

Design Analysis of a High Temperature Radiator for the Variable Specific Impulse Magnetoplasma Rocket (VASIMR)

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ABSTRACT

The Variable Specific Impulse Magnetoplasma Rocket (VASIMR), currently under development by Ad Astra Rocket Company, is a unique propulsion system that can potentially change the way space propulsion is performed. VASIMR's efficiency, when compared to that of a conventional chemical rocket, reduce propellant needed for exploration missions by a factor of 10. Currently plans include flight tests of a 200 kW VASIMR system, titled VF-200, on the International Space Station. The VF-200 will consist of two 100 kW thruster units packaged together in one engine bus. Each thruster unit has a unique heat rejection requirement of about 27 kW over a firing time of 15 minutes. In order to control rocket core temperatures, peak operating temperatures of about 300°C are expected within the thermal control loop. Design of a high temperature radiator is a unique challenge for the vehicle design. This paper will discuss the path taken to develop a steady state and transient based radiator design. The paper will describe radiator design options for the VASIMR thermal control system for use on ISS as well as future exploration vehicles.