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HYPERION: ARTIFICIAL GRAVITY REUSABLE CREWED DEEP SPACE TRANSPORT

Abstract

1 Introduction

The Hyperion can be the start of the next generation of deep-space crafts. It combines tested technology with a variety of leading research to actively simulate gravity for crew members traveling to and from Mars. To truly be the springboard for future deep space transports, it was designed to require no assistance from resupply depots at destination, prioritize human comfort for long duration transits, and have multiple configurations to adjust for the mission. The design is focused around generating artificial gravity by rotating the fixed-distance habitat and variable-distance counterweight about the propellant system in the center (X axis), while each subsystem is individually developed to support this operation. The counterweight contains a majority of the solar panels, batteries, and various supporting systems to offset the habitat's mass, while an extendable truss accounts for consumption on the habitat side. The design includes an auxiliary propellant tank in the counterweight section to balance mass and provide fault tolerance to the extendable truss. Additionally, the transport assumes a set of chemical engines, with a conservative Isp of 300 sec, will perform the major escape and capture maneuvers, while a set of Solar-Electric Propulsion (SEP) engines, modeled after the X3 Ion Thruster, will be used to support the transit orbit as necessary. Through various configurations, the Hyperion contains the unique ability to adjust to the mission phase for aerobraking and transport needs, making the concept particularly adept at reducing propellant needs, maintaining artificial gravity with minimal power, and keeping the center of mass in line with the thrust vector. This is accomplished using de-spun solar panels, Ion engines for spin-up and orbital maneuvers, an extendable truss for mass balance, and phased array communication. Hyperion is designed to meet NASA 2017-18 Revolutionary Aerospace Systems Concepts - Academic Linkage (RASCAL) requirements of developing an Artificial Gravity Reusable Crewed Deep Space Transport by 2029 and is expected to cost no more than \$2.0B per year over 11 years.

2 Conclusion

The Hyperion is in the early stages of development, but the concept can bring humanity a significant step closer to NASA's and humanity's goal of colonizing Mars.