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Author: Prof. Anatoli Petrukovich
Space Research Institute (IKI), Russian Academy of Sciences (RAS), Russian Federation

Mr. Dmitry Zarubin
Space Research Institute (IKI), Russian Academy of Sciences (RAS), Russian Federation
Dr. Natan Eismont
Space Research Institute (IKI), RAS, Russian Federation
Dr. Sergey Nemykin
State Space Corporation ROSCOSMOS, Russian Federation
Dr. Alexander Bloshenko
State Space Corporation ROSCOSMOS, Russian Federation
Dr. Sergey Zaytsev
State Space Corporation ROSCOSMOS, Russian Federation
Mr. Yuriy Aleksandrovich
State Space Corporation ROSCOSMOS, Russian Federation
Dr. Andrei Sadovski
Space Research Institute (IKI), RAS, Russian Federation

NUCLEAR ORBITAL COMPLEX "NUKLON": NEAR-EARTH ASTEROID MISSION SCENARIO

Abstract

Russian state corporation "Roscosmos" is working on a preliminary design of the nuclear in-space transportation facility "Nuklon" with about 500 kW power capacity for electric propulsion and/or payload power supply.

Mission design analysis confirms that there are numerous destinations in Solar system which can be reached with "Nuklon", including one of the near-Earth asteroids (NEA).

The main objective of the "Nuklon-to-NEA" mission scenario is to carry out a space experiment to test technologies for the asteroid-comet hazard avoidance. To date, more than 30,000 near-Earth asteroids have been discovered, the number of known candidate asteroids for the mission is significant.

The experiment results might be applied to a hybrid Earth-defense scheme development. The scheme includes the impact on trajectory of a "small" (about 10 m) asteroid and its further transit into a required orbit, which will allow further collision with another, dangerous for Earth asteroid, when the one is detected.

Conventional schemes will require Vx about 3–5 km/s. However, direct impact on asteroid trajectory in combination with Earth gravity assist maneuvers will reduce the required Vx to about 10-30 m/s. "Nuklon" electrical power capacity provide several options to achieve the required Vx.

"Nuklon-to-NEA" mission scenario includes several phases: Cis-lunar (optional), heliosphere and the NEA itself. Each of the phases will include a variety of research and scientific instruments, which might be a subject for cooperation.

The paper presents results of the "Nuklon-to-NEA" mission architecture analysis from scientific, technical and cooperation perspectives.