December 2011 MSS/LPS/SPS Joint Subcommittee Meeting
ABSTRACT SUBMITTAL FORM

The submission of an abstract is an agreement to complete a final paper for publication and attend the meeting to present this information. Complete all information requested in the author and co-author information sections; the first author listed will receive paper acceptance notices and all correspondence. Abstracts must be submitted electronically; submittal instructions are located in the call for papers. **The abstract deadline date is June 13, 2011.**

ABSTRACT INFORMATION

Title: The Grid Density Dependence of the Unsteady Pressures of the J-2X Turbines

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AUTHOR INFORMATION

Author/Presenter Name: Preston B. Schmauch
Affiliation NASA Marshall Space Flight Center
Address ER42 4203:3427
City MSFC State AL Zip 35812
Telephone (256) 544-1218 Telefax
e-mail: preston.b.schmauch@nasa.gov

2nd Author:
Affiliation
Address
City State Zip
Telephone Telefax
e-mail:

3rd Author:
Affiliation
Address
City State Zip
Telephone Telefax
e-mail:

Additional Author(s):
Affiliation
Address
City State Zip
Telephone Telefax
e-mail:

MANAGEMENT APPROVAL

The individual below certifies that the required resources are available to present this paper at the above subject JANNAF meeting.

Responsible Manager authorizing presentation: Lisa W. Griffin

Title/Agency: Branch Chief, Fluid Dynamics Branch, ER42, NASA/MSFC

Telephone Number: (256) 544-8972 e-mail: lisa.w.griffin@na Date: June 3, 2011

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Unclassified Abstract

(250-300 words; do not include figures or tables)

The J-2X engine was originally designed for the upper stage of the cancelled Crew Launch Vehicle. Although the Crew Launch Vehicle was cancelled the J-2X engine, which is currently undergoing hotfire testing, may be used on future programs. The J-2X engine is a direct decendent of the J-2 engine which powered the upper stage during the Apollo program. Many changes including a thrust increase from 230K to 294K lbf have been implemented in this engine. As part of the design requirements, the turbine blades must meet minimum hich cylce fatigue factors of safety for various vibrational modes that have resonant frequencies in the engine's operating range. The unsteady blade loading is calculated directly from CFD simulations. A grid density study was performed to understand the sensitivity of the spatial loading and the magnitude of the on blade loading due to changes in grid density. Given that the unsteady blade loading has a first order effect on the high cycle fatigue factors of safety, it is important to understand the level of convergence when applying the unsteady loads. The convergence of the unsteady pressures of several grid densities will be presented for various frequencies in the engine's operating range.