

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (Part 2) (4B)

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COMET INTERCEPTOR: AN ESA MISSION TO A DYNAMICALLY NEW SOLAR SYSTEM OBJECT

Abstract

The European Space Agency (ESA) selected in 2019 the Comet Interceptor (Comet-I) as its first fast (F) class mission. Comets are highly valuable scientific targets to understand the formation and evolution of our Solar System. Previously visited comets, however, had approached the Sun on many occasions and, consequently, had undergone substantial surface compositional and morphological alterations. Comet-I instead aims to explore a *dynamically new comet* (DNC) (or a serendipitous interstellar object), which will be visiting the inner Solar System for the first time. Comet-I's baseline is to visit a yet-to-be-discovered long-period comet with three spacecraft elements. The main ESA-provided spacecraft A will make remote observations of the target from afar ($>1,000$ km), to protect it from the dust environment. Two smaller spacecraft elements (B1 provided by JAXA and B2 provided by ESA) will be separated from spacecraft A several days before the comet encounter and will venture much closer to the comet (<500 km), carrying instruments to complement and enhance the scientific return of Comet-I. Spacecraft A will act as primary communications hub for both spacecraft B1 and B2. Comet-I will be launched in 2028 as a co-passenger with ESA's M4 ARIEL Mission on board Ariane 6.2. It will be deployed in a Sun-Earth L2 quasi-halo orbit and remain there by means of small orbit maintenance manoeuvres for a period of up to 3 years; while it awaits for the right departure conditions to intercept the target comet. The target comet is today beyond the orbit of Uranus, in an in-bound trajectory towards the inner Solar System, and remains yet undiscovered. Comet-I will rely on current astrometric survey efforts such as the soon-to-be-online Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST), which will be conducting the most sensitive search ever performed. It is expected that Comet-I's target will be discovered when still beyond the orbit of Saturn and it is likely (i.e. $>50\%$ chance) that the target may be known before Comet-I's launch.