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The Comet Interceptor Mission

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Comet Interceptor was selected in 2019 as the European Space Agency's next planetary mission, to which the Japanese space agency, JAXA, will make a major contribution. The mission is ESA's first Fast (F) project, and its primary science goal is to characterise, for the first time, a long period comet, preferably dynamically-new, or an interstellar object. An encounter with one of these objects for the first time will provide valuable data to complement that from all previous comet missions, which have by necessity studied short-period comets that have evolved during their time orbiting near the Sun from their original condition. Planned measurements of the target include its surface composition, shape, and structure, its dust environment, and the composition of the gas coma. A unique, multi-point 'snapshot' measurement of the comet- solar wind interaction region is to be obtained, complementing single spacecraft observations made at other comets. The spacecraft will be delivered to Sun-Earth Lagrange Point L2 with the ESA Ariel mission in 2029, a relatively stable location suitable for later injection onto an interplanetary trajectory to intersect the path of its target. A suitable new comet would be searched for from Earth prior to launch, and after launch if necessary, with short period comets serving as a backup destinations. With the advent of powerful facilities such as the Vera Rubin Observatory, the prospects of finding a suitable comet nearing the Sun are very promising. The possibility may exist for the spacecraft to encounter an interstellar object if one is found on a suitable trajectory. When approaching the target, two sub-spacecraft – one provided by ESA, the other by JAXA, would be released from the primary craft. The main spacecraft, which would act as the primary communication point for the whole constellation, would be targeted to pass outside the hazardous inner coma, making remote and in situ observations on the sunward side of the comet. The two sub-spacecraft will be targeted closer to the nucleus and inner coma region. We shall describe the science drivers, planned observations, and the mission's instrument complement, to be provided by consortia of institutions in Europe and Japan.

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