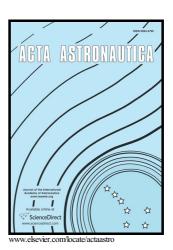
Author's Accepted Manuscript

Design of a cusped field thruster for drag-free flight

H. Liu, P.B. Chen, Q.Q. Sun, P. Hu, Y.C. Meng, W. Mao, D.R. Yu



PII: S0094-5765(15)30184-3

DOI: http://dx.doi.org/10.1016/j.actaastro.2016.04.009

Reference: AA5776

To appear in: Acta Astronautica

Received date: 28 October 2015 Accepted date: 7 April 2016

Cite this article as: H. Liu, P.B. Chen, Q.Q. Sun, P. Hu, Y.C. Meng, W. Mao and D.R. Yu, Design of a cusped field thruster for drag-free flight, *Acta Astronautica*, http://dx.doi.org/10.1016/j.actaastro.2016.04.009

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

ACCEPTED MANUSCRIPT

Design of a cusped field thruster for drag-free flight

H. Liu ^{a,*}, P. B. Chen ^a, Q. Q. Sun ^a, P. Hu ^a, Y. C. Meng ^a, W. Mao ^b, D. R. Yu ^a

^a Lab of Plasma Propulsion, Harbin Institute of Technology, Harbin 150001, China

^b Beijing Institute of Control Engineering, Beijing, China

Abstract

Drag-free flight has played a more and more important role in many space missions. The thrust

control system is the key unit to achieve drag-free flight by providing a precise compensation for

the disturbing force except gravity. The cusped field thruster has shown a significant potential to

be capable of the function due to its long life, high efficiency, and simplicity. This paper

demonstrates a cusped field thruster's feasibility in drag-free flight based on its instinctive

characteristics and describes a detailed design of a cusped field thruster made by Harbin Institute

of Technology (HIT). Furthermore, the performance test is conducted, which shows that the

cusped field thruster can achieve a continuously variable thrust from 1 to 20mN with a low noise

and high resolution below 650W, and the specific impulse can achieve 1800s under a thrust of

18mN and discharge voltage of 1000V. The thruster's overall performance indicates that the

cusped field thruster is quite capable of achieving drag-free flight. With the further optimization,

the cusped field thruster will exhibit a more extensive application value.

Keywords: cusped field thruster, drag-free flight, GOCE

1. Introduction

Many science missions, such as the test of equivalence principle, the detection of gravitational

waves and the measurement of gravity field of the earth, have shown an increasing demands for

low-disturbance environments^{1,2}, in which the residual perturbative acceleration is supposed to be

less than 10^{-10} m/s². Due to the disturbance of external environment, including the atmospheric

Corresponding author.

E-mail address: thruster@126.com

Download English Version:

https://daneshyari.com/en/article/8056047

Download Persian Version:

https://daneshyari.com/article/8056047

<u>Daneshyari.com</u>