BepiColombo Spacecraft - ESA and JAXA Joint Mission to Mercury

Why in news?

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The European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA) successfully sent two probes on a joint mission to Mercury.

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What is the mission on?

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- It is the first European mission to Mercury.
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- It is also the first to send two spacecraft to make complementary measurements of mercury and its environment at the same time.
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- An Ariane 5 rocket was launched from French Guyana.
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- It lifted an unmanned spacecraft, BepiColombo, which is carrying the two probes.
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- The spacecraft separated and went into orbit for the 7-year trip to Mercury.
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What are the components?

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- The orbiters are ESA’s Mercury Planetary Orbiter (MPO) and JAXA’s Mercury Magnetospheric Orbiter (MMO, or ‘Mio’).
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- A third component is the ESA-built Mercury Transfer Module (MTM).
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- MTM will support the duo during the long cruise to the solar system's innermost planet.

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- BepiColombo is scheduled to slip into orbit around Mercury in December 2025, after nine different planetary flybys (one of Earth, two of Venus and six of Mercury).
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- It uses a combination of solar electric propulsion and the gravity assist flybys.
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- Gravity assists flybys are precision maneuvers that involves the harnessing and using the gravity of a planet to accelerate and direct a spacecraft to its destination.
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- Flybys are essentially used to increase the energy of a spacecraft's solar orbit beyond the velocity afforded by its launch vehicle.
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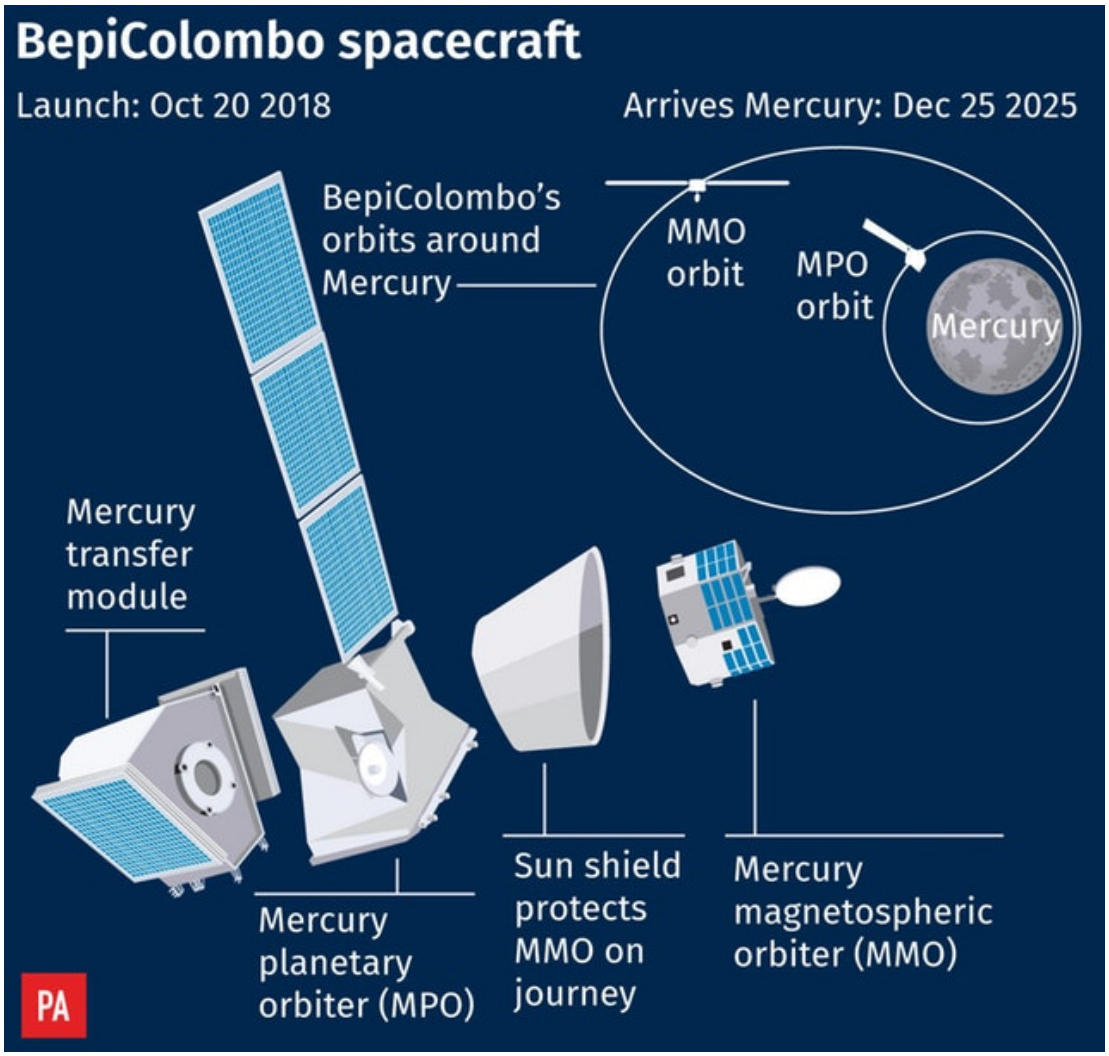

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What are the objectives?

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- **Venus en route** - The two orbiters will be able to operate some of their instruments during the cruise phase, to try and collect data at Venus.
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- Also, some of the instruments designed to study Mercury in a particular way can be used in a completely different way at Venus (has a thicker atmosphere).
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- **Mercury** - A few months before reaching Mercury, the transfer module will be abandoned.
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- This will leave the two science orbiters to be captured by Mercury’s gravity.
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- MPO will separate and descend to its own orbit, and together the orbiters will make measurements.
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- The diverse data gathered by the duo will offer a comprehensive picture of the rocky planet.
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- It would shed light on its composition, structure, magnetic field, formation and evolution, among other characteristics.
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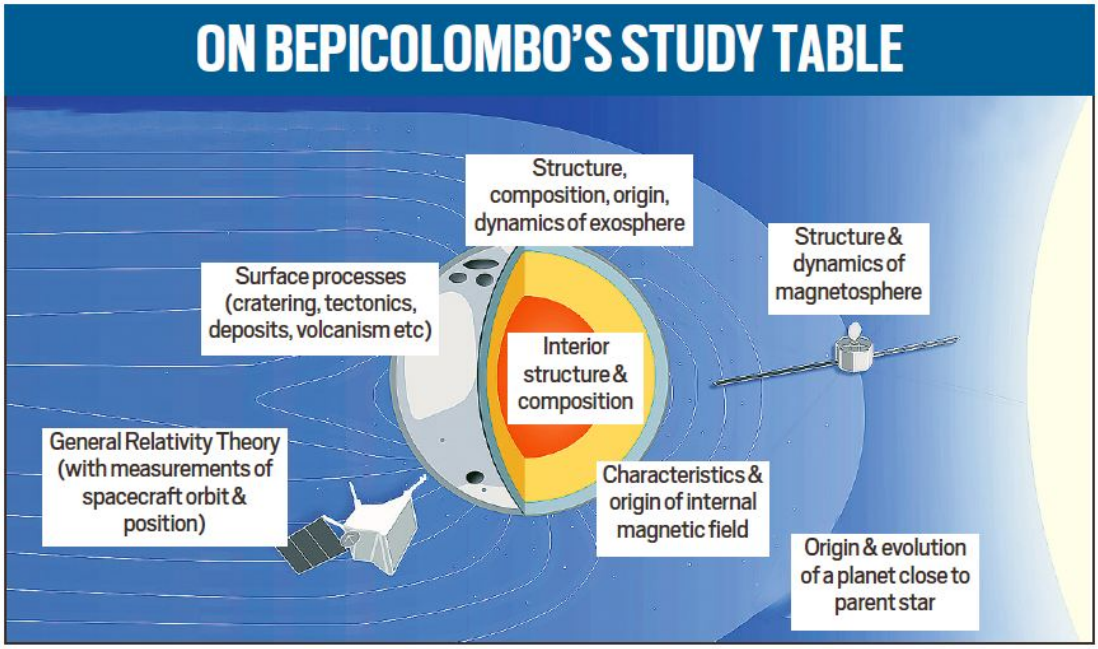

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- **Challenges** - The Sun's enormous gravity makes it difficult to place a spacecraft into a stable orbit around Mercury.
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- Thus the mission will have to ensure a controlled fall.
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- Also, the spacecraft has hence been specially designed for extreme temperatures.
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Source: Indian Express

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