



European Space Agency

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## No. 53 - Ongoing Push-broom Operations

26 Jun 2006

### Report for Period 15 May to 18 June 2006

**The work during this reporting period has been focused on continuation of push-broom operations and the preparation of the manoeuvres as part of the SMART-1 operations during the last months of the mission until Moon impact. Pushbroom operations have continued during the entire reporting period. The last pushbroom pointing finished on 16 June.**

To ensure that the lunar impact will be observable from the Earth, SMART-1's orbit will be boosted, raising the perilune distance by ~90 km. This shifts the point of impact to the Moon's near side, where impact is planned to occur on 3 September 2006.

The manoeuvre strategy consists of a series of reaction-wheel off-loadings combined with about three hours of intermittent thrust centred at apolune during 74 orbits. The asymmetric firing of the attitude thrusters will produce a small velocity variation aligned with the flight direction that will change the orbit by an accumulative effect.

Moon impact preparation:

- Flight dynamics strategy is completed
- The Swedish Space Corporation analysis is completed
- The thermal analysis and simulations are completed
- Procedures validation and testing: completed
- Manoeuvres started on 19 June

The 35° solar array offset, implemented to reduce the array's overheating, was removed after passing the peak in the temperature evolution. The solar arrays were back to original mechanical offset angles on DoY 164 at 15:30:00UTC, resulting in an increase again in temperature of about 8 °C, but within the operational limits.

All SMART-1 subsystems are nominal and are expected to continue functioning properly until the Moon impact. There will be operational thermal constraints for both the platform (specially the startrackers) and the payload at low Moon altitudes. The first will be overcome controlling the attitude to maintain at least one star tracker operational all times. The payload instruments constraints at low altitudes will be controlled by the Science and Technology Operations Centre.

The Operations Automation system has been used operationally for the first time on DoY 138. Some anomalies have been observed which are being resolved prior to full operational use.

### Future Activities

The Next future activities are focused on the following:

- Carry out the perilune raising manoeuvres and resume science afterwards
- Preparation of papers for IAA in Valencia
- Preparation of mission termination and closure

### Spacecraft Status

The spacecraft status is good with all functions working nominally.

**AOCS**

The AOC subsystem has done well in the period covered by this report. The operational highlights during this period were:

- On 13 June 2006 at about 18:00 UTC ground has commanded the SAR to its nominal offset (of about 0°)
- Push-broom operations continued during the reporting period and they finished on 16 June at 01:26:45 UTC

**Electric Propulsion, Power and Thermal****Electric propulsion**

The electric propulsion subsystem has been off during the reporting period.

**Power**

The Power Subsystem has performed very well during the reporting period. As outlined in status report no. 51, an offset of 35° between the normal of the solar arrays and the Sun direction was implemented in order to reduce the temperature reached at the arrays during the period of expected maximal emitted and reflected fluxes from the Moon surface to the spacecraft. As a result of this offset a drop in solar array output current of about 3.4 Ampère was observed. The solar arrays were back to original mechanical offset angles on DoY 164 at 15:30:00UTC resulting in an increase again in the output current of about the same amount of 3.4 Ampère.

**Orbital Information**

SMART-1 OD442 Close to Apolune 2531  
Epoch (UTC) 2006/06/19 06:46:53.7

**Elements WRT Moon and its equator of date**

Pericentre Distance (km)	2016.081255
Apocentre Distance (km)	4821.253283
Semi Major Axis (km)	3418.667269
Eccentricity	0.410273
Inclination (°)	90.750620
Ascending Node (°)	239.417835
Argument of Pericentre (°)	226.261245
True Anomaly (°)	179.999997
Osculating Orbital Period (h)	4.982422

The changes in four parameters since apolune 2498 are:

- semi-major axis +0.3 km
- perilune height -11.1 km
- apolune height +11.7 km
- orbital period +0.0 min

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