Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

Laser-Ignition of Laser-Shock Dispersed Metal Particles JAMES LIGHTSTONE, JOEL CARNEY, Indian Head Division, NSWC — Understanding the ignition and combustion of metal particles loaded in an explosive under the extreme conditions encountered in detonations is important for maximizing the energy output in blast applications. Of particular interest is the effect of particle velocity on ignition and sustained combustion. Published laboratory experiments are typically limited to velocities in the range 5 to 10 m/s. These are significantly lower than velocities achieved in detonating explosives which can reach 500 m/s to 1 km/s. The work presented in the paper describes a new technique to examine the ignition and combustion properties of particles travelling at high velocity in an oxidizing atmosphere. The technique utilizes two short (10 ns) IR laser pulses. The first launches the particles at velocities reaching 250 m/s as determined by high-speed digital shadowgraphy. The second, fired after a delay period, heats a section of the resulting particle cloud to ignition. Ignition and combustion is monitored using photodiodes, pyrometry, and time-resolved spectroscopy. Data acquired for particle sizes ranging from 1 to 100 microns and velocities ranging from 100 to 250 m/s will be presented.

James Lightstone
Indian Head Division, NSWC

Date submitted: 20 Feb 2009 Electronic form version 1.4