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Experiments on a rectangular cylinder in flutter ZACHARY TAYLOR, Faculty of Engineering, University of Western Ontario, GREGORY KOPP, ROI GURKA — The flow mechanisms for the flutter instability of suspended long span bridges are poorly understood. Currently, this disastrous phenomenon is avoided by performing wind tunnel testing on a typical section of the bridge. However, there remain gaps in knowledge between design, the case studies and the underlying fluid dynamic phenomena. To this end, an experimental program – including Particle Image Velocimetry (PIV) - has been carried out in an open wind tunnel for a rectangular section model with a chord-to-thickness ratio of 7. The position of the model was measured in order to perform phase averaging of the flow field based on the model's oscillation. The presentation will focus on the role of the vortices. These vortices will be identified by proper orthogonal decomposition (POD) of the PIV data as well as by analysis of the two-dimensional velocity gradient tensor. Divergent response with increasing velocity is characteristic of flutter; thus it is expected that energy balances are essential in describing the phenomenon. A description of the kinetic energy and turbulent production terms will be presented as well as the estimation of the dissipation from the experimental data. Preliminary results have suggested that the turbulent kinetic energy production term is crucial in describing some of the flow mechanisms. The correlation between the turbulent production and the vortex formation will be addressed.

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