TRACK 2: UAV / AERODYNAMICS

"LINEAR STABILITY ANALYSIS ON THE EFFECT OF ROTATION ON THE SUPPRESSION OF VORTEX SHEDDING AROUND ONE OR TWO CYLINDERS"

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ABSTRACT

Vortex shedding around bluff bodies has been posing a great challenge for many engineering applications and many control measures have been suggested to suppress it. In this thesis, the effect of rotation on vortex shedding suppression for one and two cylinders will be investigated. The study will be conducted using linear stability analysis. For a single rotating cylinder, it is found that vortex shedding can be suppressed at non-dimensional rotation rates beyond 1.89 and 1.82 for flows of *Re*=200 and *Re*=100 respectively. Furthermore, the author proposed that vortex shedding can be suppressed when the non-dimensional rotation rate is beyond 2.1 for Reynolds numbers up to 9000. However, more computations have to be conducted for various Reynolds numbers to verify the author's proposal. For two rotating cylinders, the effects of rotation and gap spacing between the cylinders were investigated. The flow around the two cylinders were to be fixed at *Re*=100 and the gap spacing between them were varied with *g*=1,3 & 5. It was noticed that for static cylinders at *g*=1, the critical Reynolds number of first instability increases to 52. However, at *g*=3 and *g*=5, the critical Reynolds number of first instability for static cylinders remains the same as that of a single static cylinder (*Recr*≈47). When rotation is added to the two cylinders at *g*=1,3 & 5, the critical non-dimensional rotation rates were 1.29, 1.64 and 1.70 respectively, which were lower as compared to that of a single rotating cylinder with the same flow. Thus, when two cylinders are concerned, the gap spacing between the cylinders contributed to the effect of rotation on vortex shedding.

BIOGRAPHY OF SPEAKER

ME4 Tan Qi Zhi is an Air Force Engineer. He joined the RSAF in 2011 and worked on the maintenance of weapon systems on-board the RSAF's fleet of F-16. He graduated from Nanyang Technological University with a Bachelors of Engineering in Mechanical Engineering (1st Class Honours) and completed his Masters' degree from Imperial College London in Advanced Aeronautical Engineering (Distinction) under the SAF Overseas Master Sponsorship Programme.