Spacecraft braking simulation marks key step towards real flight test

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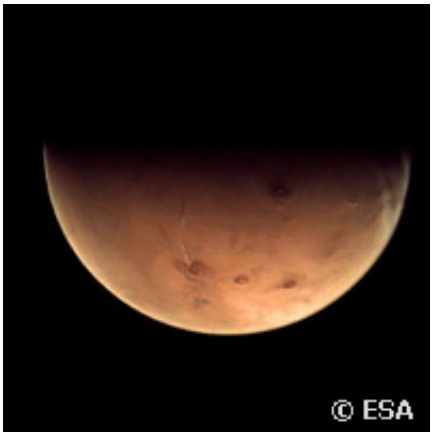

Credit: ESA

Researchers at EU-funded project AEROFAST ('Aerocapture for future space transportation') have successfully simulated a flight manoeuvre in which a space vehicle uses a planet's atmosphere to slow itself down.

The project's simulation under laboratory conditions of the manoeuvre - known as aerocapture - marks an important step towards a real flight demonstration on a planet with atmosphere, such as Earth or Mars. Using the technique would allow space missions to save fuel - and weight - and help expand the ability of humans to explore our solar system.

The project's researchers believe aerocapture technologies could eventually become a core capability for planetary transportation, moving

humans and cargo between geostationary Earth orbit and low Earth orbit, and also between the Earth and the Moon or Mars.

Led by France's ASTRIUM, the researchers integrated expertise from a range of scientific disciplines, including areas such as aerodynamics and aerothermal environments.

The team designed and simulated a typical space mission to test the concept. They first established the initial conditions required to perform each phase of a future outer space mission, including the launch, cruise and aerocapture phases.

They then worked on improving spacecraft design to meet these requirements. For example, they tested and improved on algorithms for guidance, navigation and control (GNC) systems in a laboratory simulator. They then simulated a complete mission in laboratory conditions to test spacecraft performance.

The tests confirmed that an aerocapture manoeuvre could work. The simulated mission was successful even under worst-case scenarios, while remaining within mass and budgetary constraints. The tests showed that their design of a biconic (aerodynamic) shape as the most appropriate choice for a spacecraft.

The project's prototype (a reduced-scale model) of a spacecraft's thermal protection system based on cork also provided interesting results that should be further considered, the researchers say.

AEROFAST project results already stand as a reference work for upcoming missions, including the European Space Agency's planned Mars exploration missions. The project's research has resulted in 14 articles published in peer-reviewed journals.

More information: www.aerofast.eu/

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