DESIGN OF A NEW TEST FIXTURE FOR CHARACTERIZATION OF NEAR-FIELD BLAST EFFECTS

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Measurements of blast pressure and impulse in the very near-source regime have always been problematic. The difficulties of such measurements are further enhanced by modern trends in explosives research. Classical high explosive materials produce a shock wave and gas-phase detonation products which impinge on a target. More modern multi-phase formulations might contain particles of inert metals blended with the solid-phase explosive. The resulting loading on a structure thus includes a component of impulse from the mass of these inert particles that is often not successfully measured by a standard airblast pressure transducer.

To facilitate such measurements in future experiments, AFRL has undertaken to design a test fixture which will provide supports for a number of bar gauges exposed to the blast/particle environment. The design threat for the structure is a charge at a scaled standoff of 0.83 ft/lb$^{1/3}$ [0.33 m/kg$^{1/3}$], where the environments are quite severe. A vertical reflecting surface provides for sustained reflected blast loads without interference due to clearing effects from the edges. Solid steel one-dimensional bars extend behind the reflecting surface and respond elastically to the combined environment (blast plus particles) applied at their exposed end. Strain measurements in these bars can then be correlated to pressure histories (or equivalent pressure). The entire structure is intended to remain elastic to allow repeat use of the fixture with no or minimal repairs.

This paper presents the design basis, the design methodology and approach, and the resulting fixture dimensions, properties, and characteristics.