Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

The Taylor cylinder response of PC and PMMA A.D. RESNYANSKY, Weapons and Combat Systems Division, DST Group, PO Box 1500, Edinburgh SA 5111, Australia, N.K. BOURNE, School of Materials, University of Manchester, Manchester, M13 9PL, United Kingdom, E.N. BROWN, P-23, Los Alamos National Laboratory, Los Alamos, NM 87545, USA — The well-known Taylor cylinder impact test, which follows the impact of a flat-ended cylindrical rod onto a rigid stationary anvil, is conducted over a range of impact speeds for two polymers, polymethylmethacrylate (PMMA) and polycarbonate (PC). Experiments and modelling were developed to capture the deformation behaviour of the cylinders after impact. The Taylor impact loading geometry enforces a strong influence of shear loading at impact velocities above a critical value. Introduction of shear stress at the rod-anvil interface was achieved in a new constitutive model by varying interface friction conditions. These works showed a region in which spatial and temporal variation of both longitudinal and radial deformation provided evidence of different failure modes. In a further series of experiments, we varied a range impact face conditions to control failure in the rod and resolve compressed regions within the recovered polymer cylinders. The combination of macroscopic high-speed photography and three-dimensional X-ray imaging with new constitutive modeling has identified and described the development of failure with these polymers.

Anatoly Resnyansky
Defence Science Technology Org

Date submitted: 24 Feb 2017 Electronic form version 1.4