NUMERICAL STUDY OF THE GAS FLOW IN THE NOZZLE AND A SUPERSONIC JET FOR DIFFERENT VALUES OF SPECIFIC HEATS

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On the basis numerical modeling the process has been investigated of the expiration of a supersonic jet from a flat nozzle for two ratios of specific heats and different parameters NPR. This parameters represents the ratio of the pressure at the nozzle inlet to the pressure in the environment. As a result the solid state grid model have been created for the numerical simulations of the flow of gas inside the nozzle and jet formation of compressed gas from the nozzle, which can be used to analyze the data structure.

The calculation have been carried out for values of specific heats Cp/Cv = 1.4 and Cp/Cv = 1.3, the value of the parameter NPR being 20, 15, 10, 5. When the parameter NPR = 20 there is a structure that is typical for regular reflection with the intersection point on the axis located at the exit of nozzle. When reducing to 10 NPR the structure resembling the regular reflection remains however it is shifted into the nozzle, the flow separation occurs. With further decrease of NPR to 5 the number of consecutive normal shock waves in the nozzle increases. Subsonic separating zones appear. This mode is preceded by the formation of Mach reflection. Note that for the same value of the parameter NPR, but at a smaller value of Cp/Cv intersection point shifts further away from the inlet section of the nozzle. The flow separation becomes substationally less.