LAGRANGIAN COMPUTATIONAL APPROACHES FOR MODELING AIR, SOIL, FRAGMENTATION, AND STRUCTURAL INTERACTIONS DUE TO BLAST LOADING

G. R. Johnson[1], C.A. Gerlach[1], T. J. Holmquist[1], K. T. Danielson[2], E. M. Williams[2], D. M. Fox[3]

[1]*Southwest Research Institute, Minneapolis, Minnesota, 55416, USA*
[2]*U. S. Army Engineer Research and Development Center, Vicksburg, Mississippi, 39180, USA*
[3]*U. S. Army Tank-Automotive Research, Development and Engineering Center, Warren, Michigan, 48397, USA*

ABSTRACT

This paper presents a demonstration and evaluation of the use of Lagrangian-only approaches for the complex computational problem involving air, soil, fragmentation, and structural interactions due to blast loading. A distinct contrast to other modeling techniques is that the air is modeled with a Lagrangian particle formulation. The primary advantage of Lagrangian approaches is that the grid moves with the material such that interfaces and material histories are well defined. Tracking and treatment of such complex material interactions continues to be problematic for approaches that involve an Eulerian component. These computations are accomplished by using the finite-element and meshless-particle options in the Elastic-Plastic Impact Computations (EPIC) code.