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No. 51 - Second Push-Broom Operations Phase

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Report for period 17 April to 14 May 2006

The completion of the thermal analysis being done as part of the preparation for the SMART-1 Moon impact gave the Flight Control Team a surprise. The expected increase of temperatures during May due to the Sun/Earth/Moon alignment was going to be higher than six months ago.

This especially affects the solar arrays at perilune when SMART-1 passes the subsolar point with the Sun on one side and the illumination by light reflected of the full Moon on the other, causing temperatures to rise above 105 °C. This would be close to the qualification limit of the solar arrays of 110 °C.

After several considerations including the trend analysis of the real time telemetry, it was decided not to take any risk and implement a 35° offset in the solar array orientation, enough to keep it within a reasonable range of temperatures. This was implemented on 9 May 2006 and proved to be successful, lowering the maximum reached temperature to around 85 °C instead of the 96 °C prior to the implementation of the offset.

Other SMART-1 operations have been nominal during this period which saw the start of the second push-broom observations phase.

Moon impact preparation:

- Flight Dynamics strategy is completed
- The Swedish Space Corporation Analysis is completed
- The Thermal analysis and simulations are completed
- The new procedures development, testing and validation are completed
- The SMART-1 Principal Investigator, Bernard Foing is finalizing the coordination of the SMART-1 Moon impact and observation campaign

The SMART-1 Ground Operations Automation System (GOAS) will be used operationally in the second half of May, which is a first for an ESA mission.

Future Activities

The future activities are focused on the following:

- Procedures development to raise the orbit by 90 km using the attitude thrusters in June/July
- Finalise documentation and release of the end of mission and Moon impact analysis
- Tone ranging test on SMART-1 with Chinese CLTC Kashi station and with ISRO
- Start using the SMART-1 Ground Operations Automation System (S1 GOAS)
- Preparation of papers for Spaceops and IAA in Valencia

Note: The second ranging test with the Chinese station Kashi is now confirmed for week 22.

Spacecraft Status

AOCS

The AOC subsystem has done well in the reporting period. The solar array off-pointing and the push-broom activities did not affect the overall performance of the AOCS.

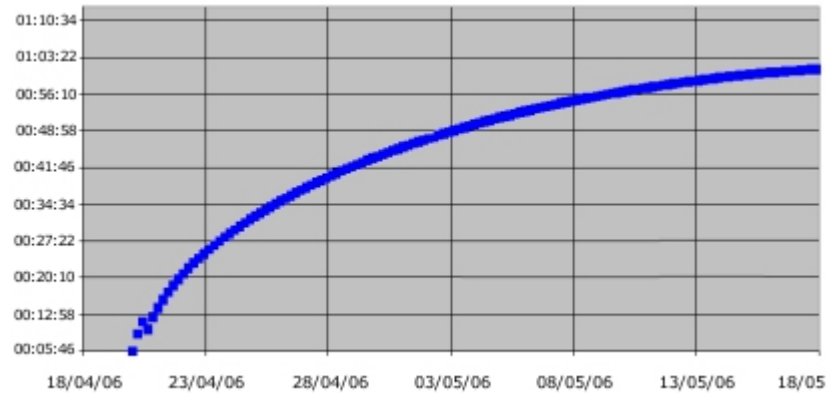
Electric Propulsion, Power and Thermal

Electric Propulsion

The Electric Propulsion has been off during the reporting period.

Power

The reporting period saw the start of an eclipse season. The evolution of the eclipse duration can be seen in the plot.



Eclipse duration in hh:mm:ss (total for Umbra and Penumbra)

During the reporting period the maximum eclipse occurred on 14 May and lasted just over one hour:

Time (UT) Event

22:02:53	SMART-1 enters Moon Penumbra
22:03:23	SMART-1 enters Moon Umbra
23:02:45	SMART-1 leaves Moon Umbra
23:03:26	SMART-1 leaves Moon Penumbra

The performance of the Power Subsystem was very good. As part of the routine analysis during the eclipse, a check of the battery cell capacity was done, showing that there is no degradation of the cells and that the performance is as expected, when compared with previous eclipses.

Thermal

The Thermal Subsystem has performed very well during the reporting period.

Orbital Information

SMART-1 OD432 Close to Apolune 2363
Epoch (UTC) 2006/05/15 09:50:25.0

Elements WRT Moon and its equator of date

Pericentre Distance (km)	2133.593201
Apocentre Distance (km)	4703.495591
Semi Major Axis (km)	3418.544396
Eccentricity	0.375877
Inclination (°)	90.852895
Ascending Node (°)	239.345651
Argument of Pericentre (°)	232.698778
True Anomaly (°)	180.000000
Osculating Orbital Period (h)	4.982153

The changes in four parameters since apolune 2329 are:

- semi-major axis -0.3 km
- perilune height -36.3 km
- apolune height +35.7 km
- orbital period -0.0 min

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