Attitude and Orbit Control for China Lunar Satellite

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Abstract   China Lunar Satellite (CLS) will be sent into a circular orbit around the Moon to perform scientific investigations concerning the lunar environment and its characteristics. It shall be launched on a LM-3A platform and will have a mass of 2300 kg at separation. CLS will orbit the Moon on a 200 km polar orbit, which yields the possibility to obtain images of the whole lunar surface including pole area in a year.

The attitude and orbit control system (AOCS) design of the CLS spacecraft is proposed. The baseline is a 3-axis stabilized system during all the phases of the mission. Orbital maneuvers are achieved by a 490 N main engine. The attitude control actuators are reaction wheels, and thrusters. The attitude determination is performed through sensors, including gyros, sun sensors, star sensors and ultraviolet sensors.

The identified AOCS modes are: 1 Separation mode. After LM-3A releases the satellite will acquire its attitude, eventually stopping residual rotational movements. 2 Cruise mode (Safe mode). During GTO and Lunar Transfer Orbit phases, the satellite will point towards the Sun for power needs. Or when a mishap takes place, the satellite has to keep its attitude and gain as much power as possible from the Sun. 3 Engine firing mode. During every orbital maneuver the spacecraft fires its main engine and is controlled by on-off it appropriately. 4 Normal operation mode. During this phase CLS will accomplish most of its mission tasks, pointing the cameras towards the surface of the Moon, pointing the high gain antenna towards Earth in order to send/receive data and pointing the solar cells toward the Sun. 5 Orbit maintenance mode. In order to keep the lunar orbit within nominal boundaries, some firings will be required.