MITIGATION OF BLAST IN A WATER MIST: EFFECT OF THE DETONATION CONFIGURATION

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In this work, blast mitigation using water mist was studied. The purpose was to assess the operational capability of the use of fire fighting systems implemented in ships or urban areas to reduce blast effects. More precisely, an attempt was made to determine the mitigation that could be obtained in the case of specific scenarios. A tunnel equipped with a water mist system allowed the assessment of water mist mitigation of blast. Blast effects were evaluated through the use of four pressure gauges placed on the tunnel walls and one pressure gauge placed at the end of the tunnel. The first step was to evaluate mitigation efficiency as a function of water mist characteristics (the droplet size and the water load) when the charge detonated inside the mist. The step two was to assess the mitigation efficiency when the charge detonated outside the mist and thus only the blast wave propagated in the mist. The reduction of initial overpressure and maximum impulse were higher when the charge exploded inside the water mist (Figure 1) and this is most likely due to the quenching of secondary reactions by the water mist.

In order to have a better understanding of mitigation mechanisms, experiments in shock tube were also carried out. The breakup of water drops in the high speed airstream behind the shock wave was observed but the presence of mist had no significant effect on the shock wave profile. This is in line with the importance of the fireball extinguishment in the mitigation process.

In the next step, the tunnel ends will be closed and the mitigation efficiency in a fully confined environment will be assessed.

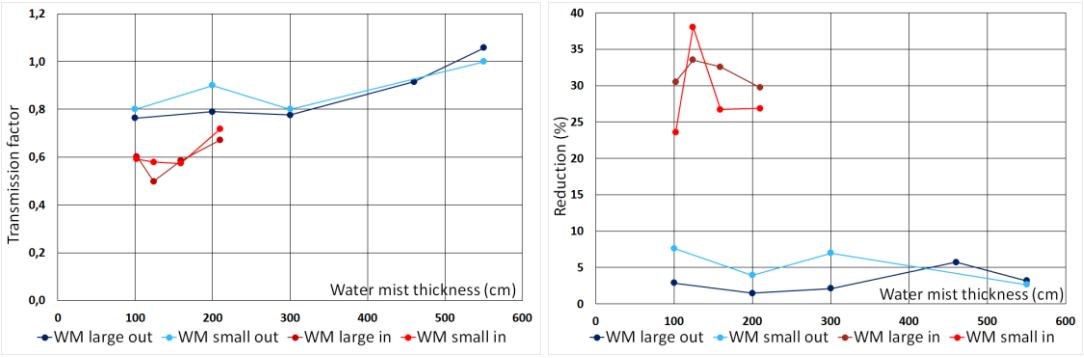

Figure 1. (Left)Transmission factor of initial overpressure and (Right) maximum impulse reduction versus the thickness of water mist which the blast wave passed in the both cases, detonation occurring inside (in) or outside the mist (out). Small: droplet diameter of 25-100 µm. Large: droplet diameter of 200-300 µm.