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RESEARCH ON THE HEATING EFFECTS OF THE MAIN ENGINE JET OF THE SUBORBITAL
VEHICLE

Abstract

Jet interaction with body flaps is an important problem that cannot be ignored in the design of suborbital vehicles, which would cause severe regional heating of the flaps and increase technical difficulty of thermal protection design. In this paper the high temperature jet interaction with the body flaps has been studied in a combustion gas flow wind tunnel experiment, and jet heating characteristics of direct acting and secondary interference are obtained and analyzed. Then according to both of the wind tunnel experiment and flight conditions, numerical simulations on the complex jet interaction flow field are carried using a multi-species frozen model which is verified by the experiment data. Furthermore, correlation analyses of heat flux and flow field characteristics both for the jet direct acting and secondary interference are performed, by which the jet heating main controlling factors and correlations are obtained for two different interference types, which should be very effective to realize a fast and accurate jet heating prediction for a suborbital vehicle.