Charasteristic of Supersonic Diffuser with Constant Circular Cross Section

Yuseok Lee(aimatgo@naver.com)[1], Hwanil Huh[2]

[1]Department of Aerospace Engineering, Graduate School of Chungnam National University, Daejeon, Republic of Korea, [2]Department of Aerospace Engineering, Chungnam National University, Daejeon, Republic of Korea

Abstract

Supersonic flow is generally a flow that exceeds Mach number 1. In supersonic flow, the difference between the total pressure and the static pressure becomes larger than the subsonic flow. This difference is a big obstacle to simulation of the supersonic environment. In order to simulate the supersonic environment, the static pressure of the supersonic jet must be made equal to that of the surrounding pressure to prevent the generation of shock waves in the test section. There is no significant difference between the total pressure and the static pressure in subsonic flow. For example, in a Mach 0.3 flow, the static pressure is 94% of the total pressure. On the other hand, in Mach 2 flow, the static pressure is 13% of the total pressure. Because of this reasons, very high total pressure are necessary and practically impossible to simulate supersonic conditions under normal atmospheric pressure environment. Therefore, it is necessary to lower the static pressure of the jet to lower the total pressure required to form the supersonic environment. This is what a supersonic diffuser does. Therefore, CFD is used to study the flow characteristics of the diffuser for a model in which the inner diameter of the supersonic diffuser is constant in a circle, based on the main variables presented by EP Neumann[1].

Keywords: *Supersonic flow, Recapturing, Diffuser*

References

[1] EP Neumann. High-efficiency supersonic diffusers, Journal of the Aeronautical Sciences, Vol. 18, No.6, 1951, pp. 369-374.

Biography

Yuseok Lee is currently a M.S. candidate student in Aerospace Engineering at the Chungnam National University in Daejeon, Republic of Korea. He is interested in supersonic/hypersonic flow.