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## SYSTEM ENGINEERING CHALLENGES FOR A SPACE STATION DESIGN – INDIAN CASE STUDY

### Abstract

India's Space Vision 2047 targets to have sustained human presence in space by having a fully functional and operational space station in orbit by 2035, with the first module planned to be launched in 2028. Towards this, the Indian Space Research Organisation has initiated preliminary studies.

This paper discusses the essential studies required to be completed for preliminary design of a typical space station, which includes assessing the functional requirements for a self-sustaining, modular, state of the art habitat in space, type of mission and orbit. Design factors are to be assessed and optimized, CONSIDERING factors such as habitable volume, technology readiness levels, alignment with international standards for interoperability, payload capacity and launch vehicle constraints such as payload capacity. The manufacturing and development plan for the space station is also to be synchronised with the launches of crew and resupply missions. The construction sequence is to be planned considering orbit studies, the need for autonomous assembly, propulsion requirements and human life support system requirements.

The paper also discusses the unique design requirements for a habitat in space capable of hosting long duration human missions. Long duration space missions require higher levels of interdisciplinary study, accommodation of the human-in-loop element as well as extensive testing and simulations on ground. This necessitates the incorporation of robust and regenerable life support systems, hygiene facilities, safety features, exercise equipment, view ports and other allied requirements to ensure the well-being of astronauts in the isolated space environment.