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Simulating Mechanical Reentry Vehicle Normal Nuclear Environments for Qualification Specifications (U)

Full system model mechanical simulations of a reentry vehicle encountering blast and impulse environments are presented. These simulations use Sierra Structural Dynamics (Salinas) and DAKOTA on the Tri-Lab Linux Capacity Clusters (TLCC). The simulated structural response of the warhead is compared with the current qualification testing specification intended to represent these hostile environments which are not able to be tested for directly. In an effort to improve the technical basis for qualifying the survivability of Sandia components in these shock inducing environments, simulation is used to design resonant beams with a dynamic response similar to that of the simulated warhead with the loading conditions of interest. The test results using the resonant beams with both mass mock and high fidelity hardware are shown and used to compare with the simulation results. This comparison encompasses a validation process utilizing the mass mock datasets which are of sufficient sample size. This validation effort augments the confidence in the full system model results, for which a limited amount of historical data is available. This work demonstrates an integrated approach in which computational simulation aids the design and development of a "physical simulation", which in turn provides validation data and increased credibility for the use of computational simulation in stockpile related decisions.