

Exploration of Other Destinations (5)  
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COMET INTERCEPTOR: ESA'S FAST-TRACK SCIENCE MISSION TO INTERCEPT A PRISTINE  
COMET

**Abstract**

Following a Call for a Fast-track mission (F-mission) opportunity issued in July 2018 to the science community, ESA's Science Programme Committee (SPC) selected in May June 2019 the Comet Interceptor mission for further study as a Fast-track mission in the ESA Science Programme, with a shared launch with the ARIEL mission in by 2028. The objective of the Comet Interceptor mission is to characterize a pristine comet by performing multi-point observations during a dedicated close-range fly-by. Previous comet missions, including ESA's pioneering spacecraft Giotto and Rosetta, encountered short-period comets, which have approached the Sun multiple times along their orbits in relatively recent times and as a consequence have undergone significant changes. Comet Interceptor will target instead a primordial comet very likely entering the inner Solar System for the first time; this could be a long-period comet from the Oort Cloud or even a rare interstellar object originating at another star. Simultaneous multi-point observations will greatly increase the 3D information provided on the target and its jets/coma. The mission architecture to enable this ground-breaking science involves a main spacecraft that will carry two small probes (one of them to be provided by JAXA) that will be released shortly before the comet encounter. The three spacecraft will embark a suite of both remote sensing and in-situ instruments, and the data from the small probes will be relayed back to Earth via the main spacecraft. The mission concept is based on a launch towards the Sun-Earth libration point L2 (SEL2). Then, the Comet Interceptor will wait in an orbit around SEL2 until a suitable target has been identified. Using its own propulsion means, the spacecraft will then initiate the transfer to intercept the target object and perform all the science measurements during the high relative velocity fly-by. This paper describes the main challenges posed by the Comet Interceptor mission and its programmatic framework as a fast-track development mission. The main design trade-offs and candidate solutions for the different mission elements (instruments, main spacecraft, small probes, ground segment) and mission phases (including the planned fly-by timeline) are identified and discussed. Specific trajectory design aspects are the subject of a dedicated paper also presented to this conference.