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VIV of a Flexible Cylinder: Three-dimensional Response Reconstruction from Limited Localized Measurement Points BANAFSHEH SEYED-AGHAZADEH, YAHYA MODARRES-SADEGHI, University of Massachusetts, Amherst — Vortex-induced vibration (VIV) of a low mass ratio flexible cylinder ($m^*<1$), is studied experimentally. The flexible tension-dominated cylinder was held fixed at both ends and was immersed in the uniform incoming flow. Dynamic response of the system was studied in the reduced velocity range of $U^*= 2.9 – 14.5$ and the Reynolds number range of $Re = 315 – 1580$. Continuous response of the cylinder was reconstructed from limited number of measurement points based on modal expansion theorem modified using Modal Assurance Criterion (MAC). This reconstruction technique made it possible to properly reconstruct a continuous response along the length of the cylinder, even when the measurement points were localized in a small region of the cylinder. Mono- and multi-frequency excitation responses as well as transition from low mode numbers to higher ones were studied. Also, flow forces acting on the cylinder were calculated and they showed a consistent relation between the regions where the cylinder was being excited by the flow ($CLv>0$) and the counterclockwise figure-eight trajectories of oscillations in which the phase difference between the inline and crossflow directions were in the range of $\varphi xy=[0\ \pi]$.

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