Abstract Submitted
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On the development of lift and drag in a rotating and translating cylinder[1] ANTONIO MARTIN-ALCANTARA, Universidad de Malaga (Spain), ENRIQUE SANMIGUEL-ROJAS, Universidad de Cordoba (Spain), RAMON FERNANDEZ-FERIA, Universidad de Malaga (Spain) — The two-dimensional flow around a rotating cylinder is investigated numerically using a vorticity forces formulation with the aim of analyzing the flow structures, and their evolutions, that contribute to the lift and drag forces on the cylinder. The Reynolds number, based on the cylinder diameter and steady free-stream speed, considered is $Re = 200$, while the non-dimensional rotation rate (ratio of the surface speed and free-stream speed) selected were $\alpha = 1$ and 3. For $\alpha = 1$ the wake behind the cylinder for the fully developed flow is oscillatory due to vortex shedding, and so are the lift and drag forces. For $\alpha = 3$ the fully developed flow is steady with constant (high) lift and (low) drag. Each of these cases is considered in two different transient problems, one with angular acceleration of the cylinder and constant speed, and the other one with translating acceleration of the cylinder and constant rotation. Special attention is paid to explaining the mechanisms of vortex shedding suppression for high rotation (when $\alpha = 3$) and its relation to the mechanisms by which the lift is enhanced and the drag is almost suppressed when the fully developed flow is reached.

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