Investigating and experimentally determining the characteristics of thermal-hydraulic processes in the cooling channels of liquid rocket engine combustion chambers featuring an extremely high degree of ribbing

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Cooling system efficiency is one of the most important parameters affecting reliability of liquid rocket engines (LRE). Using ribbed cooling channels in LRE combustion chambers makes it possible to increase the area of the heat-releasing surface, increasing the cooling system efficiency. Employing additive manufacturing and the deformational cutting technique for producing LRE combustion chambers looks promising, since it may lead to maximising the heat-releasing surface area. The article considers a test installation developed to determine characteristics of thermal-hydraulic processes taking place in cooling channels of LRE combustion chambers featuring an extremely high degree of ribbing, manufactured with the help of additive technology and deformational cutting. We present the design of prototype working segments of a combustion chamber featuring an extremely ribbed cooling channel. We developed a system for recording thermal-hydraulic characteristics using high-accuracy digital transducers. We developed techniques for experimentally investigating the characteristics of thermal-hydraulic processes in cooling channels, computing heat transfer coefficients and friction loss in order to validate the possibility of using cooling channels featuring an extremely high degree of ribbing in LRE combustion chambers.

Keywords: *thermal-hydraulic characteristics, cooling channel, combustion chamber ribbing, additive manufacturing, deformational cutting*

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