EXPERIMENTAL EVALUATION OF A SHOCK WAVE PROPAGATION IMPACTING SURFACE IRREGULARITY

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The aim of this experimental study is to characterize the behaviour of a shock wave impacting an irregularity on the surface in its path, which is supposed non-deformable and perfectly reflective. Therefore, two configurations have been investigated to perform different experiments. For the first, the shock wave results from the detonation of hemispherical gaseous charge confined in a bubble on a surface. The second configuration consists in detonating a spherical charge above a near surface mechanically non-deformable and the gaseous mixture is contained in a balloon. For the two configurations the charge is ignited at its centre with an exploding wire. For the second configuration the distance between the centre of the explosion and the near surface is called HOB (Height Of Burst). Experiments have been conducted at a small scale and the size of the irregularity is in order of some centimetres. Those experiments have to be representative within a range of one kilogram of TNT, and at one meter above the ground in the case of the spherical charge, the size of the irregularity is order of five centimetres.

In both cases, the blast wave is impacted on an irregularity, which is laid on the surface. The irregularity can take many shape and size in order to characterize the different influence on the shock wave. Thus, the data were carried out with pressure sensors as well as optical monitoring method using a high-speed camera. The pressure sensors acquired overpressure and the arrival time. A morphological method with MATLAB was resolved from the pictures produced during the various visualization tests. Knowing the frequency of the high-speed camera and the position of the shock wave, the arrival time was measured too. When a Mach stem occurred during some tests, the height of the triple point was determined with open source software (Tracker). The nature of the shock wave (incident, reflected or Mach stem) during its propagation can be modified by the irregularity compared to the propagation on free field. Moreover, due to the impact, the overpressure and arrival time depend on the geometry and the size of the irregularity.