SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

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ANALYSIS OF EFFECTIVENESS OF UTILIZATION STRATEGY FOR SPACE LAUNCH VEHICLE WITH REUSABLE FIRST STAGE IN TURNAROUND SERVICING PHASE

Abstract

In the process of space technologies operation their individual parameters may deviate from the rated values or some elements may fail. Therefore while operating the space technologies one should return them in the state when the desired output effect is guaranteed. In certain cases this problem can be solved by means of the advanced technical servicing efficient in terms of its content and frequency. The national and international experience of space technologies operation shows that the integrated solution of operational safety, reliability and economy problems is possible by means of a rational utilization of a complex of various strategies for technical condition control. The gained experience of space technologies operation is to be efficiently used for developing and operating the reusable space launch vehicle (RSLV) of the package configuration comprising the first stage reentry rocket vehicles, second stage expendable booster, and space nose section. The reentry rocket vehicle (RRV) is an unmanned reusable winged vehicle. After successful RRV mission completion and standard landing at a landing strip to prepare RSLV for a subsequent space mission necessitates the fulfillment of a number of technological operations for RRV technical condition recovery which are usually named the turnaround servicing. The RRV technical condition control during the turnaround servicing focuses on assurance of both failure-free and safe operation within the assigned timescale and efficient consumption of different resources for control purposes. So, provision of an efficient RRV turnaround servicing is a key factor determining the RSLV project realization having the set technical and economic characteristics. The given paper devoted to the analysis of efficiency of using the operation strategy of the SLV with a reusable first stage in the turnaround servicing phase presents: • The Strategy without a feedback (Rigid Strategy) based on fulfilling the preventive maintenance works in pre-assigned calendar time intervals or running times. • The Feedback Strategy (Flexible Strategy) based on monitoring the current state of an object; the control response is formed if it doesn't comply with the requirements to the object. • The Mixed Strategy combining the elements of various strategies. • Recommendations on preferable strategy identification.