A PRELIMINARY STUDY OF THE DYNAMICS OF THE TRANSITION FROM A SUSTAINABLE MODE OF COMBUSTION TO A MODE OF FLAME FLASHBACK IN A MODEL LOW-EMISSION COMBUSTOR

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Abstract: According to the results of numerical modeling of combustion processes in the model low-emission MICAEDI ONERA combustor(channel with a backward facing step), the characteristics of premixed turbulent combustion of methane in air were analyzed by studying the temporal variation of the amplitude-frequency characteristics of pressure oscillations. Several combustion modes were considered, differing only in the level of throttling of the outlet section of the chamber, and, respectively, in the pressure level in the combustor. The unsteady three-dimensional turbulent flow was calculated using the LES WALE (large-eddy simulation wall-adapting local eddy viscosity) method, and the turbulent combustion was simulated using the Zimont model based on the differential equation for the progress variable (combustion efficiency). An analysis of the calculation results showed that the boundary between the stable and unstable combustion regimes is rather arbitrary, since the modes with strong oscillations of the flame front can be similar in spectral composition to those with a lower amplitude of oscillations.

Keywords: unstable regime; turbulent combustion; combustion chambers

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