The Comet Interceptor mission – proposed to ESA F-class call

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Comet Interceptor is a proposal to the recent ESA call for 'fast' missions. We propose a mission that will launch (as secondary payload with M4 Ariel) to the Sun-Earth L2 point, where it will be 'parked' in a stable L2 halo orbit for a period of up to 2-3 years, until a suitable opportunity for a flyby mission to a dynamically new comet (DNC) presents itself. Suitable targets will be comets whose orbits suggest that they are visiting the inner Solar System for the first time, including the possibility of interstellar objects like 'Oumuamua, that will have a perihelion closer than ~1.2 au and an ecliptic plane crossing time and location reachable with 1.5-3 km/s delta-v from L2. Once a target is found, expected to be within a few years based on predictions for comet discovery rates with LSST, the spacecraft will depart on an intercept trajectory. Shortly before the flyby, the main spacecraft will deploy at least 2 sub-spacecraft, ideally along with a number of smaller cubesat-type probes, allowing multiple paths through the coma and past the nucleus to be sampled. This will give a 3D snapshot of the comet at the time of the flyby, testing spatial inhomogeneity in the coma and interaction with the solar wind on all scales. This will be a unique measurement that was not possible with Rosetta, in addition to the fact that we will target a new class of comet (a much less evolved body), which will allow interesting comparisons to be made with the results from 67P.

The various sub-spacecraft will have complementary payloads, made up of a number of low-resource instruments including cameras, mass spectrometers, magnetometers and others. The full instrument payload is to be defined following iteration on the mission design with ESA as part of the F-class process, as the final payload mass available becomes clearer. At the time of the SWT we may or may not know the outcome of the phase 1 down select for the F-class call, but it will in any case be useful to discuss different instrumentation possibilities.