

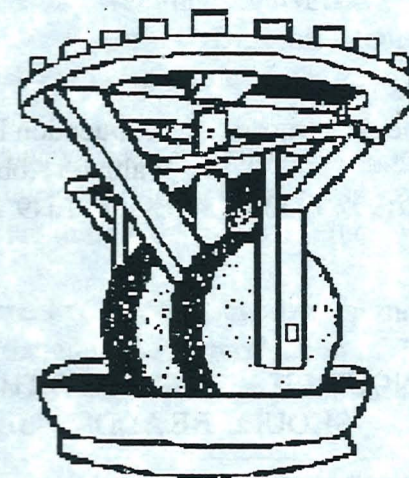
**ROYAL
GUNPOWDER
MILLS
WALTHAM ABBEY**

'TOUCHPAPER' ©

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Touchpaper

The Newsletter of the
**ROYAL GUNPOWDER MILLS WALTHAM ABBEY
FRIENDS ASSOCIATION**



**MARCH
2003**

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PLEASE NOTE: Deadline date for submissions to
the next issue is 15th May 2003

A VERY PERSONAL EDITORIAL

Welcome to the first issue of Touchpaper for 2003 which I hope will be a good year for us all.

Last year ended on a sad note for me as my wife Doreen passed away at the beginning on December, just one week from our Wedding Anniversary and just three weeks before Christmas. Difficult enough at any time but more so at that particular time.

She had always been my strongest supporter and encouraged me in everything I did and she must share equal credit for anything I have done for the Association.

At this time I will continue to keep membership details and the editing and production of Touchpaper so please continue to send me your contributions.

Norman Paul
Editor



CHAIRMAN'S CHAT

Welcome to the Spring 2003 edition. Work on site has been proceeding steadily on Wednesday and Friday mornings although there are more tasks than volunteers. From now until opening on May 3rd we will be concentrating on site maintenance and tidying up, ready for the new season which, as many of you know, will be weekends only. Leaflets giving details of the season should soon be available.

During the closed season the fallow deer have been spending more time at the southern end, particularly on Queen's Mead and are often there when we arrive on working days. Brian Harvey has reported seeing 19 together on one occasion but they are usually in smaller groups. I have seen muntjacs on three occasions but they are very shy and immediately move away.

Blue polythene rope has been used in several places to help define boundaries and, unfortunately, one deer, now known as 'Old Bluey', managed to get some round its antlers. In trying to remove this it got one hoof caught up as well. Since it is still able to feed and is much faster than us 2-legged creatures, nature will have to take its course and the rope will come off when it sheds its antlers in the Spring. Another deer became entangled in the camouflage netting near the heronry. It objected to people approaching, kicking in all directions, but with kind assistance from the Lee Valley Park rangers it was subdued, cut free and allowed to rejoin its group.

Tree fellers have been on site recently and, among other things, have cut 2 acres of alder ready for coppicing in a few years time.

During the season both Board Members and volunteers will be on duty each weekend so we look forward to seeing you there.

John Wright



ASSOCIATION MATTERS

SPECIAL 'FRIENDS DAY' ON SITE

At the last AGM in October it was resolved to change our financial year to end on December 31st. It was further resolved that, starting in 2004, the AGM and Reunion would be moved to May each year.

For this coming year it was decided to hold a very short General Meeting coupled with a Friends Day on site at the Mills in May.

This has now been set for Friday the 2nd May. Entry will be via the main entrance in Beaulieu Drive from 10.30am. There is ample space in the main carpark there. We shall be meeting up in the cafe building but, unfortunately the cafe itself will not be open. We will be supplying coffee, tea and biscuits and suggest that you might wish bring a picnic lunch.

The Exhibition Hall will be open and we hope to arrange for the audio-visual presentation to be running. Otherwise you will be free to walk around most of the site and, for those not familiar with the site, we can arrange guided tours.

Of course you may prefer to just stay in the cafe building and reminisce with each other - especially if the weather is unkind. Unfortunately we will not be able to supply a bar on this occasion.

It would be helpful if we had some indication of numbers and ask that you drop us a line by the middle of April, if not sooner, by letter, phone, fax or e-mail to the Editor (details on inside front cover).

SITE NEWS

As reported in our last issue the Gunpowder Mills, in common with many other charities throughout the UK, have experienced severe financial problems resulting in major staff redundancies. There is now only a 'skeleton staff' and we are relying extensively on volunteers to man the site when open to the public.

The site will now only be open weekends from May 3rd to 28th September and the opening times are now 11am - 5pm, although both Group visits and the Schools Programme will continue to be run during the week.

The cafe facilities have had to be downgraded somewhat but snacks and drinks will be available.

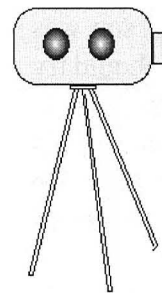
No special events have been booked as yet but it is hoped that some will be possible during the year. For the technological ones details will be added to the website which will be updated regularly.

(www.royalgunpowdermills.com).

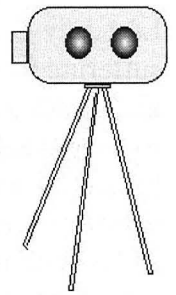
A rota has been set up for both Board members and volunteers for each weekend of the coming season to man the site but the cover is minimal so if anyone can spare the odd Saturday or Sunday to help out please contact the office on 01992 707370.

We hope that these are only interim measures to get us through this year and that, provided the financial situation improves, we will be able to expand back to normal operations next year. In a sense this is an holding operation to keep the site going since it would be a great loss if it closed completely after all the cost and effort involved in the setting up. It would also be a tragedy if this historic record of our past were to disappear.

Any help that you can give will be most appreciated by the Board and the Association.



VIDEO at the RGM



Towards the end of last summer Cut-Away Productions visited Waltham Abbey. To explain, Cut-Away is a small Video Club based on North London. We instantly recognised the unique nature of the establishment and the variety of interesting activities being organised by a small number of very dedicated staff. We were also privileged to meet former employees and to listen to some of their fascinating experiences. Enthusiastic enactors and visitors also co-operated to convey their impressions, in short, some days were almost exhausting.

One of the Videos produced is to be entered in an Institute of Amateur Cinematographers Annual Competition at St. Albans on the 18th of February. We have offered our services to RGM to produce souvenir and promotional videos. It is hoped that Brian Street's collection of guns will shortly occupy centre stage in a documentary about small arms.

In August 2002 some visiting Russian students were really impressed. Later In December they presented battlefield souvenirs of 'Their Great Patriotic War' to the museum. It would appear that many youth groups in Russia combine expedition activities with the excavation of former battle sites. Exhumed remains of fallen Russians are then re-interred, often with appropriate ceremony by Priests of the Orthodox Church.

Cut-Away hope to produce more video of the RGM, for example; 'the wild life'. Indeed, really the surface has only just been scratched. If readers have any suggestions and ideas, perhaps they may care to contact the editor. We appreciate that any record must be realistic. Cut-Away are also conscious that at Waltham Abbey there is a significant part of our National History which ought be preserved.

David Ball

A New Zealand Miscellany

Last July Freda received news from Auckland that her emigrant son was suffering from a terminal illness and the caller suggested that she should try and visit as soon as possible. Our tourist agency neighbours secured a flight for one week ahead; just in time, as things turned out, as she was at his bedside when he died, six days after our arrival. Having promised him, we stayed on with friends and family for another four weeks, being taken around and entertained.

Now for the "good news" part of this story. We were staying about a mile outside the township and one morning I decided to walk to the shops, etc. On the way back I lost the way but recalled passing a police station on the way out. Retracing my steps I enquired of the sergeant and he soon set me on the right road. Before I left he told me that he felt sure that I came from the London area - most perceptive of him! This I confirmed and added (since he was the 'arms officer') that I used to be employed at the Waltham Abbey Royal Gunpowder Factory. At this news he exclaimed that I might be able to help him. I gathered that he, Frank, and a number of other officers had formed what they called a 'gunpowder club'. They had made a heavy iron cannon or mortar which had been bored to fit beer cans, filled with concrete. Each member produced various gunpowder mixtures which were taken to their occasional meetings in a local (large) field. Here a weighed charge was placed in the mortar and, on firing, the distance the missile was projected would be measured. Here we obviously had a miniature version of the Woolwich proving ranges. Frank was keen for me to provide him with any data that would help him produce a record breaking mixture. I had to point out that gunpowder was no longer manufactured at Waltham Abbey but promised to send him a selection of relevant publications that would interest the club. I did, in fact, provide a sample of the famous potassium permanganate/glycerin spontaneous inflammation mixture - obtaining both ingredients from two separate local pharmacies.

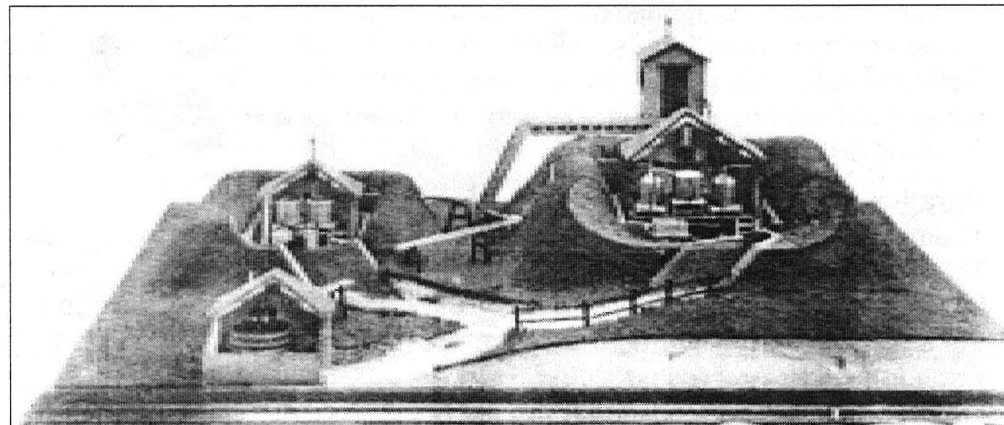
At the end of our stay I asked Freda to come and meet Frank at the Station. As we entered he took one look at her and greeted her in familiar tones. We were both puzzled by this apparent prior knowledge until he presented her with several RGM web site printouts, adding that her exhibition of paintings was going well - a small world indeed!

Ron Treadgold.

NON-LISTED PRINCIPAL STRUCTURES OF THE ROYAL GUNPOWDER MILLS

Part III DEVELOPMENT OF CHEMICAL EXPLOSIVES

Section 1. 19th Century - The Quinton Hill Nitroglycerine Factory



Model of Waltham Abbey Nitroglycerine Factory
Exhibited at Brussels Exhibition 1910

BACKGROUND

The reign of gunpowder with its three natural material constituents; saltpetre, sulphur and charcoal, as the sole world explosive for military and civil use lasted for around five centuries up to around the last quarter of the 19th century. From this point, over a very short space of time and accelerating at the end of the century, gunpowder was supplanted by the product of the new science of organic chemistry; in the military field by single base nitrocellulose (guncotton) and later the so called smokeless powders such as cordite combining nitrocellulose and nitroglycerine (double base) with civil use dominated by the nitrocellulose and nitroglycerine based materials developed originally by Nobel - dynamite, blasting gelatine and their many derivatives.

DEVELOPMENT OF CHEMICAL EXPLOSIVES

The following is a historical synopsis of main developments in chemical explosives.

These developments reflected the constant quest for more explosive power, more economy, more controllability - in the civil field particularly for blasting in mines, quarries, tunnelling, construction etc. and in the military area for propellant and high explosive.

Organic chemistry provided the way forward. An explosion is a very rapid chemical reaction, normally oxidation - combination with oxygen. It was

discovered that the introduction of the molecular nitro group (NO_2) served as an internal source of oxygen for the oxidation of the carbon and hydrogen 'fuel' atoms in carbohydrates such as cellulose or the fats such as glycerine, created the conditions for a more powerful explosion. This arose from the relatively unstable attachment of the constituent oxygen and nitrogen atoms of the nitro groups. On firing, the less stable oxygen-nitrogen linkages undergo sudden disruption and the simultaneous union of the atoms of carbon and hydrogen with those of oxygen accompanied by liberation of an enormous amount of heat energy leads to instant production of a very large volume of gaseous product, with explosive effect.

Nitration

The mode of introduction of the nitro groups is the process termed nitration. This involves treating the parent organic compound with a mixture of concentrated and sulphuric acids, the nitric acid bearing the nitro group and the sulphuric acid acting as a dehydrating agent facilitating the removal of water formed in the process.

1833 - Braconnot nitrated starch

1838 - Pelouze treated paper and cotton and various other materials with strong nitric acid, producing highly flammable materials

Nitrocellulose

1846 - Schonbein and Bottger developed the process by using a mixture of nitric and sulphuric acid to nitrate the carbohydrate fibrous cotton cellulose producing the nitric ester cellulose trinitrate or nitrocellulose as it became known, or guncotton reflecting its military application.

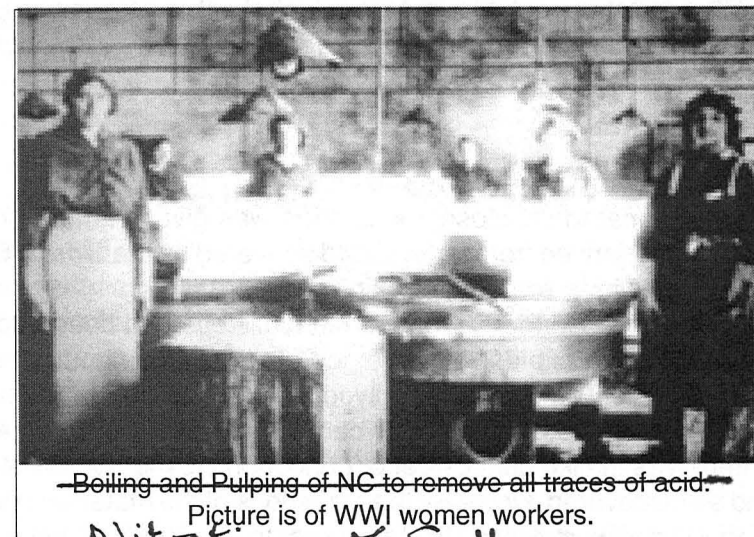
Schonbein patented guncotton and it did not take long for private industry to become aware of the potential for commercial blasting purposes of this new more powerful material. In the same year John Hall & Son of Faversham obtained manufacturing rights, built a factory and were offering guncotton with a claim that 4 ounces of guncotton equalled 24 ounces of gunpowder - an impressive demonstration of the turn of speed which the Victorian entrepreneur could raise when introducing a new product into the competitive market place. However, regrettably, the Halls also demonstrated the validity of the saying 'more haste, less speed' for in the following year their guncotton factory was destroyed by explosion and civil development went into abeyance.

Military Explosives Nitrocellulose (Cellulose Trinitrate) - Guncotton

In development of nitrocellulose the emphasis was on the military application, hence the generalised term guncotton.

Guncotton was an unstable material prone to spontaneous decomposition and there were further accidents, in France, almost to the extent of stopping

further development. However the Austrians in particular persevered and in 1862 permitted the War Office chemical advisor, later Sir, Frederick Abel to visit Baron von Lenk's experimental facility at Hirtenberg to gather information. Abel correctly deduced that purification to remove residual nitric acid was the key to safer manufacture. Abel and his team at Woolwich and Waltham Abbey developed a system whereby after acid dipping firstly the bulk of the acid was removed by centrifugal action then vigorous agitation in water followed by boiling then beating into a pulp followed by poaching i.e. stirring in water - the latter two operations being introduced by Abel, finally alkali being added as a precaution against any residual acid before pressing into finished material.



~~Boiling and Pulping of NC to remove all traces of acid.~~

Picture is of WWI women workers.

Nitration of Cotton

By 1865 Abel had sufficient confidence in the efficacy of his methods to take out a patent. This year could therefore be taken as the commencement of guncotton as a practicable manufactured material. One problem remained - dry guncotton was still a very sensitive material, making storage transportation and use difficult. The problem was eliminated by the discovery in 1868 by a member of Abel's team E.O. Brown that guncotton in its safer wet state could be stored for long periods and detonated by a small quantity of dry nitrocellulose fired by fulminate of mercury.

At a rapidly increasing pace guncotton was then adopted for use in military mines, torpedoes and blasting charges.

In 1872 a full scale production unit producing 250 t.p.a. was erected at Waltham Abbey. However, Abel's goal of developing guncotton in granular form as a military 'smokeless powder', i.e. propellant and shell filling, eluded him. Its rate of burning was too speedy.

The first smokeless Powder:

Poudre B - Guncotton based - Vieille 1886

It fell to the Frenchman Vieille to produce the first chemically based propellant - smokeless powder - guncotton based, termed Poudre B after the Minister of War General Boulanger, for use in the Lebel rifle. The excessive rate of combustion of guncotton was caused by the porosity of the fibrous material and Vieille discovered that gelatinising with the solvent mixture ether/alcohol rendered it non porous. Guncotton does not completely dissolve in ether/alcohol and Vieille used a mixture of guncotton and collodion cotton gelatinised, working the resultant paste into small squares of a dry horn like material. Collodion cotton is totally soluble in ether/alcohol. It is of a lower nitrogen content than guncotton - for smokeless powders 11.5-12.7% as opposed to guncotton 13.0-13.5%.

Civil Explosives

Nitroglycerine (Glyceryl Trinitrate)

An alternative material to cellulose for nitration was glycerol, more popularly known as glycerine, derived from fatty acid (discovered by the Swede Scheele in 1779 and popular as a remedy for skin chapping) and in 1846, the same year as Schonbein and Bottger's work on nitrocellulose had been publicised, Sobrero discovered the explosive properties of an oily compound made by nitrating glycerol which he termed piroglycerine and which later came to be known not entirely accurately as nitroglycerine. The discovery remained of academic interest as, unlike gunpowder or guncotton, no method of detonation by fuse could be discovered. However the attractions of the material in chemical and operational terms were noted - in gunpowder the fuel and oxidant elements were separate and had to be incorporated whereas in nitroglycerine they were present in intimate association in the one molecule.

When the Crimean War started in 1854 the need arose to protect the sea approaches of the Russian fortresses and Russian academics approached the Nobels, who at the time had an engineering business in St. Petersburg, seeking their aid in endeavouring to incorporate nitroglycerine in naval mines. It is possible that this was attempted in one fortress, Cronstadt, but no record exists of actual detonation.

The Nobels were Swedes and doubtless their interest was aroused by the potential for profitable business in the extensive Swedish metal ore mining industry - they had calculated that the explosive power of nitroglycerine was about 13 times that of an equal volume of gunpowder. In 1862 Immanuel,

father of Alfred Nobel, produced nitroglycerine on an experimental basis and experimented with adding it to gunpowder. This did improve substantially on the explosive performance of gunpowder but the material only preserved this property for a short time.

Blasting Oil 1863

However in the following year 1863 Alfred Nobel discovered a method of detonating nitroglycerine by a small charge fired by a fuse or percussion cap containing mercury fulminate and a small production plant was built near Stockholm offering a product which he termed nitroglycerine with the commercial name Blasting Oil. Success was immediate. The mining industry in Sweden and very shortly worldwide seized on it as a huge improvement on gunpowder in performance and economy and Alfred was on the way to fabulous fortune which he later used to fund the famous 'Nobel Prizes'.



Dynamite 1867

The new material was by no means perfect. Its liquid nature meant that it was dangerous to transport and handle and Nobel sought a way of transporting nitroglycerine more safely. In 1867 he found that it could be absorbed successfully in a type of inert porous silica called diatomite or Kieselguhr which he had been using as a packing material for nitroglycerine tins. The new product was termed Dynamite. The idea was that at point of use the nitroglycerine would be leached out of the dynamite. However doubtless Nobel and the users were delighted when a secure method of detonating dynamite itself without the need for extraction of raw nitroglycerine was discovered.

Nitroglycerine and Nitrocellulose Combination

Civil Explosives Blasting Gelatine 1875

Nitroglycerine and Nitrocellulose Collodion Cotton

Dynamite did however have disadvantages particularly its propensity to exude nitroglycerine when stored. In the course of experiments to produce a non exuding dynamite Nobel discovered in 1875 that the problem could be solved by blending collodion cotton, the type used by Vieille in Poudre B, with nitroglycerine, the nitroglycerine gelatinising the cotton, in the ratio 7% collodion 93% nitroglycerine. Probably apocryphal but the story is that Nobel was led to collodion cotton by a cut finger. In solution in ether alcohol it was sold as a protective film for cuts under the term "newskin".

The new material proved to be an explosive of very high power, unrivalled for blasting hard rock, and it enjoyed immediate success under the term Blasting Gelatine.

Military Explosives Ballistite 1887

In parallel with the above developments in the civil field interest in a military chemically based propellant, smokeless powder, had continued unabated. Vieille's Poudre B of 1886 took pride of place as the first but it had disadvantages - it was dangerous in storage in certain circumstances and efforts were spurred to better it both in this aspect and explosive power.

Inevitably the arch experimenter Alfred Nobel entered the scene. He would have been aware of the potential of his nitroglycerine/nitrocellulose blend. In blasting form it was too powerful for use as a propellant, however by 1887 he had succeeded in producing a material which had the stability and slower burning qualities required for military use. This was achieved by employing a much higher proportion of collodion - 45% and introducing 10% of camphor as a moderant of the speed of explosion. The new propellant was termed Ballistite.

Explosives Committee 1888

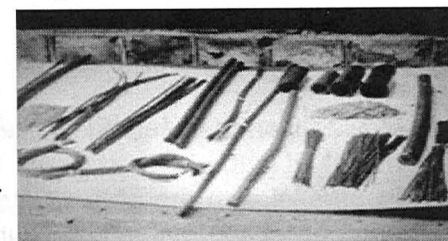
There can be little doubt that the British Government was shaken by these developments. Whilst the efforts of Abel and his team had produced a pre eminent position for Britain in guncotton it had not resulted in a successful propellant and it now appeared that Britain, the greatest Imperial power, was totally deficient in an area rapidly being taken over by other countries. In some haste therefore an Explosives Committee with Abel as President and Dewar and Dupre as members was formed with instructions to observe and report on

developments. Almost immediately they proposed to the Director of artillery that their brief be extended to 'pursue experimental investigations having for their object the advancement of knowledge of explosives and the originating of improvements and inventions in their manufacture and use'. The Committee asked for submission of samples of smokeless powders for examination, doubtless with the implication that success would bring with it substantial contracts. Nobel submitted Ballistite. This gave promising results but these were substantially affected by the evaporation of the volatile moderant camphor. Nobel was informed of this, but for some reason did not respond with any suggestion for a substance less subject to evaporation.

Cordite 1889

The Committee pursued investigation of removal of the volatile ingredient and in a prodigious turn of speed reminiscent of Hall & Son in guncotton came up with what was termed Cordite consisting of a mix of nitroglycerine and guncotton combined with a solvent acetone and incorporating a proportion of mineral jelly with the intention of reducing barrel fouling.

The composition was 58% Nitroglycerine, 37% Guncotton and 5% mineral jelly. While in plastic state the material was extruded through dies to produce rods or cords of appropriate diameter which when bundled occupied the whole of the powder space of the cartridge.



In June 1889 the Director of Artillery approved the expenditure of the princely sum of £100 to set up manufacture of Cordite at Waltham Abbey.

In 1891 Cordite was officially adopted as the propellant for the British Army's service rifle and it progressively replaced gunpowder in heavier armaments. The days of gunpowder were finally over.

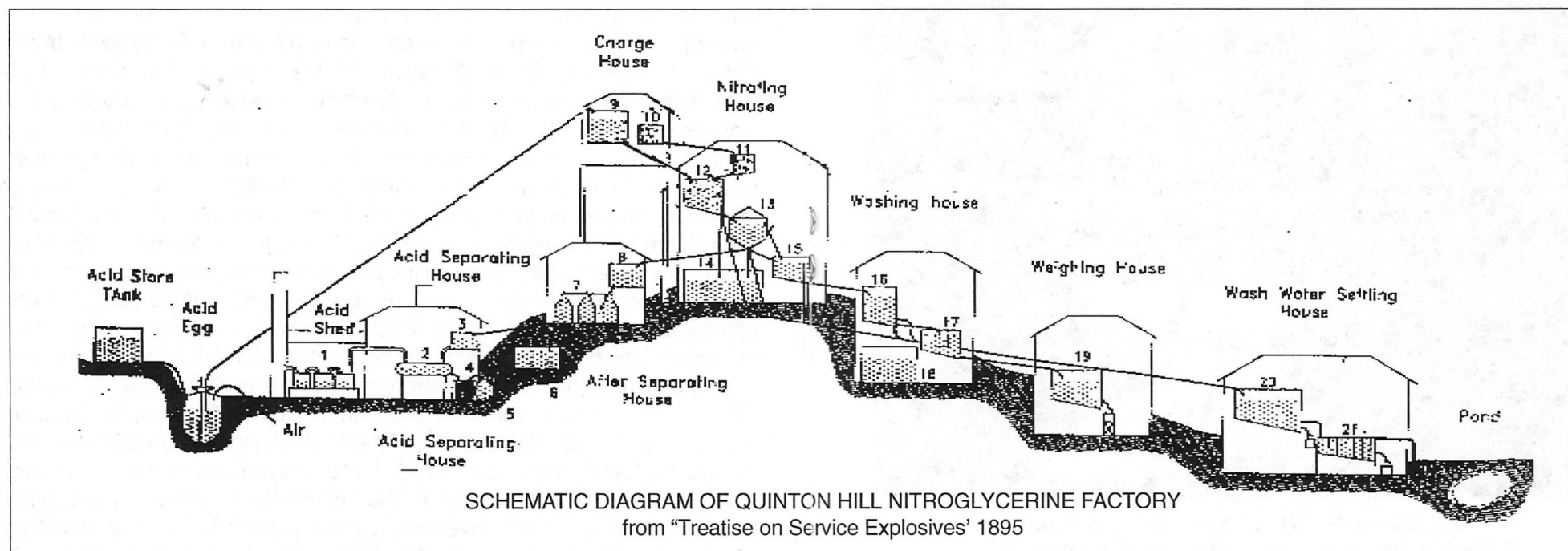
The Explosives Committee had therefore over a very short time period achieved an excellent product which had overtaken its rivals and was to serve the British Forces through various modifications for many years. However the cordite story was not without its troubles. Doubts were raised as to how far access to Nobel's work from his submission and samples had enabled short circuiting of cordite development - in fact reports of the Committee's earlier proceedings referred to 'The Committee's modification of Ballistite', without recompense to Nobel. Nobel felt strongly enough to open an action against the British Government for infringement of patent. The action failed on the grounds that there were material differences in the patent specifications - Nobel's formulation employed collodion cotton, soluble in ether/alcohol and his patent referred to nitrocellulose 'of the well known soluble kind' whereas cordite employed guncotton which was not soluble in ether/alcohol, relying instead on solubility in acetone, and the patent therefore referred to 'insoluble' nitrocellulose. However there was a degree of opinion that Nobel had not been treated entirely fairly overall. The troubles did not end there. Abel and Dewar had been permitted to take out foreign patents on cordite and derived considerable considerable financial benefit from this. Not for the first or last time there was controversy over how far scientists in Government employ using Government facilities and staff should be allowed to benefit financially, apart from any internal recognition, from discoveries made. The 'Times' was sufficiently disturbed by the cordite saga to term it the 'Cordite Scandal'.

Nitroglycerine supply - The Woolwich Laboratory had been obtaining supplies by extraction from blasting gelatine. Clearly this was only suitable for small quantities and a full scale production unit was required. Again, late in the day, possible plant purchase sources were investigated and after examination of the Nobel based Reinische Dynamitfabrik plant at Opladen in Germany an entire manufacturing unit was ordered from Germany for erection at Waltham Abbey.

NITROGLYCERINE AT WALTHAM ABBEY Quinton Hill (South Site)

Nowadays the Quinton Hill site has been completely cleared for housing, industrial development and recreational use and the following is therefore only an historical summary.

In parallel with the above developments, demand for guncotton had increased to the extent that it was necessary to expand the Factory and land was purchased at Quinton Hill on the south side of Waltham Abbey for the building of a guncotton factory. Fortuitously this was completed in 1889, the year of patenting cordite. To operate in conjunction with this for the manufacture of cordite the nitroglycerine plant imported from Germany, after some modification based on the advice of G. McRoberts, Manager of Nobel's Ardeer factory in Scotland, e.g. injection of glycerine into the mixed acids, was installed at Quinton Hill, fitting out being completed by the end of 1890. Start up was on 16th March 1891 and the story of nitroglycerine at Waltham Abbey had commenced.



1891 - 1894

The nature of nitroglycerine presented critical problems of movement. Pipelines were out of the question - they could not be opened for the frequent inspection and cleaning necessary and the only practicable method was by gravity in open lead lined guttering, covered by detachable canvas to permit cleaning. The plant was therefore dominated by two adjacent Nitrating Houses Nos.1 and 2 on the summit of Quinton Hill separated by a brick traverse with a Charge House on top of the traverse. At any one time one of the Nitrating Houses would be in operation with the other down for maintenance. After nitration of the glycerine the nitroglycerine was run down the gutters to the Washing House with the waste acid run off to an After-Separation House. The washed nitroglycerine was sent to store and the wash waters to a Wash Water Settling House.



1903 Quinton Hill Nitroglycerine Washing House
Washing tanks on upper platform and Filtration tank
on lower with a Drowning tank below the Washing tank.

1903 QUINTON HILL



Background:- Nitrating Houses and Charge House

Centre:- Washing House

Foreground:- Junction House with 'Covered Way'
housing the gravity fed NG gutter, sunk
in a gulley, and wash water gutters to
Wash Water Settling House.

It should be emphasised that production was on a batch basis, flow nitration in the form of the Schmid process was introduced into the industry in the 1930's but Waltham Abbey did not reflect this until the last days of production in the 60's.

Production progressed without major incident until there was a serious explosion in the Washing House and Nitroglycerine Store in 1894, destroying these buildings and extensively damaging surrounding buildings including the No.2 Nitrating House.



Aftermath of Explosion showing the awesome power of Nitroglycerine

The subsequent Enquiry did not establish a precise cause of the explosion but did uncover a number of risks associated with operation which demanded attention.

Risk from :-

Blow arising from fall of 'skimmer dish' in Washing House.

Use of earthenware cocks to draw off separated liquids from base of tanks e.g. if nitroglycerine froze in cold weather or cock stuck for any other reason any force applied could generate friction heat between body of cock and key causing explosion, similarly if a particle of grit lodged in cock.

Friction from vibrating lead air pipe.

Dropping of any object - the 'Use List' covered a large range of implements, any of which was an accident waiting to happen.

Other serious operational concerns :-

Practice of accumulating successive batches of nitroglycerine in store.

Proximity of danger buildings to one another.

Ineffectiveness and danger from flying bricks of brick built traverses.

Hair raisingly, an adjacent public right of way opened at weekends along which smokers strolled, often dropping matches, which could be picked up on a worker's boot.

In addition a significant recommendation was made that consideration should be given to building a second facility totally separate from existing plant. This led to the Edmonsey factory on the North Site, see below.

All of these matters were given due consideration as part of the ongoing effort for safety improvement which was part of explosives work.

Nitroglycerine was no longer stored in quantity but 'poured on' to guncotton as soon as ready, producing the safer cordite paste.

Earth traverses revetted with brick on the inside replaced brick round the Washing House and the right of way was fenced off.

The previous practice of allowing workers to walk from the Shifting Room where they had changed their boots to the process building without overshoes was stopped. Boots were now changed at the entry to the process building.

Such was the pressure for resumption of production however that in spite of the concern on building spacing No.2 Nitrating House and other buildings destroyed or damaged were speedily rebuilt on their original sites and production resumed by the autumn of the same year.

1895 - 1908

Production then progressed at a steady pace; during the Boer War producing around 181/2 tons of nitroglycerine per week.

Then in 1901 an explosion occurred in an earthenware cock at the base of a nitrator after the charge had been run off. Since the 1894 explosion there had been a painstaking process of investigation of plant improvement to enhance productivity, economy and safety. Although the effects of the 1901 explosion were relatively minor it provided a further impetus to development and in 1903 the plant in No.1 Nitrating House was replaced by that bearing the names of the senior management who had led the development effort - Nathan-Thomson-Rintoul, termed the nitrator-separator, eliminating the use of earthenware cocks in the nitrating apparatus, see Edmonsey factory commentary below, No.2 continuing on the old Nobel basis.

In the meantime due note had been taken of the Court of Enquiry's recommendation for duplicate building and in 1897 a nitroglycerine facility had been built on land to the north of the North Site at Edmonsey Mead, together with associated cordite production to the south of that.

In 1903 Cordite MD was introduced, with a significantly reduced nitroglycerine content - 30%, to reduce the barrel erosion problem which had been occurring with the original material. Reflecting this No.2 Nitrating House at Quinton Hill was put into reserve. At the same time the Edmonsey Mead House was renumbered No.1 with the Quinton Hill Houses Nos.1 and 2 taking the Numbers 2 and 3 respectively.

In 1904 the Edmonsey Mead installation was updated with Nathan-Thomson-Rintoul, larger capacity, plant, what was now the Quinton Hill No.2 House being temporarily reactivated to permit this.

In 1908 what had become Nitrating House No.3 with the old Nobel plant was demolished.

1909 - 1992

The Quinton Hill guncotton factory continued, supplying the North Site cordite factory via the internal canal system up to the Grand Magazine at the extreme north of the site for storage then moving back down the site for drying and processing to cordite. The cordite then travelled back to the extensive Water Stoves at Quinton Hill for drying.

Nitration House No.2 stayed in reserve and from 1992 after closure of what had become the Research Establishment it and all other South Site buildings were cleared, ultimately to make way for residential, recreational and industrial warehousing development.

The rebuilt Washing House of 1894 had survived in remarkably good condition and had become a unique survivor in Britain of its type. Reflecting this it was dismantled and taken to store on the North Site, which opened as an interpretative centre in 2001, with the ultimate intention of re-erecting it.

From 1904 therefore Edmonsey Mead took on the position of prime nitroglycerine producer for the Factory.

LES TUCKER

Section 2 of 'The Development of Chemical Explosives' will deal with the Edmonsey Plant on the North Site.

Section 3 will detail later developments of modern explosives including those developed when the site became a Research establishment



HOW GUNPOWDER WORKS

I've taken the opportunity to borrow a well preserved copy of "Farmers Waltham Abbey", published in 1735.

This copy contains a fine print of the well-known engraving depicting Walton's mills at the time. It was possible to make out 'R. West delin. 1735' in the bottom left-hand corner of the print, an accreditation I have not seen on other reproductions, though that may be purely due to my lack of observation. There is another accreditation in the bottom right-hand corner, but it is too faint to make out. The body of the print has very clear detailing.

I am hoping to get the Manx museum (experts in document photography) to photograph the print (and maybe decipher the accreditation) in which case I should be able to supply copies in the form of .jpeg or .tiff files to anyone interested.

On pages 2 and 3 of the book there is the following gem :-

"...Some suppose this Gunpowder to be as antient as Archimedes in Europe, (and antienter in India) yet generally Men hold the Friar of Mentz, the first Founder thereof, about three hundred and sixty-six Years since: In the making of which there requires three essential Ingredients.

1. Brimstone, whose Office is to catch Fire and Flame of a sudden, and convey it to the other two.
2. Charcoal pulverized, which continueth the Fire, and quencheth the Flame, which otherwise would consume the Strength thereof.
3. Salt-Petre, which causeth a windy Exhalation, and driveth forth the Bullet.

This Gunpowder is the Emblem of politick Revenge, for it biteth first, and barketh afterwards, the Bullet being always at the Mark before the Report is heard, so that it maketh a Noise, not by Way of Warning but of Triumph..."

Jim Hawkins
jhawkins@manx.net

TRANSPORT TO NEW HILL

When I joined George Whitbread's Detonation Section (as it was then called) in 1959, the 'road' to New Hill was little more than a rough track through some dense vegetation which extended most of the way up to the bridge over the Cornmill Stream. Once over the bridge one was in a very different environment, with few trees and good road surfaces. As most of the Section's work involved explosions in one or other of the three semi-enclosed firing chambers, we were always having the job of carting the experimental paraphernalia from the labs in L149 up to whichever firing point was to be used.

One of these firing points was in a structure about half-way up the track towards New Hill, the other two were on New Hill itself. For transport purposes the section was provided with a large and very heavy hand-cart, which had to be loaded and then manhandled up the track. It was a case of all hands to the cart, scientists and industrials alike pushed and pulled the beast in all weathers. Never was a cart so roundly cursed as that one. George knew very well how unpopular the thing was, and whenever he was directly involved in a firing he would join in the 'tractive' effort with the enormous gusto with which he did most things. He and the E Branch Superintendent (G K Adams) were also regularly badgering the admin. to obtain some better form of transport.

Eventually it became recognised in the higher reaches of the administration that the motor vehicle had been invented, and one never-to-be-forgotten day we were astounded to learn that we were to be allocated a Land Rover ! It was a pity that we weren't going to get a road to drive it on, but one can't have everything. There was a modicum of pruning carried out on the vegetation, and after all, a Land Rover is a cross-country vehicle, so we counted our blessings and certainly didn't complain. Our new pride and transport joy was equipped with the then still current 'trafficators', a pair of orange semaphore turning indicator arms which normally were tucked into the side of the vehicle, and which swung out to the horizontal when the driver indicated an intention to turn. Unfortunately, these devices were not self-cancelling, and it was easy to forget to retract them after completing a turning manoeuvre. Now the path through the vegetation was in most places hardly

any wider than the Land Rover itself, with the inevitable result that if you forgot to retract one of your trafficator arms, you would arrive at New Hill with the unfortunate device either wrapped backwards along the side of the vehicle, or missing altogether. I don't know how many trafficator arms we got through. The comments from the MT section, who of course had to maintain the vehicle, were along the lines of how much better their grandmothers could have done it.

However, the vehicle speeded up the work of the section noticeably, and it wasn't long before we actually got a second Land Rover, and then the trafficators went out of fashion and we had the now universal turning indicator lights. I don't think that any of the many section members who drove the 'Rovers' ever had a real accident, although there were some 'incidents'.

One day on New Hill I drove one of them up onto the top of an earth embankment where we were to install an air blast gauge. This embankment formed a blast wall around one of the old NG process buildings. The Land Rover got up the steep bank fairly easily in low range bottom gear. However, there was no room on the top to turn round, so when the time came to descend, I had to reverse back down. But the vehicle lost grip and began to slide backwards down the steep slope, accelerating and finally hitting the road with such violence and at such a steep angle that the towing hook hit the road surface and went straight through the tarmac. The vehicle was transfixed, impaled by its own towing hook! Fortunately the MT people took pity on me and rescued the vehicle without reporting the incident.

There was the usual Establishment speed limit of 10 mph on the New Hill roads (which were tarmac topped and in quite good condition). One afternoon after finishing for the day I was driving along the main north-south road towards the bungalow, when I was amazed to be overtaken by the other Land Rover - going backwards ! It was being driven by another member of the section (whom I won't name but who was a very skilful driver), laughing hugely at my amazement as he went past. There was, of course, no one else on New Hill at the time !

Jim Hawkins

TOUCH

Green Light in the Sky

Dear Editor

I have long been intrigued by a beam of green light that shines into the sky from south of Waltham Abbey. When driving into East London with my daughter I came to the conclusion that it must come from Docklands or somewhere in that vicinity and took the chance of writing to the Royal Greenwich Observatory to see if they knew anything about it. See the attached letter for their reply. Can you see the beam of light from Bishop's Stortford. (*No! Well not in the weather we have been having lately. Ed.*) Anyway, I thought you might like to consider it of local interest for possible inclusion in the newsletter.

Frances Burgess

Dear Mrs Burgess

Thank you for your enquiry.

The green laser beam originates above the Airy Transit circle in the Royal Observatory, Greenwich. It marks the position of the Prime Meridian line and travels some 16 km north until it reaches Beacon Hill in Chingford. Essentially it has no scientific function but serves as a marker for the line and is considered useful by aircraft approaching Heathrow!

Yours sincerely, Dr Robert Massey

Astronomy Information Officer

NATIONAL MARITIME MUSEUM

ROYAL OBSERVATORY GREENWICH

More on KU propellant

Further to Bryan Howard's item on the contribution of Waltham and Bishopton on the Martin Baker ejector seat it is interesting that the first for batch of what is recognisably propellant Ku, was actually made in the Propellant Factory in Woolwich, part of the largely unsung outstation of ERDE. Full development at Waltham followed closure of the Woolwich Factory at the end of 1956.

I recently met John Peters, the RAF pilot who with his navigator John Nicholls, successfully ejected over Iraq during the Gulf War and was badly beaten up in captivity. He expressed thanks for our contribution and said that RAF air crews had total confidence in MB seats but, when I asked why, he didn't seem too sure! Although Bishopton has closed propellant Ku, 50 or so years of age, lives on. I recently saw it being made successfully elsewhere.

An old colleague, Gordon Palmer has recently moved into care in Boston, Lincs. If anyone would like to write to him or visit, please contact me on 01562 637884.

Eric Baker

DON'T FORGET
DEADLINE FOR THE June 2003 ISSUE:
15th May 2003

BYTES

Waltham Abbey News

Sad to report the death of Betty Mathews and Eileen Henshaw, both long serving members of the Establishment. Betty, who died in October, joined the RGPF in the 1940's but kept very much in touch after retirement, holding parties each July on her birthday and in December when a band of her girls from the typing pool met up at her house each year.

Eileen, who was PA to the last Head of Establishment, died on the 11th December and was buried at the Abbey Church on the 18th.

On a happier note, Alan and Marjorie Short celebrated their Golden Wedding anniversary on December 13th.

Following the attack by the 'Axeman' the Abbey Church is counting its blessing that damage to the church interior only involved 'inanimate objects which should be repairable and paid for by insurance. Additional contributions have come from many visitors. Early in January, Ken Meakin was one of those visitors, coming up from Poole where he retired to. He's looking very well and said that retirement was the best job He'd ever had!

The Sainsbury Distribution Warehouse, which stretches alongside the M25 for a major part of the width of the old South Site, now appears to be operational but the impact to date has been minimal. It may be that many of the lorries only operate at night. The remainder of South Site is populated with hordes of 'For Sale' signs and an uncared for piece of Lee Valley Parkland.

Bryan Howard

My father, **Percy George Knapman**, was the last Superintendent of the Royal Gunpowder Factory until it closed as such in 1943, when he went up to London to the War Ministry. We lived at Government House in Highbridge Street from 1939 until 1950 when he retired. I went to Scotland after being married in the Waltham Abbey Methodist Chapel (I understand it is now the Baptist Chapel).

On the 6th December 1997 my cousin sent me an article from the Daily Telegraph saying that the old factory was going to be made into a museum and wildlife sanctuary and I was mildly interested but did nothing about it. However, my son in Wales saw something about it on the Internet and took me to Waltham last June where we were received very kindly and wanted to hear more about our life in Waltham during the war and after.

So much has changed that I could not even find our house (not surprising as I discovered it had been demolished and there is a large roundabout there now!) but I bought a large amount of books from the site bookshop and discovered that a lot of historical buildings had been demolished although some had been damaged by bombs and the V2.

Robert Taylor asked me if I would record some of my memories and send any photographs connected with the Factory as they have a display of past Superintendents and archives. So I am just completing a recording of my memories and sending a number of photo groups of the staff in 1943. I hope that there may be some still alive, or at least their friends and families who will recognise them. As I am 80 years old most of the people I knew would be 90 or 100 but one never knows.

So as you can see I will be interested in anything connected with Waltham Abbey and the Factory. I hoped that if I joined the Friends I might receive news, letters etc.

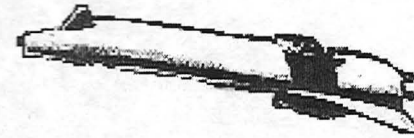
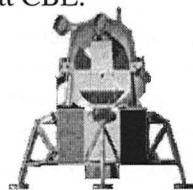
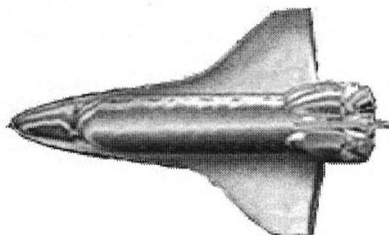
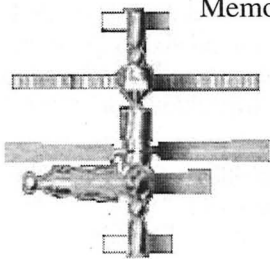
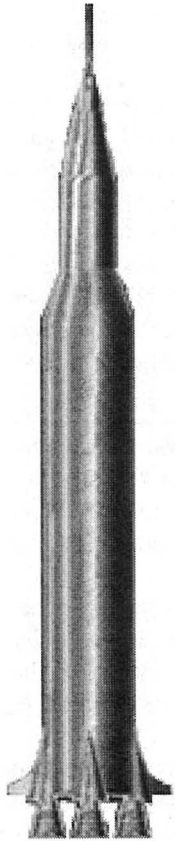
Sincerely June Cox (nee Knapman)

The BROHP Charterhouse Conference April 10-12th 2003

The conference, in its fifth year, brings together those who worked in the UK Space industry. The conference has established a reputation for interesting speakers, informality, fun and the mixing of the generations. There will be some forty presentations this year which will include Blue Streak, Chevaline, Thor Missiles in the UK, the development of nuclear warheads for Bloodhound 3, Preservation work on the Cosford V-2, the Miles 52, early work at Westcott & Summerfield, the influence of German Aeronautical Scientists after the war and early work on Supersonic flight at Farnborough. Presenter will include Engineers, Scientists and Historians. Speakers will include Dr. Colin Hicks Director General of BNSC, Prof. Colin Pillinger talking about Beagle 2, Prof. Ken Pounds talking about the history of UK Space Science, Peter Stokes exploring the continuity between German and UK rocket development and Eric 'Winkle' Brown.

Nick Hill author of 'Vertical Empire' has run for some years an award winning web site. It has now moved to a new and much shorter address. <http://www.spaceuk.org/> This site will be developed in coming weeks to update people on the conference and to encourage people to attend. Please visit the site and feel free to suggest how it might be improved. If you have friends who might be interested please forward to them the address of the web site. Alternatively you can write or phone **Dave Wright, 0151-281-1134 17, Elsmere Avenue, Liverpool, L17 4LB.**

The conference is supported by BIS, the British National Space Centre and the Royal Aeronautical Society Space Group. At this years conference we are inaugurating the Charles Martin Memorial Lecture given this year by Roy Dommett CBE.



SPACEFLIGHT REVOLUTION A NEW BOOK

David Ashford's new book 'Spaceflight Revolution' was launched last week. I have pasted below a blurb David sent me. Please pass it on to anyone who might be interested. David will be speaking and signing books at the British Rocketry Oral History Programme Charterhouse Conference April 10-12th
Dave Wright

SPACEFLIGHT REVOLUTION

by David Ashford, Imperial College Press, 2002

A revolution in spaceflight is likely soon, leading to everyday access to orbit and large-scale space tourism within fifteen years. Costly launch vehicles based on ballistic missiles are likely to be replaced by spaceplanes, using technology that exists today. In five years time, a spaceplane prototype could be built and, with a further ten years of detailed development, the design could approach airliner maturity, reducing the cost of sending people into space some one thousand times to around US\$20,000.

Spaceplane development has, in effect, been suppressed by entrenched thinking and short-term vested interests. But the present monopoly of large government space agencies is becoming unsupportable, and the market that understands the very real opportunities for space travel is rapidly approaching critical mass.

This book examines these issues and shows why space tourism will soon become the single largest business in space, and how astronomy and environmental science will be transformed by low-cost access making practicable instruments orders of magnitude larger than those today.

I had asked for details of how interested people could obtain this book but have not had a reply by the time we went to press. Ed.