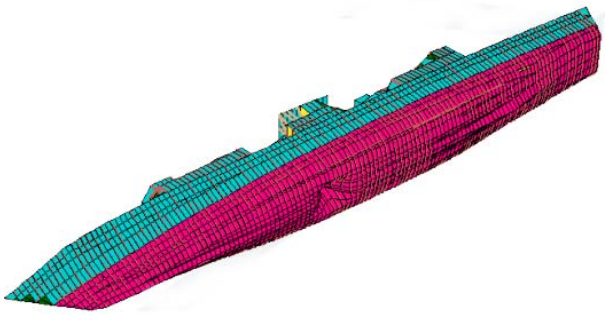

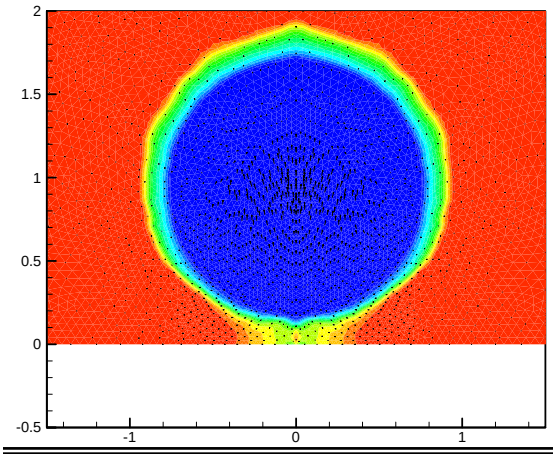

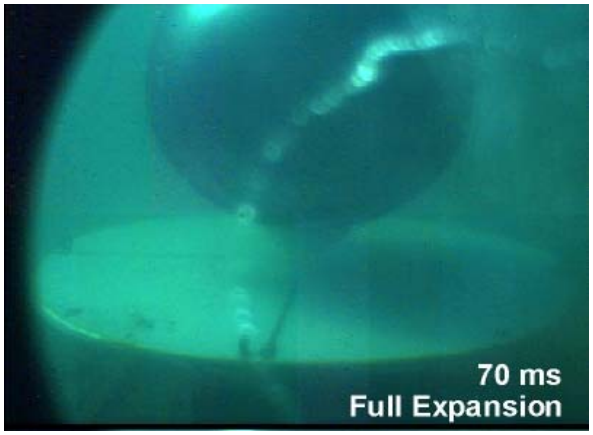

DESCRIPTION:

Martec Limited has considerable expertise in modelling the response of vessels to underwater explosions, and has developed tools which are being used to support experimental programs sponsored by the Canadian Department of National Defence. This expertise has been used to develop specialized models for both predicting pressure loading due to underwater explosions and the response of global ship models to these loads. Of particular concern in recent years are asymmetric threats, where a relatively low-tech high explosive is deployed against a high-value military asset such as the attack on the USS Cole in 2000.

Predicting the effects of underwater explosions is challenging as the target can be subjected to different types of loading depending on the device size, how close it is to the target, and the depth of the water in the immediate vicinity. A typical underwater explosive will generate a strong shock wave that can disable critical equipment due to vibration response. It may also generate effects that can damage the ship hull. Following the initial shock wave, the high-pressure gases formed by the explosive combustion expand to form a large bubble. After a certain critical size is reached the bubble collapses and restarts the expansion. If there is a solid shape in the vicinity of the bubble, the bubble will collapse as a jet of high velocity water that can produce significant local damage, possibly breaching the ship hull.

References:

1. R.A. Link, L. Donahue, J.E. Slater, "Numerical Simulation of the Loading and Response of Flat Plate Targets Subjected to Close-Proximity Underwater Explosions", 75th Shock and Vibration Symposium, October 2004, Virginia Beach, VA.
2. R.A. Link, R.C. Ripley, M. Norwood, L. Donahue, T. Josey, J. Slater, ”Analysis of the Loading and Response of Flat Plate Targets Subjected to Close-Proximity Underwater Explosions”, 74th Shock and Vibration Symposium, October 2003, San Diego, CA.