Report to SSWG on Missions in Operations – 2 November 2009

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The most important event for the division was the approval of the extensions of SOHO, Cluster, Mars Express and Venus Express by the SPC at the extraordinary meeting on 2 October. This was really a boost to staff morale as most of the contractors and a number of staff has been depending on those missions. The extensions are in principle until end of 2012; however, the last two years are subject to successful Mission Extension Reviews in 2010 for each of the missions. Our current planning foresees these reviews to take place before the summer.

Otherwise all missions continued fairly smoothly with very few minor problems. The only exception – and this had been announced well in advance was
Ulysses: The mission was terminated on 30 June. The ESA Ulysses team at JPL will be dissolved by the end of the year and the close-out activities for the mission are under way. All mission documents will be scanned and archived; preparations to transfer the Ulysses science archive to ESAC have been initiated.

SOHO: The spacecraft status has been nominal, with the High Gain Antenna (HGA) Z-axis in a fixed position. On 12 July an Emergency Sun Reacquisition (ESR-25) was triggered by a false alarm of the Coarse Sun Pointing Attitude Anomaly Detection (CSPAAD) sensor (same cause as a previous ESR in December 2004). As part of the ESR recovery a roll, momentum management and (long) station keeping manoeuvre was performed on 12, 14 and 19 July, respectively. A regular (small) station keeping and momentum management manoeuvre was performed on 11 August, followed by a 180° roll manoeuvre on 13 August.
All SOHO instruments are nominal and science operations are progressing smoothly.
Following the closure of DSN's 26-m network, SOHO's High Gain Antenna (HGA) was successfully moved in double winding mode from -18.55° to -16.7° on the Z-axis.
A new SOHO Science Archive with improved search and visualization capabilities is now available at: http://ssa.esac.esa.int/ssa/ssa.jnlp. It was developed by the Science Archive Team at ESAC.

Cluster and Double Star: Cluster constellation phasing manoeuvres were performed during May 2009 to achieve the 1000 km separation in the auroral acceleration region. In July a further phasing manoeuvre was executed to form a "flat" tetrahedron in the tail of the Earth's magnetosphere with the spacecraft separated between 1000 km and 10000 km.
The flight control team at ESOC and the science operation team at JSOC have started to prepare the long eclipse season that started end September and will last until mid November 2009. The high power amplifier, used to transmit data to the ground, will be used in low power mode during eclipse season to be able to charge the batteries and warm-up the spacecraft between eclipses. Contact with Double Star TC2 spacecraft still could not be re-established. The Chinese operators will still try to contact the spacecraft up to end of the year. After that time, if TC2 spacecraft is not recovered, we expect that the end of mission will officially be declared. The archiving phase has been started and should continue into the coming years closely linked to the activities for Cluster. Work on the Cluster long term archive that will be housed at

ESAC will start in the near future, discussions between the team at ESTEC and the archive team at ESAC have been initiated.
The Cluster Active Archive (CAA) continues to distribute data to the user community. The CAA has currently 920 registered users and from June 09 to Sept 09, the averaged data download rate was 300 GB per month.

Mars Express: The Mars Express Science Working Team (SWT) has recommended a final orbit change to a so-called 88/25 resonance in March 2010, after one month on a 131/37 intermediate orbit to secure a dedicated Phobos observation campaign. The total fuel cost for these manoeuvres is estimated to be 0.7 kg. This fuel cost, equivalent to 2 to 3 years of routine operations, was deemed acceptable in regards of the estimated remaining amount of fuel of between 4 to 6 usable kg. In principle that will leave enough reserve to cover many years of routine operations.
The payload performance has been nominal. Support has been provided to Aspera to implement a software patch to further improve performance. Tests of the PFS internal mass memory have started in view of increasing the PFS data return without impact on the other instruments.
At the end of June, the X-Band chain of transponder #2 has been entirely re-commissioned for uplink and downlink, including cross-configurations between amplifier and transmitter never tested before. All tests and measurements showed perfect health state of the units that have been dormant for 6 years, and a performance similar to chain 1. In future the regular usage of both chains is envisaged in combination with on-board autonomy to be better prepared for a potential downlink chain failure.
The analysis of data obtained in a battery deep-discharge test (DDT, end-June 2009) confirmed the degradation of the batteries to be around 30% with respect to the initial performance; better than expected at this stage into the mission. Additional DDT will be performed before the next eclipse season to test whether a recently introduced new battery charging regime in between eclipse seasons will allow for some recovery of the battery capacity.
The planning of medium-term and short-term mission planning cycles is now smoothly and routinely performed by the MEX science operations team at ESAC.

Rosetta: Status and performance of the platform are nominal. The Rosetta spacecraft exited from the Near Sun Hibernation Mode on 8 Sep 2009. Immediately after that the activity of the Spacecraft Checkout 10 started. The spacecraft suffered a safe mode on 15 September due to an overload of the AOCS processor. The spacecraft was quickly fully recovered and performance is nominal. The problem was due to an undocumented constraint for operation of that unit.

The full payload complement has been operated during the tenth payload check-out that started at the end of September and lasted for several weeks. In general the payload status is very good and instruments are getting ready for the comet operation phase. Especially the Lander teams have made excellent progress. However, still several problems have been observed with instruments updating their SW or testing new operating modes, which will require more work and additional test periods. As there is only one more active check out period planned- the flyby of asteroid Lutetia will be on 10 July 2010 and shortly after we will start deep space hibernation preparation- time is getting short. These issues are being investigated by the PI teams and are closely monitored by the RMOC and RSOC teams.

The navigation campaign for the last Earth fly by of the mission that will occur 13 November has been successfully implemented. A small trajectory correction manoeuvre was successfully

performed on 22 October. Closely coordinated with this campaign two major spacecraft activities were performed.

The tests of the Pressure Regulators that have been described at earlier occasions were completed at ESTEC. Based on these results a risk assessment prepared by experts from TEC-Q for a potential re-pressurization of the fuel tanks of Rosetta This was presented at management level during a meeting on 10 September at ESTEC. A step by step test plan based on this assessment was reviewed and agreed that should provide confidence that the 2nd re-pressurization of the fuel tanks of Rosetta can be performed. The plan was implemented and on 26 October segments of the redundant chain of the Reaction Control System were tested to gain more insight into the anomaly of PT 2 (pressure transducer). Secondly, Reaction Wheel B will be lubricated on 28 October. This is a normal procedure for which the wheels are designed; however, it requires a very tight thermal control to successfully complete the activity. The results of these tests will be reported to the SSWG verbally.

Venus Express: Spacecraft and payload operations continue as planned. Occasionally minor problems occur that affect individual observations. Besides the routine operations, spacecraft related activities focused on the preparation of the drag experiment that was successfully be performed in October 2009 and that currently is being analyzed and the finalisation of the plan describing the activities in support of the superior solar conjunction at the end of the year.
The science ground segment has completed the preparations for being able to support the planning of science observations and spacecraft operations, if the spacecraft were to operate on 3 reaction wheels as one of the wheels occasionally showed some wear.
The Venus Express archive continues to be populated with more and more data. The Venus Express science working team met with the scientists involved in the Japanese VCO (Planet-C) mission and discussed and identified opportunities for collaborative science. In future these themes will be expanded further into practical observational strategies.

Hinode: The Hinode spacecraft performs nominal in the configuration with data downlink through S-band. All three instruments are nominal and collecting high-quality science data.
Overall data capture rate by the KSAT Svalbard and Troll stations from January through August 2009 was 99.6%. For the same time frame the Bangalore station reports a capture rate of 95.2.
All Hinode data (and usage statistics) are available to the community through the Hinode Science Data Centre Europe usually within less than 24 hours after they have been taken: http://sdc.uio.no/sdc/

Chandrayaan 1: Following a number of serious technical issues including failure of star sensors and the thermal subsystem, contact was lost with the Chandrayaan-1 spacecraft on 29 August. The mission was officially declared terminated by ISRO shortly after.
The European payload instruments onboard Chandrayaan-1, SIR-2, SARA and C1XS/XSM, have for the most part met their initial scientific objectives. SIR-2 has provided high-resolution spectral data on the mineralogy of the moon although the team stated that the instrument's coverage of the Moon could have been much better. Despite a very low solar x-ray level, C1XS/XSM obtained an excellent dataset. The

division provides support to the archiving activities for the partially ESA funded European instruments and training in this area to ISRO.

Proba-2: The PROBA 2 integration team arrived for the final integration at Pletsek on 12 October 2009. After the successful execution of the functional tests, the PROBA-2 spacecraft was mounted on the launcher on 17 October. The launch of SMOS for which PROBA 2 is a passenger has been set for early morning on 2 November.
The science ground segment, which has been implemented with strong support from the Agency has been tested and is ready to support payload commissioning and the nominal operations phase.
For the PROBA -2 science data archive, to be hosted by ESAC, interface tests have been successfully performed in October. However, some hardware upgrades have to be performed in the near future to provide adequate storage space.