

## 基于非概率模型的星载天线展开机构可靠性分析

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**摘要** 对某周边桁架式大型星载天线的展开运动机理进行了研究,建立了展开机构的力学分析和非概率运动可靠性的分析模型.综合考虑尺寸误差和太空环境因素的影响,将运动功能函数视为区间变量函数,利用优化算法推导出非概率可靠性计算公式.对机构在整个展开过程中的运动可靠性进行预测,并将运动功能函数中的变量视为正态分布的概率模型下的可靠度相比较.概率可靠性指标约为非概率可靠性指标的3倍,两者的变化趋势相同,而且与试验过程比较吻合.

**关键词** [星载天线](#) [周边桁架](#) [展开机构](#) [非概率可靠性](#)

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## Reliability analysis of the deployment mechanism of a large satellite antenna based on the non-probabilistic model

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### Abstract

The deployment principium of a large hoop-truss satellite antenna is studied and the mechanical analysis model and the non-probabilistic reliability model of its deployment mechanism are presented. Synthetically considering the effect of dimension errors and the space environment factors, we treat the mechanism movement as a function of some interval variables, and derive the reliability formula by using optimization. The movement reliability of the mechanism of a large satellite antenna in the whole spreading process is predicted, and the result is compared with that based on the probabilistic model, in which all variables in the movement function are seen as normal distributed random variables. The probabilistic reliability specification is about three times larger than the non-probabilistic one, and the trends of their variation are alike. Both of them agree well with the experiment, which shows that the method of this paper is reasonable and practical.

**Key words** [satellite antenna](#) [hoop truss](#) [deployment mechanism](#) [non-probabilistic reliability](#)

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