Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

Elastic-Plastic Behavior of U6Nb Under Ramp Wave Loading
D.B. HAYES, G.T. GRAY III, Los Alamos National Laboratory, C. HALL, Sandia National Laboratories, R.S. HIXSON, Los Alamos National Laboratory — Prior shock experiments on the alloy uranium-niobium-6 wt.% (U6Nb) were absent an elastic precursor when one was expected (A. K. Zurek, et. al., Journal de Physique IV, **10** (#9) p677-682). This was later explained as a consequence of shear stress relaxation from time-dependent twinning that prevented sufficient shear stress for plastic yielding. (D. B. Hayes, et. al., Shock Compression of Condensed Matter-2003, p1177, American Institute of Physics 2004) Pressure was ramped to 13 GPa in 150-ns on eight U6Nb specimens with thicknesses from 0.5 – 1.1-mm and the back surface velocities were measured with laser interferometry. This pressure load produces a stress wave with sufficiently fast rise time so that, according to the prior work, twins do not have time to form. Four of the U6Nb specimens had been cold-rolled which increased the yield stress. Each velocity history was analyzed with a backward integration analysis to give the stress-strain response of the U6Nb. Comparison of these results with prior Hugoniot measurements shows that the U6Nb in the present experiments responds as an elastic-plastic material and the deduced yield strength of the baseline and of the cold-rolled material agree with static results.

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Date submitted: 03 May 2005 Electronic form version 1.4