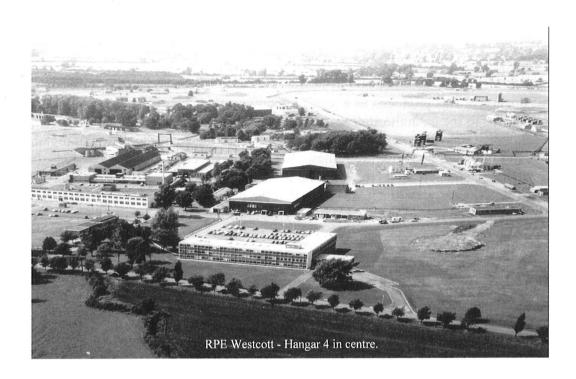
MASC 2236

Westerde a Chronology John Harlow Oct. 2010



BY

John Harlow

VER 1.0



# Preface

This document was produced as a result of conversations between those individuals who wished to see an authoritative work on the History of Westcott as a Research and Development Establishment. Initially the thoughts of the author were to put together key dates of events such that from these 'bones', 'flesh' could be added as and when at a later date and at least there would be some form of structure. Since arriving at Westcott in the early 1970's it was clear that the opportunity to pull together and document a large part of UK rocket history would soon disappear with the retirement of personnel from Westcott.

As a list, this Chronology has existed in some form for some time now but only with the upcoming 65<sup>th</sup> (and probably last) anniversary Get-Together, has it been moulded into a document. This Chronology will hopefully create some discussion amongst those gathered together and help create a more complete document.

The list largely confines itself to Westcott as a research and development establishment for the study of rocket motors/engines since it was closed as an RAF aerodrome and includes both administrative and technical aspects. Some additional data is included as Westcott passed into private hands and thence on to become a venture park.

The pre-history of Westcott as an R&D Establishment can be found in an excellent publication by Jim Hampton (A History of No 11 OTU) and the only official report on the Establishment's history is PERME MEMO 168 by Maureen Fowler (Nov 1981) – both are highly recommended.

Memories are notoriously fallible and it will come as no surprise if the list includes factual errors. The author would very much appreciate contributions from anyone who can shed light on events, especially key events that are not mentioned, and especially if referenced.

That there are large gaps is accepted (1962, 1963 for example) and there may be seen to be an emphasis on more recent years (early 1970's to 1999). The former may be due to personnel changes, then current security levels and the disastrous and somewhat random clear-out of documents that occurred at the time by Commander Hull [in a desperate search for office space!] Clearly the latter is due to the positions held and events viewed by the author.

Any anecdotes and comments found in the text are folded in to show some of the strength of feeling as to events at the time (most are from sources)

Two Appendices are also supplied: Appendix A – Sources and acknowledgements Appendix B – Accidents at Westcott.

John Harlow Wolverley 19<sup>th</sup> October 2010

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List of personnel who lost their lives in accidents whilst at Westcott

 $\left[ \right]$ 

# Introduction

Before reading this document it is probably helpful to understand a little of the history that caused the Rocket Propulsion Establishment to be brought into being.

Congreve Rockets using Black Powder for propellant were used by British forces from the early 1800's these rockets were based on Indian designs first encountered by the British during the Mysore Wars. Congreve Rockets were replaced by the stick less spin stabilised Hale rockets. The Hale rocket continued in service until 1901.

During the First World War poison gas was used and caused large No's of deaths/casualties amongst servicemen. Post WWI bomber aircraft design improved at a great rate and the prevailing expectation amongst the Civil and Military powers was that in any future conflict attacks would be made on civilian targets using aircraft armed with poison gas bombs. In the early days of war civilian casualties were expected to be very high. This expectation of high casualties led to thoughts of how to defeat the aerial menace. Conventional anti –aircraft guns were highly ineffective and used large amounts of industrial capacity to produce a weapon which was expensive large and heavy.

In around 1935 it was decided to investigate the possibility of producing unguided Anti-aircraft rockets to be fired in barrages against enemy aircraft. One of the advantages of the rocket idea was thought to be that the launchers would be smaller and lighter weight compared to anti-aircraft guns with a similar capability also both the launchers and the rockets themselves, due to there lower complexity than equivalent guns could be produced by normal manufacturing industry. Thus not tying up valuable capacity in high tech Defence manufacturing.

Cordite or Extruded Double Base (EDB) as we would now call it was the propellant of choice at the time and it was quickly realised that tremendous performance improvements could be made to rockets if the Cordite filled the available volume in the rocket tubes i.e. allowing for a larger quantity of propellant to be housed. Unfortunately there was and still is no way of bonding Cordite satisfactorily to a motor tube with the bond remaining intact when exposed to the likely service environment. Once this fact was recognised it had two major consequences first the major effort for rocket production was put into Cordite loose charge designs the second was research into other propellants notably plastic and rocket motor designs to use this case bondable propellant.

Plastic propellant rocket motors did not make it into service during WWII. however the effort expended on this propellant class, which in the UK led to the 2, 3 and 5inch (Circa 1943) Light Alloy Plastic (LAP) rocket motors and thence to the 5 inch family of motors Thrush, Starling etc and on to the large No of Service and Civil Space Motors, was of immense significance in other ways. Dr Poole at Woolwich (Post WWII Dr Poole became the second Director of the Explosives Research and Development Establishment the former Royal Gunpowder Mills at Waltham Abbey) developed the theory of internal ballistics based on conduit burning initially for application to Plastic propellant case bonded motors. It was very quickly realised that this work could be applied to other propellants and charge designs and was applied to

the design of Cordite motors with great success, more of which shortly. However at the outbreak of WWII the UK was involved in a programme of scientific exchange with the USA and the work done by Dr Poole at Woolwich and much of the other Rocket propulsion reports were sent to the USA. These reports or copies found there way to the California Institute of Technology Guggenheim Aeronautical Lab where a small team under Theodore Von Karman (Malina and Parsons) were attempting to develop rocket motors and having problems both with propellants and insulating the motor cases from the combustion products. The papers from the UK allowed a better understanding of Rocket Motor internal ballistics and composite propellants and were quickly combined with US experience in synthetic rubbers giving birth to the rubbery composite propellant family - a major leap forward in propellant technology.

As has already been said the major effort before and during WWII in the UK was put into Cordite rocket propulsion and led to the introduction of a No of rocket weapons into UK service. Such was the effort expended and advances made that an American mission to look at Rocket weapons noted that millions had been spent and that the US must obtain the technology. The main Double Base propellant technology lacking in the USA was the "Dry" or solvent less process which allowed for much larger charge cross sections to be extruded. The "Wet" or solvented process used by manufacturers in the USA led to charge cracking in charges with large cross sections. The technology for the dry process was transferred to the USA and the California Institute of Technology in conjunction with the Naval Ordnance Test Station at China Lake put the technology to good use producing huge No's of cordite rockets.

Of note here is that although in the pre WWII terminology Guided Aerial Torpedoes (GAT's) and later Guided Aerial Projectiles (GAP's) or guided missiles as we now call them were recognised as a concept in the UK none made it into service. Sir Alwyn Crows 1946 lecture to the I. Mech. E. titled The Rocket as a Weapon of War in the British Forces is of interest not only for what is talked about but what it leaves out. A number of the service rocket systems are not mentioned and of course no mention is made of the research activities on Plastic Propellant. The UK work on liquid propellants is mentioned as enabling assessment of German developments. But no mention is made of Lubbock and Gollins work for Asiatic Petroleum on Lizzy (Rocket Assisted Take Off RATO for bombers) at the Flame Warfare Establishment Langhurst nor the follow on Liquid Oxygen Petrol/Guide Aerial Projectile LOPGAP Programme. Note Post WWII LOPGAP evolved into RTV1!

In Germany of course rocketry had been given an enormous push by the post WWI " Rocket Craze" and the work of such groups and individuals as the German Society for Space Travel (VfR), Fritz Von Opel and Max Valier. Under the terms of the WWI Versailles treaty the German Military had severe restrictions placed on it and this led them to look for novel weapon system solutions to get round the terms of the treaty. They soon fixed on rocket propulsion as an area with potential. Under the German Army a Research Centre was set up at Kummersdorf an old Artillery Range and proving ground near Berlin. Here under Walter Dornberger (later Major General) and Werner von Braun systematic research was done into, not only, rocket propulsion both Solid and Liquid but into rockets and GAP's. After a No of years Kummersdorf became to small for the rocketeers and a new much larger purpose built establishment was opened - Peenemunde on the Baltic coast near to Poland.



Figures 1 & 2 Remains of the Liquid Engine Firing site at Kummersdorf where Werner Von Braun did his Army sponsored degree research (taken in 2007)

Before and during WWII Germany produced a varied assortment of Rocket Weapons such as the Nebelwerfer (Fog Thrower) and Rheinbote (Rhine Messenger) which were used with great effect against allied forces. Of great significance and now largely forgotten was the sinking of the Sloop HMS Egret on the 27th August 1943 by an HS 293 guided missile. Egret was the first warship to be lost to a guided missile. Four other British warships were lost to HS 293 missile attacks during the rest of the war. However it was the German Guided Missiles such as the rocket powered V2 and the pulse jet V1 that were used against London and other targets that caused the authorities most concern. London and of course Britain therefore has the dubious distinction of being the first City/Country to come under attack by ballistic missile. As the war in Europe came to an end and hardware and research establishments were captured the allied powers became involved in a race to obtain as much information as possible about the new rocket based guided missiles developed by Germany. The initial survey by the military of the guided missiles in an advanced stage of development and the likely effect of these weapons on future warfare led to an urgent need for research into rockets and missiles.

During WWII the use of rocket based weapons against Allied forces and civilians, the increasing amount of signals intelligence/intercepts available started the authorities to plan for Post WWII activities i.e. further research into Rocket propulsion and of course missiles Two sites were selected with Westcott being the site finally settled on.

Mark Perman Droitwich March 2011

# **1942**

Construction of Airfield

# 1943

Bomber Operational Training Unit (OTU)

# 1945

Prisoner of war repatriation Center

# 1946

Under Ministry of Supply

### 01/04

Guided Projectile Establishment (GPE) Westcott under Ministry of Supply (MoS) Bill Cook is Chief Superintendent.

#### 00/07

Di Hickman joins (as a typist)

### 00/11

First group of (10) Germans, headed by Dr Johannes Schmitt, arrives at Westcott. [The remaining 7 arrive later]





# 1947

01/08 Westcott became the Rocket Propulsion Department of RAE (under RAE)

00/08 1<sup>st</sup> Volume of RAE/RPD monthly magazine 'Venturi' published

14/08 1st Press visit.



Figure 4 D Site after the RATO explosion

#### 14/11

Dr Schmitt is one of 4 killed (Salmon, Rowland) at D Site after a German type RATO (Walter 109-510) exploded. HTP had collected in casing during firing.

00/12

1st firing of Red Jessie - mine clearance device.

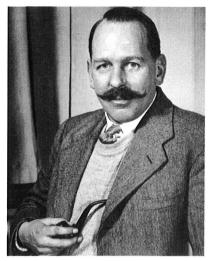


Figure 5 Air Cmdr C L Dann

09/02 C.L. Dann replaces Cook as Chief Superintendent

20/02 1st firing of LOP/GAP (presumably at the Lizzie Hut)



Figure 6 Lizzie Hut 10/08/47

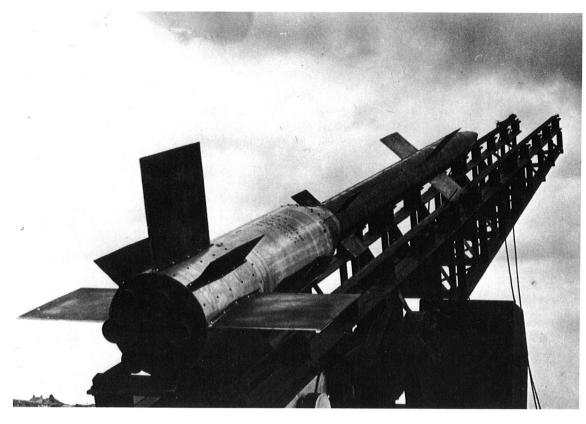


Figure 7 LOPGAP missile taken in 1945 during trials presumably at Aberporth

01/08 Ramjet (Athodyd) Department disbanded Guidance and Control Department disbanded Gas Dynamics Department disbanded Combustion and Materials Department formed

21/09 Visit to "Special Display" of Site, it's work and demonstration firings

28/10 1st flight of Lancastrian with 109-510 ATO from Westcott

02/11 1st Beta I firing

18/11 1st firing of RTV-1E, C Site

# 1949

01.01 Research Department formed Combustion and Materials Department disbanded

07.02 1st Beta II firing

17.03 1st firing of Me 163 engine, 34 site

19.03

Practical Heat Transfer Studies begin with motor firings at 32 Site

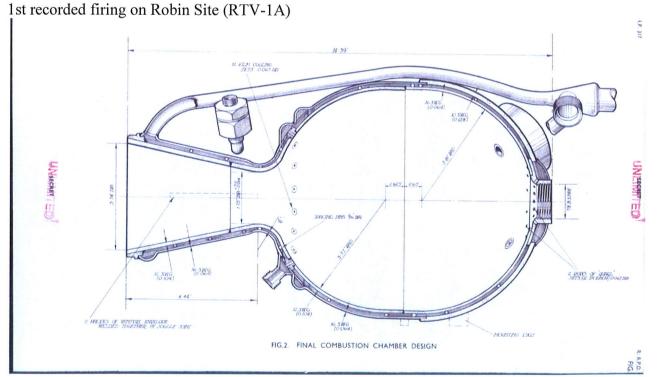
00.04 Guided Weapons Progress Committee visit

29.04 Proof testing (by explosives) of E site

#### 29.06

1st recorded explosion at Westcott of a solid propellant motor (5")

#### 28.10



# Figure 8 RTV1 Combustion Chamber

# 1950

00/02 Construction begins on the Solid Propellant Laboratories (SPL) filling factory

10/07 1st filling of a 7"solid propellant motor in SPL (7WE9 with SU/K, sent to 6 Site)

07/09 1st recorded firing on 35 site

00/09 1st intake of apprentices (6 = 5 Craft and 1 Technician)

18/091st recorded explosion at a liquid site (fuel bay, A site)

20/09 1st firing on 'German' site

13/10 Concrete bed is laid for F Site

26/10

1st filling of a 5"solid propellant motor in SPL(5WE1 with SU/K, sent to 6 Site)

27/10

1st recorded firing of RTV II engine, B site

# 1951

03/01

1st record of charge coating occurring in SPL (Charge # 171B, 46" of RNP 279<sup>S</sup>)



Figure 9 T P Hughes

00/02

Tom Hughes replaces Dann as Chief Superintendent

27/03 Visit of George Strauss MP

00/04 Guided Weapons Progress Committee visit

15/04

Napier's begin work on monopropellants at 35 Site

11/06 1<sup>st</sup> firing of a Gamma chamber (34 Site)

00/07 1st buildings of SPL are occupied and filling work commences

23/08 1st recorded explosion at 6 Site (solid propellant motor)

26/11 V-2 left Airmanship Hall for Manchester for exhibition

00/00 1st UK RATO flight (Lancastrian with DHL 2s ? - early model Sprite)

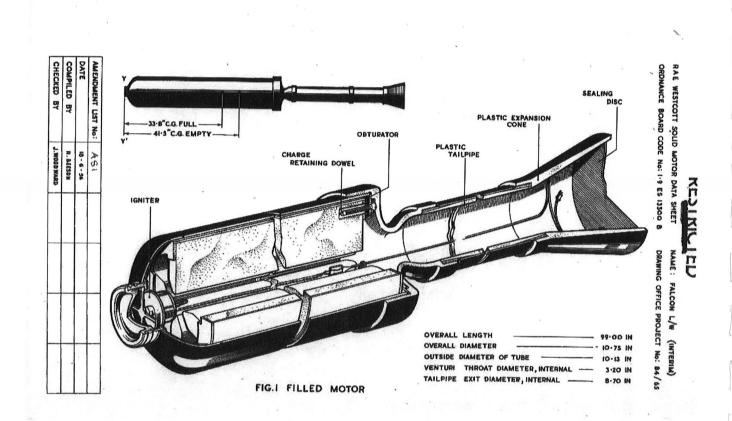
# 1952

27/02 Equipment installation completed at F Site

### 18/03

1st record of work carried out in the Flow Laboratory (rotameter calibration)

24/04



#### Figure 10 Falcon

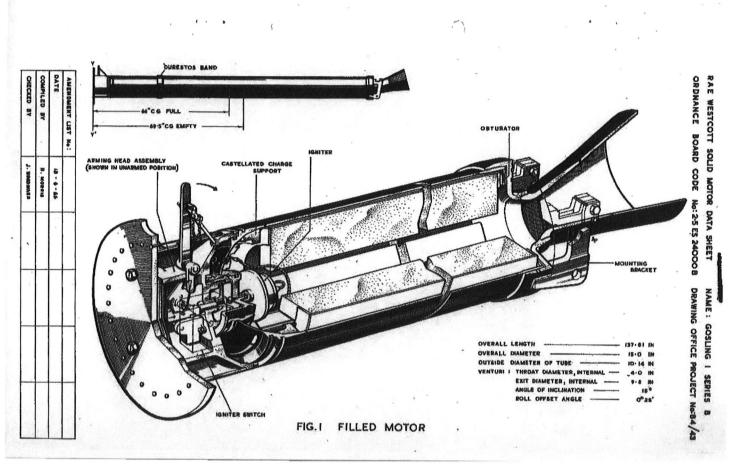
1st 10" solid propellant motor filled in SPL(RNP428, Falcon, 10WE1 - to 6 Site)

29/04 1st Twin Mayfly firing

24/05 1st firing at P 1 site (KP-1) Development work on the Gamma engine continues (34 site)

28/05

Work begins on 'Nitric acid' engine at D1 Site



#### Figure 11 Gosling 1 Series B

#### 09/06

1st Gosling solid propellant motor filled in SPL (RNP428, 10WE2 - to 6 Site)

18/06

1st Gannet solid propellant motor explodes on firing

23/06 1st (?) KP3 firing

25/07

5" ATO firings commence on 11 site

#### 25/08

Micrographic studies of silver plated copper gauzes underway (HTP programme)

16/09

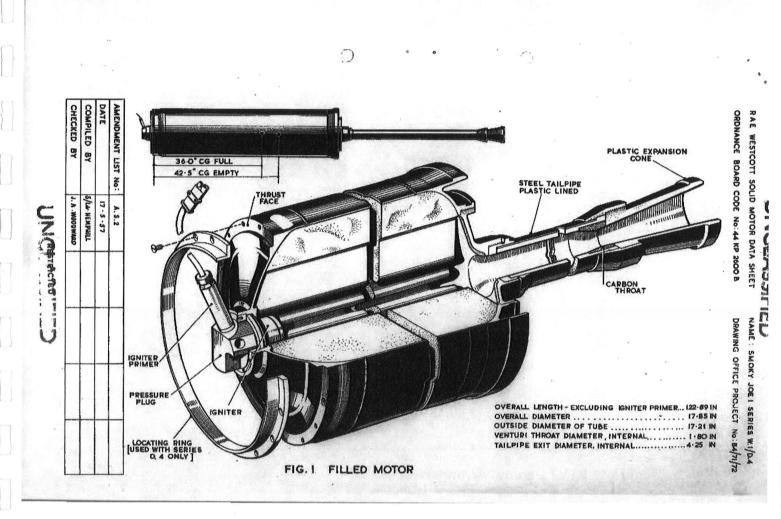
Scarab motor cluster fitted to Vickers Valetta aircraft

00/09 Clustered Scarabs fired on Valiant fuselage mock up (P1 Site)

23/09 1st Bulldog firing

17/10 1st Hydrogen Peroxide on A site

12/03 1st 17" sustainer motor fired (Smoky Joe)



#### Figure 12 Smokey Joe

16/04 1st 'cold' ignition at 32 Site

27/04 1st GFRP motor (Ladybird)

08/06 Proof testing (by explosives) of F site

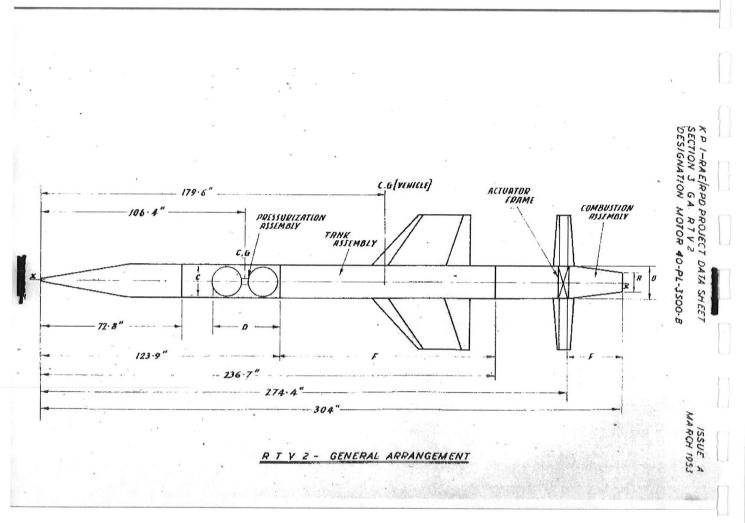
18/08 Photographic evidence of lead ingots handed to police (Church story ??)

28/08

1st firing of a Grasshopper solid propellant rocket motor, C site



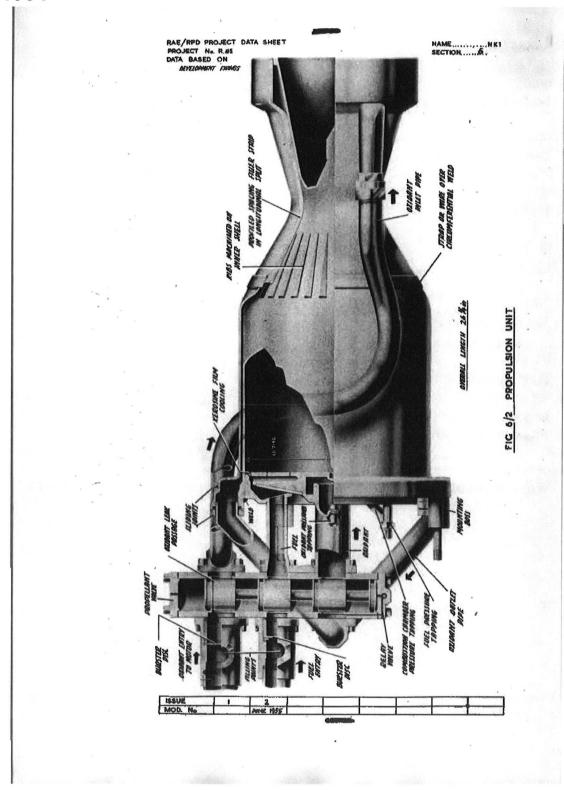
1st firing of a complete RTV II propulsion system at P 1 site (with Demon boosts)



#### Figure 13 RTV2 General Arrangement

20/11 KP 2 engine fired at C site

1954



# Figure 14 NK-1 Chamber

15/03 NK-1 engine fired at D2 site

00/04 Projects Department disbanded

00/04 Solids (S) Division formed

06/05 1st flight round of KP4 with TVC (RTV II) fired at P2 Site (Jessen)

00/07 Visit of Guided Weapons Advisory Board and Scientific Advisory Council

22/07 1st firing at F Site

00/10 Liquids (L) Division formed

26/10 330 building completed

03/11

1st radio/radar attenuation firings at Robin hangar

12/11 1st firing at B2 site

00/11

Work started on Electrothermal Propulsion using H<sub>2</sub> at mN level (330 building)

# 1955

10/01 1st Smokey Joe firing at Q site for attenuation trials

03/02

1st firings of Demon solid propellant rocket motor, 8 site

#### 08/0

1st mention of liquid Hydrogen at Westcott

#### 28/03

Last recorded cordite propellant Gosling motor filled in SPL (10WE228 using RNP 856 - to Larkhill)

#### 10/05

1st entry of Burst Book (solids) - 2" ABC flown at Pendine : split longitudinally.

#### 09/07

Last cordite RNP890 propellant 5"motor, filled in SPL (5WE883, sent to LWRE)

#### 23/08

Sealyham (IMI) motor fired for plume attenuation measurements (Q Site)

#### 20/09

Tests commence of Delta engine gauzes (filters)

#### 01/12

Post of Chief Superintendent abolished with the departure of Hughes

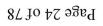


Figure 15 J E P Dunning

## 01/12

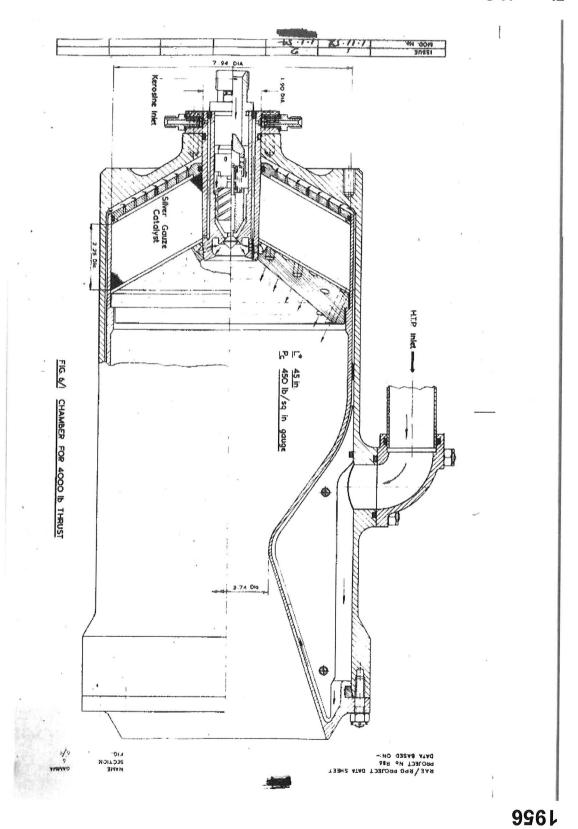
Pat Dunning appointed Establishment Director

01/12 1st firings for re-entry head materials proving



# 70/80

եigure 16 Gamma



**MESTCOTT A CHRONOLOGY** 

#### 1st Gamma I engine fired

18/04

1<sup>st</sup> Gamma II engine fired for plume attenuation measurements (Q site)

23/05? LOX filling trials at 36 Site

10/06Press Visit

29/06 Explosion in the Physics laboratory (330 building)

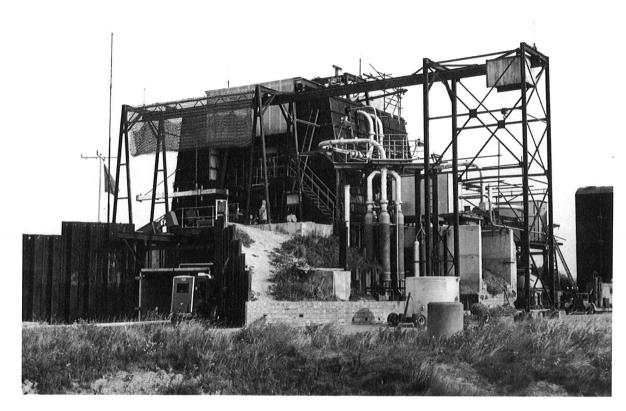
04/08

 $1^{\text{st}}$  firing of Raven (6 Site)



Figure 17 Manufacture of P Site Hardware

P2 Site



### Figure 18 P2 Site

12/09 Reconstruction of P2 Site underway (to take RZ engines)

22/10 1st explosion of a Gamma engine (Q site)

23/10 1st tests of Rolls Royce Gas Generators, 36 site and F 1 site

10/11 Test on 'ignition' of HTP inside reinforced tanks (Z Site)

# 1957

23/01 Wolfhound (IMI) motor fired for plume attenuation measurements (Q site)

18/02 1st testing of RZ-1 valves

29/03 Visit by the R.D.C.

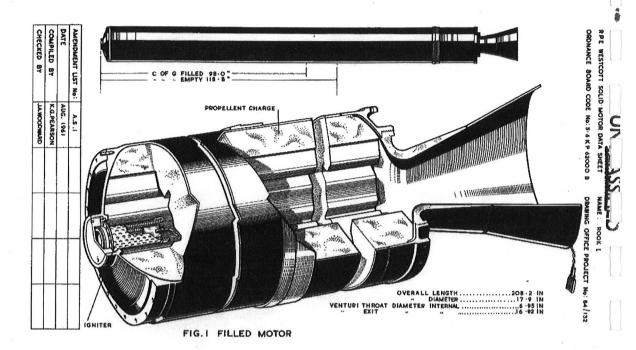
24/04 Plume studies on a single Gamma engine (Q Site)

23/05 1st recorded road accident (between Q site and runway)

01/10 1st firing of a Napier Scorpion (32 site)

06/12

1<sup>st</sup> firing of a Rolls Royce [RZ] gas generator (36 Site)



#### Figure 19 Rook 1

13/01 1<sup>st</sup> firing of Rook (6 Site)

29/01 1<sup>st</sup> ignition tests (RZ engine?) at P2 Site

05/02

After a cryogenic chilldown test, P2 site suffers cracks and structural failure

10/03 Trials begin on N site (Karl Meier)

13/03 Valve failure (rupture) on 33 site

14/03 1st firing of  $^{2}$ /<sub>3</sub> scale Stork (T.6) on Fairey's thrust alignment rig

01/04

North American Aviation (S-3D) multi-tube engine arrives (was it ever fired ?)

#### 21/05

Armstrong Whitworth Aviation install a rig at 6 site

#### 01/06

Westcott became Rocket Propulsion Establishment (RPE), independent from RAE

#### 24/06

1st firing of Woodpecker (WAC 125) in Fairey's thrust alignment rig

#### 03/07

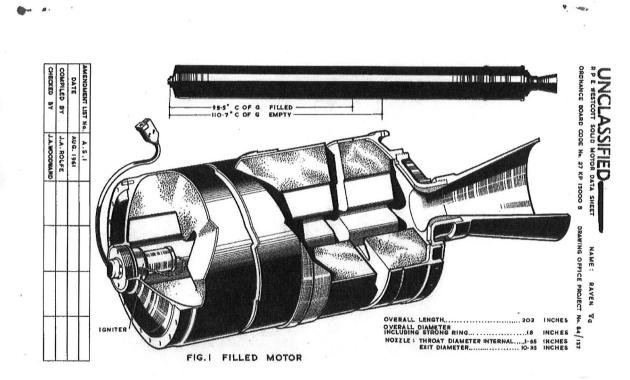
1st recorded Albatross firing

#### 16/07

1st 'firing' of the silo programme ( $^{1}/_{60}$  scale silo, L site, using nitrogen gas)

### 00/07

1<sup>st</sup> firing of the 'Propane' engine (11 Site)



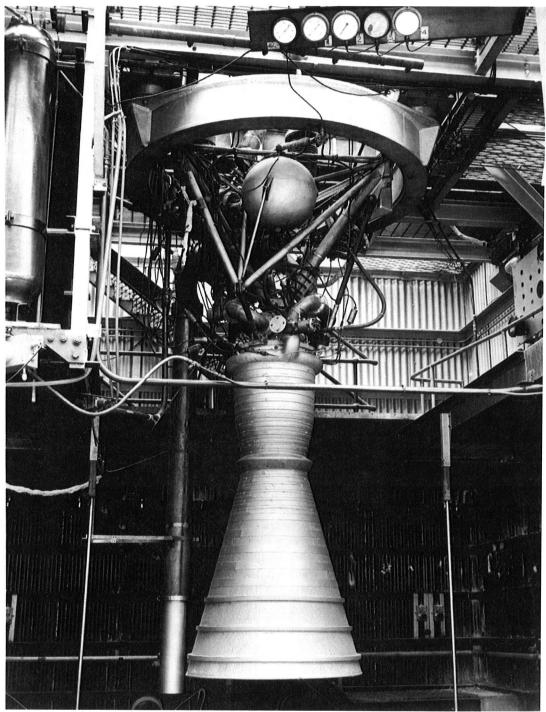
#### Figure 20 Raven Va

12/11 Raven V motor filmed by the BBC whilst being fired on L Site

## 19/12

RZ-1 flow test rig completed on 33 site





# Figure 21 RZ Engine

06/01 1st RZ-1 engine on P2 site

00/06 Ministry of Aviation (MoA) assumed responsibility of Westcott

00/10

SR 53 aircraft (XD 145) arrives by road and installed in Hangar 5 for firing tests

26/10 1st firing of Phoenix solid propellant rocket motor programme (10" polyurethane?)

# 1960

00/02

1st firing of the retro-motor for Blue Streak warhead (R Site)

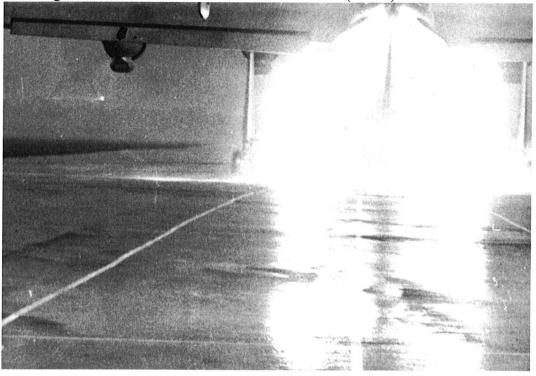
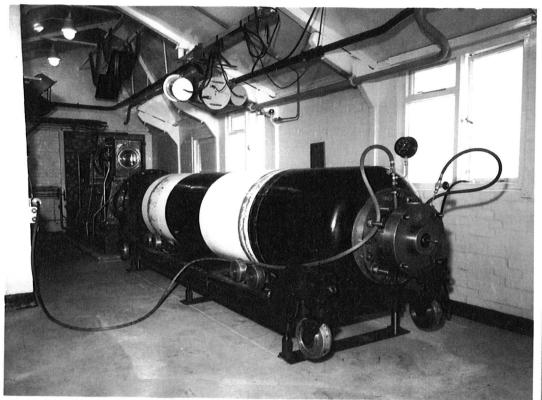


Figure 22 Beverley All motors firing



Figure 23 End of Firing





#### Figure 24 Early Stonechat being filled

13/04

1st 36" solid propellant rocket motor in SPL for preparation and filling

#### 01/06

1<sup>st</sup> fire hazard test with HTP (C Site)

12/07 Chief Scientist Conference

#### 07/09

1<sup>st</sup> firing of Albatross, 17inch sustainer for VR 725 (*became Thunderbird*) (6 Site open bay)

#### 20/12

1<sup>st</sup> firing of the hypergolic igniter programme - 37 firings in all (F1 Site)

# 1961

16/03 Wolfhound attenuation tests continue (Q Site)

18/04 1st 24" solid propellant rocket motor (solid cord) fired, R site

05/05 1<sup>st</sup> firing of Stonechat (K Site)

09/08 1<sup>st</sup> firing of the Phoenix motor for Blue Water Mk II (K2 Site)

10/08

3<sup>rd</sup> (last) firing of Albatross (K2 Site)

# 1963

29/03

1<sup>st</sup> Albatross motor fired (K Site)



# Figure 25 Skua and Petrel

30/09 1<sup>st</sup> Bantam motor fired (R Site)

# 1964

01/02 Pat Dunning publishes new structure of RPE with S, L and R Divisions

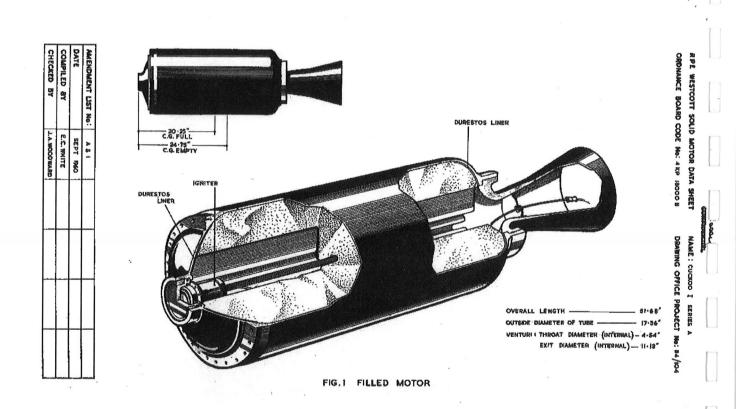
03/03 Smoky Joe motor programme (for Red Shoes) cancelled

25/03 1st liquid hydrogen produced at Westcott.

03/06

Press Day, briefings and solid and liquid propellant rocket firings including: Last firing of an RZ-2 engine at Westcott (shut down occurred just in time!)

06/10 1<sup>st</sup> firing of Cormorant motor (K Site)



# Figure 26 Cuckoo 1 Series A

20/10

1<sup>st</sup> firing of Cuckoo motor (K Site)

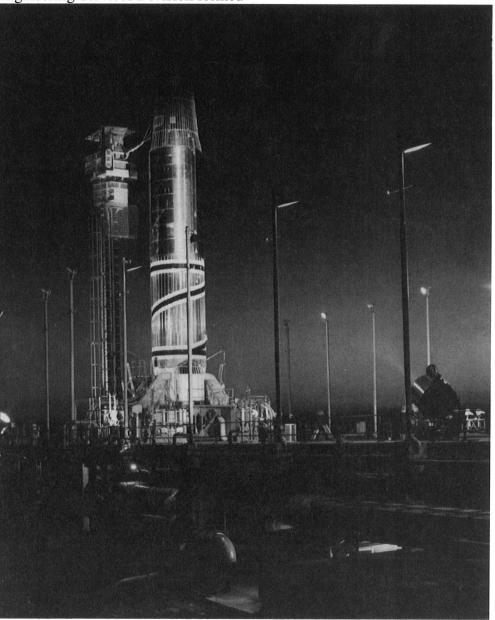
# 1965

07/04 1st 54" motor filled in SPL (54PWE 001, S 1044 propellant)

11/06 Visit by the Chief Scientist (who he then?)

11/06 1st firing of the 54" motor (K2 Site)

16/11 Engineering Services Division formed





# 1966

05/01 Propellant ignition accident in SPL. Fred Knibb lost a finger 'scraping' a Chick

08/03

1<sup>st</sup> firing of 24" motor (became Kestrel, K Site)

00/04

Ministry of Technology (MoT) assumed responsibility of Westcott

# 1967

# 03/07

Last firing of an Albatross motor (17" sustainer for Yellow Temple - Was to have been Nuclear armed Thunderbird)



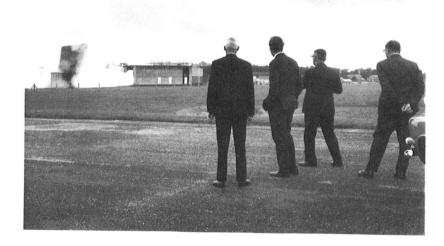
Figure 28 PLTV 1

# 1968

00.08 Occupation of the new office building (100 Bldg) begins



Figure 29 Mr Wedgewood Benn on his tour of the site



### Figure 30 Impressing the Visitor

12.09 Visit by Mr Wedgewood Benn (then Minister of Technology)

19.10 Completion of first resistojet engine

# 1969

03/07 Last (?) Smoky Joe firing at Westcott (L Site)

22/09 Completion of 3kW resistojet (Rhenium tube)

06/10 New Surgery (Building 436) completed

# 1970

00/06 Ministry of Aviation Supply (MoAS) assumed responsibility for Westcott

21/08

Ignition of a Blackcap charge during propellant (VU) machining in SPL 28

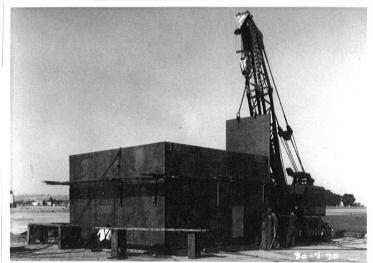


Figure 31 Building the Torrey Canyon Rig



#### Figure 32 In Action

07/11 Ignition of the first crude oil for 'Torrey Canyon' studies (P Site)

28/12 Another Blackcap charge ignites during propellant (VU) machining in SPL 28

# 1971

00/05 Ministry of Defence (MoD(PE)) assumed responsibility for Westcott

02/07

1<sup>st</sup> firing of 'Insolik motor' (6<sup>th</sup> last was 23.07.71)

#### 06/09

New Apprentice Training Centre (Building 435) accepts first students



Figure 33 Waxwing Third Stage of Black Arrow

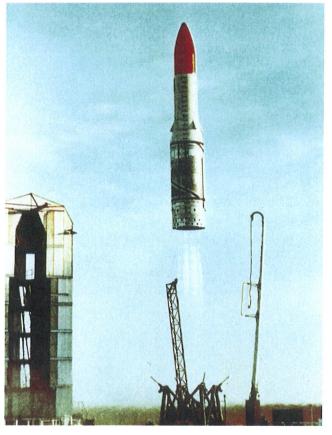


Figure 34 Black Arrow Launches

# 1972

03/07 USGW motor fired (K2 Site)

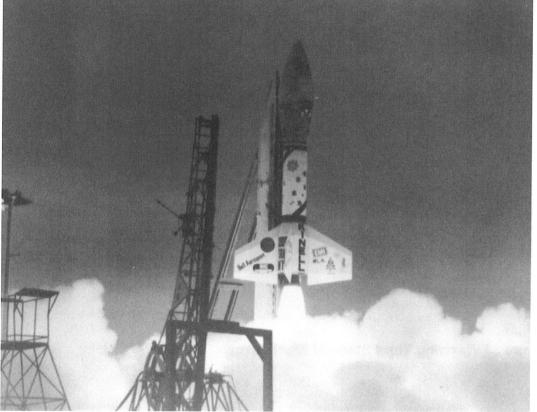


Figure 35 Falstaff Trials Vehicle launches

# 1973

01.01 L.J. Bellamy appointed Establishment Director Max appointed Deputy Director Research Department disbanded

04/01

Westcott combined with Waltham Abbey to become RPE/ERDE

01/06

Harold Young appointed Deputy Director with responsibility for closing Westcott

28/06

Visit of the Permanent Secretary

05/07

A bolt was explosively ejected from a pugmill being readied for use in SPL 12

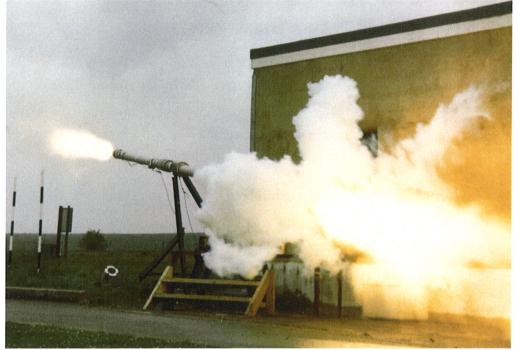
16/07

Chemistry and Applied Physics Division formed

# 1974

02.01 Last (?) Retriever motor firing at Westcott (L Site)

21.01 1<sup>st</sup> firing of Sperry IPN/HGS (A2 Site)



### Figure 36 Recoilless Launcher

28.08 1<sup>st</sup> recoilless launcher fired (F Site)

# 1975

05/02 Plessey begin firings of IPN/MTV gas generators (34 Site)

#### 17/02

Dudley Lewis (Supt. Liquids) appointed in a new post as Principal Superintendent Neville Morris (Superintendent Solids) appointed Superintendent Liquids Ken Silman appointed Superintendent Solids

#### 17/06

Herman Treutler ['Trolley'] retires (He continued to call in after this thus becoming the last German to work at Westcott – but only in a part-time consultative role)

# 1976

27/01 Accident while fitting door to new Vacuum Vessel 2 (Wooller - broken ankle)

26/03 1<sup>st</sup> AST 1226 motor - P3 Martel fired (K Site)

30/06 Ray Heron replaces Young as Deputy Director (special responsibility for ERDE)

01/10 Frank Panton replaced Bellamy as Director

# 1977

10/02 Exocet motor fired at K Site

#### 23.02

RPE/ERDE combined to become the Propellants, Explosives and Rocket Motor Establishment (PERME). Heron was supposed to assume responsibility for ERDE [with a view to becoming overall Director later ?] but rarely went there.

#### 31/03

Last full time German (Fred Jessen) departs Westcott for retirement.

#### 14/07

2049th (last) firing of Sperry IPN/HGS (A Site)

#### 23/08

Introduction of change of nomenclature of all plastic propellant motors previously motors were given (diameter in inches) PWE 001, 2, etc.] As from today, WEP nomenclature introduced for all motors starting from 0001(which was an Imp II)



Figure 37 Chevaline Polaris ready for test launch

# 1978

17/06 Graham Pearson replaced Lewis as Principal Superintendent

# 10/08

1st Honest John fired (K Site)



### Figure 38 Duke of Gloucester Presentation

06/10

Visit by the Duke of Gloucester who also officially opens the new canteen.

# 1979

23/10 A Gosling motor broke free whilst being burnt out at Z Site, it travelled 570 metres

07/05

Residual propellant ignites after the filling of a Gosling motor in SPL 9/23B

00/11

Graham Spickernell appointed Superintendent Solids (replacing Silman)

# 1980

05/05 Ray Heron T&G as Director with the departure of Panton

14/07 Barry Newman appointed Director

31/08 Post of Principal Superintendent abolished with the departure of Pearson

20/10 Director (Newman) received accepted a certificate for Chevaline work

# 1981

08/04

Last (58th) Burst Book entry - 203mm (Type 2) motor failed during a static test at K Site (K155/81) - Jon Gittins

00.11

Maureen Fowler *finally* manages to obtain agreement from Heron (DD) to publish her much modified (by Heron) draft History of PERME (PERME Memo 168). Within days of release, it is ordered (by Heron) to be withdrawn from circulation.

1982



### Figure 39 Honest John Firing

06.07 Honest John firing programme begins (L Site)

07.10

An experimental petal valved Pipit broke away from its rig during firing at K Site

# 1983

14/10 2<sup>nd</sup> firing in Nuthatch programme (using Scarab hardware)

24/10

1st firing 100lbf N<sub>2</sub>O<sub>4</sub>/MMH engine (Vac. Vessel 2, 6 site) became LEROS 2.

14/12

1st firing RAE Space Departments 20N N<sub>2</sub>O<sub>4</sub>/MMH engine (Vac.Vessel 2, 6 site)

# 1984

01/04

Westcott 'incorporated' into the Royal Ordnance Factories (ROFs)

24/04

Graham Spickernell (Supt 'S') appointed Director Air Systems at Westcott. John Rolfe assumes Superintendent Solids role (T&G)

25/09

1st firing of 100lbf thrust N<sub>2</sub>H<sub>4</sub> (PENAID) engine, Vacuum Vessel 2, 6 Site

19/10

1<sup>st</sup> Nuthatch hardware fired (15<sup>th</sup> of programme, blast pipe burns through)

21/11

Nev Morris (Superintendent R&D) publishes new structure for Liquids Division

01/12

Paul Jackman appointed Superintendent Solids

31/12

Westcott ceases to be under MoD jurisdiction.

# 1985

As a 'Private' Establishment :

#### 02/01

Now Explosives Division, R&D Centre of Royal Ordnance, Trevor Truman Director

#### 29/03

Site-wide tree planting programme underway

#### 00/11

Nev Morris publishes new structure for Liquids Division



Figure 40 Chevaline PAC

# 1986

06 07/11 Carbon filament winding machine installed in Workshop 2

### 1987

06/01 Ken Silman retires

31/01 Nev Morris retires as Assistant Director R&D

#### 01/04

BAe acquires Royal Ordnance PLC (over Hanson Trust, Vickers or Trafalgar House)

#### 18/05

Clean room available for use in Hangar 1

11/08

Explosion at SPL 48 occurs whilst pressing a Goldfinch II motor (RD 2418). The process workers had slipped out of the building so they were safe (quiet fag?)

#### 01/09

1st firing here of a Marquardt R-4D engine in a Eurostar bus (F 2 Site)

00/10 Peter Penny (now as AD Propulsion) publishes structure of Propulsion section

#### 17/12

L Division wake at the White Swan, Westcott (good bash!)

# 1988

04/01 Rocket Motors Division formed

16/03 IMI Summerfield incorporated into Royal Ordnance

25/03

Steven Salvage publishes note on separation of Westcott and Waltham Abbey About this time Steven Salvage was appraised of the strategy to make Summerfield the future headquarters of RO RMD and instructed [by Saunders?] to obstruct/stall any requests for further investment at this site.

27/06

Last Cuckoo IV motor filled in SPL (WEP 13700)

08/07

Geoff Evans publishes the structure of the Technical Department of RMD

15/07

Draft discussion document on transfer of ARC 5lbf engine manufacture (failed)

18/07

J Brookes (as MD) published new structure of RMD

20/07

Jeff Curtis (as Site Operations Manager) presents Structure of Westcott

14/09 Press Day

00/10

MoD Police replaced by Royal Ordnance Guard Force

28/11

Geoff Evans publishes Integrated structure of Projects and Technical departments

15/12

Geoff Evans publishes his infamous note *pre-empting all agreed modalities concerning the discussions and studies by the various committees as to the role of Westcott and its employees* - refer to para.5 of said note

# 1989

#### 06/04

Graham Spickernell (as MD) publishes restructuring of RMD All solid propellant matters to transfer to Summerfield All materials and Polymer sections to transfer to Summerfield Composite propellant R&D from Waltham Abbey to Summerfield (it had been intended to transfer all WA activities to Westcott - in the event, none came there)

#### 12/04

Core statements and re-organizations published for Westcott and Summerfield

#### 17/04

Re-structuring Note published by personnel, Westcott

#### 16/05

Geoff Evans presents Post-rationalization structure and asks "why are you (Westcott personnel) not *applying* for jobs at Summerfield" ! Paul Jackman publishes Post Integration Westcott Technical Structure

#### 17/05

"I am prepared to transfer to Summerfield" note issued by personnel (see above)

#### 19/05

Paul Jackman appointed Technical Manager, Westcott

#### 26/05

Geoff Evans publishes Projects/Technical Directorate structure

#### 13/07

Geoff Evans publishes another Projects/Technical management structure sets up a new Technical Authority (for safety) at Westcott

#### 01/09

Assessment Section (Westcott S(a) as was) begins operations from Summerfield

#### 04/09

Paul Jackman publishes post 04.09.89 structure (Technical Department)

#### 20/10

1st firing of Leros 20 rocket engine (F Site, for satellite AOCS)

#### 27/10

Last T8 motors filled in SPL (WEP 13894 - for Burghfield)

#### 21/12

Last R Site firing - R131/89 - a Rapier Gas Generator. Site is struck by lightning at the time of firing and loses all data records.

# 1990

17/01Geoff Evans publishes yet another Projects/Technical management structure 06/03 Visit by The Cambridge University Astronomical Society. 19.03 Last Imp XXF filled in SPL (WEP 13956 - for Shorts) 12/04Peter Flick publishes new Commercial Department organization 01/05Jeff Curtis publishes new Commercial Department organization 09/05 Last Serin motor filled in SPL (WEP 14019 - for internal use) 11/05 Last Pipit motor filled in SPL (Petal valve specials - WEP 14025 for internal use) 17/05Jeff Curtis publishes new RMD management structure (263 personnel) 15/06Brian Morris publishes new Commercial directorate organization 00/09 Last intake of apprentices (after 41 continuous years and some 450 apprentices)

28/11 Visit by Sir Sydney Bacon

03/12 Last D8 motors filled in SPL (WEP 14037 - inert, specials for Aldermaston)

# 1991

14/01 Jeff Curtis publishes new RMD management structure (239 personnel)

#### 05/02

Last firing of a PENAID engine, Vacuum Vessel 2, 6 Site

#### 02/03

1st Leros LAE launched into GTO (Astra 1B by Ariane 44LP) it performs well

#### 10/04

Letter from MRH requesting Company-wide skills survey form to be complete!

#### 25/04

Last T6 motors filled in SPL (inert, specials for Aldermaston)

#### 01/07

Bob Bosher publishes new structure for the Production Department

#### 10/07

1st Marquardt R-4D engine fired here in an Olympus spacecraft structure, F2 Site

#### 15/08

Last firing on 6 Site (open bay)

#### 00/11

Agreement with RRC (now Primex) for license production of MR 103C engine

#### 00/12

Last firing on Q Site (DRA, Blackcap for millimetric radiation proving)

# 1992

01/01 Royal Ordnance absorbed into BAe Dynamics

28/04 1st LEROS 20H fired (F site)

25/05 1st LEROS 20R fired (F site)

10/07 Di Hickman retires (she was the longest serving Westcott person - 46 years here)

14/08 Geoff Evans publishes new structure for Projects Technical department

00/09 Last firing on 37 Site (Vortex engine for DRA plume studies)

14/12

HR 1 published to cover release of staff (220 to 149) at Westcott

00/00

1st firing (delta qualification) of license built MR 103C in Mini HATF at F Site

# 1993

28/01

Managers meeting in 100 Bldg. Rationalization/redundancies announced

#### 01/03

Peter Penny publishes new Design/Engineering management structure

#### 13/05

Visit by the Royal Aeronautical Society, Halton Branch

#### 08/07

BNSC Space Technology Advizory Board (STAB) meeting and visit (100 bldg)

#### 14/07

Visit by the British Interplanetary Society

#### 25/08

Only flight of Zodiac Beachamp (mono-propellant hydrazine engine)

#### 10/09

Geoff Evans publishes new organizational structure for Technical/Projects group. Paul Jackman publishes new Config. Control and Design Management organization

#### 14/10

Graham Spickernell announces 70 jobs to go at Westcott (same at Summerfield)

#### 04/11

Release plan agreed with T.U. (*Note: Westcott from 156 in October '93 to 30 by October '94* i.e. far more than the previously announced 70)

#### 21/12

Peter Saunders publishes new Divisional structure

# 1994

01.01 706 employees at Westcott???

#### 04/01

Bob Bosher transfers to Summerfield (eventually becoming Production Manager)

#### 05/01

Jeff Curtis publishes notice on Rationalization of Westcott site Peter Penny publishes re-organized structure of Technical Directorate

#### 00/01

After a lengthy delay due to problems associated with link encryption, Protos (part of the IBSYS system) is up and running at Westcott.

#### 01/05

Management of all remaining Westcott personnel transferred to Summerfield

#### 21/07

Aerospace Museum (Cosford) visit to view collection of remaining artefacts of interest and arrange collection of same.

#### 25/07

Science Museum (London) visit to view collection of remaining artefacts etc.

#### 18/10

AJM's 486DX is operational. It took some 9 months to obtain after vacillation by Summerfield. Finally allows the VAX to be switched off and Bldg.100 to be vacated (AJM had been alone in there for 4-5 months).

#### 00/11

Tropos (part of IBSYS) up and running at Westcott (same time as Summerfield)

#### 02/11

Last 17" solid propellant rocket motor filled (Goldfinch IIC - WEP 014398 filled with plastic propellant RD 2418 in SPL 08/12)

#### 09/11

Last solid propellant rocket motor filled (5" LAP - WEP 014407, filled with plastic propellant RD 2418 in SPL 08/12)

#### 02/12

DRA plume studies firings resume since the closure of 37 Site, with the first firing of a Vortex engine at J3 Site

#### 13/12

1st firing of 200N N<sub>2</sub>H<sub>4</sub> thruster for PUC Penaid trails (6 Site, Vac 2)

22/12 With the fitting of the Gate, Liquid Engines enclave (Stalag) now completed.

# 1995

00/01

Westcott 'remnants' given 6 months grace to prove a viable business exists

#### 00/02

Planning consent for change of use for a number of buildings granted by AVDC

### 06/03

David Singleton appointed as MD Rocket Motors (now as a Business Unit)

#### 03/05

Commercial Director (Brian Morris) given 15 minutes to clear his desk and leave Summerfield (allegedly he is searched on leaving the site). Finance Director (David Howell) also given leaving orders (leave by day's end)

#### 26/05

Re-organization showing MD's 1st level managers published. Jeff Curtis appointed as Head of Liquid Engines Business

#### 15/06

Re-organization showing 1st level managers direct reports published

Was this the time at which the real remit of Singleton was actioned (i.e. to sell Westcott) ??

#### 01/07

Property Services let first unit of Westcott Business Park (to APEX Services)

#### 00/11

Jeff Curtis attempts private buy-out with bank financiers and asks personnel whether they would be prepared to accept new management. Bid fails.

#### 05/12

1st firing of joint RORM/SSTL, MON/HTPB hybrid motor (F 2 Site)

# 1996

02.02

RM back into hybrid rocket engines (1st RM MON/HTPB firing, J 3 Site)

17.02

1st Leros mission into deep space (on NEAR spacecraft, launched by a Delta II)

#### 04.09

Kaiser Marquardt approach JH at SBAC, intent on purchase of Westcott. They are referred to the MD (Singleton) at Farnborough for further discussion. (Fails)

#### 00.11

Bob Wood, Chris Grey and 'Ed Stahlof' attempt private buy-out of Westcott ( $\pm$ M4.5 cash plus other arrangements - total  $\pm$ M10) - bid fails

06.11

1st Leros mission to Mars (on Mars Global Surveyor, launched by Delta II)

# 1997

01/01

Rentokill take over security responsibility from Royal Ordnance Guard Force

#### 02/01

Stephen Henwood replaces Terry Morgan as MD of Royal Ordnance (Morgan goes on to be Head of *Personnel* !!)

#### 26/03

Royal Ordnance Rocket Motors publishes new structure (for ISO 9000)

#### 01/04

Spoof Profile article on 'Grommets Rocket to the Moon', after approval by JEC and DS is quashed by CEGs outburst.

#### 30/06

DASA visit Westcott for a pre-purchase inspection

#### 00/07

Secret meeting in Los Angeles between RM and other "interested parties" all of whom happen to be US [This is not the first of many moves designed to bring about the sale of Westcott - the fact that this meeting ever occurred has always been denied by RM Management - we *know* different]

#### 18/08

Stephen Worlock replaces David Singleton as MD Rocket Motors (Singleton promoted (!) to Farnborough)

#### 01/10

Jeff Curtis replaced by Paul Jackman as Head of Liquid Engines Business

00/10

Date set for Weapons Concepts to vacate Bldg 5 passes. (See Aug 98)

#### 00/10

1st firing of Surrey Satellite's electro-thermal thruster on J4 site (N<sub>2</sub>, H<sub>2</sub>O &CO<sub>2</sub>)

#### 07/11

Bob Bosher announces intended sale of RO(W) and JV for RO(S) at Westcott. Allied Signal, ARC, Kaiser Marquardt and Aerojet are to give initial bids.

#### 00/11

1st firing of Leros 2b (F Site, Westcott, for satellite liquid apogee propulsion)

#### 00/11

Planning consent for change of use for further buildings granted by AVDC

#### 02/12

Due diligence with ARC announced at Westcott 03/12 1st ARC representative at Westcott for site inspection

15/12 1st ARC offer tendered - considered inadequate by RO

00/12 Matra Marconi (!) put initial offer on table

00/12 Aerojet put initial offer on table

23/12

2nd ARC offer put on table - considered starting point for further negotiation

# 1998

#### 01.01

Much delayed introduction of MRP II at Westcott. After all training aids had been installed in Bldg. 424 and documentation made available, it was finally accepted as being non-viable for the small business level of LEB.

#### 06.01

Aerojet at RO(S) for Westcott purchase review

#### 07.01

 $Bo^2$  and MRH at Westcott for union meeting, announce sale to ARC likely, probable confirmation by 12.01.98 with completion 28.02.98

#### 23.01

ARC here to meet PEJ and Unions, predict completion by end-March - depends on successful completion of LTT and Leros 2b engine qualification programmes.

#### 30.01

Stephen Henwood publishes initial results of RO Strategy Review in HQ Bulletin HQ09/98 "It has *already been decided* to seek a more appropriate owner for this [LEB] business". Gives less information than already known, even on other sites.

#### 23.02

ARC representatives at Westcott again

#### 12.03

LTT finally qualified against a much revised HAC specification

#### 24.03

Simon Raynes, a BAe spokesman quoted in Space News as saying "British Aerospace no longer has any investments in the space industry".

#### 31.03

Supposed end to exclusivity of discussions between BAe/RO/RORM and ARC

#### 06.04

ARC representatives at Westcott again. Open row breaks out over release of information and the documents/data allowed to be viewed by them.

#### 07.04

Stephen Worlock talkabout at Westcott - negotiations with ARC continue.

#### 24.04

Panel meeting in S&S Club. SW, DS, JD, MRH, PEJ answered questions relating to sale. Questions on pensions were held as appropriate personnel were unable to attend (will be held later - SW)

#### 07.05

ARC register a new company ARC(UK) Ltd with Companies House

#### 13.05

1st of 2 days at which ARC (and HAC) and SW at Westcott

#### 03.08

SW letter to employees re : re-negotiating price (downward due to falling order book, leaky Leros 2b ? - seemed to be sell at any price !)

#### 05.08

Last Weapons Concepts hardware departs Bldg 5 for Glascoed, 10 months late

#### 20.08

Peter Penny meets PEJ and JH to discuss RORM structure/functions, post-sale

#### 09.09

ARC -Jim Sides and RO -Steven Henwood shake hands on the sale 'in principle' at Farnborough (Air Show)

#### 15.09

Westcott employees shown handover plan (joke - only dates and major element headings) It calls for exposure of all engine plans and documentation from 21st September (signature) and 29th September (exchange) nothing said about what is expected of the employees. Also, looks like terms and conditions for these employees on exchange of ownership will be enforced by RO. Nobody from Personnel was present (again).

#### 00.10

Meeting with MRH at Westcott announces MARS opportunity for all employees (not PEH, JH or PEJ) ~ 20 people apply.

#### 09.10

MRH, EC and PEJ announce that BAe/RO LEB sold to ARC and announces 5 MARS personnel accepted but do not say who.

#### 14.10

After warning RORM for months that he would not work for ARC, Bob Wood resigns, much to the consternation of RORM management!

#### 20.10

ARC here for (4 today, 3 tomorrow) interviews with prospective personnel and purchasing employees (we had no knowledge of the interviews and interviewees just arrived out of the blue). ARC gave presentation to workforce.

#### 21.10

After warning RORM for months that he would not work for ARC, Chris Gray resigns, much to the further consternation of RORM management !

#### 01.11

L Site rig (used by DERA) re-located within K Site perimeter

#### 10.11

Ron Bellis finishes and goes without goodbyes

#### 11.11

AJM had to return home as he is 'un-employed'! THE retained until Christmas PEJ stays on as Acting MD paid by RORM but no responsibility to them. SW & MRH here to announce sale of LEB to ARC(£M 3.5 but £M0.1 has to be repaid due to outstanding problems - £k 150/yr rent for site) '5' MARS people are : Meade, Eggleston, Bellis, Mellor (and Perman to RO(S))

#### 27.11

LEB wake at Crooked Billet (good bash)

#### 17.12

Bellis, Eggleston, Mellor and Meade hold farewell bash at Social Club.

#### 17.12

PDP discusses with JH reduction in-stores holdings and moving from SPL to the bomb dump and K site area (50 and 51 still needed).

#### 18.12

Bo<sup>2</sup> states 'not only will all SPL magazine space be required but a feasibility study on turning SPL non-magazine storage into magazines ! - clearly unaware that all the solids 'offices' have already been let!

# 1999

11/01 GIE appears as a consultant to ARC (UK) (Newton Associates)

#### 01/02

PNTS begin contract to 'clean up' SPL (Roger Neal and Norman Carr)

#### 08/02

PEJ begins one week handover to new ARC(UK) MD (Hubert - ex Marquardt)

#### 09/02

Science Museum here to catalogue all remaining rocket engine artefacts

#### 17/02

John Wheat (RO Personnel [Nottingham]) visits - "RO won't be here in 6 months"

#### 26/02

Science Museum collect all rocket engine artefacts + still photo library, some cines

#### 20/04

On-Line instrumentation system removed from Bldg 47. K site is local now. 1st burn-out of SPL buildings (SPL 05) by PNTS as part of SPL clean-up.

#### 27/04

SSTL/PNTS fire a 5,000lbf thrust HTP/HTPB hybrid (E Site) Last firing of a Lapwing IID (K Site)

#### 05/05

DRPS (Gosport) check Thorium radioactivity in Mg alloy 185FTV fin barrels

#### 06/05

A  $24^{1}/_{2}$  year old Raven fired successfully (Type VIC, K Site)

#### 11/05

SPL 13, 14 and 15 torched by PNTS - as final part of Phase 1 clean-up of SPL

#### 24/05

Summerfield team start packing old Chow motors for destruction at Shoeburyness

#### 07/06

1st batch (72 drums) of 'GJS's' Muiden Chemie AP despatched to Bridgewater

#### 08/06

1st batch (20 of 92) old Chow motors despatched to Shoeburyness for destruction

18/06 SPL 29 torched by PNTS (early, as Phase II of SPL clean-up not yet approved)PEH (and Val) visit Summerfield area with a view to transfer there, on promotion

#### 24/06

Re-grading letters out to RM employees - 61 posts downgraded, 9 upgraded (no interviews took place with employees or their line managers, so how does the company know that the employees are actually doing the jobs that have been re-graded ?!! PEH transfer on promotion job now downgraded!)

#### 30/06

Most of the 61 'released' employees leave Summerfield

#### 01/07

Further to sale of LEB RO were rumoured to reimburse ARC(UK) another £M0.5. At this time there are still outstanding warranty claims by Lockheed with 4 of LEB's Leros 1c and also Hughes Aircraft Company (HAC) with some LTTs.

#### 02/07

PEJ meets MFG - yellow line changes mean that not only can't the bomb dump hold 1.1 material but SPL 51 building license must be considerably lowered !

#### 30/07

JH accepts early retirement package and leaves Westcott. All remaining working and historical documentation was placed on to clearly labelled shelves as per instructions [4 weeks later they were found all strewn over the floor - someone wanted the cabinets !]

#### 02/08

PEH remains as the sole RM representative to run J, K, T, the new L Site and the magazines. No further news on his relocation.

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#### 20/08

Westcott Venture Park sold by British Aerospace to Rutland.

# Appendix A

### Acknowledgements.

As always in a work of this nature there were a great many people who took the time and bother to contribute details on their personal and project experiences whilst associated with the Establishment. They all deserve thanks in greater or lesser measure but the list would be endless. However, the major contributors are listed below in alphabetical order:

Ball	Gill			
Beeson	Robbie	Panton	Frank	
Bligh	Jack	Paul	Malcolm F.	
Bonner	Bernard	Payne	Brian	
		Pearson	Graham S.	
Carter	Nick	Pound	Ray	
Crook	Harold			
Cummings	Dermott	Ripp Rolfe	Dennis R. B. John A.	
Day	Monica	Rone	JOIIII 7 X.	
Dean	David	Shillingford	Stewart	
Douit	Duviu	Silman	Ken E.	
Eggleston	Henry	Spickernell	Graham J.	
288.000		Stanley	Jeff	
Fowler	Maureen	Sutton	Derek	
Green	Stanley W.	Taylor	John	
		Thompson	Tommy	
Hammond	Peter E.			
Henderson	Frank	Whitcombe	Vic	
Hickman	Di	White	Ewart C.	
		Witchell	Audrey	
Jeffs	Andy T.			
Jessen	Fred C.			
			rom other Establishments:	
Laurillard	Jack F.	Bain	Roy (RAE)	
Lawson	George I.	Becklake	John (Science Museum)	
	_	Dommett	Roy L. (RAE)	
Mapley	Roy	Chase	Rex (RAE)	
Maxwell	Bob	Day	Brian (RAE)	
McKenna	Bob	Harmer	Roy (RAE)	
	2	Hocking	Trevor (BAJ)	
North	Don	Jefferys	John (HEL)	
	L 1 XV	MacLean	Alan (RAF Cosford)	
Orton	John W.	Rogers	Norman (BAJ)	

# Appendix B

# *List of personnel who lost their lives in accidents whilst at Westcott.*

Fatalities: Date Name Cause \_\_\_\_\_ \_\_\_\_\_ 14.11.47 Unknown Walter 109-510 RATO explosion at D Site 14.11.47 Rowlands Walter 109-510 RATO explosion at D Site 14.11.47 Salmon, Joe Walter 109-510 RATO explosion at D Site 14.11.47 Schmitt, Johannes Walter 109-510 RATO explosion at D Site 1954? Noakes, Phil 33 building - low pressure pre-mixed H<sub>2</sub>/NO ignition 23.05.57 Straker, Roger Motor (bike?) accident off runway 

Other Accidents: Date Name

Cause

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