FURTHER DEVELOPMENT OF ERDC'S PROTOTYPE ADVANCED BLAST LOAD SIMULATOR

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Two years ago, the early development of a 1.2 m Advanced Blast Load Simulator (ABLS) using a gaseous detonation Driver was presented at MABS24. Significant progress has been made in finalizing the design of the prototype version, computationally simulating the results from that prototype, and determining the design of a larger 3.7 m version that will soon be constructed. High fidelity simulations were performed with multiple numerical codes, including DYSMAS, SAGE, and CHINOOK toward the development of a Virtual ABLS that can quickly determine the parameters needed so that the ABLS can generate a desired loading scenario. 2D and 3D computational fluid dynamics (CFD) simulations have been performed to reproduce the results seen by the prototype ABLS, and to develop a simplified model for the gaseous detonation process that will speed up the simulations based on a calibrated PVCG or "balloon" blast-source model developed by Ritzel[1].

Comparisons between experiment and simulation will be shown and discussed, demonstrating the capabilities of the numerical codes as well as the extent of the blast load parameters than can be simulated within the ABLS. Several items have been addressed throughout the process, including improved fuel dispersion/mixing in order to have a homogeneous fuel cloud at detonation and development of an End Wave Eliminator to prevent reflected waves traveling back up the ABLS after passing a diffraction target. The prototype ABLS has demonstrated the feasibility of the concept, and enabled a design for the larger 3.7 m version to be developed. Simulations scale-up the loading environment from the prototype level to the 3.7 m version, allowing its potential parameter space to be determined prior to construction.

[1] Ritzel DV, Matthews K, "An Adjustable Explosion-Source Model for CFD Blast Calculations", 21st Int'l. Symp. On Shock Waves, 20-25 Jul 1997, Great Keppel Island, QLD, Australia