Abstract Submitted
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Analysis of the effect of elasticity on Shock Turbulent Boundary Layer Interaction[1] JONATHAN HOY, IVAN BERMEJO-MORENO, University of Southern California — The effect of elasticity on the unsteady behavior of a shock-turbulent boundary layer interaction (STBLI) is investigated through the use of a coupled fluid structure interaction (FSI) solver which incorporates a wall-modeled large eddy simulation (WMLES) finite-volume flow solver, an undamped finite-element solid mechanics solver, and a mesh deformation solver based on a fictitious spring-system which calculates the change in flow domain mesh geometry as it is deformed by the solid domain. The FSI solver is validated through comparison to the experimental work of Willems et al (2016) and to the LES simulations of Pasquariello et al (2015). In these cases, a supersonic flow at Mach 3 is deflected downward by 20 degrees to create an oblique shock wave that impinges on the turbulent boundary layer developed over a flexible elastic panel (with a Reynolds number of 205,000 based on the boundary layer thickness upstream of the interaction). Parametric studies are then performed to investigate the impact of panel vibration on the STBLI and separation bubble dynamics, varying the panel natural frequencies and shock strength.

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