BepiColombo

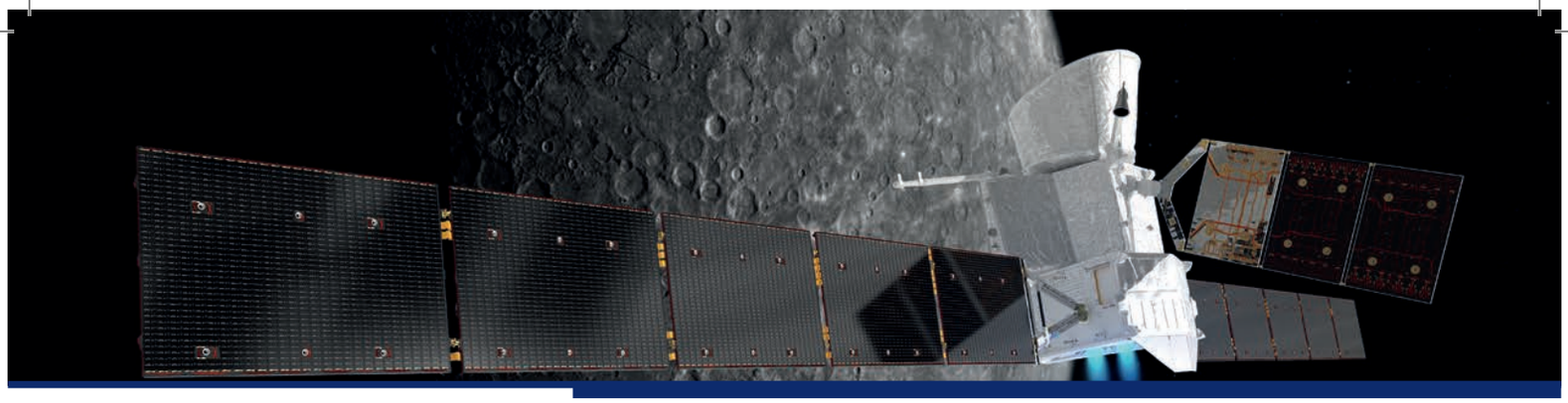
BepiColombo is Europe's first mission to Mercury. It is a joint mission between the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA), under ESA leadership.

The mission comprises a composite of two orbiters and two supporting modules which are launched in a four-module stack configuration. The orbiters are the Mercury Planetary Orbiter (MPO) and the Mercury Magnetospheric Orbiter (MMO). The supporting modules are the Mercury Transfer Module (MTM) and the MMO Sunshade and Interface Structure (MOSIF). The prime contractor for the mission is Airbus. ESA is providing the MPO, MTM and MOSIF. JAXA will supply the MMO.

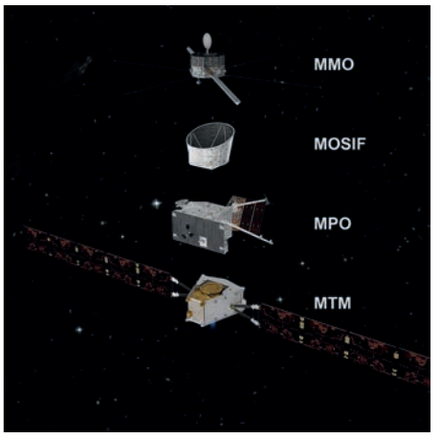
The mission is slated for launch in October 2018. On arrival at Mercury in December 2025 it will gather data for at least one year.

Mercury is the least known of the inner planets but highly interesting for planetary and solar system science and for testing theories of planetary system formation. BepiColombo will study Mercury at different wavelengths, map the planet's mineralogy and elemental composition and explore the magnetosphere and polar deposits as well as the origin of Mercury's magnetic field. Further experiments will test Einstein's theory of general relativity.

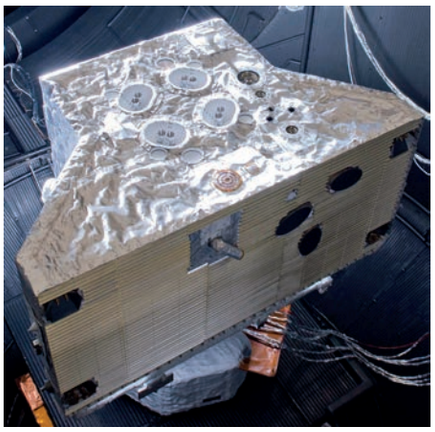
The BepiColombo spacecraft uses nine planetary gravity assist manoeuvres (one Earth flyby, two times Venus and six times Mercury) before reaching its final scientific orbit around Mercury. After the 7 year cruise phase, including 18 orbits around the Sun, the MTM is ejected before the remaining modules are captured into Mercury orbit and progressively separated. The scientific mission begins when the MPO and MMO reach their different operational orbits and the MOSIF has been ejected. With Mercury at only 0.3 AU from the sun, the spacecraft is subjected to ten times the solar intensity seen in an earth orbit.



Customer	European Space Agency (ESA)
Mission	An interplanetary exploration mission to Mercury, from ESA and JAXA (Japan Aerospace Exploration Agency)
Orbit	Cruise: Heliocentric transfer orbit At Mercury: Mercury Planetary Orbiter (MPO) polar orbit 480 km x 1500 km, 2.3 hr period Mercury Magnetospheric Orbiter (MMO) polar orbit 590 km x 11,640 km, 9.3 hr period
Spacecraft	Mercury Planetary Orbiter (MPO): Provided by ESA. Mass: 1838 kg Mercury Magnetospheric Orbiter (MMO): Provided by JAXA. Mass: 275 kg MMO Sunshade and Interface Structure (MOSIF): Provided by ESA. Mass: 125 kg Mercury Transfer Module (MTM): Provided by ESA – Carries the propulsion systems for the interplanetary cruise phase – Mass: 1843 kg
Payload	• HIRC (High Resolution Camera) • STC (Stereo Camera) • VIHI (Visible / NIR imaging Spectrometer) • MERTIS (Radiometer and infrared Imaging Spectro) • PHEBUS (UV spectro) • MIXS (X-ray spectro) • SIXS (X-ray monitor) • MGNS (gamma ray spectro) • SERENA (Neutral & ionised particles analyser) • BELA (Laser Altimeter) • MERMAG (Magnetometer) • ISA (Accelerometer) • MORE (Multi-band link)
Features	Fuel: 825 kg for chemical + 580 kg xenon for electric propulsion A sunshield protects the spin stabilised MMO during the 3-axis stabilised cruise phase
Launch mass	Total launch mass: 4074 kg
Dimensions	Overall composite: 6.3 m x 3.9 m x 3.6 m
Mission dates	Launch October 2018, arrives at Mercury December 2025
Mission duration	7 years cruise and 1 year operations at Mercury (with 1 year extension possible)
Airbus responsibilities	• Prime contractor • Mechanical propulsion Bus • Solar Arrays • Attitude & Orbit Control System (AOCS) • Central software • Functional verification



The BepiColombo elements



MPO flight spacecraft during thermal testing

The BepiColombo satellite stack

Key Features:

To meet the challenges of the mission the spacecraft employs a number of specifically tailored design features:

- Hold-down and release systems to retain the 4 large modules during launch and until separation ca. 7 years later
- Solar Electric Propulsion for the transfer to Mercury
- High temperature solutions developed for all external surfaces to combat the thermal environment near to the sun and Mercury. Even so, some surfaces will reach 400°C
- Solar Arrays capable of operating at 190°C with regular tilting to 75° away from the sun to limit the temperature
- High-temperature MLI (Multi-Layer Insulation) comprising more than 50 layers, with Nextel sunshield and titanium foils providing the outermost layers
- Autonomous control providing 21 days of nominal operation when no ground contact is possible
- Attitude and Orbit Control System (AOCS) coping with 5 flight configurations and able to provide rapid control responses to avoid loss of attitude and mission-threatening over temperature

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