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# THERMAL ARCHITECTURE FOR NEXT GENERATION COMMERCIAL SPACE ROBOTICS

**Abstract**

Space based robotics systems serve an essential role in humanity's increased presence in Low Earth Orbit (LEO) and beyond, and the thermal management of these systems is a critical factor in optimizing mission performance. This paper presents a high-level exploration of the thermal architecture governing the design and analysis of next-generation commercial space robotics at MDA.

The primary challenge addressed in this paper is the development of a high-performance thermal management system capable of operating in a wide range of orbital environments, including LEO, Geostationary Orbit (GEO), NRHO (Near Rectilinear Halo Orbit), along with Earth- Moon and Sun-Earth Lagrange points. The thermal architecture outlined herein helps to enable a competitive commercial product while ensuring survivability and performance across these diverse thermal environments.

Other key aspects discussed in this paper include the high-level methodology of employing innovative thermal design, modelling, and analysis processes to quickly understand, iterate, and mitigate the effects of harsh thermal environments on flight robotic systems.

The insights presented in this paper are an important contribution to enriching the commercial space robotics industry, ensuring the development of thermally resilient and versatile systems capable of sustained operation in a wide range of orbital environments. As the commercial space industry rapidly evolves to meet humanity's needs, the thermal architecture outlined here, enables further advancement of next-generation space robotics systems to achieve consistent mission success.