



European Space Agency

ESA Science &amp; Technology

07-Jun-2005 13:03:49

## No. 35 - Final Lunar Orbit & Instrument Lunar Commissioning

14 Mar 2005

On 27 February, as planned, SMART-1 entered its final lunar orbit [full details below]. During the transfer trajectory the payload instruments had undergone a commissioning phase to enable observations of the Moon to take place. In order to maximise the results from lunar orbit it is, however, necessary to recalibrate the instruments. This consists of taking images and spectra of particularly well known targets and cross correlating observations between SIR, the IR spectrometer and AMIE, the camera. This procedure takes some time, as it is dependent on both the visibility of the target and the correct illumination conditions.

Unfortunately, on starting the calibration program, an anomaly occurred on board. On the night of 28 February the EP engine unexpectedly fired for about 11 hours. The cause was later traced to a recent change in the software and was subsequently corrected.

The consequence of this error is a delay in the completion of the instrument lunar commissioning of a couple of weeks. On 12 March, the ESOC Flight dynamics team commanded the spacecraft to perform an equivalent burn to compensate the unintentional one. By the start of April all the instruments should be tested and calibrated and ready to start collecting valuable science data.

### Orbital/Trajectory Information

The following osculating orbital elements have been recently determined by a tracking campaign.

2005/02/28 05:18:39.9

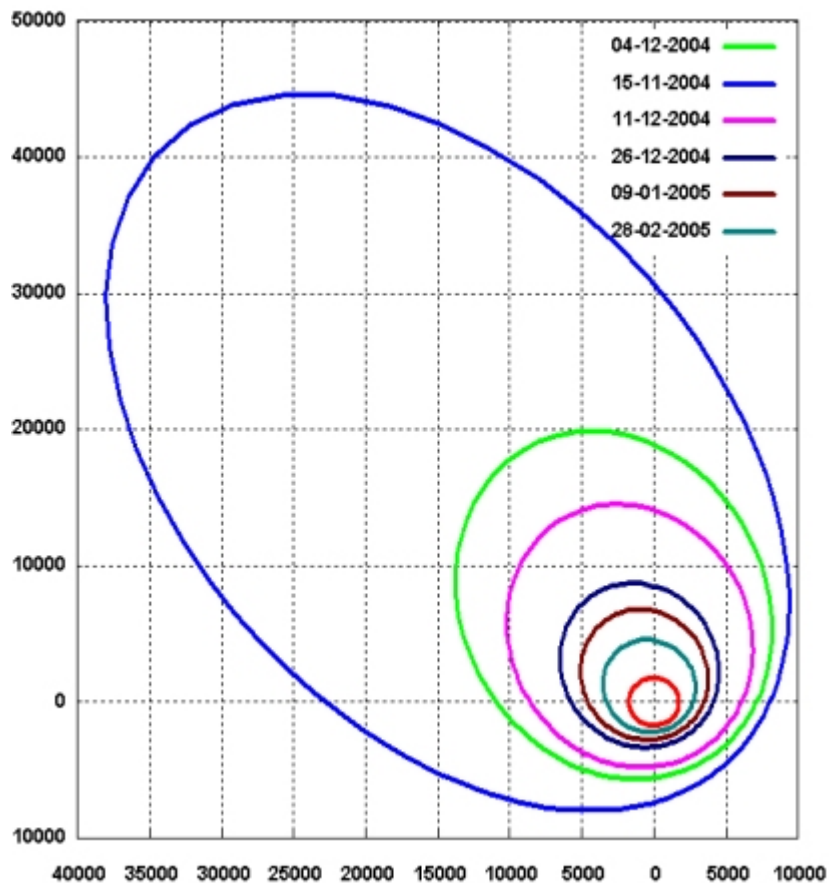
#### Elements WRT Moon and its equator of date

Pericentre Distance (km)	2208.658559
Apocentre Distance (km)	4618.220201
Semi Major Axis (km)	3413.439380
Eccentricity	0.352952
Inclination (deg)	90.063603
Asc. Node (deg)	236.458625
Arg. of Pericentre (deg)	286.175662
True Anomaly (deg)	180.000024
Osc. Orbital Period (h)	4.970998

The diagram below shows the SMART-1 osculating orbit at several dates during the spiralling in to the final operational orbit.

- The orbital period is now of slightly less than 5 hours and the inclination almost precisely 90 deg.
- This orbital period means the spacecraft maintains the same relative position with respect to the Earth ground station.
- The perilune of around 471 km and argument of 286 deg means the lowest altitude is in the Southern hemisphere at about 74 deg latitude.
- The apolune altitude is on the opposite side at around 2880 km.
- The orbital elements will vary during the operational period under the effect of the Earth gravity perturbations. The perilune will slowly decrease to about 300 km and the apolune will increase to about 3000 km, while the argument of perilune will swing around the south

pole giving the highest resolution coverage in the southern hemisphere.



SMART-1 osculating orbit up to 14 March 2005

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