GEC AVICNICS

www.rochesteravionicarchives.co.uk

TECHNOLOGY IS OUR TRADITION

When William Elliott established his successful instrument making business in London, in 1800, he laid the foundation of a company which has grown to be Europe's leading producer of electronic systems for aircraft -GEC Avionics Limited.



Formerly Marconi Avionics Limited we bear our new name with pride, as a major part of GEC, the United Kingdom's foremost engineering group.

From its very foundation, our company has made many important technological achievements, in fields as diverse as scientific, instruments, computing, telegraphy, radio, navigation, automation, radar, electro-optics and electronics of every kind.

This record of achievement, over many years, has been achieved by determination to succeed, and through innovations in technology and resource management. The same qualities are applied to the most challenging projects of the present day.

Technology is indeed the proud tradition of **GEC AVIONICS**



The BAe Jaguar, with special "strakes" (shown), depends on the GEC Avionics digital flight control, at the heart of the aircraft's "fly by wire" system, for safe, stable handling by pilots.

39L XX

submarine telegraph repeater set, using Wheatstone's principle, was produced in 1895 by Elliott Brothers (London) Limited.



19th Century balloonists flew with Elliott instruments, which were also fitted in the earliest of aeroplanes, like the Vickers Gun Bus.



Marconi AD1 Communications System c 1919. The airadio and electro-optical business of Marconi were combined with Elliott's flight automation and radar business in 1967. It is this same team which has grown to become GEC Avionics Limited.

DEDICATION IS OUR STRENGTH

GEC AVIONICS

GEC Avionics Limited is a wholly-owned subsidiary of GEC, the United Kingdom's most powerful engineering group, with the resources and experience to tackle projects on an international scale.

Business is conducted by a number of long established Divisions, each specialising in its own field and responsible to its own customers.

This enables resources and expert attention to be dedicated to projects large and small.



This schematic presentation should not be taken to represent the precise legal or trading relationships between the organisations shown.



Divisions are grouped into three Establishments, each with modern factory sites.

The company is a highly efficient team of 12,000 men and women, many of whom are professionally qualified scientists and engineers, supported by skilled technicians and crafts people.

With over 2.4 million sq.ft. of well equipped premises, the company leads Europe in the production of avionics and supplies 15% of the combined UK capital electronics output of EEA member companies.



The United States operation has its own development and production facilities.

A TOTAL SYSTEMS COMPANY

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total capability...

We deliver *total* systems hardware, software and support for applications in the air, at sea, subsea, on land and underground.

Systems, chosen for the highest standards of cost-effective performance and operational

safetv..

ASW sonar systems are installed in the Lockheed P-3C Orion patrol aircraft of the Royal Australian Air Force.

on state-of-the-art micro-electronics, electro-optics, electro-hydraulics, holographics and microwave techniques, meeting the latest international specifications.

...worldwide applications...

... including

retrofit

This world-wide business involves supplying direct to customers in seventy nations.

In addition, we have sub-contracting relationships with overseas companies.

To meet customers' international trading obligations, we have also sharing in a number of programmes.

Our total systems expertise covers the re-equipment of aircraft ission-effective systems.







All European Tornado aircraft are fitted with this advanced automatic flight control system including "fly-by-wire" control and digital autopilot/flight director.



The RAF's new fleet of AEW Nimrods are being fitted with complete Mission System Avionics.



Special "fail safe" software techniques are applied in digital electronics for slat and flap control.

lready in service, with integrated,

OUR PRODUCTS...

... in avionics

Our range of avionics, wider than any other company's, is complemented by a variety of related-technology products. Unique systems integration capabilities stem from this breadth of product experience.

tactical systems, location systems, pilot displays and night vision systems, communications, mission systems, remotely piloted aircraft, testing, research and logistics



We are pioneers in airborne radar with advanced combat and early warning systems in production. This is our SKYRANGER lightweight ranging radar.

These include systems for missile guidance and control, land navigation, vessel stabilisation, security and surveillance, subsea wellhead control, data recording,



GEC AVIONICS

Our wide range of Head-Up Display/Weapon aiming systems are chosen for new combat aircraft, and HUDWAC available for the Mirage, F-5 and A-4, are typical of systems for many aircraft already in world-wide service.



Standard Central Air Data Computers, based on these modules, can equip 30 different variants of USAF and USN aircraft, with 80% commonality and full interchangeability with existing units.

We are the main contractor for the UK's highly successful Thermal Imaging Common Modules Programme. From the 12 standard module shown any indirect-view imager can be configured for land, sea or airborne use.



AIRBORNE APPLICATIONS

civil and military transports



triplex, digital flight control electronics.

Systems and equipment for automatic flight control, automatic landing, navigation, communications and instrumentation are proven in round-the-clock operations world wide.

They include systems for helicopters, as well as supersonic, subsonic and STOL transports.



maritime aircraft

Indicators.

We supply a full complement of en-route and mission avionics for maritime helicopters and patrol aircraft, used by several nations for defence against submarines.

These well-proven acoustic processing and display systems, and more advanced performance systems under development, are geared to the requirements of many nations

BAe Nimrod MR Mk 2 equipped with our ASW Systems

and backed by experience in integrating on-board processing and displays for a variety of ASW installations.



Highly advanced AQS903 LAPADS is under development for the European EH101 project.



Our fly-by-wire systems for new combat aircraft are backed by 20 years experience in full-authority flight control.

... and related fields



magnetic tape data recording equipment for emote inspection of pipelines.



Systems supplied for defence include many for fighting vehicles.



GEC AVIONICS



Our full flight regime autothrottle control systems are installed in Boeing 747 airliners.



AD 660 Doppler Velocity Sensor, an effective groundspeed measurement system for airliners, can also be used in tactical navigation.



AQS901 ASW System is in service in Nimrod ASW aircraft of the Royal Air Force and P-3C Orion aircraft of the Royal Australian Air Force.



AQS902 Lightweight acoustic processing and display system, LAPADS, is in service on Royal Navy Sea King Mk 5 helicopters. This system can operate with free sonobuoys, or dipping sonar.

ground attack

Our avionics permit high accuracy in navigation, control and weapon aiming, by day and night, in all weathers.

Among the wide range of systems for fixed wing aircraft and helicopters are automatic flight control, Head Up Display/weapon aiming/navigation systems, laser INS, Rnav, air data and



We are the world's foremost producer of Head Up Displays. This wide angle raster HUD is the latest of over 1,500 HUDs already delivered for the General Dynamics F-16 family of aircraft.



and Head Down Displays are among 17 major systems supplied for the Panavia Tornado IDS aircraft.

stores management computers, digital map displays and many others.

These systems development and integration capabilities are applied to new aircraft and re-equipment programmes.

This unique Helicopter Air Data System measures airspeed and direction accurately, right down to the hover, on Bell Helicopter Textron AH-IS aircraft of the United States Army.



2,000 Vought A-7 Corsair 2 aircraft are fitted with our Head-Up Displays. The U.S. Navy's A-7E was the first aircraft in service with a "raster HUD" for night operations.

night vision



Actual night operations experience, worldwide, and a complete range of imaging, processing and display, systems, makes us the only avionics company able to deliver a total night attack capability — now. We can do this for new aircraft and to enhance the performance of existing fleets.o

With the FLIR picture on our wide angle raster HUD, pilots literally "see in the dark". Proven weapon delivery computation and symbology permit low altitude combat virtually as in davtime

High-performance FLIR pods, based on interoperable TICM II modules, equip subsonic and supersonic aircraft



"Cat's Eyes" NV goggles permit night vision outside the cockpit and a capability to read normally lit instruments.

AIRBORNE APPLICATIONS...

air defence



intelligence

The AD3400 multimode communications system,

adopted by British and overseas air forces, can

cover all VHF/UHF bands, AM and FM.

Rapid response and interoperability are key factors in modern air defence, in which avionics have a vital role.

We are responsible for total Airborne Early Warning mission systems, including AEW radar and communications sub-systems, with complementary equipment for combat aircraft. In addition we supply AI and ranging radars, Head Up Displays/weapon aiming systems incorporating dogfight and missile modes, together with related avionics, and air defence systems for surface use.

The GEC Avionics Skyguardian range of AEW mission systems, configured to suit the airframes of many nations, is based on the systems developed for the Royal Air Force for its AEW Nimrod Mk 3 fleet.

communications, Systems which keep the commander well informed aid tactical decision-making. An information and to fully integrated systems.

67

Current airborne communications capabilities, for example, include tactical multimode, jam-resistant and secure systems, and systems management.

Aerial surveillance is also our field, with day/night imaging/data link systems for helicopters. We also supply, and fully equip, remotelypiloted vehicles for battlefield surveillance.



important contribution is made by a range of equipments, extending



Foxhunter AI radar in production for Royal Air Force Tornado fighters.



An automatic gather and guidance system and gyro assembly form part of the semi-automatic command-to-line-of-sight system (SACLOS) of the Shorts Javelin missile.



Precision gyroscopes are supplied for the Skyflash missile guidance system



The Communications sub-system for AEW Nimrod aircraft provides clear and secure voice and data on HF, VHF and UHF for the Mission and Flight crews.



We have over 20 years experience with remotelypiloted drones and surveillance aircraft. MACHAN (depicted) is our own total systems test vehicle

SEABORNE APPLICATIONS

The widespread use of our seaborne systems extends to surface vessels, surface effect craft, submarines, submersibles and to the sea bed itself.

They include sonar processing and display systems as well as naval compass stabilisers for frigates, fast patrol boats and submarines, guidance control units and gyroscopes for torpedoes, Hovermarine autostabilisers, and thermal imagers for ship fire control/ anti-missile defence systems. For the offshore industry, there are systems employed on subsea wellhead controls, well-to-platform data links and remotely-controlled inspection vehicles.

NCS-1 is the central heading and attitude reference for many naval vessels.





GEC AVIONICS

LAND-BASED APPLICATIONS

Our equipment and capabilities are applied to road transport and military vehicles, on battlefields, in factories, in pipelines and mines, and for protecting premises.





MAVLANS "strapdown" system for land navigation and gun control gives high performance at a fraction of alternative system costs



The FASTAR battlefield surveillance radar, successor to ZB 298, features a new easy-tooperate display of perimeter and target data.



Indirect-view (Class II) imagers configured from Thermal Imaging Common Modules (TICM II) are widely used on land



Testing gas turbines automatically, using this computerised system, makes testing quicker and more reliable, prolongs engine life and saves fuel. The system has been supplied to four air forces.



HERMES, is a system which detects, identifies, tracks and counts remotely-sensed targets.

and battlefield radars, navigation and gun





Special signal processing electronics are vital to





Our Electro-optical systems guide and control shipborne missiles of virtually every kind.



Our gyro units are used in Mk 24 torpedoes of the Royal Navy.



Shipborne processing and display systems for ship and submarine sonars, in service with the Royal Navy, are micro-processor based with touch operated control and display consoles.



Rugged "strapdown" gyro assemblies and digital electronics, such as this, are at the heart of guidance and control systems of Sting Ray and Spearfish torpedoes.







Photograph, taken from an ordinary television screen, of the picture produced in total darkness by a TICM II thermal imager.

Fighting vehicle systems include muzzle velocity control, thermal imagers and laser rangefinders.



The ORION family of commercial automatic test systems are meeting industry's testing requirements, cost effectively.

A TOTAL SERVICE

As well as supplying equipment from current production, we will engineer its installation - or meet new operational requirements with competitive high technology. This total service, available world-wide, covers research, programme management, software engineering and integrated logistics support.

integrated logistics support

We have long experience in providing total support, in specialised "packages", as well as in helping customers to support themselves. Support, not limited to our own equipment, can apply from project definition right through operational service.

This policy of Integrated Logistics Support, aimed at more cost effective operations for our customers, consists of logistics planning, training, documentation, supply management, engineering support and equipment repair and maintenance.



GEC AVIONICS







Dedicated repair workshops are designed for flexibility, to ensure fast turn-round times across a wide product range.



Several million parts are stocked to support our avionic systems alone. A full range of civil and military support data is also supplied as manuals, microfiche, punched cards or audio visual material.

A TOTAL SERVICE...

programme management

Reliability testing on the production line assures

Automated parts storage in a typical division.

low defect rates in service.

In every Division, skills and resources are dedicated to each customer programme so that performance achievement, on time and on budget, can be the primary objective.

With a high proportion of professionally qualified engineers, throughout our staff and senior management, we are able to interpret requirements and respond to problems effectively. Experienced programme managers are backed up by the most modern facilities for the design and production of hardware and software to support every project phase, including:

- design
- field trials
- manufacture
- supply



A typical engineering test facility in one of ou factories.



Extensive use is made of Automatic Test Equipment throughout production. This Orion ATE, our own product, is highly cost-effective for printed circuit board testing.



ers' operational and maintenance staff are trained using our modern facilities.



- operational analysis - project definition - specification writing - development - quality assurance

- qualification

Good programme management begins with a thorough understanding of the task and the operating environment.





Extensive Computer Aided Engineering facilities also have advanced capability for custom LSI design



Professionally qualified engineers conduct and support field trials where required.

software engineering

Our wide range of advanced performance digital products is based on more than 25 years of experience in airborne digital systems of every kind.

This has created high levels of skill in software engineering to meet many different real-time computing requirements and the most stringent conditions of safety and integrity.

This expertise in applications software extends both to languages and their implementation. We are meeting the latest international standards with navigation, weapon-aiming, air data, display, flight control and other systems in current production.

As well as being an invisible asset to our hardware, software can be a deliverable item in its own right. Our capabilities in the architecture, testing, quality assurance and configuration control of high level languages, are backed by the use of the most powerful minicomputers available to industry.



Software engineering teams throughout the company are at the forefront of new systems technology. They apply engineering disciplines to every aspect of software design, development and support.

High power minicomputer, typical of many in the company.



A TOTAL SERVICE...

research

Applied research, to support every aspect of our business involves creating new techniques, solving operational problems, studying new applications and advancing the technology applied in systems.

Our laboratories have close links with product Divisions, where new ideas often originate, ensuring that research is geared to our customers' needs.

In addition to private venture working, we undertake research contracts for customers.

These include systems studies, operational analyses, VLSI and VHPIC design and development in materials, data processing, automation, optics, communications, radar, applied physics, electo-optics and many other fields.

Looking to the future, we are carrying out advanced research in such areas as Intelligent **Knowledge-Based Systems** (IKBS), parallel processing, interactive systems and molecular electronics.





An important application for IKBS is Direct Voice Input control systems for military and civil aircraft of the future.

colour map, derived from a convenient bulk store, can be presented in various forms on a variety of electronic display surfaces.

Extensive work is carried out in LSI and VLSI circuit design. This single hybrid module contains all the components needed to incorporate a MIL STD 1553 data bus into any equipment. It is equivalent to the four large circuit boards, required previously.



Aircraft actuator signalled by impulses of light can isolate an installation electrically, for greater flight safety.



Measurement of angular velocity by means of a ring laser gyro.

INVESTING IN THE FUTURE

Since our company's foundation, technology has had a historic effect on the lives of people throughout the world. To ensure future benefits in prosperity and security, industry must recognise changing needs and invest accordingly.

Our company invests in people and their skills, in facilities and products, in new technology, and, of growing importance, technology transfer.

people and skills

Having created and sustained a large team, we are developing jobs by forming new skills and harnessing new technologies.

In addition to progressive training throughout all departments, this involves initial training for new entrants including apprentices, and liaison with schools, colleges and universities. We dedicate some of our best skills and resources to young people in Youth Training Schemes, giving them real job prospects, both with us and other

About a third of our workforce, including virtually all our managers, are professionally qualified men and women. mainly in science and engineering.

GEC AVIONICS



Young people are our whole future. Alongside our regular intake of apprentices and other full-time trainees, our training for other school leavers, under national Youth Training Schemes, is resulting in large numbers finding useful employment.



Retraining extends the capabilities of those who already have industrial experience.

new facilities

Our factory sites are improved and extended to meet the changing needs of our business. New technology for research, design, manufacture and electronics, computer aided design and manufacture, hydraulics, electro-optics, microwave techniques, automatic test equipment and automated supply systems.



Part of our latest factory development at Milton Keynes.



The United States company, having expanded several times during its 21 years of operations, now has a completely new Atlanta facility.



Falcon Building at Rochester has specially stabilised foundations for high precision manufacture.

INVESTING IN THE FUTURE...

new products

technology

transfer

To meet increasing demands for system performance, improved technology is incorporated in existing products and new products are produced and qualified.

This involves the use of increasingly reliable silicon chip technology, advanced data processing, new sensors and measurement techniques and a host of other improvements.

For many years, we have been applying the technology developed for aviation and defence to many of society's other needs.

We are also working with government and academic institutions and other industries, to technologies outside our own field, wherever we can see a real requirement for them. The few examples illustrated here are typical of many others.

This J-band radar is used underground to detect the level of coal in storage bunkers.





Doppler Velocity Sensor for road vehicles measures groundspeed by radio beams as in aircraft dopplers. Sensors have been supplied for magnetically-suspended train systems.



AT DWC



Reversionary instruments for aircraft are a unique application of liquid crystal displays.



New tank sight, incorporating our CO₂ laser.

Getting oil ashore from satellite wells in the BP Magnus field depends on these "fail safe" controls and high integrity data links from each wellhead to the platform. This technology derives directly from military aircraft control systems.





SALES & SERVICE

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United States Operation

Rochester Establishment Divisions



Aerial view of Airport Works, Rochester



Towers Site, Airport Works, Rochester

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Automatic Test Equipment Division Divisional Manager: A.J. Colwell

Aviation & Service Repair Division Divisional Manager: J.A.G. Casey

Central Quality Department Divisional Manager: K.W. Boardman

Combat Air Controls Division Divisional Manager: K.S. Snelling

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Flight Controls Division Divisional Manager: B.G.S. Tucker

Guidance Systems Division Divisional Manager: R. Ruggles

Instrument Systems Division

Maritime Aircraft Systems Division Divisional Manager: R.F. Wilkinson

Powerplant Systems Division

Virtually every kind of electronic system for aviation, and allied-technology systems and equipment for defence and industry.

Specific avionics projects involving products from a number of Divisions.

Nailsea Site

Borehamwood **Establishment Divisions** and Main Departments



Rorehamwood Site



Premises at Welwyn Garden City

Basildon Establishment Divisions



Principal Basildon Site

Nailsea Establishment. **GEC** Avionics Limited, 2 High Street, Nailsea, **Bristol BS19 1BS** Tel: (0272) 865611 Telex: 444791 Manager: C.J. Frost

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Divisional Manager: J.M. Colston

Divisional Manager: I.S.D. Stitt

Head Up and Head Down Display systems and weapon aiming systems.

Computer controlled automatic test systems for production and services applications.

Repair, overhaul and after sales support. Integrated logistics support.

Quality control systems, environmental, EMC and component testing, mechanical and electrical calibration.

Autopilots, Auto-stabilisers and "Fly by Wire" Systems for combat aircraft.

Advanced technology in Avionic products.

Active controls, automatic flight control systems and automatic landing systems for transport aircraft, stabilising systems and autopilots for helicopters, control systems for RPV and drone aircraft.

Rate and attitude gyros, accelerometers, multi-axis gyro/accelerometer units, strapdown guidance and control units.

Laser and other navigation systems for aircraft, ships & land vehicles, hybrid navigation systems, weapon delivery systems.

Air data systems, stores management systems.

Airborne sonics, processing and central tactical systems, advanced flight data recorders.

Powerplant control systems. Instrumentation and monitoring. Fuel flowmeters, fuel contents systems.

GEC AVIONICS

Airborne Radar Systems Division Airborne Warning Systems Division

Wellhead sub sea control systems.

Power Conversion

Magnetic tape data recording and replay systems for military and environmental applications.

Radar systems for interdiction interceptor, close support and combat aircraft.

Real time computer-based systems and software.

Airborne warning and surveillance radar, command and control systems.

X-ray, neutron and laser equipment, battlefield radar and sensor systems, security systems.

Quality assurance, testing and calibration services.

High-performance lightweight composite structures eg. communications and radar aerials.

Radar and allied systems research.

Advanced digital signal processing systems for ship and submarine sonar systems. Thick film hybrid microcircuits.

Airborne radio communications and navigation equipment.

Command and communications systems.

Weapon guidance, acoustic signal and image processing equipment.

E-O tracking and weapon control systems video and data transmission. fibre optics. E-O sensors, surveillance: Visual low-light and thermal bands. Future E-O systems design development and feasibility studies.

GEC Avionics Limited

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