

National Aeronautics and  
Space Administration



## TECHNOLOGY SOLUTION

### Mechanical and Fluid Systems

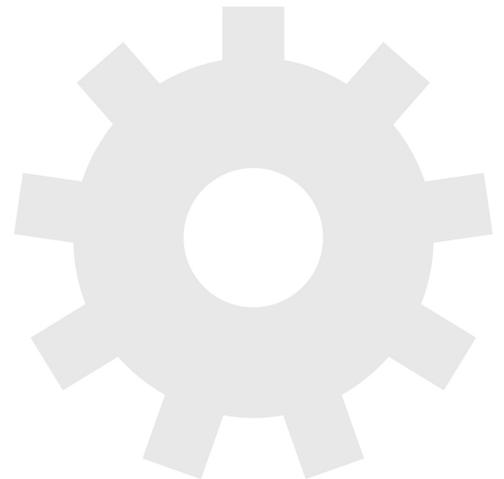
# Smallsat attitude control and energy storage

Reaction spheres for multi-axis attitude control and energy storage on small satellites

This NASA technology reduces the overall size and net power consumption of conventional three-axis attitude control systems by replacing reaction wheel ensembles with reaction spheres.

#### BENEFITS

- Infinite rotation degrees of freedom
- Smaller, more reliable, low friction losses



## THE TECHNOLOGY

Reaction spheres technology operate on a physics similar to reaction wheels, which by the conservation of angular momentum uses a rotating flywheel to spin a body in the opposite direction. Sphere systems that utilize magnetic torqueing rather than mechanical are also smaller, are more reliable, have low friction losses, and have improved lifetime performance. The proposed reaction sphere provides improved performance over traditional wheels and satisfies the push for component miniaturization, increased pointing accuracy, and power efficiency on CubeSats. Primary aims are to develop a low-friction method to contain a sphere in spaceflight and determine the feasibility of on-orbit momentum storage to supplement battery power. With appropriate placement of permanent magnets, the sphere systems can generate relatively equal value of momentum and torques for any spin axis. This sphere at any speed, produces more momentum than the wheels, resulting in faster attitude stability.

## APPLICATIONS

The technology has several potential applications:

- Transportation
- Generator manufacturing

## PUBLICATIONS

Patent No: 10053242

## More Information

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