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Commentary on

V2 Rocket

Aug 1972

The V2 Rocket

On Wednesday 7th March 1945 in the last year of the Second World War a German V2 rocket exploded at the west end of Highbridge Street causing extensive damage, loss of life and injury. The Abbey church miraculously escaped major damage. As the first long distance rocket missile to be developed, the V2 might have won the war for Germany had it been in use earlier. Fortunately for the Allied cause the invasion of Europe was already under way and the V2 was too late.

From a local history and world history point of view the V2 must be of interest. In the case of the Waltham Abbey V2 the engine detached from the missile warhead prior to the explosion and fell two miles away at Skillet Hill Farm, making a hole in a field. The farmer, Mr. Cresswell, moved the motor to the field boundary and it lay there until its discovery by a member of the Society who subsequently supervised its removal to the Museum garden in July 1975. He also discovered that in spite of its malevolent purpose, the motor had served as a site for numerous birds nesting and had probably housed a fox. It will now be cleaned up and will become a reminder of part of our history in the same way that cannons used against Napoleon now have historic interest.

Some technical notes on the V2

The rocket bomb was propelled by the combustion of ethyl alcohol (ethanol) as fuel, diluted with water and liquid oxygen as oxidant in the combustion chamber to give a temperature of about 3000°K and a pressure of about 300 p.s.i. The combustion gases accelerated through the throat of the nozzle or venturi to reach a velocity of 7000 ft/sec at the exit from the nozzle.

The propellant pumps were driven by a 500-600 H.P. turbine itself driven by steam from the decomposition of hydrogen peroxide with calcium permanganate.

A great problem was the cooling of the combustion Chamber. This was effected in two ways. Fuel was fed to a distribution ring near the exit from the nozzle and back along a cooling jacket round the combustion chamber and so entered the 18 burner cups on the combustion chamber backplate. This jacket cooling was augmented by leading some fuel through radial holes through the combustion chamber and venturi walls so as to provide a film of evaporating alcohol; small pipes can be seen which fed this fuel through the chambers and venturi walls.

The liquid oxygen was fed into the centre of each of the 18 burner cups through a rose. The motor produced, initially, about 60,000 lb thrust to propel the $12\frac{1}{2}$ ton rocket vehicle carrying a warhead of nearly one ton, filled with Amatol. The fuel consumption was about 275 lb/sec over the burning time of one minute. Another problem was that the fuel and oxidant tank had to be kept pressurised throughout the flight which reached over 50 miles high and 100 miles range. The oxidant tank was kept pressurised by the evaporating liquid oxygen at 183°C (90°F), the fuel tank was kept pressurised by using the "ram" effect of external air. Often the fuel tank exploded possibly because of the high temperature of the pressurising air. This must have occurred in the case of the Waltham Abbey V2. The accidental internal explosion separated the warhead from the motor which fell at Skillet Hill Farm. Further evidence of this first explosion is given by the appearance of the combustion chamber backplate which has been forcibly pushed back into the combustion chamber. The warhead travelled on a further two miles to land in Highbridge Street, Waltham Abbey, where it detonated on impact.

The flight of the missile was supersonic so that no warning of its arrival could be received. Technologically its development, accelerated by the stresses of wartime conditions, represented an enormous advance in rocketry.

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A great problem was the cooling of the combustion Chamber. This was effected in two ways. Fuel was fed to a distribution ring near the exit from the nozzle and back along a cooling jacket round the combustion chamber and so entered the 13 burner cups on the combustion chamber backplate. This jacket cooling was augmented by leading some fuel through radial holes through the combustion chamber and venturi walls so as to provide a film of evaporating alcohol; small pipes can be seen which fed this fuel through the chambers and venturi walls.

The liquid oxygen was fed into the centre of each of the 13 burner cups through a rose. The motor produced, initially, about 60,000 lb thrust to propel the 12½ ton rocket vehicle carrying a warhead of nearly one ton, filled with Amatol. The fuel consumption was about 275 lb/sec over the burning time of one minute. Another problem was that the fuel and oxidant tank had to be kept pressurised throughout the flight which reached over 50 miles high and 100 miles range. The oxidant tank was kept pressurised by the evaporating liquid oxygen at 183°C (90°F), the fuel tank was kept pressurised by using the "ram" effect of external air. Often the fuel tank exploded possibly because of the high temperature of the pressurising air. This must have occurred in the case of the Waltham Abbey V2. The accidental internal explosion separated the warhead from the motor which fell at Skillet Hill Farm. Further evidence of this first explosion is given by the appearance of the combustion chamber backplate which has been forcibly pushed back into the combustion chamber. The warhead travelled on a further two miles to land in Highbridge Street, Waltham Abbey, where it detonated on impact.

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