

INTRODUCTION

This document introduces the main business elements of Ad Astra Rocket Company. Its purpose is to provide a broad and summarized view of the company's history, technology base, objectives, business model and financial strategies. This document is not an offer of securities for sale in the United States. Securities may not be offered or sold in the United States absent registration or an exemption from registration. Any public offering of securities to be made in the United States will be made by means of a prospectus that may be obtained from the company and will contain detailed information about the company and its management, as well as financial statements. This executive summary is provided as introductory information only and is not intended to be the sole vehicle upon which investment decisions should be made.

COMPANY DESCRIPTION

Ad Astra Rocket Company is a private Delaware Corporation established January 14, 2005 and capitalizing on more than 25 years of NASA research and development in plasma space propulsion technology. The company has its main laboratory and corporate headquarters in the city of Webster, Texas, USA, two miles from the Johnson Space Center. Ad Astra also owns and operates Ad Astra Rocket Company, Costa Rica, a supporting research and development subsidiary, 10km west of the city of Liberia in Guanacaste, Costa Rica.

The company was initially formed to commercialize the technology of the Variable Specific Impulse Magnetoplasma Rocket (VASIMR[®]), a plasma propulsion system being developed to support an emerging market in commercial in-space transportation. Ad Astra is also pursuing near-term earthbound uses of plasma technology in waste remediation, energy and a number of plasma modeling applications.

Presently, the company's main objective is to bring the VASIMR[®] engine to full operational deployment

Ad Astra Rocket Company 141 West Bay Area Blvd. Webster, TX 77598 Telephones: USA: 281-526-0500 (voice) 281-526-0599 (fax) Costa Rica: 506-2666-9272 (voice) European Office: 0049-6192-902591, Frankfurt, Germany. www.adastrarocket.com

in space, a goal planned for late 2013. The engine could be initially operated in a number of developing market applications in Earth orbit, including drag compensation of orbiting space stations and satellite delivery, repositioning and general servicing. Later, the VASIMR[®] is expected to provide primary propulsion for cargo and supply missions to the Moon and ultimately ready access to space resources, including asteroids and comets and to support robotic and human missions to Mars and beyond.



VX-100 test bed assembly, Houston Facility

COMPANY HISTORY

Ad Astra was founded by NASA astronaut and rocket scientist Franklin R. Chang Díaz through a privatization initiative with NASA that led to the June 23, 2005 signing of a Space Act Agreement, transforming the NASA Advanced Space Propulsion Laboratory (ASPL) into the new private company. On February 6, 2006, a royalty-bearing exclusive license to the NASA VASIMR[®] patents was granted to Ad Astra by the US Government.

Following this transition, the company operated at a much faster pace exclusively on private investment capital. Major improvements to the original NASA technology have been realized, resulting in new intellectual property solely owned by Ad Astra.

On July 15, 2006 Ad Astra inaugurated a 700m² research facility in Costa Rica supporting the

Houston operation. This installation is designed to carry out reliability and life cycle studies of major VASIMR[®] components, off-loading the parent company to focus on the critical design and integration of the system. In May of 2007, the US State Department granted an export license to Ad Astra, allowing the export of the first stage of the VASIMR[®] system to this facility for reliability and life cycle testing. The Costa Rica subsidiary is also coordinating a number of earthbound applications of plasma technology, including plasma waste remediation and energy research.



Early VASIMR[®] device, at NASA Johnson Space Center

THE TEAM

Ad Astra is controlled by a board of directors elected annually by company shareholders. Board chairman and CEO is Dr. Franklin Chang Díaz, inventor of the VASIMR[®] system. Other board members include Dr. Jared P. Squire, an experimental plasma physicist from MIT with over 20 years of experience in plasma research, Dr. Tim Glover, also an experimental physicist from Rice University with extensive experience in plasma diagnostics, Mr. Robert Singer, an attorney with over 30 years experience in business and corporate law, Mr. Edelmiro Muñiz, president and owner of MEI Technologies Inc. a major aerospace company in Houston and Mr. George W. S. Abbey, former director of the NASA Johnson Space Center in Houston, Texas. Ad Astra Costa Rica is headed by Ing. Ronald Chang Díaz, an engineer and prominent businessman with over 10 years of experience in major project development. Mr. Mariano Alvarez Cañas, an economist with over 30 years of experience in investment and banking serves as the company's international business advisor and principal liaison for Ad Astra in Europe. Mr. Oscar Luis Chaves, president of Grupo Aldesa Investment Group http://www.aldesa.com/index ing.htm is a principal

business and financial advisor and handles the company's investors in Costa Rica.



Inaugurated July 15, 2006, Ad Astra Costa Rica is located at La Flor Campus of EARTH University, Guanacaste Province

The company has an advisory board that includes recognized leaders in science, space and business, such as MIT Prof. Samuel C. C. Ting, Nobel laureate (physics 1976), Academician Roald Sagdeev, former director of the Soviet Space Science Institute, Gemini, Apollo and Space Shuttle Astronaut John W. Young, Mr. Art Dula, President and Chief Executive Officer of Excalibur Almaz LLC and Mr. Chris Stott, a business faculty member of the International Space University and CEO of ManSat USA Inc.



Schematic overview of the VASIMR[®] system

THE TECHNOLOGY

VASIMR[®] works with plasma, a very hot gas at temperatures close to the interior of the sun.

Plasmas are electrically charged fluids 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.

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.



VASIMR VX-200 plasma jet, July, 2008

THE BUSINESS MODEL

The cost of launching rocket fuel into space is a major driver in the cost of space operations. Plasma rockets require much less fuel to operate. Such savings in propellant translate into increased capability and lower cost and enable a number of commercial missions to Earth's satellite constellation, which are not economically possible today, including servicing, refueling, repositioning and safe and cost-effective disposal of inoperative orbital assets. A similar analysis applies to supply missions to the Moon and a number of other applications in Earth orbit and beyond.

VASIMR[®] also has advantages over other competing plasma rockets due to its electrode-less design and its use of inexpensive and abundant propellants such as argon, neon and hydrogen. Other systems tend to suffer from wear and erosion of electrodes immersed in the hot plasma; also, the use of Xenon propellant in these systems tends to make them much more expensive to operate. The current price of commercial Xenon is about \$2000/kg vs. Argon at about \$40/kg.



VASIMR[®] VX-200 prototype test in vacuum facility

THE MARKET

Market research¹ supports the profitability of private spaceflight for tourism and other commercial applications. In recent years, private investment in non-government commercial spaceflight projects has grown dramatically. Major players, such as SpaceX, Bigelow Aerospace, Scaled Composites and Virgin Galactic are planning, over the next 8–10 years, to develop suborbital and orbital transport vehicles and modular space stations. VASIMR[®] is expected to perform the following functions in an emerging international public and private market at a fraction of the cost of competing technologies:

- 1. drag compensation for space stations
- 2. lunar cargo delivery
- 3. satellite repositioning
- 4. satellite refueling, maintenance and repair
- 5. In space resource recovery
- 6. Ultra fast deep space robotic missions



Emerging Space Market

¹ Futron Market Study: Orbital Space Travel & Destinations with Suborbital Space Travel, Oct. 2002.

NEAR AND FAR TERM PLANS

In 2009, Ad Astra expects to demonstrate the full power operation of the 200kW VX-200, the first VASIMR[®] flight-like prototype. This test will pave the way for the design and construction of the VF-200, the first flight unit, expected to be launched into space in late 2013. Preparations for this flight have already started and followed the December 8, 2008, signature of a Space Act agreement between Ad Astra and NASA to test VASIMR[®] on the International Space Station (ISS)².



Ad Astra plans to test the VF-200 flight engine on board the ISS in late 2013

Beyond this demonstration, Ad Astra plans to fill a developing high power commercial transportation niche in the Earth-Moon environment, as described above.

The 2013 VASIMR[®] test on the International Space Station is expected to lead to multiple and immediate revenue producing applications:

1) Capability of maintaining the International Space Station in a stable orbit at 1/20th of the approximately \$210 million/year present estimated cost.

2) Improvements in a variety of satellite mission applications, including plane changes, increased maneuverability and speed of completion, refueling, repair, ultimate disposal over present capabilities 3) In a combined chemical- VASIMR[®] transfer stage, it could nearly triple the payload delivery to the Moon as compared to an all chemical approach

4) In a solar-boosted mission design concept, proposed by Ad Astra, VASIMR[®] decreases the transit time of a mission to the Jupiter system to 1/5 of the all chemical mission approach (including a gravity assist)

For robotic resupply missions to future human lunar outposts, Ad Astra is designing a 2MW solar powered VASIMR[®] lunar tug capable of delivering more than twice the payload to the Moon (~34MT,) as compared to the all-chemical stage presently envisioned (~16MT.) Such enhancements in payload capability could result in savings of up to \$400M/year over the present lunar resupply architecture.



A VASIMR $^{\!\!\rm test}$ cargo tug delivers more than twice the payload to the Moon, vs. an all chemical system

Another far-term application of the technology involves resource recovery from space, particularly water, from near Earth orbiting asteroids and comets. While these missions remain in the conceptual stage, in August of 2007, Ad Astra signed a contract with Excalibur Exploration Ltd., a British Company based in Douglas, Isle of Man, granting the latter the right of first refusal to acquire VASIMR[®] engines for space resource recovery³.

PRESENT STATUS

After five years of operations, the company is maintaining a fast pace, focusing on maturing the VASIMR[®] technology to flight readiness. Through targeted experiments and technology demonstrators, the company has increased the technology readiness level (TRL, as defined by

² Ad Astra press release 121208

³ Ad Astra Press Release 082107-1

NASA <u>http://www.hq.nasa.gov/office/codeq/trl/trl.pdf</u>) of the VASIMR[®] system to a level 6. The VF-200 flight test will represent a TRL of 7 and the first demonstration of a high power plasma engine in space. Significant increases in intellectual property have been generated by Ad Astra, through its two research facilities in Texas and Costa Rica, as a result of this effort.



Technology Readiness Level evolution since company creation in 2005

The VX-200 test program has continued since mid 2008 and aims at demonstrating the VASIMR[®] system in a high level of integration. Tests are conducted in Ad Astra's 150 m³ high-vacuum chamber in the Texas facility. Major milestones in this testing program have been achieved, including:

1. First plasma	May 2008
-----------------	----------

- 2. Full (30kW) first stage power demo Oct. 2008
- 3. Second stage integration Jan. 2009
- 4. VX-200 full (2Tesla) magnetic field July 2009
- 5. VX-200 at full (200kW) rated power Oct. 2009

Following the December 8, 2008 agreement, activities with NASA are also underway to develop the configuration for the 2013 space flight test. Five "gates" or milestones are identified in the document, which both Ad Astra and NASA must cross in preparation for space flight. Gate #1, the signature of the Payload Integration Agreement (PIA), was crossed on June 3, 2009. Gate #2, the Preliminary Design Review (PDR) is planned for mid 2011. The other gates are: #3, Critical Design Review (CDR) in early 2012; #4, Certificate of Flight Readiness (COFR) in mid 2013 and #5, Flight Readiness Review in late 2013 at the launch facility just before launch.

In its development of the VASIMR[®] system, Ad Astra has established alliances with other high technology

companies with proven records. These include Alliant Techsystems (ATK)⁴ http://www.atk.com/, a major US space technology company, Nautel Ltd⁵. of Canada, http://www.nautel.com/, a world leader in high power, compact RF technology, Costa Rican Aerospace Alliance, CORAAL⁶ http://www.coraal.cr/, who is participating in the flight system design and MEI Technologies Inc., http://www.meitechinc.com/ a leading Houston-based high technology company. In addition, Ad Astra is establishing a collaborative relationship with the world leader in manufacturing temperature superconducting material. high Superpower Inc. http://www.superpower-inc.com/, who is supporting Ad Astra in the design and fabrication of the superconducting module for the VF-200 flight engine.



200 kW, VX-200 VASIMR[®] engine prototype readied for plasma tests in Ad Astra's 150 m³ vacuum chamber



High power VX-200 plasma exhaust is characterized by an array of diagnostics at Ad Astra's Webster facility.

FURTHER READING

Please Visit www.adastrarocket.com

1. F. R. Chang Díaz, "The VASIMR Rocket," <u>Scientific</u> <u>American</u> **283** (5) 90-97 (2000)

⁴ Ad Astra press release 032608

⁵ Nautel press release May 9, 2007

⁶ Ad Astra press release 090508