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# Experimental study of thermal-hydraulic characteristics of combustion chamber cooling channels with critical propulsion plant ribbing parameters

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*The article presents results of an experimental investigation studying thermal-hydraulic characteristics of combustion chamber cooling channels found in thermal propulsion plants characterised by a critically high ribbing level generated via deformational cutting technique. We show that these channels are operationally efficient when it comes to cooling high-temperature propulsion plant structures and provide reliable thermal shielding for said structures even in the case of film boil occurring in the coolant.*

**Keywords:** circular cooling channel, combustion chamber ribbing, deformational cutting, rotational flow, thermal-hydraulic characteristics.

## REFERENCES

- [1] Pelevin F.V., Ponomarev A.V., Semenov P.Yu. *Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroenie — Proceedings of Higher Educational Institutions. Machine Building*, 2015, no. 66, pp. 74–81.
- [2] Zubkov N.N. *Novosti teplosnabzheniya — Heat Supply News*, 2005, no. 4, pp. 51–53.
- [3] Zoubkov N.N. (RU), Ovtchinnikov A.I. (RU). *Method and apparatus producing a surface with alternating ridges and depressions*. Pat. 5775187 USA, Int. Cl. B23B 17/00, no. 545640, 1998.
- [4] Popov I.A., Shchelchikov A.V., Zubkov N.N., Ley R.A., Gortyshov Yu.F. *Izvestiya vysshikh uchebnykh zavedeniy. Aviatsionnaya tekhnika — Russian Aeronautics*, 2014, no. 4, pp. 49–53.
- [5] Pelevin F.V., Avraamov N.I., Orlin S.A., Sintsov A.L. *Inzhenernyy zhurnal: nauka i innovatsii — Engineering Journal: Science and Innovation*, 2013, no. 4. DOI: 10.18698/2308-6033-2013-4-698
- [6] Yagodnikov D.A., Antonov Yu.V., Vorozheeva O.A., Masalskiy N.L., Novikov A.O., Chertkov K.O. *Inzhenernyy vestnik — Engineering Bulletin*, 2014, no. 10. Available at: <http://engsi.ru/doc/739755.html>
- [7] Trusov B.G. *Inzhenernyy zhurnal: nauka i innovatsii — Engineering Journal: Science and Innovation*, 2012, no. 1, pp. 21. DOI: 10.18698/2308-6033-2012-1-31
- [8] Kudryavtsev V.M., ed. *Osnovy teorii i rascheta zhidkostnykh raketnykh dvigateley* [Foundations of liquid rocket engine theory and parameter calculation]. In 2 vols. Vol. 2. Moscow, Vysshaya Shkola Publ., 1993, 703 p.
- [9] Grigorev E.Z., Meylikhov I.S., ed. *Fizicheskie velichiny* [Physical quantities]. Moscow, Energoatomizdat Publ., 1991, 1000 p.

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