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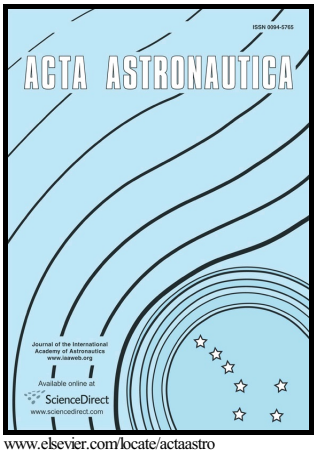

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Abstract: Sufficient mixing between the supersonic airstream and the injectant is critical for the design of scramjet engines. The information in the two-dimensional supersonic jet-to-crossflow flow field has been explored numerically and theoretically, and the numerical approach has been validated against the available experimental data in the open literature. The obtained results show that the extreme difference analysis approach can obtain deeper information than the variance analysis method, and the optimal strategy can be generated by the extreme difference analysis approach. The jet-to-crossflow pressure ratio is the most important influencing factor for the supersonic jet-to-crossflow flow field, following is the injection angle, and all the design variables have no remarkable impact on the separation length and the height of Mach disk in the range considered in the current study.

Keywords: Scramjet engine; mixing enhancement; transverse injection; optimization; supersonic flow

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