

# Accepted Manuscript

Partial admission effect on the performance and vibration of a supersonic impulse turbine

Hang Gi Lee, Ju Hyun Shin, Chang-Ho Choi, Eunhwan Jeong, Sejin Kwon



PII: S0094-5765(17)31202-X

DOI: [10.1016/j.actaastro.2018.01.025](https://doi.org/10.1016/j.actaastro.2018.01.025)

Reference: AA 6655

To appear in: *Acta Astronautica*

Received Date: 26 August 2017

Revised Date: 28 November 2017

Accepted Date: 12 January 2018

Please cite this article as: H.G. Lee, J.H. Shin, C.-H. Choi, E. Jeong, S. Kwon, Partial admission effect on the performance and vibration of a supersonic impulse turbine, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.01.025.

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.

## Partial Admission Effect on the Performance and Vibration of a Supersonic Impulse Turbine

Hang Gi Lee<sup>a,b\*</sup>, Ju Hyun Shin<sup>a</sup>, Chang-Ho Choi<sup>a</sup>, Eunhwan Jeong<sup>c</sup>, Sejin Kwon<sup>b</sup>

<sup>a</sup>*Turbopump Team, Korea Aerospace Research Institute,  
169-84 Gwahangno, Yuseong-gu, Daejeon 34133, Korea*

<sup>b</sup>*Department of Aerospace Engineering, KAIST,  
291 Daehak-ro, Yuseong-gu, Daejeon 34141, Korea*

<sup>c</sup>*Rocket Engine Team, Korea Aerospace Research Institute,  
169-84 Gwahangno, Yuseong-gu, Daejeon 34133, Korea*

### Abstract

This study experimentally investigates the effects of partial admission on the performance and vibration outcomes of a supersonic impulse turbine with circular nozzles.

The turbine of a turbopump for a gas-generator-type liquid rocket engine in the Korea Space Launch Vehicle-II is of the supersonic impulse type with the partial admission configuration for obtaining a high specific power.

Partial admission turbines with a low-flow-rate working gas exhibit benefits over turbines with full admission, such as loss reduction, ease of controllability of the turbine power output, and simple turbine configurations with separate starting sections. However, the radial force of the turbine rotor due to the partial admission causes an increase in turbine vibration.

Few experimental studies have previously been conducted regarding the partial admission effects on supersonic impulse turbines with circular nozzles.

In the present study, performance tests of supersonic impulse turbines with circular nozzles were conducted for various partial admission ratios using a turbine test facility with high-pressure air in order to investigate the resulting aerodynamic performance and vibration. Four types of turbines with partial admission ratios of 0.17, 0.42, 0.75 and 0.83 were tested.

Results show that the efficiencies at the design point increase linearly as the partial admission

Download English Version:

<https://daneshyari.com/en/article/8055629>

Download Persian Version:

<https://daneshyari.com/article/8055629>

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