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Investigation of base pressure variations in internal and external suddenly expanded flows using CFD analysis

(Article)

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Abstract

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The Aerodynamic base drag because of negative pressure at the backward-facing step is a general obstacle connected with all the moving projectiles. The aerodynamic base drag is undesirable since its contribution to the cumulative drag is substantial. The study of pressure variations in the base region is of immense help for all moving projectiles. The experimental study of aerodynamic drag over missile/projectile in a wind tunnel has various disadvantages like a considerable amount of air supply is required to conduct the test, the support mechanism is required to hold the model in wind tunnel test section which creates disturbance in the flow field and introduce the errors in the measurements. In this research paper, the similarities of base pressure variations in internal and external flows are studied using computational fluid dynamics (CFD) analysis. The CFD analysis is carried out at Mach numbers from 0.1 to 3.0. From the results, it has been found that the flow field in the base region of internal and external suddenly expanded flows are nearly the same. The base pressure in external flow can be studied relatively easily by considering it as an internal flow for Mach numbers in the range of 0.1 to 0.4 and 1.4 to 3.0, except when the Mach number is close to unity.

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Base drag CFD External flow Internal flow

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