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VX-200 VASIMR® PROTOTYPE INCREASES HIGH-POWER PERFORMANCE, DEMONSTRATES EFFICIENT CONSTANT POWER THROTTLING

[Houston, TX. For immediate release] – Ad Astra Rocket Company reports two important advances with its VX-200 high power VASIMR® engine prototype:

1) a significant increase in its high power performance over previous test data obtained in late 2010, and

2) demonstration of the VASIMR®-unique feature called "Constant Power Throttling" (CPT).

These results will be presented on Monday July 30, 2012 at the 48th American Institute of Aeronautics and Astronautics' (AIAA) Joint Propulsion Conference in Atlanta, Ga. USA, in the paper entitled: *"VASIMR® VX-200 Improved Throttling Range."*

1. High power performance improvement

Experimental data obtained in June 2012 on Ad Astra's VX-200 high power VASIMR® engine prototype showed an improvement in efficiency at intermediate values of specific impulse (I_{sp}) below the 5000 sec optimal point demonstrated in late 2010.The engine performance had yet to be optimized at these intermediate values. The June 2012 campaign successfully accomplished this task, producing a new optimized performance model that shows approximately a 10% improvement in engine efficiency over a wide I_{sp} range.

The June experimental campaign builds on prior data obtained in 2009 and 2010 which demonstrated high efficiency at high specific impulse. However, unlike the prior data, the new experiments have optimized the plasma discharge at every point, resulting in a new performance curve (Fig.-1, blue trace). This substantial improvement in performance is a new operational landmark for the 200 kW engine prototype. The attached graph also shows how the engine performance improved over several experimental campaigns that began in 2009 when the first high power tests were conducted. The efficiency improvements have been achieved by improving the design of critical engine components, "fine-tuning" the settings of the radiofrequency power system, and improving the software that controls the engine during startup and firing.

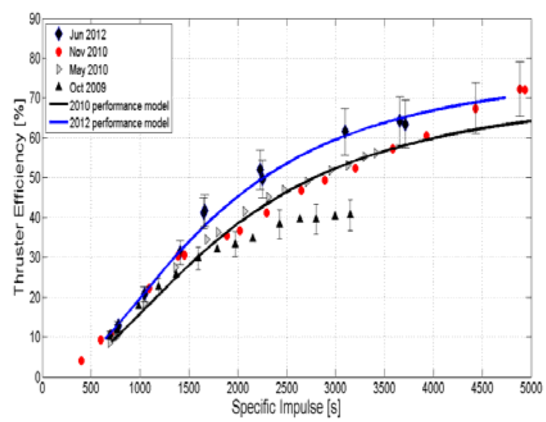

Fig-1: VX-200 engine performance over several experimental campaigns (2009 – 2012). Blue trace shows the new performance model based on the most recent data.

2. Demonstration of efficient Constant Power Throttling (CPT)

The throttling that makes VASIMR ® uniquely distinctive from other in-space propulsion designs is its ability to vary the plasma exhaust parameters (thrust and I_{sp}) while operating at a fixed total power level. This technique, called "Constant Power Throttling (CPT)," is similar to the function of a transmission in an automobile. Using optimal CPT for different phases of a mission, VASIMR® is capable of increased payload mass and decreased trip times compared to other technologies.

Constant Power Throttling is made possible by changing the relative fraction of power going to the first stage (helicon) and second stage (ion cyclotron heating (ICH)) systems and simultaneously changing the rate at which the propellant gas is fed into the engine. For high thrust, power is routed predominantly to the helicon with propellant consumed at a relatively high rate, producing more ions at lower exhaust velocity (low I_{sp}). For high I_{sp}, more power is diverted to the ICH while less power and propellant are being fed to the helicon with concomitant reductions in thrust. The June 2012 experimental data show that for power ratios ≥ 2, this process can be done without significant loss in efficiency.

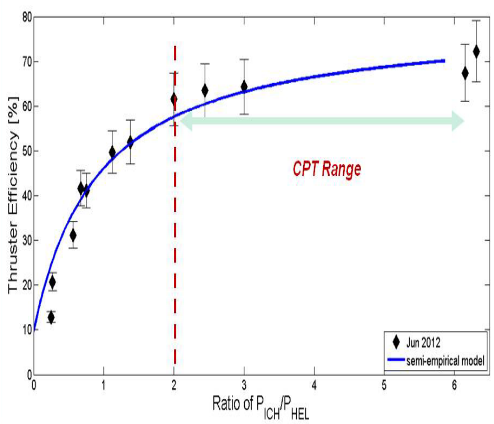

Fig-2: VX-200 engine efficiency vs second to first stage power ratio. Above a ratio of ≥ 2,throttling can be done without significant loss in efficiency.

"The recent data represent one more step in the full characterization of the engine and validate the assumptions on which our business models are based" said Franklin R. Chang Díaz, Ad Astra's CEO. "I am proud of our team and of the reliability demonstrated by the VX-200 system. It took approximately one thousand carefully adjusted firings of the engine to determine the optimized performance conditions, with both rocket stages running over wide ranges of power," said Dr. Jared P. Squire, Director of Research and leader of the experimental campaign.

ABOUT THE TECHNOLOGY

Short for Variable Specific Impulse Magnetoplasma Rocket, VASIMR® works with plasma, an electrically charged gas that can be heated to extreme temperatures by radio waves and controlled and guided by strong magnetic fields. The magnetic field also insulates any nearby structure so temperatures well beyond the melting point of materials can be achieved. The plasma can be harnessed to produce propulsion. In rocket propulsion, the higher the temperature of the exhaust gases, the higher their velocity and hence the higher their fuel efficiency. Plasma rockets feature exhaust velocities far above those achievable by their chemical cousins, so their fuel consumption is extremely low.

ABOUT AD ASTRA

Ad Astra Rocket Company was established in early 2005 to commercialize the technology of the VASIMR® engine, an advanced plasma propulsion system with potential to support an emerging in-space transportation market. The company has its main laboratory and corporate headquarters at 141 W. Bay Area Boulevard in Webster, Texas, USA, about two miles from the NASA Johnson Space Center. Ad Astra also owns and operates Ad Astra Rocket Company, Costa Rica, a supporting research and development subsidiary in Guanacaste, Costa Rica.