

Ares I-X First Stage Internal Aft Skirt Re-entry Heating Data and Modeling

C. P. Schmitz, S.B. Tashakkor
*NASA Marshall Space Flight Center
Marshall Space Flight Center, Alabama*

ABSTRACT

The CLVSTATE engineering code is being used to predict Ares-I launch vehicle first stage re-entry aerodynamic heating. An engineering analysis is developed which yields reasonable predictions for the timing of the first stage aft skirt thermal curtain failure and the resulting internal gas temperatures. The analysis is based on correlations of the Ares I-X internal aft skirt gas temperatures and has been implemented into CLVSTATE. Validation of the thermal curtain opening models has been accomplished using additional Ares I-X thermocouple, calorimeter and pressure flight data. In addition, a technique which accounts for radiation losses at high altitudes has been developed which improves the gas temperature measurements obtained by the gas temperature probes (GTP). Updates to the CLVSTATE models are shown to improve the accuracy of the internal aft skirt heating predictions which will result in increased confidence in future vehicle designs.