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NUCLEAR ORBITAL COMPLEX "NUKLON": MISSION ARCHITECTURE AND SCIENTIFIC GOALS

Abstract

Russian state corporation "Roscosmos" is working on a preliminary design of the nuclear space exploration facility "Nuklon". Structurally, "Nuklon" consists of two main elements: energy module TEM for power generation and transfer, thermal management etc, and payload module PM with payloads, electric propulsion engines and fuel tanks.

The mission starts with separate launches of the TEM and PM with two heavy-class rockets "Angara", subsequent PM and TEM rendezvous and docking at the initial low Earth orbit about 900 km, deployment of a truss structure, and, finally reactor activation. After the on-orbit assembly "Nuklon" will have mass about 40 m.t, length about 90 m and power capacity for electric propulsion and/or payload power supply about 500 kW.

Mission design analysis confirms that there are numerous destinations in Solar system which can be reached with "Nuklon". For example, near-Earth asteroids, Jupiter, as well as other object are considered as destination points.

Preliminary architecture of the first "Nuklon" mission may include three parts:

1. Lunar part at a circular Moon orbit with a survey of priority areas of the Moon surface in a wide range of electromagnetic spectrum from radio to visual of electromagnetic waves, and using scientific payloads with parameters that are usually inaccessible for conventional spacecrafts.

2. Planetary part with a visit to Jupiter system or to a near-Earth asteroid with a demonstration of the Earth defense technologies.

3. Heliospheric part with a number of plasma measurements at interplanetary trajectory.

The paper presents results of the mission architecture analysis and discusses possible scientific objectives for the first "Nuklon" mission.