

Magnetometers for Payload Attitude Control

Objectives

To contribute to payload attitude control onboard sounding rockets, satellites or high-altitude balloons by providing accurate data on the Earth's magnetic field.

Instrumentation

- Mag-13MS70, Spacemag-Lite precision three-axis fluxgate magnetometer.

Application

Attitude control on board sounding rockets, high altitude research balloons or satellite.

Background

Sounding rockets and high-altitude balloons are used for sub-orbital scientific investigations such as aeronomy research and for studying interactions with charged particles in the upper atmosphere.

Each of these means of transport cover an altitude range, with satellites flying higher than sounding rockets, themselves higher than balloons. Though the associated costs are proportional to the altitude of flight.

Sounding rockets are also used in X-ray and ultraviolet astronomy. The Earth's atmosphere

blocks out most UV and X-ray radiation, so the instruments need to be at a high enough altitude to make observations.

Method

The average flight time of a sounding rocket is less than 30 minutes, making the measurement window very small. Therefore, it is important that the instruments are oriented correctly.

The magnetometer is used to sense the payload's attitude relative to the Earth's magnetic field, and relative angular displacement from the local magnetic field line. Data from the magnetometer is combined with data from horizon sensors, or solar/lunar sensors, and star trackers and inertial attitude sensors, to give absolute payload attitude information. This information is fed into the control systems, which can make small adjustments to the attitude, if required. To ensure that the readings from the magnetometer are accurate, the magnetic cleanliness of the other instruments¹ and the position of the sensor within the payload are carefully considered.

Reference

NASA Sounding Rocket Program Handbook, Sounding Rockets Program Office, Suborbital & Special Orbital Projects Directorate, 810-HB-SRP.

¹ See e.g. AN0031

