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PEOPLE'S REPUBLIC OF CHINA**

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**Design requirements for the mitigation of operational debris
from launch vehicles**

运载火箭操作性碎片减缓设计要求

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard is proposed and managed by the National Aerospace Technology and its Application Standardization Technical Committee (SAC/TC425). This standard was drafted. Beijing Aerospace Systems Engineering Research Institute. The main drafters of this standard. Feng Yiwei, Chen Sijia, Lu Kai, Song Yuping, He Wei, Jiang Wei, Yu Yu, Zhang Tao, Xu Qian, Zhang Ran, Lu Songtao, Xie Wei.

During the launching of the launch vehicle and subsequent flight, it is necessary to pass the spacecraft separation and the final passivation process, which may generate spacecraft and air The environment is contaminated with gas or space debris, where separation and passivation actions are important sources of operational debris. As one of the first member

states to join the International Interagency Space Debris Coordination Committee (IADC), China opened in the 1990s. Conducted research on space debris, through the overall technical research of the launch vehicle, the study of the final active off-track technology, the passivation of the launch vehicle equipment, and the Research on slice control technology and mitigation engineering implementation of operational debris, breaking through relevant key technologies and verifying them in launch vehicles. Successful application, rich experience in development and engineering application for the design of the mitigation of operational debris of the launch vehicle, the active model carrier rocket will be Operational debris control and post-mission passivation operations are incorporated into the task flow. This standard will be applied to the separation of spacecraft, the final passivation of the launch vehicle, the final stage of the launch vehicle, and the self-destruction device of the launch vehicle. Research on the mitigation design of operational debris, through in-depth theoretical analysis and necessary ground testing, may be applicable to spacecraft during work. Design work for all aspects of pollution, or possible operational debris, provides effective guidance. The establishment of design requirements will enable The operational debris mitigation design after the rocket is put into orbit becomes standardized and orderly, which makes the serialization of the product possible, thus setting up the separation scheme. Design guidelines for the design of the final stage passivation scheme for the launch vehicle, and guide the design of the mitigation of operational debris for the launch vehicle. Launch vehicle operational debris mitigation design requirements

1 Scope

China's national design requirements for reducing the operational debris produced by launch vehicles. It specifies the terms and definitions, the design principles and the design requirements. Operational debris is the material a launch releases deliberately in the course of working: separation bolts, spring plungers, payload adapters, fairing liners, lens covers and the upper stage itself. Unlike debris from a collision or an explosion it is entirely predictable, which makes it the easiest kind to prevent - and it is prevented at the drawing board or not at all. The requirements follow from that: capture what would otherwise be released, use mechanisms that retain their fragments, avoid coatings and insulation that shed, and passivate the spent stage by venting its propellant and discharging its batteries so that it cannot explode years later. China launches a large share of the world's missions, so its design rules on this are consequential for everyone in orbit.

This standard specifies the design principles, design requirements, verification items and requirements for operational debris mitigation techniques for launch vehicles (or higher). And debris mitigation performance assessment. This standard applies to the design of operational debris mitigation in the entire operation of the launch vehicle from orbit to derailment.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article. Pieces. For undated references, the latest edition (including all amendments) applies to this document. Design requirements for

GB/T 32295 launch vehicle residual propellant emissions

GB/T 32455 carrier rocket terminology

GB/T 34513 Space debris mitigation requirements

3 Terms and definitions

The following terms and definitions as defined in GB/T 32455 and GB/T 34513 apply to this document.

3.1 Carrier rocket operational debris operational debris of launch vehicle The entire normal life of the launch vehicle from orbit to the on-orbit, depending on the specific technical conditions and design requirements, may or may be Objects that are released and released into the orbit, but do not include accidentally generated debris.

Note 1. Operational debris does not include combustion products of solid engines.

Note 2. Such as adapters, connectors, protective devices and/or other components.

3.2 Separation system Accept the separation command issued by the control system, complete the specified separation action according to the separation timing, and realize the predetermined separation of a separation event. A general term for the functions and required mechanisms, structures, and devices.

3.3 Connection unlocking device combination and unlocking device The device for maintaining and releasing the structure and electrical system connection constraints between the two separated bodies is realized before and after the separation command is issued.

3.4 Separation impulse device separation impulse device A means for providing the energy required for the separation to achieve the relative relative separation speed of the two centroids relative velocity.

3.5 Passivation passivation By performing actions, measures to eliminate or release energy stored in the final stage of the orbital launch vehicle that may cause the explosion to disintegrate.

Note. including depletion or emptying of the remaining propellant and high pressure gas in the final stage or upper stage of the launch vehicle, eliminating the charge in the battery and the safety of the pyrotechnics Processing and so on.