

# Accepted Manuscript

Development of solid-gas equilibrium propulsion system for small spacecraft

Toshihiro Chujo, Osamu Mori, Yuki Kubo

PII: S0094-5765(17)30505-2

DOI: [10.1016/j.actaastro.2017.07.050](https://doi.org/10.1016/j.actaastro.2017.07.050)

Reference: AA 6419

To appear in: *Acta Astronautica*

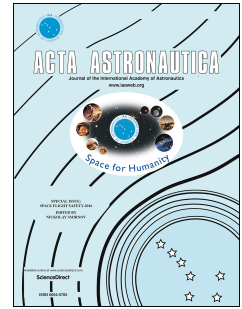
Received Date: 6 April 2017

Revised Date: 29 June 2017

Accepted Date: 31 July 2017

Please cite this article as: T. Chujo, O. Mori, Y. Kubo, Development of solid-gas equilibrium propulsion system for small spacecraft, *Acta Astronautica* (2017), doi: 10.1016/j.actaastro.2017.07.050.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final 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.



# Development of solid-gas equilibrium propulsion system for small spacecraft<sup>☆</sup>

Toshihiro Chujo<sup>1</sup>

*3-1-1, Yoshinodai, Chuo-ku, Sagamihara-shi, Kanagawa-ken 252-5210, Japan*

Osamu Mori<sup>2</sup>

*3-1-1, Yoshinodai, Chuo-ku, Sagamihara-shi, Kanagawa-ken 252-5210, Japan*

Yuki Kubo<sup>3</sup>

*3-1-1, Yoshinodai, Chuo-ku, Sagamihara-shi, Kanagawa-ken 252-5210, Japan*

---

## Abstract

A phase equilibrium propulsion system is a kind of cold gas jet, where phase equilibrium state of fuel is maintained in a tank, and its vapor is ejected when a valve is opened. One example is a gas-liquid equilibrium propulsion system that utilizes liquefied gas as fuel. It was mounted on the solar sail IKAROS and demonstrated on orbit. It is superior to high-pressure cold gas jet in higher storage efficiency and lighter configuration as the vapor pressure is comparatively lower, and suitable for small spacecraft. However, it requires a gas-liquid separation device to avoid leakage of the liquid and it makes the system complex. As another example of phase equilibrium propulsion systems, we introduce a solid-gas equilibrium propulsion system. It utilizes a sublimable substance as fuel and ejects its vapor. The vapor pressure is even lower, and it does not require such a separation device but only needs a filter to keep the solid inside the tank, and the system is much simpler and lighter. Thus it is more suitable

---

<sup>☆</sup>Submitted to Acta Astronautica 7 April 2017

*Email addresses:* `chujo.toshihiro@jaxa.jp` (Toshihiro Chujo), `mori.osamu@jaxa.jp` (Osamu Mori), `kubo.yuki@ac.jaxa.jp` (Yuki Kubo)

<sup>1</sup>Ph.D., Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency

<sup>2</sup>Ph.D., Assistant Professor, Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency

<sup>3</sup>Student, Department of Aeronautics and Astronautics, The University of Tokyo

Download English Version:

<https://daneshyari.com/en/article/5472104>

Download Persian Version:

<https://daneshyari.com/article/5472104>

[Daneshyari.com](https://daneshyari.com)