Planetary Protection at ESA
Issues & Status

Gerhard Kminek
Planetary Protection Officer, ESA

NASA Planetary Protection Subcommittee Meeting
12-13 November 2013, GSFC

Selected Missions

BepiColombo

- → Launch of a composite spacecraft, comprising the MTM, the MPO and MMO on an Ariane V from CSG; nominal launch slot opens July 2016
- → Planetary Protection Category II, due to Venus gravity assist
- → Launcher upper stage and spacecraft impact on Mars analysis described and agreed during CDR

Solar Orbiter

- → Launch of the spacecraft on a NASA provided launch vehicle from KSC; nominal launch is 2017
- → Planetary Protection Category II, due to Venus gravity assist
- → Spacecraft probability of Mars impact demonstrated to be within requirement
- → Scope for the launcher upper stage probability of Mars impact discussed with NASA

ExoMars

- → See later presentation

Jupiter Icy Moon Explorer (JUICE)

- → Selected L-class mission in the frame of the Cosmic Vision Program
- → ESA lead mission to the Jovian system with focus on Ganymede and Europa
- → Launch planned on Ariane V from CSG in 2022
- → Phase A completed; currently in PRR in preparation for Phase B
- → Planetary Protection Category III
- → Planetary protection approach for Europa agreed (probability of impact < $1x10^{-4}$)
- → Planetary protection approach for Ganymede will be reviewed based on a recently published paper during the next ESA PPWG

Candidate Missions

Phootprint

- → Mission candidate in the frame of the Mars Robotic Exploration Preparatory (MREP) Program for launch opportunities from 2024 onwards
- → ESA lead mission to return samples from the martian moon Phobos
- → Launch planned on Ariane V from CSG with a return to Woomera Test Range, Australia
- → Planetary Protection Category V, unrestricted Earth return (to be confirmed)
- → Dedicated activity initiated to evaluate the level of assurance that no unsterilized martian material naturally transferred to Phobos is accessible to a Phobos sample return mission; result will be published in a peer reviewed journal, reviewed by a panel organised by the ESF, incl. relevant governmental authorities, and a subsequent recommendation of the PPWG forwarded to COSPAR

MarcoPolo-R

- → Candidate M-class mission in the frame of the Cosmic Vision Program for launch opportunities from 2022 onwards
- → ESA lead mission to return samples from asteroid 2008EV5
- → Launch planned on Soyuz from CSG with a return to Woomera Test Range, Australia
- → Phase A completed; currently in PRR in preparation for mission selection
- → Planetary Protection Category V, unrestricted Earth return (to be confirmed)
- → In case of selection, project will publish updated analysis in a peer reviewed journal, result will be reviewed by a panel organised by the ESF, incl. relevant governmental authorities, and a subsequent recommendation of the PPWG forwarded to COSPAR

Completed R&D

Update of dry heat microbial reduction specification

→ Joint activity with NASA
→ Published by ESA as ECSS-Q-ST-70-57C standard
→ Already used at ExoMars project level, e.g., allowed full 6-log reduction credit of encapsulated bioburden at aeroshell CFRP curing

Evaluated source specific encapsulated bioburden

→ Used 5 typical materials used on flight systems
→ Results are a more than 2 order of magnitude reduction of spores/cm^3 compared to the specification value
→ Used for ExoMars 2016

Introduced rapid microbial assay

→ Joint activity with NASA
→ Published by ESA in the annex of ECSS-Q-ST-70-55C standard
→ Will be used by ExoMars 2016 to reduce the time until final count from 3 days to 7 hours and the number of plates from expected 18.500 to 3500 plates

Current R&D

Micro-meteoroid environment

→ Jovian micro-meteoroid and dust environment (to be finished end of 2013)
→ Update of interplanetary micro-meteoroid model including information on streamers (to be finished end of 2013)
→ Consolidation of interplanetary micro-meteoroid environment (planned for 2015)

Break-up / burn-up analysis tool

→ Based on same tool used for Earth entry debris analysis
→ Includes the European Mars Climate Database and the US Mars GRAM
→ Includes two tools – one simple one that can be used in Phase A/B and a complex one for verification of requirements
→ Planned to be finished by 1st quarter of 2014

In-flight containment system for Mars Sample Return

→ 2.5 year activity, incl. testing, completed at TRL-3 in June 2013
→ A 3 year continuation of this activity to reach TRL-5 is planned to start in 2014

Current R&D

Biohazard assessment on samples returned from Mars

→ Activity is focused on statistically relevant sub-sampling of samples returned from Mars to evaluate with high confidence whether the samples are safe for release from containment
→ Hypothesis to falsify is that the samples do contain evidence of life (positive hypothesis)
→ Due to the criticality, two independent teams work on this in parallel
→ One team will finish in November 2013 and the second team in February 2014

Double wall isolator system for samples returned from Mars

→ Such an isolator system has been identified as key element for a Mars sample return containment facility in numerous NASA and ESA studies
→ Activity is focused on containing the samples returned from Mars and at the same time keeping the quality of the samples intact
→ Completion of feasibility study is expected by the begin of 2014
→ Follow-on activity already planned for 2015

Questions?