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The Jupiter Ganymede Orbiter mission and spacecraft architecture

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The Europa Jupiter System Mission (EJSM) is a joint NASA-ESA mission candidate, featuring two planetary orbiters in Jovian environment. It will study Jupiter and its magnetosphere, the diversity of the Galilean satellites, the physical characteristics, composition and geology of their surfaces, with a resolution and coverage far beyond what was achieved by Galileo. It will determine their internal structure and the existence of subsurface oceans. It will study the Laplace resonance and its role in maintaining tidal heating. Constraints for the habitability of Europa over geologic timescales will be inferred from monitoring Io and Europa in the visible and infrared combined with precise determination of the satellites' orbital positions. To meet these science objectives, the EJSM mission will optimize the role of each platform. NASA-supplied Jupiter Europa Orbiter (JEO) will focus on the two "rocky" inner Galilean satellites, Io and Europa. Following a similar approach, ESA-procured Jupiter Ganymede Orbiter (JGO) will focus on the two "icy" outer Galilean satellites, Ganymede and Callisto. With these two orbiters around Europa and Ganymede, it will be possible to perform an in-depth comparison, to understand the origin of their geophysical dichotomy and to better understand the unique characteristics of Europa which may make it habitable. Coordination of observations between JEO and JGO could also bring important synergistic science.
As part of this EJSM mission, the JGO spacecraft is now one of the candidates for the "L1" launch slot in the ESA Cosmic Vision 2015/2025 plan, with a foreseen launch in 2020. All studies candidate for this L mission concepts currently undergo parallel assessment studies until end of 2010, when two mission concepts will be selected for definition studies, until 2012. Eventually, the first L mission will be selected for industrial implementation starting in 2013.
The mission scenario for JGO is based on a launch in 2020 with Ariane 5. The inter-planetary transfer will take about 5.9 years. The initial Jovian orbit will be followed by a total of four Ganymede and Callisto swing-by manoeuvres. JGO will then be injected into a resonant orbit around Callisto, providing good surface coverage. Through another swing by sequence, the Orbiter will be injected into an elliptical orbit around Ganymede , to be circularized later in the mission. The whole mission duration in the Jovian environment will last 3.5 years.
Astrium is leading an assessment study of the Jupiter Ganymede Orbiter programme for ESA. In this framework, Astrium has defined a cost-efficient spacecraft architecture, based on successful experience on ESA interplanetary missions (Rosetta, Mars Express, Venus Express) and offers innovative solutions for the main challenges of the JGO mission (high radiations and low illumination environment, long distance and long duration mission requiring high autonomy, navigation concepts). The spacecraft design is presented, including the accommodation of the set of payload instruments.