

# Accepted Manuscript

Near fields of gasper jet flows with wedged nozzle in aircraft cabin environment

Zhanqi Tang, Xujia Cui, Yong Guo, Nan Jiang, Shen Dai, Junjie Liu



PII: S0360-1323(17)30400-6

DOI: [10.1016/j.buildenv.2017.08.047](https://doi.org/10.1016/j.buildenv.2017.08.047)

Reference: BAE 5072

To appear in: *Building and Environment*

Received Date: 19 May 2017

Revised Date: 6 August 2017

Accepted Date: 23 August 2017

Please cite this article as: Tang Z, Cui X, Guo Y, Jiang N, Dai S, Liu J, Near fields of gasper jet flows with wedged nozzle in aircraft cabin environment, *Building and Environment* (2017), doi: 10.1016/j.buildenv.2017.08.047.

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.

# Near fields of gasper jet flows with wedged nozzle in aircraft cabin environment

Zhanqi Tang<sup>a</sup>, Xujia Cui<sup>a</sup>, Yong Guo<sup>a</sup>, Nan Jiang<sup>a</sup>, Shen Dai<sup>b</sup>, Junjie Liu<sup>b</sup>

<sup>a</sup> *Department of Mechanics, Tianjin University, Tianjin 300372, China*

<sup>b</sup> *School of Environmental Science and Engineering, Tianjin University, Tianjin 300372, China*

---

## ABSTRACT

---

The geometry of the outlet nozzle has a direct effect on the near fields of turbulent jets. An attempt is made to modify the gasper jet nozzle by adding wedges of different sizes. The near fields of the wedged gasper jets are measured by a hot-wire anemometer. For the with-wedges cases, the mean velocity exhibits a more rapid decay in the axial direction, and the turbulent intensity is attenuated after the “second potential core.” The higher-order statistics, such as skewness and kurtosis, indicate no obvious difference in the downstream region. As the turbulent structures are formed, the energy spectra indicate that their average energy increases under the wedges’ perturbation. Then, the anti-axial-symmetry of the transition flows is observed in two characteristic planes. The mean velocity does not exhibit a significant difference between the two planes, but the turbulent intensity in the perturbed plane embodies the wedges’ influence. The wedged nozzle affects the energy intensity and diffusion angle of the turbulent structures in the perturbed plane, and the difference from the unperturbed plane is confirmed by the discrepancy spectra. Furthermore, the anti-axial-symmetry is characterized by turbulent intermittency and entrainment. The turbulent intermittency in the perturbed plane performs with a lower value in the near-nozzle region, and evolves into axial-symmetry in the further downstream region. For turbulent entrainment, the entrainment ratio manifests that wedged nozzle reduces the flow mass in the entrainment of ambient air in the downstream region.

*Keywords: Gasper jet flows, Nozzle wedges, Anti-axial-symmetry, Energy spectra, Turbulent intermittency, Turbulent entrainment.*

---

## 1. Introduction

An aircraft cabin is a confined-space, limited-ventilation, and high-occupant-density indoor environment. In the cabin environment, a gasper serves as adjustable personalized ventilation, and plays a significant role in influencing contaminant transmission and passengers’ thermal perception by feeding supplemental air [1-5].

Download English Version:

<https://daneshyari.com/en/article/6479218>

Download Persian Version:

<https://daneshyari.com/article/6479218>

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