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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Estimating methods for the mass of remaining spacecraft
propellant**

航天器剩余推进剂质量的估算方法

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4	Me Propellant remaining amount (final state of the event) kg
5	Mfe Burner remaining amount (event end state) kg
6	Mfi Residual fuel (initial state of the event) kg
7	Mi Propellant residual (initial state of the event) kg
8	Moe Oxidizer remaining (end of event) kg
13	Pen Engine inlet pressure Pa
14	Pge Cylinder Pressure (End of Event) Pa
15	Pfe Burner Tank Pressure (End of Event) Pa
16	Pfi Burner Tank Pressure (Initial Event) Pa
17	Pgi cylinder pressure (initial state of the event) Pa
18	Poe Oxidizer Tank Pressure (End of Event) Pa
19	Poi oxidant tank pressure (initial state of the event) Pa
20	Pte Propellant Tank Pressure (End of Event) Pa

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard proposed by China Aerospace Science and Technology Corporation. This standard by the National Aerospace Technology and Standardization Technical Committee (SAC/TC425) centralized. This standard was drafted by Beijing Institute of Control Engineering. The main drafters of this standard. Song Tao, Wei Yanming, Liang Junqiang, Li Yong, Sun Shisheng, Geng Yongbing, Ding Fenglin, Li Ze, Lin Zhen, Gao Jun, Yin Wenjuan, Zhang Lan.

The remaining propellant quality determines the spacecraft's ability to work sustainably. For the return spacecraft, the remaining propellant mass is flight The spacecraft returns an important criterion before the implementation of the operation; for low-orbit spacecraft, the remaining propellant mass determines the spacecraft's subsequent orbital plane The number of operational tasks can be implemented; for high-orbit spacecraft, the remaining propellant quality determines the spacecraft orbital working life and end of life The timing of derailment is of great significance for making full use of GEO orbit resources and reducing the generation of space debris. For the purpose of providing on-orbit service merit For spacecraft, the mass of remaining propellants determines the range of services that can be

provided. Therefore, the remaining propellant mass estimation is spacecraft As an important task of rail management, the estimation result is an important basis for the prediction of the remaining life of the spacecraft and the planning of subsequent tasks. The standard will be Estimating the remaining propellant mass of spacecraft plays a guiding role. Estimation method of spacecraft residual propellant mass

1 Scope

China's national standard for estimating how much propellant is left in a spacecraft. It specifies the estimation methods, how to choose between them and how to assess the accuracy of the estimate, and it applies to surface tension tanks holding liquid propellant, with other tank types able to refer to it. Nobody can look in the tank. In weightlessness there is no surface to gauge and no bottom for the liquid to settle to: a surface tension tank holds its propellant against a sponge-like vane structure by capillary action alone, which is what makes it possible to feed an engine at all, and also what makes the contents impossible to measure directly. So the remaining mass is inferred - by book-keeping every burn since launch, by the pressure and temperature of the pressurant gas, or by the change in the spacecraft's response to a known thrust. Each method drifts in its own way, and the error grows through the mission. The answer matters because it sets the end of life: a spacecraft must keep enough propellant to reach its disposal orbit, and a wrong estimate either wastes years of service or strands it.

This standard specifies the spacecraft remaining propellant quality estimation method, estimation method selection and estimation accuracy assessment. This standard applies to spacecraft surface tension tank residual liquid propellant quality estimates, the use of other types of tank or propellant Spacecraft can refer to use.

2 Symbol

The symbols listed in Table 1 apply to this document. Table 1 symbol No. Symbol Name Unit
1 a (measured by the accelerometer) acceleration m/s²

2 Is Orbit controlled engine specific impulse m/s 3 K Propellant mixing ratio -

8 Moe Oxidizer remaining (end of event) kg

9 Moi Oxidant remaining (initial state of the event) kg 10 mi Total spacecraft mass (initial state of the event) kg 11 n Number of cylinders - 12 nen Number of engines in operation -

20 Pte Propellant Tank Pressure (End of Event) Pa

21 Pti Propellant Tank Pressure (Initial Condition) Pa