X PRIZE Team Summary Sheet
THE DA VINCI PROJECT

"For once you have tasted flight you will walk the earth with your eyes turned skywards, for there you have been and there you will long to return." - Leonardo da Vinci (1452–1519)

All the information given in this document has been cleared for official release by the X PRIZE Foundation and the da Vinci Project team. Quotes provided by DVP are shown in italics. For more information about DVP or if you have questions about DVP, please visit their web site at www.davinciproject.com.

TEAM OVERVIEW

The da Vinci Project (DVP), led by Brian Feeney of Toronto, Ontario, Canada, registered to contend for the X PRIZE on 2 June 2000. Their spacecraft, called "da Vinci," will be lifted by a reusable helium balloon to 80,000 feet where the rocket engines will fire to take the crew to the required 100 km altitude.

TEAM LEADER BACKGROUND

Brian Feeney has a strong background in large project management and 3-D computer aided design. He possesses specific design and analytical skills in liquid rocket propulsion engines and systems, aero structure layouts and design, reaction control systems, and flight profile and trajectory analysis. His own business background is in closed loop life support systems specializing in the development of advanced life support solutions for aerospace, military and commercial applications. Brian is on the Advisory Board of CSEDI, Canadian Space Exploration and Development Institute.

Short biographies of the rest of the team members are given later in this document.

DATA AT-A-GLANCE

TEAM SPECIFICATIONS

- Name: The da Vinci Project
- Leader: Brian Feeney
- Place: Toronto, Ontario, Canada
- Registered with X PRIZE: 2 June 2000
- Web: www.davinciproject.com

VEHICLE SPECIFICATIONS

- Name: Wild Fire
- Dimensions: 16 feet long, 56 inches in diameter
- Gross Take-Off Weight: 7,200 lb_m
- Dry Weight: 3,200 lb_m
- Crew Capsule: 56 inch diameter sphere
- Crew Environment: Pressurized to 1 atm with pressure suits
- Payload Capacity: 900 lb_m
- Propulsion System: 2 gimbaled, pressure fed rocket engines
- Propellants: Kerosene and liquid oxygen
- Total Thrust: 10,000 lb_f
- Reaction Control System: Cold gas helium integrated with GPS and INS for flight guidance
- Miscellaneous: One main parafoil and 1 back up chute, additional back up chute on the separable capsule, fully reusable balloon as launch platform

MISSION SPECIFICATIONS

- Ascent Method to Ignition Alt.: Reusable helium balloon
- Ascent Duration: 60 to 80 minutes
- Alt. at Ignition: 80,000 feet
- Orientation at Ignition: 80 degrees up, changing to 90 deg after 8 seconds
- Max. Accel. Force on Ascent: 3.25g
- Alt. at Engine Cut-off: 206,000 feet
- Time at Engine Cut-off: 100 seconds
- Max. Speed: 2,670 miles per hour
- Max. Altitude: 120 km
- Time in Weightless Conditions: 3.5 minutes
- Reentry Method: 52 deg ballute inflates around vehicle and cone inflates around engines
- Accel. Forces on Descent: 20 sec>3g; max 5.76g
- Landing Method: GPS guided parafoil deploys at 25,000 feet and cone inflated around engines softens landing
- Total Duration: 90 to 110 minutes
- Landing Distance from Take-off Location: 10-100 km depending on winds
- Time Between Missions: Days

VEHICLE/LAUNCH SYSTEM DESCRIPTION

The DVP vehicle is called “da Vinci” and is designed to carry three people to an altitude of 100 km and return them safely to the Earth. The entire launch system is comprised of two parts: the da Vinci rocket and an unmanned reusable helium balloon which lifts the rocket to altitude before the rocket engines are fired. Guidance is accomplished using an integrated GPS / INS system into the RCS and fully gimbaled engines.

The vehicle is a cylindrical rocket with a blunt nose cone, an inflatable base area cone (used to cushion the landing). The da Vinci is approximately 16 feet long and 56 inches in diameter. It gross initial take off weight is approximately 7,200 pounds, including a 900 pound payload (passenger) capacity. The da Vinci rocket is suspended beneath the helium balloon and carried to an altitude of 80,000 feet before its engines are fired. A GPS guided parafoil is used for landing accuracy and safety.

PROPULSION SYSTEM

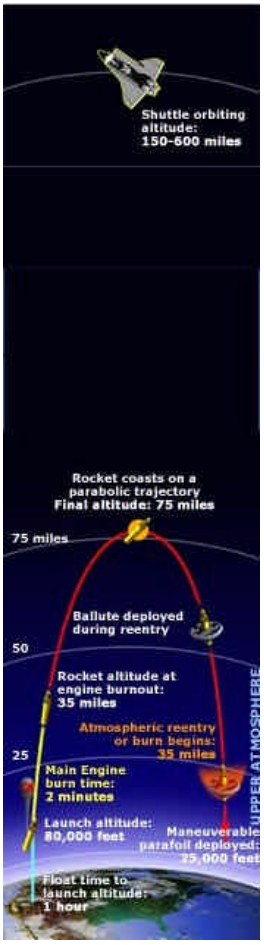
The propulsion system of da Vinci, under development since 1992, is based on the principles of reliability, re-usability, and safety. Two engines are used on da Vinci, burning kerosene with liquid oxygen in a helium pressure fed system to generate 10,000 pounds of thrust. The rocket engines, the entire propulsion subsystem, and the flight guidance system are being supplied by the DVP propulsion team in California, USA. Ground firing and flight testing have occurred already.

MISSION DESCRIPTION

VEHICLE ASCENT

The Rocket will be tethered to the world’s largest fully reusable helium balloon and floated to an altitude of 80,000 feet. The ascent sequence starts with ground launch of the helium balloon with the DVP rocket tethered 720 meters below the base of the balloon at an 80-degree up angle. After approximately one hour, the rocket will arrive at a launch altitude of 80,000 feet. Following a series of launch procedures, a 120 second computer controlled automatic countdown sequence is initiated and the engines are ignited. Immediately on engine start the rocket releases from the balloon tether and for the next 8 seconds the vehicle flies an 80 degree angle trajectory. Thrust vectoring changes the trajectory of the rocket to 90 degrees (straight up) for the remainder of flight. Main engine cut off occurs at 39 miles - 4 G's have been reached, total time since firing engines is 100 seconds. The speed is Mach 4 or about 2,670 mph (1.19 kilometers per second). The rocket continues up to apogee - about 100 seconds - 120 kilometers - and then begins free fall for 105 seconds - total zero G time about 3 minutes 30 seconds. A reentry ballute is deployed T plus 15 seconds after apogee. The main chute deploys at 25,000 feet. Landing occurs at 4 meters per second.

During the ascent (and descent) stages, a fully gimbaled camera platform attached to a helium balloon follows and films the rocket balloon float altitude is 100,000 feet plus.



WEIGHTLESSNESS

After 100 seconds and at 206,000 feet, the main engines are cut off. The crew has experienced acceleration forces up to three and half times the force of gravity (3.5 g). The speed of the vehicle at this point is Mach 4, or approximately 2,670 miles per hour. The rocket coasts for about 105 seconds to an altitude of 120 km and then begins free fall for another 105 seconds. The total time the crew experiences micro-gravity conditions is approximately 3 minutes and 30 seconds.

VEHICLE DESCENT AND LANDING

Fifteen seconds after apogee is reached a reentry ballute is deployed and a high temperature cone around the base area is inflated. (This cone is later used as the landing absorption cushion to protect the engines.) The ballute is used to increase surface area and maintain passive static stability of the reentering capsule. The main parachute deploys when the vehicle descends to 25,000 feet. The parachute flight is guided by global positioning system (GPS) to a predetermined landing site.

When it touches ground, the inflated base area cone slightly deforms to cushion the impact of the capsule. The rocket falls to one side and is supported by the main ballute at a 52 degree angle.

HARDWARE & TESTS

DVP has a full-scale engineering prototype of the da Vinci which has appeared at a wide variety of aerospace industry and general public occasions. The da Vinci full scale propulsion system has been built, tested, and flown twice successfully. Specific engine tests are described below. Full-scale aeroshell flight hardware is presently under construction. The following is a list of vehicle system and flight tests performed to date.

- 1992: Long duration engine firing test successfully completed. Numerous engine ground firing test were successfully completed throughout the 1990's leading up to the first flight test in 1999
- January 1999: Flight qualification of single engine vehicle configuration.
- 09 March 2001: Flight qualification of double engine vehicle configuration and the flight guidance system.

PUBLICITY

GUEST SPEAKING APPEARANCES

- November 2002 – York University, Engineering Faculty Canadian Space Institute
- June 2002 - University of Toronto, Engineering Faculty Canadian Space Society
- February 2002 - Queens University, Engineering Faculty Canadian Student Summit on Aerospace
- November 2001 - York University, Engineering Faculty Canadian Space Institute
- August 2001 - Press Conference City Core Golf Club
- June 2001 - Ideas City 2001, Meeting of the Minds
- May 2001 - Toronto Aviation & Aircraft Show, Downsview Park; Press Conference Toronto Aerospace Museum
- April 2001 - Canadian Aeronautics and Space Institute, Toronto Branch Annual Dinner; Carlton University, Engineering Faculty Canadian Astronautics & Space Institute
- February 2001 - University of Toronto, Engineering Faculty Annual rocket competition
- January 2001 - University of Waterloo, Canadian Undergraduate Technology Conference
- November 2000 - University of Toronto, Space Summit 2000 Conference
- July 2000 - Press Conference Ontario Science Center

TELEVISION

- June 2002 - CP24 Home Page with David Onley; CP24 Ideas City 2002
- September 2001 - BBC Documentary, Britain
- August 2001 - CP24 Ideas City 2002; CITY TV News; NEXT TV Program, National Syndication

- June 2001 - Discovery Channel, Science News Program
- May 2001 - History Channel USA, This Week in History, (First Airing); Report On Business TV, National, The Bottom Line with Michael Vaughn; CTV National, Canada AM, Toronto Aerospace Museum

- August 2000 - Report On Business TV, National, The Bottom Line with Michael Vaughn
- July 2000 - Prime TV Network, National, Prime Business Report, with Deirdre McMurdy, Main Studio; CBC National, Morning Show, Canada; Space TV, National, Canada; CTV National, Canada AM, Main Studio; CP24 News, Canada; CBLT TV News, Toronto; CFTO TV News, Toronto; CHUM City TV News, Toronto; Global National News, Canada; CBC National News, Canada; CTV National News, Canada

The above are just a few of the on air interviews. Local and regional News reports are additional to the above.

RADIO

- August 2001 – MOJO Radio, Humble and Fred Program
- June 2001 - MOJO Radio, Humble and Fred Program
- May 2001 - BBC Radio, UK
- September 2000 - CBC National Radio, CBC Morning with Sheila Rogers
- October 2000 - CBC National Radio, Quirks & Quarks 25th Anniversary Program
- July 2000 - Edmonton, Alberta Radio; CBC National Radio Canada, Quebec; CBC National Radio Canada

The above are just a few of the on air interviews. Radio News reports are additional to the above

PRINT MEDIA

- August 2002 - “Big Dreams”, Moose Jaw Herald Times
- July 2002 - “Reaching the Final Frontier”, Newsweek Magazine
- July 2002 - “The X Prize”, Discover Magazine
- September 2001 - “Launching into Open Air”, Journal of New England Technology
- August 2001 - “Blastoff to Fame”, Toronto Sun Newspaper; "Mr. Rocketman”, National Post Newspaper
- May 2001 - “Indoor Aviation Show…”, Toronto Star Newspaper; “Canucks Join Race to Space”, Toronto Star Newspaper; “Next Destination for a Family Vacation…”, Christian Science Monitor; “Racing to Win the X Prize”, National Geographic; “X Prize Paves Road to Space”, Popular Mechanics
- March, 2001 - “The da Vinci Project”, Kids World Magazine; “Entrepreneurship: The X Prize”, Engineering Science News; “A Different Kind of Space Race”, Air Transport Security
- January 2001 - “Space Tourism”, Canadian Press; “Wish You Were Here”, Globe and Mail Newspaper; “….Space Tourism”, Globe and Mail Newspaper
- November 2000 - “The $5-million man”, CA Magazine
- September 2000 - “Eyes on the Prize”, GQ Magazine
- July 2000 - “Reach For the Skys”, Macleans Magazine; “Balloon to the Moon”, Toronto Star Newspaper; “Canada’s Rocket Man”, Canadian Press

The above are just a few of the numerous National and International Print Media coverage achieved by the da Vinci Project

TEAM BACKGROUND

TEAM MEMBERS

Other members of the DVP team members include:

- Marc De Jordy - Operations Director
- Dr. Vladimir Kudriatsev – Computational Fluid Dynamics (CFD)
- Bob McCarville – Mechanical Engineering, Analysis and Design
- Bryana Kelbert – Mechanical Engineering, CAD
- Richard Kelbert – Mechanical

Engineering CAD
- Kalman Rooz - Mechanical Engineering, CAD
- Christopher Fleming - - Aerospace Engineer
- Remi Duquette - Aerospace Engineer
- Dave Loewen - Aerospace Engineer
- Noah Hansen - Aerospace Engineer
- Bill Lishman - Designer
- Paul Balcaen – Designer
- Lorne Brandt – Education Programs
- Stephen Hewitt – Media Relation, National Public Relations
- Shannon Davidson - Communication and Public Relations
- Rob Richardson – Computer Systems and Information Technologies
- Chris Johnson – Website design
- Brian Sharp - Filmmaker
- Dave Clark - Animation Specialist

X PRIZE Quote

"The X PRIZE is captivating the minds of the best and the brightest to prove that one can do what many think to be impossible. Its success will break down the barriers to growth and achievement in space flight. The entire planet's population will no longer see itself as bound to just one planet. The X PRIZE's vision will bridge the chasm once again just as the Orteig Prize did to bridge the mind barrier of crossing the Atlantic by air." – Brian Feeney

Philosophy

"DVP symbolizes the capability of the common person and visibly demonstrates what can be achieved privately without the necessity of governments' involvement. It will be an affirmation that anything is possible with vision, determination and ingenuity. DVP hopes to be an inspiration to people and to show that there is no greater power than the will of the individual, that there is freedom in exploration and joy in discovery. The important discoveries for a society seldom come at the points where the path is smooth and straight. It is the curves in that path to adventure that make the trip interesting and worthwhile." – Brian Feeney

Mission and Goals

"History is filled with the exploits of ordinary individuals doing extraordinary things and whose accomplishments propel human progress. Today, we of the da Vinci Project strive to do the same. We seek to win the X Prize, safely launching the first privately funded manned rocket into space and back. We are pulling together the best and brightest in Canada in a collaborative effort to realize this dream. We are people driven by the simple desire to participate and contribute to the true renaissance of Man in space." – Brian Feeney

X PRIZE FOUNDATION

Below is contact information for the X PRIZE Foundation.

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