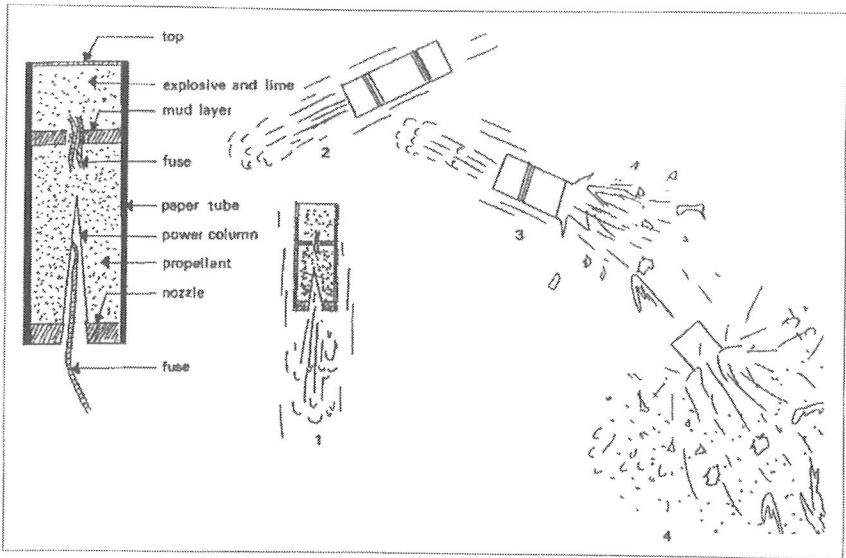


Part 1

1. China

China is generally acknowledged as the place of origin of gunpowder, in the 10th Century AD, arising from the experiments of alchemists seeking to find an elixir of immortality or more prosaically how to make gold.

Military interest in its explosive properties led to the first guns and rudimentary military rockets.



WAI 482 / 2 Earliest reliable reference to use of rockets. P'i - li - p'ao thunderbolt missiles used by Admiral Yu - Yun - wen in Battle of Ts'ai-shih 1161. Describes paper tube filled with gunpowder exploding with a noise like thunder propelling a bomb upwards then dropping down.

2. India

Possibly arising from the Chinese connection via Mongol invaders, Indian states adopted the military rocket. The East India Company's army came up against them in conflicts in the 18th century. In one battle their opponents had as many as 5000 rocketeers.

Not surprisingly the weapon made a strong impression and reports of its existence were sent to England.

3. Britain

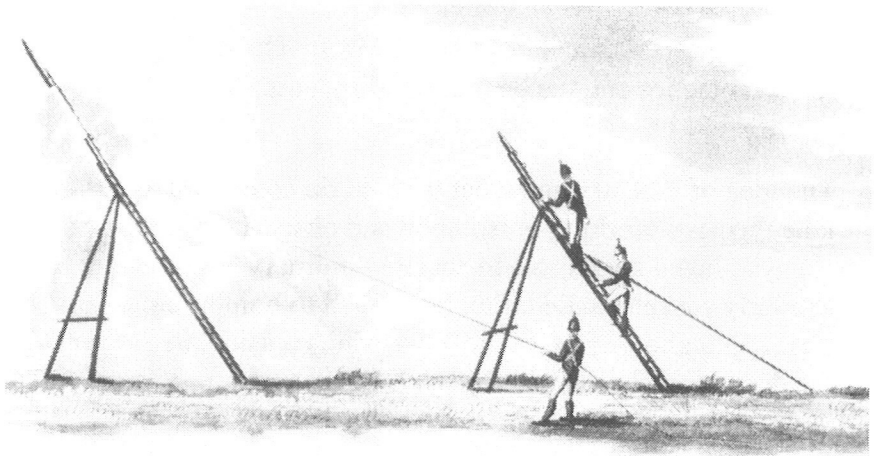
First Phase 18th / beginning 19th. Century - William Congreve

These reports impelled the military technicians to commence rocket experiments which were continued by Major, later Lt. General, William Congreve, Deputy and later Comptroller of the Royal Laboratory at Woolwich Arsenal, the centre for the study of all aspects of Army equipment and materiel.

This ambience of military experimentation would have strongly influenced Congreve's son, also William, and also later Comptroller of the Royal Laboratory. Possibly arising first from an interest in fireworks, which were a significant element in public and Royal displays at the time, Congreve developed a concept of rockets as a complete artillery system. These contained Waltham Abbey gunpowder, both as propellant and as the filling for the warhead.

Congreve proved the exception to the rule of obscurity. He was a dedicated self publicist and his work captured the imagination of the general public. Enjoying the patronage of the Prince Regent, Congreve obtained his sanction for the formation of a Rocket Brigade within the Royal Artillery. Similar units were formed in other European armies.

Within the limitations of the technology and materials of the time



WAI 40 / 14 Congreve Rockets being fired

Details of the Rocket System Wm. Congreve 1814

Congreve took the gunpowder filled war rocket as far as it could go. They had a few successes – against Napoleon at the Battle of Leipzig and various bombardments and in America in the War of 1812 a barrage of Congreve rockets at Bladensburg in Maryland caused American regiments to ‘break and flee in wild disorder’. However overall in artillery use they did not achieve the success Congreve hoped for, with aspects such as unpredictability of path of flight causing particular problems. The Royal Artillery Establishment viewed them and Congreve with less than enthusiasm, favouring the gun. Hale later took the concept forward and achieved a stickless rocket which entered European service. The last instance of the use of the Congreve type war rocket was by Russia in Turkestan in 1881.

Nevertheless Congreve had immense vision and his idea of a complete artillery system might yet come to pass. Perhaps he should be called the grandfather of rocketry.

Second Phase 20th. century up to 1930's - The theorists, the rocket societies and the beginning of success

The idea of rocketry and what it might do continued to attract lone theorists working in isolation and obscurity. Explosives have always played a dual role in society – military and civil and similarly rockets could either be applied to bombardment or to civil applications. One of the latter which particularly appealed to the dreamers was the possibility of space travel, particularly to the moon.

The conclusion they all reached was that the only vehicle which could achieve their objective was the rocket – a reaction motor utilising the Newtonian principle expressed in the Third Law of Motion – for every action there is an equal and opposite reaction. Put simply by pushing against the thrust of its expelled exhaust gases the motor propels the rocket forward.

4. Russia - Konstantin Eduardovitch Ziolkovsky

Of the early theorists none was more isolated or obscure than Konstantin Ziolkovsky, buried in a lowly teaching position in the Russian educational system. Yet astonishingly working from first principles in physics, chemistry and astronomy he worked out a plan for a space travelling rocket and vitally was the first man to conclude that this would only be possible with liquid fuel. At that time referring to the fuels available in Russia, simple kerosene.

He managed to get his treatise published in a Russian scientific journal, Science Survey, in 1903, where it was met with a deafening silence from the Russian scientific establishment.

Undeterred Ziolkovsky continued his writing and gradually achieved some degree of recognition. After the Revolution he was



Konstantin Ziolkovsky and his grandchildren

supported by the authorities and when a rocket study group was formed under Professor Rynin in the 1930's their indebtedness to the pioneer was acknowledged.

Ziolkovsky died in 1935, by that time regarded in Russia as a scientific hero.

5. France - Robert Esnault - Pelterie

Although less well known as a rocket pioneer, Esnault-Pelterie deserves recognition as an important figure in the early days of European rocketry.

Like Congreve breaching the rule of obscurity, he was a prominent industrialist and also highly influential theorist.

Esnault-Pelterie was a successful aviation innovator and manufacturer and in World War 1 was an important supplier of aircraft to the French Forces. Among other aircraft devices he had invented the control stick – ‘the joy stick’, which greatly

simplified flight control. Combined with his industrial success he was an influential writer on aviation matters, including his book 'L'Astronautique' which gave the science of astronautics its name.

When therefore he turned his attention to rocketry he brought to it a solid record of industrial and scientific achievement. He was responsible for impressive mathematical calculations of rocket efficiency and complex navigational data for inter-planetary flight.

As well as providing other rocketeers with this important theoretical backing his importance lay in the way he used his influence to promote rocketry amongst the Establishment and support the rocket societies which were becoming established in Europe and the USA. For example, he persuaded the wealthy French banker Andre Hirsch to join forces with him to offer an international prize for achievements in astronautics. At a time when rocketry and space travel were still often regarded as the province of dreamers and the deluded the fact of the prize and the willingness of some of the most prominent scientists in France to act as judges was an enormous boost to the credibility of rocket studies. This was further enhanced when the first award went to Hermann Oberth, the pioneer in Germany, see later.

To be continued.

Les Tucker