Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Multiple necking during dynamic extension of round bar: linear stability approach versus finite element calculations SKANDER EL MAI, CEA, France, SEBASTIEN MERCIER, Universite de Lorraine, France, JACQUES PETIT, CEA, France, ALAIN MOLINARI, Universite de Lorraine, France — The fragmentation of structures has been widely investigated in the literature, with experimental, numerical or analytical works. Many authors have proposed to reproduce by FEA the experimental fragmentation process by introducing for instance a perturbation to trigger instabilities. Therefore, the authors were able to capture the distribution of fragments. Few of them are interested in the characterization of the onset time of instability. In the proposed contribution, the multiple necking of a round bar in dynamic tensile loading is analysed by the finite element method. A perturbation of the initial flow stress is introduced in the numerical model. Various levels of loading velocities and of perturbation amplitudes are considered. The onset time of localized instabilities ti and the number of necks Nn have been characterized. A logarithmic dependence of variables ti and Nn with the loading velocity is shown. The time ti is observed to depend strongly on the level of the perturbations introduced in the numerical model while the number of necks Nn evolves moderately. Besides, by defining salient criteria in terms of the growth rate of the perturbation, a comparison of linear stability analysis dedicated to multiple necking with the numerical results can be performed. A good correlation in terms of onset time of instabilities and of number of necks is shown.

Skander EL Mai
CEA, France

Date submitted: 14 Feb 2013 Electronic form version 1.4