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Sting-free Unsteady Flowfield, Base Pressure and Force Measurements on Axisymmetric Bluff-Body HIROSHI HIGUCHI, Syracuse University, HIDEO SAWADA, HIROYUKI KATO, TETSUYA KUNIMASU, Japan Aerospace Exploration Agency — To avoid interference of model support, flowfields as well as aerodynamic force and base pressure on blunt short cylinders in axial flow were measured at Re=100,000 with the JAXA 60cm magnetic suspension and balance system. The fineness ratio ranged from 1.27 to 1.79. A digital telemeter system was developed for the base pressure measurement, and the velocity field was obtained using a PIV system. Vortices along separating shear layer and shear layer flappings with or without reattachment on the wall were observed. Downstream the cylinder in the azimuthal plane, PIV snapshots showed large-scale motion of longitudinal vortices. These instantaneous flowfields presented excellent axisymmetry when they were ensemble-averaged. Mean base pressure agreed with the drag variation at different fineness ratios. The present magnetic suspension and balance system allowed evaluation of low frequency unsteady aerodynamic force vector from feedback current to the coils and the detected small model movement. Base pressure fluctuations were compared with the drag fluctuations and discussed in light of overall flowfield phenomena.

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