'Careers in Research and Development in the Ministry of Defence' 1973

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EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT

WALTHAM ABBEY, ESSEX

STAFF
About 900

ERDE was formed in 1945 to carry out, on behalf of the Services, research and development concerned principally with ingredients and compositions for all types of explosives and propellants; the work and staff had a strong bias towards chemistry although physics and engineering were also represented. The interests of the Establishment have now widened considerably to include many aspects of materials technology in the fields of rubbers, plastics and composite engineering materials, but the bias towards chemistry remains. A more recent development has been towards rendering scientific and technical advice and assistance to industrial firms.

The work of ERDE is organised in the following groupings:
Propellants 1 & 2
Formulation of new solid propellants and the study of ballistic and mechanical properties. Combustion kinetics. Rheology of heavily loaded, two-phase systems and the mixing of stiff pastes. Adhesives and adhesive strength properties.

Explosives
The development of explosive compositions and research on explosion and detonation.

Non-metallic Materials
New organic polymers; synthesis, characterisation and stability. Processing and mechanical properties of composite materials.

Process Research
Development and research on chemical and processing plant, instrumentation and remote-control systems, the growth and mechanical properties of ceramic whiskers and heat transfer properties of fluids.

General Chemistry
Synthesis, analysis and thermochemical properties of organic and inorganic compounds. Development of new analytical methods particularly those based on physical techniques such as chromatography, spectroscopy and crystallography.

Within these main groupings a wide range of topics in both research and development is actively investigated. In addition to the equipment appropriate for modern chemical and physical-chemical research, the Establishment operates a variety of facilities for testing, evaluating and investigation by special techniques; supporting services include sections responsible for electronics and glass technology. An Elliott 903 computer is in use and access is available to large fast computers. The library has a wide coverage of appropriate journals and reference works and includes a well equipped lecture theatre seating 120.

Close contacts are maintained with other Government Establishments and with universities, and the Establishment has a special relationship with the University of East Anglia.

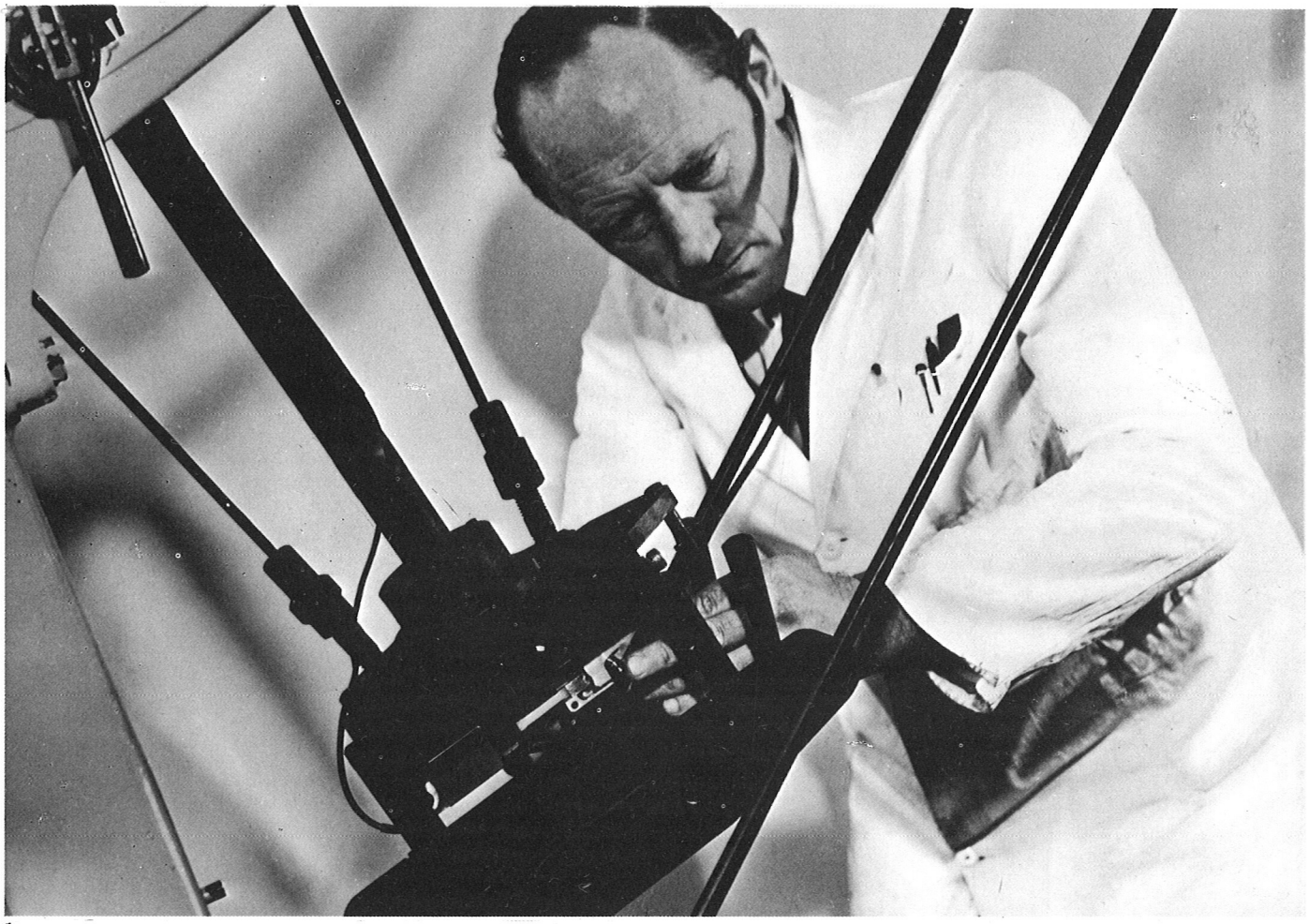
Every encouragement is given to individual scientists to publish accounts of their work in the open literature.

An adjacent modern housing estate provides living accommodation of good standard for married scientific staff joining the Establishment.

More detailed information is given in a brochure obtainable on request from the Director, Explosives Research and Development Establishment, Waltham Abbey, Essex.

Dr L. J. Bellamy CBE is to be Director of both ERDE and RPE from 1 January 1973.

1 *Avery Izod pendulum impact apparatus for testing non-metals*
2 *Plant for polyester manufacture*



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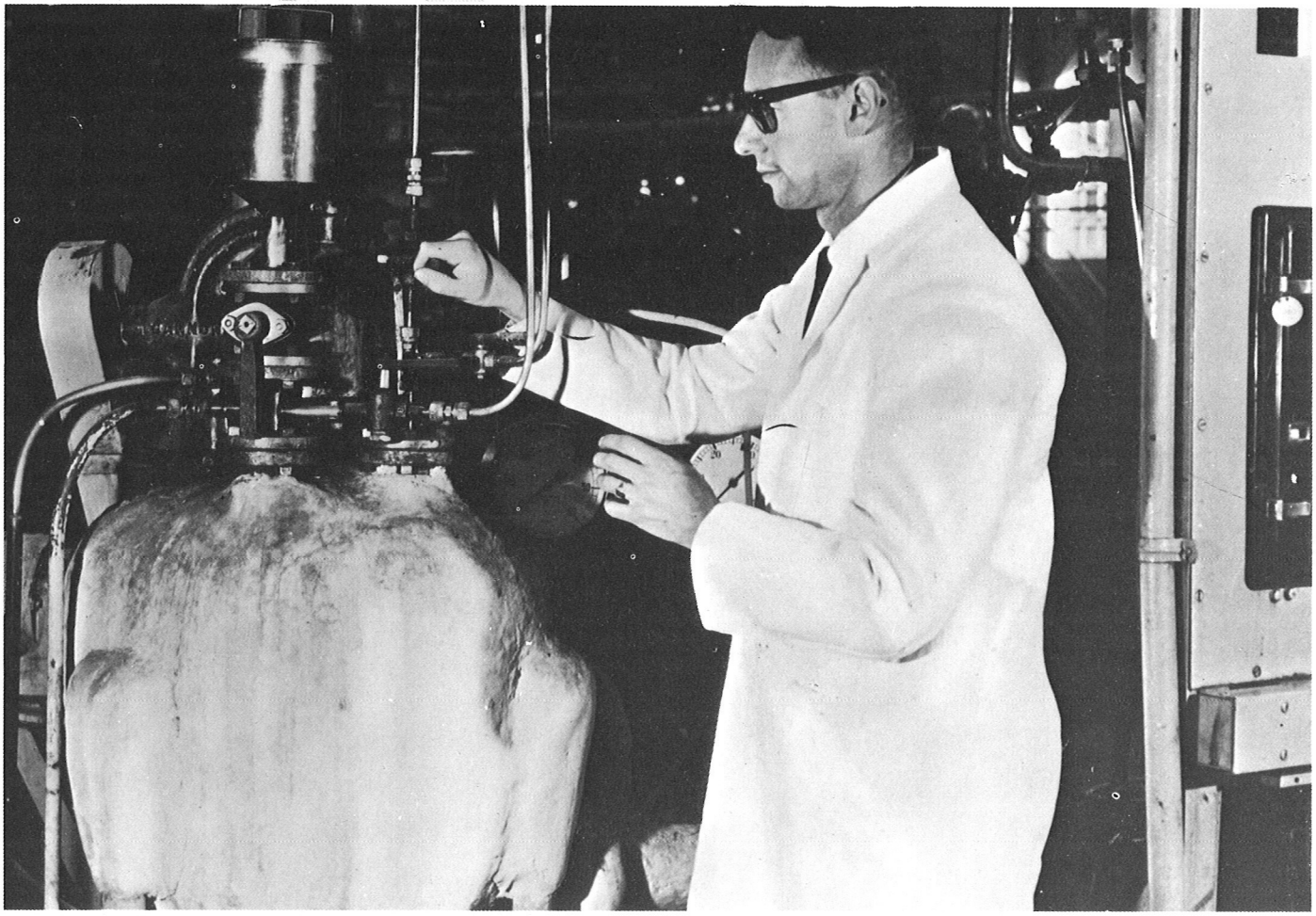


GOVERNMENT COMMUNICATIONS HQ

CHELTENHAM, GLOUCESTERSHIRE

GCHQ is engaged in research, development and production in the field of communications equipment and techniques, including communications security. The main laboratories are in Cheltenham, Gloucestershire, while the laboratories of the Communications Electronics Security Group, now part of GCHQ, are largely located in Eastcote and Northwood Hills in Middlesex. Most of GCHQ's scientists have qualifications in mathematics, computing science, physics or electronic engineering.

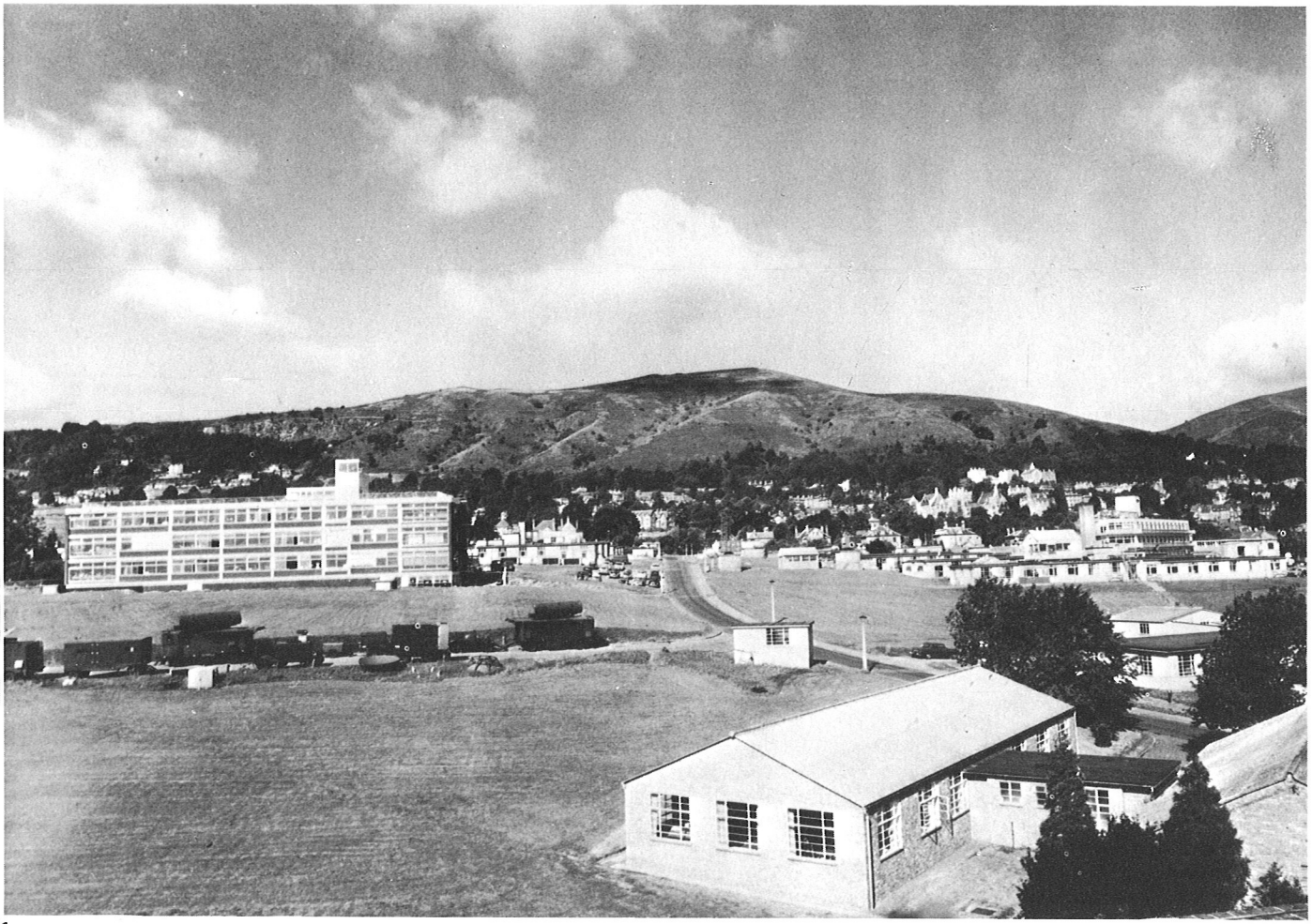
Physicists and electronic engineers are employed mainly in the electronics research and development divisions in both GCHQ and CESG and are involved in research into and development of a wide variety of communications systems covering short, medium and long ranges, with frequencies from gigahertz to kilohertz. using a variety of modulations and modulation methods. The emphasis is on the extension and practical application of telecommunications technology, although in some fields, such as speech communications and ionospheric research, the work includes an element of fundamental research. Typical projects include the development of radio equipment and aerial systems over a wide range of frequencies, including closed-circuit television, telephones, microwave and satellite systems, the detection of signals in conditions of noise, the evolution of new concepts for data and speech networks, the development of digital electronics systems and the application of electronic computing techniques. The department participates (with other Government establishments) in the planning of future civil and defence systems and undertakes the development of key items of equipment to meet these needs.

Pure mathematicians work primarily on the analysis of practical communications problems, though some are engaged in longer term theoretical work. Many of the problems call for the use of algebra, statistics and probability theory.

There is extensive computer support to all areas of GCHQ's work, and mathematicians and computer scientists employed in the computer division will be faced with a variety of tasks of a non-routine nature, ranging over mathematical and scientific programming, systems programming, real-time applications and data-handling techniques.

GCHQ also has a small operational research unit employing both mathematicians and physicists.

1 *HF aerial array*



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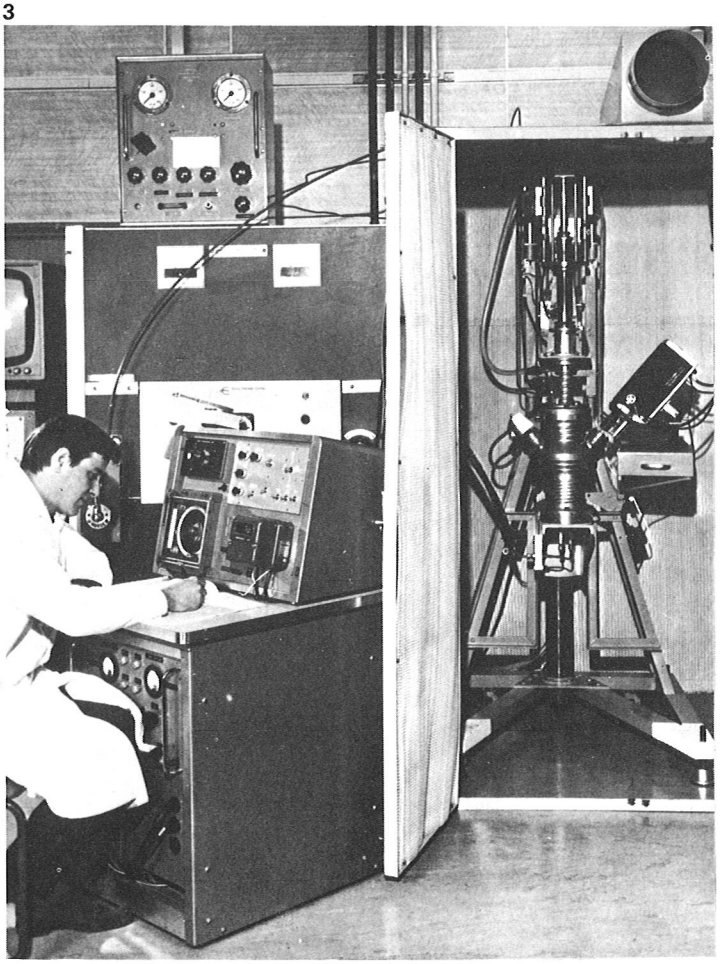

ROCKET PROPULSION ESTABLISHMENT

WESTCOTT, BUCKINGHAMSHIRE

STAFF
About 840

Guided Missiles occupy a significant position in the United Kingdom's defensive system. Their operation depends on rocket propulsion and the prime purpose of this Establishment is to conduct research and development so that the best rockets become available to the three armed services. In addition, rockets constitute the only possible means of propulsion for launching Earth satellites and space probes. In this respect, the Establishment has already made an important contribution to Britain's Upper Atmosphere Research Programme by designing and developing 'Raven', the solid propellent rocket used in the Skylark Research Vehicle. Also the Establishment did the initial design and development of the liquid propellent rockets used so successfully for propelling the Black Knight Test Vehicle.

The meteorological sounding vehicle, Skua, uses the Chick and Bantam rockets developed by the Establishment. Skua was introduced into service in 1964 by the Meteorological Office and has been purchased by the French and Spanish Governments. A larger meteorological sounding vehicle, Petrel, sponsored by the Science Research Council, is propelled by Lapwing, another rocket motor developed by the RPE.

Thus the Establishment occupies an important position within the Ministry of Defence collaborating closely with the Royal Aircraft Establishment, Farnborough; the Royal Radar Establishment, Malvern; the Explosives Research and Development Establishment, Waltham Abbey; and many important firms.

As propulsive devices, rockets may take several forms but the two that are of greatest significance at present operate by converting chemical energy, stored in liquid or solid propellents, into kinetic energy. The harnessing and conversion of these propellents constitutes the 'art' of rocket propulsion and requires efforts in many branches of modern science calling upon the knowledge and ingenuity of chemists, physicists, metallurgists, mathematicians, electronic and mechanical engineers. Because of the demands for high performance, the problems which the scientists and engineers have to face are generally more severe than are met in other scientific and technological fields. For example, a liquid propellent rocket may have some of its components operating at temperatures as low as 20°K and other components, only a few inches away, operating at over 3000°K. Working pressures may be above 1000 lb per sq inch yet the ambient pressure may be virtually zero. Thus many of the problems are unique and, because rocket science is still young, whole fields of research are waiting to be explored.

Further details are given in a booklet obtainable from the Director, Rocket Propulsion Establishment, Westcott, Bucks.

Dr L. J. Bellamy CBE is to be Director of both RPE and ERDE from 1 January 1973.

1 *View of the establishment*

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STORES AND CLOTHING RESEARCH AND DEVELOPMENT ESTABLISHMENT

FLAGSTAFF ROAD, COLCHESTER, ESSEX

STAFF
167

The Stores and Clothing Research and Development Establishment is engaged upon research and development involving all clothing and general stores used by the armed forces. These include such items as uniforms, protective clothing, footwear, tents and field shelters, camouflage equipment, cooksets, rubber, leather and plastic items.

Research activities cover the evaluation of new materials for military clothing, body armour, footwear, protection and shelter, and camouflage equipment.

Research is also carried out in associated fields, especially in camouflage, photo chemistry and specialist textile treatments; also in areas where there is no civilian counterpart such as in developing protection from thermal flash and specialised applications of textiles.

There is considerable co-operation with trade associations and industry. The main disciplines involved are materials science, classical physics and chemistry.

1 *Shows SCRDE Civilian staff visiting the Services in Norway on winter exercises. The subject is wearing an experimental Parka, and is standing at the entrance to a 10 man Arctic Tent. During this visit the subject slept in a similiar tent using the same equipment as the Services*
2 *Shows a prototype inflatable shelter with SCRDE Civilian staff conferring with Service personnel*
3 *Shows an Experimental Dog Training Suit in use*