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The Planning Payload for the EJSM Jupiter Ganymede Orbiter

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Europa Jupiter System Mission (EJSM) overview

The Europa Jupiter System Mission (EJSM) is a two-platform mission jointly studied by ESA and NASA for launch in 2020. It includes the NASA Jupiter Europa Orbiter (JEO) and the ESA Jupiter Ganymede Orbiter (JGO). EJSM/JGO is one of the three candidates for the first Class-L mission within ESA's Cosmic Vision Programme. The main goal of EJSM is to perform a comprehensive study of Jupiter system with emphasis on the four Galilean satellites. While JEO will focus on the two "rocky" inner Galilean satellites, Io and Europa, JGO will focus on the two "icy" outer Galilean satellites, Ganymede and Callisto.

Jupiter Ganymede Orbiter (JGO) overview

The main science objectives of JGO are: observations of Jupiter's interior, atmosphere, and magnetosphere, and investigation of the "icy" moons Ganymede and Callisto. For this purpose, before going into Ganymede orbit, JGO, during its 18-month tour of the Jupiter system, will study the planet, its magnetosphere, and the system itself and investigate Callisto through multiple fly-bys, to provide a firm basis for a comparative understanding of the pair Ganymede & Callisto.

The main science objectives of JGO are further detailed below:

Jupiter: study the thermal structure, dynamics and composition of the different layers of Jupiter's atmosphere; coupling processes in the atmosphere; internal structure of Jupiter.

Ganymede and Callisto: Characterisation of the ocean layer and detection subsurface water reservoirs; study of Ganymede's intrinsic magnetic field; detailed geological mapping; study physical properties of the icy crust; characterisation of the mass distribution within Ganymede; study Ganymede's internal dynamics and evolution; explore the moons' exospheres.

Jovian Magnetosphere: 3-D properties of the magneto-disk plasma sources and mass loading coupling processes (magnetosphere, ionosphere, thermosphere); aurorae and radio emissions in response to the solar wind; high energy particles.

Satellite System: temporal variations in Io's activity; the moons' interactions with the magnetosphere gravitational coupling and long-term tidal evolution of the Galilean Satellites, small satellites' studies (mass determination, ephemerides, surface composition, new detection,…)

JGO status

JGO is undergoing a 1-year competitive industrial assessment study that started in July 2009. Within ESA's Cosmic vision, it is in competition with LISA and IXO. ESA plans to select two out of the three missions at the end on 2010 for a so-called mission definition phase (Phase A/B1) in 2011/2012, that will eventually lead to the selection of the first L-Class mission for implementation starting in 2013. ESA called for EJSM Instrument studies in April 2009. More than 30 proposals were received. Payload technology developments are being identified for national funding support. The goal is to develop to TRL 5 by end of 2012 all relevant payload technologies that would be required for the timely development of the flight payload that would be selected through an AO process. The instrument studies and payload technology development are undertaken in parallel with the spacecraft industrial studies. The Study Model Payload put forward by the JSDT is used as a representative payload throughout the industrial study. Feedback in both directions between the payload studies and the industrial study will be

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implemented at key milestones in the studies. It is expected that the Study Model Payload may evolve by the end of the industrial study.

JGO Study Model Payload

The Study Model Payload (Table 1) was assembled through a close collaboration between the Joint Science Definition Team and Payload experts from within the science community. The main purpose of the Study Model Payload is i) to support the definition of the mission ii) study the accommodation of a representative payload within JGO spacecraft and iii) to define the resources that will be allocated to the flight payload that will eventually be selected through an open AO process, should EJSM/JGO be selected for the next step in the Cosmic Vision Class-L selection process.. The model payload complement was chosen by the EJSM JSDT as the reference Study Model Payload at the start of the JGO industrial study. It allows addressing most of the identified science objectives and measurement requirements identified in the Science Requirement matrix. During the study, further iterations will take place between the JSDT and the Study Model Payload contacts to make sure that all science objectives and science measurements can be addressed by the Study Model Payload. The Study Model Payload may be subject of update(s) during the industrial study, when taking into account the further elaboration of the mission science case, the results of both the payload accommodation studies by industry and the instrument assessment studies and instrument technology developments that will be on-going in parallel to the spacecraft industrial activities.

Instrument Name	Acronym	Contact
Camera package: Medium-Resolution Camera & Wide Angle Camera	WAC+MRC	J. Oberst
Magnetometer	MAG	M. Doughterty
Radio Science Transponder and ultrastable oscillator	JRST+USO	P. Tortora and M. Paetzold
Visible InfraRed Hyperspectral Imaging Spectrometer	VIRHIS	G. Filacchione
Plasma Package & Ion and Neutral Mass Spectrometer	PLP/INMS	S. Barabash and P. Wurz
Submillimeter Instrument	SWI	P. Hartogh
Radio and Plasma Wave Instrument	RPWI	J.-E Wahlund
Narrow Angle Camera	HRC	H. Hussmann
Sub-Surface Radar	SSR	L. Bruzzone
Laser Altimeter	LA	H. Hussmann
UV Imaging Spectrometer	UVIS	M. Galand

Table 1: JGO Study Model Payload