

Possible Deficiencies in Predicting Transonic Aerodynamics on the X-43a



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NASA Technical Reports Server (NTRS), et al., Steven G. Labbe

The initial X-43A flight test, June 2, 2001, resulted in a mishap and loss of the vehicle. A mishap investigation board (MIB) report and findings, including the established root cause, were publicly released on July, 23, 2003. The X-43A Flight 1 Hyper-X Launch Vehicle (HXLV) failed because the vehicle control system design was deficient for the trajectory flown due to inaccurate analytical models (Pegasus heritage and HXLV specific), which overestimated the (control) system margin. X-43A Mishap Investigation Report, Vol. I. included as Reference 1. Several specific errors were noted, 1) HXLV aerodynamics failure to model changes to wing, fin and rudder airfoil shapes due to addition of thermal protection system (TPS); 2) Fin actuation system (FAS) modeling under prediction of the control surface hinge moments and FAS compliance; and 3) Parametric uncertainties insufficient variation in the aerodynamic, FAS and control system models. In response to the MIB findings, the X-43A program has been working RTF through an approved Corrective Action Plan (CAP) over the last two years.

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