

OPTIMIZATION AND MODIFICATION OF A THIN FLAME THERMAL RADIATION SOURCE

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The Blast Dynamics Branch of the U.S. Army Ballistic Research Laboratory has been working with a thin flame thermal radiation source (TRS). This TRS unit is a basic aluminum powder/liquid oxygen system incorporating a tailored combustion chamber to shape the combusted flame and is intended to be installed in the BRL 2.44m shock tube. This facility will provide the Army a blast/thermal test facility, serve as a research tool to conduct blast/thermal synergistic experiments, and test military equipment components and materials.

Test were conducted to optimize the performance of the TRS and then characterize the thermal environment. Modifications were made to the original model to improve its performance. This included installation of a new aluminum divert valve, change in the aluminum tank pressurization, airtation system, a pneumatic control. These changes significantly improved the system's output and performance.

The TRS unit was then installed in a 2.44 meter diameter by 16.7 meter test chamber. Testing was conducted in the chamber to determine what venting would be required to expel the residual aluminum oxide particles. An array of calorimeters was used to map the thermal environment in three-dimensions. A three dimensional contour plot was generated resulting in a data base for future test based on a reference point.