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**ABSTRACT SUBMITTAL FORM**

**Unclassified Abstract**

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

The Loci-CHEM 3.2 Computational Fluid Dynamics (CFD) code is being used to predict Ares-I launch vehicle aerodynamic heating. CFD has been used to predict both ascent and stage reentry environments and has been validated against wind tunnel tests and the Ares I-X developmental flight test. Most of the CFD predictions agreed with measurements. On regions where mismatches occurred, the CFD predictions tended to be higher than measured data. These higher predictions usually occurred in complex regions, where the CFD models (mainly turbulence) contain less accurate approximations. In some instances, the errors causing the over-predictions would cause locations downstream to be affected even though the physics were still being modeled properly by CHEM. This is easily seen when comparing to the 103-AH data. In the areas where predictions were low, higher grid resolution often brought the results closer to the data. Other disagreements are attributed to Ares I-X hardware not being present in the grid, as a result of computational resources limitations. The satisfactory predictions from CHEM provide confidence that future designs and predictions from the CFD code will provide an accurate approximation of the correct values for use in design and other applications.