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Validation Experiments for Turbulent Separated Flows over Axisymmetric Afterbodies SAMANTHA GILDERSLEEVE, CHRISTOPHER L. RUMSEY, NASA Langley Research Center — Historically, the flow physics involved with most turbulent separated flows have presented fundamental challenges in validation between experimental and numerical approaches. As recognized by the CFD Vision 2030 study commissioned by NASA, validation of RANS models and scale-resolving methods for turbulent flows requires the support of advanced, high-fidelity experiments designated specifically for CFD implementation. In accordance with this effort, a new test platform, referred to as the NASA Axisymmetric Afterbody, was designed to obtain detailed information in a flow with a smooth, adverse-pressure gradient induced separation. The parametric body offers a range of flow behaviors from fully attached, incipient separation, to fully separated flow at subsonic conditions. In an initial effort to validate CFD capabilities, surface pressure measurements and flow visualizations at Re=180,000 are compared against several RANS turbulence models to understand the separation behaviors and identify critical variability between the models. Results indicate potential discrepancies due to the effect of Reynolds number and physical tunnel blockage. Ongoing work will continue the experimental campaign to obtain off-body flow measurements using SPIV and LDV techniques to yield further insight.

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