

## **THE USE OF AN INERTIAL REFERENCE SYSTEM TO MEASURE BLAST INDUCED TARGET MOTION**

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A large blast/thermal simulator (LB/TS) is currently being planned and may be constructed by the U.S. Army sometime in the 1990's. This facility will be used to determine the effects of blast induced shock waves on full scale military targets of interest. Blast data provide useful information needed to analyze the hardness and survivability of military targets. If the targets are also instrumented to measure target displacement and rotation, then additional detailed and specific information concerning target damage may be obtained.

Primarily, this paper presents the concepts contained in a data analysis computer program written at BRL that may be used to analyze target motion. To use the data analysis program, it is assumed that valid accelerations or other measurements of motion have been obtained with some system of accelerometers, gyroscopes, or other motion sensors. An in depth description of the physics in the computer program is presented. It is hoped that anyone using the data analysis software will be able to understand the program steps by referring to this paper.

This program accepts input from accelerometers mounted on rigid body bars firmly attached to a target forming a three dimensional, right-handed, or-thogonal coordinate system. It computes angular acceleration and angular velocity in the target reference frame. Linear acceleration, linear velocity, and linear and angular displacements are calculated in the earth fixed reference frame quantifying the effects of blast induced target motion.

Secondly, this paper discusses the advantages and disadvantages of different systems for obtaining target motion and discusses techniques for conditioning instrumentation output before it is input to the data analysis program.