Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

A Sensitivity Study of the Navier-Stokes-α Model SEAN BRECKLING, Air Force Institute of Technology (AFIT), MONIKA NEDA, University of Nevada, Las Vegas — We present a sensitivity study of the of the Navier Stokes-α model (NSα) with respect to perturbations of the differential filter length α. Parameter-sensitivity is evaluated using the sensitivity equations method. Once formulated, the sensitivity equations are discretized and computed alongside the NSα model using the same finite elements in space, and Crank-Nicolson in time. We provide a complete stability analysis of the scheme, along with the sensitivity results of several benchmark problems in both 2D and 3D. We further demonstrate a practical technique to determine the reliability of the NSα model in problem-specific settings. Lastly, we investigate the sensitivity and reliability of important functionals of the velocity and pressure solutions.

Sean Breckling
Air Force Institute of Technology (AFIT)

Date submitted: 13 Jun 2017 Electronic form version 1.4