

Quantified Margins and Uncertainties of W80 Abnormal Mechanical Nuclear Safety

In an assessment funded by the Advanced Simulation and Computing (ASC) Program, a W80 system model is being used to quantify the margins and uncertainties (QMU) of nuclear safety issues in abnormal mechanical environments such as handling drop accidents. Underpinning this project are the uncertainty quantification methods and computational tools developed by the ASC program, including SIERRA solid mechanics codes to perform the simulations. Uncertainties in the system model, which are prohibitively expensive to determine exclusively from comparisons with full system experiments, were derived in part by propagating uncertainties determined from model comparisons with subsystem and material characterization tests (such as the notched tension model shown below) up to the integrated system level.

In addition, novel mesh-independent methods for modeling failure propagation and material softening, recently incorporated in the Sierra solid mechanics codes, are being tested for their effectiveness and efficiency in addressing long-standing computational issues bearing on this and other systems in abnormal mechanical environments. The project has undergone peer review by a panel of experts in a series of evaluations, most recently in late 2010. The project is supporting the 2011 and 2012 W80 Annual Assessment Reports. (POC: J. Crowell, Org. 8249)

