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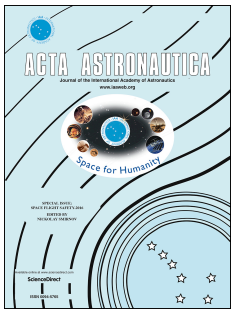

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Parameterization and Optimization for Shape-Transition Curved Isolator

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Abstract: In order to optimize total pressure recovery performance of a type of variable cross-section curved isolator, it is designed and parameterized by mathematical methods. Blending functions are utilized to morph cross-sections from entrance to exit and B-spline curves are used to control cross-section translation to meet offset requirement. Evolutionary algorithm (multi-island genetic algorithm) is introduced to search the optimum individual for the target of total pressure recovery coefficient based on numerical calculation results under no backpressure conditions. Firstly, to ensure accuracy and feasibility of the calculation method, it is validated by comparing with the wind tunnel experiment results. Then, the three typical curved isolators, including rectangular-to-circular isolator, circular isolator and rectangular isolator, are chosen to study. Finally, the optimized configuration performances are analyzed under both no backpressure and variable backpressure conditions. The result shows that the performances of optimal isolators are well in both states. In the no backpressure state, the extra total pressure loss is mainly determined by wetted area of the configuration when the offset line is optimized to minimize the total pressure loss. In the backpressure state, the separation mode switch induced by the changes of the backpressure condition is also observed in curved isolators. What's more, the withstanding

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