ENERGY DENSITY MEASUREMENTS IN BLAST WAVES

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The particle trajectories in blast waves have been measured by high speed photography of smoke tracers, and have been analyzed to map tile particle velocity, density, pressure and entropy throughout the waves. Details of tile particle trajectory analysis method and results of these measurements have been described e at previous Blast Simulation Symposia. The information about the physical properties of blast waves has been further analyzed to calculate the available energy per unit volume of the gas at any point in the wave. Integration of the specific energy provides the total energy of the wave and this can be related to the total energy yield of the explosion. It is also possible to observe the relative distribution of energy within a blast wave as it passes over or is reflected from different surfaces. Results will be presented of the energy distribution and the total energy in blast 'waves from centered 500 kg explosions, and in the
Mach stem blast waves produced by spherical shock reflections 'from real and ideal (shock-on-shock) surfaces. The total energy in the spherical blast wave is shown to approach a constant value similar in magnitude to the expected energy release from the charge, and comparisons made with results obtained using numerical predictions of blast wave properties. Differences in the energy distribution within Mach stem blast waves reflected from ideal and real surfaces will be demonstrated. Initial results indicate that although the strength of the shock over the ideal surface is greater than that over a rough real surface, the total energy in the wave is eventually greater over the rough surfaces. Possible explanations for
this effect will be suggested. The authors believe these to be the first experimental determinations of total energy within blast waves.