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On Her Majesty's Service



PROGRAMME FOR VISIT OF DUKE OF GLOUCESTER TO PERME 5-10-1978. WASC 0055

5.10.1978

Programme for visit of Duke of Gloucester to PERME

WASC 55

Procurement Executive Ministry of Defence

PERME

Propellants Explosives & Rocket Motor Establishment Westcott & Waltham Abbey

Introduction

Following the unification, in 1973, of the Explosives Research and Development Establishment (ERDE) Waltham Abbey and the Rocket Propulsion Establishment (RPE) Westcott, the combined Establishment was renamed in February 1977, the Propellants, Explosives and Rocket Motor Establishment (PERME).

PERMÉ undertakes research, exploratory development, project development and support, and in some cases production in the fields of rocket motors, rocket and gun propellants, gas generators, power cartridges and explosives for UK Defence purposes and Civil applications.

The Director of PERME is also Head of the Rocket Motor Executive (RME)* which co-ordinates all the United Kingdom resources in the field of rocket propulsion, and has overall responsibility for the development, production and commercial exploitation of rocket motors and rocket propellants.

*Rocket Motor Executive is located at Westcott.

Westcott

The work is concerned mainly with: Solid Propellant Rocket Motors Liquid Propellant Rocket Motors Gas Generators & Power Cartridges

For this purpose the following expertise and technical facilities are maintained:

RESEARCH TEAMS studying Ι.

- the application of solid propellants to rocket motors
- the application of liquid propellants to rocket motors,
- materials of high specific strength and high temperature resistance,
- combustion phenomena,
- the rocket exhaust plume,
- instrumentation and non-destructive testing techniques, ignition phenomena,
- stress analysis and failure criteria, and
- environmental effects on rocket motors.

TECHNICAL FACILITIES to conduct 2.

- static firing of rocket motors, including firing in vacuum or underwater conditions,
- vibration, centrifuge and drop tests on rocket motors,
- filling of solid propellant motors,
- filling of liquid propellant motors, and
- non-destructive testing.

ENGINEERING FACILITIES to provide 3.

conventional machining and grinding operations, welding and brazing,

carpentry, ultrasonic and spark machining, and computer operated machining.

COMPUTING FACILITIES to provide 4.

support to scientific research, computer aided design and stress analysis, and accounting and resource control.



Waltham Abbey

Waltham Abbey is concerned mainly with : Propellant Compositions for Rocket Motors, Gas Generators, Power Cartridges & Guns Explosive Compositions for Ordnance Ingredients for Explosives & Propellants Materials Development & Processing

For this purpose the following expertise and technical facilities are maintained:

RESEARCH TEAMS studying Ι.

- propellant development,
- primary explosives and some high explosive compositions,
- synthesis of propellant ingredients, and production,
- combustion and hazard assessment,
- rheological and ballistic properties of propellants,
- adhesives, plastics and rubbers, composites, synthesis of unusual polymers,
- environmental behaviour and compatibility of propellants and explosives with materials, and
- advanced analytical techniques.

TECHNICAL FACILITIES to conduct 2.

- limited production of solid propellants,
- filling and firing of solid propellant motors,
- pilot scale production of ingredients of propellants and explosives, and specialised materials,
- performance and safety tests on explosives and propellants,
- sophisticated analyses by chromatographic, spectroscopic and crystallographic techniques.

ENGINEERING FACILITIES to provide 3.

- conventional machining and grinding operations,
- welding and brazing,
- carpentry, model making, and
- pilot scale production equipment.





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Seawolf



1. rocket firing to measure characteristics of exhaust plume 2. vacuum chamber used for rocket motor firings 3. firing of carbon-carbon composite expansion cone 4. Blowpipe, rocket motors developed at PERME 5. Sea Skua, boost motor developed at PERME 6. solid propellant gas analysis techniques 7. studies of the crystal structure of explosives.

How to contact PERME Westcott

Postal Address

Procurement Executive, Ministry of Defence,

Propellants, Explosives and Rocket Motor Establishment, Westcott, Aylesbury, Buckinghamshire HP18 oNZ United Kingdom

Telephone: Aylesbury (STD 0296) 5989 Telex: 83144 Travel

Road: Map showing the location of Westcott.

For road travellers Westcott is on the A41, mid-way between Aylesbury and Bicester.

Rail: There is a regular train service from London to Aylesbury. The journey from Marylebone Station to Aylesbury Station takes 60 minutes.

If requested in advance, cars can be arranged to meet

visitors and transport them to Westcott.



How to contact PERME Waltham Abbey

Postal Address

Procurement Executive, Ministry of Defence, Propellants, Explosives and Rocket Motor Establishment, Waltham Abbey, Essex EN9 1BP United Kingdom Telephone: Lea Valley (STD 0992) 713030 Telex: 267455 Travel

Road : Map showing the location of Waltham Abbey. For road travellers Waltham Abbey is 16 miles NE of London.

Rail: There is a frequent train service from London (Victoria Line) on the Underground to Blackhorse Road Station.

The journey from Charing Cross to Blackhorse Road, changing at Warren Street, takes about 40 minutes. If requested in advance, cars can be arranged to meet visitors and transport them to Waltham Abbey.



Programme for the visit of

HRH THE DUKE OF GLOUCESTER GCVO

to the

PROPELLANTS, EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT

on Thursday 5 October 1978

Postal addresses:

Procurement Executive, Ministry of Defence Propellants, Explosives and Rocket Motor Establishment Powdermill Lane Waltham Abbey Essex EN9 1BP b

Telephone: Lea Valley (STD 0992) 713030

Procurement Executive, Ministry of Defence Propellants, Explosives and Rocket Motor Establishment Westcott Aylesbury Bucks HP18 ONZ

Telephone: Aylesbury (STD 0296) 5989

Procurement Executive, Ministry of Defence Rocket Motor Executive (also at Westcott)

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VISIT TO PERME WESTCOTT

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Seating Plan on Coach

TOP MANAGEMENT - MINISTRY OF DEFENCE



INTRODUCTION TO PERME AND THE RME

The Propellants, Explosives and Rocket Motor Establishment, PERME, comprises two main units approximately 52 miles apart, and a smaller unit at Woolwich. One unit is located at Waltham Abbey, Essex, 16 miles north-east of London and the other at Westcott, Aylesbury, Buckinghamshire, 50 miles north-west of London. The Waltham Abbey unit is divided into two sites, the North Site occupying an area of 253 acres and the South Site, occupying an area of 212 acres. As a result of a rationalisation programme within the Ministry of Defence, the North Site is being closed and its staff and facilities transferred to the South Site. The Westcott site occupies an area of 623 acres. Approximately 700 staff are employed at each main unit. The Rocket Motor Executive, RME, with some 25 staff is also located at Westcott.

THE ROLE OF PERME AND THE RME

PERME is one of 13 research and development establishments in the Procurement Executive, Ministry of Defence and, as shown in the Top Management Structure Chart, is responsible through the Deputy Controller, R&D Establishments and Research, Sector B to the Controller, R&D Establishments and Research, Mr W J Charnley.

The Director of PERME is also Head of the Rocket Motor Executive.

PERME is responsible for a programme of research, exploratory development, project development, and in some areas production, in the fields of

- a) rocket propulsion, covering rocket motors, rocket propellants, power cartridges and gas generation systems for auxiliary power units;
- b) gun and small arms propellants, and
- c) initiatory explosives.

The programme provides the technical support to the weapon design authorities of the Land, Sea and Air Controllerates of the Procurement Executive for weapons in service, under development and required in the future. PERME's work on rocket propulsion is supported mainly by Bristol Aerojet Limited which undertakes research, design, development and production of rocket motor bodies, nozzles and other components, and by Royal Ordnance Factories which carry out propellant manufacture and filling, igniter filling and the production of rocket motor hardware. In the rocket propulsion field, only one other organisation, IMI Summerfield, IMIS, (a Government Agency factory which is managed by Imperial Metal Industries Limited on behalf of the Procurement Executive) undertakes overall design, development and testing of rocket motors. IMI Summerfield undertakes research, and develops and manufactures solid propellant rocket motors using the cast double base propellant system.

PERME and IMIS with their supporting resources embrace the entire rocket motor design, development and production capabilities in the United Kingdom. No independent industrial capabilities exist outside the Procurement Executive, Ministry of Defence.

The Rocket Motor Executive was specially set up to co-ordinate and exploit commercially the UK rocket motor capabilities. Accordingly it is able to negotiate and accept contracts for the design, development and production of rocket motors for defence and civil applications.

PERME/RME MANAGEMENT STRUCTURE

Propellants, Explosives & Rocket Motor Establishment - PERME and Rocket Motor Executive - RME

Dr F H Panton MBEDirector PERME and Head of RMEMr R HeronDeputy Director PERMEMr H WilliamsDeputy Director RMEMr R H CarringtonSecretary PERMEMr A F W OllettSuperintendent Engineer PERME

Waltham Abbey

Mr G K Adams

Principal Superintendent

Dr C A BeckSuperintendent Explosives BranchDr S W BellSuperintendent Propellants 1 BranchMr L E DingleSuperintendent Process Research BranchDr B L HollingsworthSuperintendent Propellants 2 BranchDr A R OsbornSuperintendent General Chemistry Branch

Westcott

Dr J D LewisPrincipal SuperintendentDr J PowlingSuperintendent Chemistry and Applied Physics DivisionMr N J MorrisSuperintendent Liquid Propellant Rocket Motors DivisionMr K E SilmanSuperintendent Solid Propellant Rocket Motors Division

Visit to

Propellants, Explosives and Rocket Motor Establishment

WALTHAM ABBEY



LT. GENERAL SIR WILLIAM CONGREVE



THE RUINS OF THE LAST PAIR OF MILLS - 1956

HISTORY OF THE WALTHAM ABBEY ESTABLISHMENT

The Establishment occupies a site originally used for the manufacture of gunpowder but the early days of the factory are largely a matter of conjecture and legend. The first positive link between Waltham Abbey and gunpowder is contained in the State Papers of 1561 in the form of a letter to John Tamworth of Waltham Abbey concerning a contract for the supply of saltpetre and sulphur. The importance of the local manufacture was emphasized a century later by the local minister of religion, Dr Thomas Fuller, who wrote that there was more gunpowder made by the mills in his parish 'than in all England besides'. Unfortunately powder-making was a hazardous occupation and the Parish Registers for 1665 record the burials of two workmen killed by a mill explosion. The mills at this time were horse-driven but they were converted to water power by the Walton family in whose hands they remained for more than a hundred years until they were bought by the Government in 1787 from John Walton. The man who played the greatest part in this acquisition was Lieutenant General Sir William Congreve, who disputed the widely-held belief that the private manufacturers made better and cheaper gunpowder than the Government. Later Congreve demonstrated convincingly the superiority of the powder from the Royal Gunpowder Factory and was still able to show savings of some £50000 a year. Walton's Powder Mills were capable of producing 6000 barrels of gunpowder a year but by the time of the Napoleonic Wars the output was of the order of 25000 barrels. The quality of Waltham Abbey powder was recognized overseas and both sides in the American Civil War drew on the experience and expertise of the Factory. The United States Ordnance Manual for 1862 records that no one makes better powder than the British.

For several hundred years the sole product of the Factory was gunpowder but in the second half of the 19th century the manufacture of other explosives commenced. In 1872 a plant was erected for the production of guncotton but this plant was soon found to be inadequate and the first land on the South Site was acquired in 1885 for a new guncotton factory. A decision of the newly-appointed Explosives Committee, with Sir Frederick Abel as President, resulted in the setting up of further plant in 1891 for the manufacture of nitroglycerine and the first production of cordite. Other explosives produced since the turn of the century include tetryl, TNT and RDX. RDX, or Research Department Explosive, has been described as the high explosive of World War II: it is significant that for the first years of the war the Royal Gunpowder Factory was this country's only source of production, just as it had been earlier for cordite during the first two years of the First World War.

The days of the Royal Gunpowder Factory came to an end in 1945 when the present Establishment came into being, bringing with it a change in character from the role of a major production unit to that of a research and development organization with pilot plant facilities.

THE WORK OF PERME WALTHAM ABBEY

At Waltham Abbey the work is concentrated on the formulation and qualification (in terms of meeting operational, safety and economic requirements) of solid rocket propellants, gun and small arms propellants, initiatory explosives, and certain plastics and rubber components used mostly in association with explosives and propellants. The work is carried out in five scientific branches, supported by Administration and Engineering Branches and by specialist assistants to the Director who are responsible for example for Quality Assurance, Safety (embracing Ambulance, Fire Brigade and Surgery Staffs), Management Services (embracing a Library and Information Service) and Security.

Propellants 1 Branch

Carries out research, development and pilot scale production of propellants based mainly on nitrocellulose and nitroglycerine for use in guns, rockets and related devices. These propellants are widely used in small arms, artillery, naval and tank guns and in guided weapons.

Propellants 2 Branch

Undertakes research, development and pilot scale production of composite propellants based on an inorganic oxidising salt, normally ammonium perchlorate, and a plastic or rubbery binder: such propellants, extensively used in the past both for defence purposes and in motors for civil space and meteorological sounding rockets, are likely to find increasing use in weapons systems. The Branch also studies adhesion problems and the application of stiff fibre-reinforced materials in high technology structures.

General Chemistry Branch

Provides analytical and physical-chemical services for the remainder of the Waltham Abbey Establishment and undertakes liaison in the UK on behalf of the joint (Australian-UK) Tropical Trials and Research Establishment in Queensland, Australia.

Explosives Branch

Develops initiatory explosives (for which it has a production facility at the Royal Arsenal at Woolwich), and defines the hazards associated with the use of explosives and solid propellants.

Process Research Branch

Undertakes research into chemical manufacturing processes for the UK Defence Industry and carries out production of ingredients and non-metallic components not otherwise available in the United Kingdom.

Advice and Support Work

All Branches give specialist advice to many parts of the Ministry of Defence, in particular to the Royal Ordnance Factories, and to other public and private bodies.

ORDER OF EVENTS

- 0900 Assembly of guests, other than HRH The Duke of Gloucester, in the Director's Office Waltham Abbey North Site. Coffee and introduction of escorts.
- 0930 Arrival of HRH The Duke of Gloucester by helicopter at Waltham Abbey North Site His Royal Highness will be met by Admiral Sir Andrew Lewis, Lord Lieutenant of Essex, who will introduce Mr R P Laurie, High Sheriff of Essex; Councillor R C O'Malley, Chairman of Epping Forest District Council and Dr F H Panton, Director of PERME and Head of RME, who will introduce Sir Clifford Cornford, Chief of Defence Procurement; Mr W J Charnley, Controller, R&D Establishments and Research; Mr G K Adams, Principal Superintendent PERME Waltham Abbey and Mr R H Carrington, Secretary PERME.
- 0940 Introduction to PERME and Waltham Abbey Coach to Director's Block, Refreshments in Director's Office Walk to Conference Room Presentation of Senior Staff, Trade Union and Staff Side Representatives The Role of PERME and the RME (Dr F H Panton) Unveiling of Commemorative Plaque by HRH The Duke of Gloucester
- 1010 History of the Waltham Abbey Establishment (Mr M McLaren, Head of Library and Information Services)

Walk to Walton House

- 1030 Travel to South Site Coach through the town of Waltham Abbey to South Site
- 1040 Engineering Workshop (Mr R Fisher, Deputy Superintendent Engineer) Walk through Engineering Workshop
- 1053 Exhibition of Work (All Superintendents)

Walk to Exhibition Centre Presentation of memento to HRH The Duke of Gloucester

- 1123 Gun Propellant Processing (Dr S W Bell, Superintendent Propellants 1) Coach to Press House to view propellant processing facilities
- 1138 Fire Station and Surgery (Mr G K Adams, Principal Superintendent) Walk to Fire Station and Surgery to meet Fire Brigade, Ambulance Staff and Surgery Staff
- 1150 Departure by Helicopter to Westcott Coach to North Site His Royal Highness will be accompanied in the helicopter by Dr F H Panton, Sir Clifford Cornford and Mr W J Charnley
- 1200 Muffled Firing Technique The remaining guests will be given a demonstration of a technique for using foam to deaden the noise of firing proof rounds
- 1230 Light buffet luncheon for guests and escorts in the Director's Conference Room

LIST OF GUESTS AND ESCORTS

HRH the Duke of Gloucester GCVO

Admiral Sir Andrew Lewis KCB The Lord Lieutenant of Essex

Mr R P Laurie High Sheriff of Essex

Sir Clifford Cornford KCB Chief of Defence Procurement, Ministry of Defence (PE)

Mr W J Charnley CB Controller, R&D Establishments and Research Ministry of Defence (PE)

Councillor R C O'Malley -Chairman Epping Forest District Council

Lieutenant Colonel Simon Bland CVO Equerry to HRH the Duke of Gloucester - Dr F H Panton MBE Director of PERME & Head of RME

- Mr G K Adams Principal Superintendent, Waltham Abbey

- Dr A R Osborn Superintendent General Chemistry Branch

- Dr B L Hollingsworth Superintendent Propellants 2 Branch

- Dr S W Bell Superintendent Propellants 1 Branch

- Dr C A Beck Superintendent Explosives Branch

- Mr L E Dingle Superintendent Process Research Branch

FORMAL INTRODUCTIONS TO HRH THE DUKE OF GLOUCESTER AT THE HELICOPTER LANDING SITE

Introductions by the Lord Lieutenant of Essex, Admiral Sir Andrew Lewis

Mr R P Laurie	-	High Sheriff of Essex
Councillor R C O'Malley	-	Chairman Epping Forest District Council
Sir Clifford Cornford	-	Chief of Defence Procurement, Ministry of
		Defence (PE)
Mr W J Charnley	-	Controller, R&D Establishments and Research,
		Ministry of Defence (PE)
Dr F H Panton	_	Director PERME & Head of RME
Mr G K Adams	-	Principal Superintendent PERME Waltham Abbev
Mr R H Carrington	-	Secretary/PERME



Introductions by Mr G K Adams

1 Dr C A Beck 2 Dr S W Bell 3 Mr L E Dingle 4 Dr B L Hollingsworth 5 Dr A R Osborn 6 Mr N J Parratt 7 Dr D H Richards 8 Mr A Bird 9 Mr J Brent 10 Mr T Douglas 11 Mr M J Hicks 12 Mr R Horner 13 Mrs J C D James 14 Mr K Potter 15 Mr J R White - Vice Chairman 16 Mr D Brewer 17 Mr S E Edmans 18 Mr E G Lidster 19 Mr E Morgan 20 Mr S Titchener - Vice Chairman

21 Mr J E Ward

Superintendent Explosives Branch Superintendent Propellants 1 Branch Superintendent Process Research Branch Superintendent Propellants 2 Branch Superintendent General Chemistry Branch Senior Principal Scientific Officer Senior Principal Scientific Officer

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Local Whitley Committee Staff Side Representatives

Local Joint Industrial Committee Trade Union Representatives

UNVEILING OF COMMEMORATIVE PLAQUE

To commemorate the visit of His Royal Highness the Duke of Gloucester to PERME Waltham Abbey, His Royal Highness will be asked to unveil a plaque. When the transfer from the North Site to the South Site has been completed the plaque will be resited in the new Director's Building.

The ceremony will consist of a brief statement by Dr F H Panton followed by a reply and the unveiling by HRH The Duke of Gloucester.

DIRECTORS CONFERENCE ROOM - SEATING PLAN

1 Dr C A Beck 2 Dr S W Bell 3 Mr L E Dingle 4 Dr B L Hollingsworth 5 Dr A R Osborn 6 Mr N J Parratt 7 Dr D H Richards 8 Mr A Bird Mr J Brent 9 10 Mr T Douglas 11 Mr M S Hicks 12 Mr R Horner 13 Mrs J C D James 14 Mr K Potter 15 Mr J R White 16 Mr D Brewer 17 Mr S E Edmans 18 Mr E G Lidster 19 Mr E Morgan 20 Mr S Titchener 21 Mr J E Ward 22 Mr R Carrington 23 Mr W J Charnley 24 Mr R P Laurie 25 Mr G K Adams 26 Councillor R C O'Malley 27 Admiral Sir Andrew Lewis 28 Lieutenant Colonel Simon Bland 29 Sir Clifford Cornford 30 HRH The Duke of Gloucester

31 Dr F H Panton



WALTON HOUSE

2

CANNON

Display of exhibits relating to the 400 year association of Waltham Abbey with propellants and explosives.



1

ENGINEERING WORKSHOP

Workshops incorporating conventional machining, grinding, welding, brazing and carpentry equipment are maintained to manufacture research equipment and pilot scale production plant in support of the scientific programme.

1 Excel Surface Grinder

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- 2 Huron Milling Machine
- 3 General Machining Area
- 4 Asquith Vertical Drill
- 5 Nitration Vessel



Examples of the major scientific activities of the Waltham Abbey Establishment will be displayed.

Before departure from the Exhibition Centre His Royal Highness will be asked to accept a memento of his visit to PERME Waltham Abbey.



- 1 Initiatory Explosives
- 2 Explosives sensitiveness and hazards
- 3 Nitrocellulose propellants
- 4 Composite propellant applications
- 5 Adhesives applications
- 6 Motor hardware development
- 7 Fibre composite technology

- 8 Chemicals and Materials processing and development
- 9 Stability and compatibility
- 10 Ultraviolet monitoring
- 11 Rationalisation
- 12 Plant and Equipment, Design and manufacture
- 13 Apprentices Work
- 14 Presentation

GUN PROPELLANT PROCESSING

High energy gun propellants being developed for the up-rated 120 mm gun for the Chieftain tank are extruded in this building. On view will be a batch of experimental gun propellant.

The equipment used for this development, and that used for production at ROF Bishopton, is old and inefficient. PERME is the focus of a joint programme with the ROFs to modernise gun propellant production facilities. A new press control system incorporating a microprocessor will be viewed extruding an inert propellant.



WARNING

Stringent safety precautions are taken during the manufacture and handling of propellants.

This area of the Establishment is classed a "Danger Area" and the following items must not be taken into the area.

Matches Lighters Cigarettes Cigars Tobacco Pipes Snuff Bags and Parcels Umbrellas and Sticks Radio Receivers Files Scissors and other sharp instruments

The party will be asked to leave any such items on the coach.

FIRE STATION AND SURGERY

The importance of these services was appreciated in the very early days of the Royal Gunpowder Factory. The first reference to a fire engine appears in orders of 1788.

Surgeons were appointed from 1787 - the first receiving an annual salary of £63.17s.4d - whilst permanent surgery premises have existed since 1894.



SEATING PLAN ON COACH - WALTHAM ABBEY

			\bigcirc
1	HRH The Duke of Gloucester		
2	Dr F H Panton	1 17	
3	Admiral Sir Andrew Lewis		
4	Mr G K Adams		Constant Constant
5	Mr R P Laurie	L	
6	Dr A R Osborn		
7	Councillor R C O'Malley		•
8	Dr C A Beck		
9	Mr L Dingle		ſ
10	Lieutenant Colonel Simon Bland	r	2 1
11	Sir Clifford Cornford		
12	Dr B L Hollingsworth	0 10	
13	Mr W J Charnley		4 3
14	Dr S W Bell		L
15	*Mr R Carrington	11 12	
16	Detective		6 5
17	Mr J A Bell		
		13 14	8 7
		15 16	
	*part of morning only		

Visit to

Propellants, Explosives and Rocket Motor Establishment

WESTCOTT



SKYLARK BEING TESTED AT WOOMERA IN EARLY 1960's



DEVELOPMENT TEST FIRINGS FOR THE BLUE STREAK BEING CARRIED OUT AT P2 SITE CIRCA 1963

HISTORY OF THE WESTCOTT ESTABLISHMENT

At the end of World War II British interest in rocket technology was stimulated by the awareness of German advances in this field, and the Ministry of Supply set up, in 1946, the Guided Projectile Establishment, to be responsible for research and development in ground-launched guided missiles. The site, at Westcott, was a disused RAF base. Many of the original buildings were utilized after extensive conversion to provide, for instance, workshops, specialised facilities, and test sites for firing motors. Large test sites permitting static testing of complete missiles were also constructed. Following German practice, early research was concentrated on liquid bi-propellant engines, with sections on fuel supply, combustion chamber design, instrumentation, etc.

In 1947 the Establishment became the Rocket Propulsion Department of the Royal Aircraft Establishment. Its terms of reference were narrowed to include only the propulsion aspects of rockets, work on all other aspects being transferred to the Guided Weapons Department of the RAE.

In 1949 work was started on solid propellant motors. To satisfy the need, created by the use of new plastic propellants, for new motor filling techniques an experimental filling factory was instigated in 1950 and completed in 1952. A significant contribution to Britain's Upper Atmosphere Research Programme was the development of the Raven motor containing one ton of plastic propellant and was used in the Skylark Upper Atmosphere Research Vehicle, which reached altitudes of over 100 miles.

As motor technology developed, so too did the need for supporting research, particularly in materials, chemistry, and physical and chemical studies of combustion processes. In 1951 for example a Combustion and Materials Division was formed.

In 1955 Rolls Royce contracted to build a liquid bi-propellant engine, designated RZ1 and using liquid oxygen and kerosine, which formed the propulsion unit of Blue Streak. Testing of the engine required facilities capable of handling thrusts greater than any yet encountered at Westcott, as well as new measuring and recording equipment. With this objective the P2 Site was prepared and tests were started in 1958. By 1960 some 500 firings had been made.

The link with RAE was severed in August 1958 and the name of the Establishment changed to the Rocket Propulsion Establishment. Several major building projects were subsequently completed, including a new Administration Building in 1968 and a new Materials Laboratory shortly afterwards.

In 1971, in accordance with the recommendations of the White Paper on Government Organisation for Defence Procurement and Civil Aerospace, the RPE became the responsibility of the Procurement Executive of the Ministry of Defence. As part of the rationalisation of defence research establishments it was merged with the Explosives Research and Development Establishment, Waltham Abbey in January 1973, with one Director responsible for the unified Establishment. Further rationalisation was effected in 1975 by the transfer of the Rocket Motor Executive to Westcott. In 1976 the posts of Director ERDE/RPE and Head of RME were combined.

In February 1977 ERDE/RPE was re-named the Propellants, Explosives and Rocket Motor Establishment (PERME).

THE WORK OF PERME WESTCOTT

The work at Westcott is concentrated on rocket motors, gas generators and power cartridges and is carried out in three research and development Divisions supported by Administration and Engineering Divisions and by specialist assistants to the Director as at Waltham Abbey.

Solid Propellant Rocket Motors Division

This Division is responsible for all aspects of design and development of solid propellant rocket motors, gas generators and power cartridges, for military and civil applications. These are produced to meet user requirements, including those of Prime Contractors such as British Aerospace and work extends from the period from initial conception through development and production to 'in service' surveillance throughout the life of the rocket motor.

The Division is also responsible for developing motor filling procedures and specifying these to the Royal Ordnance Factory responsible for production filling. Extramural support is provided mainly by Bristol Aerojet Limited and by various Royal Ordnance Factories.

Although the Division is mainly engaged in development work some effort is deployed on research

Liquid Propellant Rocket Motors Division

Undertakes design, development and research on rocket motors utilising packageable liquid propellants, such as inhibited red fuming nitric acid as oxidant, and mixed amine fuels, which can be sealed into tanks, ready for instant use but storable for the whole life of the missile. Packaged liquid propellant motors are used in military applications where control of thrust on command is necessary. This feature demands a high degree of mechanical complexity, requiring components such as control valves, pistons, etc.

The Division is also responsible for the development of special handling procedures necessary for the propellants, for tank filling procedures, and in-service training and surveillance.

Chemistry and Applied Physics Division

This Division, working towards the progressive improvement of overall rocket motor performance, contributes to most aspects of rocket technology; materials and techniques of construction; methods of proving quality and performance; integrity of propellant charges; liquid propellants and their containment; motor functioning and the rocket exhaust plume. In all of these the Division's prime responsibility is to look to the future so the emphasis is on research. Innovation is however frequently carried through to development. Some routine testing and analysis are performed.

ORDER OF EVENTS

1200 Assembly of guests, to await the arrival of HRH the Duke of Gloucester, in the Director's Office, Westcott. Reception by Mr R Heron, Deputy Director PERME. Sherry and introduction of escorts.

1230 Arrival of HRH the Duke of Gloucester by helicopter

His Royal Highness will be met by Major J D Young, the Lord Lieutenant of Buckinghamshire, who will introduce Mr J M A Paterson, High Sheriff of Buckinghamshire; Councillor Mrs E D Embleton, Chairman Aylesbury Vale District Council; Mr R Heron, Deputy Director PERME; Mr H Williams, Deputy Director RME and Dr J D Lewis, Principal Superintendent PERME Westcott.

Mr Heron will introduce Sir Clifford Cornford, Chief of Defence Procurement and Mr W J Charnley, Controller, R&D Establishments and Research to Mr J M A Paterson, High Sheriff of Buckinghamshire and Councillor Mrs E D Embleton, Chairman Aylesbury Vale District Council.

1240 Canteen

Coach to new Canteen Presentation of Senior Staff and Trade Union Representatives

- 1253 Opening Ceremony of the new Canteen
- 1300 Luncheon

1410 Introduction to PERME Westcott, on coach (Mr R Heron, Deputy Director PERME)

Coach to Exhibition Centre

- 1415 Exhibition of Work (All Superintendents)
- 1445 Firing of Solid Propellant Rocket Motor (Mr K E Silman, Superintendent Solids Division)

Coach to firing site, inspection of site Firing of solid propellant rocket motor

1510 Firing of Liquid Propellant Rocket Motor (Mr N J Morris, Superintendent Liquids Division) Coach to Liquid Propellant Engine Test Site, passing en route Environmental Test Facilities, Special Test Site and General Purpose Firing Sites

Firing of Liquid Propellant Rocket Motor

- 1530 Engineering Work (Mr A F W Ollett, Superintendent Engineer PERME) Coach to Engineering Workshop Walk through Machine Shop to exhibition of work Presentation of memento to HRH the Duke of Gloucester
- 1600 Rocket Motor Executive (Mr H Williams, Deputy Director Rocket Motor Executive) Coach to Director's Building RME Exhibition
- 1620 Walk to Director's Office
- 1630 Departure of HRH the Duke of Gloucester His Royal Highness will be accompanied to the departure area by all guests and their escorts

LIST OF GUESTS AND ESCORTS

HRH The Duke of Gloucester GCVO

Major J D Young The Lord Lieutenant of Buckinghamshire

Mr J M A Paterson High Sheriff of Buckinghamshire

Councillor Mrs E D Embleton Chairman Aylesbury Vale District Council

Sir Clifford Cornford KCB Chief of Defence Procurement Ministry of Defence (PE)

Mr W J Charnley CB Controller, R&D Establishments and Research Ministry of Defence (PE)

Lieutenant Colonel Simon Bland CVO Equerry to HRH the Duke of Gloucester

Mr B Kirby Property Services Agency - Dr F H Panton MBE Director PERME and Head RME

- Mr R Heron Deputy Director PERME

- Dr J D Lewis Principal Superintendent Westcott

- Dr J Powling Superintendent Chemistry and Applied Physics Division
- Mr H Williams Deputy Director Rocket Motor Executive
- Mr N J Morris Superintendent Liquid Propellant Rocket Motors Division
- Mr K E Silman Superintendent Solid Propellant Rocket Motors Division

- Mr A F W Ollett Superintendent Engineer PERME

FORMAL INTRODUCTIONS TO HRH THE DUKE OF GLOUCESTER AT THE HELICOPTER LANDING SITE

Introductions by the Lord Lieutenant of Buckinghamshire, Major J D Young.

Mr R Heron –	Deputy Director PERME
Mr J M A Paterson –	High Sheriff of Buckinghamshire
Councillor Mrs E D Embleton–	Chairman Aylesbury Vale District Council
Dr J D Lewis –	Principal Superintendent PERME Westcott
Mr H Williams –	Deputy Director RME
aductions by Mr. P. Haran	

Introductions by Mr R Heron

Sir Clifford Cornford	-	Chief of Defence Procurement, Ministry of Defence
Mr W J Charnley	-	Controller, R&D Establishments and Research,
		Ministry of Defence (PE)



Introductions by Mr R Heron

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1	Mr N J Morris	Superintendent Liquid Propellant Rocket Motors Division
2	Mr A F W Ollett	Superintendent Engineer PERME
3	Dr J Powling	Superintendent Chemistry & Applied Physics Division
4	Mr K E Silman	Superintendent Solid Propellant Rocket Motors Division
5	Mr D S Dean	Senior Principal Scientific Officer
6	Dr D E Jensen	Senior Principal Scientific Officer
7	Mr W A Brown	
8	Dr H J Buswell	
9	Mr A B Cherry	
10	Dr J M Cousins	Local Whitley Committee
11	Mr J M McBryde (Staff Side Representatives
12	Mrs J B R Marsh	
13	Mr D J North	
14	Mr A Rose - Vice Chairman	
15	Mr G Beasley	
16	Mr R M Godfrey	
17	Mrs P Guttridge · Vice Chairman	
18	Mr M Rees	Local Joint Industrial Committee
19	Mr G Spinks	Trade Union Representatives
20	Mr C Tuersley	
21	Mr H Wallace	
22	Mrs S Simpson	1
23	Mr B Kirby	Property Services Agency

OPENING CEREMONY OF NEW CANTEEN

After the formal introductions have been completed the party will move into the main Canteen area where staff will be assembled.

His Royal Highness will be asked to unveil a plaque to commemorate his visit to PERME Westcott and the opening of the new Canteen.

The ceremony will consist of a brief statement by Dr F H Panton followed by a reply and the unveiling by HRH The Duke of Gloucester.



LUNCHEON ARRANGEMENTS

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After the ceremony the Party will move into the Senior Staff Dining Area for Luncheon.



EXHIBITION CENTRE

Examples of the work of the three Divisions of Westcott covering aspects of research and development activities will be displayed.



- Early liquid propellant technology
- 2 Packaged liquid propellant motors
- 3 Stiletto

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- 4 Solid propellant rocket motors, military projects
- 5 Solid propellant rocket motors, civil projects
- 6 Research on solid propellant motors
- 7 Non destructive testing
- 8 Plume technology
- 9 Ignition
- 10 Compatibility of materials
- 11 Materials
- 12 Stonechat

FIRING OF SOLID PROPELLANT ROCKET MOTOR

Static firings of rocket motors are carried out for research purposes and during the development phase of a motor to prove the design. During the production phase motors are proof tested to ensure consistency in performance and quality.

The sequence of operations covering safety procedures, instrumentation, calibration of load cells, and preparation of the motor for firing will be seen.



WARNING

1. Stringent safety precautions are taken during the handling and testing of rocket motors. This area of the Establishment is classed a "Danger Area" and smoking is prohibited.

2. The party will be asked to wear protective headgear during the visit to the firing bay.

FIRING OF LIQUID PROPELLANT ROCKET MOTOR

Rocket motors using liquid propellants are vastly different in terms of engineering and operational characteristics from motors using solid propellants.

The unique capability of varying the thrust level on command will be demonstrated by a firing of a packaged liquid propellant system. On ignition the motor will be operated at a high thrust level to simulate a boost phase, to launch the missile, followed by a lower level of thrust to propel the missile to its target.



The Engineering Division provides a full range of services such as Design, Drawing Office, Photographic, Chemical and Technical Facilities in support of the scientific and development work of the Establishment. Examples of the work will be displayed.

Before departure from the Engineering Workshop His Royal Highness will be asked to accept a memento of his visit to Westcott.



ROCKET MOTOR EXECUTIVE

The Rocket Motor Executive is an organisation within the Ministry of Defence, able to negotiate and accept contracts, where appropriate, for the design, development and production of rocket motors for defence and civil applications. To fulfil this function, the Rocket Motor Executive coordinates the work of a number of establishments within the Ministry of Defence and Industry, and has direct responsibility for the activities of IMI Summerfield.

The range of these capabilities and some current projects will be displayed.



SEATING PLAN ON COACH - WESTCOTT

1 2 3 4 5	HRH The Duke of Gloucester Dr F H Panton Major J D Young Mr R Heron Mr J M A Paterson	17		
6	Dr J D Lewis			
/ Q	Louncillor Mrs E D Embleton			
g	Mr K Silman		r	
10	Lieutenant Colonel Simon Bland	r ·	2	1
11	Sir Clifford Cornford			-
12	Mr H Williams	9 10		
13	Mr W J Charnley		4	3
14	Mr N Morris		L	
15	Mr R Carrington	11 12	6	5
16	Detective		0	<u> </u>
17	Mr A C Parmee	12 14		
18	Mr A F W Ollett	13 14	8	7
			L	
		15 16	18	

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