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: Validation and Simulation of Ares I Scale Model Acoustic Test - 3 - Modeling and Evaluating the Effect of Rainbird Water Deluge Inclusion

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Unclassified Abstract

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

The Ares I Scale Model Acoustics Test (ASMAT) is a series of live-fire tests of scaled rocket motors meant to simulate the conditions of the Ares I launch configuration. These tests have provided a well documented set of high fidelity measurements useful for validation including data taken over a range of test conditions and containing phenomena like Ignition Over-Pressure and water suppression of acoustics. Building on dry simulations of the ASMAT tests with the vehicle at 5 ft. elevation (100 ft. real vehicle elevation), wet simulations of the ASMAT test setup have been performed using the Loci/CHEM computational fluid dynamics software to explore the effect of rainbird water suppression inclusion on the launch platform deck. Two-phase water simulation has been performed using an energy and mass coupled lagrangian particle system module where liquid phase emissions are segregated into clouds of virtual particles and gas phase mass transfer is accomplished through simple Weber number controlled breakup and boiling models. Comparisons have been performed to the dry 5 ft. elevation cases, using configurations with and without launch mounts. These cases have been used to explore the interaction between rainbird spray patterns and launch mount geometry and evaluate the acoustic sound pressure level knockdown achieved through above-deck rainbird deluge inclusion. This comparison has been anchored with validation from live-fire test data which showed a reduction in rainbird effectiveness with the presence of a launch mount.