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Failure Statistics Analysis of China's Spacecraft in Full-Life

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Abstract : The historical failures data of the spacecraft is very useful to improve the spacecraft design and the test philosophies and reduce the spacecraft flight risk. A study of spacecraft failures data was performed, which is the most comprehensive statistics of spacecrafts in China. 2593 on-orbit failures data and 1298 ground data that occurred on 150 spacecraft launched from 2000 to 2016 were identified and collected, which covered the navigation satellites, communication satellites, remote sensing deep space exploration manned spaceflight platforms. In this paper, the failures were analyzed to compare different spacecraft subsystem and estimate their impact on the mission, then the development of spacecraft in China was evaluated from design, software, workmanship, management, parts, and materials. Finally, the lessons learned from the past years show that electrical and mechanical failures are responsible for the largest parts, and the key solution to reduce in-orbit failures is improving design technology, enough redundancy, adequate space environment protection measures, and adequate ground testing.

Keywords : spacecraft anomalies, anomalies mechanism, failure cause, spacecraft testing
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