Accepted Manuscript

Investigation of flame establishment and stabilization mechanism in a kerosene fueled supersonic combustor equipped with a thin strut

Junlong Zhang, Juntao Chang, Jicheng Ma, Chenlin Zhang, Wen Bao

PII: S1270-9638(17)31095-7
DOI: http://dx.doi.org/10.1016/j.ast.2017.08.005
Reference: AESCTE 4145

To appear in: *Aerospace Science and Technology*

Received date: 15 June 2017
Revised date: 25 July 2017
Accepted date: 7 August 2017

Please cite this article in press as: J. Zhang et al., Investigation of flame establishment and stabilization mechanism in a kerosene fueled supersonic combustor equipped with a thin strut, *Aerosp. Sci. Technol.* (2017), http://dx.doi.org/10.1016/j.ast.2017.08.005

Investigation of flame establishment and stabilization mechanism in a kerosene fueled supersonic combustor equipped with a thin strut

Junlong Zhang[1], Juntao Chang[2], Jicheng Ma[3], Chenlin Zhang[4], Wen Bao [5]
Harbin Institute of Technology, 150001 Heilongjiang, People's Republic of China

Abstract: The flame establishment and propagation processes in a supersonic combustor fueled by liquid kerosene at Mach 6 condition were observed by high speed photography. In this paper, a thin strut acted as the flame holder equipped in the center of the combustor. In the experiment condition, the Mach number in the inlet of the combustor is 2.8, with the stagnation state T_t=1680K, P_t=1.87MPa. The combustion establishment process and the flame characteristics in the supersonic combustor were well captured and reproduced by the high-speed camera, with the camera parameter of 5000 frames per second. Experimental results show that initial flame appears around the plasma jet torch in the recirculation zone at the tailing edge of the strut, and grows to form a steady flame in the center of main inflow. The attribute of the flame is partially premixed flame in the experimental conditions, and the flame could be divided into three main parts in accordance with the flame characteristics. By the analysis of the high speed images, different flame propagation patterns in the flame establishment processes are found in different equivalence ratios, the mechanism of which is explained in this paper.

Keyword: flame propagation; flame stabilization; supersonic combustor; strut flame holder;

1 PhD Candidate, School of Energy Science and Engineering, junlongzhang1990@163.com.

2 Professor, Academy of Fundamental and Interdisciplinary Sciences, changjuntao@hit.edu.cn.（Corresponding author）

3, PhD Candidate School of Energy Science and Engineering, 15B902032@hit.edu.cn.

4 PhD Candidate, School of Energy Science and Engineering,14B302007@hit.edu.cn.

5 Professor, School of Energy Science and Engineering; baowen@hit.edu.cn.