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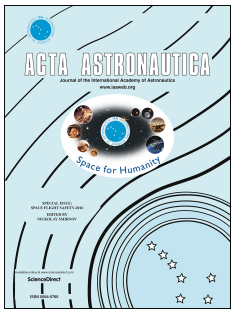

Investigation of flameholding characteristics in a kerosene-fueled scramjet combustor with tandem dual-cavity

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Investigation of Flameholding Characteristics in a Kerosene-fueled Scramjet Combustor with Tandem Dual-Cavity

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The flameholding characteristics in a kerosene-fueled scramjet combustor with a tandem dual-cavity were investigated experimentally under various inlet stagnation pressure conditions. Flame stabilization locations were judged by the pressure distributions and flame luminescence images. The results show that at lower and higher equivalence ratios, the flame was stabilized in the downstream and upstream cavities, respectively. While at intermediate range of equivalence ratio the flame was oscillating between the two cavities. The inlet stagnation pressure has a significant impact on the flameholding characteristics by affecting the relative pressure rise and the flame speed. The transition of flame stabilization location can occur in a higher local flow Mach number in the case of the higher inlet stagnation pressure.

1. Introduction

Interest in the flameholding of the supersonic combustor in scramjet has been persistent since 1950s and it became an active area of research around the world [1]. Compared with hydrogen fuel, liquid hydrocarbon fuel has a higher energy density and favorable handling characteristics [2]. However, their additional atomization, evaporation processes and longer ignition delay time [3] pose a significant challenge in flameholding due to the extremely short flow residence times. Hence, more attentions are given to the flameholding characteristic of hydrocarbon fuel in