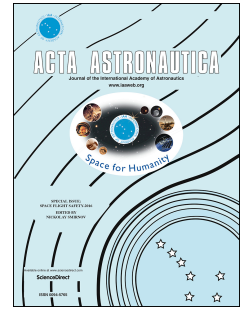


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Experimental study of near-blowoff characteristics in a cavity-based supersonic combustor

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**Experimental study of near-blowoff characteristics in a cavity-based supersonic combustor**

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Lean blowoff characteristics of an ethylene-fueled model scramjet combustor with cavity flameholder are investigated under the inflow conditions of  $Ma=2.52$  and  $T_0=1600$  K. It is observed that, lean blowoff limits increase with increasing injection distance and which for the single-orifice cases are found to be higher than those for the multiple-orifice cases. For the multiple-orifice cases studied, once the flame is ignited, it can always be stabilized by the cavity as long as the fuel supply is constant. For the single-orifice cases, however, the flame can be extinguished intermittently even if the fuel is served continuously. That is, the lean flames are more stable for the multiple-orifice cases. Near-blowoff dynamics are then analyzed for the less unstable single-orifice cases. When the lean blowoff limits are approached, the cavity flames become less and less stable and may be partially extinguished. Nevertheless, the residual flame within the cavity may reignite the combustible mixture outside the cavity and the entire flame may restabilize. When the equivalence ratio is further decreased, ultimate blowoff takes place and is found to occur in multiple steps - the shear-layer flame becomes weaker, the flame is partially extinguished near the trailing edge, the flame shrinks into the latter part of the cavity, the flame moves towards the cavity front wall and is subsequently extinguished completely.

**Keywords:** blowoff, cavity, supersonic, combustion

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