

SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic and Combined Cycle Propulsion (9)

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Prof. Xiaoqiang Fan

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INDUCED BY BACKPRESSURE**Abstract**

The unsteady combustion of the scramjet can usually produce high backpressure for the hypersonic inlet, which will make the inlet unstart. In order to investigate the unstart and restart process of the inlet induced by backpressure, a generic hypersonic inlet with downstream transvers jets was studied in a Mach 3 wind tunnel. The backpressure produced by combustion was simulated by downstream transvers jets. In the experiments, the transvers jets injected after the started flow of the inlet established, and the total pressure of the jets increased until the inlet unstated, then the total pressure of the jets decreased and the inlet restarted. The flowfield structure of the inlet-isolator in the unstart/restart process was recorded by time-accurate high speed schlieren system. Results showed the formation and disappearance mechanism of the massive separation at the entrance of unstated inlet. The experiments also found that there is a notable flowfield hysteresis in the unstart and restart process. These findings on the start of hypersonic inlet can provide more insight on inlet unstart/restart mechanism, prediction, and control.