

P23 Numerical Simulation of Muzzle Blast

Tyler-Street, M

Abstract:

Structural design methods for naval ships include environmental, operational and military load cases. One of the operational loads acting on a typical naval vessel is the muzzle blast from a gun.

Simulating the muzzle blast load acting on a ship structure with CFD and ALE methods leads to large numerical models with high CPU requirements as a large volume of the surrounding air domain has to be included in the model.

A numerically efficient method is required to determine the limits of the gun orientation (azimuth and elevation) for the ship structure. When a gun is fired at low elevation angles, the structure in the vicinity of the muzzle may be subjected to high loads. This is of particular interest for the latest naval designs which employ thin decking in order to minimize structural weight and cost.

A modified version of the Heaps et al [1] analytical blast model has been implemented into LSDYNA as a user defined muzzle blast load. This is implemented in a similar manner to a mine blast model [2]. The loading model enables the structural response to be evaluated for a wide range of gun orientations in a numerically efficient manner.

References

[1] Heaps. C.W., et al., Computer implementation of a muzzle blast prediction technique, BRL, BRL-MR-3443, Aberdeen, Maryland, May 1985, AD-A158344.

[2] Implementation Of A User Defined Mine Blast Model In LSDYNA, Mark Tyler-Street, Piet-Jan Leerdam , MABS 22, Bourges, 4-9 November 2012

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