

# Outlook for Probe and Lander Missions in ESA's programmes

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ARD, the Advanced Re-entry Demonstrator launched in 1998, was the first ever entry vehicle launched by ESA. The Huygens Probe to Titan, which was part of the NASA/ESA/ASI Cassini-Huygens mission to the Saturn System launched in 1997, was ESA's first planetary entry probe mission, but also a first in several aspects of planetary exploration. ESA's contribution to Cassini-Huygens was carried out as part of ESA's Space Science mandatory programme, at that time called Horizons 2000, but now known as Cosmic Vision 2015-2025 (Ref. 1) implemented within the Science and Robotic Exploration directorate (SRE). The Mars Express mission carried the UK-led Beagle 2 lander to Mars in 2003, which unfortunately failed to return data. The Rosetta spacecraft, launched in 2004 to comet Comet 67P/Churyumov-Gerasimenko, carries the Philae lander that it plans to deliver upon arrival at the comet in early 2014. Aerodynamic drag experiments are carried out at Venus with Venus Express (Ref. 2), in preparation for aerobraking tests planned in 2012. Such experiments should provide new information about Venus upper atmosphere and help improve engineering models of Venus upper atmosphere of interest for future Venus entry probe missions.

The outlook for future planetary probes and landers looks great for future ESA missions. The international science community responded to the first call for ESA's Cosmic Vision mission proposals with several mission concepts that included planetary probes/landers. Three such missions were selected for further studies: i) The ESA/NASA Titan Saturn System Mission studied in 2008-2009 that included a Titan Lake lander and an atmospheric hot air balloon (montgolfière); ii) the ESA/JAXA Marco Polo Asteroid Sample Return mission studied in 2009, iii) the joint ESA/NASA Europa Jupiter System Mission (EJSM) currently under study, whose ESA contribution is currently under study as a potential Class-L (large) mission within the Cosmic Vision programme, considers a penetrator being studied as a possible surface element for either Ganymede or Europa. In ESA's community, there is also great interest in future missions to Venus and to the outer planets that would carry planetary probes and/or balloons.

Two other ESA programmes include planetary probes and/or landers. As part of the Mars Exploration programme (Ref. 3), implemented within the Science and Robotic Exploration (SRE) directorate, the ExoMars programme, being implemented in collaboration between ESA and NASA, includes two missions in the 2016-2018 time frame. The first mission, the ExoMars Trace Gas and Data Relay Orbiter, planned for launch in 2016, consists of an Orbiter plus an Entry Descent and Landing Demonstrator that will deliver a fixed, short-lived, battery-powered lander station on the surface of Mars. The second mission, planned for launch in 2018, consists of two rovers, that would be delivered by a single entry probe. A network of Mars surface stations is being studied as a possible future Mars mission. Technology preparation activities are under way in preparation for ESA's participation to the Mars Sample Return mission. Within the Human Space Flight (HSF) programme, ESA's European EXperimental Re-entry Testbed (EXPERT), is being developed in collaboration with Russia for launch by a Volnia rocket within one year. ESA/HSF is also studying an unmanned lander mission to the Lunar South Pole to pave the way for future human exploration of the Moon (Ref. 4).

Ref. 1: <http://sci.esa.int/cosmicvision/>

Ref. 2: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=46689>

Ref. 3: <http://sci.esa.int/exploration/>

Ref. 4: [http://www.esa.int/esaCP/SEM83CIK97G\\_index\\_0.html](http://www.esa.int/esaCP/SEM83CIK97G_index_0.html)