List of Potential Target NEOs for Human Missions

Abstract
During the last decade the interest in exploration missions towards Near Earth Objects (NEOs) has grown and many studies have been published. This paper précises appropriate constraints for the selection of potential target asteroids, i.e. Earth close approach distance under 0.2 AU between 2015 and 2050, 180 days mission duration, residence time, asteroid characteristics (size, rotation rate) and re-entry velocity. On that basis and using the actual ephemeris data of the JPL HORIZONS system, a list of NEOs has been calculated for exploration missions requiring a total delta-v of between 5 and 10 km/s.

• In all past studies the minimum delta-v for an impulsive mission to an asteroid coincides with the asteroid's close approach to Earth.*
• Close approaches up to 0.2 AU (~30 Mill. km) as a mean value of other studies count as an appropriate limit for further calculation.
• Consequently the baseline data for all figures of this poster are asteroids taken from the NASA Horizons server (on the 16. Sept. 2013) with an Earth close approach of under 0.2 AU between 2015 and 2050.
• It is assumed that transfer stages and the manned capsule are assembled in a circular park orbit of 200 km altitude around Earth.
• Starting from there the mission phases consist of the Earth departure manoeuvre (EDM), outbound time of flight (out TOF), asteroid arrival manoeuvre (AAM), stay time on/at the asteroid, asteroid departure manoeuvre (ADM), inbound time of flight (in TOF) an re-entry into Earth's atmosphere and landing.
• The overall mission time beginning with the EDM shall stay within 180 days.
• All calculated delta-v are minimum delta-v solving the lambert's problem.

Accessible NEAs and launch opportunities for a 180 days mission and launch dates from 2015 to 2050 dependent on delta-v

Accessible NEAs for a 180 days mission and launch dates from 2015 to 2050

Delta-v for a 180 days mission to 1999 AO10 dependent on the launch date

Re-entry velocities for abort trajectories of a 180 days mission to 1999 AO10 launched on 21. August 2025

Delta-v for abort trajectories of a 180 days mission to 1999 AO10 launched on 21. August 2025

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