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# INTEGRATIVE OPTIMIZED DESIGN OF HIGHLY RELIABLE REPETITIVE FOLDING SPATIAL MECHANISM AND STRUCTURE

**Abstract**

The mechanism and structure of future space vehicles needs to be reusable, highly reliable and light to meet the complicated mechanical and thermal coupled circumstance of the space. The repetitive folding payload bay door structure and mechanism system of the space vehicle is integrative optimized designed using light, multi-functional load bearing and thermal protective material. The reliability of the product highly depends on the design and the load bearing capacity of the reusable locking system, sealing components' parametric property, therefore, the above factors need to be synthetically considered. Integrative optimized design of repetitive folding spatial mechanism, structure and seal parts is conducted using the international commercial integrative optimized design platform (ModelCenter). Based on the multidisciplinary analysis of payload bay door system, the parametric design model and strength property analysis model of the bay door are built; based on the operating process of spatial mechanism, the coupled rigid and flexible dynamic simulation model and integrated components model are built. The designing parameters of payload bay door system are selected by using Parametric Study method. This approach defines key parameters. The designing feasibility is explored by Design of Experiments method (DOE); payload bay door structure design, locking latches layout, seal component parameters are optimized, which improves the product properties and reliability index. The design and manufacture of repetitive folding payload bay door structure and mechanism system of the space vehicle is studied in this paper, which is preliminary work for research of space vehicles in the future.