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TNO-PML Developments of Blast Resistant Doors and Walls

The article reflects the views of the authors and not necessarily those of the Prins Maurits Laboratory and/or Royal Netherlands Navy.

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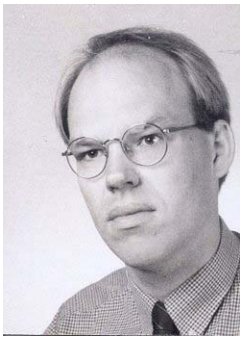

Andre G. van Erkel *is project leader and coordinator at the Prins Maurits Laboratory of the Netherlands Organisation for Applied Scientific Research (**TNO-PML**) since 1985. In the group Platform Technology he is an expert on blast resistance of naval structures, for in- and external explosions. He is active in the field of modelling of internal explosions and dynamic structural response for steel and composite structures. He is involved in several large-scale experiments and the vulnerability reduction of sensors for the new integrated topside design of warships. He manages the research, design and application of blast resistant structures e.g. bulkheads, doors, boxgirders and protection etc onboard (new) ships and naval platforms.*

SYNOPSIS

The impact of an Anti Ship Missile is one of the most threatening scenarios for a naval platform. The accompanying warhead detonation will endanger crew, platform and its mission. A naval engineer has various options to reduce the vulnerability of his platform design, like smart arrangement and protection. One of the most important options is to increase the blast resistance of the longitudinal subdivision i.e. watertight (WT) bulkheads and doors. This paper will address the ongoing developments on blast resistant light or moderate weight steel structures at the Prins Maurits Laboratory of the Netherlands Organisation for Applied Scientific Research (TNO-PML) for the Royal Netherlands Navy (RNLN) and other parties.

After an introduction on the threat and the followed approach, five structural products will be elaborated for two loading levels. Two blast resistant doors and three blast resistant bulkhead concepts have been developed and all concepts have been validated by full scale experiments. The development of a blast resistant WT-door for conventional bulkheads, the membrane door for high blast loading, the blast & ballistic resistant PriMa Double Bulkhead, a new single plate optimised bulkhead and the patented add-on Curvature Limiter for existing walls will be dealt with. Both door designs and the double bulkhead design will be implemented in the new RNLN Air Defence Command Frigate (LCF) and the other bulkhead concept will be implemented in other naval structures.

The following aspects will be shortly mentioned: the design principles, the interaction of fragments and structural response, the experimental validation and the implementation. Experiments on mitigating the explosion pressure by means of water spray will be briefly examined as well.

It must be noted that, although the initiation of the development of these blast resistant structures is for Naval Defence purposes, there is a highly potential spin-off for in- and external explosions for bunkers, ammunition storage facilities and for applications in the offshore industry.