

Titan and Enceladus mission (TANDEM)

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Our understanding of Titan's atmosphere and surface has recently been enhanced by the data returned by the Cassini-Huygens mission. The Cassini orbiter will continue to be operational for about 3 more years during its extended mission. After this mission, any unanswered questions will forever remain unknown, unless we go back with an optimized orbital tour and advanced instrumentation. **Considering the complementary nature of the geological, chemical and evolutionary history of Titan and Enceladus, we propose to carry out studies for a mission to perform an in situ exploration of these two objects in tandem.** In our proposal we determine key science measurements, the types of samples that would be needed and the instrument suites for achieving the science goals. In particular, we develop conceptual designs for delivering the science payload, including orbiters, aerial platforms and probes, and define a launch/delivery/communication management architecture.

This mission will require new technologies and capabilities so that the science goals can be achieved within the cost cap and acceptable risks. International participation will play a key role in achieving all the science goals of this mission. We will build this mission concept around a central core of single orbiter, a single Titan aerial probe and a core group of category 1 instruments. Aerobraking with Titan's atmosphere will be given serious consideration to minimize resource requirements and risk. This approach will allow a single orbiter to be used for both Enceladus science and Titan science with final orbit around Titan and later release of aerial probe(s) into Titan's atmosphere. The Titan aerial probe may be a Montgolfière balloon concept that will use the waster heat ~ 1000 watts from a single RTG power system. There will be a release of penetrator(s) on Enceladus also.

This proposal addresses directly several of the scientific questions highlighted in the ESA Cosmic Vision 2015-2025 call, particularly: **1.3 “Life and habitability in the Solar System”** and **2.2 “The giant planets and their environments”**, but also **2.1 “From the Sun to the edge of the Solar System”**. The suggested launch date is about or beyond 2020.