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An investigation to control base pressure in suddenly expanded flows

(Article)

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Abstract

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In suddenly expanded flows , due to the abrupt expansion of the flow from a nozzle into an enlarged duct, the pressure reduces in the base region of the enlarged duct which increases the base drag. The techniques used to increase the base pressure are namely passive control technique and active control technique. In passive control technique the geometrical modifications are employed by providing splitter plates, ribs, cavities etc. while in active control technique the secondary control jets are provided in the base region of an enlarged duct to increase base pressure up to atmospheric pressure . The air blowing pressure from secondary control jets should be optimum. This paper presents the computational fluid dynamic (CFD) analysis to optimize blowing pressure ratio i.e. the ratio of inlet pressure of control jets to the atmospheric pressure , to increase base pressure up to atmospheric pressure in the base region of an enlarged duct. In the present study, CFD analysis was carried out for different air blowing pressure ratios to optimize it. Flow and geometry parameters considered for the analysis are Mach number, area ratio, nozzle pressure ratio and blowing pressure ratio. Mach numbers considered for analysis are 1.5, 2.0 and 2.5. Area ratios and nozzle pressure ratios considered for analysis are 2, 5 and 8. The CFD analysis is done for different combinations of Mach numbers, area ratios, and the nozzle pressure ratios by varying blowing pressure ratio from 2 to 8 in step of 1. Based on analysis results anyone can select optimum value of blowing pressure ratio at a given Mach number, area ratio and nozzle pressure ratio to increase base pressure nearly up to atmospheric pressurepressure. © 2018 Praise Worthy Prize S.r.l.-All rights reserved.

SciVal Topic Prominence

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