

UNDERWATER FRAGMENTATION OF CYLINDERS

J. J. Lee¹ and G. Rude¹

¹ *Defence R&D Canada – Suffield
PO Box 4000, Station Main, Medicine Hat, Alberta, T1A 8K6, Canada*

ABSTRACT

Because underwater explosion fragments have a limited range of propagation, fragment damage from cased underwater charges has not been considered a serious threat. With recent interest in asymmetric threats and close-proximity improvised explosives, there is renewed interest in the fragmentation properties of cased underwater explosives, particularly in shallow depths where fragments can be launched out of the spray dome into the air. The present paper examines the fragmentation characteristics of metal cylinders filled with explosive and detonated underwater. The fragmentation process was filmed using high-speed video, revealing a fragment cloud closely confined to the detonation product bubble. However, small protrusions appearing on the bubble surface at later times may indicate fragments overtaking the bubble interface. Fragment samples were recovered after the test, and the size distributions showed a typical bi-linear trend with the average fragment masses significantly larger than in air. As expected, the fragment velocities decayed quickly due to water drag, limiting the damage threat to very short distances from the charge. This study provides some insight into the underwater fragmentation process and damage potential of the fragments.