TOWARDS A SIMPLIFIED BLAST WAVE PREDICTION MODEL USING DIFFERENT TYPES OF EXPERIMENTAL DIAGNOSTICS

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Abstract: This work presents an experimental study with important implications for the safety of sensitive sites. Sensitive sites such as nuclear power plants, chemical facilities, and military installations are potential targets for terrorist attacks and other security threats. The design of protective obstacle against explosions is a critical aspect of ensuring the safety of these sites.

The present experimental research investigates at reduced-scale the propagation of shock waves around a hemi-cylindrical barrier (Figure 1) subjected to an explosion, and the results provide valuable insights into the behavior of shock waves in complex environments. The findings demonstrate the effectiveness of a model (namely the S-model) in describing the propagation of shock waves and their interaction with a rigid protective barrier. The results provide important information for the design of protective barriers that can withstand the impact of explosions and mitigate the damage caused by high intensity blast. Diagnostic methods deployed during the study include pressure gauges and high-speed imaging for instance.

The collaboration between the Institut de Radioprotection et de Sûreté Nucléaire (IRSN), and the Institut franco-allemand de Recherche de Saint-Louis (ISL) highlights the importance of interdisciplinary research in addressing complex security and safety challenges. The combined expertise of IRSN and ISL in assessing and managing security risks complements numerical research on shock wave propagation and barrier design.

Figure 1: Non deformable hemi-cylindrical structures (IRSN, left – ISL, right) – IRSN BlastS table (centre)