

Abstract Submitted
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A Numerical Study of the unstart event in a supersonic engine¹

IK JANG, RENE PECNIK, PARVIZ MOIN, Stanford University — The objective of this study is to assess the capability of an unsteady Reynolds averaged Navier-Stokes (URANS) method to predict the unstart phenomenon in a scramjet engine. Both started and unstarted Mach 5 flows in the inlet/isolator part of a scramjet engine were numerically investigated. The unstart event is initiated by raising a mechanical flap located at the downstream of the inlet/isolator, and the motion of the flap was simulated by an immersed boundary method. The simulation results were compared with a series of experiments (Wagner et al., AIAA paper, 2007, 2008, 2009) and a hybrid LES/RANS study (Boles et al., AIAA paper, 2009) performed on the same geometry and flow conditions. The critical angle of the flap to initiate the unstart event as well as the pressure distribution on the wall of the isolator in the started flow are in good agreement with the experiment and the simulation of Boles et al. On the other hand, the upstream moving shock speed is not well predicted and the cause of discrepancy is the subject of the ongoing study.

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