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ARTIFICIAL GRAVITY ORBITAL STATION (AGOS)-THE SIMULATION OF GRAVITY IN A ROTATING SPACE STATION

Abstract

The International Space Station ISS will probably be decommissioned by 2030. This paper presents a design for a modular orbital station as a possible successor of ISS. The rotating elements of the station simulate artificial gravity (AG) by centrifugal forces. AGOS is built of cylindrical modules and structural framework. We compare inflatable structures with prefabricated rigid modules, with regard to transport, safety and practicability. The resulting design proposes light-weight constructions using thin aluminium sheets and trapezoid sheeting. The station can be enlarged in stages, the initial stage 1 has a mass of approx. 270 tons and a diameter of 102 meters. 24 crew members can live and work in a 0.9 g environment. To establish the initial stage 15 launches to Low Earth Orbit (LEO) with payloads of 18-22 tons will be necessary. For launching we propose esp. the reusable SpaceX Falcon launcher to minimize costs. By changing its rotation rate AGOS stage 1 can be used as a testbed to study the influence of different g-levels on human health. We give a detailed description of our AGOS design including possible enlargements. The final enlargement provides a closed rotating ring of 32 living quarter modules for approx. 180 persons. If lunar material is available within the next decades, a rotating Agricultural Sphere could be attached to AGOS to provide nutrition for the inhabitants. We also present a technical solution for the joints between rotating and non-rotating parts of the station. Last not least we propose a time frame to plan, produce and erect AGOS, emphasizing international cooperation.