

WASC 2075

WAI 545

'Careers in  
Research'  
Min. of Technology  
1970

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WA/ 54#5

# Careers in Research

MINISTRY OF TECHNOLOGY

**1970**

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# Explosives Research and Development Establishment

Waltham Abbey, Essex

## STAFF

About 900

The Explosives Research and Development Establishment is the principal chemical research establishment in the Ministry. Despite its title, its work is not exclusively concerned with explosives technology. Inorganic, organic, analytical and, in particular, physico-chemical research is carried out and there is a chemical engineering branch.

The range of interests is very wide and covers polymers and the inorganic structural material fields as well as those of propellants and explosives. Current research topics include :

- New organic polymers ; synthesis, characterization and stability
- Processing and mechanical property evaluation of rubbers, plastics and composite materials
- The growth and mechanical properties of ceramic 'whiskers'
- Rheology of heavily loaded two phase systems and the mixing of stiff pastes
- Adhesives and adhesive strength properties
- Synthesis, analysis and thermochemical properties of organic and inorganic compounds and the development of pilot plant manufacturing processes
- Formulation of new solid propellants and the study of ballistic and mechanical properties
- The development of explosive compositions and research on explosion and detonation
- Heat transfer properties of fluids
- Development and research on chemical and processing plant, instrumentation and remote control mechanisms

The staff includes 175 professionally qualified officers, the majority in chemical science but some in physics and engineering sciences. Five members of the scientific staff hold senior appointments based on individual merit. Close contacts are maintained with universities, affording opportunities and freedom for academic work. The most modern equipments such as NMR, mass spectrometers, infra red spectrographs are available. Excellent supporting facilities include a very well equipped glass technology section and a library containing a comprehensive selection of appropriate scientific works and publications.

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

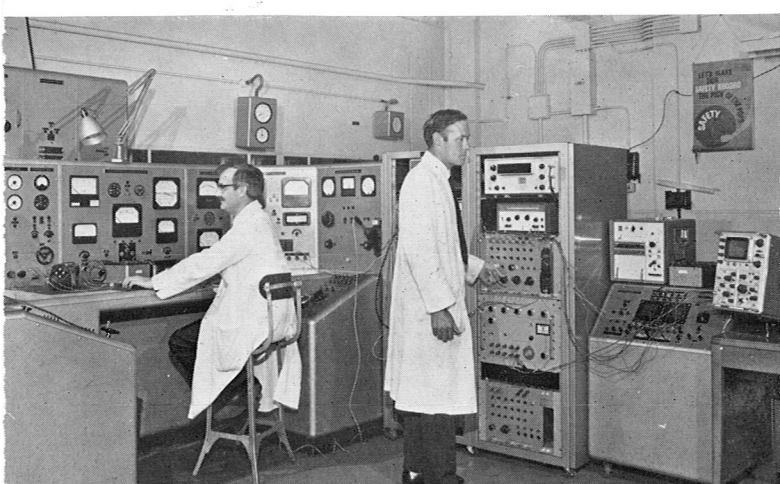
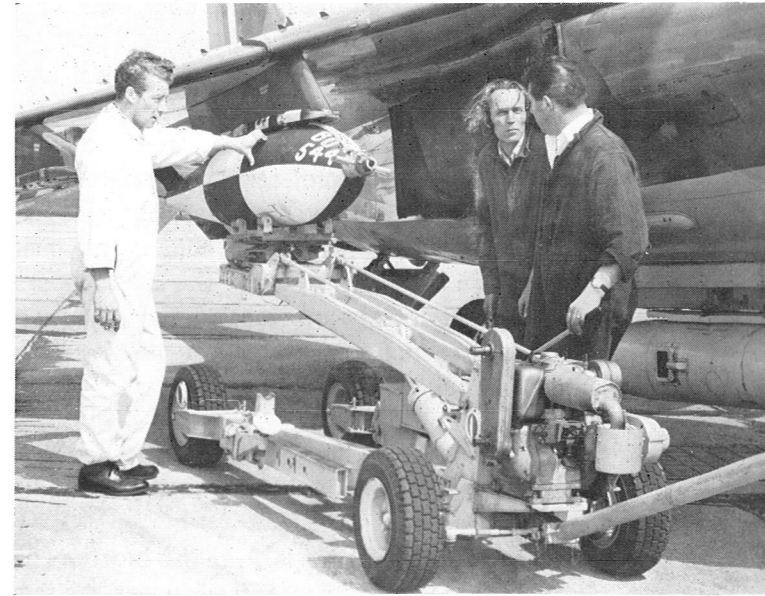
More detailed information is given in a brochure obtainable on request from the Director, Explosives Research and Development Establishment, Waltham Abbey, Essex.



**Experimental Establishment**

below: Aircraft  
bottom: Testing electronics

below: Armament  
bottom: Computer print-out





Removing silicon nitride whiskers from one of the experimental high temperature reactors at ERDE

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# **Fire Research Station**

## **Boreham Wood, Hertfordshire**

### **STAFF**

183 including 21 Scientific Works Professional Officers and 45 Experimental Grades

### **CURRENT EXPENDITURE**

£420 000 a year

### **DIVISIONS**

Detection and electronics ; extinguishing materials and equipment ; industrial and toxic hazards.  
Building development and regulations. Structural and material fire tests ; information and statistics

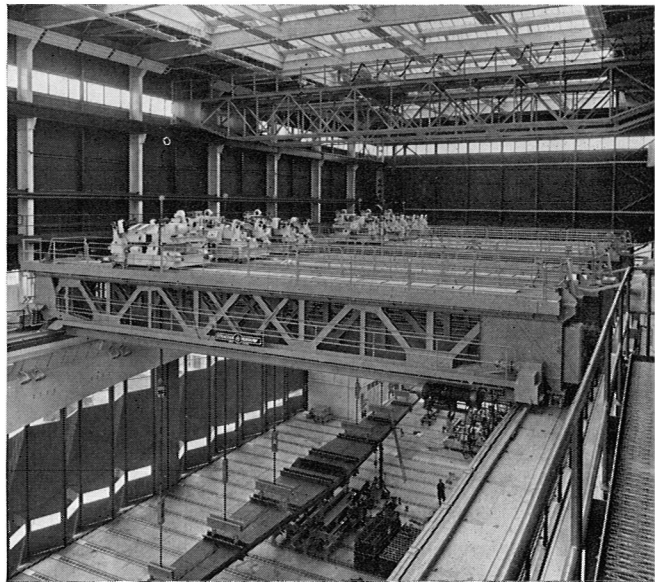
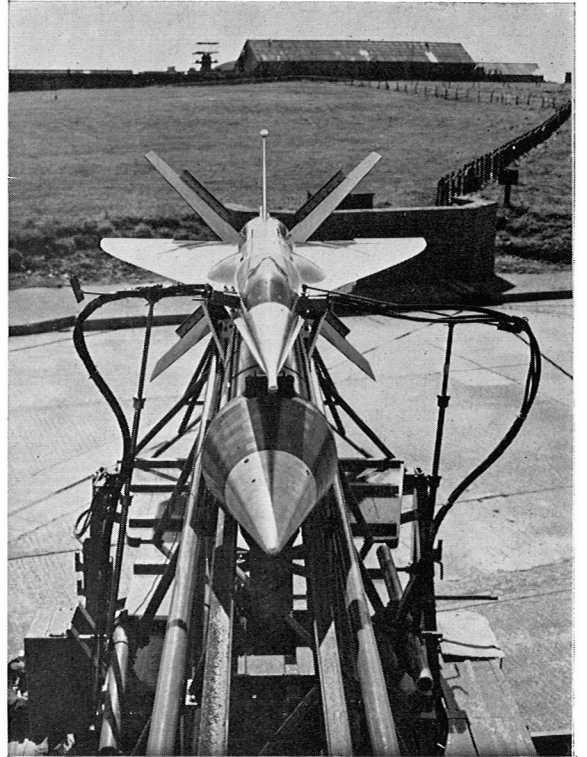
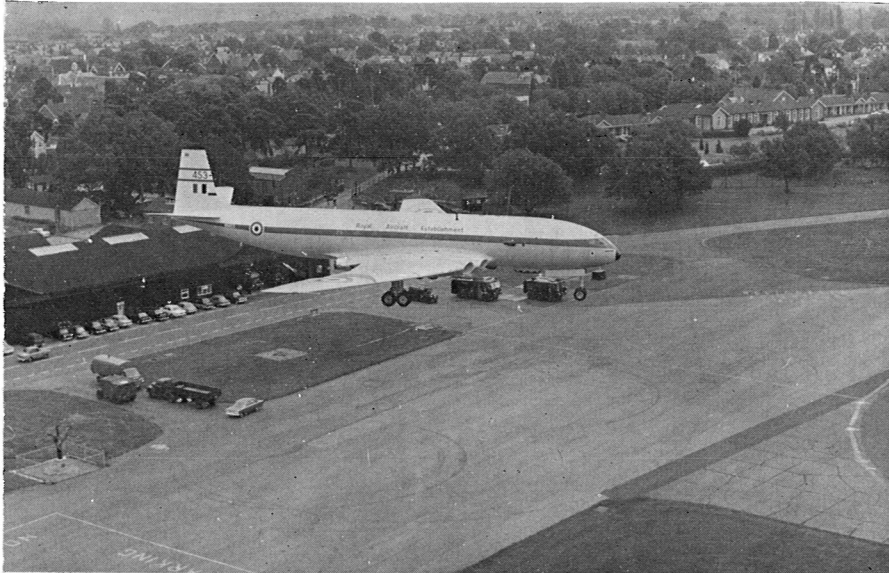
### **SPECIAL EQUIPMENT**

Furnaces for full-scale fire tests on walls, floors and columns  
Special buildings for full-scale fire tests  
Models Laboratory for indoor experimental fires  
Wind Tunnel for studying fires in wind  
Range of hydraulic equipment for extinction studies  
Dust explosion equipment

The Fire Research Station is sponsored jointly by Government and Insurance, represented by the Ministry of Technology and the Fire Offices' Committee, and is the largest single organisation in the world carrying out research aimed at reducing the loss of life and property due to fire. Its activities include studies of the basic processes occurring in fires, of methods of extinction and detection, and the testing of structures and materials. The staff includes physicists, chemists, mathematicians, engineers and architects.

Every year some 200 000 reports of fires are analyzed to give information for operational research leading to more efficient means of fire prevention and fire-fighting. In these and other investigations increasing use is being made of computers for complex analyses. Experimental work is carried out using both small and full-scale fires. Three large furnaces are used to study the behaviour of full-scale structures in fire under various loading and restraint conditions. A high proportion of losses arise from a small number of large fires. The importance of early detection is therefore paramount. New and improved methods of detection with special emphasis on cost-effectiveness are an important part of the work. Water is the most important fire-fighting medium, and new ways are constantly being sought to make it more effective. For special applications, new chemical methods of fire extinction are being sought and studied both in the laboratory and by means of full-scale fires. Economically, industrial fires are the most important and attention is therefore paid to the danger of fires and explosions arising out of the use of new materials and industrial processes.

Further details are contained in the booklet 'Fire Research Station' obtainable on application to the Director of Fire Research, Fire Research Station, Boreham Wood, Hertfordshire.



- top left: Radio Department's flying laboratory, a Comet IIE, landing at Farnborough over the famous 'black sheds'
- top right: A 'Titania' all-steel model mounted on a Gosling rocket, which reaches speeds of about 3,000 mph.
- bottom left: An unusual fish-eye lens view of Jindivik radio-controlled targets being prepared at RAE Llanbedr
- bottom right: Main test frame in Structures Department, RAE, Farnborough



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# Rocket Propulsion Establishment

Westcott, Bucks

## STAFF

About 840

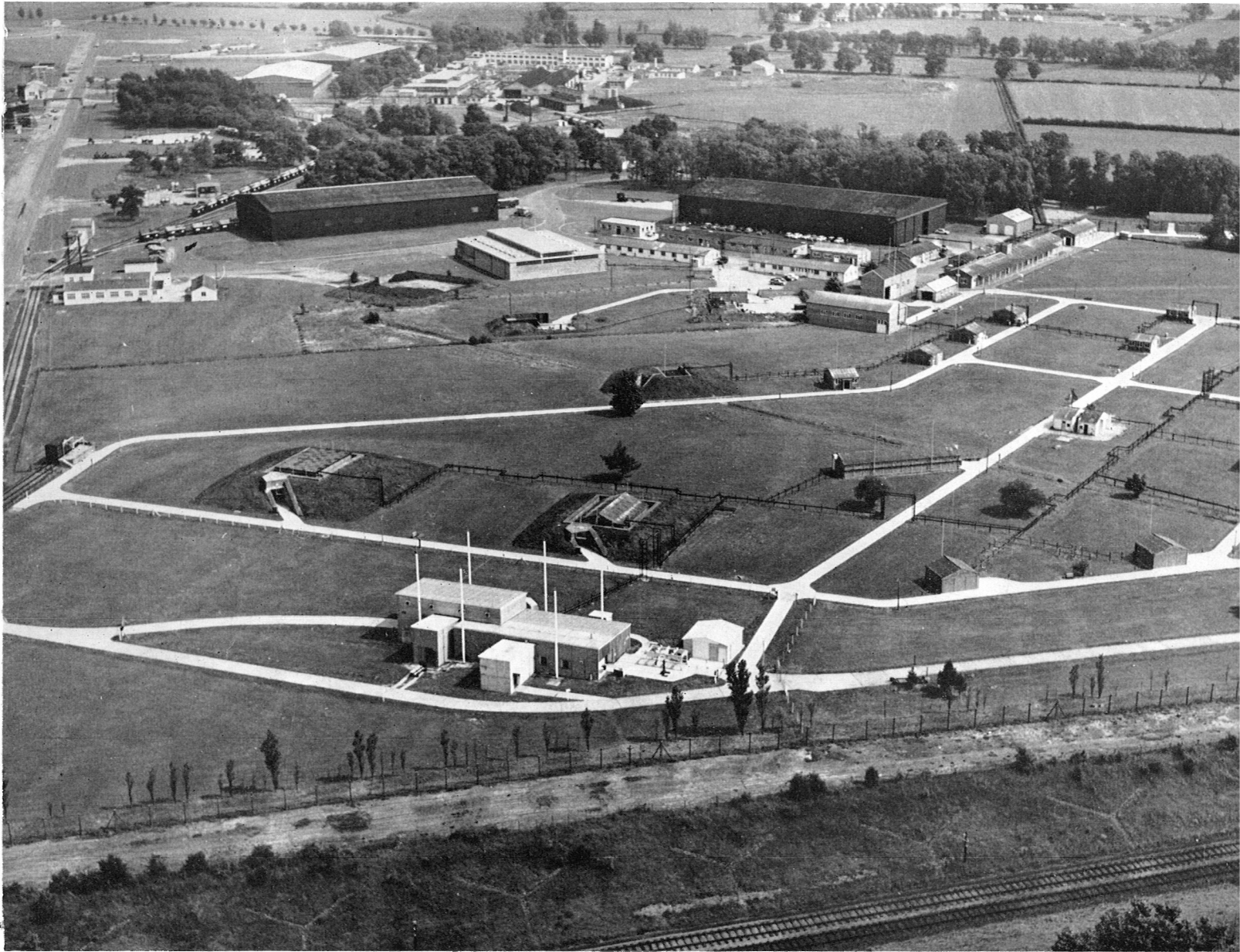
Guided Missiles occupy a significant position in the United Kingdom's defensive system. Their operation depends on rocket propulsion and the prime purpose of this Establishment is to conduct research and development so that the best rockets become available to the three armed services. In addition, rockets 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 propellant rocket used in the Skylark Research Vehicle. Also the Establishment did the initial design and development of the liquid propellant rockets used so successfully for propelling the Black Knight Test Vehicle.

Work is now in hand on the propulsion units for Black Arrow, the successor to Black Knight, and research continues on behalf of ELDO (The European Launcher Development Organization). 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 Technology, collaborating closely with the Royal Aircraft Establishment, Farnborough; the Royal Radar Establishment, Malvern; the Explosive 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 propellant 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.

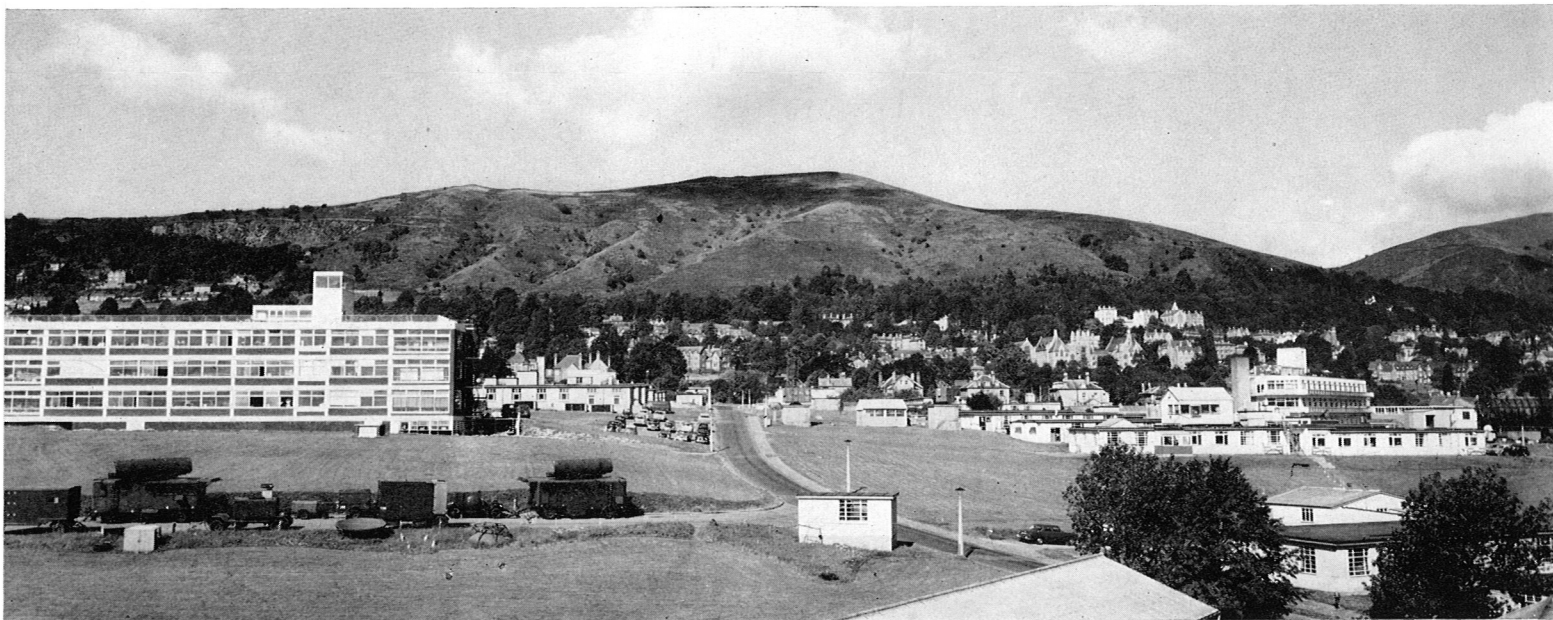
Further details are given in a booklet obtainable from the Director, Rocket Propulsion Establishment, Westcott, Bucks.



View of the Rocket Propulsion Establishment

# Royal Radar Establishment

## Malvern, Worcestershire



View of Royal Radar Establishment

### STAFF

About 2700

The Royal Radar Establishment can provide the young scientist, applied scientist, engineer or mathematician with interesting research or development work of the most challenging quality in electronics and allied fields.

The work of the Establishment covers the whole field of electronics, from fundamental research and device development to equipment and system development, in order to provide radar and related equipment for the Army, the R.A.F. and the Air Traffic Control System of the UK. It embodies a parallel effort to identify and make available to UK industry those advances obtained in its defence oriented and aviation work which might have wider possibilities for industrial or commercial exploitation. The Establishment takes a leading role in fostering co-operative research in the electronics and computer industries of the UK and strives to make significant research contributions of its own for the advancement of these industries.

The main R & D work of the Establishment is carried out in two Departments, (1) the Physics and Electronics Department which is divided into two Groups—the Physics Group and the Electronics