

Orbiter Entry Aeroheating Working Group Viscous Cfd Boundary Layer Transition Trailblazer Solutions



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NASA Technical Reports Server (NTRS), et al., William A. Wood

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BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 26 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. Boundary layer transition correlations for the Shuttle Orbiter have been previously developed utilizing a two-layer boundary layer prediction technique. The particular two-layer technique that was used is limited to Mach numbers less than 20. To allow assessments at Mach numbers greater than 20, it is proposed to use viscous CFD to predict boundary layer properties. This report addresses if the existing Orbiter entry aeroheating viscous CFD solutions, which were originally intended to be used for heat transfer rate predictions, adequately resolve boundary layer edge properties and if the existing two-layer results could be leveraged to reduce the number of needed CFD solutions. The boundary layer edge parameters from viscous CFD solutions are extracted along the wind side centerline of the Space Shuttle Orbiter at reentry conditions, and are compared with results from the two-layer boundary layer prediction technique. The differences between the viscous CFD and two-layer prediction techniques vary between Mach 6 and 18 flight conditions and Mach 6 wind tunnel conditions, and there is not a straightforward scaling between the viscous CFD and two-layer values. Therefore: it is not possible to leverage the existing two-layer Orbiter flight boundary layer data set as a substitute for a viscous CFD data set; but viscous CFD solutions at the current grid resolution are sufficient to produce a boundary layer data set suitable for applying edge-based boundary layer transition correlations. This item ships from La Vergne, TN. Paperback.



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