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Ground-Based Preparatory Activities (11)
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RESEARCH ON FAST TEST METHOD OF SPACECRAFT FOR EMERGENCY LAUNCH MISSION

Abstract

Comprehensive testing is an important part of spacecraft pre-launching. This paper focuses on the research of rapid testing technology, in order to shorten the preparation period of emergency launching effectively. In this paper, a designing method of test unit based on the shortest response time of test instruction is proposed. This technology, refines the design of the time interval between instructions, reduces the test time occupancy of a single test unit effectively. A parallel automatic test technology for multiple test units is proposed, which can be raised by adding the number of tested units per unit time. The high system throughput, reduce the overall trial cycle. Meanwhile, a fast evaluation method of test results is designed through telemetry parameters full-cycle continuous automatic interpretation and real-time interpretation mechanism for critical events. The test evaluation result could be completed in time by using the mentioned method. The key of test unit designing method is building the shortest response time model of test instruction. The interval between instructions in test program design is arranged on the basis of the model. The acquisition of response time mainly considers two factors. One is to ensure that the response of spacecraft for the instructions can be observed in expected time. Secondly, to ensure safety, the launch of the current instruction will not affect the previous instruction. The parallel testing technology uses automatic scheduling mechanism to carry out parallel testing units. The method calculates each test unit and the parameters automatically, and executes all of them in parallel from the beginning. Based on the principle of decomposition of long waiting interval, the effect of granularity and test switching on task execution is considered comprehensively. To ensure test safety, test units are designed to be mutually exclusive to prevent interference with each other while testing units are designed to be mutually exclusive. The test instructions are constrained at a minimum interval to prevent sudden excitation at the same time. The fast test evaluation method distributes the result evaluation into the testing process. The key events are arranged into test cases to evaluate the implementation results of test cases in time. Meanwhile, the design of automatic interpretation criterion for telemetry data realizes real-time monitoring of data one by one throughout the whole testing period. It is proved that this method can effectively monitor the working status of spacecraft in real time. Through the development of evaluation report template, test evaluation report is generated at the first time of case completion to reduce the time of post-report writing. This paper takes a certain spacecraft as an example, using normal

test unit design method and test flow, 40 test units needs 60 hours. By adopting the fast test method, the units can be completed in 23 hours. The testing time shortens 62