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No. 42 - Ion Drive Restarted

25 Aug 2005

Report for Period 18 July to 14 August

Overall Status: After 5 months of Electric Propulsion pause, SMART-1's ion engine was nominally restarted as planned on 2 August. The EP power is being set to 1325W due to the Sun distance seasonal effect.

The critical point of 1.8 Kg of Xenon will be achieved during the first week of September when special procedures will be implemented. The tests done with the simulator have predicted a transition to under-regulated thrust at a remaining xenon level of 0.73 to 0.78 kg (depending upon temperature).

The EP operations are planned to last until mid September assuming simulator behaviour. The second half of September has been reserved for possible special operations in case the engine does not behave as expected.

Future Activities

- EP orbit re-boost operation in August and September
- Start work for next phase of ground automation activities
- SMART-1 Presentations in international conferences:

SMART-1 Operations	Fukuoka, Japan	17-21 October
Operationally Enhanced Electric Propulsion Performance on Electrically Propelled Spacecraft	Princeton,USA (TBC)	1 November
SMART-1 Lunar Mission: Operational experience with its Automatic Attitude and Orbit Control Subsystem and its relation with Electric Propulsion System	Loutraki, Greece	17-21 October
SMART-1 Lunar Mission: Startracker Operations Experience	Loutraki, Greece	17-21 October
SMART-1 Lunar Mission: Reducing Mission Operations Costs	Kyoto, Japan	11-13 October

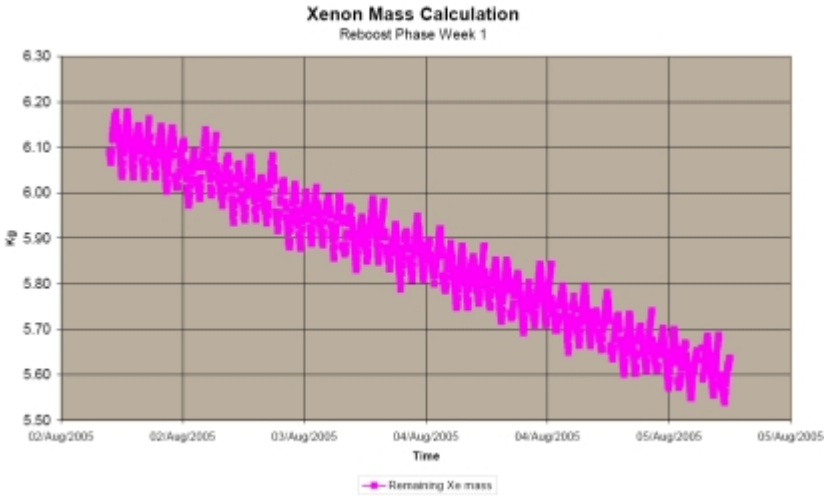
Spacecraft Status

AOCS
The AOC subsystem has done well in the period covered by this report.

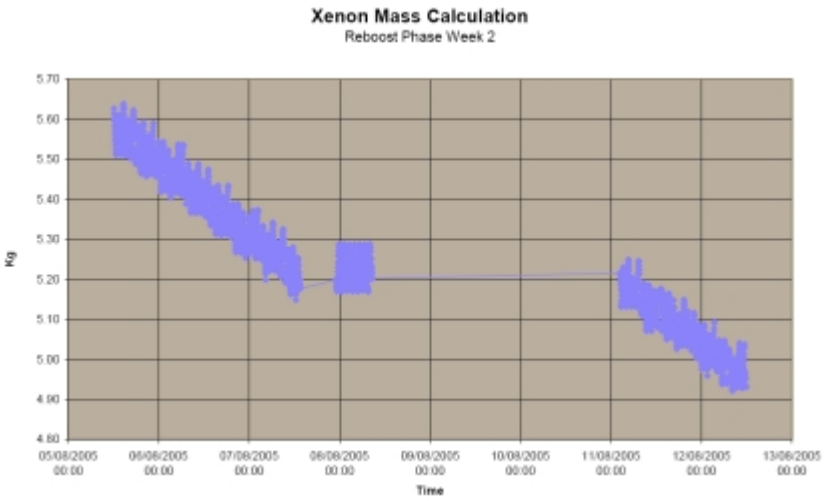
Electric Propulsion, Power and Thermal
The re-boost phase has started during the reporting period. EP, Power and Thermal subsystems were working well. Due to the season effect, the re-boost phase started close to the maximum spacecraft to Sun distance, it means, close to the point of lower solar array power generation.

EP activities have re-started on 2 August. The Flight Dynamic strategy consists in 2 pulses per orbit of 68 minutes each. During this period, the FlameOut Monitoring is only enabled approximately half of the pulse duration. It is switched on just 3 minutes after the expected regular thrust event and it is disabled 35 minutes before the expected end of the pulse. The reason of that is to avoid an automatic recovery action that could be executed after the power off commanded by Flight Dynamic.

The following plot corresponds to the called Re-boost Phase Week 1: 2 Aug 10:00:00 – 5 Aug 12:00:00.



The following plot corresponds to the called Re-boost Phase Week 2: 5 Aug 12:00:00 – 12 Aug 12:00:00). Note that due to problems in rerouting some data is missing. EP was off from Aug 8th until August 11th.



Orbital Information

Due to the firing of the ion engine the orbit of SMART-1 is constantly changing. Two snapshots are provided on 8 August and 15 August.

Orbit for 8 August

SMART-1 OD342 – Close to Apolune 1013

Epoch (UTC) 2005/08/08 07:23:02.8

Elements WRT Moon and its equator of date	
Pericentre Distance (km)	2163.053106
Apocentre Distance (km)	4650.306859
Semi Major Axis (km)	3406.679983
Eccentricity	0.365055
Inclination (°)	89.969852
Ascending Node (°)	237.563641
Argument of Pericentre (°)	252.925140
True Anomaly (°)	179.717592
Osculating Orbital Period (h)	4.956239

The changes since apolune 979 are as follows:

- Semi-major axis: +4.1 km
- Perilune height: -7.4 km
- Apolune height: +15.5 km
- Orbital period: +0.5 min

Orbit for 15 August

SMART-1 OD345 – Close to Apolune 1047
Epoch (UTC) 2005/08/15 08:09:23.2

Elements WRT Moon and its equator of date	
Pericentre Distance (km)	2147.667749
Apocentre Distance (km)	4675.530762
Semi Major Axis (km)	3411.599256
Eccentricity	0.370481
Inclination (°)	90.285959
Ascending Node (°)	237.610355
Argument of Pericentre (°)	259.553885
True Anomaly (°)	179.899028
Osculating Orbital Period (h)	4.966978

The changes since apolune 1013 are as follows:

- Semi-major axis: +4.9 km
- Perilune height: -15.4 km
- Apolune height: +25.2 km
- Orbital period: +0.6 min

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