Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Benchmark Smooth Body Flow Separation Experiments[1] DANIEL SIMMONS, FLINT THOMAS, THOMAS CORKE, Institute for Flow Physics and Control, , Notre Dame, IN, 46556 — The accurate and repeatable computational fluid dynamics (CFD)-based prediction of turbulent flow separation relevant to off-design aerodynamic configurations remains an important challenge. There is a clear need for improved models that can accurately capture the essential flow physics associated with smooth body, adverse pressure gradient (APG) generated flow separation and reattachment. In this paper archival benchmark smooth body flow separation experiments are described that will be used for model development. These include: (1) attached smooth body APG turbulent boundary layer (TBL) flow, (2) APG TBL flow with incipient separation, (3) APG TBL separation with a small-scale separation bubble and (4) TBL separation with a large region of separated flow extending over a significant fraction of the smooth body surface. The model geometry is fully two-dimensional and consists of a flat TBL development plate followed by a large convex ramp surface with APG controlled by a fully adjustable flexible top tunnel ceiling. Experimental results characterizing the large-scale flow separation case are highlighted.

[1]NASA NNX15AU26A

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Date submitted: 01 Aug 2017 Electronic form version 1.4