USE OF CFD/CSD IN PROTECTING TACTICAL MILITARY VEHICLES FROM MINE DETONATIONS

LOTTATI,I.; EIDELMAN,S.; SOUSK,S.; DILLON,J.

Successful efforts to improve the resistance of tactical vehicles to mine detonations are reported. The design methodology has been based on numerical simulation for blast/structure interaction and structure deformation as a result of the blast load. Computational Fluid Dynamic (CFD) simulations have been performed in three dimensions. CFD output is linked to the input of the Computational Structural Dynamics (CSD) code DYNA3D. Robust pre-processors and post-processors complete the simulation tool set. Detailed three dimensional simulations against full configurations of tactical vehicles have been validated by instrumented field tests.

CFD simulations were performed with the code AUGUST-3D, which uses the Second Order Godunov method on adaptive unstructured tetrahedral grids. The BKW equation of state was used to accurately simulate the initial near-field real-gas blast expansion. The DYNA3D code was used for structural dynamic simulation.

Results from tests with protected vehicles, including the 5-ton cargo truck, against wheel and command detonated mine threats are reported. Included are results involving the use of tire inserts for 5-ton cargo trucks and for High Mobility Multipurpose Wheeled Vehicles (HMMWV). CSD results involve using metals, composites, and rubber for blast protection.

The results being reported are part of the modeling effort of The Technical Cooperation Program, Working Technical Panel 1, Key Technical Area (KTA) 1-29, "Protection of Wheeled Vehicles Occupants From Landmine Effects". The overall effort demonstrates the cost effectiveness of detailed CFD/CSD simulations in increasing the protection capabilities of tactical vehicles against mine detonations.