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QUASI-TWO-DIMENSIONAL EVALUATION AND OPTIMIZATION DESIGN FOR HYPERSONIC SCRAMJET PROPULSIVE FLOWPATH

Abstract

Quasi-two-dimensional method for the computation of the scramjet flow path is developed by introducing the variable specific heat method and one-dimensional method for complete combustion to the two-dimensional N-S equation. the influences to the scramjet performance by shock and boundary layer separation were handled by this method, in addition, the thrust and impulse as well as the parameters variations along the axis direction of the scramjet were given in a acceptable time. Validated by the computation of the reacting flow of NAL's dual mode scramjet model, the influences of the configuration of inlet, the location and means of the fuel injection, the expanding angles of the combustor are analyzed. Based on quasi-two-dimensional method, The single and Multi-objective optimization designs of 2D scramjet propulsive flowpath are carried out on cruise operation point by Genetic Algorithm(GA),and Multi-objective GAs. To the single objective optimization, the objective function is impulse. Then, to the multi-objective optimization, the objectives are impulse and heat flux. The single objective optimization reached the maximum impulse of flowpath, and according to the results of multi-objective optimization a Pareto front is got.