SHOCK WAVES ATTENUATION USING WATERMIST

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Warships can be submitted to high explosives detonation effects due to war conditions or terrorist attacks. It can lead catastrophic effects on crews and embarked equipments.
There is a critical need to develop and demonstrate anticipatory damage control response systems that will limit damage from explosions.
In this study, the fire suppression devices are envisaged to reduce the shock effects and to improve safety. Experimental and numerical investigations are led in order to attenuate a shock wave by a water mist.
In a first step, experiments in a shock tube were conducted at IUSTI (Fig. 1) to study the physics of the phenomenon and to confirm the interest of the concept[1,2,3]. To support this experimental approach a 1D two phase gas–particles code (PEGASE) has been developed[2]. In a second step experimental full-scale tests were conducted in open configurations on the firing ground of DGA Techniques navales with 4,5 kg explosive charges (Fig. 2). The results obtained show a significant reduction of the blast wave intensity in particular in term of maximum pressure level.
A numerical approach using both codes PEGASE and OURANOS is in progress. It includes the optimization of the future tests planned in confined conditions. The aim of these tests is to simulate real configurations taking into account the reflexion of shock waves and the effect of quasi static pressure.

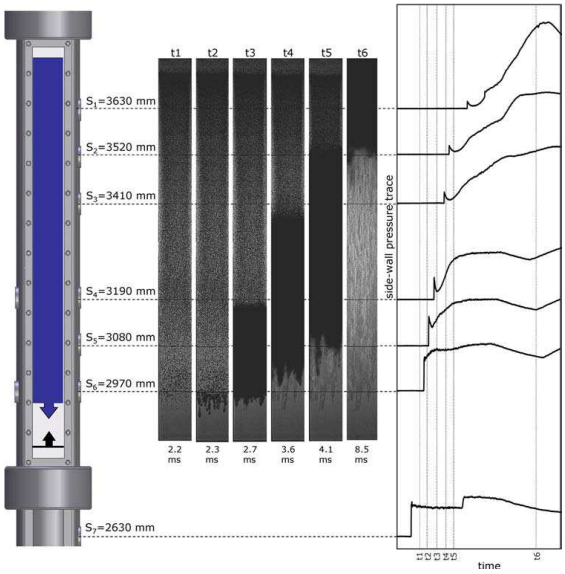

Fig 1: Sequence of pictures showing the effect of a M_{is}=1.5 planar shock wave moving upwards through a cloud of droplets 500µm in diameter falling downwards

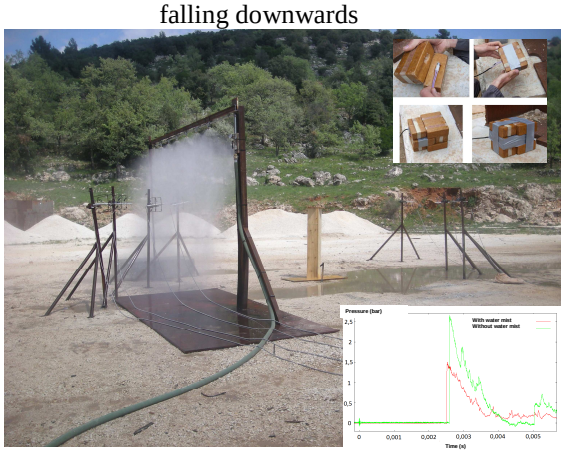

Fig 2: Full-scale test configuration : 4.5 kg high explosive charges

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