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OPTIMIZATION OF THE MULTIPLE PAYLOADS ADAPTER STRUCTURE CONFIGURATION

Abstract

Multiple payloads adapter configuration design includes iterative rounds and the technical indicators of the payloads may change with the demonstration progress. It is essential to process structure optimization to meet the stiffness design targets (eg. longitudinal and lateral natural frequency) in each round, considering the structure layout, weight limit, thermal control demands, etc. The kinetic equation of the adapter was deduced by the D'Alembert theory in this paper to find the solution directly linking the natural frequency and structural parameters by which structural optimization can be completed without involving the specified structure configuration of the adapter cabins. The objective function was built to minimize the total structural weight under the main restrains of the longitudinal and lateral natural frequency, while the cross-sectional areas and other geometries of each cabin were obtained as design variables. The algorithm based on the sensitivity analysis of the design variables was successfully employed to search the global function minimum. Several groups of initiative variables were randomly generated and the optimum results with small degree of deviation were achieved.