

ADVANCED DESIGN CONCEPTS FOR A LARGE BLAST/THERMAL SIMULATOR

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For several years now, BRL has been developing the concept of a Large Blast/Thermal Simulator (LB/TS) suitable to simulate both thermal and blast effects of nuclear explosions for testing the vulnerability and survivability of full-scale tactical equipment. The blast compressed gas into a large expansion tunnel. The thermal effects will be simulated by a thermal radiation source (TRS).

The initial design concept used conventional features for producing the blast wave such as drivers of staggered length, diaphragms and cold driver gas. The advanced-concept U.S. LB/TS will employ heated nitrogen as driver gas to cover a larger range of shock overpressures and to avoid distortion of the simulated blast wave by the cold driver gas. It will have a semicircular test section of 10 meters radius and will be over 250 meters long. Real-time flow control devices will be advantageously used in two areas of the LB/TS. Throat valves will be employed instead of diaphragms to regulate the gas flow out of the high-pressure driver section into the expansion tunnel. By controlling and varying the flow area of the valves, the blast wave can be shaped in a desired fashion. Likewise, a rarefaction wave eliminator (RWE) at the downstream end of the expansion tunnel will be used to control the flow exiting the LB/TS, thus preventing the generation of upstream traveling rarefaction waves, or shocks.

The proposed facility should allow up to 150 tests per year. This paper describes the advanced-concept design features of the planned U.S. LB/TS and the basic phenomenology involved in blast wave simulation and real-time flow control.