



Proposed mission to Mars and his Trojan Asteroid Family

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In the context of ESA's past call for medium class missions, we were investigating missions to Mars in combination with a flyby at a Mars Trojan on the way to the planet. We set up a three-impulse (Earth departure, mid-course correction and Mars orbit insertion) model to determine physically possible trajectories and flyby scenarios optimized in terms of required propellant and time (i.e. operation costs). We propose several scenarios in the time frame 2020-2050 including trajectories that involve more than one revolution about the sun. With the Earth and Mars ephemerides relatively fixed in space and time, the Trojan candidate has to be "at the right place at the right time" to minimize expensive spacecraft course adjustments. In principle, flybys are possible for any Trojan target – but we cut-off and present models having flyby delta-v < 1 km/s and transit time of < 5 years. We report on several scenarios, each including a flyby at one Trojan. Our results show that flybys of most of the Trojans are well conceivable. One good candidate for such a mission is Trojan 311999 (2007 NS2). With a launch in September 2028, the required additional delta-v will be less than 100 m/s, associated with a total transfer time (from Earth to Mars) of approximately 800 days. While a standalone mission to a Mars Trojan is currently probably far from practical due to costs, a combined mission to Mars and one of its Trojans is conceivable, and valuable science may be obtained at reasonable added resources.