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VISUALIZATION OF SUPERSONIC FLOW OVER CYLINDERS WITH VARIOUS HEIGHTS

Abstract

Fine structures of supersonic flow over cylinders with various heights of 1mm, 2mm and 4mm were measured in a Ma=3.0 low-noise supersonic wind tunnel using Nanoparticle-based Planar Laser Scattering (NPLS) technique. The diameters of the cylinders are all 4mm, and the boundary layer ahead of the cylinder remains laminar state and is about 1.2mm in thickness. In the NPLS figure, expansion wave, three-dimensional bow detached shock wave, reattachment shock wave and separation region ahead of the cylinders are clearly visualized. By varying the height of the cylinders, the influence of the height on the wake flow was studied. Lower the cylinder is, closer the reattachment shock wave after the cylinder will be to the cylinder, and shorter the distance between reattachment shock wave and the detached shock wave will be. Moreover, vortices in the wake flow of the 1mm high cylinder are isolated and simple, while to the 4mm high cylinder are complex and mixed-up. Sweepbacks of the three-dimensional bow detached shock wave of cylinders of different heights almost remain unchanged. The height of the cylinder has a great impact on the wake flow and the lower cylinder has a relatively longer laminar section and transition section.