**Assessment of hard disk Head Gimbal Assembly (HGA) aeroelastic stability**

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Hard disk drives play an integral part in today's computing hardware due to its superior cost per unit capacity when compared to other available storage media. The hard disk performance is normally measured in read/write speed and reliability and the demands for better performance are never ending. The head gimbal assembly (HGA) refers to the structural component of the data reading mechanism which hovers above the spinning media disc during operation. Higher data reading/writing rate requires the disc to spin faster which results in higher induced flow velocity above the disc surface and, consequently, larger unsteady aerodynamic forces on the HGA. These forces are unsteady as the HGA itself continuously rotates during the data seeking motion, hence the flow velocity it experiences is always changing. This research attempts to determine the HGA dynamics using unsteady flow aerodynamic model and a simplified 1-DOF structural model. The unsteady aerodynamic calculation is based on the Leishman-Beddoes dynamic stall model which makes use of superposition of indicial responses. Finally, the complete HGA aeroelastic system stability is assessed by determining its pitch angle when it is exposed to oncoming flow due to disc rotation. Two parameters are studied here namely, the disc RPM and the structural stiffness. Hopf bifurcation on bifurcation diagrams are used to determine the aeroelastic system stability boundary. The results show regions of parameters where the system is stable and this data is useful in the hard disk conceptual design stage. This calculation method is vastly more computationally economical than a full-scale CFD simulation, albeit with slight trade-off in accuracy. It can be further improved by including more features to the model such as ground effects, slider proximity to the disc, structural bending, and HGA motion.