SOME FEATURES OF TEMPERATURE FIELDS IN THE COMBUSTION CHAMBER OF A GAS TURBINE ENGINE

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Abstract: Based on the analysis of experimental data, periodic specific features of temperature fields at the outlet of the flame tube of the combustion chamber of a gas turbine engine have been revealed. It is shown that, contrary to expectations, the temperature fields in the central belt of the outlet cross section of the flame tube do not reflect the individuality of each burner device: the number of maxima and minima of the temperature field is twice less than the number of combustion chamber burners. Thus, it was found for the first time that at the outlet of the flame tube, there is a pairwise integration of temperature fields created by neighboring burners. It was found that the pairwise integration of the temperature fields of neighboring burners is not random: in different experiments, the temperature fields of the same burners are always combined. This indicates that the reason for such integration is some design feature of the combustion chamber. Based on the analysis performed, it is concluded that the cause of the pairwise integration of temperature fields are the racks located at the combustion chamber inlet but the nature of this effect remains unclear.

Keywords: gas turbine engine; combustion chamber; flame tube; temperature fields; combustion

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Figure Captions

Figure 1 Schematic diagram of the installation for testing the annular combustion chamber [15]: *1*–*10* — thermocouples; and arrow in (*b*) (view from the turbine side) — direction of rotation of the turret with thermocouple combs. The racks in the combustion chamber inlet diffuser are not shown in (*a*)

Figure 2 Schematic (sweep) of the combustion chamber inlet part: *1* — rack; *2* — flame tube mountings; and *3* — burner devices with swirl vanes

Figure 3 Average temperature fields from thermocouple data of the central (*a*), inner (*b*), and outer belts (*c*)

Figure 4 Fourier series coefficients for different modes of the central (*a*), inner (*b*), and outer belt temperature fields (*c*)

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