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Portfolio

Twin Vortices behind a Flat Plate

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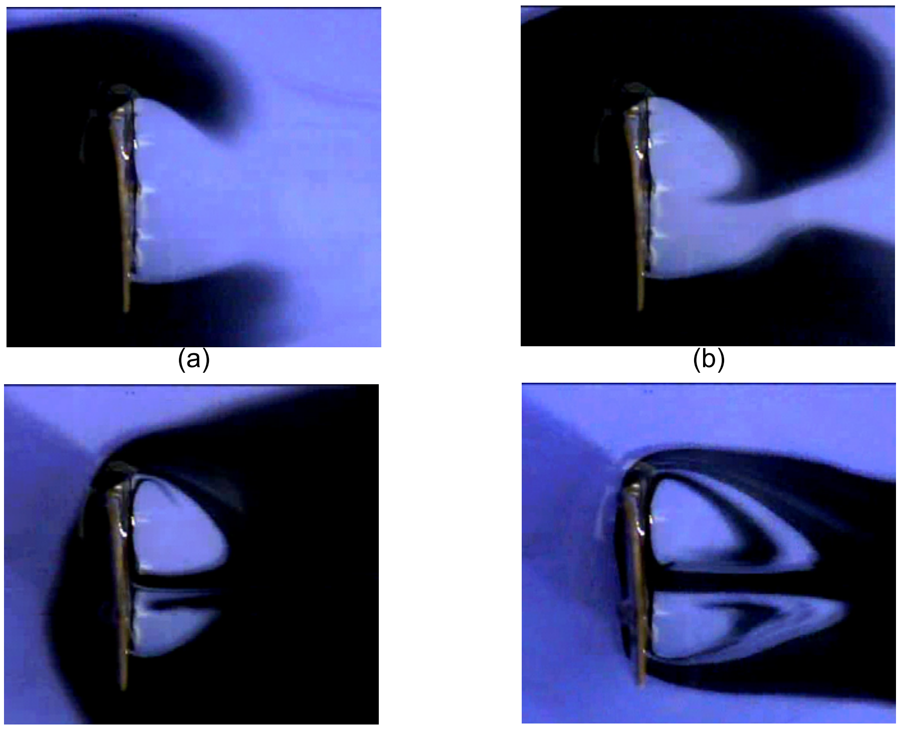

(a) (b) (c) (d)

Fig. 1. Twin vortices formation behind a flat plate kept normal to a water stream at Reynolds number 969 (based on plate width).

Water flow visualization with printing-ink was used to capture the evolution and formation of twin vortices behind a flat plate. Uniform flow of water in a rectangular channel was used as the test-section. Twin vortices behind a cylinder are captured at Reynolds number, Re, about 60-140, however for higher Re twin vortices are not formed any more (Ref. 1)*. This is because of the smooth contour of the geometry towards the base. In case of shapes without smooth contour towards base, it may be possible to position the twin vortices at a much higher Re. With this motivation, flow past a flat plate kept normal to the flow was visualized. Flow development was recorded on a video. Four stages of twin vortex formation (Fig. 1) were extracted from the video. The vortices form at Re as high as 969, which is large compared to that of flow over a cylinder. This may be because the sharp turning at the plate edge causes formation of large vortices (Ref. 2)**, leading a higher suction at the base region. This relatively higher suction (compared to a cylinder) makes it possible to hold the twin vortices up to a significantly larger Re.

References : * Houghton, E. L. and Carruthers, N. B., Aerodynamics for Engineering Students, 3rd Edition, (1982), Edward Arnold Ltd., Scotland.

** Lovaraju, P. and Rathakrishnan, E., Subsonic and Transonic Jet Control with Cross-wire, AIAA Journal, 44-11 (2006), 2700-2705.