Standardized Coarse Azimuth Pointing System

A functional and operating coarse-pointing system for any balloon-borne platform with a suspended payload less than 5,500 lbs.

The legacy rotator, currently used on balloon missions, is a standardized balloon flight subsystem that is mounted right above the payload, and it separates the rotation of the gondola from the balloon. The legacy rotator is about 124 lbs., was designed to support a maximum payload of 8,000 lbs., and was designed to withstand a 10G axial termination load factor. A majority of balloon payloads are no greater than 5,500 lbs., thus the legacy rotator is over designed for most balloon missions. Reduction of mass of the rotator is important. Depending on the balloon launch vehicle, a reduction of mass allows for more instrumentation to be added to the payload or for a longer flight duration. This would allow for more science data to be collected per balloon flight. There is a need for a designed coarse azimuth pointing system that was at least 25% lighter than the legacy rotator, that was capable of carrying a 5,500 lb. maximum suspended payload, and capable of withstanding a 10G axial termination load factor. The Standardized Coarse Azimuth Pointing System is 34% lighter than the legacy rotator, while meeting other requirements.
THE TECHNOLOGY

The Standardized Coarse Azimuth Pointing System is a system for any balloon-borne platform with a suspended payload that was less than 5,500 lbs. It separates the rotation of the gondola and the payload from the balloon. The rotator utilizes GPS and solar sensors for command orientation of the payload. There are solar sensors at the top of the rotator providing a 360-degree view. A guidance, navigation, and control system commands sensors to look at a specific point. For example, sensors can detect the position of the sun. The sensor command is sent through the avionics packages on board to start the motor and turn the shaft until the sensors send feedback that they are at the commanded position. The rotator holds the payload at that position until commanded otherwise. The rotator is designed to have a 5 arc-minute pointing capability, and it has demonstrated a 1.4 arc-minute accuracy. The motor runs on a 28V battery source. The system is designed to be operational in a thermal range of -80 degrees Celsius to +50 degrees Celsius. The system can also accommodate the option of integrating a slip ring with 20 separate channels for power, DSL link, and AART communications.

The Standardized Coarse Azimuth Pointing System features a hollow titanium shaft, 3-D printed solar sensor mounts, 3-D printed avionics package mounts, and a custom motor frame mount. The system also utilizes 3-D printed templates to standardize the assembly of both rotators, so that nonuniform match drilling is not a problem.

APPLICATIONS
The technology has several potential applications:
- High-altitude balloon systems
- Near space balloon systems

PUBLICATIONS
Patent Pending

More Information
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