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USING HARD DRIVE BASED REACTION WHEELS FOR ATTITUDE CONTROL ON THE TSAT5  
CUBESAT**Abstract**

Reaction wheels are a critical part of active attitude control for spacecraft, including CubeSats. There are several commercially available CubeSat-class reaction wheels. However, these critical components are often cost-prohibitive, especially those developed by educational institutions and student groups. Recent work has suggested that standard computer hard disk drives (HDDs) could be adapted into a low-cost commercial off the shelf (COTS) solution. By further developing these low-cost reaction wheels, spacecraft development costs can be reduced and space can be made more accessible. To this end, this paper details the development of such a HDD-based reaction wheel for the TSAT5 CubeSat.

TSAT5 is a 3U CubeSat under development by the University of Manitoba Space Applications and Technology Society (UMSATS): a student design group at the University of Manitoba dedicated to the development of 3U CubeSats to compete in the Canadian Satellite Design Challenge (CSDC). The primary payload for this spacecraft is an educational outreach themed Earth observation mission: allowing members of the general public to request real-time imaging of their target locations using innovative web and amateur radio based user interfaces. This payload requires active 2-axis control to fulfill its mission. However, like many other student design teams, commercially available CubeSat reaction wheels are not a viable option for this student group. To overcome this challenge, two custom reaction wheels, derived from HDD components, are under development. This paper presents the process of converting a HDD into an engineering model reaction wheel to fulfill the mission requirements of the TSAT5 spacecraft.