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Numerical study of axisymmetric body with high angle of attack

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Axisymmetric bodies have numerous industrial applications and from a scientific perspective they can also be used to study many phenomena in the fluid dynamics including the separation phenomenon. Flow around a slender body like a cylindrical cone with high fineness ratio, asymmetrically separated at high angles of attack. The physical mechanism of this phenomenon is not entirely clear, but there are two theories to explain it: hydrodynamic instability of non-viscous symmetric separated vortices or separation and asymmetric re-attachment of flow. To achieve optimum flight performance, this phenomenon needs to be investigated. In this paper, a cylindrical cone at different angles of attack is investigate numerically.It is expected that by increasing angle of attack, vortices starts to become unstable and at an angle of about 30 degrees, vortices become asymmetric. For this study various methods were used, including asymmetric grid and adding small sidewash angle, and the phenomenon of asymmetric flow at angles of attack higher than 35 degrees was obtained. As in the results were observed the asymmetry phenomenon does not occur until an angle of 20 degrees and from angle of about 30 degrees, this phenomenon occurred. As the angle of attack increases, the asymmetry and consequently, the lateral force, increases.

Biography

Ghazal Hosseinzadeh is a PhD student of aerospace engineering in the field of aerodynamics at Amirkabir university of technology. She recieved her MSc in aerospace engineering from Amirkabir university of technology and Kamyar Mansour is professor at Amirkabir university of technology.

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