

SPACE PROPULSION SYMPOSIUM (C4)  
Poster Session (P)

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NUMERICAL STUDY ON DETONATION INITIATION BY SHOCK WAVE VIA OVER-EXPANSION  
IN A SUPERSONIC PREMIXED FLOW

**Abstract**

In this paper, detonation initiation by shock wave via over-expansion in a supersonic premixed flow is numerically investigated. The results confirm the possibility of this absolutely new method of detonation initiation in a supersonic flow, which is much simpler and less disturbing to the flow field than traditional methods, including initiation through a hot jet and through a wedge. Some involved problems in this method are also revealed, such as formation of aerodynamic wedge by boundary layer separation, dependence of overdriven degree of detonation on the back pressure, the characteristics of flow field behind the detonation wave, etc. To resolve these problems, the Spalart-Allmaras turbulence model and mesh adaptation module is applied in the CFD code. This work is very meaningful and instructive for experiments about detonation in supersonic wind tunnels and thus for future application of detonation wave engine in supersonic and hypersonic flights.