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MAGNETIC COILS FOR ATTITUDE OF CONTROL OF STUDSAT-2

**Abstract**

Attitude of a spacecraft is its orientation in space. Project STUDSAT-2 (STUDENT SATellite-2), India's first twin nano-satellite mission (STUDSAT-2A and STUDSAT-2B) aims to demonstrate inter-satellite Communication (link). The payload requires pointing accuracy of about 10. This is achieved by the actuator system. The determination of the attitude so that it can be controlled is done by the sensors. STUDSAT -2 uses Sun sensors, Gyro Sensors and Magnetometer readings in order to determine the current position of satellite. The actuator system of STUDSAT-2 includes three torquer coils and a 3-axis reaction wheel system with least internal disturbances. The coarse pointing of the payload is achieved by using the torque coils. After the satellite is released from the launch vehicle it will have angular velocity. To have controlled on the satellite attitude it is necessary to make its angular velocity to zero. After the attitude of satellite is determined using sun sensors and magnetometer, the actuator system comes into the picture. In the Project STUDSAT-2, the three torque coils are used which is placed on the three sides of the satellite to achieve the coarse pointing. The magnetic torquer coils have an air core around which the wires are wound in a loop in number of layers. These wires are supplied with a current and they generate a magnetic field around them which interacts with the geomagnetic field of the earth and generates a force which in return gives the satellite the desired orientation. The major advantage of using the torque coils are that the losses are less as the air cored is used. Also the mass distribution is uniform which makes it useful for producing the uniform torque in the desired direction. The basic principle behind the working of the torque coil is that it generates a magnetic moment depending upon the amount of current passed through it, and this magnetic moment at the presence of any external magnetic field gives the required torque for the orientation of the satellite. This torque will always be perpendicular to the Earth's magnetic field. The attitude control system cannot control all three axes at the same time. In the Project STUDSAT-2, three torque coils are used to control the three axes of the satellite by providing pointing accuracy upto 5 degrees.