Dynamic response of circular cylinders in cross-flow

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Abstract: This paper presents results of an experimental study conducted to evaluate the effects of an interfering stationary cylinder, located downstream, on the flow induced vibration of an upstream elastically mounted circular cylinder. The upstream cylinder was used with two different surface conditions; one relatively smooth and the other being rough. The interference effects were studied extensively by changing the diameter ratios (d/D) of the two cylinders and the gap spacing (g/D) between them. One additional free stream turbulence intensity level was used over chosen points to evaluate its influence over the interference effects. The single cylinder response was used as a reference to highlight the interference effects. Results indicate that the interference effect ceases for gap spacings g/D $\geq$ 3-4 and of $\geq$ 0.5-1.0 in the vortex-shedding and fluid elastic excitation regions, respectively; depending on the relative ratio d/D. A delay in the initiation of motion was noted over that of a single cylinder which has not been previously reported. A limiting turbulence was observed beyond which excessive vibration is induced.