# Attitude Determination & Control Subsystem Description

The Attitude Determination and Control (ADC) subsystem is responsible for determining the orientation and position of the spacecraft relative to the other spacecraft as well as issue commands to the Propulsion subsystem to execute orbital maneuvers.

Attitude determination can be accomplished using several methods. Sun and star trackers use external cameras to determine a spacecraft’s orientation based on the observed positions of the sun and or constellations. Gyroscopes and accelerometers can be used to determine the roll rates of a spacecraft. A GPS receiver can be used to determine the relative locations of the spacecraft in their orbits. Component selection will depend heavily on the volume, cost, and power constraints.

Similar to attitude determination, control over the spacecraft’s orientation can be accomplished through several methods, and which is ultimately selected depends on the volume, cost, and power constraints. Reaction wheels use the torque generated from a rotating mass to precisely align the spacecraft along the desired vector; but are mechanically complex, expensive, and power intensive to use. Magnetorquers use current running through coils of wire to interact with the Earth’s magnetic field, providing the force necessary to orient the spacecraft. However, the Earth’s magnetic field is not constant across its surface and also vary due to changes in solar output, introducing a degree of uncertainty into the process.