

Inertial Measurement Units

Encyclopedia Article

Inertial Measurement Units

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Inertial Measurement Units

Inertial Measurement Units provide inertial attitude and **velocity** data to a spacecraft's guidance, navigation, and control system. On the space shuttle, IMU data are used to convert steering commands into control surface, engine gimbal, and reaction control system thruster fire commands. Flight can be accomplished with just one IMU but the shuttle has three for redundancy.

Shuttle IMUs are located forward of the flight deck control and display panels. The inertial sensors each consist of two **gyroscopes**, each with two degrees of freedom. The gyroscopes are used to maintain the IMU's inertial orientation. Four resolvers in each IMU measure vehicle attitude. Two accelerometers in each IMU measure linear vehicle accelerations. IMUs are carefully calibrated prior to each shuttle flight, and on-orbit alignments using a star tracker are necessary to correct the effects of uncompensated gyro drift.

During ascent, the IMUs provide accelerometer and resolver data to the navigation software to determine attitude and display flight parameters. In orbit, the IMUs provide attitude and accelerometer data. On entry, IMU data again contribute to state vector determination—identifying the precise attitude and speed of travel of the orbiter.

See Also

Flight Control (Volume 3);; Guidance and Control Systems (Volume 3);; Gyroscopes (Volume 3).

Internet Resources

Kennedy Space Center: Science, Technology and Engineering.
<<http://science.ksc.nasa.gov> 03e;.