

WASC 2120

Commentary for
2008 Rocket
Event at
WARGM
Mark Perman

Ian MacFarlane

From: Mark Mortlock [mark.mortlock@royalgunpowdermills.com]
Sent: 29 May 2008 15:06
To: 'len.stuart@iee.org'
Subject: Rocket and Space Programme

-----Original Message-----

From: Liz And Mark Perman [mailto:liz.mark@gmail.com]
Sent: 27 May 2008 23:13
To: mark.mortlock@royalgunpowdermills.com
Cc: 'Lynne Lennard'; 'John Harlow'
Subject: Stuff for the programme

Hi Mark/John

First Draft - I suspect its way to long also needs checking and some dates adding.

John please feel free to suggest changes or rewrite for that matter.

Regards

Mark

Section Rocket and Propellant Research at the Mills + RGM Rockets Exhibition

Why Rockets and Space 2008.

The Royal Gunpowder Mills Waltham Abbey was producing Black Powder (Gunpowder) from the 16??'s. In 18?? The mills were taken over by the government and refurbished this coincided with the development of the rocket as a weapon. Rockets (known as Congreve Rockets) using Black Powder for propulsion were used in the Napoleonic Wars and in the War of American independence. The use of Congreve rockets was immortalised in the American National Anthem with the line "And the rockets' red glare, the bombs bursting in air". Congreve rockets would be recognisable to anyone who has fired a "November 5th" rocket i.e. a stick stabilised rocket. Congreve Rockets were replaced for UK military use by an improved design the Hale Rocket these were still on the inventory list for mountain troops in the 1890's. However black powder rockets fell out of use because of the increase in reliability and accuracy of artillery and the availability of better gun propellants.

Meanwhile back at the Royal Gunpowder Mills 186? research was progressing on Guncotton and its safe manufacture and processing this led to the later patenting of Cordite, primarily a mixture of Nitrocellulose and Nitro-glycerine, one of the first smokeless propellants for guns and small arms. Much later (mid 1930's) it was realised that Cordite could be used as a rocket propellant and it was rockets using cordite propellant that were used by British forces in such forms as ground to air anti-aircraft rockets, from ground attack aircraft against all manner of targets and for bombardment with the land and sea mattress systems. Technically known as Extruded Double Base Propellant EDB is still in use today.

Thanks to the development of cordite propellant research continued apace and in 1941 the Germans produced a castable version of Double Base Propellant. This when combined with the addition of Nitramine based explosives, developed at Waltham Abbey in the 1930's, combined to produce high energy propellants. This type of propellant is still in use today in many small rocket and missile systems.

The advances in Rocket Technology made in Germany during the 1930's and 40's were not lost on the UK - The first country in the world to come under ballistic (V2) and cruise (V1) missile attack as well as the first country to lose a warship, HMS Egret 1943, to a guided missile. A little known fact is that captured German rocket scientists as well as going to the US and former USSR also came to the UK and were distributed around the country at various research establishments such as the now renamed Explosives Research and Development Establishment (ERDE) Waltham Abbey and its sister establishment the Rocket Propulsion Establishment (RPE) at Westcott, Bucks. At the end of WWII Waltham Abbey closed as a manufacturing plant and was converted

into a Research and Development Establishment. With the aid of captured German material a vast programme of work was started to understand the developments that had been made in Germany and amongst the allied countries in order to produce reliable guided weapons and of course fundamental to these new guided weapons were the propulsion systems.

Initially following German practice a lot of effort was put into Liquid propellants systems however Liquid propellants met with resistance from the armed forces and with the development of the high energy nitramine loaded double base propellants and Composite propellants were soon completely outclassed for tactical missile applications.

This brings the tale neatly to Composite Propellants (An intimate mixture of an Oxidiser and Fuel held together with a binder) starting in 1935 at Woolwich Arsenal. At the same time Britain was developing Plastic Explosives and logically this expertise was brought to bear with the production of Plastic Propellant (1939) physically has the appearance of plasticene.

Unfortunately plastic propellant was not sufficiently developed to go into service use in WWII. Although a 5in Dia motor was designed and produced in 1943 (The 5 inch Light Alloy Plastic (LAP) is on display in the exhibition).

ERDE along with RPE developed plastic propellant into a world leading product. The US and other countries concentrated on a castable or rubbery form of composite propellant which until the 1980's had lower energies and a smaller range of burning rates (A very important factor for Solid Propellants). The high performance Plastic propellants developed at ERDE Waltham Abbey were used in a number of military systems and in all of the civil sounding rockets such as Skua (5in dia), Petrel (7.5in Dia, Skylark (17in Dia), Falstaff (36in Dia) and even on the British Satellite Launcher Black Arrow's third stage the Waxwing. Examples of motors for the sounding rockets and a Waxwing can be seen on display around the site.

During its existence Waltham Abbey was closely tied to the development of rocketry in the UK and the following items are good examples on display on site.

Cutaway Congreve Rocket on display in the Rockets exhibition.

5in LAP the original UK plastic propellant rocket motor

Skylark - The most powerful Skylark vehicle was capable of an apogee of 1200Km motors for this vehicle were variants of the Cuckoo Raven and Goldfinch all available on site

The Met Rockets - Skua and Petrel used by the UK Met office

Gosling boost motor - Used on a large No of missiles and had a large No of charge designs starting with EDB moving on to various variants of plastic and also CDB propellants. A history of UK Rocket development in its own right.

Others please suggest!