

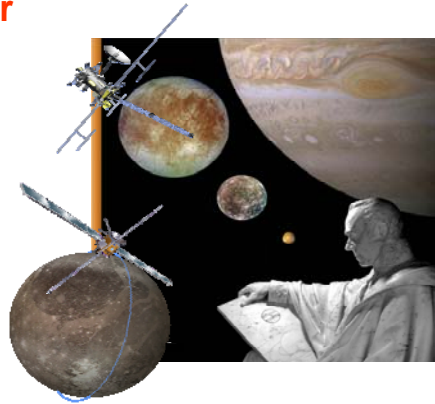
Jupiter Ganymede Orbiter

(Laplace Cosmic Vision proposal)

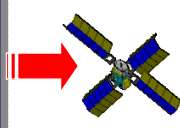
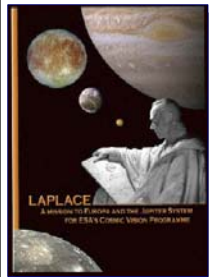
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Laplace → Europa Jupiter System Mission



Jupiter Planetary Orbiter



Europa Orbiter

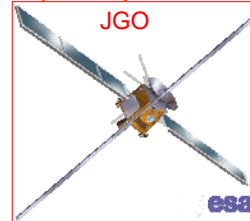


Jupiter Magnetospheric Orbiter



Europa Surface Element

Jupiter Ganymede Orbiter



JGO



Jupiter Europa Orbiter

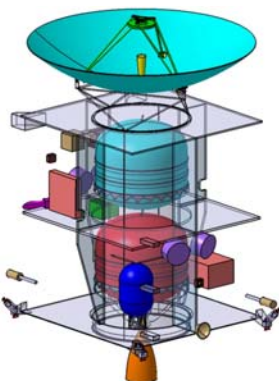
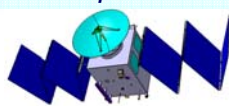



JEO

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JGO spacecraft

JGO: solar panels and HGA

- 3-axis stabilized S/C
- S/C total dry mass: 1275kg
- EAM 500 N main engine
- Bi-propellant MON/MMH system; 2x1108L propellant tanks, 2 He pressurant tanks
- 2.8 m HGA 2 omni-directional LGAs, 2 MGAs
- 51m² solar array (GaAs LILT solar cells); Li-Ion battery
- HICDS - LEON2 based dual redundant computer
- Single flash-based SSMM board of 256Gbits
- Radiation: 82krad for the whole mission behind 8mm Al
- **73kg model payload** mass (~80 kg shielding behind 8mm Al)

JGO without side panels

JGO in Ariane fairing

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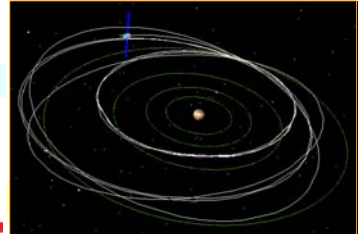
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JGO tour

Phase	Description	Start Date	End Date	Duration [d]
Launch	Ariane 5 from CSG	11 Mar 2020		-
Low Earth Orbit	Cruise with instrument calibration; VEEGA manoeuvres; Trajectory correction manoeuvres	11 Mar 2020	4 Feb 2026	2156
Interplanetary	Jupiter Orbit Insertion (13x245Rj)	4 Feb 2026		-
Jupiter orbit and Callisto resonant Orbits	Jupiter magnetosphere and surface science	4 Feb 2026	02 Aug 2026	179
	4 Ganymede fly-bys for ΔV saving	02 Aug 2026	16 Dec 2026	136
	Orbit change to Callisto	16 Dec 2026	11 Feb 2027	57
	Resonant orbit with 19 fly-bys (min. 200km)	11 Feb 2027	29 Feb 2028	383
	Orbit change to Ganymede	29 Feb 2028	22 May 2028	83
Ganymede Orbits	Initial elliptic orbit (200 x 6000 km)	22 May 2028	10 Aug 2028	≤ 80
	Circular orbit (200 km)	10 Aug 2028	06 Feb 2029	≤180
End of Life	Impact on Ganymede surface	06 Feb 2029		-

Callisto resonant orbit



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JGO planning payload (1)

Instrument	Acronym	Contribution to Science Goals	Characteristics	Mass*	Power
Wide Angle Camera Medium Resolution Camera	WAC + MRC	; Global, regional and local surface mapping of Ganymede and Callisto	WAC: framing camera, spectral range: 350-1050 nm, FoV: 117° spatial resolution: 400 m/pix @200 km MRC: pushbroom, spectral range: 350-1050 nm, FoV: 14.7° spatial resolution for stereo: 50 m/pix @ 200 km, Filters: 4-color + panchromatic	7.5	16
Sub millimeter wave sounder	SWI	Characterize the dynamics of stratosphere of Jupiter; Determine vertical profiles of: windspeed and temperature	Spectral range: 550-230 μm, 2 channels FoV: 0.15° – 0.065°	9.7	50
Thermal Mapper	TIR	Characterize dynamics of Jupiter's shallow atmosphere; detect endogenic activity on the satellites	5 – 25 μm, FoV:6.9° 4 narrow filter bands, Resolution (IFOV): 0.5mrad/pixel	5	5
Visible/Near Infrared Hyperspectral imaging spectrometer	VIRHIS	Composition of non-ice components on Ganymede & Callisto; State & crystallinity of surface ices	Pushbroom imaging spectrometer, Spectral range: two channels: 400-2200 & 2000-5200 nm, Spectral resolution: Resolution @500 km: 62-125 m	17	20
Radio Science Experiment	JRST+ USO	Characterize the interior state of Ganymede, presence of a deep ocean and other gravity anomalies	2-way Doppler with Ka-Band transponder including SSPA & USO	3.5	35

**Mass values are excluding margin and shielding; power values are also excluding margins.
Note: SWI and PLP power levels are peak power, SSR mass without antenna & MAG mass without boom
Note: Radio Science experiment power includes power of a SSPA which power (~ 30W) is also already taken into account in the spacecraft telecommunications power budget*



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JGO planning payload (2)

Instrument	Acronym	Contribution to Science Goals	Characteristics	Mass*	Power
Sub-surface Radar	SSR	Probe the structure of the Ganymede subsurface & identify warm ice or anomalies within the ice shell	Single frequency: 20-50 Mhz Dipole antenna length: 10 m tip-to-tip	10	20
Ultraviolet imaging spectrometer	UVIS	Characterize the composition & dynamics of the atmospheres of Ganymede & Callisto	EUV: 50-110 nm FUV+MUUV: 110-320 nm, FOV: 0.1x2° Resolution:> 0.01°	6.5	3
Magnetometer	Mag	Characterize Ganymede's intrinsic magnetic field and its interaction with the Jovian field	Dual tri-axial fluxgate sensors on 3 meter boom	1.5	1.5
Plasma Package	PLP	Characterize the interaction between Ganymede & Callisto and the space environment to constrain induction responses	Thermal plasma number density, Electrons: 1 eV - 1 MeV; Ions: 1 eV - 5 MeV, ENA: 1 eV - 100 keV	8.9	30
Micro Laser Altimeter	MLA	Determine amplitude and phase of gravitation tides on Ganymede: global, regional and local topography of Ganymede and Callisto	Single Beam: 1064 nm, 10 m spot	3.6	26
Total				73 kg	207 W

**Mass values are excluding margin and shielding; power values are also excluding margins.
Note: SWI and PLP power levels are peak power, SSR mass without antenna & MAG mass without boom
Note: UVIS instrument power is average, peak power is expected to be 12 W.*



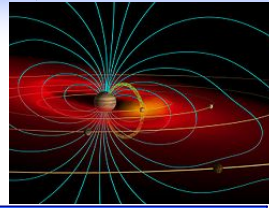
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JGO Plasma Package

- Science:**
- Structure and dynamics of Jupiter's fast rotating magnetosphere
 - Jupiter as an efficient particle accelerator
 - Interaction of Jupiter's magnetosphere with the moons and its effects



Instrument: Package of several sensors

Sensor	Name	Function (species and energy range)
Dual Langmuir probe	LAP	Thermal plasma number density
Electron spectrometer	ELS	Electron measurements, 1 eV – 20 keV
Hot plasma spectrometer	HPS	Ion measurements, 1 eV – 10 keV with mass resolution
Medium plasma spectrometer	MPS	Ion measurements, 3 keV – 60 keV with mass resolution
Energetic charge particle spectrometer	EPS	Ion measurements, 3 keV – 5000 keV with mass resolution) Electron measurements, 15 keV – 1000 keV
Energetic neutrals analyzer	ENA	ENA imaging, 10 eV – 100 keV
Radiation shield	SHD	Radiation protection

Mass: 9.2 kg; Power: 32 W (Max); Data rate: 2-20 kbps

Thank you

