

Accepted Manuscript

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PII: S0094-5765(17)31775-7

DOI: [10.1016/j.actaastro.2017.12.045](https://doi.org/10.1016/j.actaastro.2017.12.045)

Reference: AA 6625

To appear in: *Acta Astronautica*

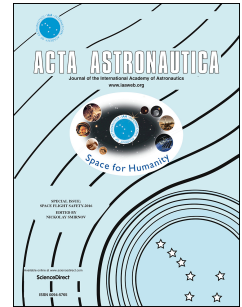
Received Date: 3 December 2017

Revised Date: 26 December 2017

Accepted Date: 29 December 2017

Please cite this article as: L. Yin, W. Liu, Gaseous film cooling investigation in a multi-element splash platelet injector, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2017.12.045.

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Gaseous Film cooling Investigation in a Multi-element Splash Platelet Injector

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Abstract: Film cooling is an effective technique that protects chamber walls in rocket combustion against chemical attacks and heat fluxes. This study discusses cooling effect in a multi-element GO_2/CH_4 splash platelet injector. Influence parameters, such as slot height, slot number, percentage of coolant, and injection position on cooling effect, were investigated. GCH_4 with 298.15 K was applied as film coolant. In the first step, slot heights of 0.2 and 0.4 millimeter were compared by applying a constant film mass flow rate. Temperature, CH_4 mole fraction distribution, and flow field structure were obtained. The effects of slot number, percentage of coolant, and injection position on wall temperature distribution were then determined. Finally, the reasons for the low cooling efficiency were analyzed. Improvement in the method is proposed to achieve improved cooling effect for splash platelet injectors.

Keywords: splash platelet injector; film cooling; GCH_4 ; wall temperature distribution; cooling effect

Nomenclature

ω	: angle in injector triangle (deg)	b	: slot width (mm)
E_r	: activation energy (J/kg mol)	N	: slot number
C	: arbitrary specification	k	: specific reaction rate coefficient
L^*	: characteristic length (mm)	$\nu_{j,i}$: stoichiometric coefficient
L_C	: combustion length (mm)	$H3$: thickness of the faceplate (mm)
c^*	: characteristic velocity (m/s)	$H2$: thickness of the middle plate (mm)
μ	: coefficients of viscosity (Pa s)	N_s	: total number of species

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