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SPACE STATION EMERGENCY PLANNING AND MANAGEMENT UNDER TYPICAL RESUPPLY FAILURES

**Abstract**

Human spaceflights are high-risk activities, which will inevitably lead to various faults and even accidents during the missions. This paper is to study countermeasure and adjustment methods of space station logistic support under the situation of typical resupply failures. According to the review of previous resupply failures and the evaluation of their impacts on the space station operations, the typical modes of LEO space station resupply are Multiple-Resupply-Spacecraft (MRS-mode) and Single-Resupply-Spacecraft (SRS-mode) respectively. MRS-mode is implemented in International Space Station (ISS) operations with multiple cargo spacecrafts from different countries. SRS-mode was implemented in Salyut and Mir spaceflights and will be the mode of operation in the future Chinese Space Station program, with a dedicated cargo spacecraft. This report focuses on the SRS-mode and analyzes the impact of typical resupply faults/failures on the operation, and proposes possible countermeasures and the operational scenario adjustment to mitigate operational impacts caused by resupply failures for SRS-mode space station operation. Moreover, taking the launch delay and launch failure of the cargo spaceship as an example, the impact of typical failures on the operation and the adjustment strategy of the planning scheme are simulated. Ultimately, we summarize what can be learned from the failures and how to reduce the negative impacts by addressing possible mitigation measures. The corresponding countermeasures include assuring sufficient critical on-orbit resources to bridge resupply gaps, putting forward the next launch time and adjusting the arrangement of on-orbit tasks according to resources on board. Furthermore, quality control should also be strengthened to ensure the success of the next launch mission. The results of this paper could be helpful for the relevant organization to organize and streamline their resupply logistics for the upcoming Chinese Space Station.