projecting flight information onto a screen directly in the pilot's line of sight.

A further refinement has recently been introduced, so that night-time flying is now no more difficult than a normal daylight mission. We have harnessed holograms to an infrared camera to reproduce the outside world on the same screen, now offering a massively increased field of view. This new unit, part of the USAF's LANTIRN (Low Altitude Navigation, Targeting Infrared for Night) system, could be worth £100M of export business. Indeed, our exports have contributed £500M to Britain's balance of payments over the last ten years.

But our work isn't exclusively for military applications, although the very tight constraints of defence contracts provide a unique proving-ground for today's most advanced technical concepts.

Turning to the competitive world of civil aviation, it's some indication of our international status that we were invited to lead the Anglo-French team working on the Automatic Flight Control System (AFCS) for Concorde. This equipment has also been specified for commercial use on the BAC One Eleven.

In all modesty, there's hardly an aircraft of any consequence in the air today without the aid of some piece of Marconi Avionics hardware. Our Full Flight Regime Autothrottle for the 747 is currently used by 21 operators worldwide, and the 757 uses our Engine Supervisory Control for its RB 211s.
Bringing the story right up to date, our development of "intelligent" self-monitoring slat and flap controls for the A310 Airbus, like all our most ambitious experiments today, shows the way towards the standard aviation practice of the future.

Borehamwood

Radar, digital signal processing and lasers are the mainstay of our Borehamwood site and its satellites in Hertfordshire and Buckinghamshire. They include operations at Radlett, Hemel Hempstead, Welwyn Garden City and Milton Keynes.

In all, just over three and a half thousand people are employed across a number of separate Divisions, and Borehamwood's Research Laboratory is engaged on the essential spadework for the projects of the next decade.

The largest electronics contract ever awarded in the UK was won by Marconi Avionics: Airborne Early Warning (AEW) Nimrod now in production at Hemel Hempstead, who are also developing an appropriate range of special simulations and test equipment.

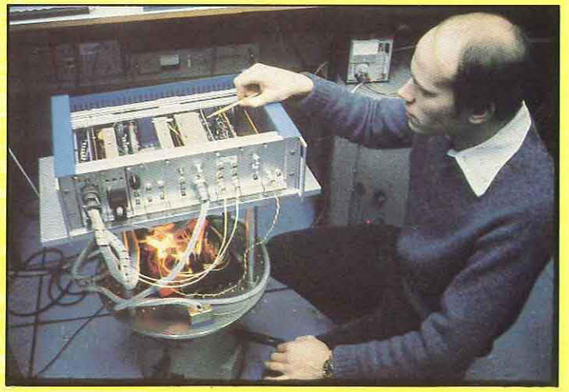
Interceptor radar for Tornado is another substantial contract involving Borehamwood and its satellite unit in Milton Keynes. This is pulse Doppler equipment able to operate in several modes, all using the latest microwave techniques to automatically detect and track airborne targets.

Also in the field of microwaves, Borehamwood are exploring millimetric wavelengths in order to distinguish between man-made objects (which have smooth surfaces) and natural ones (which, excepting water and ice, are rough).

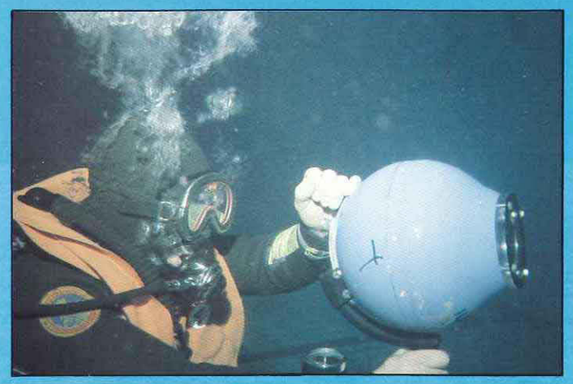
Lasers have great potential, and one of the uses Borehamwood visualise is in gyroscopes: a laser would not be effected by acceleration and so orientation can be made accurate even under 20G.

Lightweight military battlefield radars have reached new levels of portability and effectiveness, and lucrative spin-offs into the security and surveillance markets are being vigorously pursued. A particular application of this new technology developed for the National Coal Board measures coal levels in underground bunkers.

Our work in the Applied Physics Division is universally acknowledged as pre-eminent in its field, particularly its medical x-ray applications. And developments currently under way in CO^2 lasers will undoubtedly reinforce existing successes and help to underscore the remarkable versatility of this uniquely progressive company.



Basildon



In addition to avionics activities in airborne radio communication and navigation, our Basildon site include electro-optics as a very important area of expertise. Applications for such advanced technology are increasingly significant: from torpedo navigation devices as part of the Stingray project to helicopter-borne infrared surveillance cameras; from flameproof cameras for use on oil rigs to a television camera capable of working underwater without colour distortion at depths of up to 2,000 feet. This enjoyed the full glare of publicity when a television programme was made about Prince Charles' dive on the wrecked Tudor warship 'Mary Rose' in the Solent.

In the airadio field, our Doppler Velocity Sensor (AD660 — now FAA and CAA certified) has made a significant contribution in. monitoring groundspeed during take-off and landing, when such information is critical.

Products also include the TACAN for Tornado, and secure communications systems for Naval and RAF aircraft are continuously in demand. On the radar side, line replaceable units (LRUs) for many of Marconi Avionics' most advanced systems — including Foxhunter — are manufactured at Basildon.

Television surveillance also goes airborne for our specially stabilised helicopter-mounted camera system known as Heli-Tele, currently grossing millions of pounds' worth of export orders every year. Basildon's unique solid state charge coupled device (CCD) camera is, among other uses, placed in an aircraft cockpit to record the information from head-up displays manufactured at Rochester.

Security is another area of considerable technical interest, and we can harness seismic and infrared sensors, daylight and low-light level televisions, displays and communications to a wide range of perimeter protection systems. These have been supplied to major industries worldwide and also guard vital public utilities.

So the breadth of our involvement at Basildon may certainly be seen as representative of our whole approach — in- depth research supported by state-of-the-art production capability.

Nailsea

One of our most recently established sites is at Nailsea, ten miles south west of Bristol. Here we are developing innovative electronics for sub-sea application, together with the more established techniques of design and development associated with power conversion technology.

The Offshore Projects Group is currently involved in the B.P. Magnus Field, 150 miles north east of the Shetlands. They are working on electronic control and monitoring systems to help solve the problems of production control arising from remote well heads 600 feet down on the sea bed. Although this type of work is different from that traditionally undertaken by Marconi Avionics, the skills and expertise relied upon are very similar.

The Power Conversion Group produces a broad range of both low and high voltage power supplies. The project teams continuously examine techniques to enhance the development of smaller, lighter, more efficient power conversion units. The PCUs are designed principally for military application, and must consequently be able to withstand far more rigorous conditions than would be necessary for commercial or industrial applications. These problems, together with the tight time-scale which is invariably involved, create many challenges for the power conversion engineers.

Preparing for the 21st century

Inevitably, the information in a publication of this nature cannot pretend to be exhaustive. With the vastly accelerated pace of technical change today, many of our words will be out of date before the ink is dry on the page. But that's the nature of progress, and our commitment is total.

We have tried to give you some idea of the solid base from which Marconi Avionics is now poised to press forward through the next crucially important decades. And of the contribution that you could make in helping us to do so.

We've already talked about the way our project teams work. So you'll be aware that we believe in throwing you in at the deep end, right from the word go.

We hope you'll take it as a compliment, rather than as an imposition. Because it's really a vote of confidence in your ability to adapt fast and cope with the pressure of combining technical exploration with commercial considerations.

From the first time you meet your colleagues to work on your initial assignment, we'll be looking to you to grow rapidly in professional stature. So that when the time comes, you will be numbered among the people whose responsibility it will be to lead us out of the twentieth century and into the next.

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