

UNDEX TRIALS AND SIMULATIONS OF SUBMERGED CYLINDERS

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Key words : Underwater Shock, Submerged Cylinder, Simulation Tool Validation

TNO has developed a number of simulation tools for describing the structural response of naval ships exposed to underwater shock. Typically these tools are one or two orders of magnitude more efficient than a full Arbitrary Lagrangian Eulerian (ALE) approach but they are evidently more limited in scope. Up to now, the tools are validated using shock trials of surface vessels including the Royal Netherlands Navy M-frigate and the Air Defence and Command Frigate.

The fluid structure interaction of submarines differs in several respects from surface ships. Moreover, submarines are simultaneously exposed to possibly high hydrostatic loading and shock. The TNO simulations tools 3DCAV and SIT (Simplified Interaction Tool) are now being extended to submarine applications.

In close cooperation with the German WTD 71, shock tests have been performed on a submerged steel cylindrical shell structure of approximately one meter diameter and two meter length. During and after the tests the deformations and accelerations of the hull and the interior structure have been measured. The results are being used to validate the new submarine related functionalities of the simulation tools. The first results show a very good resemblance. In future the validated tools may be used for full scale simulations.