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ADVANCED SHOCK TUBE FACILITIES TO STUDY THE RESPONSE OF MATERIALS AND STRUCTURES TO SIMULATED NUCLEAR ENVIRONMENTS

Mohsen Sanai, Adam Ziemba, and Mike Pinto

SRI International, 333 Ravenswood Ave, Menlo Park, California, 94027, USA

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In support of the Defense Threat Reduction Agency (DTRA) nuclear weapon effects programs, SRI has invested and expanded its existing shock tube facilities to generate the precise airblast environments necessary to study the response of materials and structures to nuclear airblast. The explosives driver designs are based on a tailored charge technique (presented at MABS 10-12) that provides significant cost savings compared with gas-driven shock tubes or field experiments. Our 6.5-in.-diameter shock tube (Figure 1) applies a uniform (reflected) blast pressure in the 10,000 psi range to targets held at its muzzle end. Shattering of brittle targets such as glass is recorded by four high-speed video (HSV) cameras, and the size and velocity distributions of resulting fragments are obtained by processing video images using ProAnalyst software. Our 8-ft-diameter shock tube (Figure 2) expands to 12 ft in diameter at test point and produces free-field pressures of up to 60 psi and durations of 200 ms to expose large targets to equivalent nuclear yields in the15 kT range. Sample test data from ongoing projects will be presented.

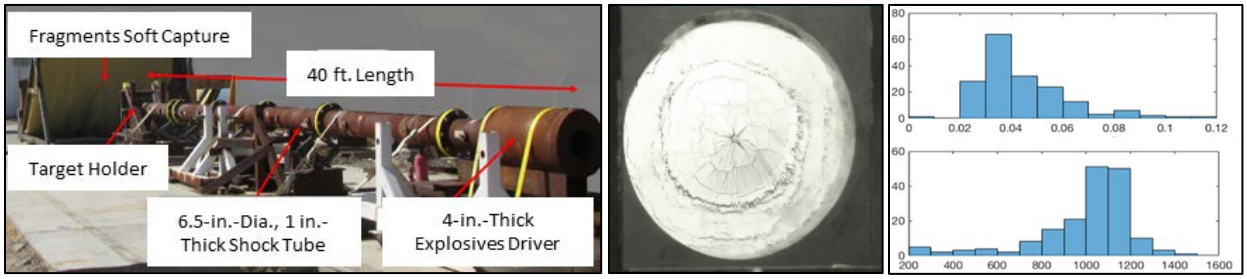

Figure 1. SRI's 40-ft-long, 6.5-in.-diameter explosives-driven shock tube shown with a fragment soft-capture system (left); high-speed video image from a shattering glass plate 1 ms after shock arrival (middle); and number of particles vs. fragments projected area in units of in^2 (top right) and velocity in units of ft/s (bottom right) obtained by processing video images.

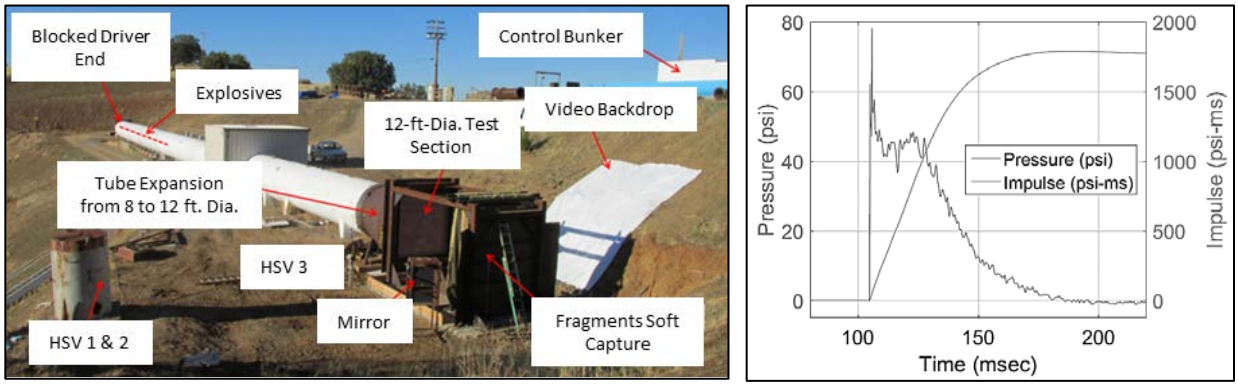

Figure 2. SRI's 268-ft-long explosives-driven shock tube shown with the 8-ft x 8-ft test target holder, 3 high-speed video (HSV) cameras, and soft fragment capture setup (left) and the pressure applied to the target (right) from the incident 22-psi, 100-ms-long pressure measured at the same location without the target.