YOU AND AVIONICS
FORMULA FOR SUCCESS

AVIONICS
ONE OF THE FUNDAMENTALS OF FLIGHT

To a bird, flying is as natural as walking is to a man. But for man, flying is at best a clumsy imitation of what birds achieve with such grace and ease.

One of the functions of avionics is to bring manned flight closer to that state of natural perfection – to make flight safer, more efficient, and to put man more firmly in control of an alien environment.

Avionic systems are more than just optional extras in a modern aircraft. Although they're often tucked away out of sight in the aircraft's fuselage and cockpit, and their function and purpose is only dimly understood by the layman, avionic systems are as indispensable to a modern aircraft as its engines and airframe. Avionic systems don't merely help an aircraft to fly better or more safely, increasingly they literally help it to fly. In fact, the fundamentally unstable designs made necessary by the endless search for higher performance would simply never get off the ground without assistance from electronic flight control systems.

Today, avionic systems make a fundamental contribution in every area of flight. Perhaps the best way to understand what avionic systems are, and what modern avionics technology can achieve, is to look again at a bird, whose own avionic systems have been perfected over millions of years of evolution.

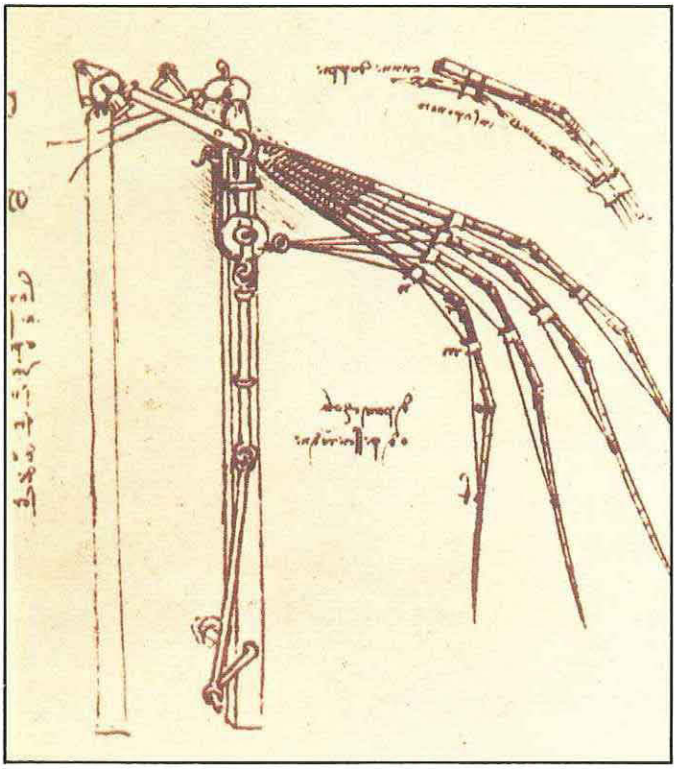
A bird can navigate with pinpoint accuracy over long distances, often to within a few yards on a journey of thousands of miles. Avionic systems help an aircraft do the same, for example, to land blind within feet of a pre-determined spot.

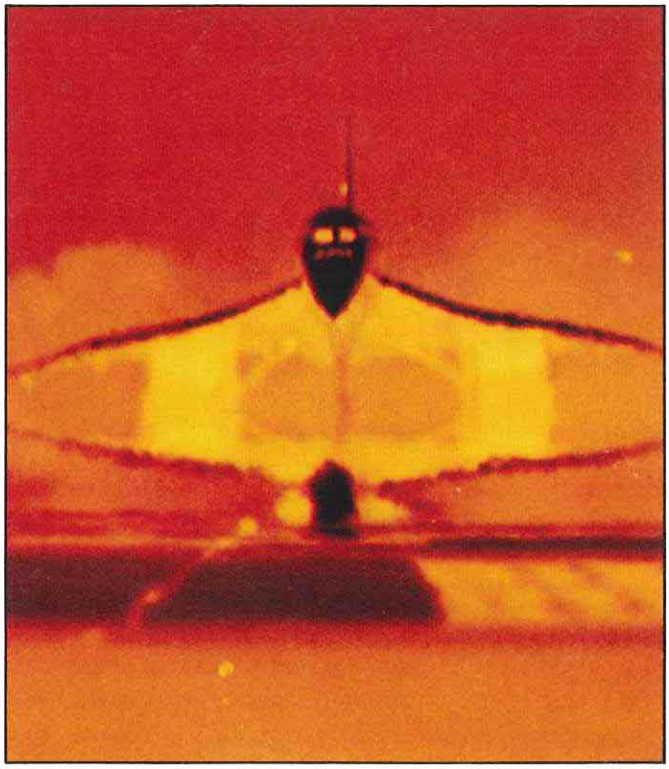
A bird has almost infinite manoeuvrability and control. Avionics can materially enhance the control characteristics of a high-performance aircraft, transforming a basically unstable design into one which is pleasant and predictable to fly.

A bird in flight can communicate, and can warn of approaching danger. Avionics help a pilot to communicate, with other aircraft, or with the ground.

A bird can defend itself. Avionics are behind the defensive and attacking capabilities of all modern military aircraft.

Today, flight and avionics are inseparable. And more than in any other field of electronics, avionics engineering is totally involved in the final application – helping aircraft to fly.





HOW AN AVIONIC SYSTEM TAKES SHAPE

Mention the word 'avionics' to a man in the street, and the likely response (if any) will be that it is something to do with black boxes.

To a very limited extent that's true; avionic systems do contain a number of 'black boxes' – the line replaceable units round which the system is built.

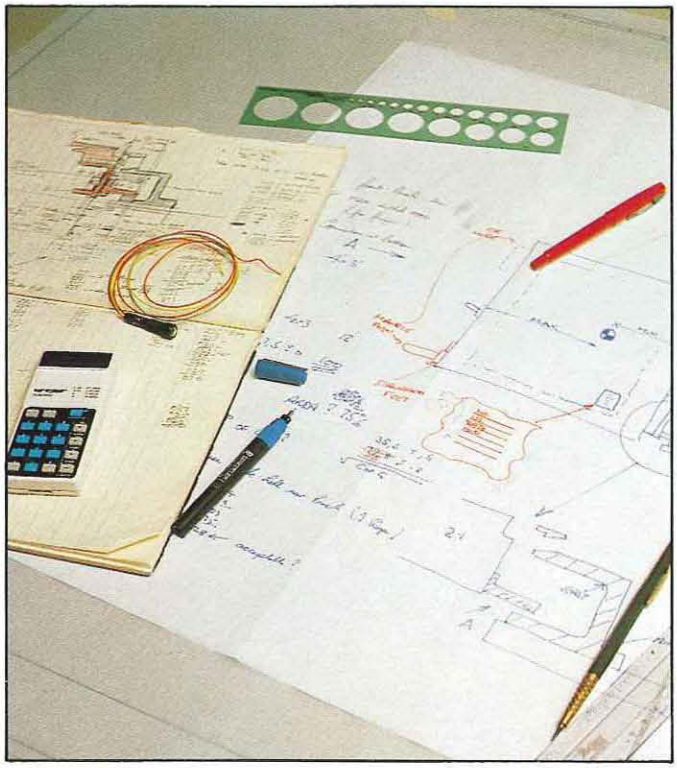
But at Marconi Avionics, we're not in business to build black boxes, but to design, develop, manufacture and install complete avionic systems.

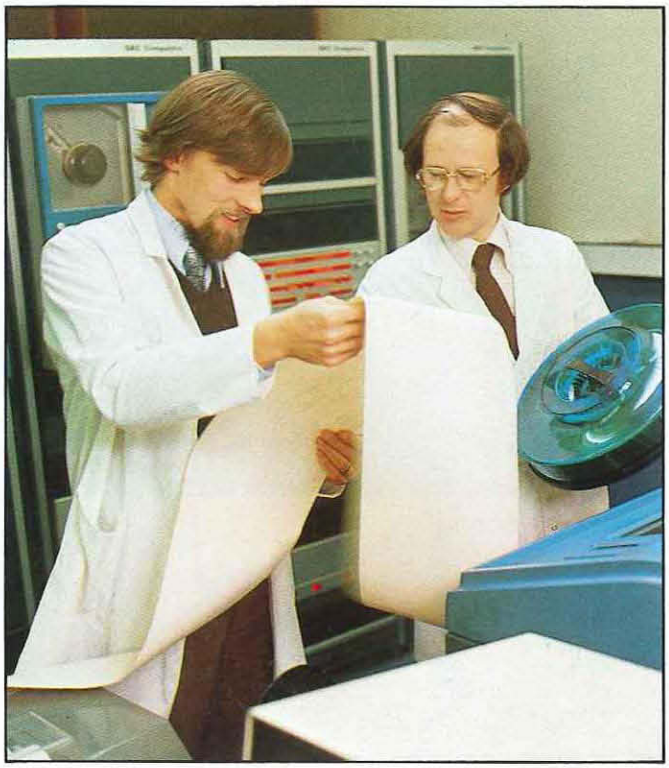
The difference is fundamental – and it's a difference that accounts for our special need for graduates, and for the satisfaction and involvement that we can offer them. Developing the sophisticated circuitry of an avionics 'black box' would certainly hold a lot of interest – for a time. But when you're a member of one of our engineering teams, your horizons aren't limited to a collection of components or a bread-board circuit on a bench. You have to apply your mind to technical problems on an altogether bigger scale – fundamental, theoretical problems that often go back to the basics of flight itself. For example, the engineers developing tomorrow's flight control systems will have to concern themselves with the basic design philosophy of the aircraft they're designing for.

Where do we start? Where does the development of an avionic system begin? It begins with a problem – a customer's problem which they have thrown at us in the hope of finding a practical solution. The problem is theoretical, and the first step towards the answer is equally theoretical – an outline definition, a shadowy concept of what the system will be and do. Systems engineering is arguably the most creative part of a highly creative engineering process. Because if someone asked you to develop a new instrument landing system, or to find a way for projecting flight information into a pilot's view no matter which way he turns his head, you wouldn't come up with the answer by thinking in straight lines.

Systems engineers at Marconi Avionics come from all kinds of scientific and technical disciplines. What distinguishes them is an unusual breadth of intellect – a mind that can encompass the scale and complexity of the problems that are our stock in trade, and then create the right answers.

Suppose your theoretical system looks



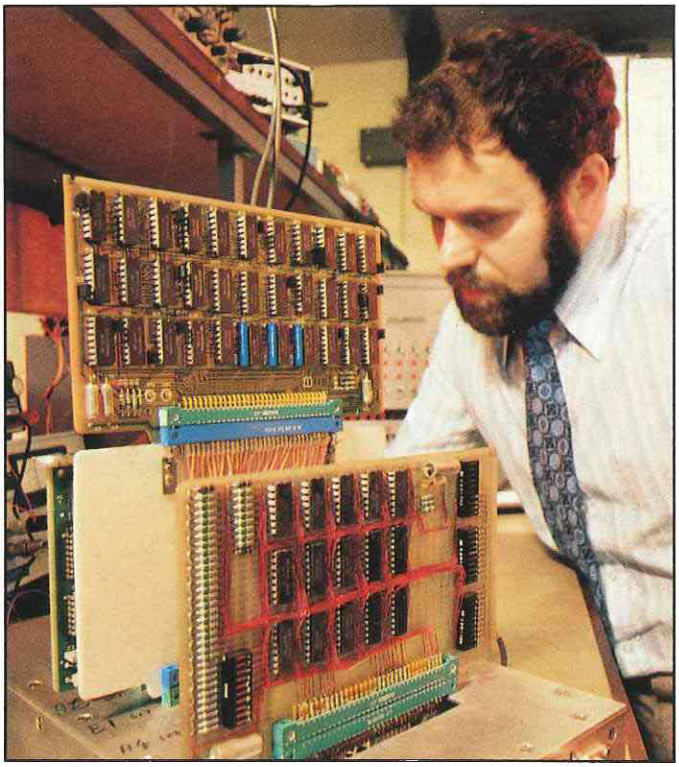


good on paper. How can you prove it will work in practice without committing millions of pounds and thousands of man-hours on what might eventually be an abortive exercise? The answer is to produce a mathematical model of the system, and carry out an exhaustive series of simulation studies. Digital techniques are used increasingly in avionic systems and increasingly, a system's functions and the situations it will be called on to handle can be expressed in mathematical terms. Modelling and simulating a complex avionic system can be a gigantic task, and calls for equally gigantic computer processing power, together with the programming and mathematical skills to use that power effectively.

So far so good. Now comes the task of giving a theoretical system its concrete shape. The basic function here is circuit design. But our circuits are very far from basic. In applications where the penalties for component failure can be fatal, component selection becomes critical. Sometimes, the best theoretical circuits, take up too much space or generate too much heat, so a compromise must be found. Circuits which may work individually may enigmatically fail when interfaced. Or they may perform up to their specification on the perfectly clean power supplies of the lab, but not on the supplies available in real life, in a real aircraft. And always at the back of the designer's mind is the aircraft itself, and the special challenge it poses to his or her engineering ability.

But even when the system is working on a bench or in a test rig, it's still a big jump before it's installed in the cockpit or fuselage of an aircraft. How will it take to being accelerated at 3g, vibrated at high and low frequencies, exposed to extremes of temperature and barometric pressure? How will it physically fit into the aircraft anyway?

It's a long way from the systems engineer's first pencilled thoughts and the path is never easy. But by pooling our knowledge, by a tight interaction and integration of disciplines, by co-operation and collaboration, we get there. No matter how long it takes, or how many problems we encounter along the way, the formula works.



THE MARCONI AVIONICS FORMULA
ORIGINAL IDEAS PLUS AN ENVIRONMENT WHERE IDEAS BECOME ACTION

Marconi Avionics is a company that's involved in some highly advanced technologies – including some in which it leads the world.

It's also a company which is outstandingly successful commercially.

The combination of advanced technology and commercial success is one that, sadly, seems to have eluded many British companies. So how have we managed to get the formula right, and to turn original ideas into successful action?

The future that starts with the past

One of the strengths of Marconi Avionics is that we're by no means newcomers to the areas of technology in which we excel. Our involvement in avionic systems started back in the 50's when, as Elliott Automation, we made a number of significant developments in fields such as pilots' displays and airborne radar. So twenty years ago we already had established close and productive links with the aerospace industry, as well as the methodology of applying highly advanced technologies to practical engineering problems.

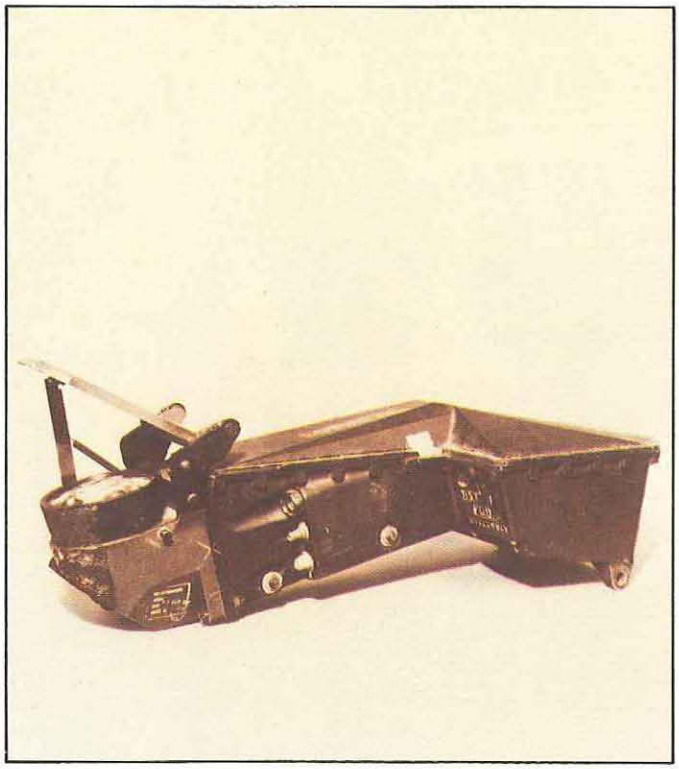
Then came the merger with GEC, which in the meantime had merged with the Marconi Company – an organisation with a unique name and a unique place in the history of electronics.

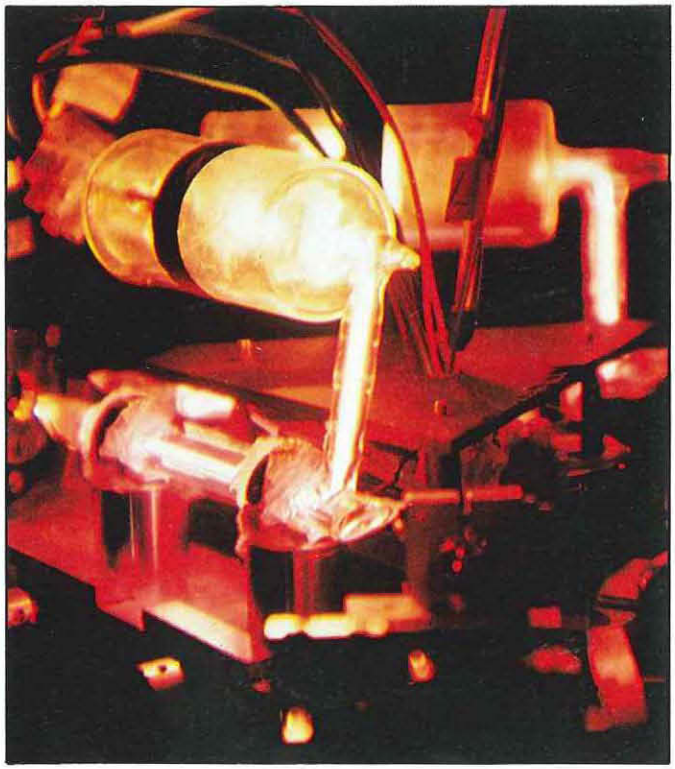
The merger produced an organisation of unparalled strength and experience – the pre-eminence in electronics which has always been associated with the name Marconi; the aerospace experience and connections of Elliott's; and the financial resources and management skills of GEC.

In recent years, at a time when the need for large-scale capital investment has proved a headache for many companies, the strength of our organisation has really come into its own, and has enabled us, among other things, to make the scale of investment necessary to develop new technologies.

Generating ideas

One of the distinguishing features of Marconi Avionics is an inexhaustible stream of original technical ideas, a high proportion of which are successfully developed and implemented. With us, good ideas end in production on the factory floor, not in the waste-paper basket. The volume of new thinking within the Company is probably best demonstrated by our increasing diversity. As we develop a new technique, so we develop completely new applications for that technique.





For example, our pioneering work in digital signal processing – originally for airborne radar applications – led us into completely new applications, such as sonar. And within two years, a small, specialist team investigating digital signal processing had grown into a full-scale development and production unit occupying its own substantial premises.

R & D at the grass roots

Perhaps one of the reasons why we're so good at generating and developing ideas is the fact that most research and development work takes place within small groups who are close to the final application, and who are therefore in a good position to judge whether an idea is worth developing or not. We have facilities for basic scientific and technological research on a large scale and at the highest levels. But the majority of our ideas originate from the small groups of men and women who form our basic working units – the project teams.

The achievement of individual teams in originating and developing new ideas can be spectacular. One such group were held up in their normal work, waiting for a number of vital components to be delivered. So they devoted their unexpected spare time to a separate project which they themselves created. Two weeks later, they had developed a TV camera in which charge coupled devices replaced the conventional cathode ray tube, and whose lens took up more space than the whole of its electronics.

Anything you need, just ask

The example we've just quoted illustrates another of our strengths – and another major element in our formula for turning ideas into actions.

We're fortunate in being a company with massive financial resources. Even though we're highly cost-conscious and intolerant of waste, we have both the means and the willingness to invest heavily in the plant, machinery and equipment that will help a project succeed, and help our engineers make the most effective use of their abilities.

If you discover a real need for a piece of specialised equipment when you're in the middle of a project, all you have to do is ask for it.

You'll be surprised how quickly it arrives.

YOUR FIRST FULL YEAR IN AVIONICS

Sometime within the next few months, you'll graduate in your own particular engineering, scientific or numerate discipline.

Twelve months later, you could be an established member of a project team at Marconi Avionics, with positive achievements to show for your months of work, and with a positive idea of where your career is leading.

How do you make such a profound transition in such a relatively short time? What's more important, how do we help you make it?

The best introduction to work is work

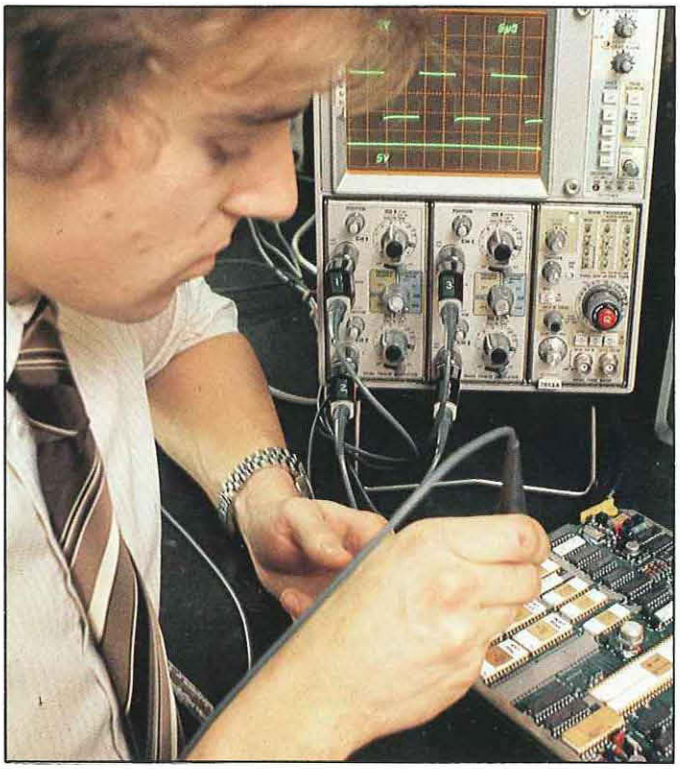
At Marconi Avionics, we don't believe in a lengthy, formal introduction to the Company and its work. We believe it's far more satisfactory for graduates to become immediately involved in a specific job, and to associate themselves with a specific project.

So by the time we make you a formal offer, we'll already have identified a role for you in a project team whose work ties in as closely as possible with your degree subject and your own special interests.

You'll join that team not as an 'extra', but as a full working member. Your team's objectives, and your own personal objectives, will be clearly defined. You'll have a real job of work to do – a contribution to make which will make big demands on the knowledge you've gained at university, and on your ability to apply that knowledge in completely new ways. At the same time, through working contact with other members of your team (who will probably come from totally different backgrounds and disciplines to yours) and with other teams working on the same project, you'll start to build your own broad experience base.

The concept of the project team is an important one, because it's fundamental to our whole approach to large-scale capital electronics projects. Irrespective of the size of the project team (and many of our projects number among the largest in Europe) the overall task is broken down into small task cells, each of which is the responsibility of one project team. In this way, we reduce projects to manageable proportions, and, more important still, enable individual men and women to identify closely with the project they're working on, no matter how big it may be.

Working in this way, even your first year can give you tangible achievements to look back on. You may have written a software module that's part of a complex suite of real-time programs. You could have designed a logic module for a



flight control system. Or designed a circuit so as to overcome the problems of excessive power consumption or heat generation.

Whatever your achievement, it will be real, it will be yours, and it will make a significant contribution to the success of the overall project in which you'll be involved.

Not bad for your first year's work.

...and future years

For your first year or so you'll be too busy adjusting to your new way of life to give much thought to your long-term career.

But as you find your feet, you'll start to look ahead a bit, to bigger jobs with more responsibility and more money.

At Marconi Avionics, it's no exaggeration to say that we can match the career demands of even the most ambitious graduate.

For a start, our exceptionally high, sustained rate of growth means that we're generating a lot of new jobs all the time. Which is why, at any of our locations, you'll find a rising generation of project managers who are still in their twenties.

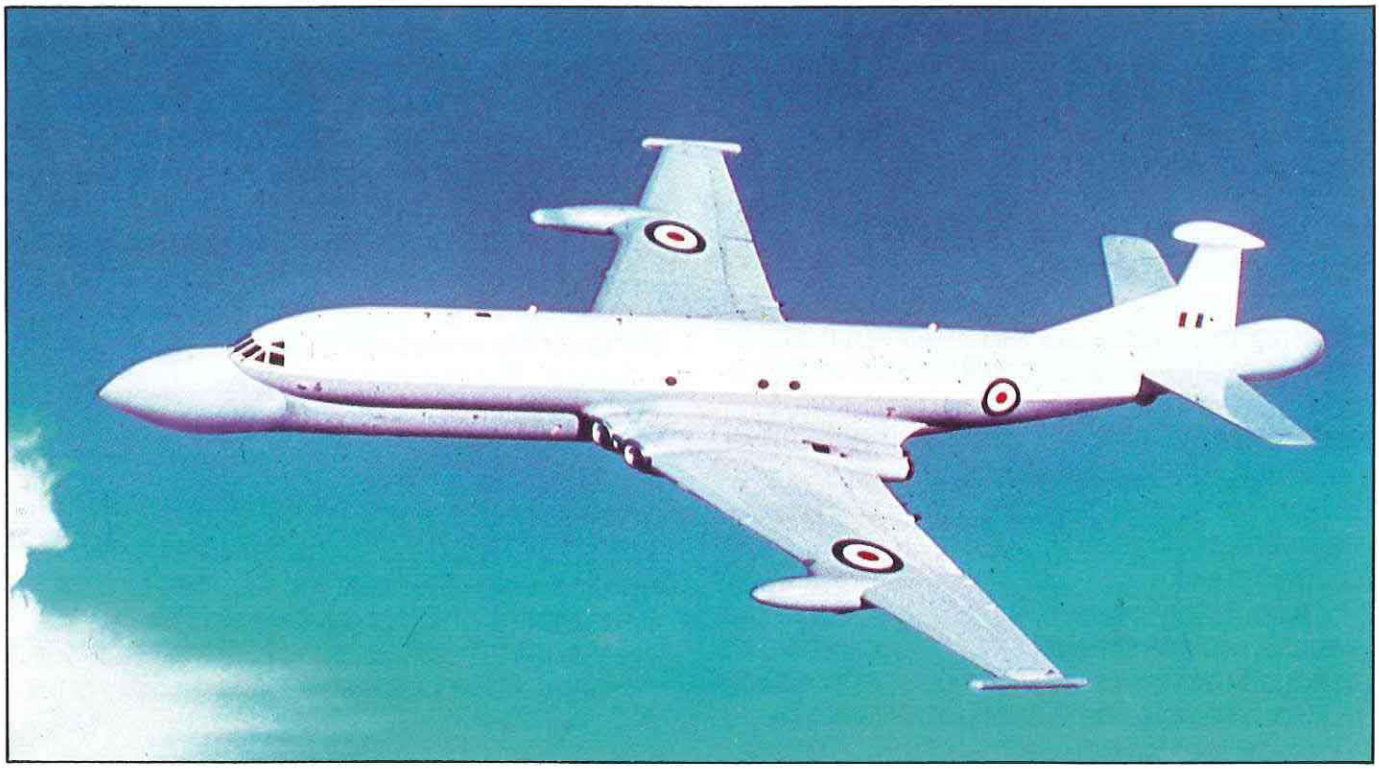
Even in the very long term, working with Marconi Avionics can satisfy your career goals, no matter how high or how rarefied they may be.

The majority of our engineers develop their careers through assuming responsibility for the work of increasing numbers of people. Theirs is the challenge – and the satisfaction – of leading and motivating a team; of making themselves personally accountable for delivering on time and within budget; of deciding engineering approaches to problems and defining specific technical tasks.

But important as such men and women are, we need an equally important minority of people who quite openly shy away from the problems of man-management. They're the technocrats, the people who have chosen to make themselves experts in their own highly specialised field of technology and who have an invaluable contribution to make throughout our business.

The day may still be a long way off when you decide which of these two contrasting profiles more accurately describes you.

But when that day arrives, you can be sure that we'll have the right role ready and waiting for you.



THE MARCONI AVIONICS CHECK LIST
WHERE ARE WE?

Marconi Avionics operates from three main locations, all in South East England or the Home Counties.

Rochester, Kent

Our Head Office: Marconi Avionics Limited, Airport Works, Rochester, Kent ME1 2XX. Telephone: Medway (0634) 44400.

A wide variety of projects are in hand at this establishment such as an advanced automatic throttle control system for Boeing 747's; flight control systems for Concorde and the British and French versions of the Lynx helicopter; pilot's head up displays for the American F16 and the A7 Corsair 2 aircraft; air data systems for the US Army Cobra AH1S helicopter and acoustic processing and display systems for the British Nimrod MR Mk 2. Other work covers such projects as microprocessor applications; inertial navigation and engine control systems; gyro devices, and control systems for North Sea oil rigs.

Basildon, Essex

Marconi Avionics Limited, Christopher Martin Road, Basildon, Essex. Telephone: Basildon (0268) 22822.

Here we are engaged in a variety of projects covering advanced airborne communications and navigational systems, CCTV for commercial, industrial, underwater and military applications, infra red and thermal imaging systems for surveillance and monitoring, and even underwater acoustics. We also have a future systems laboratory to identify the systems' problems of tomorrow – and create their solution today.

Borehamwood, Herts.

Marconi Avionics Limited, Elstree Way, Borehamwood, Herts. Telephone: 01-953 2030.

At this establishment we are working on airborne and interceptor radars for such aircraft as Nimrod and Tornado, battlefield surveillance radar; lasers for navigational and industrial applications; radiation devices for medical and industrial use; intruder alarms; software development; thick film production and general research activities.

Environment

All our locations are right on the doorstep of areas which combine attractive countryside with an equally attractive choice of accommodation.

For example, the Weald of Kent, with its hopfields, the coastal resorts of North Kent, and towns which have their own special place in British history, such as Canterbury are all within easy reach of Rochester, itself a city of historical interest.

Basildon can't claim to be an outstanding natural beauty, but it's right on the edge of some of the most unspoilt and least discovered areas in the whole of the South East. The Essex countryside is open and rolling and the villages with their highly decorated houses seem somehow to have escaped 20th century.

For anyone whose idea of fun is messing around in boats, Essex is one of the biggest sailing and boating centres in the UK.

Much the same applies to the Hertfordshire countryside to the North of St. Albans, only here the countryside is more hilly and wooded, the villages even more closely tucked away in the landscape. St. Albans is a short journey away from Borehamwood. It's a town that still bears ample evidence of its long and varied history.

But if our three locations are close to the country, they're also within easy reach of London, which in each case is less than an hour away by train.

Our United States interests are served by Marconi Avionics Inc., Atlanta, Georgia, USA.

How can I get more information?

By writing to the Personnel Officer at any of the locations.

Working away from base

Many engineers with Marconi Avionics have the opportunity to spend a certain amount of time away from their usual location – for instance, when a system is being installed in an aircraft, our engineers have to be on hand to cope with any unexpected problems that may arise. As our export volume grows, so does the chance of being sent to an aircraft manufacturer's location in the U.K., Europe or America.

After work

As you'd expect in a company where a large number of lively-minded young people work closely together, many tend to base much of their social life on the sports and other recreational facilities which their own location has to offer. So no matter which of our three locations you join, you'll find facilities already in existence for most majority sports – and many minority ones.