

Guidance, Navigation, and Control (GN&C)

The International Space Station is a large, free-flying vehicle. The attitude or orientation of the ISS with respect to Earth and the Sun must be controlled; this is important for maintaining thermal, power, and microgravity levels, as well as for communications.

The GN&C system tracks the Sun, communications and navigation satellites, and ground stations. Solar arrays, thermal radiators, and communications antennas aboard the ISS are pointed using the tracking information.

The preferred method of attitude control is the use of gyrodynes, Control Moment Gyroscopes (CMGs) mounted on the Z1 Truss segment. CMGs are 98-kilogram (220-pound) steel wheels that spin at 6,600 revolutions per minute (rpm). The high-rotation velocity and large mass allow a considerable amount of angular momentum to be stored. Each CMG has gimbals and can be repositioned to any attitude. As the CMG is repositioned, the resulting force causes the ISS to move. Using multiple CMGs permits the ISS to be moved to new positions or permits the attitude to be held constant. The advantages of this system are that it relies on electrical power generated by the solar arrays and that it provides smooth, continuously variable attitude control. CMGs are, however, limited in the amount of angular momentum they can provide and the rate at which they can move the Station. When CMGs can no longer provide the requisite energy, rocket engines are called upon.

