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PANEL-EMBEDDED REACTION WHEEL FOR SMALL SPACECRAFT

Abstract

With the satellite industry moving more towards smaller and smaller satellites each year, there is mounting pressure to accomplish more with less. Multi-function subsystems that blur the line between the traditional engineering disciplines have the potential to change the way we design space systems. One aspect of spacecraft systems design that could be improved upon is the spacecraft structure. Using advanced design and manufacturing tools, spacecraft structures could be used to house embedded sensors, antennas or even radiation shielding. By embedding equipment into the spacecraft structure, payload designers have more volume to work with, which will provide more opportunities for space science. This paper examines the feasibility of low-profile reaction wheels (RW) that could eventually be embedded into the composite core of a spacecraft structure. By using a fly-wheel as an integrated motor rotor, we created extremely low-profile RW housing without requiring the typical height for a standard motor. In addition to using a low-profile form factor enabling a panel-embedded mount, the RW employs a composite rotor will help in optimizing mass allocation, while simplifying rotor balancing. Compared with conventional reaction wheels, this new, low profile RW will reduce the cost and complexity of small satellite missions, thereby improving access to space.