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**Base Pressure Control using Quarter Circle Rib in a Suddenly Expanded Duct at Screech Prone Mach Number M = 1.8**

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**Abstract**
Occurrence of sudden expansion is widespread in the defence and automobile industry. At the blunt base of the fuselage, missiles, projectiles and aircraft bombs, the flow gets separated at the base and forms low-pressure recirculation, leading to a significant increase in the base drag. This paper addresses how this low base pressure at the base can be controlled. In this study, quarter circle ribs are used as a control mechanism to regulate the base pressure in a suddenly expanded flow of area ratio 4.84, Mach M = 1.8 for nozzle pressure ratios (NPRs) ranging from 3 to 11 at various rib locations in the range from 11 mm, 22mm, 33 mm, 44 mm and 66mm for duct length ranging from L = 1D to 6D. Results show for 11 mm rib location and 1 mm rib radius, there is a declining trend in the base till nozzle pressure ratio of 6 and for further increases in the expansion level, there is a progressive increase in the base pressure ratio. The highest base pressure value is 2 for a 4 mm rib radius at the highest simulated nozzle pressure ratio. This trend continues for 22 mm rib locations. With a further shift in the rib location, there is a considerable increase in the base pressure ratio. These values are 2.5, 3 and 3.75 for rib locations at 33 mm, 44 mm and 66 mm for a rib radius of 4 mm at the highest level of under-expansion. It is seen that even though the effectiveness of the 1 mm rib radius was nil for all the rib locations except when the rib is located at 66 mm. When a quarter circle rib of radius 1 mm is used, there is a significant increase in the base pressure and base suction is nearly zero. This study is a technology demonstration and the database created from this study can be used to design aerospace vehicles. It will be beneficial at the initial design stage as a wind tunnel test is costly. 

**Author Keywords**
Base drag; L/D ratio; level of expansion; screech prone Mach number

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