Ad Astra Rocket Company
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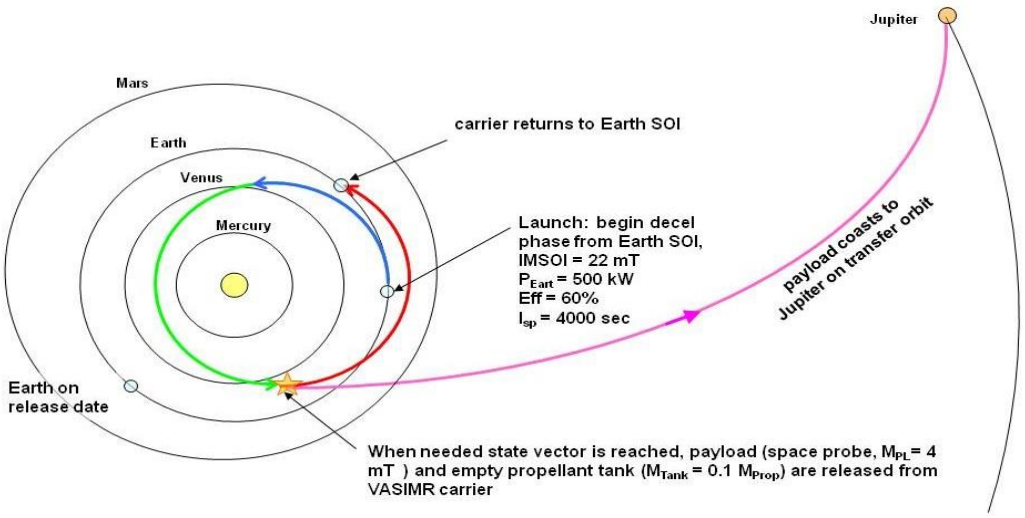
Ad Astra's VASIMR® Deep Space Catapult

Ad Astra Rocket Co (Ad Astra), developers of the VASIMR® electric propulsion engine, presents the advantages of its propulsion technology to deliver large (>2Mt) scientific payloads to points in deep space, such as the Jupiter system, very fast, by means of a high power (> 300 kW), solar electric propulsion (SEP) space tug.

Concept of a 300 kW VASIMR®-SEP space tug with attached payload

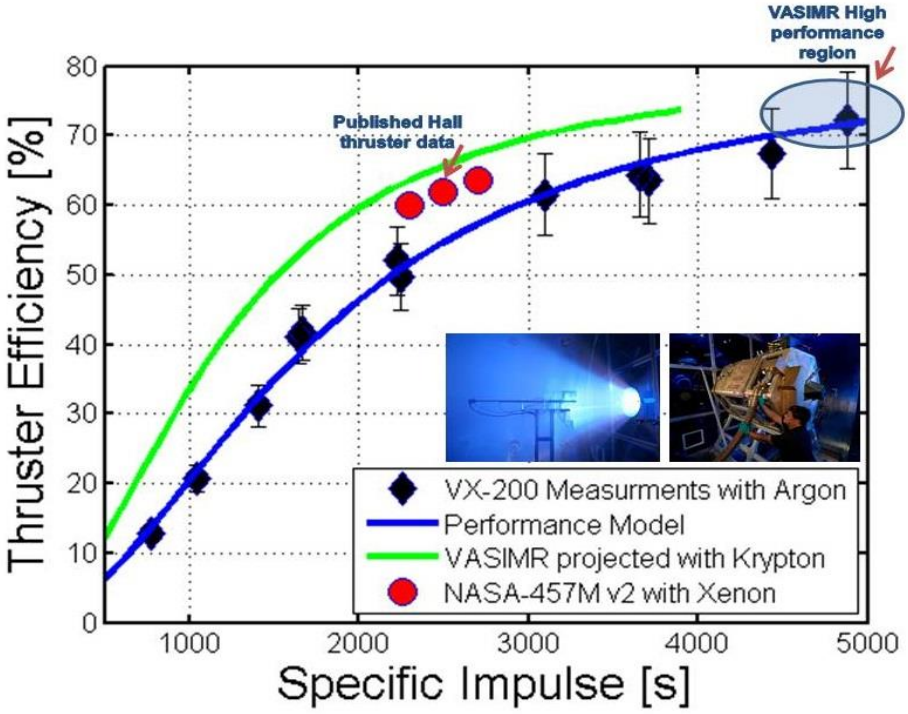
Instead of relying on a gravity assist, the mission architecture enables the space tug to deliver sufficient impulse to the payload in an accelerating boost arc trajectory of high solar illumination in the inner solar system. After enough velocity is achieved, the tug releases the payload, which coasts to its destination in the Jupiter system. The space tug is recovered for multiple uses. The VASIMR® propulsion system could provide fast and affordable primary propulsion for a growing market of deep space planetary missions carrying exploratory robots. Since the tug is parked in high Earth orbit for multiple uses, its launch cost could be amortized over several missions and payload capability for multiple missions could be significantly enhanced.



As an example, a 22 t solar-electric, VASIMR® driven spacecraft, starting at the Earth Sphere of Influence, delivers a 4,000 Kg payload to Jupiter in about 2.8 years (for comparison: NASA's 3,625 kg Juno spacecraft will take over 5 years to reach Jupiter). A trajectory animation of this mission, showing the various phases of flight and the evolution of trajectory and performance parameters is available at https://youtube.com/watch?v=vSP1nUnJ9EI .

Ad Astra has executed more than 10,000 reliable high-power firings of its 200 kW VX-200 VASIMR® rocket prototype, running with argon propellant in its Houston vacuum chamber with greater than 70% thruster efficiency[1]. Operation with krypton was also demonstrated in 2012.

The high power scalability of the VASIMR® engine favors this technology over competing electric thrusters for high power SEP applications. Its electrode-less design is expected to reduce component wear and increase lifetime. The engine has inherent high power density and high specific impulse (I_{sp}) and no concerns for thruster scalability at total power of up to 1 MW. VASIMR® systems also use more economical propellants, such as argon (~$5/kg) and krypton (~$300/kg), than conventional Hall and ion thrusters, which operate with much rarer and expensive xenon (~$1000/kg). Such flexibility results in significant operational cost savings.



VX-200 performance data, (Inset: VX-200 engine, and VX-200 plume at 200 kW)

[1] B. Longmier, et al. ***"Improved Efficiency and Throttling Range of the VX-200 Magnetoplasma Thruster"*** JOURNAL OF PROPULSION AND POWER, Vol. 30, No. 1, January–February 2014

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