Status on the Verification of Combustion Stability for the J-2X Engine Thrust Chamber Assembly

M. Casiano – NASA Marshall Space Flight Center, Huntsville, AL
T. Hinerman – Pratt & Whitney Rocketdyne, Canoga Park, CA
R. J. Kenny – NASA Marshall Space Flight Center, Huntsville, AL
J. Hulka – Jacobs ESSSA, Huntsville, AL
G. Barnett – NASA Marshall Space Flight Center, Huntsville, AL
F. Dodd – Pratt & Whitney Rocketdyne, Canoga Park, CA
T. Martin – Pratt & Whitney Rocketdyne, Canoga Park, CA

Development is underway of the J-2X engine, a liquid oxygen/liquid hydrogen rocket engine for use on the Space Launch System. The Engine E10001 began hot fire testing in June 2011 and testing will continue with subsequent engines. The J-2X engine main combustion chamber contains both acoustic cavities and baffles. These stability aids are intended to dampen the acoustics in the main combustion chamber. Verification of the engine thrust chamber stability is determined primarily by examining experimental data using a dynamic stability rating technique; however, additional requirements were included to guard against any spontaneous instability or rough combustion. Startup and shutdown chug oscillations are also characterized for this engine. This paper details the stability requirements and verification including low and high frequency dynamics, a discussion on sensor selection and sensor port dynamics, and the process developed to assess combustion stability. A status on the stability results is also provided and discussed.